PROJECT MANUAL
For
BARRAUD PARK
PUMP STATION 153
PHASE I

Bid Opening

June 16, 2015

City of Norfolk
Department of Utilities

*** PLEASE NOTE ***

These BID DOCUMENTS refer to the Hampton Roads Planning District Commission’s Regional Standards, Fifth Edition, December, 2010, as amended, which may be obtained from:

HAMPTON ROADS PLANNING DISTRICT COMMISSION
723 WOODLAKE DRIVE
CHESAPEAKE, VA 23320
PHONE (757) 420-8300

COMMONWEALTH OF VIRGINIA
DAVID M. PARKER
Lic. No. 21306
5-12-15
PROFESSIONAL ENGINEER
# REGIONAL CONSTRUCTION STANDARDS
## Fifth Edition

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May, 2015  
City of Norfolk Department of Utilities
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**DIVISION 28 – NOT APPLICABLE**

**DIVISION 31 – EARTHWORK**

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<tr>
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<td>312000-1 to 10</td>
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<td>312319</td>
<td>Dewatering</td>
<td>312319-1 to 5</td>
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<td>315000</td>
<td>Excavation Support and Protection</td>
<td>315000-1 to 3</td>
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</table>

**DIVISION 32 – NOT APPLICABLE**

**DIVISION 33 – NOT APPLICABLE**
SECTION 101

DEFINITIONS OF TERMS

I. GENERAL DEFINITIONS

Wherever used in the Contract Documents, the following terms shall have the meanings indicated and shall be applicable to both the singular and plural thereof:

1.1 Addenda - Written or graphic instruments issued prior to the opening of Bids which clarify, correct or change the Bid Documents or the Contract Documents.

1.2 Agreement - The written agreement between the Owner and the Contractor covering the Work to be performed; other Contract Documents are attached to the Agreement and made a part thereof as provided therein.

1.3 Application for Payment - The form provided in the Contract Documents which is to be used by the Contractor in requesting progress and final payments and which is to include such supporting documentation as is required by the Contract Documents.

1.4 Bid - The offer or proposal of the Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

1.5 Bid Documents - Documentation issued prior to the bid date, including documentation accompanying the Bid (Drawings, Project Specifications, HRPDC Regional Construction Standards, Addenda, and Special Provisions) and any post-Bid documentation submitted prior to the Notice of Award.

1.6 Bidder - Any person, firm or corporation submitting a Bid for the Work.

1.7 Bonds - Performance and Payment Bonds furnished by the Contractor and the Contractor's surety in accordance with the Contract Documents.

1.8 Bid Security - Bid Bonds and other instruments of surety, furnished by the Contractor or the Contractor's surety in accordance with the Contract Documents.

1.9 Change Order - A written order to the Contractor authorizing an addition, deletion, or revision in the Work within the general scope of the Contract Documents that authorizes an adjustment in the Contract Price and/or Contract Time; issued on or after the Effective Date of the Agreement.

1.10 Completion Date - The date specified in the Notice to Proceed for final completion of the Work.

1.11 Contract Documents - The Agreement, including the Bid Documents, Notice of Award, Notice to Proceed, Field Orders, Change Orders, and modifications.

1.12 Contract Price - The total monies payable to the Contractor under the terms and conditions of the Agreement.
1.13 **Contract Time** - The number of calendar days stated in the Agreement for the completion of the Work. Calendar days shall be understood to be consecutive.

1.14 **Contractor** - The person, firm or corporation with whom the Owner has executed the Agreement.

1.15 **Day** - A calendar day of twenty-four hours measured from midnight to the next midnight. Calendar days shall be understood to be consecutive.

1.16 **Defective** - An adjective, which when modifying the word Work, refers to Work that is unsatisfactory, faulty or deficient, or does not conform to the Contract Documents, or does not meet the requirements of any inspection, reference standard, test or approval referred to in the Contract Documents, or has been damaged prior to the Owner’s acceptance.

1.17 **Drawings** - The plans that show the character and scope of the Work to be performed.

1.18 **Effective Date of the Agreement** - The date indicated in the introductory paragraph of the Agreement.

1.19 **Engineer** - The person, firm or corporation named as such in the Agreement. In the event the Owner should not require the services of the Engineer, then the powers, duties, and responsibilities conferred in the Contract Documents to the Engineer shall be construed to be those of the Owner.

1.20 **Field Order** - A verbal or written order effecting a change in the Work not involving an adjustment in the Contract Price or an extension of the Contract Time, issued by the Engineer or Owner to the Contractor during construction.

1.21 **Final Completion** - All work, including punch list items noted at the final inspection, is complete to the satisfaction of the Owner.

1.22 **Laws and Regulations** - Any and all applicable laws, rules, regulations, ordinances, codes and orders of any and all governmental bodies, agencies, authorities and courts having jurisdiction.

1.23 **Liens** - Liens, charges, security interests or encumbrances upon real or personal property.

1.24 **May** - The term "may" is permissive.

1.25 **Notice** - All written notices, demands, instructions, claims, approvals, and disapprovals required to obtain compliance with the Contract Documents. Any written notice by either party to the Agreement shall be sufficiently given if delivered to or at the last known business address of the person, firm or corporation constituting the party to the Agreement, or to his, their, or its authorized agent, representative or officer, or when enclosed in a postage envelope addressed to such last known business address and deposited in a United States mailbox. Notice shall be deemed received within 3 business days of U.S. Mail Service postmark date.

1.26 **Notice of Award** - A written notice by the Owner to the apparent Successful Bidder stating that upon compliance by the apparent Successful Bidder with the conditions precedent enumerated therein, within the time specified, the Owner will sign and deliver the Agreement.

1.27 **Notice to Proceed** - A written notice given by the Owner to the Contractor (with a copy to the Engineer, if appropriate) fixing the date on which the Contract Time will commence to run and on which the Contractor shall start to perform its obligations under the Agreement.
1.28 **Owner** - The public body or authority, corporation, association, firm or person with whom the Contractor has entered into the Agreement and for whom the Work is to be provided.

1.29 **Owner's Representative** - The person, firm or corporation named by the Owner to act as the Owner’s agent.

1.30 **Partial Utilization** - Use by the Owner of a substantially completed part of the Work for the purpose for which it is intended (or a related purpose) prior to Substantial Completion of all the Work.

1.31 **Project** - The entire Work as described in the Contract Documents, including Work that is necessary and incidental to the furnishing of all materials, services, equipment, labor and supplies required to install, perform, and complete all items of Work in accordance with Contract Documents.

1.32 **Reference Standards** - Those bulletins, standards, rules, methods of analysis or test, codes, and specifications of other agencies, engineering societies, or industrial associations referred to in the Contract Documents. These refer to the latest edition, including amendments in effect and published at the time the Project was advertised, unless specifically referred to by edition, volume, or date.

1.33 **Regional Construction Standards** - The construction standards, published by the Hampton Roads Planning District Commission (HRPDC) as amended from time to time.

1.34 **Responsible Bidder** - A person or firm who, in the sole opinion of the Owner, has the capability in all respects, to fully perform the contractual requirements as well as the moral and business integrity and reliability to assure good faith performance.

1.35 **Responsive Bidder** - A person or firm who has submitted a bid that conforms in all material respects to the Bid Documents.

1.36 **Resident Project Representative** - The authorized representative of the Engineer or Owner who is assigned to the Project or any part thereof.

1.37 **Roadway Prism** - All of the land or area within the right of way that needs to be cut, filled, graded, or otherwise disturbed to produce the design cross section, including, but not limited to, areas for curbs, ditches, sidewalks, paths, and slopes to match existing grade.

1.38 **Rock** - Any indurated material with a minimum compressive strength of 200psi that requires drilling, wedging, blasting, or other methods of brute force for excavation.

1.39 **Shall** - The term "shall" is mandatory.

1.40 **Shop Drawings** - All drawings, diagrams, illustrations, schedules, specified design related submittals, and other data or information which are specifically prepared or assembled by or for the Contractor and submitted by the Contractor to illustrate some portion of the Work.

1.41 **Special Provisions** - Requirements in addition to or modification of the HRPDC Regional Construction Standards.

1.42 **Specifications** - Those portions of the Contract Documents or HRPDC Regional Construction Standards consisting of written technical descriptions of materials, equipment, construction systems, standards and workmanship as applied to the Work and certain administrative details applicable.
thereto.

1.43 *Standard Details* - Those portions of the HRPDC Regional Construction Standards consisting of drawings, explanatory of another drawing, indicating in detail and at a larger scale, the design, location, composition and correlation of elements and materials.

1.44 *Subcontractor* - A person, firm or corporation having a direct contract with the Contractor or with any other Subcontractor for the performance of a part of the Work at the site.

1.45 *Substantial Completion* - That date certified by the Owner when the construction of the Project or a specified part thereof is sufficiently completed in accordance with the Contract Documents, including completion of all tests, so that the Project or specified part can be utilized for the purpose for which it is intended.

1.46 *Successful Bidder* - The lowest, responsible and responsive Bidder to whom the Owner (on the basis of the Owner's evaluation as hereinafter provided) makes an award.

1.47 *Supplier* - Any person or organization that supplies materials or equipment for the Work, including that fabricated to a special design.

1.48 *Underground Facilities* - All pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels or other such facilities or attachments, and any encasements containing such facilities which have been installed underground to furnish any of the following services or materials: electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, sewage and drainage removal, traffic or other control systems or water.

1.49 *Work* - All labor, materials, equipment, transportation, supervision, or other facilities, duties or incidentals necessary for execution and completion of the Project in compliance with the Contract Documents.

End of Section
SECTION 102

BIDDING REQUIREMENTS AND CONDITIONS

I. INVITATION FOR BIDS

Long Form

PROJECT: Barraud Park, Pump Station #153, Phase I
LOCATION: Norfolk, VA
CONTACT NAME AND NUMBER: Selo Qejvani, Project Manager
                        Tel: (757) 664-6773
                        Email: Selaudin.Qejvani@norfolk.gov (Email is preferred)

The City of Norfolk will receive sealed Bids for the above titled Project at the office of the Department of Utilities located at 400 Granby Street, 2nd floor, Norfolk, VA 23510 until 3:00 p.m. local time on June 16, 2015, at which time the Bids will be publicly opened and read aloud. Any Bids received after the specified time and date will not be considered. The Work under this Project consists of the construction of Pump Station 153, including but not limited to 50 LF of 12” gravity sewer, 177 LF of 8” force main, 30 LF of 3/4” copper water service, 20 LF of 3/4” gas service piping and a natural gas powered bypass pump. The pump station will be a wet well/dry well configuration with a control room structure. Limited site demolition is part of the project scope. The work is to be completed within 365 calendar days from the Notice to Proceed (N.T.P.). Substantial completion will occur within 335 calendar days from N.T.P.

The full Invitation for Bids is available at the Department of Utilities (757-664-6701), on the City of Norfolk’s web site, http://www.norfolk.gov/Bids.aspx, on the DemandStar web site, http://www.demandstar.com, and in the local office of Builders and Contractors Exchange, Inc. (757-858-0680) and the Virginia Minority Supplier Development Council (757-823-4587). Electronic copies of the Bid Documents are available at no cost online at the City’s web site under the “Utilities” heading. All prospective bidders and anyone wishing to receive addenda to the Bid Documents must be on the Plan Holders List. The procedure for registration on the Plan Holders List follows: go to http://www.norfolk.gov/Bids.aspx under the “Utilities” heading, click on this project’s title in the first screen, click on the Plan Holders List on the second screen and complete the registration form. Contact the Project Manager if you have any questions regarding downloading the Bid Documents or Plan Holders registration. The Bid Documents may be examined at the office of the Department of Utilities located at 400 Granby Street, Norfolk, Virginia 23510. A set of the Bid Documents may be purchased directly from the Department of Utilities for a nonrefundable payment of $50.00. Only Checks or Money Orders made payable to “Department of Utilities” are acceptable.

It is the policy of the City of Norfolk to facilitate the establishment, preservation, and strengthening of small businesses and businesses owned by women and minorities and to encourage their participation in the City’s procurement activities. Toward that end, the City encourages these firms to compete and encourages non-minority firms to provide for the participation of small businesses and businesses owned by women and minorities through partnerships, joint ventures, subcontracts, and other contractual opportunities. Bidders (offerors) are asked, as part of their submission, to describe any planned use of such businesses in fulfilling this contract.
“Bidders must comply with the following: the President’s Executive Order #11246 prohibiting discrimination in employment regarding race, color, creed, sex, or national origin; the President’s Executive Order #12138 and 11625 regarding utilization of MBE/WBE firms; the Civil Rights Act of 1964. Bidders must certify that they do not or will not maintain or provide for their employees any facilities that are segregated on the basis of race, color, creed, or national origin.” By execution of the Bid Form and Contract Documents the contractor certifies to the afore mentioned requirements.

The Hampton Roads Planning District Commission’s Regional Construction Standards, Fifth Edition, December 2010, are hereby referenced and are part of the Bid Documents, except as may be modified by the Special Provisions of this Project or as may be shown by bold type for additions and strike-throughs for deletions. Copies of the Regional Construction Standards may be purchased at the offices of the HRPDC, 723 Woodlake Drive, Chesapeake, VA 23320 (Telephone 757-420-8300) or Executive Tower, Suite 1-C, 2101 Executive Drive, Hampton, VA 23666 (Telephone 757-262-0094). The latest edition of the Regional Construction Standards and Publication Updates may be downloaded at the HRPDC website http://www.hrpdcva.gov/Regional_Construction_Stnds/REGCONST_Home.asp

Bid Security in the amount of five percent (5%) of the Bid shall be submitted with each Bid.

A MANDATORY/NON-MANDATORY PRE-BID CONFERENCE will be held on June 2, 2015, at 10:00 a.m.-p.m. Local Time at 400 Granby Street, 2nd floor, Norfolk, VA 23510. Bidders must be present at the start of this meeting.

Contractor registration in accordance with Title 2.2 Chapter 43, Code of Virginia is required. The Bidder shall include in its Bid the following notation: "Licensed Virginia Contractor No. _______." Evidence of a Class A Certificate of Registration must be shown before the bid may be received and considered under a general or sub-contract of $40,000.00 or more or when the volume of work is $300,000.00 or more within any given twelve (12) month period. For jobs of at least $1,500.00 but less than $40,000.00, bidders are required to show evidence of a Class B Certificate of Registration. Under the aforesaid law, it is a Class I misdemeanor to bid or engage in any work without appropriate Class A or Class B license. The State Registration number must appear on the envelope containing the bid whenever the bid amounts to $1,500.00 or more.

Withdrawal of Bids due to error shall be subject to and in accordance with Section 2.2-4330 of the Code of Virginia and the Contract Documents. Procedures for submitting, withdrawing and evaluating Bids and other pertinent information are contained in the Instructions to Bidders. All bids will be evaluated in accordance with the City of Norfolk Procurement Procedures and the City reserves the right to waive informalities and to reject bids. The decision to award will be posed in a designated public area in accordance with Virginia Code 11-66(A).

All construction contracts must comply with Section 33, 1-58 of the Code of the City of Norfolk, VA 1979, as amended, regarding Substance Abuse and Drug-Free Work Place policy for City Construction Contracts. (See Appendix A)

The Owner reserves the right to waive minor non-substantive informalities in the Bid, to reject any/or all Bids, to award any Bid in whole or in part and award the Bid considered to be in the best interest of the Owner. The Owner also reserves the right to negotiate with the lowest responsive, responsible Bidder should Bid exceed available funds.
The City of Norfolk does not discriminate in the solicitation or awarding of contracts on the basis of race, religion, faith-based organizations, color, national origin, age, disability or any other basis prohibited by state or federal law.

By:  Cherryl F. Barnett, P.E.
    Engineering Manager
II. INSTRUCTIONS TO BIDDERS

1. Bid Documents

1.1. Complete sets of Bid Documents shall be used in preparing Bids. Neither the Owner nor the Engineer assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bid Documents.

1.2. The Owner, in making copies of the Bid Documents available on the above terms does so only for the purpose of obtaining Bids on the Work and does not confer or license or grant permission for any other use.

1.3. The Special Provisions for this Project as set forth in Section 110 were prepared by CLARK NEXSEN, Inc. and are dated May 12, 2015. Additional Special Provisions for this Project appear as modifications to the HRPDC Regional Construction Standards by strike-throughs for deletions and bold type for additions in Sections 100 through 109.

1.4. The Drawings for this Project, prepared by CLARK NEXSEN, Inc. and dated May 12, 2015, are defined as follows:

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<td>G1</td>
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<td>General Notes</td>
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<tr>
<td>C2</td>
<td>Legend, Abbreviations and Notes</td>
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<td>C3</td>
<td>Demolition and E&amp;S Plan</td>
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<td>Pump Station Site Plan</td>
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<td>Tree Protection Details and Notes</td>
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<td>Details</td>
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<td>Details</td>
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<td>Power and Lighting</td>
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<tr>
<td>E3</td>
<td>Schedules and Riser Diagram</td>
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2. Examination of Contract Documents and Project Site.

2.1. It is the responsibility of each Bidder before submitting a Bid:

A. to examine thoroughly the Bid Documents;

B. to visit the site to become familiar with and satisfy the Bidder as to the general, local and site conditions that may affect cost, progress, performance, or furnishing of the Work;

C. to study and carefully correlate the Bidder’s knowledge and observations with the Bid Documents and such other related data; and,

D. to promptly notify the Owner of all conflicts, errors, ambiguities or discrepancies which the Bidder has discovered in or between the Bid Documents and such other related documents or field/site conditions.

2.2 Reference is made to Sections 104 III and 104 IV, for information relating to reports, explorations, underground facilities, and easements. On request, at the discretion of the Owner, the Owner will provide each Bidder access to the site to conduct such examinations, investigations, explorations, tests and studies as each Bidder deems necessary for submission of a Bid. The Bidder shall fill all holes and clean up and restore the site to its former condition, including reseeding and/or resodding any disturbed areas upon completion of such explorations, investigations, tests and studies, and hold the Owner harmless from any damage to property or injury to persons resulting from or arising out of such exploration, investigation, tests, and studies. The Bidder shall obtain and comply with all local and state permitting requirements.

3. Interpretations and Addenda.

3.1. No oral explanation in regard to the meaning of the Contract Documents will be made, and no oral instructions will be given before the award of the Work. Discrepancies, omissions or doubts as to the meaning of the Contract Documents shall be communicated in writing to the Owner for interpretation. Bidders should act promptly and allow sufficient time for a reply to reach them before the submission of their Bids. Any interpretation made will be in the form of an addendum to the Contract Documents, which will be forwarded to all known Bidders, and its receipt shall be acknowledged on the Bid Form. All questions shall be received no later than 7 days prior to the date for opening of Bids.

3.2. Addenda may also be issued to modify the Contract Documents.


4.1. Each bid shall be accompanied by a Bidder’s bond issued by a company authorized and licensed to transact business as surety in the Commonwealth of Virginia, a certified check, or cash escrow, in an amount equal to not less than five (5) percent of the total amount of the bid. Upon approval of the Owner’s attorney, in accordance with Section 2.2-4338, Code of Virginia, 1950, as amended, a Bidder may furnish a personal bond, property bond, or bank or savings and loan association’s letter of credit on certain designated funds for the amount required for the Bid Security. The Bid Security shall be accompanied by a certified copy of the power of attorney for the surety attorney-in-fact.
Said bid security shall be left with the Owner, subject to the conditions specified herein, as a guarantee of good faith on the part of the Bidder that if the bid is accepted, the Bidder shall execute the contract. **If a certified check is offered as guarantee, it shall be made payable to the ‘City Treasurer of Norfolk, VA.’**

4.2. The Bid Security shall be returned to all except the three (3) lowest Bidders within ten (10) days after the date of Bid opening. The Bid Security will be returned to the three (3) lowest Bidders within five (5) days after the execution of an Agreement and Performance and Payment Bonds and Certificates of Insurance have been approved by the Owner. None of the three (3) lowest Bids shall be deemed rejected, notwithstanding acceptance of one of the Bids, until the Agreement has been executed by both the Owner and the Successful Bidder.

5. **Liquidated Damages.**

5.1. Provisions for liquidated damages are set forth in Section 108-X and in Section 102 III (Bid Form).

6. **Preparation of Bid.**

6.1. All blanks on the Bid Form shall legibly and carefully be completed in ink.

6.2. Bids by corporations shall be executed in the corporate name by the president or a vice-president (or other corporate officer accompanied by evidence of authority to sign) and attested by the secretary or an assistant secretary. The corporate address and state of incorporation shall be shown below the signature.

6.3. Bids by unincorporated organizations shall be executed in the organization’s name and signed by an individual having authority to enter into a contract on behalf of such organization, whose title shall appear under the signature and the official address of the organization shall be shown below the signature. For example, if such organization is a Limited Liability Company, the Bid shall be signed by its manager, or if such organization is a Limited Partnership, the Bid shall be signed by a general partner.

6.4. All names shall be typed or printed in ink below the signature. All names shall be the legal name of the corporation, unincorporated organization and/or individual.

6.5. The Bid shall contain an acknowledgment of receipt of all Addenda (the numbers of which shall be filled in on the Bid Form).

6.6. The address, telephone number, e-mail address and fax number for communications regarding the Bid shall be provided.

6.7. It is understood and agreed that, in the event an Agreement is executed for the supplies, equipment or services included in the Bid, no indication of such sales or services to the Owner shall be used in any way in product literature or advertising without the written consent of the Owner.

7. **Quantities and Unit Prices.**
7.1. The Owner reserves the right to increase or decrease the amount of any class or portion of the Work. No such change in the Work shall be considered as a waiver of any condition of the Agreement nor shall such change invalidate any of the provisions thereof. Payment will be made at the unit or lump sum prices under the Agreement only for the work actually performed or materials furnished and accepted.

7.2. Bidders shall include in their Bid prices the entire cost of each item set forth in the Bid, and it is understood and agreed that there is included in each lump sum or unit price bid item the entire cost necessary or incidental to the completion of that portion of the work, unless such incidental work is expressly included in other lump sum or unit price bid items.

8. **General Equipment or Material Specification.**

8.1. When the Bid Documents specify one or more manufacturer's brand names or makes of materials, devices or equipment as indicating a quality, style, appearance or performance, with the statement "or equal," the Bidder shall base the Bid on either one of the specified brands or an alternate brand which the Bidder intends to substitute. Use of an alternate shall not be permitted unless it has been found to be equal or better by the Owner and at no additional cost to the Owner.

8.2. The burden of proof as to the comparative quality and suitability of alternative equipment, articles or materials shall be upon the Bidder. The Bidder shall furnish at its own expense, such information relating thereto as may be required by the Owner. The Owner shall be the sole judge as to the comparative quality and suitability of alternative equipment, articles or materials and the Owner’s decisions shall be final. Any other brand, make or material, device or equipment which, in the opinion of the Owner is recognized to be the equal of that specified, considering quality, workmanship and economy of operation and is suitable for the purpose intended, shall be accepted. In the event of any adverse decision by the Owner, no claim of any sort shall be made or allowed against the Engineer or Owner. Samples, if requested by the Bidder, may be returned at the Bidder’s expense.

8.3. If in the sole discretion of the Owner an item proposed by the Contractor does not qualify as an “or equal” item it may be considered as a proposed substitute item. The Contractor shall furnish the Owner any such information as the Owner may request to evaluate the substitute item to include estimates of costs or credits, redesign, claims or schedule impacts, warranty or maintenance issues or payment of any license or royalty that could directly or indirectly result from acceptance of the substitute. Any cost or time impacts to the project schedule caused by the Contractor’s submission of a substitute shall be borne by the Contractor. Any costs incurred by the Owner or by the Owner’s Engineer in reviewing the suitability of the substitute item shall be borne by the Contractor. The Owner may refuse to accept a substitute unless an acceptable adjustment in the contract price is offered by the contractor.

9. **Proprietary Material and Equipment Specification.**

9.1. Where any item of equipment or material is specified by proprietary name, trade name, catalog reference, or name of one or more manufacturers, without the addition of such expressions as "or equal," it is to be understood that those items are so specified for reasons of standardization in maintenance and operation, or for reasons of obtaining desirable features best suited to the requirements of the Specifications. This specific equipment shall form the basis of the Bid and be furnished
Additive/Alternate Bids

10.1. Additive Bids

Additive bid items are those in addition to the base Bid items. Bidders shall submit additive Bids on all items as shown on the Bid form. Award shall be based on the lowest responsive and responsible Bid for base Bid plus all additive bid items listed and in accordance with any criteria in the Special Provisions.

10.2. Alternate Bids

Alternate bid items are those where more than one type of improvement may be considered for a portion or all of the Work due to the character of the improvement and uncertainties which may be encountered during construction. If alternate Bids are requested for a portion of or all of the Work, Bidders shall submit alternate Bids for all alternate(s) the Bidder or its Subcontractor is qualified to perform. Award shall be based on the lowest responsive and responsible Bid for the base Bid plus the amount added or deleted for the alternate bid items selected by the Owner and in accordance with any criteria in the Special Provisions. The alternates selected shall be at the sole discretion and in the best interests of the Owner.

11. Submission of Bids.

11.1. Bids shall be submitted at the time and place indicated in the Invitation for Bids and shall be sealed, marked with the Project title and name and address of the Bidder, and accompanied by the bid guarantee and other required documents. The Bid may not be changed by markings on the envelope. Only the amounts indicated on the Bid Form will be considered in determining the final Bid amount.

11.2. When a license is required, the Bidder shall include in its Bid over the Bidder’s signature the following notation: "VIRGINIA LICENSED CONTRACTOR NO. __________" (Ref. Title 2.2, Chapter 43, and Title 54.1, Chapter 11, Code of Virginia).

11.3. When a license is not so required and a person who is not the holder of a License enters a Bid, such person shall include in its Bid over the Bidder’s signature the following notation: "LICENSING NOT REQUIRED UNDER VIRGINIA STATE CODE."

11.4. The Contractor shall complete and submit the Debarment Certification form. A copy of the form is included in Section 102, VI at the end of this Section.

11.5. The Contractor shall complete and submit the Non Collusion Affidavit form. A copy of the form is included in Section 102, III.K in this section.

12. Receipt and Opening of Bids.

12.1. Bids will be opened publicly at the time and place and under the conditions stated in the Invitation for Bids. The Owner's Representative whose duty it is to open Bids will decide when the specified time has arrived. No responsibility will be attached to any such person for the premature opening of
a Bid not properly addressed and identified. It is the responsibility of the Bidder to assure that the
Bid is delivered to the designated place of receipt prior to the time set for the receipt of Bids. No Bid
received after the time designated for receipt will be considered.

12.2. Bids will be opened and read aloud publicly.

13. Bids to Remain Subject to Acceptance.

13.1. All Bids shall remain subject to acceptance for 90 Days after the day of the Bid opening, but the
Owner may, in its sole discretion, release any Bid and return the Bid Security prior to that date, or
extend the acceptance period an additional 90 days with the consent of the apparent low bidder and
surety.


14.1 Withdrawal of Bids filed with the Owner may be made only by a representative of the firm submitting
the Bid, who shall appear in person prior to the deadline designated in the advertisement for receipt
of Bids. Such representative shall furnish satisfactory identification and proof that they are
authorized to withdraw the Bid. Telephone, e-mail, or facsimile notices will not be considered.
Additions and/or deletions marked on the outside of the Bid envelope will not be considered.

14.2 In accordance with Section 2.2-4330(A)(i) of the Code of Virginia, as amended, If the Bid price was
substantially lower than the other Bids solely to a mistake therein, provided the Bid was submitted in
good faith, and the mistake was a clerical mistake as opposed to a judgment mistake, and was
actually due to an unintentional arithmetic error or an unintentional omission of a quantity of work,
labor, or material made directly in the compilation of a bid, which unintentional arithmetic error or
unintentional omission can be clearly shown by objective evidence drawn from inspection of original
work papers, documents, and materials used in the preparation of the Bid sought to be withdrawn and
provided further the Bidder shall give notice in writing of his claim of right to withdraw within two
(2) business days after the Bid opening, then the Bid may be withdrawn. The Bidder shall, within the
following two (2) business days provide the subjective data required in this section to satisfy the
Owner’s representative that the grounds for such withdrawal do exist.

14.3 Should the Bidder refuse to enter into the Agreement after notification of award, the Bid Security
shall be forfeited.

14.4 No Bid may be withdrawn under this section when the result would be the awarding of the
Agreement on another Bid to the same Bidder or to another Bidder in which the ownership of the
withdrawing Bidder is more than five percent.

14.5 If a Bid is withdrawn under the authority of this section, the remaining Bids shall be evaluated to
determine the lowest responsive and responsible Bidder.

14.6 No Bidder who is permitted to withdraw a Bid shall, for compensation, supply any material or labor
to or perform any subcontract or other work agreement for the person or firm to whom awarded, or
otherwise benefit, directly or indirectly, from the performance of the Project for which the withdrawn
Bid was submitted.
14.7 If withdrawal of any Bid is denied, the Bidder shall be notified in writing stating the reasons for this decision. Any Bidder who desires to appeal a decision denying withdrawal of Bid shall, as sole remedy, institute legal action provided by Section 2.2-4358 and Section 2.2-4364(B), Code of Virginia, 1950, as amended.

15. Evaluation of Bids.

15.1. In evaluating Bids, the Owner shall consider the qualifications of the Bidders, whether or not the Bids comply with the prescribed requirements, unit and lump sum prices, and additive/alternate bid items if requested in the Bid Form.

15.2. The Owner may consider the qualifications and experience of subcontractors and other persons and organizations (including those who are to furnish the principal items of material or equipment) proposed for those portions of the Work for which the identity of Subcontractors and other persons and organizations shall be submitted as specified in the Bid Documents.

15.3. The Owner may conduct such investigations as deemed necessary to establish the responsibility, qualifications and financial ability of the Bidders, proposed Subcontractors and other persons and organizations to do the Work in accordance with the Bid Documents to the Owner's satisfaction within the prescribed time.

15.4. Bids will be based upon the estimated quantities shown in the Bid Form. Bids will be compared on the basis of a total computed price; arrived at by taking the sum of the estimated quantities of each Bid Item, multiplied by the corresponding unit price bid, and any lump sum Bids on the individual items. Discrepancies between the multiplication of units of work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum. Discrepancies between words and figures will be resolved in favor of words. The right to reject any or all Bids or to accept any Bid considered of advantage to the Owner is reserved.

15.5. Unless all Bids are canceled or rejected, the Owner reserves the right granted by Section 2.2-4318 of the Code of Virginia, as amended, to negotiate with the lowest responsible, responsive Bidder to obtain a Contract Price within the funds budgeted for the construction project. Negotiations with the lowest Bidder may include both modification of the Contract Price and the Scope of Work/Specifications to be performed. The Owner shall initiate such negotiations by Written Notice to the lowest responsible, responsive Bidder that its Bid exceeds the available funds and that the Owner wishes to negotiate a lower Contract Price. The Owner and the lowest responsive, responsible Bidder shall agree to the times, places, and manner of negotiations.

15.6. The acceptance of a Bid will be a notice in writing, signed by the Owner, and no other act shall constitute the acceptance of a Bid.

15.7 The Owner reserves the right to waive minor informalities in the Bid, to reject any/or all Bids, to award any Bid in whole or in part, and to award the Bid considered to be in the best interest of the Owner.

16. Qualifications of Bidders and Subcontractors.

16.1. The Contractor’s Questionnaire is included in the Bid Documents and shall be submitted upon
request within 72 hours with the signed bid form. This information will assist the Owner in investigations and determination of the Contractor's qualifications to perform the Work.

16.2. To demonstrate their qualification to perform the Work, each Bidder shall be prepared to submit further written satisfactory evidence that the Bidder has sufficient experience, necessary capital, materials, machinery and skilled workers to complete the Work. If financial statements are required they shall be of such date as the Owner shall determine and shall be prepared on forms acceptable to the Owner. The Owner may make such investigations as deemed necessary to determine the ability of the Bidder to perform the Work. The Owner's decision or judgment on these matters shall be final, conclusive and binding.

16.3. The apparent low Bidder shall, within seven consecutive days after the day of the bid opening, submit to the Owner a list of all Subcontractors who will be performing work on the Agreement. Such list shall be accompanied by an experience statement with pertinent information as to similar projects and other evidence of experience and qualification for each such Subcontractor, person and organization. If the Owner, after due investigation, has reasonable objection to any proposed Subcontractor, other person or organization, the Owner may, before giving the Notice of Award, request the apparent low Bidder to submit an acceptable substitute without an increase in Bid price. If the apparent low Bidder declines to make any such substitution, the contract shall not be awarded to such Bidder, but his declining to make any such substitution will not constitute grounds for sacrificing his Bid Security. For any Subcontractors, other person or organization so listed and to whom Owner does not make written objection prior to the giving of the Notice of Award, it will be deemed the Owner has no objection.

16.4. By submitting their Bid, Bidders certify that they are not now debarred by the Federal Government or by the Commonwealth of Virginia or by any other state, or by any town, city, or county, from submitting Bids on contracts for construction covered by this solicitation, nor are they an agent of any person or entity that is now so debarred.

16.5. If the Bidder is organized as a stock or nonstock corporation, a limited liability company, a business trust, or a limited partnership, or is registered as a registered limited liability partnership, the Bidder must be authorized to transact business in the Commonwealth as a domestic or foreign entity if so required by Title 13.1 or Title 50 of the Code of Virginia, or as otherwise required by law. The Bidder shall include the identification number issued by the State Corporation Commission on the Bid form or describe why the Bidder is not required to be so authorized. Any Bidder failing to do so shall not be awarded the Contract unless the Owner issues a waiver of this requirement and administrative policies and procedures are established by the locality. If the Bidder allows its existence to lapse, or its certificate of authority or registration to transact business in the Commonwealth of Virginia to expire, or be revoked or cancelled, such will be deemed as an act of default enabling the Owner to all remedies for default, including but not limited to revocation of this Agreement.
17. Sham or Collusive Bids.

17.1. The Bids of any Bidder or Bidders who engage in collusive bidding shall be rejected. Any Bidder who submits more than one Bid in such a manner as to make it appear that the Bids submitted are on a competitive basis from different parties shall be considered a collusive Bidder.

17.2. The provisions contained in Sections 2.2-4367 through 2.2-4377, Code of Virginia, as amended, and Section(s) of the Code of the City/County of Virginia, as amended, shall be applicable to all contracts solicited or entered into by Owner. By submitting their Bids, all Bidders certify that their Bids are made without collusion or fraud, and that they have not offered or received any kickbacks or inducements from any other Bidder, Supplier, manufacturer or subcontractor in connection with their Bid, and they have not conferred with any public employee having official responsibility for this procurement transaction, any payment, loan, subscription, advance, deposit of money, services or anything of more than nominal value, present or promised, unless consideration of substantially equal or greater value was exchanged.

18. Time of Essence

18.1. As the provisions hereof relating to the time for performance and completion of the Work are for the purpose of enabling the Owner to proceed with the construction of public improvements in accordance with pre-planned programs, such provisions are of the essence.

19. Project Documents

19.1. The Hampton Roads Planning District Commission Regional Standards Fifth Edition are hereby defined as the City of Norfolk, Department of Utilities Standard Specifications. Department of Public Works Standard Specifications, latest edition and the accompanying Project Documents are intended to supplement each other, so that anything shown on the accompanying Project Documents but not mentioned in the specifications, or vice versa, shall be required as if both specified and shown. In the event of a conflict between the standards and specifications referenced herein, the order of precedence shall be as follows: Special Provisions, Project Documents, Regional Standards, City of Norfolk Department of Utilities Standard Design Criteria, City of Norfolk Department of Public Works Standard Specifications, Supplemental Specifications.
III. BID FORM

Bids to be opened: Time **3:00 a.m./p.m., June 16, 2015**

Work to be Completed in:
- Substantial Completion: **335** Calendar Days
- Final Completion: **365** Calendar Days

Liquidated Damages:
- One Thousand Dollars and No Cents ($1000.00) per calendar day after time for Substantial Completion has expired.
- Five Hundred Dollars and No Cents ($500.00) per calendar day after time for Final Completion has expired.

Performance Bond: 100%
Payment Bond: 100%
Bid Security: 5%

Contractor and owner recognize that time is of the essence of this agreement and that the owner will suffer financial loss if the work is not completed within the times specified, plus any extensions thereof allowed in accordance with the contract documents. The parties also recognize the delays, expense, and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by the owner if the work is not completed on time. Accordingly, instead of requiring any such proof, owner and contractor agree that as liquidated damages for delay (but not as penalty), contractor shall pay owner One Thousand Dollars and No Cents ($1000.00) for each calendar day that expires after the time specified for substantial completion until the work is substantially complete. After substantial completion, if contractor shall neglect, refuse, or fail to complete the remaining work within the contract time or any proper extension thereof granted by owner, contractor shall pay owner Five Hundred Dollars and No Cents ($500.00) for each calendar day that expires after the time specified for final completion and readiness for final payment until the work is completed and ready for final payment. If substantial completion is not achieved by the time of final completion then liquidated damages for both substantial and final completion shall run concurrently until substantial completion is achieved.

To: **Director of Utilities**
**City of Norfolk, Virginia**

A. BID PRICE

OPTION A - LUMP SUM BID

Not Used
OPTION B - COMBINATION LUMP SUM AND UNIT PRICE BID

In compliance with the Bid Documents, titled Barraud Park, Pump Station #153, Phase I, and all Addenda issued to date all of which are part of this Bid, the undersigned hereby proposes to furnish all items including materials, supervision, labor, and equipment in strict accordance with, said Contract Documents, for the sum of:

(1) LUMP SUM BID

LUMP SUM BID: ($_____________) In Words

(2) UNIT PRICE BID

<table>
<thead>
<tr>
<th>NO.</th>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
<th>UNIT PRICE</th>
<th>TOTAL PRICE</th>
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<tr>
<td>2</td>
<td>Additional Wastewater Pump</td>
<td>EA</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Additional Aggregate Base (VDOT No. 21A)</td>
<td>TON</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Additional Select Bedding (VDOT No. 57 Stone)</td>
<td>TON</td>
<td>200</td>
<td>$38.00</td>
<td>$7,600.00</td>
</tr>
<tr>
<td>5</td>
<td>Additional Select Backfill</td>
<td>CY</td>
<td>200</td>
<td>$35.00</td>
<td>$7,000.00</td>
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TOTAL OF ALL UNIT PRICE ITEMS ($_____________) In Words

Bidder acknowledges that estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all Unit Price Bid items will be based on actual quantities provided, determined as provided in the Contract Documents. The prices quoted shall include without exception all materials, supervision, labor, equipment, appliances, clean-up, applicable sales, use and other taxes, insurance, building permit or fees, and the Contractor's labor, overhead, profit, mobilization and other mark-ups, and in full accordance with the Contract Documents. Include allowance for waste where appropriate. The unit prices shall be maintained throughout the Contract Time. Unit prices shall be used in determining additions or deductions from the total Contract Price in the event of changes due to unforeseen conditions in the Work.

TOTAL BASE BID (LUMP SUM PLUS TOTAL UNIT PRICE BID): ($_____________) In Words

OPTION C - UNIT PRICE BID

Not Used
MBE/WBE Compliance Checklist

Name of Recipient/Prime Contractor: __________________________________________________________

Project Name: __________________________________________ Project Number: ____________________

Check Procurement Type: (Check applicable boxes)

☐ Service – Engineering
☐ Services – Legal
☐ Construction Contractor (Prime)
☐ Construction Contractor (Subcontract)
☐ Supplies
☐ Equipment

In order to be in compliance with the federal procurement requirements, funding recipients and contractors are obligated to make reasonable efforts, otherwise known as “good faith efforts,” to solicit Minority-Owned Business Enterprises (MBE) and Women-Owned Business Enterprises (WBE) in their procurement methods. The goal of this good faith effort is to increase contracting opportunities for MBE/WBE firms. It is not sufficient to just have a competitive bidding process that is open to MBE/WBE firms. Funding recipients and contractors must seek out qualified MBE/WBE firms.

Recipients are required to include provisions in their bid documents and take affirmative steps to solicit MBE/WBE firm participation in procuring services, supplies, equipment and in awarding construction contract. The successful prime contractor must also seek MBE/WBE firm participation in obtaining subcontracts for construction work, equipment, services and supplies prior to bid submittal.

Demonstration of good faith efforts must be documented. This checklist is designed to facilitate and document compliance with “good faith efforts.” Failure to comply with MBE/WBE procurement requirements will result in the recipient incurring costs that are ineligible for reimbursement from our program.

Please check boxes where activities are completed and provide documentation; explain unchecked boxes in comments below and use additional pages if necessary:

☐ Certified Affidavit of Publication of Newspaper advertisement soliciting MBE/WBE participation.
   (Suggested advertisement language: Minority Owned Businesses (MBEs) and Women Owned Businesses (WBEs) are encouraged to respond.)
   __________________________________________
   __________________________________________
   __________________________________________
   __________________________________________

☐ Your advertisements from publications that target MBE/WBE firms. (Only consider when it is believed that this advertisement may increase MBE/WBE participation.)
   __________________________________________
   __________________________________________
   __________________________________________
   __________________________________________

Obtain current lists of MBE/WBE firms. (Documentation must be on file and available for examination. A possible resources is: http://dmbe.virginia.gov/)
   __________________________________________
   __________________________________________
   __________________________________________
   __________________________________________
☐ List sources used to identify MBE/WBE firms:

_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________

☐ Identify potential MBE/WBE firms for direct solicitation (you may attach your list).

_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________

☐ Directly solicit MBE/WBE firms. Provide list of MBE/WBE firms solicited and solicitation letters sent to all MBE/WBE firms. (Solicit those MBE/WBE firms that you would reasonably expect to respond and submit a quote.)

_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________

☐ Description of contacts (i.e. telephone calls) and dates of contacts with MBE/WBE firms.

_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________

☐ Description how you identified portions of work that could be divided or subcontracted and performed by qualified MBE/WBE firms. (Reduced contract size/quantities when economically feasible to permit participation of MBE/WBE firms.)

_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________

☐ Copies of MBE/WBE firm certification information for all proposed prime and subcontractor MBE/WBE firms.

_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________

Successful bidders/offereors should take reasonable affirmative steps to subcontract with MBE and WBE firms whenever additional subcontracting opportunities arise during the performance of the contract.

Comments:

_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________

December 2010

Barraud Park, Pump Station #153, Phase I
May, 2015
City of Norfolk Department of Utilities
B. ADDENDA

The undersigned acknowledges receipt of the following addenda:

Addendum No. __________________________ Dated: ____________.
Addendum No. __________________________ Dated: ____________.
Addendum No. __________________________ Dated: ____________.

C. We agree to enter into an Agreement with the City of Norfolk, Virginia within ten (10) days of the award of same to us for the price named in our Bid.

D. It is expressly agreed by us that the City of Norfolk, Virginia shall have the right to reject any and all Bids and to waive any minor non-substantive errors in the Bid and accept the Bid in the (Locality’s) best interests.

E. In default of the performance on our part of the conditions of Bid, our failure to enter into an Agreement with the City of Norfolk, Virginia, within the time above set, we herewith furnish a Bid Security in the amount of $______________, which shall be absolutely forfeited to the City of Norfolk, Virginia, but otherwise the said Bid Security shall be returned.

F. We agree to begin Work at any time we may be notified by the Owner, and complete all of the Work embraced in the Agreement within _______ Days;

G. [This applies to projects over $200,000 unless otherwise indicated]. I/We elect to utilize the Escrow Account Procedure described in the provision of this bid if determined to be the successful low Bidder. ___________ (write "Yes" or "No"). ___________ Bid total does not qualify for escrow account option

H. The undersigned has read all sections under "Instructions to Bidders."

I. By signing the attached, the bidder certifies that a copy of the City of Norfolk Department of Utilities Standard Specifications is in the Bidder’s possession, and that all work called for in the contract documents will be done in accordance with these specifications as prioritized in Section II.19.1.

J. Bidder acknowledges that “American Iron & Steel” requirements apply on this project.

K. By signing, each signatory acknowledges any strike-throughs contained herein, unless hand-written.

L. CONTRACTOR’S REGISTRATION, SCC NUMBER AND SIGNATURE

Registered Virginia Contractor Class and No. ________________________________

Registration Expires ____________________________________________________

State Corporation Commission (SCC) Number _______________________________

(NOTE: FAILURE TO INCLUDE CONTRACTOR’S REGISTRATION and SCC NUMBER ARE GROUNDS FOR REJECTION OF THE BID.)
Contractor________________________ Signed____________________

Date_________________________ Title_________________________

NOTE: If Bidder is a corporation, write state of incorporation under signature.

MAILING ADDRESS AND TELEPHONE/E-Mail/FAX NUMBER OF BIDDER:

_______________________________________________________________________________________
_______________________________________________________________________________________
_______________________________________________________________________________________
_______________________________________________________________________________________

(____) [Telephone] E-mail________________________; FAX_______________________

IF CORPORATION, PROVIDE NAME AND MAILING ADDRESS AS REQUIRED BELOW.

<table>
<thead>
<tr>
<th>PRESIDENT</th>
<th>SECRETARY</th>
<th>TREASURER</th>
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IF PARTNERSHIP, PROPRIETORSHIP, LIMITED LIABILITY COMPANY OR OTHER FIRM, PROVIDE NAME AND MAILING ADDRESS OF EACH PARTNER, PROPRIETOR, OR MEMBER OF FIRM.

<table>
<thead>
<tr>
<th>Partner 1</th>
<th>Partner 2</th>
<th>Partner 3</th>
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<tr>
<th>Partner 4</th>
<th>Partner 5</th>
<th>Partner 6</th>
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</table>
N. NON COLLUSION AFFIDAVIT

Norfolk, Virginia Project: Barraud Park, Pump Station #153, Phase I

Bid Date:_____________

COMMONWEALTH OF VIRGINIA
(City/County)

This day personally appeared before the undersigned, a Notary Public in and for the City/County and State aforesaid, ___________________________ who having been first duly sworn according to law, did depose and aver as follows:

(a) That he/she is ____________________________________________
    (Owner, Partner, President, etc.)
    of ________________________________________________________
    (insert name of Bidder)

(b) That he/she is personally familiar with the Bid of _________________________________
    (Insert Company Name)
    submitted in connection with the above captioned Owner’s project.

(c) That said Bid was formulated and submitted in good faith as the true bid of said Bidder.

1. In preparation and submission of this Bid, the Bidder did not either directly or indirectly, enter into any combination or agreement with any person, firm or corporation or enter into any agreement, participate in any collusion, or otherwise take any action in the restraint of free, competitive bidding in violation of the Sherman act (15 U.S.C. Section 1) or sections 59.1-9.1 through 59.1-9.17 or sections 59.1-68.6 through 59.1-68.8 of the Code of Virginia.

2. The undersigned Bidder hereby certifies that neither this Bid nor any claim resulting therefrom, is the result of, or affected by, any act of collusion with, or any act of another person or persons, firm or corporation engaged in the same line of business or commerce; and that no person acting for or employed by the Owner has any personal interest in this Bid.

3. The undersigned hereby further agrees that upon request of the Owner, the records and books pertaining to this Bid will be voluntarily supplied, furnished, and released to the Owner.

4. The undersigned hereby further certifies that the Bidder has not knowingly falsified, concealed, misled, or covered up by any trick, scheme, or device a material fact in connection with this bid. The undersigned also certifies that the Bidder has not made any false, fictitious or fraudulent statements or representations or made or used any false writing or documents knowing the same to contain any false, fictitious or fraudulent statement or entry in connection with this Bid.

December 2010
5. The undersigned further agrees that the Bidder will comply with section 2.2-4374 of the Code of Virginia, 1950, as amended, and has not bought or purchased any equipment from any person employed by the Owner as an independent contractor to furnish architectural or engineering services for this Project, nor from any partnership, association or corporation in which such architect or engineer has a pecuniary interest.

6. The undersigned further agrees to inform and require compliance by the following persons and entities with this anti-collusion statement as a condition of payment: all subcontractors, consultants, subconsultants, or any person, corporation, or legal entities that provide or furnish labor, material, equipment, or work related to this project.

7. All Covenants and Agreements made by the Contractor are made by it on behalf of the Contractor and its successors, personal representatives and assigns, the same as if they had been specifically named in each instance.

And further this deponent saith not.

_______________________________
Name of Company/Bidder

_______________________________
Title (Owner, Partner, President)

Subscribed and sworn to before me this__________day of________________, 20___

My commission expires:______________________________, 20___

_______________________________
Notary Public
IV. BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned, ___________________________ as Principal, and
                                                                                                     ____________________________________________________________________________ as Surety, are hereby
held and firmly bound unto ______________________ as OWNER in the penal sum of ______________ (Five Percent)
for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, successors and assigns.

Signed, this ______day of ___________, 20__.  

The Condition of the above obligation is such that whereas the Principal has submitted to the OWNER a certain BID, attached hereto and hereby made a part hereof to enter into an Agreement in writing, for the

___________________________________________________________

NOW, THEREFORE,

(a) If said BID shall be rejected, or

(b) If said BID shall be accepted and the Principal shall execute and deliver an Agreement in the Form of Agreement attachment hereto (properly completed in accordance with said BID) and shall furnish a BOND for faithful performance of said Agreement, and for the payment of all persons performing labor or furnishing materials in connection therewith, then this obligation shall be void, otherwise the same shall remain in force and effect; it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety and its BOND shall be in no way impaired or affected by any extension of the time within which the OWNER may accept such BID; and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year set forth above.

____________________
Principal

____________________
Surety

By: ______________________
Attorney-in-Fact

IMPORTANT - Surety companies executing BONDS shall appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the Commonwealth of Virginia.

December 2010

Barraud Park, Pump Station #153, Phase I
May, 2015
City of Norfolk Department of Utilities
V. QUESTIONNAIRE

If requested by the Owner, the following questions shall be answered in full by the Bidder, and returned to the Owner within 72 hours, and submitted with the signed bid form.

1. Name of Company: __________________________________________________________
   Trade Name (if different from Company Name): ___________________________________
   Principal Office Address: _____________________________________________________
   __________________________________________________________________________
   Telephone No(s.): ___________________________________________________________
   Fax No(s.): __________________________________________________________________

   a. If a Corporation, answer the following:

   When Incorporated: ___________________________________________________________
   In What State: ______________________________________________________________
   Names and Addresses of Directors: ___________________________________________
   __________________________________________________________________________
   Names and Addresses of Shareholders: _________________________________________
   __________________________________________________________________________

   b. If an Unincorporated Organization, answer the following:

   Date of Organization: _________________________________________________________
   Names and Addresses of Owners or Members: _________________________________
   __________________________________________________________________________
   Type and State of Organization: _____________________________________________

   c. If a Partnership, state whether Partnership is General or Limited:_______________

   Names and Addresses of Owners or Partners: _________________________________
   __________________________________________________________________________
2. a. How many years has this Bidder been in business as a Contractor under its present business name?

b. What are prior names of this Bidder, if any?

3. How many years’ experience in this type of construction work has this Bidder had:

   1) As a Contractor ______________  2) As a Subcontractor ______________

4. Provide a list of uncompleted Contracts at present held by this Bidder (attach supplemental sheet if necessary):

<table>
<thead>
<tr>
<th>Contract</th>
<th>Type of Work</th>
<th>Amount</th>
<th>Percentage Completed</th>
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</table>

5. List the Bidder's crew foremen and supervisors proposed for this Project and their years of related experience:

<table>
<thead>
<tr>
<th>Name</th>
<th>Years of Experience</th>
<th>Dates of Employment with Bidder</th>
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6. What construction equipment does this Bidder own that is available for the proposed work (attach supplemental sheet if necessary)?

   __________________________________________
   __________________________________________
   __________________________________________
7. Does this Bidder plan to subcontract any part of this work? If so, list name, address, years experience, and type and amount of work to be performed by each subcontractor:

___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________

8. Provide a list of projects similar in character and scope to the Work specified under this Contract which have been successfully completed by this Bidder and proposed subcontractors or employees with principal roles in this contract during the past three five years (attach supplemental sheet if necessary).

(The term "completed" means accepted and final payment received from the Owner or authorized representative).

<table>
<thead>
<tr>
<th>Location &amp; Type of Work</th>
<th>Owner's Name/ Address</th>
<th>Contact Person (Name and Telephone)</th>
<th>Date Completed</th>
<th>Contract Price</th>
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9. Have you ever performed work for a municipal corporation, local governing body, or similar agency previously? (If all such bodies are listed under 8, this question need not be completed).

_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________

10. a. Has this Bidder ever failed to complete any work awarded to it? _________ If yes, give name of Owner, name of Bonding Company and circumstances:

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

b. Is this Bidder debarred by the Federal Government or by the Commonwealth of Virginia or by any other state, or by any town, city, or county?

Yes _______ No _________ If yes, please provide details:

_____________________________________________________________________
_____________________________________________________________________


c. Has this Bidder ever had any judgements entered against it for the breach of contract for construction? ______ If yes, please provide details:

_____________________________________________________________________
_____________________________________________________________________


d. Give a summary of your financial statement. (List assets and liabilities, use an insert sheet, if necessary).

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

11. State approximate largest dollar volume of work performed by this Bidder in one year:

________________________________________________________________________
12. Give two (2) Banking Institution References:
   a. 
      Name: _______________________________________________________________
      Address: _____________________________________________________________
      Credit Available: ______________________________________________________
   b. 
      Name: _______________________________________________________________
      Address: _____________________________________________________________
      Credit Available: ______________________________________________________

13. List three material suppliers and amount of credit available:
    _____________________________________ _________________________________
    _____________________________________ _________________________________
    _____________________________________ _________________________________

14. List insurance coverage and amount (or attach certificate of insurance):
    _____________________________________ _________________________________
    Liability-Property
    _____________________________________ _________________________________
    Liability-Personal Injury
    _____________________________________ _________________________________
    Vehicle and Equipment
    _____________________________________ _________________________________
    Other - Identify

15. Bonding reference - List surety company and highest coverage:
    _____________________________________ _________________________________

16. Have you or your authorized representative, personally inspected the location of the proposed Work, and do you have a clear understanding of the requirements of the Bid Documents?
    _____________________________________ _________________________________

The undersigned hereby authorizes and consents to any person, firm or corporation to furnish any information requested by the Owner in verification of this statement of contractor's qualifications. Also, if it is the apparent low Bidder, the undersigned hereby agrees to furnish the Owner upon request, a complete and current financial statement:
Contractor: __________________________________________

By: ________________________________________________

Title: ______________________ Date: ________________
VI. CERTIFICATION REGARDING DEBARMENT

This is to certify that this person/firm/corporation is not now debarred by the Federal Government or by the Commonwealth of Virginia or by any other state, or by any town, city, or county, from submitting Bids on contracts for construction covered by this solicitation, nor are they an agent of any person or entity that is now so debarred.

_________________________________
Name of Official

_________________________________
Title

_________________________________
Firm or Corporation

_________________________________
Date

End of Section
SECTION 103

AWARD AND EXECUTION OF AGREEMENT

1. AWARD AND EXECUTION OF AGREEMENT

1. Notice of Award.

1.1. A Notice of Award will be issued by the Owner, or the Bids rejected as soon as reasonably possible, but no later than 90 Days after the date of the opening of Bids. The Owner may, in its sole discretion, release any Bid and return the Bid Security prior to that date, or extend the acceptance period an additional 90 days with the consent of the apparent low bidder and surety.

1.2. The Owner reserves the right to waive any minor formalities, to reject any and all Bids in whole or in part, and may advertise for new Bids if, in its judgment, the best interests of the Owner will be served.

1.3. At the time of the issuance of the Notice of Award, the Owner shall publicly post an announcement of the award on/at http://norfolk.gov/Bids.aspx

2. Signing of Agreement.

2.1. When the Owner gives a Notice of Award to the Successful Bidder, it will be accompanied by 4 original copies of the Agreement, with all other written Contract Documents attached. Within 10 Days thereafter the Contractor shall sign and deliver all the original copies of the Agreement and attached documents to the Owner with the required Bid Security and Certificate of Insurance. Within 30 Days thereafter the Owner shall deliver one fully signed copy to the Contractor.

2.2. If the Successful Bidder fails to execute the Agreement within the time specified, the amount of Bid Security shall be paid to the Owner. In such case the Owner, at its discretion, may award the Work to the second Successful Bidder, or reject all Bids.


3.1. The Successful Bidder shall execute and provide to the Owner, within 10 Days following Notice of Award, Performance and Payment Bonds with surety in an amount equal to 100% of the accepted Bid. The sureties of all Bonds shall be of such surety company or companies as are approved by the Owner and are authorized to transact business in the Commonwealth of Virginia. If the execution is by an attorney-in-fact, a power of attorney evidencing the authority of such attorney shall be attached to the Bond. Such power of attorney shall bear the same date as the Bond to which it is attached.

3.2. All Bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws and Regulations and shall be executed by such sureties as are named in the current list of “Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies” as published in Circular 570 (amended) by the Audit Staff, Bureau of Government Financial Operations, U. S. Treasury Department.

3.3. Performance and Payment Bonds shall remain in full force during the warranty period defined in Section 107, VII.
4. **Contractor’s Insurance.**

4.1. The Contractor shall provide and keep in full force and affect during the performance of the Work the kinds and amounts of insurance specified in Section 4.3 below and shall comply with all other provisions of this Section. Such insurance shall be provided and kept in full force by insurance companies authorized to do business in the Commonwealth of Virginia, and regulated by the Virginia Bureau of Insurance. All premiums and other costs of such insurance shall be paid by the Contractor. It will be assumed that the consideration paid or to be paid to the Contractor for the performance of the Work includes the premiums and other such costs of such insurance, and the Owner shall not be responsible therefore. Each insurance policy and certificate of insurance shall be signed by duly authorized representatives of such insurance companies in the State and shall be countersigned by duly authorized agents of such companies. The Contractor shall not be required to furnish the Owner with copies of the insurance contracts required by this Section unless requested from time to time by the Owner; but the Contractor shall provide on forms furnished by the Insurance Company or Owner a Certificate of Insurance issued by such Insurance Companies, in which the company shall irrevocably warrant that the insurance is provided to enable the Contractor to comply with and provide the required insurance; (provided, however, that in no event shall the insurance contract be expanded to afford coverage which is greater than the maximum coverage approved for writing in the Commonwealth of Virginia) and that it will not be canceled unless at least thirty days' prior written Notice to the effect is given to the Owner, anything in such insurance contract to the contrary notwithstanding, and that the insurance contract has been endorsed accordingly.

4.2. The Contractor shall provide the certificate of insurance to the Owner within 10 Days following the Notice of Award.

4.3. Insurance Requirements:

A. The Contractor shall purchase and maintain during the life of this Agreement such Comprehensive General Liability Insurance including product and completed operations liability insurance as will provide protection from Contractor’s performance of the Work and Contractor’s other obligations under the Contract Documents, whether such performance is by Contractor, or by Subcontractor, by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable and shall otherwise bear responsibility therefore. The Contractor further agrees that all limits will be made available which are excess of the amounts below:

<table>
<thead>
<tr>
<th>(1)</th>
<th>Workers Compensation and Employers Liability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coverage A - Statutory</td>
<td>Coverage B - $100,000/$100,000/$500,000</td>
</tr>
</tbody>
</table>

A broad form of all states endorsement shall be attached.

<table>
<thead>
<tr>
<th>(2)</th>
<th>Commercial Auto Liability Including Hired and Non-Owned Car Liability Coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limit of Liability - $1,000,000 Per Occurrence</td>
<td></td>
</tr>
</tbody>
</table>
The Contractor shall purchase and maintain during the life of this Agreement such commercial automobile liability insurance including employer’s non-ownership liability and hired car liability insurance to protect him and any Subcontractors performing Work covered by this Agreement from claims for damages, whether such operations be by him or any Subcontractor, or by anyone directly or indirectly employed by either of them.

(3) Commercial General Liability Including Contractual and Completed Operations.

Limit of Liability - $1,000,000 Per Occurrence


Limit of Liability - $1,000,000 Per Occurrence
$3,000,000 Aggregate

B. The Contractor shall be responsible for securing the Work site and shall assume all risk for vandalism or other damage that may occur, to project components, during construction.

C. The Owner shall be named as an additional insured on the Commercial General Liability per ISO 2010 on a primary basis. The Contractor shall obtain a waiver of subrogation from its insurers on Worker’s Compensation and All Risk Insurance policies. This requirement may be satisfied by obtaining appropriate endorsements to any master or blanket policy of insurance maintained. Owner’s Commercial General Liability shall not contribute in any loss payment insured under the Contractor’s Commercial General Liability policy.

D. Contingent liability and property damage insurance to protect the Owner (or his employees and agents, including the Engineer) shall be provided by endorsements to general liability or property damage policies. All aforesaid policies shall be endorsed to provide that the insurance company shall notify the Owner if policies are to be terminated or altered during the life of the contract.

E. The General Liability insurance shall carry a contractual liability endorsement covering the hold harmless agreements contained in the Owner standard contract and the certificates filed with the Owner shall show that the contractual liability coverage has been obtained.

F. Insurance coverage for personal injury and property damage, including insurance on vehicles and equipment, shall be in the same company.

G. The Contractor shall also be required to submit to the Owner evidence of insurance coverage or self-insurance for all claims arising under the Worker’s Compensation Laws of the State of Virginia.

H. The Contractor will indemnify and hold harmless the Owner, and the Owner’s officers, agents, employees, and other representatives, against any liability, loss or expense (including the loss of use of the Project), due to any act or omission of Contractor or any of their Subcontractors or of any of their respective employees in connection with the Work of the Contractor hereunder or due to any omissions or supervisory acts of the Owner in connection with the Work performed by the Contractor.
II. NOTICE OF AWARD

TO: _______________________________________________________________
_______________________________________________________________
_______________________________________________________________
_______________________________________________________________

PROJECT TITLE: Barraud Park, Pump Station #153, Phase I
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

The Owner has considered the Bid submitted by you for the above described Work in response to its
Invitation for Bids dated ________________, 20__, and Instructions to Bidders.

You are hereby notified that your Bid has been accepted for the Work in the amount of $______________.

You are required by the terms of the Bid Documents to fully execute and return all 4 copies of the Agreement
along with the required Contractor’s Performance Bond, Payment Bond, and Certificates of Insurance, and
Procurement Information Form within 10 Days from the date of this Notice of Award.

The Certificate of Insurance must name the City of Norfolk as beneficiary (additional insured). It
should also be accompanied by a Government Cancellation Clause/Statement guaranteeing a 30-day
written cancellation notice. The certificate should also show that you have obtained:

1. Workmen’s Compensation Insurance (including occupational diseases) covering the
   employees of the contractor and any of his subcontractors.

2. Public Liability Insurance naming the City of Norfolk as additional insured.

3. Comprehensive General Liability Insurance with contractual liability coverage of at least
   $500,000/$1,000,000 for bodily injury and $250,000/$500,000 for property damage.

4. Automobile Liability Insurance including bodily injury and property damage for owned,
   non-owned, and hired vehicles with minimum limits per occurrence of $500,000/$1,000,000
   for bodily injury and $250,000/$500,000 for property damage.

Because these are requirements for all construction projects in the City of Norfolk, work on the project
cannot begin until they are fulfilled.

As soon as the Agreement, bond forms, and certificate of insurance are submitted, the City will begin
processing the necessary papers. You may begin work on the project after the Agreement and Notice
to Proceed are issued to you.

The Hazards Communication Policy adopted by the Department of Utilities will be in effect during all
work performed on and around City-owned facilities and properties. If you do not have a copy of this
policy, please contact this office at 664-6701. We will be glad to send a copy to you.
If you fail to execute the Agreement and to furnish said Bonds and Certificate of Insurance within 10 Days from the date of this Notice, said Owner will be entitled to consider all your rights arising out of the Owner’s acceptance of your Bid as abandoned and as a forfeiture of your Bid Security. The Owner will be entitled to such other rights as may be granted by law.

You are required to return an acknowledged copy of this Notice of Award to the Owner. The notice of award shall not be construed as notice to proceed.

Dated this _____ day of ________________, 20__.

OWNER

________________________________                           _____________________________
  Owner
  By: ________________________________  By:______________________________
  Name

CONTRACTOR

________________________________                           _____________________________
  Contractor
  By: ________________________________  By:______________________________
  Name

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III. AGREEMENT

This AGREEMENT, dated this ______ day of ________, 2013, by and between The City of Norfolk, Virginia, acting by and through the City Manager, hereinafter called the Owner; and (Insert the Contractor’s Company Name), (a corporation or an unincorporated organization organized and existing under the laws of the State of Virginia or, an individual trading under the above name) hereinafter called the Contractor.

WITNESSETH: The Owner and Contractor, for the consideration stated herein, agree as follows:

A. Scope of Work

The Contractor shall perform all required Work and shall provide and furnish all labor, materials, necessary tools, expendable equipment and utility and transportation service and all else required to complete the construction of the Barraud Park, Pump Station #153, Phase I project all in strict accordance with the Drawings and Specifications, including any and all Addenda, and in strict compliance with the Contract Documents, the terms of which are incorporated herein by reference.

It is understood and agreed that said labor, materials, tools, equipment and service shall be furnished and said Work performed and completed under the direction and supervision of the Contractor and subject to the approval of the Owner or its authorized representative.

B. Engineer

This Project has been designed by CLARK NEXSEN who is hereinafter called the Engineer. However, the Norfolk Department of Utilities will act as the Owner’s Representative, assume all duties and responsibilities, and have the rights and authority assigned to the Engineer in the Contract Documents in connection with completion of the Work in accordance with the Contract Documents. In the event the Owner should not require the services of the Engineer for any or all parts of the project, the power, duties, and responsibilities conferred hereto to the Engineer shall be construed to be those of the Owner or its authorized representative.

C. Guarantee

All materials and equipment, furnished by the Contractor, and all construction involved in this Agreement are hereby guaranteed by the Contractor to be free from defects owing to faulty materials or workmanship for a period of one year after date of Final Completion of the Work. All Work that proves defective, by reason of faulty material or workmanship within said period of one year, shall be replaced by the Contractor free of cost to the Owner. These guarantees shall not operate as a waiver of any of the Owner’s rights and remedies for default under or breach of the Agreement which rights and remedies may be exercised at any time within the period of any applicable statute of limitations.
D. The Owner shall pay the Contractor as just compensation for the satisfactory performance of the Work, subject to any additions or deductions as provided in the contractor’s bid, Section 102, Clause III Bid Form submitted (Bid Opening Date).

The Contract Price is _______________________________________________ ($________) based upon unit and/or lump sum prices extended as submitted in the contractor’s bid, Section 102, Clause III Bid Form dated (Bid Opening Date).

E. Payments

The Owner will pay the Contract Price to the Contractor in the manner and at such times as set forth in Section 109 of the Hampton Roads Planning District Commission Regional Construction Standards, Fifth Edition, as referenced in Section I. below and as specifically revised for this Project.

F. Time

The undersigned Contractor agrees to commence Work within 10 Days after the date of Notice to Proceed and further agrees to Substantially Complete all Work under this Agreement within 335 Calendar Days from the date of the Notice to Proceed and to reach Final Completion of all Work under this Agreement within 365 Calendar Days from the date of the Notice to Proceed.

G. Applicable Law/Compliance

(1) Applicable Law

This Agreement shall be deemed to be a Virginia contract and shall be governed as to all matters of validity, interpretations, obligations, performance, or otherwise, exclusively by the laws of the Commonwealth of Virginia, and all questions arising with respect thereto shall be determined in accordance with such laws. Regardless of where actually delivered and accepted, this Agreement shall be deemed to have been delivered and accepted by the parties in the Commonwealth of Virginia.

(2) Compliance with all Laws

Contractor shall comply with all federal, state and local statutes, ordinances, and regulations, now in effect or hereafter adopted, in the performance of Work set forth herein. Contractor represents that it possesses all necessary licenses and permits required to conduct its business and will acquire any additional license and permits necessary for performance of this Agreement prior to the initiation of Work. [If the Contractor is a corporation] Contractor further expressly represents that it is a corporation in good standing in the Commonwealth of Virginia and will remain in good standing throughout the term of the contract. Contractor shall at all times observe all health and safety measures and precautions necessary for the sanitary and safe performance of the contract Work.

(3) Venue
Any and all suits for any claims or for any breach or dispute arising out of these Contract Documents shall be maintained in the appropriate court of competent jurisdiction in the City of Norfolk.

(4) Environmental Considerations

Any cost or expense associated with environmentally related violations of the law, the creation or maintenance of a nuisance, or releases of hazardous substance, including but not limited to, the cost of any clean up activities, removals, remediation, responses, damages, fines, administrative or civil penalties or charges imposed on the Owner, whether because of actions or suits by any governmental or regulatory agency or by any private party, as a result of the release of any hazardous substances, or any noncompliance with or failure to meet any federal, state or local standards, requirements, laws, statutes, regulations or the law of nuisance by the Contractor (or its agents, officers, employees, subcontractors, consultants, subconsultants, or any other persons, corporations, or legal entities employed, utilized, or retained by the Contractor) in the performance of this Agreement or related activities, shall be paid by the Contractor.


(a) Employment discrimination by Contractor shall be prohibited. During the performance of this Agreement, Contractor agrees as follows:

(i) Contractor will not discriminate against any employee or applicant for employment because of race, religion, color, sex, national origin, age, disability, or any other basis prohibited by state law relating to discrimination in employment, except where there is a bona fide occupational qualification/consideration reasonably necessary to the normal operation of Contractor. Contractor will conform to the provisions of the Federal Civil Rights Act of 1964, as amended, as well as the Virginia Fair Employment Act of 1975, as amended, where applicable, the Virginians With Disabilities Act, the Americans With Disabilities Act, and the Code of Virginia § 2.2-4311. If the award is made to a faith-based organization, the organization shall not discriminate against any recipient of goods, services, or disbursements made pursuant to the Agreement on the basis of the recipient’s religion, religious belief, refusal to participate in a religious practice, or on the basis of race, age, color, gender or national origin and shall be subject to the same rules as other organizations that contract with public bodies to account for the use of the funds provided; however, if the faith-based organization segregates public funds into separate accounts, only the accounts and programs funded with public funds shall be subject to audit by the public body. Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the provisions of this nondiscrimination clause.

(ii) Contractor, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, will state that Contractor is an equal opportunity employer.
(iii) Notices, advertisements and solicitations placed in accordance with federal law, rule or regulations shall be deemed sufficient for the purpose of meeting the requirements of this section.

(iv) Contractor will include the provisions of the foregoing subsections (i) and (ii), and (iii) in every subcontract or purchase order of over $10,000, so that the provisions will be binding upon each subcontractor or vendor.

(b) During the performance of this Agreement, Contractor agrees as follows:

(i) Contractor will provide a drug-free workplace for Contractor’s employees.

(ii) Contractor will post in conspicuous places, available to employees and applicants for employment, a statement notifying employees that the unlawful manufacture, sale, distribution, dispensation, possession, or use of a controlled substance or marijuana is prohibited in Contractor’s workplace and specifying the actions that will be taken against employees for violations of such prohibition.

(iii) Contractor will state in all solicitations or advertisements for employees placed by or on behalf of Contractor that Contractor maintains a drug-free workplace.

(iv) Contractor will include the provisions of the foregoing subsections (i), (ii) and (iii) in every subcontract or purchase order of over $10,000, so that the provisions will be binding upon each subcontractor or vendor.

(v) For the purposes of this section, “Drug-free workplace” means a site for the performance of work done in connection with a specific contract awarded to a Contractor, the employees of whom are prohibited from engaging in the unlawful manufacture, sale, distribution, dispensation, possession, or use of any controlled substance or marijuana during the performance of the contract.”

(6) Compliance With Federal Immigration Law

At all times during which any term of this Agreement is in effect, the Contractor does not and shall not knowingly employ any unauthorized alien. For purposes of this section, an “unauthorized alien” shall mean any alien who is neither lawfully admitted for permanent residence in the United States nor authorized to be employed by either Title 8, section 1324a of the United States Code or the U.S. Attorney General.

(7) Compliance With State Law – Authorization To Transact Business In The Commonwealth

Contractor hereby represents that it is organized as a stock or nonstock corporation, limited liability company, business trust, or limited partnership or registered as a registered limited liability partnership and is authorized to transact business in the Commonwealth as a domestic or foreign business entity if so required by Title 13.1 or Title 50 or as otherwise required by law.
H. Liquidated Damages

The damage and loss to the Owner resulting from failure of the Contractor to complete the Work within the time specified in this Agreement, plus any extension of time granted, shall be stipulated in Section 108.X, and Section 102.III, Bid Form. Damage monies may be withheld on partial and final payment to the Contractor. (See Section 102.III Bid Form and Section 108.X for explanation and specified dollar amounts.) **Liquidated damages as stipulated in the Bid Form, in the amount of $1,000.00 per Calendar Day for failure to meet the substantial completion date and $500.00 per Calendar Day for failure to meet the final completion date will be assessed by the Owner for failure of the Contractor to complete the Work on or before the Date of Substantial and Final Completion stated above or as may be modified by duly executed Change Orders. If Substantial Completion has not been achieved by the scheduled Final Completion date, the liquidated damages for Substantial Completion will run until Substantial Completion is achieved.**

I. Component Parts of the Contract

This Agreement includes all completed components of the Bid and Contract Documents as defined in Section 101 of the HRPDC Regional Construction Standards (Latest Edition indicated in the Invitation For Bids), as revised for this Project all of which are incorporated herein by reference.

J. Binding

This Agreement shall be binding upon all parties hereto and their respective heirs, executors, administrators, successors, and assigns.

K. Changes to the Agreement

No provision of this Agreement shall be changed, amended, modified, waived, or discharged except as agreed to in writing by the Owner and the Contractor.

L. Emergency Services

Under emergency conditions the City reserves the right to utilize the Contractor for related services, as deemed appropriate to help resolve the emergency. During the contract period, if an emergency situation (natural or man-made) occurs, the Contractor agrees to dedicate the personnel allocated to this project to assist the Owner during the recovery period. The Owner shall direct this work in writing and costs will be paid according to the rates for Additional Services. Hourly rates for these services will be at the rates agreed upon under this agreement.

THE REMAINDER OF THIS PAGE INTENTIONALLY LEFT BLANK
IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be executed as of the day and
first above written in 4 (four) counterparts each of which shall for all purposes be deemed an original.

OWNER

City of Norfolk
Owner

By: _____________________________
City Manager

Date: ____________________________
Attest: __________________________
Address: __________________________

Attest: __________________________
City Clerk

APPROVED AS TO CONTENT:
Contractor’s Registration No.: _______________
(If Contractor is a corporation or an unincorporated
organization, attach evidence of authority to sign)

____________________________________
Director of Utilities

APPROVED AS TO FORM:

____________________________________
Deputy City Attorney

I hereby certify that the money required for this contract (agreement, obligation or expenditure) is in the City
Treasury to the credit of the fund from which it is to be drawn, and not appropriated for any other purpose.

Account No: __________________________
Amount: __________________________

Contract No: __________________________
Vendor Code: __________________________

Director of Finance

IV. PERFORMANCE BOND

December 2010

Hampton Roads Planning District Commission

Barraud Park, Pump Station #153, Phase I
May, 2015
City of Norfolk Department of Utilities
KNOW ALL PERSONS BY THESE PRESENTS, that _______________________________________

of __________________________________________________, hereinafter called the Contractor and ______________________, a corporation duly organized and existing under and by virtue of the laws of the State of ____________, hereinafter called the Surety, and authorized to transact business within the Commonwealth of Virginia as the Surety, are held and firmly bound unto _____________________________ as Owner, in the sum of __________________________ dollars ($__________), lawful money of the United States of America, for payment of which, well and truly made to the Owner, the Contractor and the Surety bind themselves and each of their heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents as follows:

THE CONDITION OF THE ABOVE OBLIGATION IS SUCH THAT:

WHEREAS, the Contractor has executed and entered into a certain Agreement, hereto attached, with the Owner dated ____________, 20____, for ___________________________________________ __________________________________________________________________________ __________________________________________________________________________

NOW THEREFORE, if the Contractor, and its successors and assigns, shall at all times duly, promptly, and faithfully perform the Work and any alteration in or addition to the obligations of the Contractor arising thereunder, including the matter of infringement, if any, of patents or other proprietary rights, and shall assure all guarantees against defective workmanship and materials, including the guarantee period following final completion by the Contractor and final acceptance by the Owner and comply with all the covenants therein contained in the Specifications, Drawings, and other Contract Documents required to be performed by the Contractor, in the manner and within the times provided in the Agreement, and shall fully indemnify and save harmless the Owner from all costs and damage which it may suffer by reason or failure to do so, and shall fully reimburse and repay it all outlay and expenses which it may incur in making good any default, and reasonable counsel fees incurred in the prosecution of or defense of any action arising out of or in connection with any such default, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, HOWEVER, that the Surety, for value received, for itself and its successors and assigns, hereby stipulates and agrees that no change, extension of time, alteration, or addition to the terms of the Contract Documents or to the Work to be performed thereunder, or payment thereunder before the time required therein, or waiver of any provision thereof, or assignment, subletting or transfer thereof or any part thereof, shall in any way affect its obligation on this Bond, and it does hereby waive notice of any such change, extension of time, alteration, addition to the terms of the Contract Documents or any such payment, waiver, assignment, subcontract or transfer.

PROVIDED, FURTHER, that no final settlement between the Owner and the Contractor shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

Whenever Contractor shall be declared by Owner to be in default under the Contract, the Owner having performed Owner’s obligations thereunder, the Owner shall have the right, at its option, to require the Surety to promptly proceed to remedy the default within 30 days of notice by proceeding or procuring others to proceed with completing the Agreement with its terms and conditions; and all reserves, deferred payments, and other funds provided by the Agreement to be paid to Contractor shall be paid to Surety at the same times.
and under the same conditions as by the terms of that Agreement such fund would have been paid to Contractor had the Agreement been performed by Contractor; and Surety shall be entitled to such funds in preference to any assignee of Principal of any adverse claimant. Notwithstanding the above, the Owner shall have the right, with the approval of the Surety which shall not be unreasonably withheld, to take over and assume completion of the Agreement and be promptly paid in cash by the Surety for the cost of such completion less the balance of the Contract price.

IN WITNESS WHEREOF, all above parties bounded together have executed this instrument this ____ day of ______________, 20___, the name and corporate seal of each corporate party being hereto affixed and those presents duly signed by its undersigned representative, pursuant to authority of its governing body.

CONTRACTOR

_________________________________

By:_________________________________(Seal)

Name:______________________________

Title:_______________________________

______________________________________________________________________________

Attest

SURETY

______________________________________________

By:_________________________________(Seal)

______________________________________________________________________________

Attest

APPROVED AS TO FORM: ______________, 20___

______________________________________________________________________________

DEPUTY CITY ATTORNEY

NOTE: Date of Bond shall not be prior to the date of the Agreement. If the Contractor is a partnership, all partners shall execute the Bond.

IMPORTANT: The Surety named on this Bond shall be one who is licensed to conduct business in the Commonwealth of Virginia, and named in the current list of Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies, as published in Circular 570 (amended) by the Audit Staff Bureau of Accounts, U.S. Treasury Department. All Bonds signed by an agent shall be accompanied by a certified copy of the authority to act for the Surety at the time of signing of this Bond.
V. PAYMENT BOND

KNOW ALL PERSONS BY THESE PRESENTS, that

________________________________________
of ______________________________________
____________________________ hereinafter called the Contractor and __________________________, a corporation duly
organized and existing under and by virtue of the laws of the State ___________________, hereinafter called
the Surety, and authorized to transact business within the Commonwealth of Virginia as the Surety, are held
and firmly bound unto __________________________________ as Owner, in the sum
of __________________________ dollars ($__________), lawful money of the United States of America, for
payment of which, well and truly be made to the Owner, the Contractor and the Surety bind themselves and
each of their heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these
presents as follows:

THE CONDITION OF THE ABOVE OBLIGATION IS SUCH THAT:

WHEREAS, the Contractor has executed and entered into a certain Agreement, hereto attached, with the
Owner dated ___________________, 20___, for _____________________________________________
____________________________________________________________________________________
____________________________________________________________________________________

NOW THEREFORE, if the Contractor shall promptly make payments to all persons, firms, subcontractors,
and corporations furnishing materials for or performing labor in the prosecution of the Work provided for in
the Agreement, and any authorized extension or modification thereof, including all amounts due for
materials, lubricants, oil, gasoline, repairs on machinery, equipment, and tools consumed, used or rented in
connection with the construction of the Work, and all insurance premiums on the Work, and for all labor
performed in the Work, whether by Subcontractor or otherwise, then this obligation shall be void, otherwise
to remain in full force and effect.

PROVIDED, HOWEVER, that the Surety, for value received, hereby stipulates and agrees that no change,
extension of time, alteration, or addition to the terms of the Contract Documents or to the Work to be
performed thereunder, shall in any way affect its obligation on this Bond, and it does hereby waive notice of
any such change, extension of time, alteration, or addition to the terms of the Contract Documents.

PROVIDED, FURTHER, that no final settlement between the Owner and the Contractor shall abridge the
right of any beneficiary hereunder, whose claim may be unsatisfied.

THE REMAINDER OF THIS PAGE INTENTIONALLY LEFT BLANK
IN WITNESS WHEREOF, all above parties bounded together have executed this instrument this ___ day of __________, 20___, the name and corporate seal of each corporate party being hereto affixed and those presents duly signed by its undersigned representative, pursuant to authority of its governing body.

**CONTRACTOR**

By: __________________________ (Seal)

Name: _________________________

Title: _________________________

__________________________________
Attest

**SURETY**

__________________________________
By: __________________________ (Seal)

__________________________________
Attest

**APPROVED AS TO FORM:** ____________________, 20______

__________________________________
DEPUTY CITY ATTORNEY

NOTE: Date of Bond shall not be prior to the date of the Agreement. If the Contractor is a partnership, all partners shall execute the Bond.

IMPORTANT: The Surety named on this Bond shall be one who is licensed to conduct business in the Commonwealth of Virginia, and named in the current list of Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies, as published in Circular 570 (amended) by the Audit Staff Bureau of Accounts, U.S. Treasury Department. All Bonds signed by an agent shall be accompanied by a certified copy of the authority to act for the Surety at the time of signing of this Bond.

THE REMAINDER OF THIS PAGE INTENTIONALLY LEFT BLANK
VI. IRREVOCABLE LETTER OF CREDIT

IRREVOCABLE LETTER OF CREDIT NO. ______

WORDS IN PARENTHESES ARE INSTRUCTIONS. ANY VARIATIONS WILL BE REJECTED.

BANK LETTERHEAD

Marcus D. Jones, City Manager
City of Norfolk
810 Union Street
1101 City Hall Building
Norfolk, VA 23510

To Whom It May Concern:

We hereby authorize the City Manager, or agent, to draw on us for the account of (Developer’s Name and Address) up to an aggregate amount of U.S. Dollars (Amount) available by your drafts at sight accompanied by certification of Director, Department of Public Works, that the developer failed to complete installation or performance in accordance with a plan known as (Plan Name and Number) or otherwise failed to perform in accordance with an agreement dated ____________ between (Developer’s Name) and the City. This Letter of Credit is irrevocable and unconditional.

We hereby further agree that:

(a) Drafts drawn under and in compliance with the terms of this Letter of Credit will be duly honored if presented at our office on or before (This Date Must Be At Least Six Months After Agreement Expiration Date).

(b) Funds available under this Letter of Credit shall be paid by us in such amounts and at such times as determined by the Director, Department of Public Works, or the City Manager, in their sole discretion, provided that the amount drawn shall not exceed the aggregate amount specified herein. Checks will be made payable to “Treasurer, City of Norfolk” and directed to the attention of the City Manager.

(c) We shall have no right, duty, obligation or responsibility to evaluate the performance or non-performance of the underlying contract between our customer and the beneficiary of this Letter of Credit.

(d) We hereby agree that no change, extension of time, alteration or addition to work to be performed or to the plans and specifications relating to the same, shall in any way affect our obligations under this Letter of Credit and we hereby waive notice of any such change, extension of time, alteration, or addition, on the understanding that no such change, extension of time, alteration, or addition shall increase the amount of our obligation under this Letter of Credit.

(e) It is a condition of this Letter of Credit that it will be automatically extended for successive six (6) month periods of time unless thirty (30) days prior to an expiration date we notify the Director,
Department of Public Works, in writing by registered mail, that we elect not to renew this Letter of Credit for such additional period.

(f) Upon receipt by you of such notice of non-renewal or in the event of a default, you may draw hereunder by means of your drafts on us, at sight accompanied by your written certification that you have not released liability under the aforesaid agreement or undertaking and the proceeds of your draft will be used by you to meet eventual payments under your agreement or until your undertaking is satisfied. You will refund to us the amount paid, less any amounts which may have been paid by you in the meantime under this agreement or undertaking. A default shall be deemed to have occurred on the part of the Developer whenever, in the sole judgment of the City Manager or the Director, Department of Public Works, the Developer is not diligently and satisfactorily completing the improvements for which the Letter of Credit has been given as security or at the date the underlying agreement, or any extension thereof, expires.

(g) If the issuer of this Letter of Credit becomes critically undercapitalized, as defined in the Code of Federal Regulations, or insolvent, as defined in any applicable federal or state statute or regulation, the City shall be immediately entitled to draw on this Letter of Credit. In such event, you may draw on this Letter of Credit by means of your drafts on us, at sight accompanied by certification of the City Manager or the Director, Department of Public Works, that the issuer of this Letter of Credit has become critically undercapitalized, as defined in the Code of Federal Regulations, or insolvent, as defined in any applicable federal or state statute or regulation. The refund provisions of paragraph (f) above would also apply to a draft under this paragraph.

(h) Except so far as otherwise expressly stated, this Letter of Credit is subject to the Uniform Customs and Practice for Documentary Credits, International Chamber of Commerce in effect on the date of issuance. The amount of any draft drawn hereunder must be endorsed on the reserve side hereof. All drafts must be marked “Drawn under (Bank’s Name) Letter of Credit (No. and Date as above)”. 

THE REMAINDER OF THIS PAGE INTENTIONALLY LEFT BLANK
Approval of this Letter of Credit by the City shall be deemed acceptance without further notice to the bank and/or the Developer.

______________________________  
(Bank Name)

By: ______________________________  
(Signature)

______________________________  
(Print or type name and title)

ACKNOWLEDGMENT (Notarization)

STATE OF _______________________:

COUNTY/CITY OF ________________:

I, ______________________________, a Notary Public in and for the State and County/City aforesaid, do hereby certify that ______________________________ whose name is signed to the foregoing, this day personally appeared before me in my State and County/City aforesaid and acknowledged the same.

Given under my hand this ______ day of ___________________, 20_____.

____________________________________  
Notary Public

My Commission Expires: ______________

CITY OF NORFOLK, VIRGINIA

APPROVED AS TO FORM AND CORRECTNESS:

____________________________________  
City Attorney’s Office
VII. ESCROW AGREEMENT

THIS AGREEMENT made and entered into this ___________ day of ________________, 20__, by, between and among the City of Norfolk, Virginia (hereinafter "City"), a municipal corporation chartered by the Commonwealth of Virginia:

___________________________________________________________ (hereinafter “Contractor”),

(Name of Bank)

(Address of Bank)

a trust company, bank, or savings and loan institution with its principal office located in the Commonwealth of Virginia (hereinafter referred to collectively as “Bank”) and

(Name of Surety)

(Address of Surety)

(herinafter “Surety”) provides:

I. The city and the Contractor have entered into a contract with respect to the city of Norfolk Bid No. ___________________________,

[entitled or described as]

(“the contract”). This Agreement is pursuant to, but in no way amends or modifies the contract. Payments made hereunder or the release of funds from escrow shall not be deemed approval or acceptance of performance by the Contractor.

II. In order to assure full and satisfactory performance by the Contractor of its obligations under the contract, the City is required thereby to retain certain amounts otherwise due the Contractor. The Contractor has, with the approval of the City, elected to have these retained amounts held in escrow by the Bank. This agreement sets forth the terms of the escrow. The Bank shall not be deemed a party to, bound by, or required to inquire into the terms of, the contract or any other instrument or agreement between the City and the Contractor.

III. The City shall from time to time pursuant to its contract pay to the Bank amounts retained by it under the contract. Except as to amounts actually withdrawn from escrow by the City, the Contractor shall look solely to the Bank for the payment of funds retained under the contract and paid by the City to the Bank.

The risk of loss by diminution of the principal of any funds invested under the terms of this contact shall be solely upon the Contractor.

Funds and securities held by the Bank pursuant to this Escrow Agreement shall not be subject to levy, garnishment, attachment, lien, or other process whatsoever. Contractor agrees not to
assign, pledge, discount, sell or otherwise transfer or dispose of his interest in the escrow account or any part thereof, except to the Surety.

IV. Upon receipt of checks or warrants drawn by the City and made payable to it as escrow agent, the Bank shall promptly notify the Contractor, negotiate the same and deposit or invest and reinvest the proceeds in approved securities in accordance with the written instructions of the contractor. In no event shall the Bank invest the escrowed funds in any security not approved.

V. The following securities, and none other, are approved securities for all purposes of this Agreement:

1. United States Treasury bonds, United States Treasury Notes, United States Treasury Certificates of Indebtedness or United States Treasury Bills,
2. Bonds, notes and other evidences of indebtedness unconditionally guaranteed as to the payment of principal and interest by the United States,
3. Bonds or notes of the Commonwealth of Virginia,
4. Bonds of any political subdivision of the Commonwealth of the Bank or deposit by the Contractor, a Standard and Poor’s or Moody’s Investors Service rating of at least “A”, and
5. Certificates of deposit issued by commercial Banks located within the Commonwealth, including , but not limited to, those insured by the Bank and its affiliates,
6. Any bonds, notes, or other evidences of indebtedness listed in Sections (1) through (3) may be purchased pursuant to a repurchase agreement with a bank, within or without the Commonwealth of Virginia having a combined capital, surplus and undivided profit of not less than $25,000,000, provided the obligation of the Bank to repurchase is within the time limitations established for investments as set forth herein. The repurchase agreement shall be considered a purchase of such securities even if title, and/or possession of such securities is not transferred to the Escrow Agent, so long as the repurchase obligation of the Bank is collateralized by the securities themselves, and the securities have on the date of the repurchase agreement a fair market value equal to at least 100% of the amount of the repurchase obligation of the Bank, and the securities are held by a third party, and segregated from other securities owned by the Bank.

No security is approved hereunder which matures more than five years after the date of its purchase by the Bank or deposit by the Contractor.

VI. The Contractor may from time to time withdraw the whole or any portion of the escrowed funds by depositing with the Bank approved securities in an amount equal to, or in excess of, the amount so withdrawn. Any securities so deposited or withdrawn shall be valued at such time of deposit or withdrawal at the lower or par or market value, the latter as determined by the Bank. Any securities so deposited shall thereupon become a part of the escrowed fund.

Upon receipt of a direction signed by the City Manager or Assistant City Manager, the Bank shall pay the principal of the fund, or any specified amount thereof, to the City of Norfolk for the account of the project. Such payment shall be made in cash as soon as is practicable after receipt of the direction.
Upon receipt of a direction signed by the City Manager or Assistant City Manager or Director of Public Works or Director of Utilities, the Bank shall pay and deliver the principal of the fund, or any specified amount thereof, to the Contractor, in cash or in kind, as may be specified by the Contractor. Such payment and delivery shall be made as soon as is practicable after receipt of the direction.

VII. For its services hereunder the Bank shall be entitled to a reasonable fee in accordance with its published schedule of fees or as may be agreed upon by the Bank and the Contractor. Such fee and any other costs of administration of the Agreement shall be paid from the income earned upon the escrowed fund and, if such income is not sufficient to pay the same, by the Contractor.

VIII. The net income earned and received upon the principal of the escrowed fund shall be paid over to the Contractor in quarterly or more frequent installments. Until so paid or applied to pay the Bank’s fee or any other costs of administration such income shall be deemed a part of the principal of the fund.

IX. The Surety undertakes no obligation hereby but joins in this Agreement for the Sole purpose of acknowledging that its obligations as surety for the Contractor’s performance of the contract are not affected hereby.

THE REMAINDER OF THIS PAGE INTENTIONALLY LEFT BLANK
WITNESS the following signatures, all as of the day and year first above written.

CITY OF NORFOLK, VIRGINIA

By: ______________________________________
   City Manager or Assistant City Manager

ATTEST:

City Clerk

______________________________
Contractor

APPROVED AS TO FORM AND CORRECTNESS:

By: ______________________________________
   Officer, Partner or Owner

Deputy City Attorney

______________________________
(Seal)

Name: ________________________________
Title: ________________________________

______________________________
Bank

By: ________________________________
Signature

Name: ________________________________
Title: ________________________________

______________________________
Surety

By: ________________________________
Signature

Name: ________________________________
Title: ________________________________

Ref:     DOT FORM C-8
REV 1/1/87

MGR/gt 12/21/89

1 If executed by Attorney-in-Fact, fully-executed Power of Attorney is attached. The power is recorded in Norfolk Circuit Court in Deed Book No. _______, Page ___________.

December  2010       103 - 22

Hampton Roads
Planning District Commission

Barraud Park, Pump Station #153, Phase I
May, 2015
City of Norfolk Department of Utilities
VIII. NOTICE TO PROCEED

TO: ___________________________   DATE: _________________________________

___________________________   PROJECT: ______________________________

___________________________   _______________________________________

___________________________   _______________________________________

You are hereby notified to commence Work in accordance with the Agreement dated ______________, 20__, on or before ______________, 20__, and you are to substantially complete the Work within 335 Days thereafter and reach Final Completion of the Work within 30 Days thereafter. The date of Final Completion of all Work is therefore ______________, 20__.

Liquidated damages as stipulated in the Bid Form, in the amount of $1000.00 per Calendar Day for failure to meet the substantial completion date and $500.00 per Calendar Day for failure to meet the final completion date will be assessed by the Owner for failure of the Contractor to complete the Work on or before the Date of Substantial and Final Completion stated above or as may be modified by duly executed Change Orders. If Substantial completion has not been achieved by the scheduled Final completion date, the liquidated damages will run concurrently until substantial completion is achieved.

OWNER: City of Norfolk

BY: ______________________________

TITLE: ______________________________

ACCEPTANCE OF NOTICE:

Receipt of the above NOTICE TO PROCEED is hereby acknowledged by:

_____________________________
this the ____________ day of
__________________, 20 __

CONTRACTOR:______________________

BY: ______________________________

TITLE: ______________________________

End of Section
SECTION 104

SCOPE OF WORK

I. INTENT OF AGREEMENT

1.1. The intent of the Agreement is to provide for completion of the Work specified therein.

1.2. If, during the performance of the Work, the Contractor finds a conflict, error or discrepancy in the Contract Documents, the Contractor shall so report to the Owner in writing at once and before proceeding with the Work affected thereby, except in the case of emergency or public safety, shall obtain a written interpretation or clarification from the Owner however, the Contractor shall not be liable to the Owner for failure to report any conflict, error or discrepancy in the Contract Documents unless the Contractor has actual knowledge thereof or should reasonably have known thereof.

II. AMENDING AND SUPPLEMENTING CONTRACT DOCUMENTS

2.1. The Contract Documents may be amended to provide for additions, deletions and revisions in the Work or to modify the terms and conditions thereof by a Change or Field Order pursuant to Section 109 II.

III. EXPLORATIONS AND REPORTS

3.1. Reference is made to the Special Provisions for identification of those reports of explorations and tests of subsurface conditions at the site that have been utilized by the Owner in preparation of the Contract Documents.

3.2. The Contractor shall visit the site of the proposed Work and make such explorations as the Contractor determines to be necessary.

IV. UNDERGROUND FACILITIES

4.1. The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the site is based on information and data furnished to the Owner or Engineer by the owners of such Underground Facilities or by others.

4.2. The Owner and Engineer shall not be responsible for the accuracy or completeness of any such information and data. The Contractor shall have full responsibility for reviewing and checking all such information and data, for locating all Underground Facilities shown or indicated in the Contract Documents, for coordination of the Work with the owner’s of such Underground Facilities during construction, for the safety and protection of said facilities, and repairing any damage thereto resulting from the Work, the cost of all of which will be considered as having been included in the Contract Base Bid.

4.3. If an Underground Facility is uncovered or revealed at or contiguous to the site which was not shown or indicated in the Contract Documents and which the Contractor could not reasonably have been expected to be aware of, the Contractor shall, promptly after becoming aware thereof and before performing any Work affected thereby, identify and immediately notify the owner of such Underground Facility and give written Notice thereof to that owner and to the Owner. The Owner will promptly review the Underground Facility to determine the extent to which the Contract
Documents should be modified to reflect and document the consequences of the existence of the Underground Facility, and the Contract Documents will be amended or supplemented to the extent necessary. During such time the Contractor shall be responsible for the safety and protection of any such Underground Facility which is in service or which is to be placed in service. The Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Time, or both, to the extent that they are attributable to the existence of any Underground Facility in service or which is to be placed in service, which directly and unavoidably impacts the installation of the Work, that was not shown or indicated in the Contract Documents and which the Contractor could not reasonably have been expected to be aware of.

4.4. If the existence of an Underground Facility described above unavoidably impacts the installation of the Work, the Contractor shall, to the fullest extent possible, continue the Work on other portions of the site. All delays must be shown by the Contractor to be directly attributable to said unforeseen conditions and limited to the time actually occasioned by such unforeseen conditions, and that the Contractor has prosecuted the other portions of the Work to the fullest extent possible.

4.5 The Contractor shall comply with the Underground Utility Damage Prevention Act, Section 56-265.14 through 56-26532, Code of Virginia of 1950, as enacted and amended, and shall be responsible for notifying the owners of utilities and requesting the locating and marking of all underground facilities before beginning any excavation.

4.6 The Contractor should be aware that in some instances buried cables, gas lines, sewer lines, and water lines 2-inches and smaller in diameter may have to be excavated by hand and slightly relocated to facilitate construction of the Work under this Agreement. This shall be considered incidental to the Work, and the Contractor will not be eligible for additional compensation.

4.7 At points where the Contractor’s operations are adjacent to the properties of any utility, including railroads, and damage to which might result in considerable expense, loss, or inconvenience, Work shall not commence until arrangements necessary for the protection thereof have been completed.

4.8 The Contractor shall cooperate with owners of utility lines so that removal and adjustment operations may progress in a reasonable manner, duplication of adjustment work may be reduced to a minimum, and services rendered by those parties will not be unnecessarily interrupted.

4.9 If any utility service is interrupted as a result of accidental breakage or of being exposed or unsupported, the Contractor shall promptly notify the proper authority and shall cooperate with the authority in the restoration of service. If utility service is interrupted, repair work shall be continuous until service is restored. The Contractor shall be responsible for any damage to utilities that are attributable to his neglect or methods of performing the Work.

V. SUBSURFACE CONDITIONS

5.1. The Contractor shall promptly, and if possible, before such conditions are disturbed, except in the event of an emergency, notify the Owner by written Notice of:

A. subsurface or latent physical conditions at the site differing materially from those indicated in the Contract Documents; or

B. 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 the Contract Documents.
5.2. The Owner shall promptly investigate the conditions, and if it is confirmed that such conditions do so materially differ and cause an increase or decrease in the cost of, or in the time required for, performance of the Work, an equitable adjustment shall be made and the Agreement shall be modified by a Change Order. Any claim of the Contractor for adjustment hereunder shall not be allowed unless the Contractor has given the required written Notice; provided that the Owner may, if the facts so justify, consider and adjust any such claims asserted before the date of final payment.

5.3 All required written Notices shall be submitted to the Owner within 20 Days after occurrence of the event giving rise to such claim, or within 20 Days after the claimant recognizes the condition, whichever is later.

VI. SITE SECURITY

6.1. The Contractor shall be responsible for the security and safety of all project facilities including, but not limited to, all equipment, materials, site structures, and construction thereon. All security measures deemed necessary by the Contractor to comply with this requirement shall be at the Contractor’s expense at no additional cost to the Owner. The Contractor shall be responsible for all site security until final acceptance of the Work by the Owner.

VII. CLEAN-UP, DISPOSAL AND RESTORATION

7.1. The Contractor shall maintain the site of the project in an orderly and clean condition and shall at intervals of no more than three (3) working days and at its expense, remove and legally dispose of accumulations of rubbish or refuse materials, surplus concrete, mortar and excavated materials not required or suitable for backfill from public and private property and rights-of-way. Washings from concrete mixers or mixing boxes shall not be deposited directly or indirectly in the drainage or sewer system or on paved streets. The Contractor shall keep the site, inclusive of vehicular and pedestrian traffic routes through the site, free of dirt and dust by periodic blading, power brooming, watering or other approved means. Road surfaces adjacent to the work area shall be cleaned of soil with mechanical brooms or other approved methods at the end of each working day. Road shoulders and driveways shall be stabilized so as to allow traffic flow (including mail and paper delivery vehicles, school buses and emergency vehicles) by the end of each working day.

7.2. The Contractor shall confine all equipment, the storage of materials and equipment, and the operations of workmen to areas permitted by law, ordinances, permits, or the requirements of the Contract Documents, and shall not unreasonably encumber the premises with materials or equipment.

7.3. The Contractor shall not load nor permit any part of any structure to be loaded with weights that will endanger the structure, nor shall any part of the work be subjected to stresses or pressures that will endanger it.

7.4. Upon completion and before final acceptance of the Work performed under the Agreement, the Contractor shall remove and legally dispose of all rubbish, surplus or discarded materials, false work, forms, temporary structures, field offices, signs, temporary erosion and siltation control measures, and equipment and machinery, and shall leave the site and ground occupied in connection with the performance of the Work in the conditions existing before the Work was started, to the satisfaction of the Owner.

7.5. All waste materials, including but not limited to excavated materials, demolished pavement, arboreal (landscaping) waste and other debris, that are not suitable for Project related purposes (e.g., backfill) or are surplus to the needs of the Project, both as determined by the Owner, shall become the
property of the Contractor. The Contractor shall dispose of all such material in accordance with his accepted Disposal Plan, as specified below, at no additional cost to the Owner.

A. The Contractor shall submit a Disposal Plan for review and acceptance by the Owner prior to performing any Work that might generate waste materials. The plan shall include a complete description of the materials that are expected to be encountered and their proposed disposal site(s). The Contractor may change his Disposal Plan only by written notice to the Owner. The acceptance of a plan and/or any related notice to the Owner must be evidenced by a written response from the Owner.

B. The Contractor shall insure that all permits related to his disposal operations have been obtained, and the Contractor shall comply with all requirements of those permits. The Contractor shall show evidence that all required permits have been obtained for all disposal sites by submitting a copy of all such permits to the Owner as part of the Contractor's Disposal Plan.

End of Section
SECTION 105

CONTROL OF WORK

I. REUSE OF CONTRACT DOCUMENTS

1.1. Neither the Contractor nor any Subcontractor or Supplier or other person or organization performing or furnishing any of the Work under a direct or indirect contract with the Owner shall have or acquire any title to or ownership rights in any of the Contract Documents (or copies thereof) prepared by or bearing the seal of the Engineer; and, they shall not reuse any of the Contract Documents on extensions of the Project or any other project without written consent of the Owner and Engineer and specific written verification by the Owner.

II. COPIES OF CONTRACT DOCUMENTS

2.1. The Owner will furnish to the Contractor up to ten (10) copies of the Contract Documents as are reasonably necessary for the execution of the Work. Additional copies will be furnished, upon request, at the cost of reproduction.

III. CONTRACT DOCUMENTS


3.2. In cases of conflicts, Special Provisions shall govern over the Regional Construction Standards; Specifications shall govern over Drawings; figure dimensions shall govern over scaled dimensions; and, detailed Drawings shall govern over general Drawings; unless, the interpretation would result in a violation of any law or regulation applicable to the performance of the Work.

3.3. The Contractor shall, upon discovering any error, omission, or discrepancy in the Contract Documents, immediately notify the Owner.

IV. SHOP DRAWINGS AND SUBMITTALS

4.1. The Contractor shall compile a complete and comprehensive schedule of all the submittals anticipated to be made during the progress of the Work. The schedule shall include a list of each type of item for which the Contractor's drawings, Shop Drawings, material affidavits, material samples, guarantees, or other types of submittals are required. The Contractor shall submit a completed copy of the Approved Products List for all standard sewer, water, and force main items. All items used shall have been manufactured within two (2) years of the bid date of the project.

4.2. Prior to each submittal, the Contractor shall carefully review and coordinate all aspects of each item or sample submitted with any other item or sample being submitted and verify that each item and sample adheres in all respects with the requirements of the Contract Documents.

4.3. The Contractor shall certify that all materials used in the Work are in complete compliance with all specified provisions. Certification shall not be construed as relieving the Contractor from its responsibility of furnishing satisfactory materials. At the time of each submission, the Contractor shall in writing call the Owner's attention to any deviations that the Shop Drawings or samples may have from the requirements of the Contract Documents.

4.4. The Contractor shall submit four (4) copies, plus the number of copies desired to be returned, of Shop Drawings or submittals that are required by Section 105 or the Special Provisions for a total of
not more than ten (10). Each submission shall be accompanied by letter of transmittal in duplicate, listing the contents of the submission and identifying each item by reference to specification section or Drawing. The data shown on the Shop Drawings shall be complete with respect to quantities, dimensions, specified performance and design criteria, materials and similar data to show the Owner the materials and equipment the Contractor proposes to provide.

4.5. The Contractor shall also submit samples to the Owner for review and approval in accordance with the accepted schedule of submittals. Each sample shall be identified clearly as to material, supplier, pertinent data such as catalog numbers and the use for which intended and otherwise as the Owner may require for review. The review of a separate item or sample will not indicate approval of any assembly in which the separate item or sample functions.

4.6. The Contractor is responsible for submitting all Shop Drawings and schedules in a timely manner to avoid delaying the Work. The Owner shall within 21 days after receipt, return Shop Drawings and schedules to the Contractor indicating approval or disapproval. Shop Drawings will not be reviewed prior to issuance of the N.T.P.

4.7. Review and/or approval of Shop Drawings will be for general conformance with the Contract Documents and shall not relieve the Contractor from the responsibility of furnishing materials and equipment of proper dimension, size, quality, quantity, and all performance characteristics to efficiently perform the requirements and intent of the Contract Documents. Approval shall not be construed as permitting any departure from the Project requirements, authorization of any increase in price, or approval of departures from additional details or instructions previously furnished by the Owner.

4.8. Before submitting each Shop Drawing or sample, the Contractor shall have determined and verified:

A. All field measurements, quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers and similar information with respect thereto;

B. All materials with respect to the intended use, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the work; and

C. All information relative to the Contractor’s sole responsibility in respect of means, methods, techniques, sequences and procedures of construction and safety precautions and progress incident thereto.

4.9. Each Shop Drawing and sample submission shall bear a stamp or specific written indication that the Contractor has satisfied Contractor’s obligation under the Contract Documents with respect to the Contractor’s review and approval of that submission. The Contractor’s Shop Drawing stamp shall be as follows (or as otherwise approved by the Owner and Engineer):
4.10. The Engineer will review and approve or disapprove or return as incomplete Shop Drawings and samples in accordance with the schedule of submittals submissions accepted by the Engineer. The Engineer’s review and approval or disapproval will not extend to means, methods, techniques, sequences or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto. The Contractor shall make corrections required by the Engineer, and shall return the requested number of copies of Shop Drawings and samples for review and approval. The Contractor shall direct specific attention in writing to revisions other than the corrections called for by the Engineer on previous submittals. Upon approval, two marked copies will be returned to the Contractor.

4.11. No progress payments will be made to the Contractor until the schedules are submitted to and acceptable to the Engineer. The progress schedule shall be acceptable to the Engineer as being the Contractor’s schedule for the orderly progression of the Work to completion within any specified Contract Times, but such acceptance will neither impose on the Engineer responsibility for the sequencing, scheduling or progress of the Work nor interfere with or relieve the Contractor from the Contractor’s full responsibility therefor.

4.12. The Engineer will record time required by the Engineer or Engineer’s consultants for excessive submittal review occasioned by the Contractor’s re-submission, in excess of one re-submission of a required submittal, caused by unverified, unchecked or un-reviewed, incomplete, inaccurate or erroneous, or nonconforming submittals. The Engineer's costs will be an estimated average billing rate for labor plus related expenses.

4.13. Within ten (10) days after the Effective Date of the Agreement, the Contractor shall submit to the Engineer for approval a schedule listing the manufacturer of the items of equipment and materials proposed for the construction. Following approval of the schedule, no changes in material or
equipment from those listed will be allowed except in unusual or extenuating circumstances. When such circumstances arise, the Contractor shall request, in writing, the Owner’s approval of the proposed change, stating the circumstances necessitating such a change. The intent of this schedule is to name the manufacturers of material specified by a product standard and to designate which manufacturer will be used when more than one has been named for an item. The schedule shall not be interpreted as allowing any change from base Bid items or those substitute items offered with the Bid and accepted in the Agreement.

V. RECORD DRAWINGS

5.1. The Contractor shall keep one record copy of all Special Provisions, Specifications, Drawings, Addenda, Written Amendments, Change Orders, Shop Drawings, Owner-approved submittals, and samples at the site in good order and annotated to show all changes made during the construction process. These documents shall be available to the Owner for examination and shall be submitted to the Owner upon completion of the Work. As-built information (including dimensions, materials, existing utilities) shall also be included on the Drawings. Progress payments may be withheld for failure to keep neat, accurate and complete record drawings. **Record Drawings shall be submitted with monthly invoices.**

5.2. The Contractor shall include any field changes, deviations from the Drawings due both to field conditions and Change Orders.

5.3. Record information for projects shall include the following as a minimum:

A. Size, horizontal and vertical location of all existing utilities uncovered during the course of the work. This shall include telephone cables and conduits, TV cables and conduits, electrical cables and conduits, gas lines, water line, sewer force mains, sanitary sewers, storm sewers and the like.

B. Horizontal and vertical location of the water, force main, sanitary and storm sewer installed at every 100-foot station, at interconnections, and at fittings, tees, bends and offsets. The frequency and location of survey shots will match the proposed grade elevations shown on the Drawings.

C. Location of lines plugged or capped, blowoffs, and air vents.

D. Location of all restraining devices used; for example, thrust blocks, retainer glands, tie rods, etc.

E. Location of all valves, ends of all lines and other fittings shall be accurately located by triangulation from two permanent structures, which will be visible on the ground surface.

F. Location and size of all taps and service line connections made, including corporation stops (if any) used for testing purposes.

G. Size (if greater than ¾”) material, depth and location of both ends of the water service lines are required.

H. Rim elevations of manholes and invert elevations of pipes entering and exiting the manhole.

I. Size, material, depth and location of sewer laterals including:

1. Measurements taken from the nearest downstream manhole, then measure over
perpendicular from that point on the main to the end of the lateral. All measurements are taken from the center of the manhole cover.

2. If lateral comes out of a manhole in a cul-de-sac; triangulation from that manhole will be required.

3. Measured depth from the finished grade at the end of the lateral.

J. Information required for public storm drain systems:

1. Size, material and location of all storm sewer lines.

2. Elevations shall be provided for all ditch, pipe and structure inverts and rims.

5.4 The Record Drawings shall include the following minimum accuracy for survey measurements and field measurements.

A. Horizontal accuracy:

1. Both surface and subsurface gravity sanitary sewer systems shall be measured in a survey to +/- 1.0 foot at the structure location.

2. Both surface and subsurface pressure systems shall be measured in a survey to +/- 1.0 foot at the structure location.

3. Curb/curb and gutter shall be measured in a survey to +/- 1.0 foot at high points, low points, curb returns, and various other positions following good engineering, construction and surveying practices.

4. Storm Water Management Facilities (SWMF) shall be measured in a survey to +/- 1.0 foot, including the top of bank, bottom of bank, edge of water, pipes, structures, and setback distances to property lines and/or right-of-way lines and any unusual feature of each SWMF.

5. Utility system components including, but not limited to, fire hydrants, meter vaults, meter boxes, water services, corporation stops, fittings, thrust restraint, laterals, cleanouts, valves, blowoff assemblies, air vent assemblies, water sampling stations, etc. shall be measured in a survey to +/- 1.0 foot.

6. Project landscaping shall be measured in a survey to +/- 1.0 foot. Only large significant features, such as trees, will be surveyed. The species and caliper (size) shall be noted.

7. Street signs and light poles shall be measured in a survey to +/- 1.0 foot.

B. Vertical accuracy:

<table>
<thead>
<tr>
<th></th>
<th>Survey Accuracy</th>
<th>Field Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manhole Rim</td>
<td>+/- 0.01 ft.</td>
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</tr>
<tr>
<td>Manhole Invert</td>
<td>+/- 0.01 ft.</td>
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<tr>
<td>Gravity Sewer Slope</td>
<td>+/- 0.02%</td>
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<tr>
<td>Valve Depth</td>
<td>+/- 0.1 ft.</td>
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<tr>
<td>Pressure/vacuum systems</td>
<td>+/-0.05 ft.</td>
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VI. ACCESS TO PROJECT

6.1. The Owner, the Owner’s Representatives, the Engineer, testing agencies and governmental agencies with jurisdictional interests shall have access to the Project at all times for their observations, inspecting, and testing. The Contractor shall provide proper and safe conditions for such access.

VII. SURVEYS AND REFERENCE POINTS

7.1. The Owner shall furnish all necessary Drawings showing property lines and/or easements and the location of the Work. The Contractor shall provide a land surveyor licensed in the Commonwealth of Virginia to execute the Work in accordance with the Contract Documents and shall be responsible for the accuracy of this Work.

7.2. The Owner has established or will establish such general reference and control points and benchmarks on or about the Project site as will enable the Contractor to proceed with the Work. Prior to issuance of the Notice to Proceed, if the Contractor finds that any previously established reference points have been destroyed or misplaced, the Contractor shall promptly notify the Owner, and the Owner shall replace such general reference points and benchmarks at the Owner’s expense.

7.3. The Contractor shall protect and preserve the established control points, benchmarks and monuments and shall make no changes in locations without the written approval of the Owner. Any of these which may be lost or destroyed or which require shifting because of necessary changes in grades or locations shall, subject to prior approval of the Owner, be replaced and accurately located by the Contractor, at no expense to the Owner.

7.4. The contractor shall be responsible for the layout of the proposed work in its entirety. The layout shall be performed by a Licensed Land Surveyor and based on NAVD 88 (92) Datum.

VIII. WORKING HOURS

8.1. Normal working hours shall be 7:30 a.m. to 4:30 p.m., Monday through Friday, except that Work shall not start any earlier than one-half hour after sunrise or continue beyond one-half hour prior to sunset. If the Contractor desires to perform Work outside the normal working hours, on Holidays, or on weekends, the Contractor shall request permission, in writing, 48-hours in advance to allow arrangements to be made. The Contractor may be charged an inspection fee by the Owner if such work is approved. Where the Owner specifically directs the Contractor to work outside of normal working hours, no inspection fee will be imposed. The Owner may refuse the Contractor permission to work outside the normal working hours. The Contractor shall make reasonable efforts to avoid undue noise during the night and on weekends, including, but not limited to, fireproof covering necessary to dampen excessive noise from engines or pumps which operate before 7:00 a.m. and after 9:00 p.m., if it is necessary to work at those times.

8.2. The Contractor shall designate a representative and furnish a telephone number at which the representative may be contacted at any time after working hours. This representative shall be empowered and authorized to provide such personnel and equipment as may be required to remedy emergency situations that may develop after normal working hours, or on weekends and holidays.
8.3. The Contractor shall receive approval of the Owner, in advance, of any work to be performed on Holidays. The Owner reserves the right to deny permission to work on Sundays and/or Holidays without cause.

Holidays are as listed below:

- New Years Day: 1st day of January
- Martin Luther King’s Birthday: 3rd Monday in January
- President’s Day: 3rd Monday in February
- Memorial Day: Last Monday in July
- Independence Day: 4th day in July
- Labor Day: 1st Monday in September
- Veteran’s Day: 11th day of November
- Thanksgiving Day: 4th Thursday in November
- Day after Thanksgiving: Friday after 4th Thursday in November
- Christmas Eve: 24th day of December
- Christmas Day: 25th day of December

If January 1, July 4, Veterans Day or Christmas fall on a Sunday, the following Monday shall be considered the Holiday. If these dates fall on a Saturday, the previous Friday shall be considered the Holiday.

The Contractor’s attention is called to Section 109-1.5.C.1.d. regarding Owner compensation by the Contractor for overtime work performed outside normal working hours.

IX. PROJECT COORDINATION

9.1 Coordination with Owner

A. The Contractor shall coordinate all construction activities with the Owner and shall obtain the Owner’s approval as to schedule of Work, permits, temporary work, and traffic control.

B. Progress meetings shall be held monthly on a date to be set by the Owner. The Contractor shall be present at all progress meetings. If progress is not made as scheduled, or if the Owner desires to discuss revised progress schedules or the quality of workmanship or other aspects of the work, additional progress meetings can be required.

C. The Owner may construct or reconstruct any utility service in the highway or street or grant a permit for the same at any time. The Contractor shall not be entitled to any damages occasioned thereby other than a consideration of an extension of time.

D. When authorized by the Owner, the Contractor shall allow any person, firm, or corporation to make an opening within the limits of the Project upon presentation of a duly executed permit from the Owner. When directed by the Owner, the Contractor shall satisfactorily repair portions of the Work disturbed by the openings. The necessary Work will be paid for as extra Work in accordance with these specifications and shall be subject to the same conditions as the original Work performed.

9.2 Coordination with Utilities

A. The Owner and Contractor agree that disruption to public services shall be avoided whenever possible and minimized when it is not avoidable. In cases where the disruption of existing facilities could adversely impact public service delivery, acceptable duration(s) and time(s)
of the outages shall be coordinated between the Contractor and Owner, so as to explicitly minimize disruption to public service delivery.

B. Before the initiation of any excavation, the Contractor shall locate all existing utilities, culverts, and other structures. Work shall be coordinated with affected utility companies. Prior to excavation, the Contractor shall contact MISS UTILITY at (800) 552-7001 and comply with all MISS UTILITY requirements.

C. All existing utilities, both public and private (including sewer, gas, water, electrical services, etc.), shall be protected and their operation shall be maintained throughout the course of the Work. Any temporary shutdown of an existing service shall be arranged by the Contractor between the Contractor and the responsible agency. The Contractor shall assume full responsibility and defend and hold the Owner harmless from the result of any damage that may occur as a result of the Contractor’s activities.

D. If any utility service is interrupted as a result of accidental breakage or of being exposed or unsupported, the Contractor shall promptly notify the proper authority and shall cooperate with the authority in the restoration of service. If utility service is interrupted, repair work shall be continuous until service is restored. The Contractor shall be responsible for any damage to utilities that are attributable to his neglect or methods of performing the work.

E. The Owner shall provide Utility companies with copies of the construction plans and or scope of work prior to construction. If requested by the Owner, the Contractor shall provide each affected utility company with a copy of the proposed schedule of progress prior to commencing work.

F. Existing facilities (such as water and sewer valves) shall be operated only by the facility owner or under the direct supervision of the facility owner’s personnel. The Contractor shall inform the owner at least 48-hours in advance of the need for the operation of existing facilities.

G. At points where the Contractor’s operations are adjacent to the properties of any utility, including railroads, and damage to which might result in considerable expense, loss, or inconvenience, Work shall not commence until arrangements necessary for the protection thereof have been completed.

H. The Contractor shall cooperate with owners of utilities so that location, removal and adjustment operations may progress in a reasonable manner; duplication of adjustment work may be reduced to a minimum; and, services rendered by those parties will not be unnecessarily interrupted.

I. The Contractor should be aware that in some instances buried cables, gas lines, water lines, etc., two inches and smaller in diameter may have to be excavated by hand and slightly relocated to facilitate construction of the Work under this contract. This shall be considered incidental to the Work, and shall be performed at no additional cost to the Owner.

J. Should the location of any pipe or conduit greater than two-inches in diameter, pole, or other structures, above or below the ground be such that in the opinion of the Owner or his representative its removal, realignment, or change will be required due to work to be performed under this Contract, the removal, realignment, or change will be done as a Change Order, or will be done by the Owner of the obstructions, without cost to the Contractor. The Contractor shall maintain at his own expense the structures until such removal and before and after such realignment or change. The Contractor shall not be entitled to any claim for
damages or extra compensation because of the presence of said structure, or because of any delay in the removal or relocation of the same.

X. SUPERVISION

10.1. The Contractor shall supervise and direct the Work, and shall be solely responsible for the means, methods, techniques, sequences and procedures of construction. The Contractor shall employ and maintain on the Project a qualified supervisor who shall have been designated in writing by the Contractor as the Contractor's representative at the site. The supervisor shall have full authority to act on behalf of the Contractor and all communications given to the supervisor shall be the same as if mailed to the business address of the Contractor. The supervisor or a designated representative shall be present on the site at all times as required to perform adequate supervision and coordination of the Work. The Contractor shall notify the Owner in writing prior to any change of supervisor, and receive the Owner’s approval for the replacement. The supervisor shall be assigned exclusively to this project.

10.2. Upon notification to the Contractor, the Owner reserves the right to suspend the Work until such time as a supervisor satisfactory to the Owner is assigned to the project. Contract Time shall not be extended for such suspension nor shall the Contractor be entitled to any additional payment of any kind whatsoever as a result of such suspended work.

10.3. Any employee of the Contractor or Subcontractor who is deemed unsuitable may be removed from the job site by the Owner, provided that Written Notice and just cause is given to the Contractor. Said employee shall be removed immediately upon receipt of said Notice.

XI. UNCOVERING WORK

11.1. If any work has been covered or concealed without the Owner’s approval prior to being covered or concealed, the Owner may request to see such work and it shall be exposed by the Contractor. The Contractor shall pay the cost of opening or uncovering and replacement and shall, in addition, at no cost to the Owner, make the necessary corrections to bring the work into accord with the Contract Documents.

11.2. Uncovering work shall be at the Contractor’s expense unless the Contractor has given the Owner timely notice of the Contractor’s intention to cover the same and the Owner has not acted with reasonable promptness in response to such notice.

11.3. If the Owner considers it necessary or advisable that covered Work previously approved be re-inspected or tested by others, the Contractor, at the Owner’s request, shall uncover, expose or otherwise make available for observation, inspection or testing as the Owner may require, that portion of the Work in question, furnishing all necessary labor, materials, tools, and equipment. If it is found that such Work is defective, the Contractor shall bear all the expenses of such uncovering, exposure, observation inspection and testing and of satisfactory reconstruction. If, however, such Work is not found to be defective, the Contractor will be allowed an increase in the Contract Price or an extension of the Contract Time or both directly attributable to such uncovering, exposure, observation, inspection, testing and reconstruction and an appropriate Change Order shall be issued.

XII. REMOVAL OF UNACCEPTABLE WORK

12.1. All Work that does not conform to the requirements of the Contract Documents shall be unacceptable.
12.2. The Contractor shall remove or correct all unacceptable and defective Work or materials. The replacement of Work and materials shall conform to the Contract Documents or be in a manner acceptable to the Owner. The Contractor shall bear all costs of such correction and/or removal and replacement.

12.3. Work done contrary to or regardless of the instructions of the Owner, Work done beyond the lines shown or as directed, except as herein provided, or any extra Work done without authority, will be considered unauthorized and will not be paid for under the provisions of the Agreement. Work so done may be ordered removed or replaced at no cost to the Owner.

12.4 If the Work is defective, or the Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to furnish or perform the Work in such a way that the completed Work will conform to the Contract Documents, the Owner may order the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of the Owner to stop the Work shall not give rise to any duty on the part of the Owner to exercise this right for the benefit of the Contractor or any surety or other party. If the Contractor does not remedy, remove, or replace the rejected or condemned Work as instructed by the Owner within the time period stated by the Owner but in no case to exceed 30 Days after receiving written Notice, such remedy, removal, or replacement may be accomplished by the Owner at the Contractor’s expense.

XIII. SUBSTANTIAL COMPLETION

13.1. Prior to Final Payment, but following completion of all required tests and inspections, the Contractor may request in writing that the Owner certify that the entire Project or any phase of the Project is Substantially Complete and request the Owner issue a Certificate of Substantial Completion. Within fourteen (14) working days the Owner will conduct an inspection of the Project with the Contractor and either issue a Certificate of Substantial Completion or notify the Contractor in writing of the incomplete items. The Certificate and attachments shall include the following:

A. A listing of responsibilities for the security, operation, safety, maintenance, utilities and insurance on the substantially completed portion;

B. A tentative list of items to be completed or corrected prior to final payment; and,

C. The maximum time for items to be completed or corrected prior to final payment.

13.2. The Owner shall have the right to exclude the Contractor from the Project or phase of the Work certified to be Substantially Complete; however, the Owner will allow the Contractor reasonable access to complete or correct the Work.

XIV. USE OF COMPLETED PORTIONS

14.1. The Owner shall have the right to take possession of and use any completed or partially completed portions of the Work, notwithstanding that the time for completing the entire Work or such portions may not have expired, but such taking possession and use shall not be deemed an acceptance of any Work not completed in accordance with the Contract Documents. If such prior use increases the cost of or delays the Work, the Contractor shall be entitled to such extra compensation or extension of time or both as the Owner and the Contractor may agree by a Change Order.

XV. FINAL INSPECTION

15.1. Upon receiving written Notice from the Contractor that the entire Work or an agreed upon portion is complete, the Owner will make a final inspection with the Contractor, and will notify the Contractor...
in writing of all particulars in which this inspection reveals that the Work is incomplete or defective. The Contractor shall immediately take such measures as are necessary to complete such work or remedy such deficiencies.

15.2. This procedure shall be repeated until all items are corrected to the satisfaction of the Owner. Only written notification to the Contractor from the Owner will constitute final acceptance of any part of the Work under the Agreement.

XVI. CLAIMS

16.1. All claims, disputes, demands and other matters in question arising out of or relating to the Agreement or the Contract Documents, except for claims which have been waived by the Contractor’s acceptance of final payment, will be addressed in accordance with the provisions of the Virginia Public Procurement Act and as stated herein; provided, however, the provisions of Section 2.2-4366 of that Act will not be applicable without the separate express written consent of the Owner.

16.2. Early or prior knowledge by the Owner of an existing or impending claim for damages could alter the plans, scheduling, or other action of the Owner or result in mitigation or elimination of the effect of the act objected to by the Contractor. Therefore, a written statement describing the act of omission or commission by the Owner or its agents that allegedly caused damage to the Contractor and the nature of the claimed damage shall be submitted to the Owner at the time of occurrence or beginning of the Work upon which the claim and subsequent action are based. If such damage is deemed certain in the opinion of the Contractor to result from his acting on an order from the Owner, he shall immediately take written exception to the order. Submission of a notice of claim as specified shall be mandatory. Failure to submit such notice shall be a conclusive waiver to such claim for damages by the Contractor. An oral notice or statement will not be sufficient nor will a notice or statement after the event.

The Contractor shall immediately notify the Owner of potential claim items for extra work. If the Contractor is directed by the Owner or performs work which is mutually deemed by the Contractor and the Owner not to be included under any of the items of the Bid and which has not been specifically ordered in writing by the Owner as extra work, the Contractor shall make a claim to the Owner for extra payment for such work by Written Notice within five (5) days after the occurrence, with detailed cost data to support the claim or the claim will not be considered.

If the Contractor’s claim contains data that cannot be verified by the Owner’s records, the data shall be subject to a complete audit by the Owner or its authorized representative if they are to be used as a basis for claim settlement.

If the Contractor wishes to make claim for an increase in the Contract Price or Contract Time, he shall submit all supporting data to the Owner and Engineer within twenty (20) Days from the time of initial occurrence. Failure to submit such data within twenty (20) Days shall be a conclusive waiver to such claim by the Contractor.

16.3 Claims, disputes, and other matters relating to the acceptability of the Work or the interpretation of the requirements of the Contract Documents pertaining to the performance and furnishing of the Work and claims in respect to changes in the Contract Price or Contract times will be referred initially to the Engineer in writing with a request for a formal decision in accordance with this paragraph. Written Notice of each such claim, dispute or other matter shall be delivered by the Contractor to the Engineer and the Owner promptly (but in no event later than twenty (20) days) after the start of the occurrence or event giving rise thereto, and written supporting data shall be submitted to the Engineer and the Owner promptly, (but not later than twenty (20) days) after the start of such
occurrence or event and monthly thereafter for continuing events unless the Engineer allows an additional period of time for the submission of additional accurate data in support of such claim, dispute or other matter. The Owner shall submit any response to the Engineer and the Contractor within ten (10) days after receipt of the Contractor’s last submittal (unless the Engineer allows additional time).

The Engineer shall render a written decision within twenty (20) days of receipt of the Owner’s response. The Engineer’s written decision on such claim, dispute, or other matter shall be final and binding upon the Owner and Contractor unless, within twenty (20) days after issuance of the Engineer’s written decision, either party appeals the decision by giving the other party and the Engineer written notice of a request for negotiation.

Within ten (10) days of the delivery of said Notice, senior representatives of the Owner and the Contractor, having authority to settle the dispute, and the Engineer shall meet at a mutually acceptable time and place, and thereafter as often as they reasonably deem necessary, to exchange relevant information and to attempt to resolve the dispute. The Owner’s representative will participate in good faith during the negotiation and will have authority to approve changes in the Contract Time and Price.

In the event a mutually acceptable decision cannot be reached through negotiation within twenty (20) days of the appealing party’s Notice, (or mutually agreeable longer period), or if the party receiving such Notice will not meet within ten (10) days, the Owner or Contractor may declare, by written Notice, delivered to the other party and to the Engineer, that the negotiation was unsuccessful and may initiate further appeal.

Any further appeal shall be initiated by written Notice of the appeal by the Owner or Contractor to the Engineer and non-appealing party within twenty (20) calendar days of receipt of the Notice of unsuccessful negotiation. Failure to issue a Notice of appeal within said period will result in the Engineer’s decision being final and binding to the fullest extent allowed by law. If a written Notice of appeal is issued, the claim or dispute may be submitted for non-binding mediation at the discretion of Owner. If Owner chooses non-binding mediation, it shall be a condition precedent to the institution of any further administrative, legal or equitable proceedings by either party.

If the Owner requests mediation upon issuance of the Notice of appeal, the parties shall endeavor to agree to a single mediator to mediate the dispute in a session not to exceed one-half day in length, unless extended by the agreement of both parties. If the parties cannot agree on a single mediator, they shall request the chief judge of the local state circuit court to designate a mediator. Unless the parties mutually agree otherwise, the mediation shall occur within ten (10) days of the mediator’s selection. The costs of the mediation shall be paid by the parties on a pro rata basis.

The results of successful mediation will be implemented by a Change Order. Should the mediation be unsuccessful, it shall be terminated by written Notice to all involved by the mediator or Owner or Contractor. The dispute resolution process shall then proceed in accordance with paragraph 16.4.

16.4.  A formal proceeding may then be instituted by the appealing party in a forum of competent jurisdiction within the Owner’s locality, to exercise such rights or remedies as the appealing party may have with respect to such claim, dispute or other matter in accordance with applicable state and city laws and regulations.

In the event of any litigation between the parties arising out of this Agreement, the prevailing party will be entitled to recover its attorneys’ fees and expert fees, as well as all other costs and expenses of such litigation.
16.5. The Contractor shall carry on the Work and adhere to the progress schedule during all disputes or disagreements with the Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as the Owner and the Contractor may otherwise agree in writing.

XVII. ENGINEER’S STATUS

17.1. All Work shall be performed under the general observation of the Engineer (if specified in the Special Provisions, otherwise, the Owner shall serve as the Engineer at its discretion). The Contractor shall carry out the Work in accordance with the Contract Documents. The construction means, methods, techniques, sequences of procedures, and safety precautions and programs in connection with the Work shall be at the direction and the responsibility of the Contractor. The Engineer shall have authority to and shall reject any and all Work whenever it is necessary to do so in order to insure the proper execution of the Work in accordance with the Contract Documents. The Engineer shall have no authority to approve or order changes in the Work that alter the terms or conditions of the Agreement. The Owner shall confirm by written Notice within fourteen (14) calendar Days any oral order, direction, requirement or determination.

17.2. In case of the termination of the employment of the Engineer, the Owner may appoint a capable and reputable Engineer as a replacement. The status under the Agreement of the Engineer shall be that of the former Engineer.

17.3. Approval by the Engineer of any materials, plans, equipment or drawings proposed by the Contractor, shall be construed only to constitute an approval of general design. Such approval shall not relieve the Contractor for any responsibility for the accurate and complete performance of the work in accordance with Contract Documents, or from any duty, obligation, performance guarantee or other liability imposed upon him by the provisions of the Agreement.

17.4 The Contractor may be required to accompany the Owner for an on-site review of the project after award, but prior to the pre-construction conference and issuance of the Notice to Proceed. The purpose of the on-site review will be to compile a property report that will list, according to the following categories, the properties affected by construction as determined mutually by the Contractor and the Owner, or his representative.

A. Unrestrained access to and from residences and business locations. This includes but is not limited to, the following types of scheduled projects:
   1. Street repair (non-emergency) or improvement projects.
   2. Utilities repair (non-emergency) or improvement projects.
   3. Sidewalk repair (non-emergency) or improvement projects.

B. Right to enjoy one’s residence or business free of disturbing and unusual environmental changes as a result of an Owner-authorized construction project. Examples of such changes are excessive noise, dust, light, as well as unusual working hours and odors. This includes, but is not limited to, projects such as:
   1. Drainage repair (non-emergency) or improvement projects.
   2. Sewage repair (non-emergency) or improvement projects.

C. The right to properly plan for the relocation of one’s personal property which must be moved as a result of an Owner-authorized construction project. This includes, but is not limited to, the following:
   1. Trees, shrubs, plants and flowers.
   2. Play equipment.
   3. Portable buildings.
   4. Fences (above grade or underground electric pet containment).
5. Automobiles.

The property report is to remain on file with the Owner and the Contractor until project closeout.

XVIII. NOTICE TO COMPLY ORDER
See page 105-15.

XIX. STOP WORK ORDER
See page 105-16.

End of Section
NOTICE TO COMPLY

Department of ____________________________

Pursuant to Section ________________________ of the Code of the City/County of ____________________________, Virginia, as amended, a City Manager/County Administrator Designee inspected your site at ____________________________
on ____________________________, 20___ at _______ a.m. / p.m.

The following conditions of noncompliance were noted:

☐ SILT FENCE DOWN
☐ DISTURBED AREAS NOT STABILIZED
☐ SEDIMENT TRAPPING DEVICES NOT INSTALLED PROPERLY
☐ TRACKING ON PUBLIC ROAD
☐ OTHER: ____________________________

The following corrective measures are needed to bring you into compliance:

• ______________________________________
• ______________________________________
• ______________________________________
• ______________________________________
• ______________________________________

These measures are to be completed before ____________, 20____.

Notice ordered by ____________________________, on ____________, 20____.
(Designee of City Manager/County Administrator)

Hand Delivered ____________ Certified Mail __________

If you have any questions, please call ________________.
(Telephone number)
STOP WORK ORDER

Permit Number __________
Date __________

Department of _____________________________

Pursuant to Section ________________________ of the Code of the City/County of __________________________, Virginia, as amended, a substantial Code violation exists at __________________________. You are hereby notified that further work at this location must be

IMMEDIATELY DISCONTINUED

Corrective Measures Required:

___________________________________________________________

___________________________________________________________

___________________________________________________________

___________________________________________________________

Ordered by: ________________________________, on ____________, 20____.
(Designee of City Manager/County Administrator)

Notice served to ____________________________, on ____________, 20____.

Stop Work Order in Effect Until __________________________

________________________
(Signature of Enforcement Officer)
SECTION 106
CONTROL OF MATERIAL

I. TESTS AND INSPECTIONS

1.1. All material and workmanship shall be subject to inspection, examination and test by the Owner at any time during manufacture and/or construction. The Owner shall have the right to reject defective material and workmanship or require their correction. The City will furnish testing services for compaction and concrete.

1.2. The Contractor shall provide at its expense the testing and inspection services required by the Contract Documents. The Owner will provide at his expense all inspection and testing services not required by the Contract Documents; provided, however, the Contractor will be responsible for the payment of all failing tests.

1.3. The Contractor shall furnish promptly without additional charge all reasonable facilities, labor, and materials, necessary and convenient for making such tests as may be designated in the Contract Documents. The Contractor shall work with the Owner and the Engineer in scheduling and coordinating Owner provided testing or inspection services.

1.4. If the Contract Documents, laws, ordinances, rules, regulations or orders of any public body having jurisdiction require any Work (or part thereto) specifically to be inspected, tested, or approved by someone other than the Owner, the Contractor shall assume full responsibility for arranging and obtaining such inspections, tests or approvals, pay all costs in connection therewith, and furnish the Owner the required certificates of inspection, or approval. All Components shall be listed and labeled by a nationally recognized testing lab. The Contractor shall also be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests or approvals required for the Owner’s acceptance of materials or equipment to be incorporated in the Work, or of materials, mix designs, or equipment submitted for approval prior to the Contractor’s purchase thereof for incorporation in the Work.

1.5. Inspections, tests or approvals by the Owner shall not relieve the Contractor from its obligations to perform the Work in accordance with the requirements of the Contract Documents.

1.6. The failure of the Owner to reject or condemn materials and workmanship not conforming to the Contract Documents shall not prevent the Owner from rejecting materials and workmanship found not to be in accordance with the Contract Documents at any time prior to the acceptance of the completed Work, nor shall it be considered as a waiver of any nonconformance with the Contract Documents which may be discovered later, or as preventing the Owner at any time prior to the expiration of the guarantee period or of the expiration of any applicable statutory limitation period for legal actions for Contractor default from recovering damages for work not in accordance with the Contract Documents.
II. LABOR, MATERIALS AND EQUIPMENT

2.1. The Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. The Contractor shall at all times maintain good discipline and order at the site.

2.2. Unless otherwise specified, the Contractor shall furnish and assume full responsibility for all materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities and all facilities and incidentals necessary for the furnishing, performance, testing, start-up, and completion of the Work.

2.3. All materials and equipment shall be of good quality and new, except as otherwise provided in the Contract Documents. If required by the Owner, the Contractor shall furnish satisfactory evidence (including reports of required tests) as to the kind and quality of materials and equipment. All materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned in accordance with the instructions of the applicable Supplier except as otherwise provided in the Contract Documents. All material shall be manufactured within two (2) years of the bid date of the project.

2.4. It shall be the responsibility of the Contractor to legally dispose of all excess material at his expense unless otherwise indicated on the Drawings and/or noted in the Specifications.

2.5. No material that is not required for the Work on this Project may be stored on site or within the Project boundaries or on land designated for Project use, unless approved by the Owner in writing prior to placement.

Equipment Rental Reimbursement Rates: The contractor shall use the monthly rate, or a percentage thereof, for equipment as stated in the most current edition of the Rental Rate Blue Book for any and all claims for extra compensation, which may arise in the course of the work. Rates are based on Twenty-two (22) work days per month.

III. WORK BY OWNER

3.1. The Owner may perform other work related to the Project at the site by the Owner’s own forces, have other work performed by utility owners, or let other direct contracts for Work at the site. If the fact that such other work is to be performed was not noted in the Contract Documents, Written Notice will be given to the Contractor prior to starting any such other work.

End of Section
SECTION 107

LEGAL RELATIONS AND RESPONSIBILITY TO THE PUBLIC

I. PERMITS AND REGULATIONS

1.1. The Contractor shall procure all permits and licenses pay all charges, fees and taxes and give all notices necessary and incidental to the due and lawful prosecution of the Work except those provided by the Owner, and specified in the Special Provisions.

1.2. The Contractor shall be fully responsible for knowledge of and shall abide by each and every law, rule or regulation of all public bodies having political jurisdiction over the Project and in force at the time of the Contract; including, the safety of persons or property and the protection of persons and property form damage, injury or loss. The Contractor shall erect and maintain all necessary safeguards for such safety and protection and hold harmless the Owner and its agents, officers, or employees against any claim for liability arising from or based on any violation, whether by himself, his agents, his employees or subcontractors. If the Contractor observes that the Contract Documents are at variance with any such law, he shall promptly notify the Owner in writing. The Contractor shall execute and file the documents, statements, and affidavits required under any applicable federal or state law or regulation affecting his Bid or Agreement or prosecution of the Work thereunder. The Contractor shall permit examination of any records made subject to such examination by any federal or state law or by regulations promulgated thereunder by any state or federal agency charged with enforcement of such law. The Contractor shall not be entitled to claim any damages for delay occasioned by compliance with such laws. Where such laws are changed during the course of the Agreement, and where such changes create additional costs to the Agreement or affect the time of the Agreement, such changes shall be made effective through Change Orders prepared in accordance with the Contract Documents.

1.3. The Contractor shall comply fully with the U.S. Department of Labor Safety and Health Regulation promulgated under the Occupational Safety and Health Act of 1970, as amended, and under Section 107 of the Contract Work Hours and Safety Standards Act, as amended. The Contractor shall also comply fully with the Overhead High Voltage Act as set forth in Chapter 30, Title 59.1 of the Code of Virginia; Subpart P - “Elevations, Trenching and Shoring”, of the Virginia Occupational Safety and Health Standards for Construction Industry; the Virginia Confined Space Standard 1910.146 of the Virginia Occupational Safety and Health Standards for General Industry; and the “Underground Utility Damage Prevention Act” as set forth in Chapter 10.3, Title 56 of the Code of Virginia, 1950, as amended. The above listing of safety laws and regulations is for informational purposes and in no way alters or limits Contractor’s responsibility to comply with the safety laws of all public bodies having jurisdiction as set forth in Section 107-1.2 above.

II. LAND, EASEMENTS, AND RIGHTS-OF-WAY

2.1. Prior to issuance of Notice to Proceed, the Owner shall obtain all land, easements, and rights-of-way necessary for carrying out and for the completion of the work to be performed and pursuant to the Contract Documents, unless otherwise specified herein or otherwise mutually agreed. A land surveyor licensed in the Commonwealth of Virginia must perform the layout. Easements for temporary uses and detours requested by the Contractor and approved by the Owner in lieu of a detour within the right of way or easement area shall be acquired by the Contractor without the
Owner being a party to the Agreement.

2.2. The Owner shall provide to the Contractor information that delineates and describes the lands owned, rights-of-way, or easements acquired, and permits obtained.

2.3. The Contractor shall provide at its own expense and without liability to the Owner any additional land and access thereto that the Contractor may desire for temporary construction facilities, or for storage of materials. The Contractor shall not use private property in connection with the Work unless prior written permission is obtained from the property owner. A copy of the written permission indicating the name, address, and phone number of the property owner shall be furnished to the Owner. Upon completion of the use of the property, the Contractor shall also furnish the Owner a release signed by the property owner indicating that the property has been satisfactorily restored.

2.4. The Contractor shall acquire all necessary and appropriate Permit(s) from the locality, VDOT, or both, for entrance(s) to off-site storage or lay-down yard(s) and shall abide by all conditions required by the Permit. The Contractor shall be solely responsible for all costs incurred in acquiring the Permit and all costs associated with the efforts necessary to comply to Permit requirements.

The Contractor shall utilize the most direct means of access to the Work area and shall not access the Work area through adjacent neighborhoods, parking areas, etc. Any and all damages to adjacent areas resulting from the Contractor’s activities shall be the sole responsibility of the contractor and shall be repaired at the Contractor’s expense, to the complete satisfaction of the Owner, locality/VDOT, and the affected property owner(s).

III. PROTECTION OF WORK, PROPERTY & PERSONS

3.1. The Contractor will be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. The Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to all employees on the Work and other persons who may be affected thereby, all the Work and all materials or equipment to be incorporated therein, whether in storage on or off the site, and other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction. The Contractor shall provide and maintain all necessary watchmen, barricades, lights, and warning signs, and take all necessary precautions for the protection and safety of the public.

3.2. The Contractor shall comply with all applicable laws, ordinances, rules, regulations and orders of any public body having jurisdiction. The Contractor shall erect and maintain, as required by the conditions and progress of the Work, all necessary safeguards for safety and protection, and shall notify owners of adjacent utilities when prosecution of the Work may affect them. The Contractor shall remedy all damage, injury or loss to any property caused, directly or indirectly, in whole or in part, by the Contractor, any Subcontractor, or anyone for whose acts any of them will be liable.

3.3. The Contractor shall designate a responsible member of its organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated in writing by the Contractor to the Owner

3.4. In accordance with generally accepted construction practices, and the requirements of OSHA, the
Contractor shall be solely and completely responsible for conditions of the Project site. This requirement shall apply continuously and not be limited to normal working hours. The Contractor shall comply with Federal and State safety regulations, at the site of the Work and provide such equipment and medical facilities as necessary to supply first aid service to anyone who may be injured. The Contractor shall promptly report in writing to the Owner all accidents whatsoever arising out of, or in connection with, the performance of the Work whether on, or adjacent to, the site and which caused death, personal injury or property damages, giving full details and statement of witnesses. In addition, if death or serious injuries or serious damages are caused, the accidents shall be reported immediately to both the Engineer and the Owner. If any claim is made by anyone against the Contractor or any subcontractor on account of any accident, the Contractor shall promptly report the facts, in writing, to the Owner.

3.5. Until final acceptance of the Work by the Owner, the Contractor shall have charge and care thereof and shall take every precaution against damage to the Work or to any part thereof by action of the elements or from any other cause whether installed, in storage, or off-site. The Contractor shall rebuild, repair, restore, and make good damage to any portion of the Work occasioned by any of the foregoing causes before final acceptance and shall bear the expense thereof. The Owner may reimburse the Contractor for repair of damage to Work attributable to unforeseeable causes beyond the control of and without the fault or negligence of the Contractor. In case of suspension of work, the Contractor shall be responsible for the Project and shall take such precautions as may be necessary to prevent damage to the Work, provide for erosion and environmental control and drainage control, and erect any necessary temporary structures, signs, or other facilities at his own expense. During the 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 the Contract and shall take adequate precautions to protect new tree growth and other important vegetation against damage.

3.6. Emergency traffic such as police, fire and disaster units shall be provided reasonable access to the work area at all times. The Contractor shall coordinate partial or full street closures with all emergency services, such as police, fire and disaster units, and shall bear the responsibility of notification to same of all closures, blockages and re-openings.

3.7. The Contractor shall, during the progress of the Work and as directed by the Owner, remove from the Owner’s property and from all public and private property and rights-of-way, at its own expense, all temporary structures, rubbish, debris, piles of earth, foreign matter, and waste materials resulting from his operations. The site of the Work shall be restored to the conditions existing before the Work was started, to the satisfaction of the Owner. Lawns, pavements, sidewalks, and other surfaces shall be preserved where practicable, but if damaged, shall be fully restored.

3.8. The Owner may take corrective action if the Contractor fails to perform cleanup and restoration in an orderly, continuous, and expeditious manner. The Owner may take corrective action three days after delivery of notice to do so to the Contractor and deduct the cost from any monies due the Contractor.

3.9. The Contractor shall preserve property and improvements along the lines of and adjacent to the Work unless their removal or destruction is called for by the Contract Documents. The Contractor shall use suitable precautions to prevent damage to such property.
3.10. When the Contractor finds it necessary to enter on private property, he shall secure from the property owner or lessee a written permit for such entry prior to moving thereon. An executed copy of this permit shall be furnished to the Owner.

3.11. The Contractor shall be responsible for damage or injury to property during the prosecution of the Work resulting from any act, omission, neglect, or misconduct in the method of executing the Work or attributable to defective Work or materials. This responsibility shall not be released until final acceptance of the Project.

3.12. When direct or indirect damage is done to property by or on account of any act, omission, neglect or misconduct in the method of executing the Work or in consequence of the non-execution thereof on the part of the Contractor, the Contractor shall restore such property to a condition substantially equal to that existing before such damage was done by repairing, rebuilding or restoring, as may be directed by the Owner, or making settlement with the property owner. The Contractor shall secure from the property owner a release from any claim against the Owner without additional compensation therefor. A copy of this release shall be furnished to the Owner.

3.13. All property boundary markers shown on the Drawings or discovered during the course of construction shall be protected. All property boundary markers disturbed due to construction activities shall be replaced by the Contractor at no expense to the Owner. Property boundary markers shall be restored by a surveyor licensed in the State of Virginia and all restored property boundary markers shall be shown on the Record Drawings.

3.14. The Contractor shall employ a licensed Plumbing Contractor, who shall obtain the necessary permits and shall do all Work on private property in accordance with the International Plumbing Code, latest edition. The Owner will obtain the permission of the property owner to work on private property. No payment will be made for work done on private property until all restoration work is complete to the satisfaction of the Owner and the homeowner.

The Contractor shall be paid based on the number of permits that have been signed and approved by the Building and Codes Inspector as evidenced by copies of the approved permits submitted to and accepted by the Engineer. Copies of permits shall be submitted with monthly invoices.

3.15. The Contractor will notify the affected property owners, in writing ten (10) calendar Days prior to commencement of Work. “Affected Property Owners” shall be those property owners whose properties are affected by construction on the Project in the following manner: (i) restrained access to and from residences and business locations; (ii) interference with the right to enjoy one’s residence or business free of disturbing and unusual environmental changes as a result of the Project, such as excessive noise, dust, light, as well as unusual working hours and odors; and (iii) the relocation of personal property, such as trees, shrubs, plants and flowers, play equipment, portable buildings, fences and automobiles, which must be moved as a result of the Project. Such Notice shall be deemed properly given if mailed by first class, postage prepaid, to the address for the property owners shown in the local tax records.

3.16. It shall be the Contractor’s paramount responsibility to additionally notify each residence and business that construction adjacent to their property is imminent. This notification will be given and noted no less than 48 hours prior to Work commencing adjacent to the affected property. The Notice from the Contractor shall be written and may be hand delivered to each affected residence and
business. A separate Notice shall be delivered each time the entrance to each residence and business will be blocked or inaccessible.

A. If this Notice is mailed, time is to be allowed such that receipt by the addressee is at least 48 hours prior to Work commencement. Such Notice shall be deemed properly given if mailed by first class, postage prepaid, to the address for the property owners shown in the local tax records. A duplicate copy of each mailed Notice is to be forwarded to the Owner.

B. If this Notice is hand delivered, a duplicate copy of each Notice is to be forwarded to the Owner indicating the date of delivery and if personal contact was achieved.

IV. ENVIRONMENTAL STIPULATIONS

4.1. Any cost associated with violations of the law including, but not limited to, remediations, clean up cost, fines, administrative or civil penalties or charges, and third party claims imposed on the Owner by any regulatory agency or by any third party as a result of the Contractor’s noncompliance with federal, state, or local environmental laws and regulations or nuisance statutes by the Contractor or by Subcontractors, consultants, sub-consultants, or any other persons, corporations or legal entities retained by the Contractor for this Agreement, shall be paid by the Contractor.

No separate payment will be made for the Work or precautions described herein except where provided for as a specific item in the Agreement or except where provision has been made for such payment in these specifications.

4.2. Pollution:

A. Water

The Contractor shall exercise every reasonable precaution throughout the duration of the project to prevent pollution of rivers, streams, and impoundments. Pollutants such as chemicals, fuels, lubricants, bitumens, raw sewage, paints, sedimentation, and other harmful material shall not be discharged into or alongside rivers, streams, or impoundments or into channels leading to them.

Construction discharge water shall be filtered to remove deleterious materials prior to discharge into state waters. During specified spawning seasons, discharges and construction activities in spawning areas of state waters shall be restricted so as not to disturb or inhibit aquatic species that are indigenous to the waters. Neither water nor other effluence shall be discharged onto wetlands or breeding or nesting areas of migratory waterfowl. When used extensively in wetlands, heavy equipment shall be placed on mats. Temporary construction fills and mats in wetlands and flood plains shall be constructed of approved non-erodible materials and shall be removed by the Contractor to natural ground when the Owner so directs.

If the Contractor dumps, discharges, or spills any oil or chemical that reaches or has the potential to reach a waterway, he shall immediately notify all appropriate jurisdictional state and federal agencies and shall take immediate actions to contain, remove, and properly dispose of the oil or chemical.
Excavation material shall be disposed of in approved areas above the mean high water mark shown on the plans in a manner that will prevent the return of solid or suspended materials to state waters. If the mark is not shown on the plans, the mean high water mark shall be considered the elevation of the top of stream banks.

1. All waste materials, including but not limited to excavated materials, demolished pavement, arboreal (landscaping) waste and other debris, that are not suitable for project related purposes (e.g. backfill) or are surplus to the needs of the project, both as determined by the Engineer, shall become the property of the Contractor. The Contractor shall dispose of all such material in accordance with his accepted Disposal Plan at no additional cost to the City.

2. The contractor shall submit a Disposal Plan for review and acceptance by the Engineer prior to performing any work that might generate waste materials. The plan shall include a complete description of the materials that are expected to be encountered and their proposed disposal site(s). The Contractor may change his Disposal Plan only by written notice to the Engineer. The acceptance of a plan and/or any related notice to the Engineer must be evidenced by a written response from the Engineer.

3. The Contractor shall insure that all permits related to his disposal operations have been obtained, and the Contractor shall comply with all requirements of those permits. The Contractor shall show evidence that all required permits have been obtained for all disposal sites by submitting a copy of all such permits to the Engineer as part of the Contractor’s Disposal Plan.

Construction operations in rivers, streams, or impoundments shall be restricted to those areas where channel changes are shown on the plans and to those that shall be entered for the construction of structures. Rivers, streams, and impoundments shall be cleared of false-work, piling, debris, or other obstructions placed therein or caused by construction operations.

The Contractor shall prevent stream constriction that would reduce stream flows below the minimum, as defined by the State Water Control Board, during construction operations. If it is necessary to relocate an existing stream or drainage facility temporarily to facilitate construction, the Contractor shall design and provide temporary channels or culverts of adequate size to carry the normal flow of the stream or drainage facility. The Contractor shall submit a temporary relocation design to the Owner for review and acceptance in sufficient time to allow for discussion and correction prior to beginning the work the design covers. Costs for the temporary relocation of the stream or drainage facility shall be included in the Contract Price for the related pipe or box culvert.

When a live watercourse must be crossed by construction vehicles more than twice in any six month period, a temporary vehicular stream crossing constructed of nonerodible material shall be provided.

Contractor shall comply with all provisions of the latest edition of the Virginia Erosion and Sedimentation Control Handbook.
B. **Air**

The Contractor shall comply with the provisions of the State Air Pollution Control Law and Rules of the State Air Pollution Control Board, including notifications required therein.

Burning shall be performed in accordance with applicable local laws and ordinances and under the constant surveillance of watchpersons. Care shall be taken so that the burning of materials does not destroy or damage property or cause excessive air pollution. The Contractor shall not burn rubber tires, asphalt, used crankcase oil, or other materials that produce dense smoke. Burning shall not be initiated when atmospheric conditions are such that smoke will create a hazard to the motoring public or airport operations. Provisions shall be made for flagging vehicular traffic if visibility is obstructed or impaired by smoke. At no time shall a fire be left unattended.

Asphalt mixing plants shall be designed, equipped, and operated so that the amount and quality of air pollutants emitted will conform to the Rules of the State Air Pollution Control Board.

Emission standards for asbestos incorporated in the EPA's National Emission Standards for Hazardous Air Pollutants apply to the demolition or renovation of any institutional, commercial, or industrial building, structure, facility, installation, or portion thereof that contains friable asbestos.

C. **Noise**

The Contractor's operations shall be performed so that exterior noise levels measured during a noise-sensitive operation shall not be more than 80 decibels within 100 feet from the point of origin or within ten (10) feet of a noise-sensitive facility. Noise-sensitive facility is any facility for which lowered noise levels are essential if the facility is to serve its intended purpose. Such facilities include, but are not limited to, those associated with residences, hospitals, nursing homes, churches, schools, libraries, parks and recreational areas.

The Owner may monitor construction-related noise. If construction noise levels exceed the specified limits, the Contractor shall take corrective action before proceeding with operations. The Contractor shall be responsible for costs associated with the abatement of construction noise and the delay of operations attributable to noncompliance with these requirements.

The Owner may prohibit or restrict to certain portions of the project any work that produces objectionable noise between 9 P.M. and 7 A.M. If other hours are established by local ordinance, the local ordinance shall govern.

Equipment shall in no way be altered so as to result in noise levels that are greater than those produced by the original equipment.

When feasible, the Contractor shall establish haul routes that direct his vehicles away from developed areas and ensure that noise from hauling operations is kept to a minimum.
These requirements are not applicable if the noise produced by sources other than the Contractor’s operation at the point of reception is greater than the noise from the Contractor’s operation at the same point.

D. Forest Fires

The Contractor shall take all reasonable precautions to prevent and suppress forest fires in any area involved in construction operations or occupied by him as a result of such operations. The Contractor shall cooperate with the proper authorities of the state and federal governments in reporting, preventing, and suppressing forest fires. Labor, tools, or equipment furnished by the Contractor upon the order of any forest official issued under authority granted the official by law shall not be considered a part of the Contract. For fires originating by no fault of the Contractor, the Contractor may negotiate with the proper forest official for compensation for such labor, tools, or equipment.

4.3. Archeological, Paleontological, and Rare Mineralogical Findings:

In the event of the discovery of prehistoric ruins, Indian or early settler sites, burial grounds, skeletal remains, relics, artifacts, fossils, stone tools, meteorites, or other articles of archeological, paleontological, or rare mineralogical interest during the prosecution of work, the Contractor shall act immediately to suspend work at the site of the discovery and notify the Owner. The Owner will immediately notify the proper state authority charged with the responsibility of investigating and evaluating such finds. The Contractor shall cooperate and, upon request by the Owner, assist in protecting, mapping, and removing the findings. Findings shall become the property of the Owner unless they are located on federal lands, in which event they shall become the property of the U.S. government.

When such work delays the progress of the Work, the Owner will give consideration to adjustments in the Contract Time limit. However, no adjustment in Contract Price nor Time will be allowed for delays that do not exceed 2 working days from the time the Contractor is notified to stop work. If the contractor is assisting in removing the remains, the Owner will give consideration to adjustment in payment.

V. TEMPORARY FACILITIES

5.1. The Contractor shall provide and maintain in a neat, sanitary condition such accommodations for the use of employees as may be necessary to comply with the requirements of any governing body and regulatory agency having jurisdiction.

The Contractor shall pay for and furnish temporary facilities (such as light, power, and water) complete with connecting piping, wiring, lamps, and similar equipment as necessary. The Contractor shall install, maintain, and remove temporary facilities upon completion of the Work. The Contractor shall obtain all permits and bear all costs in connection with temporary facilities at no expense to the Owner. The use of temporary facilities shall be in compliance with the requirements of the facility owner.

5.2. The Contractor shall provide at least one self-contained single-occupant toilet unit of the chemical, or aerated recirculation type, properly vented and fully enclosed with a glass fiber reinforced polyester shell or similar non absorbent material. Unit shall be emptied and serviced regularly.
VI. EMERGENCIES

6.1. In emergencies affecting the safety of persons, or the Work, or property at the site or adjacent thereto, the Contractor, without special instruction or authorization from the Owner, shall act to prevent threatened damage, injury or loss. The Contractor shall give the Owner prompt Written Notice of any significant changes in the Work or deviations from the Contract Documents caused thereby. Any compensation, claimed by the Contractor on account of emergency work, shall be determined by agreement between the Owner and the Contractor, and a Change Order shall be issued to document the changes.

6.2. During the contract period, if an emergency situation (natural or man made) occurs, the Contractor agrees to dedicate the equipment and personnel allocated to this project to assist the Owner during the recovery period. The Owner shall direct this work and costs will be paid on a time and material basis. Pre-approved rates will be applied as backed up by certified payrolls and rental rates.

6.3. If an emergency situation should occur (natural or manmade) during the contract period and the project is shut down for any length of time, the contractor shall not receive any monetary compensation, with the exception of work performed to prepare the site for the impending event. However, an extension on contract time will be allowed.

VII. WARRANTY AND GUARANTEE

7.1. The Contractor shall warrant and guarantee to the Owner that all Work is in accordance with the Contract Documents and is not defective. Prompt notice of all defects shall be given to the Contractor. The Contractor shall promptly correct all defective Work performed and replace defective materials or items found deficient during the final inspection, in a manner satisfactory and at no additional cost to the Owner for a period of one (1) year following the date of Final Completion; provided, however, if the local ordinances or code regarding warranties and guarantees, or if any provision in the local ordinances or code regarding the timing of performance or defect bonds conflicts with such one (1) year period, the local ordinance or code shall control. This warranty and guarantee shall not operate as a waiver of any of the rights and remedies of the Owner for default under or breach of the Agreement which rights and remedies may be exercised at any time within the period of any applicable statute of limitations.

The City shall hold a “pre-final” inspection to test all valves and hydrants. The City Inspector and representatives from the Water Distribution Division shall be present for the inspection. The final inspection will not be held until all deficiencies found in the pre-final inspection have been corrected.

7.2. Where defective Work (and damage to other Work resulting therefrom) has been corrected, removed or replaced under this Article, the correction period hereunder with respect to such Work will be extended for an additional period of one (1) year after such corrections or removal and replacement has been satisfactorily completed. Repetitive malfunction of an equipment or product item shall be cause for replacement and an extension of the correction period to a date one (1) year following acceptable replacement. A repetitive malfunction shall be defined as the third failure of an equipment or product item following original acceptance.

7.3. If the Contractor does not promptly correct the defective Work or replace defective materials, the
Owner may have the defective Work corrected or the rejected Work removed and replaced, and all costs of such removal and replacement shall be paid by the Contractor.

7.4. Certain equipment or items may be required in the Contract Documents to be warranted for periods longer than one year.

7.5. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Contract Documents or by Change Order.

VIII. OPENING SECTIONS OF PROJECTS TO TRAFFIC

8.1. When specified in the Contract or when directed by the Owner, certain sections of the Work may be opened to traffic.

8.2. On any section of the Work opened by order of the Owner where the Contract Documents do not provide for traffic to be carried through the Work and the Contractor has not been dilatory in prosecuting the Work, the Contractor will not be required to assume any expense entailed in maintaining the road for traffic. Such expense will be borne by the Owner or will be compensated for by Change Order. Repair of slides and repair of damage attributable to traffic will be compensated for by Change Order. The cost of all other repairs shall be borne by the Contractor.

8.3. On any section of the Work opened by the order of the Owner where the Contract Documents do not provide for traffic to be carried through the Work, any additional cost for the completion of other items of Work that are occasioned because of the changed working conditions will be compensated by Change Order.

8.4. If the Contractor is dilatory in completing the Work, he shall not be relieved of the responsibility for maintenance during the period the section is opened to traffic prior to final acceptance. Any expense resulting from the opening of such portions under these circumstances, except for slides, shall be borne by the Contractor. The Contractor shall conduct the remainder of the construction operations so as to cause the least obstruction to traffic.

IX. NO WAIVER OF LEGAL RIGHTS

9.1. The Owner shall not be precluded or stopped by any measurement, estimate, or certificate made either before or after final acceptance of the Work and payment therefor from showing (1) the true amount and character of the Work performed and materials furnished by the Contractor, (2) that any such measurement, estimate, or certificate is untrue or incorrectly made, or (3) that the Work or materials do not conform with the provisions of the Contract. The Owner shall not be precluded or stopped, notwithstanding any such measurement, estimate, or certificate, and payment in accordance therewith, from recovering from the Contractor or his surety, or both, such damage as it may sustain by reason of his failure to comply with the terms of the Contract. Neither the acceptance by the Owner or any representative of the Owner, 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 Owner shall operate as a waiver of any portion of the Contract or of any power herein reserved or of any right to damages. A waiver of any breach of the Contract shall not be held to be a waiver of any other or subsequent breach. The Owner reserves all rights, privileges, immunities and defenses available to it at law.
SECTION 108

PROSECUTION AND PROGRESS OF WORK

I. PATENT FEES AND ROYALTIES

1.1. The Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product or device is specified in the Contract Documents for use in the performance of the Work and if to the actual knowledge of the Owner its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by the Owner in the Contract Documents.

1.2. To the fullest extent permitted by Laws and Regulations, the Contractor shall indemnify and hold harmless the Owner, the Engineer, the Engineer’s Consultants and the officers, directors, employees, agents and other consultants of each and any of them from and against all claims, costs, losses and damages arising out of or resulting from any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product or device not specified in the Contract Documents.

II. TAXES

2.1. The Contractor shall pay all sales, consumer, use and other similar taxes required to be paid by the Contractor in accordance with the Laws and Regulations of the Project that are applicable during the performance of the Work. (The Contractor may apply to the Virginia Department of Environmental Quality for tax exempt status for certain wastewater products.)

III. NOTICE TO PROCEED

3.1. Written Notice to Proceed will be given after the Agreement has been executed and the required Bid Security and insurances have been filed with and approved by the Owner.

3.2. The Contractor shall notify the Owner and all other governing bodies having jurisdiction, of the time and location that work will begin at least 48 hours prior to beginning Work.

IV. PRE-CONSTRUCTION CONFERENCE

4.1. Within ten (10) Days of the Effective Date of the Agreement, a conference attended by the Contractor, the Owner, and others as appropriate will be held to discuss the Project, and to discuss procedures relating to Shop Drawings, submittals, Applications for Payment, and other Project issues, and to establish a working relationship among the parties as to the Work.

V. CONSTRUCTION PROGRESS SCHEDULE

5.1. Within ten (10) Days after the Effective Date of the Agreement, the Contractor shall submit a written schedule to the Owner showing the proposed order of Work and indicating the time required for completion of major items of Work. This schedule shall take into account the passage or handling of traffic with the least practicable interference and the orderly, timely and efficient prosecution of the
Work. The schedule will be used as an indication of the sequence of the major construction operations and as a check on the progress of the Work.

A. A construction schedule in the form of a critical path shall be submitted to the Owner as part of the submittal process prior to beginning construction and shall be updated when duration or sequencing changes.

B. Upon receipt of an approved “Work Schedule”, the Contractor shall submit to the Owner, within 10 days,

1. An estimated payment schedule by each month of project duration.
2. A composite curve to show the estimated value of work completed and stored materials less specified retainage.
3. Key months when work will be 50, 80, 90, and 100 percent complete shall be established.
4. Identify when facilities will be fully operational.

C. During the course of work, the Contractor shall update with new composite curves at key months or whenever variation is expected to be more than plus or minus 10 percent. The original or previous composite curves shall be retained as dashed curves on all updates.

D. The Owner reserves the right to audit all reports and schedules. For cost-reimbursement contracts, change orders issued for fixed priced contracts or other contracts in excess of $30,000, which include the provisions of services, the Contractor shall retain all books, records and other documents relative to this contract for five (5) years after final payment or until audited by the Office of the City Auditor or designee, whichever is sooner. The City of Norfolk Utilities Department its authorized agents and/or City Auditors shall have full access to and the right to examine and duplicate any of said materials during said period.

5.2. The Contractor shall update the progress schedule monthly to reflect any schedule changes required to complete the remaining Work in accordance with the requirements of the Contract Documents. The updated schedule shall be submitted to the Owner for acceptance with the monthly application for progress payment; no payment will be made if the updated schedule is not submitted. All proposed adjustments in the progress schedule shall generally conform to the progress schedule then in effect and will comply with any provisions of the general requirements applicable thereto.

VI. SUBCONTRACTS

6.1. Except as otherwise noted, contract Work, the cost of which is at least fifty percent (50%) of the total Contract Price shall be performed by the Contractor’s own organization.

6.2. No part of the Work shall be transferred or subcontracted without prior written consent of the Owner, and no such consent or approval shall release the Contractor from any obligations to the Owner or persons employed by the Subcontractors, or to those supplying materials to the Subcontractors.

6.3. The Contractor agrees that it is as fully responsible to the Owner for the acts and omissions of its Subcontractors and persons either directly or indirectly employed by the Subcontractors as it is for the acts or omissions of persons directly employed.
6.4. Nothing contained in the Agreement shall create any contractual relation between any Subcontractor and the Owner.

6.5. The Contractor shall provide the Owner, in writing, the names of any minority and disadvantaged business subcontractors to be used on the project on the form provided, including the estimated dollar amount of such subcontract and the minority classification of such subcontractors. A minority and disadvantaged business is one that is at least 51% owned by an Asian American, Black, Hispanic, American Indian, Eskimo, Aleut, or Female. No contract pay applications or invoices will be reviewed or processed until the Owner receives this information.

VII. COMMENCEMENT AND PROSECUTION OF WORK

7.1. The Contractor shall commence Work within ten (10) Days of the date specified in the Notice to Proceed. Time being of the essence of this Project, the Contractor shall prosecute the Work diligently, using such means and methods of construction as will secure its full completion within the time period specified in the Agreement. No Work shall be done at the site prior to the date specified in the Notice to Proceed.

7.2. The Contractor shall proceed with the Work at such rate of progress to insure full completion within the Contract Time. It is expressly understood and agreed, by and between the Contractor and the Owner, that the Contract Time for the completion of the Work as specified in the Agreement is a reasonable time, taking into consideration the average climatic and economic conditions and other factors prevailing in the locality of the Project.

7.3. The Contract Time will commence on the date indicated in the Notice to Proceed.

7.4. Once the Contractor has commenced Work, it shall be prosecuted continuously and to the fullest extent possible except for interruptions caused by delays authorized or ordered by the Owner by a Change Order or by weather.

Except as set forth below, Contractor agrees that it will make no claim for damages arising from delay and that the Contractor’s sole remedy for delay is to request a Change Order as set forth herein. The Contract time may be extended by Change Order for such reasonable time as the Owner determines if:

i) The Contractor is delayed in the progress of work by any act or omission of the Owner or the Engineer, or by any separate Contractor employed by the Owner, or by strikes, lockouts, fire, adverse weather conditions not reasonably anticipated, or acts of nature;

ii) Such delay affects the overall completion of the work;

iii) The Contractor gives written notice to the Owner within 48 hours of the start of the occurrence, stating the cause of the potential delay and estimate of the possible time extension involved; and

iv) The Contractor gives written notice to the Owner of any actual time extension requested as a result of the aforementioned occurrences within 10 days after the delay has been remedied.
Notwithstanding the foregoing, it is agreed that this paragraph does not prevent Contractor from making a claim for costs or damages for unreasonable delay caused by acts of omissions of the Owner, its agents or employees due to causes within their control, provided that the Contractor satisfies the notice requirements contained herein.

7.5. Gifts, gratuities, or favors shall not be given or offered by the Contractor to personnel of the Owner.

7.6. The Contractor shall not employ any personnel of the Owner or the Engineer for any services without the prior written consent of the Owner.

7.7. Workers shall have sufficient skill and experience to perform properly the Work assigned to them. Workers engaged in special or skilled work shall have sufficient experience in such work and in the operation of equipment required to perform it properly and satisfactorily. Any person employed by the Contractor or any subcontractor who, in the opinion of the Owner, does not perform his work in a proper and skillful manner or is intemperate or disorderly shall, at the written request of the Owner, be removed forthwith by the Contractor or subcontractor employing the person and shall not be employed again on any portion of the work without the approval of the Owner.

7.8. Equipment shall be of sufficient size and in such mechanical condition as to meet the requirements of the Work and produce a satisfactory quality of work. Equipment and the Contractor’s methods and means shall be such that no damage to the roadway, adjacent property, or other highways will result from its use. The Owner may order the removal and require replacement of unsatisfactory equipment.

VIII. SUSPENSION OF WORK

8.1. The Owner may, at any time and without cause, suspend the Work or any portion thereof for a period of not more than 90 Days or such further time as agreed upon by the Contractor, by Written Notice to the Contractor. Such Notice shall specify the date on which Work shall be resumed and the Contractor shall resume the Work on the date so specified. The Contractor will be allowed an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to any suspension if the Contractor makes a claim in accordance with the Contract Documents, except that no such increase or extension shall be allowed if the suspension was due to a failure by the Contractor to perform the Work in accordance with the Agreement.

IX. TERMINATION OF AGREEMENT

9.1. Termination for the Convenience of the Owner

The performance of Work under this Agreement may be terminated by the Owner in accordance with this section in whole, or in part(s), whenever the Owner shall determine that such termination is in the best interest of the Owner. Any such termination shall be effected by delivery to the Contractor of a notice of termination specifying the extent to which performance of Work under the Agreement is terminated, and the date upon which such termination becomes effective.

After receipt of a notice of termination, and except as otherwise directed by the Owner, the Contractor shall:

A. Stop Work under the Agreement on the date and to the extent specified in the notice of termination.
B. Place no further orders or subcontracts for materials, services, or facilities, except as may be necessary for completion of such portion of the Work under the Agreement that is not terminated.

C. Terminate all orders and subcontracts to the extent that they relate to the performance of the Work terminated by the notice of termination.

D. Assign to the Owner, and as directed by the Owner, all of the right, title and interest of the Contractor under the orders and subcontracts so terminated. The Owner shall have the right and discretion to settle or pay any and all claims arising out of the termination of such orders and subcontracts.

E. Settle all outstanding liabilities and all claims arising out of such termination of orders and subcontracts, with the approval or ratification of the Owner. This approval or ratification will be final for all purposes of this section.

F. Transfer title and deliver to the Owner, as directed by the Owner, the fabricated or unfabricated parts, Work in process, completed Work, supplies, and other materials produced as a part of or acquired in connection with the performance of the Work terminated by the notice of termination, and the completed or partially completed plans, drawings, information and other property which, if the Agreement has been completed, would have been required to be furnished to the Owner.

G. Use his best efforts to sell as directed or authorized by the Owner, property of the type referred to in Paragraph F above; provided, however, that the Contractor shall not be required to extend credit to any purchaser. The proceeds of any such transfer or disposition shall be applied in reduction of any payments to be made by the Owner to the Contractor under this Agreement or shall otherwise be credited to the Contract price or cost of the Work covered by this Agreement or paid in such manner as directed by the Owner. The Contractor may acquire any such property under the conditions prescribed and at a price or prices approved by the Owner.

H. Complete performance of that Work which was not terminated by the Owner.

I. Take such action as may be necessary, or as the Owner may direct, for the protection and preservation of the property related to this Agreement which is in the possession of the Contractor and in which the Owner has, or may acquire, an interest.

J. Within 30 Days after the receipt of the Notice of termination, the Contractor may submit a list to the Owner for approval, certified 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 Owner, and may request the Owner to remove such approved items or enter into a storage agreement covering the same. Not later than 15 Days thereafter, the Owner will accept title to such approved items and remove them or enter into a storage agreement covering same. The list submitted shall be subject to final verification by the Owner upon removal of the items, or if the items were stored within 45 Days from the date of submission of the list. Any necessary adjustment to correct the list as submitted shall be made prior to final settlement.
K. Within 30 Days after receipt of the notice of termination, the Contractor shall submit to the Owner his termination claim. Such claim shall be submitted in writing. Upon failure of the Contractor to submit its termination claim within the time allowed, the Owner may, at its discretion, reject such termination claim. Such termination claim shall include the cost of the following:

1. The cost of supplies accepted by the Owner and not previously paid for by the Owner, appropriately adjusted for any saving of freight or other charges.

2. The cost incurred in the performance of the Work terminated, including Initial cost and preparatory expense allocable thereto, but exclusive of any cost attributable to supplies paid or to be paid for by the Owner.

3. The cost of settling and paying claims arising out of the termination of Work under subcontracts or orders which are properly chargeable to the terminated portion of the Agreement, exclusive of amounts paid or payable on account of supplies or materials delivered or services furnished by subcontractors or vendors prior to the effective date of notice of termination and previously paid for by the Owner.

4. A reasonable amount of profit or commission, which will be determined based on the Project's specific overhead and expense data at the rate computed in the original Contract Price or, at the discretion of the Owner, as determined by an audit. The cost of the audit will be borne by the Contractor.

5. Cost of reasonable storage, transportation and other costs incurred in connection with the protection or disposition of property allocable to this termination portion of the Agreement.

6. The total sum to be paid to the Contractor shall not exceed the Contract Price as reduced by the amount of payments previously made and its further reduced by the Contract Price of Work not terminated. Said total sum shall also be reduced by the reasonable value, as determined by the Owner, of property which is destroyed, lost, stolen, or damaged so as to become undeliverable to the Owner or to a buyer.

9.2. Termination with Cause/Default

In the event that the Contractor shall for any reason or through any cause be in default of the terms of this Agreement, the Owner may give the Contractor written Notice of such default by certified mail/return receipt requested at the address set forth herein.

Unless otherwise provided, Contractor shall have ten (10) Days from the date such notice is mailed in which to cure the default. Upon failure of the Contractor to cure the default, the Owner may immediately cancel and terminate this Agreement as of the mailing date of the default notice.

Upon termination, the Contractor shall withdraw its personnel and equipment, cease performance of any further Work under this Agreement, and turn over to the Owner any Work in process for which payment has been made.

In the event of violations of law, safety or health standards and regulations, this Agreement may be immediately canceled and terminated by the Owner and provisions herein with respect to opportunity
to cure default shall not be applicable.

9.3. Contractor’s Right to Terminate the Agreement

Should the Work be stopped for a period of 90 Days or more, through no fault of the Contractor, or should the Owner fail to pay the Contractor any payment within a reasonable length of time after said payment shall become due, the Contractor may, upon seven (7) Days written notice to the Owner, stop Work, or terminate the Agreement and recover from the Owner payment for all Work executed, plus any loss actually sustained, plus reasonable profit and damage; provided, however, the total recovery from Owner shall not exceed the Contract Price.

X. LIQUIDATED DAMAGES

10.1. It is mutually understood and agreed by and between the Contractor and Owner that in the execution of the Work, time is an essential element of the Agreement, and it is important that the Work proceed vigorously to completion.

10.2. The Owner has the right to deduct any liquidated damages from any money in the Owner’s hands, otherwise due, or to become due, to the Contractor, and to sue for and recover any additional compensation for damages for non-performance of the Work or failure to complete the Work within the Contract Time.

10.3. The assessment of liquidated damages for failure to complete the Work within the Contract Time shall not constitute a waiver of the Owner’s right to collect any additional damages that the Owner may sustain by failure of the Contractor to carry out the terms of the Agreement.

The contract will contain a clause deducting One Thousand Dollars and No Cents ($1000.00) per calendar day as liquidated damages for failure to complete work prior to the established Substantial Completion date. And an additional Five Hundred Dollars and No Cents ($500.00) per calendar day as liquidated damages for failure to complete work prior to the established Final Completion date. If substantial completion is not achieved by the time of final completion then liquidated damages for both substantial and final completion shall run concurrently until substantial completion is achieved.

10.4. In the event of delay in the completion of the Work as specified beyond the Completion Date as adjusted by Change Orders, it would be difficult to determine the exact amount of the loss or damages suffered by the Owner due to delays in completion of the Agreement. Therefore, for every Day of delay past Completion Date of this Agreement as adjusted by Change Orders, the Contractor and the Contractor’s Surety will be liable to the Owner, as liquidated damages for delay and not as a penalty, in the sum designated in Section 102, III. Bid Form, and in paragraph H of the Agreement between Contractor and Owner as set forth in Section 103, for each and every calendar Day the Contractor shall be in default, as follows:

A. If Substantial Completion has not been achieved by the scheduled Substantial Completion date, the Substantial Completion liquidated damages shall accrue each day until Substantial Completion is achieved.

B. If neither Substantial Completion nor Final Completion has been achieved by the scheduled Final Completion date, only Substantial Completion liquidated damages shall accrue each day until Substantial Completion is achieved and, thereafter, Final Completion liquidated damages shall accrue each day until Final Completion is achieved.
C. If Substantial Completion has been achieved but Final Completion has not been achieved by the Final Completion date, Final Completion liquidated damages shall accrue each day until Final Completion is achieved.

D. Substantial Completion liquidated damages and Final Completion liquidated damages shall not run concurrently.

E. The scheduled Final Completion date shall not be extended, in any case, solely because Substantial Completion was not achieved by the scheduled Substantial Completion date.

F. This paragraph will not apply to delays in completion of the Work due to acts of God, acts of the Public Enemy, acts of the Government (in either its sovereign or contractual capacity), fires, floods, strikes, or unusually severe weather, provided, that the Contractor shall, within five (5) days from the end of the month in which such delay occurred, notify the Owner in writing of the causes of delay and the facts relating thereto; and, provided that such delay occurs prior to the Substantial Completion date or, if Substantial Completion has been achieved, such delay occurs prior to the Final Completion date. Failure to provide such notice shall preclude the Contractor from claiming that delays resulted from the acts of God, acts of the Public Enemy, acts of the Government (in either its sovereign or contractual capacity), fires, floods, strikes, or unusually severe weather.

G. Nothing in the above clause shall be interpreted as limiting in any way, the Owner’s right to proceed against the Contractor for additional damages or losses. Liquidated damages are for delay only and are in addition to any other rights available to the Owner by contract or law. To the fullest extent permitted by Laws and Regulations, the Contractor shall waive any defense as to the validity of such liquidated damages as set forth herein on the grounds that such liquidated damages are void as penalties or are not reasonably related to actual damages.

10.5. Weather shall be considered “unusually severe”, only if a weather condition (or any combination of weather conditions) prevents the Contractor from working a number of workdays during a calendar month, which number exceeds the number of workdays listed below for that calendar month. Delays will only be allowed for the amount of lost work days in excess of the following:

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<th>Month</th>
<th>Lost Work Days</th>
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<td>January</td>
<td>6</td>
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<td>February</td>
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<td>3</td>
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<tr>
<td>December</td>
<td>5</td>
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</table>

10.6. The Contractor shall anticipate the potential loss of the number of workdays listed above for each calendar month due to weather, and shall schedule the Work accordingly. Any schedules submitted shall include the above number of days each month as lost days. The Owner shall determine, upon examination of submitted evidence, whether or not weather prevented the Contractor from performing Work on the days claimed by the Contractor. The Owner’s determination shall be final and binding upon the parties.

10.7. The Work shall be considered complete when the following criteria have been met; all items of the Work have been constructed, inspected and accepted by the Owner and further that all punch list items have been corrected and the Owner has issued a letter of acceptance.
XI. SEPARATE CONTRACTS BY OWNER

11.1. The Owner reserves the right to award other contracts in connection with the Project, the work under which may proceed simultaneously with the execution of this Agreement. The Contractor shall afford other separate contractors reasonable opportunity for the introduction and storage of their materials and the execution of their work, and the Contractor shall take all reasonable action to coordinate its Work with theirs. If the work performed by the separate contractor is defective or so performed as to prevent the Contractor from performing the Work, the Contractor shall immediately notify the Owner upon discovering such conditions. Upon receiving notification, the Owner shall take such appropriate steps as are necessary to allow the Contractor to perform Work under the Agreement, and appropriate extensions of time and change orders will be given to the Contractor, pursuant to the Agreement, to compensate for any delays and extra costs caused by separate contractor’s performance.

XII. INDEMNIFICATION

12.1. To the fullest extent permitted by Laws and Regulations, the Contractor shall indemnify and hold harmless the Owner, the Engineer, the Engineer’s Consultants and officers, directors, employees, agents and other consultants of each and any of them from and against all claims, costs, losses and damages (including, but not limited to all fees and charges of engineers, architects, attorneys and other professionals and all court or arbitration or other dispute resolution costs) caused by, arising out of or resulting from the performance of the Work, provided that any such claim, cost, loss or damage: (i) is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom, and (ii) is caused in whole or in part by any negligent act, errors, omissions, recklessness, or intentionally wrongful conduct of the Contractor, any Subcontractor, any supplier, any person or organization directly or indirectly employed by any of them to perform or furnish any of the Work or anyone for whose acts any of them may be liable, regardless of whether or not caused in part by any negligence or omission of a person or entity indemnified hereunder or whether liability is imposed upon such indemnified party by Laws and Regulations regardless of the negligence of any such person or entity.

12.2. In any and all claims against the Owner or any of the Owner’s consultants, agents, officers, directors, or employees by any employee (or the survivor or personal representative of such employee) of the Contractor, any Subcontractor, any supplier, any person or organization directly or indirectly employed by any of them to perform or furnish any of the Work or anyone for whose acts any of them may be liable, the indemnification obligation shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for the Contractor or any such Subcontractor, supplier or other person or organization under workers’ compensation acts, disability benefit acts or other employee benefit acts.

12.3. The indemnification obligations of the Contractor shall not extend to the damages caused by the Owner and the Owner’s consultants, officers, directors, employees or agents resulting from the negligent preparation or approval of, Drawings, or Specifications.

End of Section
SECTION 109
MEASUREMENT AND PAYMENT

I. MEASUREMENT AND PAYMENT PROCEDURES

1.1. General

A. Measurement will be made on the basis of completion of the Work in accordance with the Contract Documents and the appropriate specification section.

B. Measurement of quantities will be made by the Contractor in the presence of the Owner. The methods of measurement and computations used in determination of quantities of materials furnished and installed shall be those generally recognized as conforming to good engineering practice.

C. The term "Complete in Place" will mean that the item of Work shall be furnished and installed in accordance with the Contract Documents complete with all appurtenances necessary for the item to be used for its intended function. Testing and acceptable results shall be included.

D. Linear foot and vertical foot measurements shall be measured along the horizontal plane of the ground or paved surface.

E. Area computations shall be made on the surface. Pay measurements for area computations will not exceed plan dimensions as shown on the Drawings, unless otherwise approved by the Owner in writing.

F. No payment will be made for length, width, or depth, in excess of that shown on the Drawings or specified in the Specifications for any construction, unless otherwise approved by the Owner in writing.

G. The term "Each" when used as an item of payment will mean complete payment for the Work described in the Contract Documents.

H. The word "Lump Sum" when used as an item of payment will mean complete payment for Work described in the item, including all materials, labor, and equipment necessary to complete the Work in accordance with the Contract Documents.

I. Quantities will be measured and paid for in accordance with one of the following methods, and as specified on the Bid form

1.1. Incidental Items

J. There are numerous incidental items of work that are required to complete the Project. While these items may not be specifically mentioned or illustrated by the Contract Documents and there may be no specific pay items listed for them, the Contractor will be required to perform those incidental tasks that can be anticipated through inspection of the
Contract Documents, inspection of the construction area, and experience in this class of construction.

K. Items considered incidental work shall not be measured for payment or paid for as such unless specified as unit price by items on the bid form. These items and their costs shall be included in the unit prices or lump sum bid for the pay items unless bid separately. Incidental items include but are not limited to the following:

1. Allaying dust and mud
2. Daily cleanup, **Daily Pavement restoration**
3. Excavation and dewatering
4. Furnishing, hauling, placing, manipulating, and compacting material
5. Location of existing utilities
6. Material royalties
7. Mobilization and demobilization
8. Offsite disposal of excess excavated, surplus and remnant excavated materials
9. Permits, unless provided by the Owner
10. Removal and replacement of existing signs, fences, mail boxes, and similar existing improvements
11. Site restoration and cleanup
12. Site security
13. Stakeout and surveying
14. Traffic control
15. Minor relocation of buried cables, gas lines, water lines, sewer lines, or similar utility lines 2 inches and smaller in diameter
16. Construction entrances
17. Pavement marking
18. Final Surface restoration
19. Top soil and seeding
20. Clearing and grubbing
21. Protection of existing utilities and other facilities.

L. **Description of Measurement and Payment Items**

Refer to Section 110 - Special Provisions. Appendix D

1.2 **Schedule of Values for Lump Sum Bid Items**

A. Within fourteen (14) days after the Effective Date of the Agreement, the Contractor shall submit a schedule of values for all of the Work which shall include quantities and prices of items aggregating the Contract Price and shall subdivide the Work into component parts in sufficient detail to serve as the basis for progress payments during construction. Such prices shall include an appropriate amount of overhead and profit applicable to each item of Work. The Owner shall review the schedule and shall respond in writing to the Contractor within ten (10) Days either approving or disapproving the schedule. If the schedule of values is disapproved, the Contractor shall resubmit the schedule with revised value or additional substantiating data and the Owner shall either approve or disapprove the revised schedule within ten (10) Days. No payments shall be processed or approved until the schedule of values is approved by the Owner.
1.3 Application for Progress Payment by Contractor

A. Unless otherwise provided in this Section, the Owner shall make monthly progress payments to the Contractor on the basis of a duly certified and approved Application for Payment for Work performed during the preceding calendar month as approved by the Owner.

B. At least ten (10) Days before each partial progress payment (but not more often than once a month), the Contractor shall submit to the Owner an Application for Payment filled out and signed by the Contractor for the Work completed during the period covered by the partial progress payment estimate and supported by such data as is required by the Contract Documents.

C. The schedule of values for lump sum items established as provided in Section 109-1.2 shall serve as the basis for progress payments and shall be incorporated into a form of Application for Payment acceptable to the Owner.

D. Record drawings must be submitted with monthly invoices per section 105.V

1.4 Payment for Material on Hand

If payment is requested on the basis of materials and equipment not incorporated in the Work, but delivered and suitably stored at the site or at another location agreed to in writing, the Application for Payment shall be accompanied by a bill of sale, invoice or other instrument documenting that the materials and equipment are free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance, all of which will be satisfactory to the Owner. The Owner, at its sole discretion, may not pay for stored materials without prejudice and without cause.

1.5 Review of Applications for Progress Payments

A. The Owner shall, within ten (10) Days after receipt of each Application for Payment, make such investigations as deemed necessary to verify the accuracy of the Application for Payment and either accept the application as accurate and suitable for payment or return the Application to the Contractor indicating in writing the Owner’s reasons for refusing payment. If payment is refused, the Contractor shall make the necessary corrections and resubmit the Application and the Owner shall have an additional ten (10) Days after receipt of the corrected Application for Payment from the Contractor to determine whether this Application is accurate and suitable for payment.

B. The Owner shall, within 30 Days after acceptance of the Application for Payment, make payment to the Contractor. The Owner may refuse to make payment of the full amount because claims have been made against the Owner on account of the Contractor’s performance or furnishing of the Work, or because Liens have been filed in connection with the Work, or because there are other claims entitling the Owner to a set-off against the payment. The Owner shall give the Contractor immediate written Notice stating the reasons for its failure to make payment.
C. The Owner may also refuse to make payment of the full amount because there are other items entitling the Owner to retain set-offs from the amount recommended, including but not limited to:

1. Owner compensation to the Engineer for actual costs for extra personnel hours for labor plus expenses because of the following Contractor caused events:
   a. Witnessing re-testing of corrected or replaced defective work.
   b. Return visits to manufacturing facilities to witness factory testing or re-testing.
   c. Evaluation of proposed substitutes and in making changes to Contract Documents occasioned thereby.
   d. Overtime worked by the Contractor necessitating the Engineer, Resident Project Representative (and support staff, if any), to work overtime.

2. Liability for liquidated damages incurred by the Contractor as set forth in the Agreement.

3. Loss to Owner caused by Contractor acts or omissions including, but not limited to:
   a. Defective Work not remedied;
   b. Claims filed or reasonable evidence indicating probable filing of claims against the Contractor;
   c. Failure of the Contractor to make payments properly to subcontractors or for materials or labor;
   d. A reasonable doubt that the Project can be completed for the balance then unpaid;
   e. Failure to maintain (each month) the record set of Drawings and Specifications. Failure to provide the Owner with record Drawings and Specifications within thirty (30) calendar Days from the date of the Substantial Completion;
   f. Failure to periodically remove and dispose of accumulated debris, rubbish, and discarded/damaged materials;
   g. Persistent failure to carry out the Work in accordance with the Contract Documents;
   h. A reasonable doubt that the Work will be completed within the Contract Time.
4. Failure of the Contractor to submit an updated progress schedule or other required supporting documentation (if requested by the Owner) to the Owner with the monthly application for progress payment.

1.6 Retained Funds

A. The Owner shall retain five percent (5%) of the total amount of each partial progress payment to assure faithful performance of the Agreement by the Contractor. The Owner will release all retainage upon Final Payment.

B. Pursuant to and in accordance with Section 2.2-4334 of the Code of Virginia, the Contractor may exercise the option to use the escrow account utilization procedure with respect to retained funds. The Contractor may do so by indicating its preference for this procedure in the appropriate space provided on the Bid Form.

1. Should this option be selected, the Contractor shall execute the Escrow Agreement and shall submit same to the Owner in the manner prescribed by law. If the Escrow Agreement form is not submitted as noted, the Contractor shall forfeit such rights to the use of the escrow account utilization procedure.

2. In order to have retained funds paid to an escrow account, the Escrow Agreement shall be executed by the Contractor, the escrow agent, and the surety, and shall be submitted by the Contractor to the Owner for approval by the Owner’s attorney. The Contractor’s escrow agent shall be a trust company, bank or savings institution with its principal office located in the Commonwealth of Virginia. The Escrow Agreement shall contain the complete address of the escrow agent and surety, and the executed Escrow Agreement will be authority for the Owner to make payment of retained funds to the Escrow Agent. After approving the Escrow Agreement, the Owner shall pay to the escrow agent the funds retained as provided herein except that funds retained for lack of progress or other deficiencies on the part of the Contractor shall not be paid to the Escrow Agent. The Escrow Agent may, in accordance with the terms of the Escrow Agreement, invest the funds paid into the escrow account and pay earnings on such investments to the Contractor or release the funds to the Contractor provided that such funds are fully secured by approved securities.

3. Retained funds invested and securities held as collateral for retainage may be released only as and when directed by the Owner. When the Final Payment is paid, the Owner shall direct to the Contractor monies due as determined by the Owner. The Owner reserves the right to recall retained funds and to release retained funds to the surety upon receipt of written request from the Contractor or in the event of default.

4. The escrow account procedure shall apply to any contract for the sum of Two Hundred Thousand Dollars ($200,000), or more, for construction of highways, roads, streets, bridges, parking lots, demolition, clearing, grading, excavating, paving, pile driving, miscellaneous drainage structures, and the installation of water, gas, sewer lines, and pumping stations.
1.7 Conditions of Payment to Contractor

A. All material and Work covered by partial progress payments shall thereupon become the sole property of the Owner, but this provision shall not be construed as relieving the Contractor from the sole responsibility for the safety and protection of all materials and Work upon which payments have been made or the restoration or replacement of any damaged or stolen Work or property or as a waiver of the right of the Owner to require the fulfillment of all the terms of the Agreement.

B. Prior to Substantial Completion, the Owner, with the concurrence of the Contractor, may use any completed or substantially completed portions of the Work. Such use shall not constitute an acceptance of such portions of the Work.

C. The Owner shall have the right to enter the premises for the purpose of doing work not covered by the Contract Documents. This provision shall not be construed as relieving the Contractor of the sole responsibility for the care and protection of the Work, or the restoration of any damaged Work except such as may be caused by agents or employees of the Owner.

D. The Contractor shall indemnify and save the Owner or the Owner's agents harmless from all claims growing out of the lawful demands of Subcontractors, laborers, workmen, mechanics, material men, and furnishers of machinery and parts thereof, equipment, tools and all supplies, incurred in the furtherance of the performance of the Work. The Contractor shall, at the Owner's request, furnish satisfactory evidence that all obligations of the nature designated above have been paid, discharged, or waived. If the Contractor fails to do so the Owner may, after having notified the Contractor, either pay unpaid bills or withhold from the Contractor's unpaid compensation a sum of money deemed reasonably sufficient to pay any and all such lawful claims until satisfactory evidence is furnished that all liabilities have been fully discharged whereupon payment to the Contractor shall be resumed, in accordance with the terms of the Contract Documents but in no event shall the provisions of this Section be construed to impose any obligations upon the Owner to either Contractor, the Surety, or any third party. In paying any unpaid bills of the Contractor, any payment so made by the Owner shall be considered as a payment made under the Contract Documents by the Owner to the Contractor and the Owner shall not be liable to the Contractor for any such payments made in good faith.

E. The Contractor shall take one of the two following actions within seven (7) days after receipt of amounts paid to the Contractor by the Owner for Work performed by the Subcontractor under the Agreement:

1. Pay to the Subcontractor the proportionate share of the total payment received attributable to the Work performed by the Subcontractor under the Agreement; or

2. Notify the Owner and Subcontractor, in writing, or his intention to withhold all or a part of the Subcontractor’s payment with the reason for nonpayment.

F. All contracts awarded by the Contractor to a Subcontractor for any portion of the Work shall include:
1. An interest clause that obligates the Contractor to pay interest to the Subcontractor on all amounts owed by the Contractor that remain unpaid after seven (7) days following receipt by the Contractor of payment from the Owner for Work performed by the Subcontractor under that contract, except for amounts withheld as allowed.

2. An interest rate clause stating, “Unless otherwise provided under the terms of this contract, interest shall accrue at the rate of one percent per month.”

3. A payment clause that requires (i) individual contractors to provide their social security numbers and (ii) proprietorships, partnerships, limited liability companies and corporations to provide their federal employer identification numbers.

G. The Contractor shall include in each of its subcontracts a provision requiring each Subcontractor to include or otherwise be subject to the same payment and interest requirements as specified in Section 1.7 above, with respect to each lower-tier Subcontractor.

H. A Contractor’s obligation to pay an interest charge to a Subcontractor pursuant to the payment clause in this section may not be construed to be an obligation of the Owner. A contract modification may not be made for the purpose of providing reimbursement for such interest charge. A cost reimbursement claim may not include any amount for reimbursement for such interest charge.

1.8 Final Payment

After the Contractor has completed all corrective Work as determined by a final inspection to the satisfaction of the Owner and has delivered all maintenance and operations manuals, schedules, guarantees, bonds, certificates of inspection, and other documents as required by the Contract Documents, the Contractor may make application for final payment following the procedure for partial progress payments. Within thirty (30) days after approval, the Owner shall pay to the Contractor the amount stated, less all prior payments and advances to or for the account of the Contractor. All prior estimates and payments including those relating to extra Work shall be subject to correction by this payment, which is called the Final Payment. The Contractor's obligation to perform the Work and complete the Project in accordance with the Contract Documents shall be absolute. Neither approval of any progress or Final Payment by the Owner nor the issuance of a Certificate of Substantial Completion, nor any payment by Owner to Contractor under the Contract Documents, nor any use or occupancy of the Project or any part thereof by Owner, nor any act of acceptance by Owner nor any failure to do so, nor any correction of defective Work by Owner shall constitute an acceptance of Work not in accordance with the Contract Documents.

1.9 Acceptance of Final Payment Constitutes Release

The acceptance by the Contractor of the Final Payment shall be and operate as a release to the Owner of all claims and of all liability to the Contractor for all things done or furnished in connection with this Work excepting the Contractor's claims for interest upon Final Payment, should this payment be improperly delayed. No payment, final or otherwise, or partial or entire use or occupancy of the Work by the Owner, shall constitute an acceptance of any Work or materials not in accordance with the Contract Documents, nor shall the same relieve the Contractor of responsibility for faulty
materials or workmanship or operate to release the Contractor or his Surety from any obligation under the Contract, the Performance Bond and Payment Bond.

1.10 Assignments

Neither party to the Agreement shall sell, transfer, assign or otherwise dispose of the whole or any parts of the Agreement or of the right, title or interest therein without the prior written consent of the other, nor shall the Contractor assign any monies due or to become due hereunder, without the previous written consent of the Owner.

1.12 Payment Affidavit

The Owner, before making any payment, including the final payment, if it is deemed that such procedure necessary to protect his interests, may require the Contractor to furnish an affidavit from all subcontractors and material suppliers used in conjunction with this Contract that each has been paid in full, or in the alternative, an affidavit that so far as he has knowledge or information, all payments have been made and that there is no basis under which a claim against the payment bond could be filed. However, the Owner may make payments in part or in full to the Contractor without requiring the affidavits, and the payments so made shall not impair the obligations of any Surety or Sureties on any bond or bonds furnished under this Contract.

II. CHANGE ORDERS AND FIELD ORDERS

2.1. The Owner may at any time, as the need arises, order changes within the scope of the Work without invalidating the Agreement. If such changes increase or decrease the amount due under the Contract Documents, or in the time required for performance of the Work, an equitable adjustment shall be authorized by Change Order.

2.2. The Contract Price and Contract Time may be changed only by a Change Order, approved by the Owner prior to the performance of the Work by the Contractor or granted by the Owner upon written Notice by Contractor submitted in accordance with Section 104-5.2 and 5.3 or Section 105-16.2. The value of any Work covered by a Change Order or of any claim for increase or decrease in the Contract Price or Contract Time shall be established in accordance with the following methods in the order of precedence listed below:

A. established contract unit prices;

B. an agreed lump sum or unit price established by direct negotiation between the Contractor and the Owner;

C. In the event that any changes in the Work are not settled under A. and B. above, the Contract Price shall be adjusted for non-negotiated items in accordance with the following:

1. In any case such change involves extra Work which is performed by the Contractor, the Contract Price shall be increased by fifteen (15%) for overhead and profit. (a) the direct cost of such Work, as mutually agreed upon or otherwise as determined in accordance with the Contract Documents, and (b) ten percent (10%) of the amount of (a) to cover Contractor’s additional job (field and home office) overhead, and (c) five percent (5%) of the sum of (a) and (b) to cover Contractor’s additional job profit.


2. In any case such change involves extra Work which is performed by a Subcontractor, the Contract Price shall be increased by ten percent (10%) of total determined in paragraph C(1) above for overhead and profit. (a) the amount paid by the Contractor to the Subcontractor for such extra Work, and (b) seven and one half percent (7-1/2%) of the amount paid to the Subcontractor to cover the Contractor's additional job (field and home office) overhead and (c) five percent (5%) of the sum of (a) and (b) to cover Contractor's additional job profit. On Work performed by the Subcontractor, the Subcontractor shall be allowed overhead and profit in accordance with paragraph C(1) above.

3. In the case of either subparagraph 1 or 2 above, the Contract Price shall also be increased by the corresponding increase in the cost of the Contractor’s performance bond.

2.3. It is the Contractor's responsibility to notify his Surety of any change affecting the general scope of the Work or change in the Contract Price and/or Contract Time so that the amount of the applicable Bonds shall be adjusted accordingly. The Contractor shall furnish proof of such adjustment to the Owner.

2.4. Whenever changes, alterations, additions, omissions, or revisions are called for by the Owner for which the necessary Drawings and details have been completed and submitted to the Contractor, or when changes, alterations, additions or omissions are clearly given in writing to the Contractor, the Contractor is to submit an itemized statement of quantities and prices incidental to such revisions, changes, additions and omissions.

2.5. The Owner may at any time order minor changes within the scope of Work by issuing a Field Order. The Contractor shall proceed with the performance of any changes in the Work so ordered by the Owner unless the Contractor believes that such Field Order entitles the Contractor to a change in Contract Price or Time or both, in which event the Contractor shall give the Owner written Notice thereof within seven (7) days after the receipt of the ordered change. The Contractor shall not execute such changes pending the receipt of an executed Change Order or further instruction from the Owner. The Owner shall respond to such written Notice from Contractor within twenty-one (21) days after receipt.

2.6. If any item in the Agreement is determined to be unnecessary for the proper completion of the Work contracted, the Owner may, upon written Notice to the Contractor, eliminate such item from the Agreement. Payment will not be made for such item except that the Contractor shall be compensated for the actual cost of any Work performed for the installation of such item and the net cost of materials purchased, including freight and tax costs, as evidenced by invoice. No additional compensation will be made for overhead or anticipated profit.

2.7. The Contractor shall not be entitled to any adjustment in the Contract Price or Contract Time due to any condition or alleged condition if:

A. The Contractor knew of the existence of such conditions at the time the Contractor made a final commitment to the Owner in respect of Contract Price and Contract Time by the submission of a Bid; or

B. The existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test or study of the site and contiguous areas required by the Contract Documents to be conducted by or for the Contractor prior to the Contractor making such final commitment; or
C. The Contractor failed to give the written Notice within the time and as required by Section 104-5.2 and 5.3 or Section 105-16.2.
III. CHANGE ORDER

City of Norfolk
DEPARTMENT OF UTILITIES
CHANGE ORDER

PROJECT: CONTRACT TIME: Calendar Days
CHANGE ORDER No. CONTRACT No. VENDOR CODE:
DATE PREPARED:

Description of work under this contract:

Changes Ordered:

Reason for Change Order:
See attached supplement sheet.

Subject to the following conditions an equitable adjustment is established as set out below:

<table>
<thead>
<tr>
<th>Item</th>
<th>Contract Price</th>
<th>Contract Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>() Not Changed</td>
<td>Dollars</td>
<td>() Not Changed</td>
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<tr>
<td>() Increased By</td>
<td>Dollars</td>
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</tr>
<tr>
<td>() Decreased By</td>
<td>Dollars</td>
<td>() Decreased By</td>
</tr>
</tbody>
</table>

Contract Amount adjusted to $****. Bonded amount is $***. Bond rider is / is not required.

The foregoing is in accordance with your proposal(s) dated

and as listed below:
A. The aforementioned change, and work affected thereby, is subject to all contract stipulations and covenants.
B. The rights of the City are not prejudiced; and
C. All claims against the City which are incidental to or as consequence of the aforementioned changes are satisfied.

We are sending you the original and three (3) copies of this change order for your acceptance. Please return to us the original and (3) copies, all bearing your dated signature. One copy will be returned to you after approval by the City.

City of Norfolk

By: Kenneth Turner, P.E. Engineering Manager

Company: Date: Signature: Date:

I hereby certify that the money required for this change order is in the City Treasury to the credit of the fund from which it is to be drawn and not appropriated for any other purpose.

$ Amount

Account No. Director of Finance Date

Kristen M. Lentz, P.E.
Director of Utilities

Date

Approved as to form by
City Attorney: 10/84

December 2010

Barraud Park, Pump Station #153, Phase I
May, 2015
City of Norfolk Department of Utilities
### IV. APPLICATION FOR PAYMENT

#### PROJECT SUMMARY

Date: ______________________  Contractor’s Name: __________________________

Project Name: __________________________  Project Number: ______________________

Original Contract Amount: $________________
Original Contract Time: ________________ days

Adjusted Contract Amount (by approved Change Orders): $________________
Adjusted Contract Time (by approved Change Orders): _______________ days
Adjusted Contract Completion Date: _______________

#### STATUS OF WORK PERFORMED

A. Total Value of All Work Performed to Date: $_______________
B. Less _______% Retained by Owner: $_______________
C. Net Amount Earned on Contract to Date: (A-B) $_______________
D. Less Amounts of Previous Payments Approved: $_______________

**BALANCE DUE THIS PAYMENT:** (C – D) $_______________

Value of Work Remaining to be Completed: $_______________
Percentage Complete to Date (Value/Time): % %

#### CERTIFICATION OF CONTRACTOR

I certify to the best of my knowledge and belief that all items and amounts on the face of the attached estimate and invoice and this Application for Payment are correct; that all Work has been performed and/or material supplied in full accordance with the terms and conditions of the Contract Documents, including all duly authorized deviations, substitutions, alterations, additions and/or deletions; that the foregoing is a true and correct statement of the Contract Price up to and including the last day of the period covered by this estimate and Application for Payment; that no part of the "BALANCE DUE THIS PAYMENT" has been received; that all previous Progress Payments received on this Agreement have been applied by the undersigned to discharge in full all obligations of the undersigned incurred in connection with the Work covered by prior applications for payment under this Agreement; and that all materials and equipment incorporated in said payment or otherwise listed in or covered by this Application for Payment are free and clear of all liens, claims, security interest and encumbrances.

#### APPROVALS

This Application for Payment has been checked, verified and approved for payment by:

<table>
<thead>
<tr>
<th>Contractor</th>
<th>By</th>
<th>Title</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction Inspector</td>
<td>By</td>
<td>Title</td>
<td>Date</td>
</tr>
<tr>
<td>Engineer (Consultant)</td>
<td>By</td>
<td>Title</td>
<td>Date</td>
</tr>
<tr>
<td>Project Manager (City of Norfolk)</td>
<td>By</td>
<td>Title</td>
<td>Date</td>
</tr>
</tbody>
</table>

December 2010

*Barraud Park, Pump Station #153, Phase I*
*May, 2015*
*City of Norfolk Department of Utilities*
V. ESCROW AGREEMENT

THIS ESCROW AGREEMENT, made and entered into this ___ day of __________, 20__, by, between and among the _____________________________ (Owner) and ______________________________ (Contractor); and ____________________________________________ (Bank), a trust company, bank, or savings and loan institution with its principal office located in the Commonwealth and ___________________________ (Surety), provides:

5.1. The Owner and the Contractor have entered into an Agreement dated (month, date, year), with respect to a Project titled ______________________________ (the Agreement). This Escrow Agreement is pursuant to, but in no way amends or modifies the Agreement. Payments made hereunder or the release of funds from escrow shall not be deemed approval or acceptance of performance by the Contractor.

5.2. In order to assure full and satisfactory performance by the Contractor of its obligations under the Agreement, the Owner is entitled to retain certain amounts otherwise due the Contractor, known as retainage. The Contractor has, with the approval of the Owner, elected to have such retainage held in escrow by the Bank. This document sets forth the terms of the escrow. The Bank shall not be deemed a party to, bound by, or required to inquire into the terms of the Agreement or any other instrument or agreement between the Owner and the Contractor.

5.3. The Owner shall from time to time pursuant to its Agreement pay to the Bank amounts retained by it under the Agreement. Except as to amounts actually withdrawn from escrow by the Owner, the Contractor shall look solely to the Bank for the payment of funds retained under the Agreement and paid by the Owner to the Bank.

The risk of loss by diminution of the principal of any funds invested under the terms of this Escrow Agreement shall be solely upon the Contractor.

5.4. Funds and securities held by the Bank pursuant to this Escrow Agreement shall not be subject to levy, garnishment, attachment, lien or other process whatsoever. The Contractor agrees not to assign, pledge, discount, sell or otherwise transfer or dispose of its interest in the escrow account or any part thereof, except to the Surety.

5.5. The following securities, and none other, are approved securities for all purposes of this Escrow Agreement:

A. Unites States Treasury Bonds, United States Treasury Notes, United States Treasury Certificates of Indebtedness or United States Treasury Bills;

B. Bonds, notes and other evidences of indebtedness unconditionally guaranteed as to the payment of principal and interest by the United States.

C. Bonds or notes of the Commonwealth of Virginia;

D. Bonds of any political subdivision of the Commonwealth of Virginia, if such bonds carried, at the time of purchase by the Bank or deposit by the Contractor, a Standard and Poor’s or Moody’s Investors Service rating of at least “A”; and,
E. Certificates of deposit issued by commercial banks located within the Commonwealth, including, but not limited to, those insured by the Bank and its affiliates.

F. Any bonds, notes, or other evidences of indebtedness listed in Paragraphs A through C may be purchased pursuant to a repurchase agreement with a bank, within or without the Commonwealth of Virginia having a combined capital, surplus and undivided profit of not less than $25,000,000, provided the obligation of the Bank to repurchase is within the time limitations established for investments as set forth herein. The repurchase agreement shall be considered a purchase of such securities even if title, and/or possession of such securities is not transferred to the Escrow Agent, so long as the repurchase obligation of the Bank is collateralized by the securities themselves, and the securities have on the date of the repurchase agreement a fair market value equal to at least 100% of the amount of the repurchase obligation of the Bank and the securities are held by a third party, and segregated from other securities owned by the Bank.

No security is approved hereunder which matures more than five years after the date of its purchase by the Bank or deposit by the Contractor.

5.6. The Contractor may from time to time withdraw the whole or any portion of the escrowed funds by depositing with the Bank securities approved, in writing, by the Owner in an amount equal to, or in excess of, the amount so withdrawn. Any securities so deposited or withdrawn shall be valued at such time of deposit or withdrawal at the lower par or market value, the latter as determined by the Bank. Any securities so deposited shall thereupon become a part of the escrowed fund.

Upon receipt of a direction signed by the chief administrative and financial official of the Owner, the Bank shall pay the principal of the fund, or any specified amount thereof, to the Owner. Such payment shall be made as soon as is practicable after receipt of the direction.

Upon receipt of a direction signed by either the chief administrative or the chief financial official on behalf of the Owner, the Bank shall pay and deliver the principal of the fund, or any specified portion thereof, to the Contractor, in cash or in kind, as may be specified by the Contractor. Such payment and delivery shall be made as soon as is practicable after receipt of the direction.

5.7. For its services hereunder the Bank shall be entitled to a reasonable fee in accordance with its published schedule of fees or as may be agreed upon by the Bank and the Contractor. Such fee and any other costs of administration of this Escrow Agreement shall be paid from the income earned upon the escrow fund and, if such income is not sufficient to pay the same, by the Contractor.

Under no circumstances shall the Owner be responsible to the Bank for any fee or costs of administering this Escrow Agreement, account, or escrow fund.

5.8. The net income earned and received upon the principal of the escrow fund shall be paid over to the Contractor in quarterly or more frequent installations. Until so paid or applied to pay the Bank’s fee or any other costs of administration such income shall be deemed a part of the principal of the fund. All income earned shall be reported by the Bank to the Internal Revenue Service and other taxing authorities on the Contractor’s Tax I.D. Number, except for interest withdrawn by the Owner pursuant to paragraph IV.
5.9. The Surety undertakes no obligation hereby but joins in the escrow Agreement for the sole purpose of acknowledging that its obligations as surety for the Contractor’s performance of the Agreement are not affected hereby.

WITNESS the following signatures, all as of the day and year first above written.

______________________________
OWNER:

______________________________________
Name of Owner

______________________________________
By:

______________________________________
Title

______________________________
CONTRACTOR:

______________________________________
Name of Contractor

______________________________________
Contractor’s Tax I.D. Number

______________________________________
By:

______________________________________
Officer, Partner, or Owner

______________________________
BANK:

______________________________________
Name of Bank

______________________________________
Mailing Address for Payments

______________________________________
Account Number

______________________________________
By:

______________________________________
President/Vice-President

______________________________
SURETY:

______________________________________
Name of Surety

______________________________________
By _____________________________
Attorney-in-Fact
VI. AFFIDAVIT OF PAYMENT OF CLAIMS

BY: __________________________________________________________ (Contractor)

____________________________________________________________________

THIS DAY ________________________________________ _______ personally appeared before me, _
___________________________________________, a Notary Public in and for the City/County/State of _
Virginia, and being by me first duly sworn states that all Subcontractors and suppliers of labor and materials _
have been paid all sums due them to date for work performed or materials furnished in the performance of _
the Agreement between:

_______________________________________________________ (Owner)

and____________________________________________________ (Contractor)

dated ___________, 20___, for the construction of ___________________________________

or arrangements have been made by the Contractor satisfactory to such Subcontractors and suppliers with respect to the payments of such sums as may be due them by the Contractor.

__________________________________________________________

CONTRACTOR

BY: __________________________
TITLE: _______________________
DATE: _______________________

SEAL OF CONTRACTOR

Subscribed and sworn to before me this
____ day of ____________, 20___.

My commission expires on the
____ day of ____________, 20___.

________________________________
NOTARY PUBLIC

________________________________
NOTARY SEAL
VII. CERTIFICATE OF SUBSTANTIAL COMPLETION

Project Description: ______________________________________ Project No ______________________

_________________________ Other: __________________________

Location: ___________________ Completion Date: _______________

Contract For: ___________________ Contractor: ___________________

Owner: ______________________

This Certificate of Substantial Completion applies to all Work under the Contract Documents or to the following specified parts thereof:

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

TO WIT: The Owner and Contractor are hereby advised that the work to which this certificate applies has been inspected by authorized representatives of the Owner, Contractor, and Engineer, and that all Work is hereby declared to be substantially complete in accordance with the Contract Documents on:

______________________________ Date of Substantial Completion

A tentative list of items to be completed or corrected is attached hereto. This list may not be all-inclusive and the failure to include an item in it does not alter the responsibility of the CONTRACTOR to complete all items of the Work in accordance with the Contract Documents. When this certificate applies to a specified part of the Work, the items in this tentative list shall be completed or corrected by the CONTRACTOR within _______ days of the above date of substantial completion. The date of substantial completion is the date which all guarantees and warranties begin, except as follows:

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

This certificate is issued, accepted, and acknowledged by:

______________________  ________________  ________________________  ____________

Engineer           By   Title   Date

______________________  ________________  ________________________  ____________

Contractor         By   Title   Date

______________________  ________________  ________________________  ____________

Owner               By   Title   Date
VIII. STATEMENT OF SURETY COMPANY

IN ACCORDANCE with the provisions of the AGREEMENT dated__________, 20__,

BETWEEN ____________________________________________________________ (OWNER)

AND ________________________________________________________________ (CONTRACTOR)

THE ________________________________________________________________ (SURETY)

SURETY on the Material and Labor Payment BOND of:

_________________________________________________________ (CONTRACTOR)

after a careful examination of the books and records of said CONTRACTOR or after receipt of an affidavit from CONTRACTOR, which examination of affidavit satisfies SURETY that all claims for labor and materials have been satisfactorily settled, hereby approves of the final payment to the said

_________________________________________________________ (OWNER), CONTRACTOR, and by these presents witnesseth that payment to the CONTRACTOR of the final estimates shall not relieve SURETY of any of its obligations to

_________________________________________________________ (OWNER)

as set forth in the said SURETY COMPANY'S BOND.

IN WITNESS WHEREOF, said SURETY has hereunto set its hand and seal this _____ day of ________________, 20__.

ATTEST:

(SEAL) _____________________________ BY _________________________________

______________________________

P R E S I D E N T

NOTE: This statement, if executed by any person other than the President or Vice President of the Company, shall be accompanied by a certificate of even date showing authority conferred upon the person so signing to execute such instruments on behalf of the Company represented.
IX. CONTRACTOR'S RELEASE

KNOW ALL MEN BY THESE PRESENTS THAT:

_________________________ (Contractor) ______________________ of ______________________ County/City and State of __________________ does hereby acknowledge that he has received this day from the ______________________ (Owner) the sum of One Dollar ($1.00) and other valuable consideration in full satisfaction and payment of all sums of money owing, payable and belonging to ______________________ (Contractor) Dated ______________, 20___.

NOW, THEREFORE, the said ______________________ (Contractor) ______________________ (for myself, my heirs, executors and administrators; for itself, its successors and assigns) do by these presents remise, release, quitclaim and forever discharge the said ______________________, Owner, its successors and assigns, of and from all claims and demands arising from or in connection with the said Agreement dated ______________, 20____, and of and from all, and all manner of action and actions, cause and causes of action and actions, suits, debts, dues, duties, sum and sums of money accounts, reckonings, bonds, bills, specialties, covenants, contracts, agreements, promises, variances, damages, judgements, extents, executions, claims and demand, whatsoever in law or equity, or otherwise which against the said ______________________, Owner, its successors and assigns ever had, now have, or which (I, my heirs, executors, or administrators; it, its successors and assigns) hereafter can, shall or may have, for upon or by reason for any matter, cause or thing whatsoever, from the beginning of the world to the date of these presents.

IN WITNESS WHEREOF ______________________ (Contractor) ______________________ has caused these presents to be duly executed this _________ day of ____________________, 20____.

Signed, Sealed and Delivered in the Presence of:

_______________________________     CONTRACTOR_________________________

(SEAL)

BY: _______________________________

__________________________

Title

ATTEST:

_______________________________

SECRETARY
X. MANHOLE/STRUCTURE PROTECTIVE COATING POST INSTALLATION CERTIFICATION
(Submit prior to Substantial Completion)

Project Name

Owner

Contractor

Agreement No.

Applicator __________________________ I

Company Name: __________________________

Address: ________________________________

Telephone: ______________________________

Applicator __________________________ Date

This applicator is certified by __________________________,(Addr), Coatings Manufacturer, located at __________________________
(Address)

and approved in the proper application of the specified coating system. The materials and workmanship for Type B (80 mil) coatings systems are warranted for a period of five (5) years from the date of Substantial Completion of the project.

Coatings Manufacturer Authorized Representative/Title __________________________ Date

Coating System: __________________________

(Use Separate Form For Each Coating System Applied)

<table>
<thead>
<tr>
<th>Date Applied</th>
<th>Manhole/Structure Number</th>
<th>Actual Substrate Conditions</th>
<th>Ambient Air Conditions</th>
<th>Min/Max Reccoat</th>
<th>Dry Film Thickness</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>CSP Rating</td>
<td>Temp. (°F)</td>
<td>Moisture (Yes/No)</td>
<td>Temp. (°F)</td>
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I certify that the coating system identified below was installed in conformance with the manufacturer’s recommendations at the conditions listed below.

Applicator __________________________ Date

December 2010

Barraud Park, Pump Station #153, Phase I
May, 2015
City of Norfolk Department of Utilities
<table>
<thead>
<tr>
<th>Date Applied</th>
<th>Manhole/Structure Number</th>
<th>Actual Substrate Conditions</th>
<th>Ambient Air Conditions</th>
<th>Min/Max Recoat (Hrs/Hrs)</th>
<th>Dry Film Thickness (Avg) (Min)</th>
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<td>Moisture (Yes/No)</td>
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<td>Temp. (°F)</td>
<td>Humidity (%)</td>
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XI. STANDARD BID ITEMS AND UNITS
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<tr>
<th>Section</th>
<th>Bid Item</th>
<th>Category</th>
<th>Unit</th>
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<tbody>
<tr>
<td>301</td>
<td>Clearing-and-grubbing</td>
<td>Clearing-and-Grubbing</td>
<td>ACRE or LS</td>
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<td>301</td>
<td>Tree-protection fencing</td>
<td>Clearing-and-Grubbing</td>
<td>LF or EA</td>
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<tr>
<td>302</td>
<td>Storm sewer pipe (diameter and type)</td>
<td>Drainage-Structures</td>
<td>LF</td>
</tr>
<tr>
<td>302</td>
<td>Pipe culverts (waterway-opening)</td>
<td>Drainage-Structures</td>
<td>LF</td>
</tr>
<tr>
<td>302</td>
<td>Pipe reducers (larger diameter)</td>
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<td>302</td>
<td>Jacked pipe (diameter and type)</td>
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<td>302</td>
<td>Reinstalled pipe (diameter)</td>
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<tr>
<td>302</td>
<td>End sections (standard and size)</td>
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<td>End walls</td>
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<td>302</td>
<td>Box culverts (waterway-opening)</td>
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<td>302</td>
<td>Pipe grate</td>
<td>Drainage-Structures</td>
<td>LF or EA</td>
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<tr>
<td>302</td>
<td>Drop / yard inlets, catch basins, and intake boxes</td>
<td>Drainage-Structures</td>
<td>EA</td>
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<td>302</td>
<td>Base section (drop inlets and manholes)</td>
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<td>302</td>
<td>Manhole (0-6' depth) (4 or 5-foot diameter)</td>
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<td>302</td>
<td>Manhole (&gt;6' depth) (4 or 5-foot diameter)</td>
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<td>Conflict manhole</td>
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<td>Concrete spring boxes</td>
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<td>Junction boxes</td>
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<td>Precast Arches</td>
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<td>303</td>
<td>Regular excavation</td>
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<td>303</td>
<td>Pavement demolition (type and depth of pavement) [in proposed pavement]</td>
<td>Earthwork</td>
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<tr>
<td>303</td>
<td>Pavement demolition (type and depth of pavement) [outside proposed pavement]</td>
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<tr>
<td>303</td>
<td>Curb &amp; gutter demolition</td>
<td>Earthwork</td>
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<td>Existing structure demolition</td>
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<td>Existing pipe demolition</td>
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<td>Existing driveway demolition</td>
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<td>303</td>
<td>Undercut Excavation (regular)</td>
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<td>Select Material (min.-CBR)</td>
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<td>303</td>
<td>Select Bedding (regular)</td>
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<td>CY or TON</td>
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<td>303</td>
<td>Suitable Fill (regular)</td>
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<td>Backfill of Undercut Excavation (regular)</td>
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<td>Surcharge placement and removal</td>
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<td>Settlement plate</td>
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<td>303</td>
<td>Geotextile fabric for Base Preparation</td>
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<td>303</td>
<td>Select Bedding/Backfill of Undercut Excavation (trenching)</td>
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<td>CY or TON</td>
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<td>303</td>
<td>Sheeting, bracing, and shoring left in place (trenching)</td>
<td>Earthwork</td>
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<td>303</td>
<td>Rip-Rap for erosion control</td>
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<td>TON or SY</td>
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<td>303</td>
<td>Check dam (log or rock)</td>
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<td>303</td>
<td>Baled straw check dam</td>
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<td>Temporary silt fence</td>
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<td>Geotextile fabric for Erosion Control</td>
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<td>Sediment basin excavation</td>
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<td>Slope drain</td>
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<td>Siltation control excavation for Sedimentation Traps and Basins</td>
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<td>Inlet Protection (type of device)</td>
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<td>305</td>
<td>Select material—Type I</td>
<td>Subgrade and Shoulders</td>
<td>TON</td>
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<td>305</td>
<td>Select material—Types II or III</td>
<td>Subgrade and Shoulders</td>
<td>CY</td>
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<td>310</td>
<td>Aggregate material (base course)</td>
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<td>Aggregate base material (base course for curb and gutter)</td>
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<td>Tack-coat</td>
<td>Tack and Prime Coat</td>
<td>GALLON or SY</td>
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<td>310</td>
<td>Prime-coat</td>
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<td>Asphalt surface treatment</td>
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<td>SY</td>
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<td>315/315A</td>
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<td>Bituminous Leveling Course</td>
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<td>Edge clipping of shoulders</td>
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<td>Asphalt Driveways (Thickness)</td>
<td>Asphalt Concrete Pavement</td>
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<td>317</td>
<td>Pavement Patch</td>
<td>Pavement Patching</td>
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<td>406</td>
<td>Reinforcing steel or welded wire mesh</td>
<td>Reinforcing Steel</td>
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<td>406</td>
<td>Epoxy-coated reinforcing steel</td>
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<td>414</td>
<td>Dry riprap (class and depth)</td>
<td>Riprap</td>
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<td>414</td>
<td>Mortared riprap</td>
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<td>Grouted riprap</td>
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<td>Concrete riprap-in-bags</td>
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<td>Erosion control rip rap</td>
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<td>Underdrain and combination underdrain</td>
<td>Underdrains</td>
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<td>Geotextile Fabric</td>
<td>Underdrains</td>
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<td>Curb, combination curb and gutter (detail designation)</td>
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<td>Energy Dissipators</td>
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<td>Sign island</td>
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<td>Median Strips</td>
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<td>Directional island curb</td>
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<td>Hydraulic cement concrete sidewalks (thickness)</td>
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<td>Curb Cut Ramps</td>
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<td>Composite Detectable Warning Panels</td>
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<td>Concrete Driveway Replacement (Pipe Installation)</td>
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<td>Guardrail (Standard)</td>
<td>Guardrail and Steel-Median-Barriers</td>
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<td>Radial guardrail (Standard)</td>
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<td>Median-barrier (Standard)</td>
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<td>Intermediate anchorage assembly</td>
<td>Guardrail and Steel-Median-Barriers</td>
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<td>Terminal Guardrail Treatment (Back of ditch)</td>
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<td>Terminal Guardrail (Roadway side)</td>
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<td>Reuse guardrail terminal (Standard and type)</td>
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<td>Guardrail and Steel-Median-Barriers</td>
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<td>Guardrail terminal-site preparation (Standard)</td>
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<td>Bull nose barrier</td>
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<td>505</td>
<td>Guardrail terminal (Standard and type)</td>
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<td>Fences (Standard and Height)</td>
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<td>507</td>
<td>Gate (Standard and Length)</td>
<td>Fences</td>
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<td>507</td>
<td>Remove, reset, relay, adjust, install, modify, reconstruct relocate, existing (Item or standard)</td>
<td>Relocating or Modifying Existing Miscellaneous Items</td>
<td>EA, LF, SY, CY or LS</td>
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<td>510</td>
<td>Adjust structure heights</td>
<td>Relocating or Modifying Existing Miscellaneous Items</td>
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<tr>
<td>Section</td>
<td>Bid Item</td>
<td>Category</td>
<td>Unit</td>
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<tr>
<td>511</td>
<td>Allaying dust</td>
<td>Allaying Dust</td>
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<td>Wood pole (Class and length)</td>
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<td>Conduit (Type and size)</td>
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<td>Trench Excavation (Standard)</td>
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**Sanitary Sewer Rehabilitation** *(Sections 810–822)*

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<td>Heavy Cleaning (diameter and number of passes greater than 3)</td>
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<td>Pipe Rehabilitation By Cured-In-Place Method</td>
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<td>Sewer Point Repair (diameter, material, and depth 0-6, 6-8, 8-10, 10-12, 12-14, 14-16, 16-18, 18-20, &gt;20)</td>
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<td>Insitu Structural Point Repair / Wall Thickness = ______ mm (diameter)</td>
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<td>Manhole Cementitious Coating (4- or 5-ft diameter)</td>
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<td>Manhole Frame Seals</td>
<td>Manhole Rehabilitation</td>
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</table>

End of Section
SECTION 110

SPECIAL PROVISIONS

I. CONSTRUCTION DRAWINGS:

Plans are the property of the Owner and shall not be used for any purposes other than those specified in these Contract Documents.

II. HAMPTON ROADS PLANNING DISTRICT COMMISSION REGIONAL CONSTRUCTION STANDARDS:

Prior to Construction, the Contractor is required to obtain a copy of the Hampton Roads Planning District Commission Regional Construction Standards (Fifth Edition), from the Hampton Roads Planning District Commission located in Chesapeake, Virginia.

The following modifications, additions, or deletions to the HRPDC Regional Construction Standards are hereby incorporated into the contract documents.

III. MANHOLE VERIFICATION

The elevation of each newly installed sanitary sewer manhole shall be verified, in the presence of the inspector, prior to continuing with the installation of the new main.

IV. INSURANCE COVERAGE – OFF DUTY POLICE OFFICERS

When an off-duty officer is hired by a private Contractor to direct traffic around the construction site on which the Contractor is working, that officer becomes the “statutory employee” of the Contractor. The Contractor is responsible for providing workers’ compensation coverage for its employees, including the officer(s) it hires to direct traffic around its site. Va. Code § 65.2-302.

V. COOPERATIVE PROCUREMENT

The procurement of goods and/or services provided for in the resulting contract is being conducted pursuant to Virginia Code § 2.2-4304. Therefore, the contractor agrees that it will contract with any other public agency or body in the Commonwealth of Virginia who so desires, to permit those public agencies or bodies to purchase such goods and/or services at contract prices, in accordance with the terms, conditions, and specifications of this RFP. The contractor shall deal directly with each public agency or body seeking to obtain any goods and/or services pursuant to the resulting contract or from this RFP and in accordance with Virginia Code § 2.2-4304. The City shall not be responsible or liable for any costs, expenses, or any other matters of any type to either the contractor or the public agency or body seeking to obtain any goods and/or services pursuant to this cooperative procurement provision. Each entity shall be responsible for the administration of its individual contract with the contractor.
VI. APPENDICES

VII. TECHNICAL SPECIFICATIONS

Department of Utilities Supplemental Specifications
APPENDICES

APPENDIX A: Substance Abuse and Drug-Free Workplace Ordinance
APPENDIX B: Procurement Information Form
APPENDIX C: Norfolk Modifications
APPENDIX D: Measurement and Payment Item Descriptions
APPENDIX E: City of Norfolk Department of Utilities Standard Construction Details
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APPENDIX G: Application to Perform Utility Work in Right of Way
APPENDIX H: Soil Borings
APPENDIX I: Tree protection Notes
APPENDIX J: Contractor’s Use of Temporary Facilities and Staging Areas
APPENDIX K: Hampton Roads Regional Special Inspection Guidelines and Procedures
APPENDIX L: Storm Water Pollution Prevention Plan
APPENDIX A

Substance Abuse and Drug-Free Workplace Ordinance
ORDINANCE No. 38,261

R-1

AN ORDINANCE TO AMEND AND REORDAIN CHAPTER 33.1 OF THE NORFOLK CITY CODE, 1979, BY ADDING ONE NEW SECTION NUMBERED 33.1-58 ENTITLED SUBSTANCE ABUSE AND DRUG-FREE WORK PLACE POLICY FOR CITY CONSTRUCTION CONTRACTS.

WHEREAS, the City of Norfolk has pledged to maintain a Substance Abuse and Drug-Free Work Place; and

WHEREAS, the City of Norfolk intends to extend this policy to contractors engaged through the City's procurement process and are the recipients of public funds, therefore,

BE IT ORDAINED by the Council of the City of Norfolk:

Section 1:- That Chapter 33.1 of the Norfolk City Code, 1979, is hereby amended and reordained by adding one subsection numbered 33.1-58 which shall read as follows:

Sec. 33.1-58. Substance Abuse and Drug-Free Work Place Policy for City Construction Contracts.

Every bid response for a construction project solicited on or after March 1, 1996, shall include, by reference or incorporation, legally defensible, written substance abuse policies which shall be in effect during the period of performance of the contract. Notwithstanding the aforesaid, every contract as declared by the Director of Public Works entered into on or after March 1, 1996, shall include, by reference or incorporation, legally defensible, written substance abuse policies which shall be in effect during the period of performance of the contract. The substance abuse policy shall include all workers who will perform on City of Norfolk projects both general and sub-contractors. Said policies shall include, but not be limited to, the following requirements:
(a) Drug testing by a state approved laboratory licensed to conduct such tests in accordance with standards established by the National Institute On Drug Abuse (NIDA). Drugs to be tested for shall be as follow:

(1) Amphetamines/Methamphetamine (e.g., crystal and speed);
(2) Cocaine and Crack Cocaine;
(3) Opiates (e.g., Codeine, Heroin, Morphine, Hydromorphone, Hydrocodone);
(4) Phencyclidine (PCP); and
(5) Marijuana (THC).
(6) Alcohol.

(b) Drug testing will be conducted on the employee(s) by and at the expense of the employer before the employee(s) is/are allowed to visit and/or work on any job site.

(c) Random drug testing shall be required. The criteria for random testing should be based upon the function(s) performed by the employee, particularly those functions in which a momentary lapse could cause death, serious bodily injury or destruction of property.

(d) Testing upon reasonable suspicion is required. For purposes of this section, "reasonable suspicion" means - an articulable belief based on specific facts, and reasonable inferences, drawn from those facts, that an employee is under the influence of drugs or alcohol. Circumstances which constitute a basis for determining reasonable suspicion may include, but are not limited to:

(1) a pattern of abnormal or erratic behavior (e.g. hyperactivity, unexplained mood swings, paranoia, hallucinations);
(2) information provided by a reliable and credible source;
(3) a work-related accident;
(4) direct observation of drug or alcohol use;
(5) possession of drugs or drug paraphernalia; or
(6) presence of the physical symptoms of drug or alcohol use (e.g., glassy or bloodshot eyes, odor of alcohol on breath, slurred speech, needle marks/scar tracks on arms, unusual drowsiness or sluggishness).

(e) Written notice of the testing policy is required to be given to all employees by the employer.
(f) A consent form shall be executed authorizing the drug and/or substance abuse testing and permitting the release of tests results to the employer to be used to prove compliance with drug and/or substance abuse policies. Test results for all personnel working pursuant to a City of Norfolk contract will be made available to the City on a confidential basis.

(g) A refusal to consent section will be required which specifically informs the employee that refusal to consent to a drug and/or substance abuse test will be grounds for preventing the employee from working on City of Norfolk contracted work.

(h) Confirmation of positive test results through at least one additional test is required.

(i) Confidentiality of tests results, except as exempted by other sections of this section, is required as part of any drug and/or substance abuse policy adopted pursuant to this section.

(j) An employer is required to notify the City of Norfolk of any employee who is arrested or convicted for drug related offenses as stipulated in this section as soon as such information is known to the employer.

(k) A section stipulating that searches may be conducted of all areas and property jointly controlled by the employee(s) and the employer, or fully controlled by the employer, is required.

(l) A severability section stating that each provision of the drug and/or substance abuse policy is severable from other sections and provisions of the policy and, if found to be illegal by a Court, such invalidity shall not affect the validity of the other sections or provisions.

(m) No contractor shall allow any employee to engage in work on a City of Norfolk project upon notification of a positive test result unless and until the employees is certified to be drug free.

(n) That the City Manager is hereby authorized to take all actions necessary to implement the aforesaid provisions including, defining terms, establishing reports and forms and establishing deadlines for the production of information.

Section 2:- That this ordinance shall be in effect from and after its adoption.
Adopted by Council February 6, 1996
Effective February 6, 1996

TRUE COPY
TESTE:

R. BRECKENRIDGE DAUGHTREY, CITY CLERK

BY: ____________________________
DEPUTY CITY CLERK
APPENDIX B

Procurement Information Form
CITY OF NORFOLK  
DEPARTMENT OF UTILITIES  
PROCUREMENT INFORMATION FORM

In an effort to document the extent of our minority and Norfolk procurement activities, the Department of Utilities, Division of Engineering, P. O. Box 1080, Norfolk, VA 23501, requests that you complete this form and return it to us with the signed construction contract or professional services agreement. This information will be used for statistical purposes only.

PROJECT NAME: ________________________________________________________

FIRM’S NAME: ________________________________________________________

1. What is your firm’s minority status (based on the Federal or State criteria)?

1a. Please circle the alpha description that applies to your firm. Is the majority ownership of the firm:

   a) African American male owned   b) African American female owned
   c) White female owned           d) Other female owned
   e) Hispanic                     f) Eskimo
   g) Asian American               h) American Indian
   i) Aleut

2. Does your firm intend to use minority firms in conducting the work? ___Yes ___No. If yes, please list the minority firm’s name and dollar value of the work.

   FIRM’S NAME    DOLLAR VALUE

3. Please state your firm’s intention to procure materials from minority firms and the dollar value of those procurements.

   FIRM’S NAME    DOLLAR VALUE
4. Please list the dollar value of your firm’s minority payroll for the project (to be provided quarterly).

<table>
<thead>
<tr>
<th>Quarter</th>
<th>1st Quarter</th>
<th>2nd Quarter</th>
<th>3rd Quarter</th>
<th>4th Quarter</th>
</tr>
</thead>
</table>

5. Please list the dollar value of the firm’s payroll for the project paid to Norfolk residents (to be provided quarterly).

<table>
<thead>
<tr>
<th>Quarter</th>
<th>1st Quarter</th>
<th>2nd Quarter</th>
<th>3rd Quarter</th>
<th>4th Quarter</th>
</tr>
</thead>
</table>

6. What is the dollar value of your firm’s procurement for project materials and services from firms located in Norfolk?

<table>
<thead>
<tr>
<th>Firm’s Name</th>
<th>Dollar Value</th>
</tr>
</thead>
</table>

I certify that the above information is correct to the best of my knowledge, as of the below date.

Signature: ___________________________ Date: __________

Title: ________________________________
APPENDIX C

Norfolk Modifications
### THE CITY OF NORFOLK MODIFICATIONS TO HRPDC REGIONAL STANDARDS, 5th Edition

<table>
<thead>
<tr>
<th>Section</th>
<th>Sub-Section</th>
<th>Name</th>
<th>Add/Delete</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Sections Sections 200 - 800</td>
<td></td>
<td>Measurement for Payment</td>
<td>Replace</td>
<td>See Appendix D for City of Norfolk Department of Utilities Measurement and Payment Item Descriptions. Replace all references to Measurement for Payment in the technical specifications with Appendix D.</td>
</tr>
<tr>
<td>109</td>
<td>XI</td>
<td>Standard Bid Items and Units</td>
<td>Delete</td>
<td>Use City of Norfolk Measurement and Payment descriptions. Refer to Appendix D.</td>
</tr>
<tr>
<td>All 100 sections</td>
<td></td>
<td>General Provisions</td>
<td>Replace</td>
<td>Revise all HRPDC General Provisions with Norfolk City Modifications and Department of Utilities Modifications</td>
</tr>
<tr>
<td>200</td>
<td>II.2.2</td>
<td>Quality Assurance</td>
<td>Add</td>
<td>Norfolk Arboricultural Specifications and Standard Practice Manual</td>
</tr>
<tr>
<td></td>
<td>III.3.6</td>
<td>Submittals</td>
<td>Add</td>
<td>Add the following sentences: “Requests for substitutions shall be submitted at the pre-construction meeting and must be approved in writing by the Engineer prior to the start of any construction.”</td>
</tr>
<tr>
<td></td>
<td>V.5.6.A.1.c</td>
<td>Hydraulic Cement Concrete</td>
<td>Delete</td>
<td>Delete the words, &quot;fly ash&quot;</td>
</tr>
<tr>
<td></td>
<td>V.5.6.A.1.c.(1)</td>
<td>Hydraulic Cement Concrete</td>
<td>Delete</td>
<td>Delete the entire paragraph</td>
</tr>
<tr>
<td></td>
<td>V.5.6.A.1.d</td>
<td>Hydraulic Cement Concrete</td>
<td>Delete</td>
<td>Delete the words, &quot;the fly ash content shall not exceed 30% for Class F,&quot;</td>
</tr>
<tr>
<td></td>
<td>V.5.6.A.6.g</td>
<td>Hydraulic Cement Concrete</td>
<td>Delete</td>
<td>Delete the entire section</td>
</tr>
<tr>
<td></td>
<td>V.5.10.A.9</td>
<td>Ductile Iron Pipe</td>
<td>Add</td>
<td>Ductile Iron pipe shall have Protecto 401 ceramic epoxy lining, or equal hydrogen sulfide resistant lining approved by the Department.</td>
</tr>
<tr>
<td></td>
<td>V.10.B.5</td>
<td>PVC Pipe</td>
<td>Modify</td>
<td>Correct the second sentence to read: “When Compact fittings are used, they shall have a minimum acceptable pressure rating of 350 psi.”</td>
</tr>
<tr>
<td></td>
<td>V. 5.10.D</td>
<td>HDPE Pipe</td>
<td>Delete</td>
<td>HDPE shall not be used</td>
</tr>
<tr>
<td></td>
<td>V.5.10.E.1.a.b</td>
<td>Valves</td>
<td>Delete</td>
<td>Delete “with threaded connections” from the first sentence.</td>
</tr>
<tr>
<td></td>
<td>V.5.10.E.1.a.c</td>
<td>Valves</td>
<td>Add</td>
<td>Accessories: Provide zinc plated bonnet bolts, studs and nuts for unsubmerged service. Provide stainless bonnet bolts, studs and nuts for submerged service. Make wedging devices bronze to iron or bronze to bronze. Provide glands which are bronze or bronze bushed and bronze gland bolts and nuts.</td>
</tr>
<tr>
<td></td>
<td>V.5.10.E.1.c</td>
<td>Valve Operators</td>
<td>Delete</td>
<td>“A valve key wrench of adequate length and of each type required shall be provided for each project.”</td>
</tr>
<tr>
<td></td>
<td>V.5.10.E.1.d</td>
<td>Valve Stem Extensions</td>
<td>Delete</td>
<td>Strike out section</td>
</tr>
</tbody>
</table>
### THE CITY OF NORFOLK MODIFICATIONS TO HRPDC REGIONAL STANDARDS, 5th Edition

<table>
<thead>
<tr>
<th>Section</th>
<th>Sub-Section</th>
<th>Name</th>
<th>Add/ Delete</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>V.5.10.E.3.</td>
<td>Check Valves</td>
<td>Add</td>
<td>Provide single disc swing check valves designed to allow a full diameter passage and to operate with a minimum loss of pressure. Provide 1/8 through 3 inch check valves that meet the requirements of MSS SP-80. Provide 4 inch through 24 inch check valves that meet the requirements of AWWA C508. Equip check valves with bronze renewable seat rings, bronze discs or disc rings and bronze disc hinge bushings and pins. Carefully mount discs and provide discs that swivel in disc hinges. Provide pins, discs and other parts that are noncorrosive, nonsticking and properly cured to operate satisfactorily within a temperature range of 34 to 100 degrees Fahrenheit and with the fluids specified. Equip 6 inch and larger check valves with outside levers and weights. Provide check valves manufactured by American Flow Control, Clow Valve, M&amp;H Valve, Mueller Valve, or approved equal.</td>
</tr>
<tr>
<td></td>
<td>V.5.10.G.3.c</td>
<td>Joint Restraint Devices</td>
<td>Add</td>
<td>Harnessing: For ductile-iron pipe and fittings with mechanical joints that require harnessing, provide ductile-iron mechanical joint retainer glands.</td>
</tr>
<tr>
<td></td>
<td>V.5.10.G.4.c</td>
<td>Joint Restraint Devices</td>
<td>Add</td>
<td>Harnessing: For PVC joints requiring harnessing, provide Series 1300/1390 restraining fittings as manufactured by Uni-flange, Corp., Series 1110 HV and Series 2000 PV as manufactured by EBAA Iron Sales, Inc., or equal.</td>
</tr>
<tr>
<td></td>
<td>V.5.11.A.5</td>
<td>Ductile Iron Pipe Fittings</td>
<td>Modify</td>
<td>Correct the second sentence to read: “When Compact fittings are used, they shall have a minimum acceptable pressure rating of 350 psi.”</td>
</tr>
<tr>
<td></td>
<td>V.5.11.A.7.a</td>
<td>Ductile Iron Pipe Fittings</td>
<td>Add</td>
<td>After ANSI/AWWA add “Current department approved linings include Protecto 401 ceramic epoxy lining. Other hydrogen sulfide resistant linings shall be submitted for review and approval as equal.”</td>
</tr>
<tr>
<td></td>
<td>V.5.11.B.8</td>
<td>PVC Pipe Fittings</td>
<td>Add</td>
<td>Add paragraph “For Mains installed, where cover is 10’ (ten feet) or greater, the pipe shall be C900/C905 DR 18 or Ductile Iron.”</td>
</tr>
<tr>
<td></td>
<td>V.5.11.B.9</td>
<td>PVC Pipe Fittings</td>
<td>Add</td>
<td>Add paragraph “All fittings shall be molded or ductile iron. No fabricated fittings will be allowed.”</td>
</tr>
<tr>
<td></td>
<td>V.5.19.A.5</td>
<td>Ductile Iron Pipe fittings</td>
<td>Modify</td>
<td>Correct the second sentence to read: “When Compact fittings are used, they shall have a minimum acceptable pressure rating of 350 psi.”</td>
</tr>
<tr>
<td></td>
<td>V.5.19.B.3.</td>
<td>PVC Pipe</td>
<td>Delete</td>
<td>“couplings, and fabricated fittings” and “or fitting”.</td>
</tr>
<tr>
<td></td>
<td>V.5.19.B.6</td>
<td>PVC Pipe</td>
<td>Add</td>
<td>Add as the final sentence in the paragraph: “Where Schedule 80 PVC is used, solvent cement shall meet the requirement of ASTM D-2564.”</td>
</tr>
<tr>
<td></td>
<td>V.5.19.B.7.</td>
<td>PVC Pipe</td>
<td>Delete</td>
<td>Strike out paragraph</td>
</tr>
<tr>
<td></td>
<td>V.5.19.E</td>
<td>Copper Water Pipe</td>
<td>Delete</td>
<td>Strike the sentence that starts, “Fittings shall be wrought…”</td>
</tr>
<tr>
<td></td>
<td>V.5.19.F.1.c.</td>
<td>Valves</td>
<td>Delete</td>
<td>Strike out “with threaded connections”.</td>
</tr>
<tr>
<td></td>
<td>V.5.19.F.1.d.</td>
<td>Valves</td>
<td>Add</td>
<td>All gate valves for water shall open right (clockwise).</td>
</tr>
<tr>
<td></td>
<td>V.5.19.F.3.a</td>
<td>Butterfly Valves</td>
<td>Modify</td>
<td>Replace “16 inches” with “20 inches”.</td>
</tr>
<tr>
<td></td>
<td>V.5.19.F.1.d.</td>
<td>Valve Operators</td>
<td>Modify</td>
<td>Strike out the sentence that begins, “A valve key wrench…” Add the following: “NOTE: Water valves open right (clockwise).”</td>
</tr>
<tr>
<td></td>
<td>V.5.19.F.5.</td>
<td>Valve Stem Extensions</td>
<td>Delete</td>
<td>Strike out paragraph</td>
</tr>
<tr>
<td>Section</td>
<td>Sub-Section</td>
<td>Name</td>
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<td>Modification</td>
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<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>V.5.19.H.2</td>
<td>Fire Hydrants</td>
<td></td>
<td>Delete</td>
<td>&quot;The fire hydrant shall be painted with a high gloss, alkalyd industrial enamel (colors to be selected by Owner)&quot;.</td>
</tr>
<tr>
<td>V.5.19.H.3</td>
<td>Fire Hydrants</td>
<td></td>
<td>Delete</td>
<td>Strike out paragraph</td>
</tr>
<tr>
<td>V.5.19.H.6</td>
<td>Fire Hydrants</td>
<td></td>
<td>Delete</td>
<td>Strike out paragraph</td>
</tr>
<tr>
<td>V.5.19.H.7</td>
<td>Fire Hydrants</td>
<td></td>
<td>Add</td>
<td>&quot;All fire hydrants shall be manufactured in complete accordance with American Water Works Association Specification C502, latest revised edition, and shall be as manufactured by the Darling Valve &amp; Manufacturing Company (Model B-50-B), Mueller Centurian A-421, Pacer Model W-67, Kennedy K-81, or approved equal. Hydrants shall have full 360 degree revolving heads and shall open by turning the operating nut to the right (clockwise).&quot;</td>
</tr>
<tr>
<td>V.5.19.K.4.a.</td>
<td>Concrete</td>
<td>Reaction Blocking</td>
<td>Add</td>
<td>Add the phrase, &quot;, or as designated by the Engineer,&quot; after the word, &quot;Drawings&quot;.</td>
</tr>
<tr>
<td>V.5.19.K.4</td>
<td>Concrete</td>
<td>Reaction Blocking</td>
<td>Delete</td>
<td>subsections b and c</td>
</tr>
<tr>
<td>V.5.19.L.2</td>
<td>Tapping Valves and Sleeves</td>
<td></td>
<td>Delete</td>
<td>Strike out the sentence, “The valves shall be subjected to a factory test…”</td>
</tr>
<tr>
<td>V.5.19.L.3.a.</td>
<td>Tapping Sleeves for DI Pipe and PVC C-900</td>
<td></td>
<td>Modify</td>
<td>In the first sentence insert “full bodied” between “shall be” and “mechanical joint”. Delete “in accordance with ANSI/AWWA C110/A21.10. and” from the sentence beginning with “Tapping sleeves shall be…”</td>
</tr>
<tr>
<td>V.5.19.L.3.b.</td>
<td>PVC pipe (Other than C-900)</td>
<td></td>
<td>Delete</td>
<td>Strike out the first paragraph, which begins, “Tapping sleeves shall be complete…”</td>
</tr>
<tr>
<td>V.5.20.B.</td>
<td>Subsurface Utility Warning Tape</td>
<td></td>
<td>Modify</td>
<td>Replace “metalized” with “non-metallic”.</td>
</tr>
<tr>
<td>V.5.21.F.1</td>
<td>Manhole Rehabilitation Using Cementious Products</td>
<td></td>
<td>Delete</td>
<td>Delete entire section</td>
</tr>
<tr>
<td>V.5.21.I.2</td>
<td>Manhole Frame Seals</td>
<td></td>
<td>Delete</td>
<td>After &quot;only be installed with&quot; delete &quot;the cementious lining and&quot;</td>
</tr>
<tr>
<td>II.2.2.E.1</td>
<td>Trench Bedding and Backfilling</td>
<td></td>
<td>Modify</td>
<td>Replace “Contractor” with “Inspector”.</td>
</tr>
<tr>
<td>II.2.2.E.4</td>
<td>Trench Bedding and Backfilling</td>
<td></td>
<td>Modify</td>
<td>Replace the paragraph with: &quot;Backfill material shall be solidly compacted around the pipe in 6&quot; layers up to sub-base of the roadway or the existing ground elevation. As a minimum, compact each layer of the backfill material to 95% maximum density as determined in accordance with VTM-1.</td>
</tr>
<tr>
<td>II.2.2.E.7</td>
<td>Trench Bedding and Backfilling</td>
<td></td>
<td>Modify</td>
<td>Replace in the first sentence, &quot;...material to not less than the following percentages at the maximum...&quot; with &quot;...material to 95% maximum...&quot;.</td>
</tr>
<tr>
<td>II.2.2.E.7</td>
<td>Trench Bedding and Backfilling</td>
<td></td>
<td>Delete</td>
<td>sub sections &quot;a – c&quot;.</td>
</tr>
<tr>
<td>Section</td>
<td>Sub-Section</td>
<td>Name</td>
<td>Add/ Delete</td>
<td>Modification</td>
</tr>
<tr>
<td>---------</td>
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<td>------</td>
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<td>--------------</td>
</tr>
<tr>
<td>II.2.2.E.7.G</td>
<td>Trench Bedding and Backfilling</td>
<td>Add</td>
<td>“The City may, at any time, require compaction testing to ensure compliance with the specifications. A recognized testing laboratory that is selected by the City will conduct all tests. The testing laboratory is to be qualified in the field of the materials to be tested. If applicable, all tests will be conducted in accordance with V.D.O.T.'S “Manual for Virginia Testing Methods” (Current Edition, as Revised). Payment for all tests will be in accordance with the following: A) The cost of all tests failing to meet the minimum requirements will be borne by the Contractor. B) The costs of all tests that either meet or exceed the minimum requirements shall be borne by the City.”</td>
<td></td>
</tr>
<tr>
<td>II.2.2.G.2.</td>
<td>Pavement Removal for Placement of Pipelines</td>
<td>Modify</td>
<td>Replace the sentence beginning with “The minimum requirements for a …” with “Temporary paving shall be installed and maintained to provide a suitable driving surface on residential streets. Contractor shall allay dust. Acceptable daily temporary pavement shall be VDOT 21A Stone, BM-25, recycled asphalt pavement and crush concrete. Crushed concrete shall be permitted on a case by case basis. The inspector has the final decision of the acceptability of temporary paving”</td>
<td></td>
</tr>
<tr>
<td>II.2.3.</td>
<td>Tolerances</td>
<td>Delete</td>
<td>Complete Section</td>
<td></td>
</tr>
<tr>
<td>801</td>
<td>II.2.2.C.7.</td>
<td>Pipe Installation</td>
<td>Modify</td>
<td>Replace “300” with “100”</td>
</tr>
<tr>
<td>II.2.2.F.</td>
<td>Tracer Wire</td>
<td>Modify</td>
<td>Replace “attached every 10 feet to” with “Directly on top of the pipe secure by placing acceptable Fill Material by hand.”</td>
<td></td>
</tr>
<tr>
<td>II.2.2.G.</td>
<td>Subsurface Utility Tape</td>
<td>Modify</td>
<td>Re-write the paragraph to read, “All non-metallic water mains shall be identified by a subsurface non-metallic utility warning tape placed at an elevation of 12” above the copper tracer wire or as directed by the owner, conforming to Section 200.”</td>
<td></td>
</tr>
<tr>
<td>II.2.3.A.</td>
<td>Valve Installation</td>
<td>Modify</td>
<td>After “direction of openings” insert the following, “(All water valves open right)”. Re-write the second sentence to read, &quot;Valves found not opening to the right, or determined to be defective by the Owner shall be rejected, removed from the site, and replaced by the Contractor at no additional cost to the Owner.”</td>
<td></td>
</tr>
<tr>
<td>II.2.6.C.</td>
<td>Restraint</td>
<td>Add</td>
<td>After “…coating” add the following, “or as directed by the Owner.”</td>
<td></td>
</tr>
<tr>
<td>II.2.7.C.</td>
<td>Connections to Existing Mains</td>
<td>Delete</td>
<td>Delete the sentence that begins with, “Connection shall be…”</td>
<td></td>
</tr>
<tr>
<td>II.2.7.F.4</td>
<td>Connections to Existing Mains</td>
<td>Modify</td>
<td>Replace the paragraph with, &quot;Tie-ins to existing mains shall only be performed after the new main has been satisfactorily pressure tested and chlorinated. The contractor may not tie-in the new main to the existing main until after the results of the bacteriological tests have been completed and approved by the owner.”</td>
<td></td>
</tr>
<tr>
<td>801</td>
<td>II.2.7.G.</td>
<td>Tapping Existing Mains Under Pressure</td>
<td>Delete</td>
<td>Delete subsections 3, 4, and 6.</td>
</tr>
<tr>
<td>II.2.7.G.5.</td>
<td>Tapping Existing Mains Under Pressure</td>
<td>Modify</td>
<td>Change the sentence to read, &quot;Pressure shall be maintained for one (1) hour period without evidence of leakage.”</td>
<td></td>
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<tr>
<td>II.2.7.G.7.</td>
<td>Tapping Existing Mains Under Pressure</td>
<td>Add</td>
<td>In the first sentence, after “…branch are acceptable” add the following, “unless otherwise directed by the Owner.”</td>
<td></td>
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<tr>
<td>Section</td>
<td>Sub-Section</td>
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<td>Add/ Delete</td>
<td>Modification</td>
</tr>
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</table>
| II.2.8.B.1. | Pressure Test | Modify | In the sentence which begins, “Water mains shall be…” remove the portion that states, “1.5 times the expected working pressure or” and the portion that states, “,whichever is greater”.
| II.2.8.B.7. | Pressure Test | Modify | Replace this subsection with, “The test pressure shall be maintained at the pressure stated in the project specifications throughout the duration of the test period. The water used to maintain the test pressure shall be measured and shall be less than the allowable leakage in order for the main to have passed the test.”
| II.2.8.C.2. | Leakage Test | Modify | Insert the word “excess” between “…until the” and “leakage.”
| II.2.1.E. | General | Add | Provide cut sheets for all manholes, 100 ft. stations and end-of-line cleanouts.
| II.2.1.F. | General | Add | All Services which are reconnected to the replaced sewer main shall be shown on the "As Built" drawings with the exact distance from the nearest manhole and with the details of the method of reconnection.
| II.2.2.C.4. | Pipe Laying | Add | "If a swab is in the pipe for cleaning, the grade shall be checked and recorded for each joint of pipe.
| II.2.2.C.6 | Pipe Laying | Modify | After”…shall be closed” insert ” by use of a temporary bulkhead” and delete ” to the satisfaction of the Owner”.
| II.2.2.D.1. | Alignment and Grade | Modify | Replace "Drawings" with "approved laying schedule".
| II.2.2.D.2. | Alignment and Grade | Delete | Entire subsection
| II.2.3.B. | Manhole Installation | Add | To the end of the second sentence after: non-shrink grout-"and coated to match surfaces of manholes."
| II.2.4.B.1.a. (5). | Pipe Testing - Gravity Lines | Add | "Contractor is responsible for uncovering and restoring spot check sites at no additional cost to the Owner."
| II.2.4.B.1.a. (8) | Pipe Testing - Gravity Lines | Modify | Replace the last sentence with, "See Section 811."
| II.2.5.B | Connections | Modify | In parentheses should read (where stubs are bricked up or openings do not exist).
| II.2.6 | Manhole Coating Warranty | Modify | In third line change to Final Completion.
| II.2.2.F | Tracer Wire | Modify | Replace "attached every 10 feet to" with "Directly on top of the pipe secure by placing acceptable Fill Material by hand."
| II.2.2.G | Subsurface Utility Tape | Modify | Re-write the paragraph to read "All non-metallic water mains shall be identified by a subsurface non-metallic utility warning tape placed at an elevation of 12" above the copper tracer wire or as directed by the Owner, conforming to Section 200."
| II.2.3.A | Valve Installation | Modify | After "direction of openings" insert the following: "(All sanitary sewer valves open left)”. Re-write the second sentence to read "Valves found not opening to the left, or determined to be defective by the Owner shall be rejected, removed from the site, and replaced by the Contractor at no additional cost to the Owner.”

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# THE CITY OF NORFOLK MODIFICATIONS TO HRPDC REGIONAL STANDARDS, 5th Edition

<table>
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<td>805</td>
<td>I.1.2.B.2</td>
<td>Unusual Conditions</td>
<td>Modify</td>
<td>Replace the second half of the sentence that begins, “pressure tested in place...” and ends “…and tested in place.” with “,” and meets current Virginia Department of Health Sewage Collection and Treatment Regulations.”</td>
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<tr>
<td>810</td>
<td>II.2.2.F.3</td>
<td>Acceptance of Cleaning Operation</td>
<td>Add</td>
<td>A television inspection shall be completed after cleaning to verify that the cleaning operation was successful. The television inspection shall be in accordance with Section 811 - Television Inspection.</td>
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<td>811</td>
<td>I.1.2.D.</td>
<td>Submittals</td>
<td>Add</td>
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<td>I.1.2.E.</td>
<td>Submittals</td>
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<td>Overflow Containment and Cleanup Plan</td>
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<td>II.2.1.B.1.</td>
<td>Equipment</td>
<td>Add</td>
<td>Sewer scanner and evaluation technology, similar to the Blackhawk pipeline assessment system, is an acceptable alternative to CCTV.</td>
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<td></td>
<td>II.2.2.A.2.</td>
<td>Flow Control</td>
<td>Modify</td>
<td>The end of the last sentence to read, &quot;...unless approved by the Owner in advance&quot;.</td>
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### Standard Details

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<td>Payment Limits Trench Excavation and Backfill</td>
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<td>Trench Width Detail for Payment of Contingent Items</td>
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<td>Typical Chain Link Fence &amp; Gate Detail</td>
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<td>Pavement Patching for Flexible Pavement</td>
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<td>Water Service Installation Detail</td>
<td>Replace</td>
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<td>Precast Concrete Vault - Non-Load Bearing</td>
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<td>Precast Concrete Vault - H20 Loading</td>
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<td>Standard Valve Box Frame and Cover</td>
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<td>and CWS 02 for Small Valve Box Frame and Cover.</td>
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<td>Manual Air Vent Assembly</td>
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<td>Steel Casing Detail</td>
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<td>Restraining Rod Detail</td>
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<td>Standard Precast Concrete Manhole w/Extended Monolithic Base</td>
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<td>Precast Concrete Shallow Manhole</td>
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<td>Use Norfolk Standard Detail for Shallow Precast Sewer Manhole, CS 04</td>
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<td>Sanitary Sewer Straddle Manhole</td>
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<td>Sanitary Sewer Interior Drop Manhole</td>
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<td>Use Norfolk Standard Detail for Standard Precast Sewer Drop Manhole, CS 05</td>
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<td>Sanitary Sewer Exterior Drop Manhole (For Existing Manhole Only)</td>
<td>Replace</td>
<td>Use the Norfolk Standard Detail for Standard D.I. Drop Connection for Existing Brick Manhole, CS 01</td>
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<td>Connection into Existing Manhole</td>
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<td>Use Norfolk Standard Detail for Mainline Cleanout Casting and Cover, CS 10</td>
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<td>Sanitary Service Lateral Clean Out Frame and Cover For Heavy Loads</td>
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<td>Sanitary Sewer Main Line Clean Out Box</td>
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APPENDIX D

Measurement and Payment Item Descriptions
MEASUREMENT AND PAYMENT ITEM DESCRIPTIONS

This project is bid as a combination lump sum and unit price bid. All labor, material, equipment and incidentals required to complete the Work as specified in the Contract Documents (specifications) and shown on the Drawings are included in the lump sum bid. The unit price bid items apply to items over and above the Work as specified in the Contract Documents (specifications) and shown on the Drawings, and shall be used as ordered in writing by the Owner.

(1) Lump Sum Bid the following items are included, but not limited to:

1. Incidental Costs:
   a. Labor.
   b. Equipment.
   c. Materials.
   d. Transportation.
   e. Tools.
   f. Bonds and Insurance.
   g. Worker's Compensation.
   h. Licenses.
   i. Permits.
   j. Test Pits.
   l. Mobilization and Demobilization.
   m. Taxes.
   n. General Overhead.
   o. Profits.
   p. **Construction layout, surveys and subsurface utility engineering.**
   q. All other expenses necessary for prosecution of the work, and as indicated on drawings.

2. Tests:
   a. Laboratory and Shop Tests.
   b. Hydrostatic and Leakage Tests.
   c. Soil Tests.
   d. Painting Tests.
   e. Material and Equipment Tests.
   f. Mechanical Performance Tests.
   g. Mechanical Systems Cleaning and Flushing.
   h. Electrical and Instrumentation Testing, Startup, and Troubleshooting.

3. Pump Station:
   a. Mobilization and demobilization.
   b. Excavation and backfill and associated dewatering.
   c. Pumps, piping, valves, fittings, and appurtenances required to complete the Work as specified in the Contract Documents.
   d. Heating and ventilation.
   e. Electrical work inside and outside the Pump Station.
   f. Pump station foundation and structure.
   g. Thermal and moisture protection.
h. Masonry, metal fabrication, hand rails and railings, doors and windows, painting and finishes, plumbing fixtures, and wall louvers.
i. Factory performance testing.
j. Field and pressure testing of the pump station piping.
k. Sheet ing, shoring, and other excavation support.
l. Instrumentation work.

4. Sanitary Sewer Gravity Pipe
   a. Backfilling, compacting and compaction testing
   b. Bedding as detailed on the drawings
   c. Dewatering
   d. Disposal of surplus material
   e. Excavation
   f. Flushing
   g. Gravity sewer main and appurtenances
   h. Precast Concrete Manhole
   i. Manhole, frame and cover
   j. Main line fittings
   k. Restoration in right-of-way and easements (not including curb and gutter restoration and pavement restoration, unless otherwise noted).
l. Stripping and stockpiling topsoil
m. Temporary seeding and stabilization
n. Temporary sheeting and bracing
o. Testing

5. Sanitary Sewer Force Main
   a. Backfilling, compacting, and compaction testing
   b. Bedding material
   c. Exterior coatings
   d. Dewatering
   e. Disposal of surplus material
   f. Excavation
   g. Flushing
   h. Force main, including fittings and appurtenances
   i. Restoration in right-of-way and easements (not including curb and gutter restoration and pavement restoration, unless otherwise noted).
j. Shoulder restoration
   k. Temporary seeding and stabilization
   l. Temporary sheeting and bracing
   m. Testing
   n. Thrust restraint
   o. Tracer wire and subsurface marking tape
   p. Water for testing

6. Site Restoration
   a. Replacement of topsoil, seeding, and sodding as specified including materials, labor, soil, seed, mulch, fertilizer, watering and maintenance of seeded areas.
b. Rough and finish grading to existing condition or proposed condition as required.

c. Erosion control.

d. Remove and dispose of all excess materials off-site.

e. Restoration of adjacent properties.

7. Erosion and Sediment Control

a. Silt fence.

b. Safety fence.

c. Tree and root protection.

d. Inlet protection.

e. Other erosion and sediment control measures as shown on the Drawings or specified in the Contract Documents in accordance with the Virginia Erosion and Sediment Control Handbook.

8. Pavement Replacement

a. Furnishing and installing temporary and permanent pavement disturbed by the Contractor's operations or otherwise required by the Drawings or the Contract Documents, using materials including but not limited to: Class A-5 paving concrete; Type SM-2A Asphalt concrete; VDOT Coarse Aggregate; VDOT Fine Aggregate furnished, installed and compacted in place and all labor, equipment, materials and incidentals to complete the Work as shown on the Drawings or specified in the Contract Documents.

b. Furnishing and installing curb and gutter.

c. Furnishing, installing, and removing when necessary, all temporary paving.

d. Restoration of disturbed paved parking areas and driveways.

e. Restoration of disturbed gravel parking areas and driveways.

f. Maintenance of the paved surface.

g. Excavation.

9. Electrical Site Work

a. Furnishing all transformers and wiring for electrical services.

b. Furnishing and installing all outside cabinets, conduits, pull boxes, duct banks, and lighting.

c. Excavation and backfill.

d. Circuit breakers.

e. Coordination with power company and establishment of temporary service needed during construction and reestablishment of permanent service to completed station.

10. Instrumentation and Control

a. Furnishing and installing all instrumentation complete, including all sensors, switches and associated wiring.

b. Furnishing and installing antennae as specified.

c. All other labor, equipment, materials and incidentals required to complete the Work as shown on the Drawings or specified in the Contract Documents.
d. Furnishing SCADA equipment to be installed by Owner's designate as described in the Specifications.

(2) Unit Price Bid

2. Additional Wastewater Pump
   a. The contractor shall provide additional vertical wastewater pump and motor, identical to the primary station wastewater pump, specified elsewhere.
   b. This pump shall have identical design points, make and model, and shall be of the same manufacturer as the primary pumps.
   c. Complete power and control cable, of sufficient length to reach the control panel in the pump station, shall be included.
   d. Included in the cost of the additional wastewater pump is their delivery to the Norfolk Utilities Combined Operations Center, 1316 Ballentine Boulevard, Norfolk, VA 23504, or to another location within the City of Norfolk, as may be designated by the Owner, at a time agreeable to the Owner.

3. Additional Aggregate Base (VDOT No. 21A)
   Payment for this item will be based upon the DAILY presentation of delivery tickets to the City’s inspector. Delivery tickets must be given to the City’s inspector on a daily basis and will NOT be accepted with monthly invoices. The costs shall include the furnishing and placement of aggregate base material (VDOT No. 21A), or as directed by the City’s inspector, in conformance with lines, grades and thickness shown on the Contract Drawings. Included shall be the cost of sub-grade preparation including excavation, grading and sub-grade compaction as specified 21A Aggregate will be measured and paid for by the TON. The City’s inspector shall approve in advance 21A Aggregate hauled to the job site for replacement unstable areas of the roadway outside of pipe trenches during the road rebuilding process.

   A delivery ticket shall accompany each load of 21A material. Each ticket will be serially numbered, list the company supplying the fill material, truck number of trucks delivering material, date, size of load, and project where delivered. In the event a material delivery ticket and delivery do not correspond, the City’s inspector may refuse the delivery of payment until such conditions are corrected to the satisfaction of the City’s inspector.

4. Additional Select Bedding, No. 57 Stone
   Payment for this item, when properly installed for water main, sewer forcemain or as directed by the City will be based upon the DAILY presentation of delivery tickets to the City’s inspector. Delivery tickets must be given to the City’s inspector on a daily basis and will NOT be accepted with monthly invoices. Select bedding, No. 57 stone, will be measured and paid for by the TON at the established price of $38.00 per ton.

   The Contractor shall designate the source of material and provide appropriate data as part of the submittal process. The City’s inspector shall approve select bedding material hauled to the job site for use.

   Payment will only be made for select bedding used during the installation of pipe work and will not be paid for when in the sole opinion of the City’s inspector, proper dewatering methods have not been used. Select bedding required for the installation of manholes and
hydrants and where otherwise shown on the drawings will not be measured for payment as such, its’ costs shall be included in the unit prices bid for those items.

A delivery ticket shall accompany each load of select bedding material. Each ticket will be serially numbered, list the company supplying the fill material, truck number of trucks delivering material, date, size of load, and the project where delivered. In the event a material delivery ticket and delivery do not correspond, the City’s inspector may refuse the delivery and / or payment until such conditions are corrected to the satisfaction of the City’s inspector. Payment shall include the proper removal, replacement and disposal of surplus material.

5. Additional Select Backfill
Payment for this item will be based upon the DAILY presentation of delivery tickets to the City’s inspector. Delivery tickets must be given to the City’s inspector on a daily basis and will NOT be accepted with monthly invoices. Select backfill will be measured and paid for by the CUBIC YARD at the established price of $35.00 per CUBIC YARD. This item includes placement and compaction.

The City’s inspector shall approve select backfill such as borrow sand or other common granular fill hauled to the job site for use.

A delivery ticket shall accompany each load of select backfill material. Each ticket will be serially numbered, list the company supplying the fill material, truck number of trucks delivering material, date, size of load, and the project where delivered. In the event a material delivery ticket and delivery do not correspond, the City’s inspector may refuse the delivery and / or payment until such conditions are corrected to the satisfaction of the City’s inspector. Payment shall include the proper removal, replacement and disposal of surplus material.

The Contractor shall designate the source of material and provide appropriate data as part of the submittal process. In the event borrow sand is stored at the project site, it shall be kept at a completely separate location from native soils which are also stored at the construction site.
APPENDIX E

City of Norfolk Department of Utilities Standard Construction Details

(SEE CONTRACT DRAWINGS FOR REFERENCED DETAILS)

APPENDIX F

Project Sign Detail
(8) 3/4"x4" GALVANIZED CARRIAGE BOLTS w/ WASHERS @ 12" O.C.

3/4" A-B PLYWOOD

1-1/2"x1" C-BORE

4"x4" PRESSURE TREATED WOOD

CONCRETE FILL
APPENDIX G

Application to Perform Utility Work in Right of Way
RIGHT OF WAY
PERMIT APPLICATION
(Type or Print Clearly)

Miss Utility Ticket #: Norfolk Permit #: 

Applicant Name: ___________ Start Date: ____/____/____ End Date: ____/____/____

Applicant Address: 
(Street) __________________________ (City) ___________ (State) ___________ (Zip) ___________

Construction Contact Person: __________________ Fax # ___________ Phone # ___________

Subcontractors Name: ___________________ Phone # ___________

Worksite address: __________________ Planning District: ________

Is the proposed work area located within a drip line any public tree? Yes ___ No ___ (if yes separate tree permit required)

Install: Gas line: ___ Electric line: ___ Sewer line: ___ Water line: ___ Storm Drain: ___ Communication line: ___ Test Holes: ___

Description of Work for Gas, Sewer, Water, or Storm Drain:
Main: ___ _______ (feet) Service Lateral: ___ _______ (feet) Valve: ___ Cathodic Protection: ___

Description of Work for Electric or Communication Facilities – (list quantity and size):

Conduit: _______ (feet) Conduit size: _______ (in.) Number of conduits: _______ Coaxial Cable: _______ (feet)
Fiber Optic Cable: _______ (feet) Electric Cable/Conductor: _______ (feet) Communications Cable: _______ (feet)
Depth of Cover: _______ (in.) (24 inches min.)

Install Pole, Guy, Aerial Cable/Conductor:
Number of poles: New: _______ Renewed: _______ Removed: _______
Number of guy wires/anchors: New: _______ Renewed: _______ Removed: _______
Aerial Cable/Conductor: New: _______ (feet) Removed: _______ (feet) Renewed: _______ (feet)

Install Cabinets, Vaults, Manholes, Junction Boxes, Pedestals, Transformers, Switches, Meters, etc.:
Number of cabinets: _______ Number of Junction Boxes: _______ Number of pedestals: _______ Meters: _______
Number of Transformers: _______ Number of Switches: _______ Number of witness markers: _______ 
Number of Vaults: _______ Number of Manholes: _______ Number of Standby Power Supplies: _______

Does installation comply with the City's landscaping and site location policy? Yes: ___ No: ___ N/A: ___

Dirt Utility Cut(s) (list cut size, length x width) Note: If any cuts are in asphalt, concrete or brick, please use Street and Major Utility Construction Permit Application in addition to this application.
Quantity ______ Cut _______ x _______ Quantity ______ Cut _______ x _______ Quantity ______ Cut _______ x _______

Method of Construction:
Open Pavement Cut: Direct Buried: Jack & Bore: Horizontal Directional Drilling (HDD): Aerial: _______

A Permit will not be issued unless accompanied by a proper site plan of proposed work. Site plan shall show all requested work on the application including property line or city right of way, edge of pavement, curb & gutter, sidewalk, driveways, closest cross street, city trees and north arrow. Existing sewer and water lines and reference them to the edge of pavement. All work shall be done in accordance with this application or as amended by this office. Please submit application and site plan in duplicate (2 copies).

The Permittee, its agents, employees, officers and assignee assume all responsibility and liability for any injury to persons or damage to public or private property, caused directly or indirectly, by the performance of permitted work under this permit. Furthermore, the Permittee, its agents, employees, officers and assignees agree to save and hold harmless the City of Norfolk, its agents, employees and officers from any and all claims, demands, actions, judgments, executions, damages or proceeding for any and all personal actions, judgments, executions, damages or proceedings for any and all personal injury, and injuries to property, real or personal, public or private caused by or arising out of directly or indirectly, from the performance of permitted work.

I certify that the above information is accurate, that proper permission from the pole owner has been obtained to perform the work, and that all work will be done in accordance with the City of Norfolk Right of Way Excavation and Restoration Manual, dated July 1, 2002 as amended.

PRINT NAME _______ DATE _______ SIGNATURE _______
# Street and Major Utility Construction Permit Application

<table>
<thead>
<tr>
<th>Construction Date(s):</th>
<th>From:</th>
<th>To:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>General Contractor/Utility:</th>
<th></th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Address:</th>
<th></th>
</tr>
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<th>Phone:</th>
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<th>Fax:</th>
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<table>
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<table>
<thead>
<tr>
<th>Sub-Contractor:</th>
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</table>

<table>
<thead>
<tr>
<th>Worksite Address:</th>
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</tr>
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</table>

<table>
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<tr>
<th>Project/Work ID#:</th>
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<table>
<thead>
<tr>
<th>Excavation/Utility Cut Description(s): (list cut size, length x width for each pavement type)</th>
<th>Quantity: ______ Asphalt: ______ x ______ Concrete: ______ x ______ Brick: ______ x ______</th>
</tr>
</thead>
<tbody>
<tr>
<td>Note: If all cuts are in dirt, please use ROW Permit form instead.</td>
<td>Quantity: ______ Asphalt: ______ x ______ Concrete: ______ x ______ Brick: ______ x ______</td>
</tr>
<tr>
<td></td>
<td>Quantity: ______ Asphalt: ______ x ______ Concrete: ______ x ______ Brick: ______ x ______</td>
</tr>
<tr>
<td></td>
<td>Quantity: ______ Asphalt: ______ x ______ Concrete: ______ x ______ Brick: ______ x ______</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Method: (select all that apply)</th>
<th>Open Cut</th>
<th>HDD</th>
<th>Bore</th>
<th>Other ________</th>
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<table>
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<tr>
<th>Restoration Type: (select all that apply)</th>
<th>Single Cut</th>
<th>Multiple Cuts</th>
<th>Full Street Repave</th>
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</table>

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<tr>
<th>Reason for work:</th>
<th></th>
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<table>
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<tr>
<th>Is the work being performed for the City of Norfolk?</th>
<th>No</th>
<th>Yes, for ________</th>
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<tr>
<th>Primary &amp; Secondary Contacts (contractor performing the work):</th>
<th>Name:</th>
<th>Work Phone:</th>
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</thead>
<tbody>
<tr>
<td>Name:</td>
<td>Work Phone:</td>
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</tr>
<tr>
<td>Cell Phone:</td>
<td>After Hours:</td>
<td></td>
</tr>
<tr>
<td>E-mail:</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Name:</th>
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<tbody>
<tr>
<td>Cell Phone:</td>
<td>After Hours:</td>
</tr>
<tr>
<td>E-mail:</td>
<td></td>
</tr>
</tbody>
</table>

The Permittee, its agents, employees, officers, and assignees assume all responsibility and liability for any injury to persons or damage to public or private property caused directly or indirectly, by the performance or permitted work under this permit. Furthermore, the Permittee, its agents, employees, officers and assignees agree to save and hold harmless the City of Norfolk, its agents, employees and officers from any and all claims, demands, actions, judgments, executions, damages, or proceeding for any and all personal actions, judgments, executions, damages, or proceedings for any and all personal injury, and injuries to property, real or personal, public or private caused by or arising out of directly or indirectly, from the performance or permitted work. I certify the above information is correct.

I certify that the above information is accurate.

PRINT NAME _______ DATE _______ SIGNATURE _______

RETURN COMPLETED APPLICATION TO:
RIGHT-OF-WAY PERMITS OFFICE, 810 UNION STREET, ROOM 200, CITY HALL BUILDING, NORFOLK, VA 23510
PHONE: (757) 664-7306 FAX: (757) 664-4696 E-MAIL: mailto:pwrow@norfolk.gov
Street, Lane, Sidewalk Closure Permit Application

<table>
<thead>
<tr>
<th>Closure Date(s):</th>
<th>From:</th>
<th>To:</th>
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</thead>
<tbody>
<tr>
<td>Closure Time(s):</td>
<td>From:</td>
<td>To:</td>
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<td>General Contractor/Utility:</td>
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<td>E-mail:</td>
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<tr>
<td>Sub-Contractor:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Worksite Address:</td>
<td></td>
<td></td>
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</table>

**Closest Street(s):**

<table>
<thead>
<tr>
<th>Lane Description: (select all that apply)</th>
<th>Left</th>
<th>Right</th>
<th>Shoulder</th>
<th>Center</th>
<th>Sidewalk</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Center Left</td>
<td>Center Right</td>
<td>Parking Lane</td>
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</table>

<table>
<thead>
<tr>
<th>Direction: (select all that apply)</th>
<th>North</th>
<th>South</th>
<th>East</th>
<th>West</th>
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</table>

<table>
<thead>
<tr>
<th>Type: (select all that apply)</th>
<th>Single</th>
<th>Multiple</th>
<th>Mobile</th>
<th>Alternating</th>
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</thead>
<tbody>
<tr>
<td>Flagger</td>
<td>Off-duty Police Officer</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

**Reason for closure:**

<table>
<thead>
<tr>
<th>Primary &amp; Secondary Contacts (contractor performing the work):</th>
<th>Name:</th>
<th>Name:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work Phone:</td>
<td>Cell Phone:</td>
<td>After Hours:</td>
</tr>
<tr>
<td>E-mail:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Application must be submitted **seven (7) business days in advance of the requested closure.**
2. A permit will not be issued unless this application is accompanied by a traffic control plan for the requested closure.
3. The traffic control plan must show work zone, all traffic control devices, street, lane or sidewalk to be closed, closest street, and north arrow. All plans must comply with the latest version of the Virginia Work Area Protection Manual and the Manual for Uniform Traffic Control Devices.

The Permitee, its agents, employees, officers and assignees agree to save and hold harmless the City of Norfolk, its agents, employees and officers from any and all claims, demands, actions, judgments, executions, damages or proceeding for any and all personal actions, judgments, executions, damages or proceedings for any and all personal injury, and injuries to property, real or personal, public or private caused by or arising out of directly or indirectly, from the performance of permitted work.

I certify that the above information is accurate.

PRINT NAME_________________ DATE________ SIGNATURE________________

RETURN COMPLETED APPLICATION TO:
RIGHT-OF-WAY PERMITS OFFICE, 810 UNION STREET, ROOM 200, CITY HALL BUILDING, NORFOLK, VA 23510
PHONE: (757) 664-7306 FAX: (757) 664-4696 E-MAIL: mailto:pwrow@norfolk.gov
APPENDIX H

Soil Borings
BORING LOG LEGEND

KEY TO DRILLING SYMBOLS

- Split Spoon Sample (ASTM D 1588)
- Undisturbed Sample (ASTM D 1587)
- Rock Coring (ASTM D 2113)
- Roller Cone Advanced
- Seepage into Borehole

Water Table at Time of Drilling
Water Table after 24 hrs.
Boring Cave In
Loss of Drilling Fluid
Auger Refusal
Roller Cone Refusal

H.S.A. Hollow Stem Auger Drilling
M.R. Mud Rotary Wash Drilling
PP Pocket Penetrometer (tsf)
REC Core Recovery (%)
RQD Rock Quality Designator (%)
SCR Solid Core Recovery (%)

Approximate Strata Change Depth
Different Soil Types
Approximate Strata Change Depth
Similar Soil Types

CORRELATION OF RELATIVE DENSITY AND CONSISTENCY WORLD STANDARD PENETRATION TEST RESISTANCE (ASTM D 1586)\(^6\)

<table>
<thead>
<tr>
<th>SPT N</th>
<th>RELATIVE DENSITY</th>
<th>SPT N</th>
<th>CONSISTENCY</th>
<th>SILT &amp; CLAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 4</td>
<td>Very Loose</td>
<td>0 - 2</td>
<td>Very Soft</td>
<td></td>
</tr>
<tr>
<td>5 - 10</td>
<td>Loose</td>
<td>3 - 4</td>
<td>Soft</td>
<td></td>
</tr>
<tr>
<td>11 - 30</td>
<td>Firm</td>
<td>5 - 8</td>
<td>Firm</td>
<td></td>
</tr>
<tr>
<td>31 - 50</td>
<td>Dense</td>
<td>9 - 15</td>
<td>Stiff</td>
<td></td>
</tr>
<tr>
<td>51 +</td>
<td>Very Dense</td>
<td>16 - 30</td>
<td>Very Stiff</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>31 - 50</td>
<td>Hard</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>51 +</td>
<td>Very Hard</td>
<td></td>
</tr>
</tbody>
</table>

ROCK QUALITY\(^6\)

<table>
<thead>
<tr>
<th>RQD (%)</th>
<th>DIAGNOSTIC DESCRIPTION</th>
<th>ROCK PARAMETER FIELD/LAB RATIO</th>
<th>SPACING</th>
<th>JOINTS</th>
<th>BEDDING</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 25</td>
<td>Very Poor</td>
<td>0.15</td>
<td>Less than 2&quot;</td>
<td>Very Close</td>
<td>Very Thin</td>
</tr>
<tr>
<td>25 - 50</td>
<td>Poor</td>
<td>0.20</td>
<td>2&quot; to 1'</td>
<td>Close</td>
<td>Thin</td>
</tr>
<tr>
<td>50 - 75</td>
<td>Fair</td>
<td>0.25</td>
<td>1' to 3'</td>
<td>Moderately Close</td>
<td>Medium</td>
</tr>
<tr>
<td>75 - 90</td>
<td>Good</td>
<td>0.30 to 0.70</td>
<td>3' to 10'</td>
<td>Wide</td>
<td>Thick</td>
</tr>
<tr>
<td>90 - 100</td>
<td>Excellent</td>
<td>0.70 to 1.00</td>
<td>More than 10'</td>
<td>Very Wide</td>
<td>Very Thick</td>
</tr>
</tbody>
</table>

HARDNESS

- Very Hard - Breaking specimens requires several hard hammer blows
- Hard - Hard hammer blow required to detach specimens
- Moderately Hard - Light hammer blow required to detach specimens
- Medium - May be scratched 1/16" deep by a knife or nail, breaks into several pieces by light hammer blow
- Soft - Can be gouged readily by knife or nail, corners and edges broken by finger pressure
- Very Soft - May be carved with a knife and readily broken by finger pressure

WEATHERING

- Fresh - Fresh rock, bright crystals, no staining
- Slight - Minimum staining and discoloration, open joints contain clay
- Moderate - Significant portions of rock shows staining and discoloration, strong rock fragments
- Severe - All rock shows staining, rock fabric evident but reduced strength
- Very Severe - All rock shows staining, rock mass effectively reduced to soil with strong rock fragments remaining
- Complete - Rock reduced to soil with rock fabric not discernable

\(^6\) Resistance of a standard 2-inch O.D., 1.375-inch I.D. split spoon sampler driven by a 140 pound hammer free-falling 30 inches.
\(^6\) after Terzaghi and Peck, 1968
\(^6\) after D. U. Deere, 1963. 1967
## Soil Classification Chart (ASTM D 2487)

### Major Divisions

#### Coarse Grained Soils
- **Gravel and Gravelly Soils**
  - More than 50% of coarse fraction retained on No. 4 sieve
  - **Symbols**
    - GW: Clean Gravels (little or no fines)
    - GP: Gravels with Fines (appreciable amount of fines)
  - Typical Descriptions
    - Well-graded Gravels, Gravel - Sand Mixtures, Little or No Fines
    - Poorly-graded Gravels, Gravel - Sand Mixtures, Little or No Fines

#### Fine Grained Soils
- **Silty and Sandy Soils**
  - More than 50% of material is larger than No. 200 sieve size
  - **Symbols**
    - SW: Clean Sands (little or no fines)
    - SP: Sand with Fines (appreciable amount of fines)
  - Typical Descriptions
    - Well-graded Sands, Gravelly Sands, Little or No Fines
    - Poorly-graded Sands, Gravelly Sand, Little or No Fines

#### Highly Organic Soils
- **Organic Soils**
  - **Symbols**
    - ML: Low Plasticity, Liquid Limit Less Than 50
    - CL: Organic Silts and Organic Clays of Low Plasticity
    - OL: Organic Silts and Organic Clays of Medium Plasticity
    - MH: Inorganic Silts and Micaceous, Diatomaceous and Elastic Silty Soils
    - CH: Inorganic Clays of High Plasticity, Fat Clays
    - OH: Organic Clays of Medium to High Plasticity, Organic Silts

#### Other Soils
- **Uncontrolled Fills**
  - Disturbed Soils with Possible Debris and Rubble, Old Construction Wastes, Non-Engineered Backfills

- ** Decomposed or Partially Weathered Rock**
  - Transitional Material Between Soil and Rock Which May Retain the Relict Structure of the Parent Rock

### Atterberg Limits

- **Particle Size Identification**
  - Boulders: Greater than 300 mm (12 in.)
  - Cobbles: 75 mm to 300 mm (3 - 12 in.)
  - Gravel: Coarse - 19.0 mm to 37.5 mm (0.75 - 1.5 in.)
    - Fine - 4.75 mm to 19.0 mm (0.1875 - 0.75 in.)
  - Sands: Coarse - 2.00 mm to 4.75 mm
    - Medium - 0.425 mm to 2.00 mm
    - Fine - 0.075 mm to 0.425 mm
  - Silts & Clays: Less than 0.075 mm

- **Plasticity Index (PI) & Shrink-Swell Potential**
  - 0 - 4: None
  - 4 - 15: Slight or Low
  - 15 - 30: Medium to High
  - 31+: High to Very High

- **Additional Relative Descriptive Values**
  - Trace < 10%
  - Some < 35% but > 20%
  - Little < 20% but > 10%
  - And > 35%

---

**Note:** The chart includes graphical representations of the Atterberg limits, with a triangle labeled 'High Plasticity' and 'Low Plasticity' along with 'Gravel' symbols.
**TEST BORING RECORD**

**GeoEnvironmental Resources, Inc.**

Environmental, Groundwater, Hazardous Materials, Geotechnical & Industrial Engineering Consultants

**Boring #: B-1** (Page 1 of 1)

**Project:** Barraud Park Water/Sewer Replacement  
**GER Project Number:** 110-6370

**Location:** Norfolk, VA  
**Driller:** Fishburne

**Depth (ft.):** 50.0  
**Elevation (ft.):** 8.0  
**Client:** Clark Nexsen

**Hammer Type:** Automatic

<table>
<thead>
<tr>
<th>Elevation (ft)</th>
<th>Depth (m)</th>
<th>Lithology</th>
<th>Material Description</th>
<th>Ground Water</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>5</td>
<td>1.5</td>
<td>Topsoil</td>
<td>2 inches</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>3.0</td>
<td>FILL</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>4.5</td>
<td>Sandy, Low Plasticity CLAY (CL)</td>
<td>Firm, brown</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>6.0</td>
<td>Silty SAND (SM)</td>
<td>Loose, light brown, fine to medium</td>
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<td></td>
</tr>
<tr>
<td>25</td>
<td>7.5</td>
<td>Slightly Silty SAND (SP-SM)</td>
<td>Firm to very loose, tan, fine</td>
<td></td>
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<tr>
<td>30</td>
<td>9.0</td>
<td>Silty SAND (SM)</td>
<td>Very loose, grey, fine to medium</td>
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<td></td>
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<tr>
<td>35</td>
<td>10.5</td>
<td>Silty, Low Plasticity CLAY (CL)</td>
<td>Very soft, dark grey, with trace fine sand</td>
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<tr>
<td>40</td>
<td>12.0</td>
<td>Silty, High Plasticity CLAY (CH)</td>
<td>Very soft, dark grey, with trace fine sand</td>
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<tr>
<td>45</td>
<td>13.5</td>
<td>Very Silty CLAY (CL-ML)</td>
<td>Soft, dark grey, with trace fine sand</td>
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<tr>
<td>50</td>
<td>15.0</td>
<td>Silty SAND (SM)</td>
<td>Firm, grey, fine to medium</td>
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<td>55</td>
<td>16.5</td>
<td>Silty SAND (SM)</td>
<td>Firm, light grey, fine to coarse</td>
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<tr>
<td>60</td>
<td>18.0</td>
<td>Silty SAND (SM)</td>
<td>Firm, grey, fine to medium, with little clay and little shell fragments (Yorktown Formation)</td>
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<td>65</td>
<td>19.5</td>
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*black silty sand and crushed stone

**Uncorrected Penetration Resistance (blows/foot):**

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GeoEnvironmental Resources, Inc.  2712 Southern Boulevard, Suite 101  Virginia Beach, VA 23452  757-463-3200  www.geronline.com
TEST BORING RECORD

GeoEnvironmental Resources, Inc. Environmental, Groundwater, Hazardous Materials, Geotechnical & Industrial Engineering Consultants

Project: Barraud Park Water/Sewer Replacement GER Project Number: 110-6370
Location: Norfolk, VA Driller: Fishburne
Date Drilled: 12/11/2013 Drill Method: 4” Mud Rotary

Boring #: B-2 (Page 1 of 1)

Client: Clark Nexsen

Depth (ft.): 50.0 Elevation (ft.): 8.5

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<th>Elevation (ft.)</th>
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<td>3.0</td>
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Boring terminated at 50 feet.

Hammer Type: Automatic

Penetration Resistance (blows/foot)

0  4  6  8  14  2  2  2  2  33  20  12  13
APPENDIX I

Tree Protection Notes
1. **PROTECTED TREE:**

With exception of those trees specifically shown to be removed, all existing trees on public and private property shall be actively preserved and protected by the Contractor, and any subcontractors, from damage to the crown area, trunk, root system, or rooting environment (soil system) during construction.

2. **CRITICAL ROOT ZONE:**

*GENERAL:* The critical root zone (CRZ) is defined as the surface area of the ground directly beneath the limits of the crown (branch) spread of a tree. The CRZ is also commonly referred to as the dripline. (see Tree Protection Fencing detail). It is within this zone that the majority of larger roots that provide support for the tree, and transport water and nutrients, exist. A relatively high percentage of absorptive roots also typically occur within the CRZ. In urban areas rooting depths within the CRZ rarely occur below 30 inches, with most roots found within the upper 18 inches of the soil profile. Paved street surfaces (curb face to curb face) are not included in the CRZ.

*CONSTRUCTION PROCEDURES:* No construction vehicles, equipment, materials, supplies, or temporary facilities (trailers, portable toilets) may be placed within the CRZ of protected trees, paved streets (curb to curb) excepted. The following types of items are restricted from the CRZ: Vehicles (construction or personal), construction equipment not specifically approved and incidental to the work, concrete washout, fuel or chemical storage, temporary stockpile of soil, piping and other construction materials and supplies. Parks & Forestry may grant exemptions for work within the CRZ where suitable tree protection measures are implemented, i.e. hand digging, installation of mulch construction mat, etc.

3. **HAND DIG ZONE:**

*GENERAL:* The Hand Dig Zone (HDZ) is the area of the root system that is likely to contain the majority of support and transport roots 2 inches and larger in diameter. Hand dig zones vary based on tree size and species characteristics, soil conditions, and other site factors that affect rooting patterns.

*CONSTRUCTION PROCEDURES:* The City Forester will determine the extent of all hand dig zones within the CRZ once the proposed location of...
the sewer/water service lateral has been determined following a joint preconstruction field review with the Contractor, Engineer or Project Inspector, and City Forester. All roots 2 inches and larger in diameter (any dimension) encountered to a 30” depth in the HDZ, outside the actual space occupied by pipes or other elements being constructed, shall be preserved and protected from abrasions, cuts or other significant wounds. Excavation shall be tunneled beneath these roots. It is strongly recommended that an air spade powered by an air compressor (AIR-SPADE 150/90 manufactured by CEG, INC. Verona, PA, or approved equal) be utilized to expose protected roots without injury. Protected roots bridging any open excavation for more than 24 hours shall be loosely wrapped in wet burlap to prevent excessive dehydration of the exposed root surface. Roots less than 2 inches in diameter in any dimension may be cut, where necessary, with a sharp ax, sharpened flat spade or hand pruning saw at the edge of the excavation. Once excavation reaches 30 inches, and larger roots do not prohibit access, mechanical equipment may be used to deepen the excavation. In areas where roots are encountered, work shall be performed and scheduled to close excavations as quickly as possible over exposed roots.

4. PRECONSTRUCTION FORESTRY REVIEW - LAYOUT OF SANITARY SEWER/WATER LATERALS AND OTHER UTILITY EXCAVATION, AND EQUIPMENT CLEARANCE PRUNING REVIEW:

A. SEWER/WATER LATERAL LAYOUT - GENERAL: The location of existing/proposed sewer and water piping, private clean-outs, property line clean-outs, water meter boxes, and points of discharge from private/commercial dwellings shown on the construction plans are approximate based on current records and some preliminary field investigation.

LATERAL LAYOUT - CONSTRUCTION PROCEDURES: The Contractor shall be responsible for locating all existing and proposed sewer/water connections at the main, clean-out/meter, and within five feet of the residence or building serviced (where applicable). The Contractor shall also determine and field verify all service connections along all utility lines scheduled for replacement, including all point repairs.

For the purposes of identifying and resolving any conflicts with existing trees, once all existing and active service connections have been determined, and prior to beginning any utility improvements, the Contractor shall tour the job-site with the Engineer, Plumber (where applicable), and City Forester to determine the location/relocation of sewer and water taps, sewer clean-out and
water meter box locations, alignment of sewer and water piping on public and private property, water valves, point repairs, insertion and receiving pit locations, dewatering pit locations, utility location pits, and pruning requirements for equipment clearance. Where in the sole opinion of the City Forester, excavation with a trencher, back-hoe, or other mechanical equipment for the installation of service piping or sewer clean-outs/water meter boxes would likely result in extensive root damage to existing trees, hand digging will be required. Where feasible, new service piping will be placed in a location that will least impact tree roots and facilitate utility installation. There shall be no utility main replacement work, lateral replacements, or utility tap work performed at any location where utility tap locations and lateral alignments have not been jointly reviewed by the Engineer, Contractor, Plumber (where applicable), and City Forester, and approved by the Engineer.

B. **TREE PRUNING – GENERAL:** Existing tree limbs indicated to remain might obstruct construction operations.

**TREE PRUNING – CONSTRUCTION PROCEDURES:** All clearance pruning requirements not specifically indicated on the plans shall require the issuance of a separate Tree Work Permit. Equipment clearance and pruning requirements, including any special conditions, will be determined during a required preconstruction review between the Contractor, Equipment Operator, Project Engineer, and City Forester.

5. **ROOT PRUNE:**

**GENERAL:** The purpose for root pruning of existing trees adjacent to construction is to provide a cleaner, more controlled cut than is normally accomplished by conventional excavating machines.

**CONSTRUCTION PROCEDURES:** Root pruning, where indicated, within the critical root zone shall be accomplished by hand with sharpened spades or hand pruners, or with approved root-pruning machinery. Approved root-pruning machinery includes a rock saw or a vibratory plow (cable puller) with a 30” (min.) blade. In certain applications a sharpened trencher (Ditch-witch) may be permitted. Blades must be sharpened prior to each project start. The location of the cut is at the edge of the proposed excavation, on the side closest to the protected tree(s). Large roots encountered that cannot be severed with root pruning machinery are to be hand cut with a sharpened pruning saw (see detail this sheet). Prior to root pruning, the Contractor shall layout in the field the alignment of the cut for
approval by a Parks & Forestry Inspector. All root prune areas require an open trench forestry inspection prior to backfilling.

6. CONCRETE DEMOLITION AND REMOVAL WITHIN THE CRZ:

All concrete and asphalt removal completed within the CRZ must be completed by a method that prevents any severance or damage to roots located directly beneath or adjacent to the hardscape surface. Equipment working from a hard surface (paved street, sidewalk, driveway, etc.) may be utilized to pick up concrete and asphalt sections.

7. EXCAVATION PROCEDURES WITHIN THE CRZ

GENERAL: Protection of trees adjacent to excavation involves three areas of operations: Placement of excavated materials (dirt, pipe, etc.) root pruning/hand digging, and protection of trunk and limbs.

CONSTRUCTION PROCEDURES: Excavated fill dirt must be placed outside of the critical root zone of adjacent trees where there is sufficient room. If no room exists due to the location of adjacent structures or trees and the fill cannot be placed on a hardscape surface, the fill must be placed on plywood or other suitable decking to contain the fill and minimize point source soil compaction within the critical root zone (see detail this sheet). Additionally, where it is necessary to operate equipment within the critical root zone (paved streets excepted), a six-inch layer of wood chips shall be placed and maintained within the construction access-way to minimize soil compaction and root damaged caused by the equipment. Following construction the wood chips must be removed with hand tools and the site restored to preexisting conditions.

Hand digging or root pruning will be required where noted on the drawings or otherwise indicated during the preconstruction forestry review. (See Hand Dig Zone, and Root Prune for specific procedures).

Extreme care must be taken to avoid injury (scarring, breakage, etc.) to the trunk and crown area (branches) of protected trees. Wherever possible, construction equipment shall be maneuvered as needed to avoid unnecessary pruning or contact with protected trees. Where there is a high probability of equipment contact with the trunk of protected trees, wooden armoring may be required to be installed on protected trees, as specified by the City Forester, prior to conducting any construction adjacent to protected trees.
8. **OPEN TRENCH FORESTRY INSPECTIONS:**

All excavation within the hand dig zone as noted or otherwise designated by the City Forester require inspection by a Norfolk Parks & Forestry inspector prior to backfilling. The purpose of the inspection is to verify that structural roots 2" and larger in diameter have been protected, and to assess the tree for structural impacts (wind-throw potential). The City Forester may also require inspection of certain areas approved for excavation with mechanical equipment. It is not necessary for all piping to be installed prior to this inspection, provided that excavation within the area designated for hand digging has been dug to the proposed depth of pipe, or a minimum 30-inch depth. Should the Contractor backfill any of these locations prior to inspection by a Parks & Forestry inspector, the City Forester may require the Contractor to remove the backfill material within the hand-dig zone (or mechanically excavated area requiring forestry inspection), at the Contractor's expense, as necessary to complete the inspection. Where in the City Forester’s opinion, no immediate hazard is apparent, the Contractor shall be given a maximum period of 72 hours to remove the backfill.

Open trench forestry inspections will not be completed on weekends or City-observed holidays. The Contractor must provide the Bureau of Parks & Forestry with a minimum 24-hour working day notice for all open trench forestry inspections. Open trench forestry inspections will be conducted between the hours of 9:00 a.m. – 3:00 p.m., Monday – Friday, and may be scheduled by calling the Bureau of Parks & Forestry at 823-4023 between the hours of 7:00 a.m. – 4:00 p.m., Monday – Friday.

9. **TREE PRUNING:**

   A. **Preconstruction Pruning:**

   **PRECONSTRUCTION PRUNING - GENERAL:** The purpose of clearance pruning is to provide construction equipment access beneath and adjacent to the crown (branch area) of protected trees to prevent unnecessary breakage or scarring of limbs.

   Clearance pruning requirements will be determined during the Preconstruction Forestry Review (see notes, this sheet).

   **PRECONSTRUCTION PRUNING - CONSTRUCTION PROCEDURES:** All authorized pruning work shall be completed by an approved, licensed, insured Arborist holding current Arborist Certification with the International Society of Arboriculture. The Contractor shall not prune or cause to have pruned any tree located on City property without first securing a separate Tree Work
Permit from the Bureau of Parks & Forestry. The Contractor must seek and receive permission from the property owner prior to pruning any tree on private property. All pruning work shall be completed at the Contractor’s expense. The City of Norfolk may elect, at its option, to complete any equipment clearance pruning on public street rights of way.

B Selective Pruning Of Construction-Damaged Trees:

GENERAL: The purpose of selective pruning is to remove broken or otherwise wounded branches from protected trees that are damaged through construction related activities. The City Forester will direct selective pruning and therapeutic requirements needed to restore tree health or structure. All work must be completed by a professional, ISA Certified Arborist, at the Contractor’s expense.

CONSTRUCTION PROCEDURES: The City Forester will assess all construction-damaged trees and order the appropriate selective pruning requirements. Damages may also be assessed to the Contractor for the value loss of any protected tree damaged through careless or negligent equipment operations, or contractual violations including nonconformance to contract tree protection requirements detailed in the project specifications or drawings, or otherwise directed. Trees that are damaged beyond reasonable aesthetic, structural or physiological recovery will be appraised to determine the value of the tree, and the Contractor will be held liable for the value loss and any associated removal or site restoration costs.

10. DAMAGE TO PROTECTED TREES:

The Contractor shall be responsible for any damage to protected trees resulting from negligent or careless operations, including but not limited to limb breakage, trunk wounds or abrasions, excessive root damage, soil compaction, etc. Upon such occurrence the City Forester will evaluate the extent of damage and determine the appropriate remedial action to be taken at the Contractor’s expense, including but not limited to corrective pruning, bark tracing, cabling and bracing, hazard evaluation, removal and soil/site restoration. If in the sole opinion of the City Forester, the amount of damage to any City-owned tree has resulted in a significant loss of functional, aesthetic, architectural, or economic value, the Contractor will also be required to reimburse the City for the full loss in tree value.

Value loss will be determined through an appraisal completed by the City Forester following established procedures published in the “Guide for Plant Appraisal”, authored by the Council of Tree and Landscape
Appraisers. In the event of any dispute between the Contractor and City over the value loss of any tree so damaged or destroyed, the City Forester will take into consideration an independent tree appraisal completed by an experienced consulting Arborist holding current membership in good standing with the American Society of Consulting Arborists (ASCA), in establishing the actual value loss. All costs associated with an independent appraisal shall be the Contractor’s responsibility.

11. TREE PROTECTION SIGNAGE:

GENERAL: The purpose of tree protection signage is to alert Contractors and construction trades as to the importance placed upon tree protection within the project area. Two types of tree protection signs are required, Area Signs, and a Concrete Washout Signs.

CONSTRUCTION PROCEDURES: Area Signs shall be 11”x 15” heavy duty cardboard, blaze orange colored background with black block letters, 1” high, with the inscription “Keep Out – Tree Protection Area”. The area signs shall be attached to the tree protection fence every 50’ on center.

Concrete Wash-Out Signs shall be large enough to be clearly seen by truck drivers and posted at all locations approved for disposal of concrete rinse. The disposal of any concrete rinse within the critical root zone of any tree, or any area where the rinse could move or leach to the CRZ of a protected tree is strictly prohibited

12. TREE PROTECTION FENCING:

GENERAL: The purpose of tree protection fencing is to prevent unauthorized encroachment of equipment and vehicles, or storage/temporary placement of construction materials, spoils, or debris within the critical root zone of protected trees.

CONSTRUCTION PROCEDURES: Tree Protection Fencing shall be blaze-orange in color, heavy-duty plastic mesh fence, 4 feet tall, securely attached to metal 2” U-channel post, set a maximum of 8’ on center.

Tree protection fencing shall be installed prior to commencing with any proposed construction activity within 10 feet of any protected tree, paved streets (curb to curb) excepted. The City Forester may waive the requirement for tree protection fencing adjacent to street trees where the placement of such would adversely affect traffic flow or safety, or when the Contractor has clearly demonstrated a capability to manage construction operations adjacent to street trees without undo risk of tree damage. The Contractor shall be responsible for maintaining tree
protection fencing erect and in good repair throughout the duration of construction activities for which the fencing was required.

13. **TREE ORDINANCE AND TREE WORK PERMIT:**

The Contractor shall conform to all requirements of the City of Norfolk Tree Ordinance (Chapter 45, Norfolk City Code). A Tree Work Permit authorizing the completion of work as shown or described will be issued directly to the City of Norfolk Department of Utilities. The Contractor will be provided with a copy of the Tree Work Permit at the preconstruction meeting. The Tree Work Permit must be retained on the job-site for the duration of the project. Any work not specifically shown or described including but not limited to tree pruning, tree removal, or any change orders for which a Tree Work Permit would be required in accordance with the Tree Ordinance, will require a separate Tree Work Permit. It is the Contractor’s responsibility to secure all necessary Tree Work Permits prior to proceeding with any activity regulated by the Tree Ordinance.
APPENDIX J

Contractor’s Use of Temporary Facilities and Staging Areas
Appendix J

Contractor’s Use of Temporary Facilities and Staging Areas

1. The Contractor shall provide at its own expense and without liability to the City any additional land and access thereto that the Contractor may desire for temporary construction facilities, staging areas, or storage of materials. The Contractor shall not use private property in connection with the Work unless prior written permission is obtained from the property owner.

2. The Contractor’s use of the staging area will have the same requirements as the construction activity area in the Contract Documents.

3. The Contractor’s use of the staging area shall be in compliance with all City ordinances to include:
   A. Vector Control – the contractor shall be responsible for keeping the grass mowed and keeping the area in a clean and orderly condition.
   B. Erosion Control – erosion control such as silt fence, inlet protection, etc. shall be provided at the site in accordance with City code and shall comply with the same requirements included in the contract documents.
   C. Noise Control – the Contractor shall be responsible for complying with City noise ordinances and shall comply with the same requirements included in the contract documents.
   D. Graffiti Control – the contractor shall remove/erase all graffiti and or other defilement of facilities on the staging area within two working days.

4. The Contractor shall be responsible for the security and safety of all staging area facilities including, but not limited to, all equipment, materials, site structures, and construction thereon. All security measures deemed necessary by the Contractor to comply with this requirement shall be at the Contractor’s expense and at no additional cost to the City. The Contractor shall be responsible for all site security until final acceptance of the Work by the City.

5. The Contractor shall maintain the staging area in an orderly and clean condition and shall at intervals of no more than three (3) days and at its expense, remove and legally dispose of accumulations of rubbish or refuse materials, surplus concrete, mortar and excavated materials not required on the project. Washings from concrete mixers or mixing boxes shall not be deposited directly or indirectly in the drainage or sewer system or on paved streets.

6. The Contractor shall keep the site, inclusive of vehicular and pedestrian traffic routes through the site, free of dirt and dust by periodic blading, power brooming, watering or other approved means. Road surfaces adjacent to the area shall be cleaned of soil with mechanical brooms or other approved methods at the end of each working day.

7. The Contractor shall confine all equipment, the storage of materials and equipment, and the operations of workmen to areas permitted by law, ordinances, permits, or the requirements of the Contract Documents.
8. Upon completion of the use of the staging area, the Contractor shall remove and legally dispose of all rubbish, surplus or discarded materials, false work, forms, temporary structures, field offices, signs, temporary erosion and siltation control measures, and equipment and machinery, and shall leave the site in the conditions existing before the Work was started, to the satisfaction of the City.

9. The Contractor shall, during the progress of the Work and as directed by the City, remove from the City’s property and from all public and private property and rights-of-way, at its own expense, all temporary structures, rubbish, debris, piles of earth, foreign matter, and waste materials resulting from his operations. The site of the Work shall be restored to the conditions existing before the Work was started, to the satisfaction of the Owner. Lawns, pavements, sidewalks, and other surfaces shall be preserved where practicable, but if damaged, shall be fully restored.

10. The Contractor shall be responsible for the safe storage of material furnished by him or to him, and accepted by him and intended for the work.

11. Above ground fuel storage tanks, lubricants, oil, grease and other petroleum products shall be stored in a fashion to prevent spills. The contractor shall be responsible for cleaning up any spills and shall comply with all applicable regulations pertaining to storage and use of hazardous products.

12. Construction staging areas shall not have more than 2 points of ingress/egress to the site.

13. Construction staging areas shall have a 6 foot high chain link fence around the perimeter and all activities associated with the staging shall be contained within the fenced area. The fence shall have a green and black 8mil woven geotextile screening fabric 6 feet high securely attached to the fence every 24 inches at the top and bottom of the fence.
APPENDIX K

Hampton Roads Regional Special Inspection Guidelines and Procedures
Hampton Roads Regional Special Inspection Guidelines and Procedures
2009 USBC Edition

Revised: March 23, 2011

Participating Localities:

Accomack
Cape Charles
Chesapeake
Chincoteague
Franklin
Hampton
Isle of Wight
James City County
Newport News

Norfolk
Northampton
Poquoson
Portsmouth
Suffolk
Southampton
Virginia Beach
Williamsburg
York County
ACKNOWLEDGMENTS

The participating localities express our appreciation for the valuable assistance of all of the individuals and organizations who contributed to the creation of and revisions to *Hampton Roads Regional Special Inspection Guidelines and Procedures*. The committee included the following members:

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Company</th>
<th>Address</th>
<th>Phone</th>
<th>Email</th>
</tr>
</thead>
<tbody>
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Preface

As noted in the BOCA International manual *Designing a Special Inspection Program*,

The effects of structural failures are far too many to list. The seriousness of such events gained the attention of the U.S. government. In August of 1982, a Subcommittee, chaired by Albert Gore, Jr., held investigative hearings to examine the causes of structural failure and find common problems associated with these conditions. The Subcommittee’s ultimate goal was to eliminate those problems; thereby, decreasing the number of failures. (BOCA, P. 2)

To accomplish this goal, the Hampton Roads building safety community has joined together to formulate a uniform set of procedures for the manner in which participating jurisdictions enforce special inspection provisions of the Virginia Uniform Statewide Building Code (USBC). The provisions for special inspections are intended to provide a higher degree of expertise in the implementation of the structural design for critical aspects of building construction not normally found in the local building department.

The 2009 USBC effective March 1, 2011, incorporates and amends the International Code Council, Inc. (ICC) 2009 International Building Code. The *Hampton Roads Regional Special Inspection Guidelines and Procedures* provides and coordinates the procedures for special inspections that are required by both the referenced USBC and IBC. These procedures and guidelines are intended to be useable during the design and permitting process and on the job site by containing the pertinent information needed for successful application of a special inspection program.

The *Hampton Roads Regional Special Inspection Guidelines and Procedures* includes the following:

- The responsibilities of the Registered Design Professional responsible for the structural design;
- The role of each member of the building construction team to include the Registered Design Professionals, Building Owner, Contractors, the Special Inspectors and Agents, and local Building Official;
- The experience and qualifications necessary to supervise and perform special inspections;
- Identification of the required areas of special inspections, and;
- Administrative procedures that include a uniform special inspection form that is accepted by the participating localities, important definitions, reporting requirements, and conflict resolution procedures.

The purpose of the *Hampton Roads Regional Special Inspection Guidelines and Procedures* is to increase awareness of the special inspection requirements and to have a uniform procedure applicable throughout the participating Hampton Roads communities. In addition, the procedure should help reduce the problem associated with permitting and performing special inspections in participating localities. Should you have any questions or suggestions for future editions of this document, contact the Procedure Coordinator noted on page 1.
1. Introduction

A. Purpose

The provisions for special inspections are intended to provide a higher degree of scrutiny for aspects of construction that, upon failure, would cause significant harm. These aspects of construction include soil suitability analysis, fabrication and installation of structural steel members, certain concrete and masonry construction, fabrication and installation of wood structural elements, pile and pier foundations, sprayed fire-resistant materials, wall panels and veneer systems, EIFS, special cases and smoke control systems as detailed in the International Building Code (IBC).

The IBC as adopted by reference through the Virginia Uniform Statewide Building Code (USBC) intends that an experienced expert be in responsible charge of the inspection of these special types of construction. The Hampton Roads building safety community has joined together in agreement to implement a uniform procedure for the manner in which jurisdictions enforce the special inspection requirements of the USBC and the IBC. This includes the standard for experience and qualifications necessary to adequately control the work being performed, duties of the special inspector, reporting requirements, as well as oversight by each jurisdiction. It specifies the type and manner of work and how it is to be performed and any supervision required. It also clarifies the requirements for reporting the results and record keeping.

This procedure is intended to safeguard public safety and general welfare through structural strength of building materials by:

- Clearly defining the responsibility of all parties involved in the special inspection process;
- Standardizing the necessary qualifications required for Special Inspectors and Laboratories;
- Applying the special inspection provisions of the USBC in a consistent manner across the Hampton Roads Community.

B. Background

Numerous structural failures occurred during the late 1970’s and early 1980’s throughout the United States. These failures resulted in personal tragedies and tremendous property damage costs. However, most if not all of these failures were predictable in nature and centered on one common theme; lack of an adequate construction inspection process.

In August of 1982, the U.S. House of Representatives, Subcommittee on Investigations and Oversight, chaired by Albert Gore, Jr., held investigative hearings to examine the causes of structural failures. This subcommittee was part of the Committee on Science and Technology. In March of 1984, the Committee on Science and Technology’s report titled Structural Failures in Public Facilities, House Report 98-621, was presented to the 98th Congress. The following are highlights from this report.

The central issue addressed by the Subcommittee was:

"Are there common problems associated with structural failures, the elimination of which would decrease the number of failures?"

While the Subcommittee identified over twenty contributing factors, two common problems were felt to be the most critical:
Hampton Roads Regional Special Inspection Guidelines and Procedures

- The need for improved organization on construction projects and better communication between participants.
- The need for construction inspection by the Structural Engineer of Record (SER) during the construction of principal structural components.

The Subcommittee found that:

“For a variety of reasons, the structural engineer of record or his designee is often not present on the job site during the construction of principal structural components. The absence of the structural engineer has permitted flaws and changes on site to go unnoticed and uncorrected.”

The Subcommittee recommended that:

“Professional organizations, such as the Building Officials and Code Administrators International (BOCA), the International Conference and Building Officials (ICBO), and the Southern Building Code Conference International, should make every effort to ensure that provisions are written into the building codes and adopted in public forum which make the on-site presence of the structural engineer mandatory during the construction of structural components on public facilities.”

Model code organizations and Building Officials have attempted to address structural failures by enacting and enforcing Special Inspection provisions since 1987. However, the model codes fell short of requiring the Structural Engineer of Record to serve as the Special Inspector.

As time has elapsed and memories fade, special inspections and the role of the Structural Engineer of Record have been topics of controversy and confusion in recent years. Many organizations, such as the American Consulting Engineers Council (ACEC) and the Virginia Structural Engineers Council (VSEC) as well as the Council of American Structural Engineers (CASE), agree with the Subcommittee’s recommendations and believe strongly that the Structural Engineer of Record or his Agent should serve as the Special Inspector whenever possible and practical.

2. Definitions

Words used in this procedure shall have a meaning as defined in the USBC and the IBC. Unless otherwise expressly stated, other words and terms shall have the meaning shown in this procedure. Where terms are not defined through the methods authorized by this section, such terms shall have ordinarily accepted meanings such as the context implies.

Agents of Special Inspector (Agents). Qualified individuals or agencies working under the direction of the Special Inspectors who are providing the inspections and tests necessary to complete the special inspection process.

Approved. See VCC-202

Approved agency. See VCC-1702.1

Approved documents. Includes building construction documents as approved by the municipality including all approved revisions; and also fabrication and erection documents as approved by municipality including all approved revisions.

Approved fabricator. See VCC-1702.1
Hampton Roads Regional Special Inspection Guidelines and Procedures

**Architect of Record (AR)**. The registered design professional (RDP) retained by the Owner to design or specify architectural construction in accordance with the USBC and whose signature and seal appears on the approved architectural construction documents.

**Building**. See VCC -202

**Building Official**. The local government authority charged with the administration and enforcement of the USBC. This shall include any duly authorized technical assistant as specified in the USBC.

**Building Occupancy Category**. See VCC -1603.1.4, 1603.1.5, and 1604.5

**Certificate of Compliance**. See VCC 1702; document issued by a supplier of materials and products that certifies they meet the specified requirements.

**Construction documents**. See VCC -202

**Contractor**: A General Contractor licensed in the Commonwealth of Virginia (See Commonwealth of Virginia, Title 54.1)

**Fabricated item**. See VCC -1702.1

**Fabrication and erection documents**. All of the written, graphic, and pictorial documents prepared or assembled after issuance of a building permit and in addition to the municipality approved construction documents, describing the design, location, and physical characteristics of the building components or materials necessary for fabrication, assembly, or erection of the elements of the project. (Examples would include, but are not limited to, concrete reinforcing shop drawings, steel fabrication and erection shop drawings, and metal building fabrication and erection shop drawings.)

**Final Report of Special Inspections**. A certification by the Special Inspector which shall indicate that all construction elements subject to special inspections as identified by the jurisdiction approved Statement of Special Inspections (SSI) for all materials or phases of construction have been inspected prior to concealment, and in the Special Inspector’s professional opinion and knowledge, the construction project complies with jurisdiction’s approved Construction Documents.

**Geotechnical Engineer of Record (GER)**. The RDP retained by the Owner to design or specify earthwork and foundations in accordance with the USBC, and whose seal and signature appear on the jurisdiction approved geotechnical report.

**Inspection**. The continuous or periodic observation of work and the performance of tests for certain building or structural components to establish conformance with jurisdiction approved documents as required by the USBC and the IBC.

**Inspection Certificate**. See VCC 1702.1

**Inspection and testing agency**. An established and recognized agency or agencies, meeting the requirements of ASTM E 329 and accredited, retained by the Owner, independent of the Contractors performing the work subject to special inspections, to perform special inspections and materials testing required by the USBC and the IBC. See IBC-1702.1 Approved agency.

**Owner**. See VCC-202.

**Pre-engineered structural elements**. Structural elements specified by the SER but which may be designed by a specialty RDP. (Examples are items such as open web steel joists and joist girders; wood trusses;
combination wood, metal and plywood joists; pre-cast concrete elements; prefabricated wood or metal buildings; tilt-up concrete panel reinforcement and lifting hardware.)

**Primary Registered Design Professional of Record (PRDP).** The leader of the design team charged with the preparation of construction documents, either an architect or professional engineer. The Primary Registered Design Professional of Record is responsible for determining and interpreting the needs of the client or for coordinating the work of the other members of the design team.

**Primary structural system.** The combination of elements which serve to laterally brace and support the weight of the building’s structural shell, the applicable live loads based upon use and occupancy, wind, snow, ice, thermal and seismic environmental loads.

**Registered Design Professional (RDP).** See VCC-202

**Special Inspection, yes (Y), continuous (C), periodic (P), and not required (N).** See VCC-1702.1

**Sprayed fire-resistant materials.** See VCC-1702.1

**Structural observation.** See VCC-1702.1

**Shall.** This term indicates mandatory requirements.

**Special Inspector (SI).** The SI is the RDP who is directly responsible for special inspections, materials testing, and related services as described in the approved SSI. The SI shall be retained by the Owner, independent of the Contractors performing the work subject to special inspection. The SI must be approved by the Building Official. The SI shall be listed as Agent 1 on the SSI.

**Statement of Special Inspections (SSI).** The SSI is a statement prepared by an RDP and shall be approved by the appropriate RDP(s) of Record and submitted by the permit applicant. The SSI includes the scope (schedule) of the special inspection services applicable to a construction project, and the RDP’s and inspection and testing agencies that will provide those services. The SSI is required as a condition for permit issuance in accordance with IBC as amended by USBC and must be approved by the Building Official.

**Structural Engineer of Record (SER).** The RDP retained by the Owner to design or specify structural documents in accordance with the USBC, and whose signature and seal appear on the jurisdiction approved structural construction documents.

**Structure.** See VCC-202.

**USBC,** The adopted statewide building code in Virginia and includes Parts I, II, and III.

**VCC,** Virginia Construction Code, Part I of the USBC which adopts and amends the IBC.

### 3. Responsibilities

The **Building Official** is responsible for the issuance of the building permit and the Certificate of Occupancy. Prior to issuing the Building Permit, the Building Official will review and approve the Construction Documents, the SSI, and the qualifications of the SI and the Agents. The Building Official shall review field reports of special inspections as directed by these guidelines and procedures. The Building Official has the authority to issue a stop work order if it is found that the approved special inspectors or laboratories are not being utilized to perform required special inspections. The Certificate of Occupancy or final inspection shall be issued only after the Building Official has received and approved the Final Report of Special Inspections.
The Contractor is responsible for the construction of the project in accordance with the approved Construction Documents and the USBC. In addition, the Contractor is responsible for controlling the quality of construction and for providing the SI and Agents safe access to the elements that require inspection or testing. The Contractor shall coordinate construction related activities, including scheduling and timely notification of the need for Special Inspections and shall cooperate with the project’s design professionals, including the SI and Agents. The Contractor shall make the site available for inspections as necessary and shall deliver samples for testing when needed. The Contractor shall respond promptly when informed of nonconforming work. The special inspection process does not relieve the Contractor of responsibility for quality control.

The Owner shall be responsible for the fees and costs related to the performance of special inspection services. The Owner or their authorized agent shall sign the SSI.

The Primary Registered Design Professional of Record (PRDP) shall be responsible for informing the Owner of the need to provide for special inspections and for assisting the Owner as may be needed to retain the services of an SI. A RDP shall complete a SSI that shall include the Special Inspectors (SI) and Agent(s). The RDP shall also review and act upon conditions noted in interim special inspection reports. The RDP shall also be responsible for supplying the SI with the necessary copies of current appropriate Construction Documents and approved submittals, fabrication, and erection documents, including those revisions and change orders affecting work to be inspected or tested.

The Special Inspector (SI) is responsible for performing, documenting, managing, and coordinating the special inspections and the efforts of the various Agents. Individual Agents may be retained by the Owner or by the SI, but they are responsible to the SI. The Agents who are responsible for conducting inspections or tests shall be identified in the SSI that is submitted to the Building Official. The SI shall provide copies of inspection reports to the RDP of Record, Owner, Contractor and Building Official. All discrepancies shall be brought to the attention of the Contractor for correction. The SI shall report deviations from the approved Construction Documents to the appropriate RDP of Record for their resolution. Uncorrected work shall be reported to the Building Official and the appropriate RDP of Record.

The Structural Engineer of Record (SER) shall be responsible for identifying in the Construction Documents the specific structural special inspections to be performed for the project in order to meet the requirements of the USBC and any other requirements specified by the SER.

4. When Special Inspections are required

The USBC requires special inspections be made in accordance with the requirements of the IBC. The requirements for special inspections shall be determined prior to and are requisite for issuance of the building permit.

Special inspections are required for building components identified in the IBC when the design of these components is required to be performed by a professional engineer or architect. (See attached CHART A in Appendix B which is taken from § 54.1 – 402 of the Code of Virginia.)

Special inspections are not required:

- For work of a minor nature or as warranted by conditions in the jurisdiction as approved by the building official.
- For building components unless the design involves the practice of professional engineering and architecture as defined by the USBC.
- Unless otherwise required by the building official, for occupancies in Groups R-3, R-4 or R-5 and occupancies in Group U that are accessory to a residential occupancy.
Note: Check the requirements for each component of a building or structure listed in IBC Chapter 17 to determine if the exceptions to the requirement for special inspections of that component are applicable.

5. Special Cases

As per section 1704.15 of the IBC, Special inspections shall be required for proposed work that is, in the opinion of the building official or the RDP, unusual in its nature, such as but not limited to, the following examples:

- Construction materials and systems that are alternatives to materials and systems prescribed by the building code according to Section 112 USBC.
- Unusual design applications of materials described in the building code.
- Materials and systems required to be installed in accordance with additional manufacturer’s instructions that prescribe requirements not contained in the building code or in standards referenced by the building code.

6. Special Inspector/Laboratory Qualifications

Special inspections shall be performed by individuals and Agents that are qualified in accordance with these procedures and are under the direct supervision of an RDP in responsible charge of special inspection activities. The RDP shall ensure that the individuals under their charge are performing only those special inspections that are consistent with their knowledge and training for the specified inspections in accordance with the edition of ASTM E329 and the USBC that is in force at the time of permit issuance.

The USBC requires that special inspections must be conducted under the supervision of a registered design professional. This places a requirement that the individual responsible for the coordination of special inspections (Agent 1) must be a Virginia licensed engineer or architect. Individuals or firms that conduct testing and/or special inspections (and the procedures they must follow) must comply with the requirements of ASTM E329. Firms providing special inspection services (or qualifications for individual inspectors) may submit documentation demonstrating equivalency by another recognized standard to the minimum qualifications, certification, and experience requirements of ASTM E329. The Building Official may approve the firm or individual after evaluating and determining that equivalency has been met.

Written documentation shall be provided to the Building Official demonstrating the applicable Agency’s laboratory accreditation. Individual resumes indicating pertinent training, certifications, and/or other qualifications shall be provided for special inspection personnel associated with the project. Each local building department may prescribe the manner of qualification documentation and frequency of updating information regarding firm or individual inspector approval.

7. Completing the Statement of Special Inspection (SSI)

A complete SSI shall be provided with the application for permit. A complete SSI will contain the following:

- The Statement of Special Inspections form shall be completed to include signatures by the parties identified on the SSI to include:
  - A Registered Design Professional (RDP) is required to complete the statement and schedule. Although not required, typically this is accomplished by a RDP associated with the project design and understanding the critical elements. This can be the Structural Engineer of Record (SER), Special Inspector (SI) or any other RDP knowledgeable of the project that can execute the form. Their name is typed/printed on the line “Type or print name of the preparer of the
Schedule.” The Virginia RDP seal and signature of the preparer is to be located above the printed name where indicated.

- The applicant’s signature is required if the person applying for the permit is different from the owner. This can be the owner’s authorized representative, a RDP authorized by the Owner or the appropriately licensed Contractor that will be performing the work. The Applicant provides a signature on the “Permit Applicant’s Signature” line. If the Applicant and Owner are the same and the Owner has signed on the “Owner’s Authorization” line, a separate signature is not required on this line.

- The project Owner’s authorization is required as they are responsible for the fees and costs of the Special Inspector. By signing this form, they acknowledge that special inspections are required for the project and agree to notify the Building Official of any changes regarding the special inspection agents. The owner provides a signature on the “Owner’s Authorization” line.

- The Primary RDP of Record for the design provides a signature on the “Primary RDP of Record” line. The Primary RDP of Record is usually the person with the most direct contact with the owner. Typically, this would be the primary design professional that coordinated the completion of the plans. By signing, the Primary RDP of Record is not taking on a responsibility for the entire special inspection process nor approval of the special inspection team. The signature is an acknowledgement that special inspections are required on the job based on the design of his/her project, has advised the owner of their responsibility to provide and pay for special inspections, and has assured that special inspections are properly called for in the schedule for areas dictated by his/her design are incorporated.

- The Structural Engineer of Record (if different from the Primary RDP of Record noted above) signs the SER line. The signature is an acknowledgement that the SER has reviewed the statement to ensure all required inspections dictated by his/her design are incorporated.

- The company name of the Special Inspector (Agent 1) is to be typed or printed on “Special Inspector” line. The RDP overseeing the implementation of special inspections for the project for the above named company will place his/her signature in the “Special Inspector (Signature)” line.

- The Building Official shall sign the form after all required signatures have been executed, he/she is satisfied that the area(s) of special inspections have been properly identified and called for, and he/she is satisfied that the special inspection agents and testing laboratories are properly qualified and certified. The signature of the Building Official shall signify acceptance and approval of the Statement/Schedule of Special Inspections.

- The Schedule of Special Inspections shall be included with proper identification of elements requiring special inspections continuous, periodic, and not required (C, P, N), as well as the associated Agent(s) responsible for inspection and/or testing.

- Agents for special inspections shall be identified to include address, phone number and responsible party. (Agent 1, Agent 2, Laboratory, etc…) Agent 1 shall always be the primary Special Inspector responsible for the coordination of the entire special inspection process.

- Proper documentation as to appropriate qualifications and certifications as discussed in Section 6.

8. Pre-construction Meeting
Pre-construction meetings are to be conducted by the SI at the start of the project unless work is of a minor nature and waived by the Building Official. The meeting is to be attended by the following individuals:

- Special Inspector
- Special Inspection Agent(s)
- Contractor
- Subcontractor’s representatives for each trade of work specified in the SSI

The following individuals are to be notified of the pre-construction meeting and are encouraged to attend whenever possible:

- Owner
- RDP(s) of Record for each scope of work specified in the SSI
- Building Official (or his/her designee)

The meeting should provide a forum to review and explain the following:

- Work to be reviewed as specified in the SSI.
- Inspections performed by the Building Official.
- Timely notification required by the Contractor to the SI of when the work is ready for inspections during the course of the work.
- Procedures to document, correct, re-inspect, and complete items found to be non compliant or deficient.
- Identification of the RDP designated to resolve field deviations and non-compliant items if different from the RDPs responsible for preparing the construction documents.
- Contact information of individuals involved with the project.
- Discussion of the inspections and testing to be performed.
- Proper submission and distribution of reports and supplemental information.
- Discussion of coordination of all work to be performed in accordance with the Contract Documents and that no changes shall be permitted unless authorized and approved in writing by the RDP of Record for the work in question.

A report shall be prepared by the SI indicating that the pre-construction meeting was conducted. The report shall indicate the date and location of the meeting, who attended and a brief description of the items discussed. A copy of the report shall be distributed as required in Section 9.

9. Reports of Special Inspections

The SI or agent shall provide a report for each inspection according to the standards of ASTM E-329. The SI shall provide copies of inspection reports to the PRDP, SER, Owner, Contractor, and Building Official. The SI shall report deviations from the approved Construction Documents to the appropriate RDP for their resolution before proceeding with the inspection of the deficient work. All inspection and test reports shall be submitted within seven (7) working days of the inspection or test performed. In no case shall inspections be performed by the Building Official that would allow the concealment of work required to be inspected by the SI unless verification has been received that the special inspection has been successfully performed.

Special inspection and testing reports shall indicate that the specified work has been inspected and found to be in compliance with the approved construction documents unless deficiencies are noted. Reports containing deficiencies or non compliant work shall describe the nature and specific location of the discrepancies.
At the completion of a project, all recorded non compliant work shall be documented as having been corrected or approved by the RDP(s) of Record or other RDP(s) responsible for any review and approval of deviations or changes from the approved construction documents as appropriate.

Upon request of the Building Official, the SI shall submit a letter indicating completion of a specific area or phase of special inspections and testing for a particular construction discipline.

10. Final Report of Special Inspections

Upon completion of all special inspections and testing specified on the SSI, the SI shall, after review and approval by the appropriate RDP(s), submit a Final Report of Special Inspections, which includes the completed Schedule of Special Inspections, and if applicable, a Fabricator’s Certificate of Compliance as required by IBC 1704.2.2 to the Building Official for review and approval. **The Building Official review and approval is required prior to final building inspection approval or issuance of a Certificate of Occupancy.**

11. Changes in Design, Construction and Special Inspection Personnel

In the event that the members of the Special Inspections Team or the organizations or individuals contracted as agents to the Special Inspectors are changed during the course of construction, the **Owner** shall provide a written notification for such change to the Building Official. Such notice shall identify the replacement organization or replacement individual and shall furnish the documentation necessary; including resume and experience to illustrate such organization or individual is qualified for the work required. The Building Official shall approve or deny such replacement. The **Owner** shall then provide a revised Statement of Special Inspections signed by all parties. A new preconstruction meeting with the Design Team, Construction Team, Special Inspection Team, and the replacement organization or a replacement individual must be provided. The **Owner** shall ensure that there is a timely transfer of information and responsibility to the replacement party.

12. Referenced Documents

- ASTM E-329, Standard specification for agencies engaged in construction inspection and testing.

13. Revisions to this document (including Statement of Special Inspections)

This document is endorsed by the jurisdictions listed on the cover sheet. Revisions will be made from time to time by this group. Any unauthorized revision may cause the document not to be accepted by the jurisdictions.
This Statement of Special Inspections is submitted as a condition for permit issuance in accordance with the International Building Code (IBC) as stated in the Virginia Uniform Statewide Building Code (USBC). It includes a Schedule of Special Inspections applicable to this project as well as the name of the Special Inspector, and the identity of other testing laboratories or agencies intended to be retained for conducting these inspections or tests.

The Special Inspector shall keep records of all inspections, and shall furnish inspection reports to the Building Official, appropriate Registered Design Professional(s) (RDP(s)), Owner and Contractor. All discrepancies shall be brought to the immediate attention of the Contractor for correction. If the discrepancies are not corrected, the discrepancies shall be brought to the attention of the Building Official and appropriate RDP(s). Interim reports shall be submitted to the Building Official, Owner, Contractor, and the appropriate RDP(s) according to the Hampton Roads Regional Special Inspection Guidelines and Procedures.

Jobsite safety is solely the responsibility of the contractor. Materials and activities to be inspected are not to include the contractor’s equipment and methods used to erect or install the materials listed. All fees/costs related to the performance of Special Inspections shall be the responsibility of the Owner. Additionally, the undersigned (RDP or SER) are only acknowledging that the items enumerated on the Schedule of Special Inspections are consistent with the required design elements, the applicable sections of the Uniform Statewide Building Code, and their area of expertise.

**REVIEW, AUTHORIZATION & ACCEPTANCE**

**Permit Applicant (If not Owner):**

Signature / date: 

Printed Name: 

**Owner’s Authorization (If other than Applicant):**

Signature / date: 

Printed Name: 

**Primary RDP of Record:**

(Review and acceptance of schedule):

Signature / date: 

Printed Name: David M. Parker, P.E.

**SER of Record**

(Review and acceptance of schedule):

Signature / date: 

Printed Name: Stephen T. Weber, P.E.

**Building Official’s Acceptance:**

Signature / date: 

Printed Name: 

**SCHEDULE OF SI PREPARED BY:**

Virginia RDP Seal of SI Preparer

Stephen T. Weber, P.E.

Printed Name of the Preparer of the Schedule (on line above)

**Special Inspector:**

Signature / date: 

Printed Name: Stephen T. Weber, P.E.

SI Company Name: Clark Nexsen, Inc.
# SCHEDULE OF SPECIAL INSPECTIONS

<table>
<thead>
<tr>
<th>MATERIAL / ACTIVITY</th>
<th>TYPE OF INSPECTION</th>
<th>APPLICABLE TO THIS PROJECT</th>
<th>EXTENT / REFERENCE</th>
<th>AGENT</th>
<th>COMPLETED</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GENERAL</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Pre-construction Conference</td>
<td>Meeting with parties listed in Section 6 of the HRRSIGP to discuss Special Inspection procedures</td>
<td>Y</td>
<td>Scheduled by SI with the Contractor prior to commencement of work.</td>
<td>1,2,3</td>
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<td><strong>EARTHWORK</strong></td>
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<tr>
<td>Site Preparation (building)</td>
<td>Field testing and inspection</td>
<td>Y/P</td>
<td>Field Review; IBC 1704.7</td>
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<tr>
<td>Fill material (building)</td>
<td>Review submittals, field testing and inspection</td>
<td>Y/P</td>
<td>Field Review; IBC 1704.7</td>
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<tr>
<td>Fill compaction (building)</td>
<td>In-place density tests</td>
<td>Y/C</td>
<td>Field Review; IBC 1704.7</td>
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<tr>
<td>Foundation sub-grade</td>
<td>Field inspection of foundation subgrade prior to placement of concrete</td>
<td>Y/P</td>
<td>Field Review; IBC 1704.7</td>
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<tr>
<td><strong>PILE/DRILLED PIER FOUNDATIONS</strong></td>
<td></td>
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<tr>
<td>Materials</td>
<td>Review product, sizes and lengths</td>
<td>N</td>
<td>IBC 1704.8, .9 or .10</td>
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<td></td>
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<tr>
<td>Test piles</td>
<td>Monitor driving of test piles</td>
<td>N</td>
<td>IBC 1704.8, .9 or .10</td>
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<tr>
<td>Pile/drilled pier installation</td>
<td>Monitor drilling, placement, driving of piles,</td>
<td>N</td>
<td>IBC 1704.8, .9 or .10</td>
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<tr>
<td></td>
<td>Including cut off and tip elevation</td>
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<tr>
<td>Pile load test</td>
<td>Monitor pile load test</td>
<td>N</td>
<td>IBC 1704.8, .9 or .10</td>
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<tr>
<td><strong>CONCRETE</strong></td>
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<tr>
<td>Materials</td>
<td>Review product supplied versus certificates of compliance and mix design</td>
<td>Y/P</td>
<td>Submittal &amp; Field Review; IBC 1704.4.1, ACI 318: Ch.4 &amp; 5; IBC 1904.2.2, 1913.3 &amp; 1913.3</td>
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<tr>
<td>Installation of reinforcing steel, including prestress tendons and anchor bolts as well as welding</td>
<td>Field inspection of placement</td>
<td>Y/C</td>
<td>Field Review; ACI 318:3.5, 3.5.2 &amp; Ch. 7; AWS D1.4; IBC 1704.4, 1911.5, 1913.4</td>
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<td>Formwork installation</td>
<td>Field inspection</td>
<td>Y/P</td>
<td>Field Review; ACI 318: 6.1.1; IBC 1704.4</td>
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<td>Concreting operations &amp; placement</td>
<td>Field inspection of placement/sampling</td>
<td>Y/C</td>
<td>Field Review; ACI 318: 5.6, 5.8, 5.9-10; ASTM C 172, C 31; IBC 1704.4, 1913.6, 1913.7, 1918.8, 1913.10</td>
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<td>Concrete curing</td>
<td>Field inspection of curing process</td>
<td>Y/P</td>
<td>Field Review; ACI 318: 5.11-13; IBC 1704.4, 1913.9</td>
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<tr>
<td>Concrete strength</td>
<td>Evaluation of concrete strength</td>
<td>Y/P</td>
<td>Lab Testing; ACI 318: 6.2; IBC 1704.4</td>
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<tr>
<td>Application of forces for prestressed concrete</td>
<td>Field inspection</td>
<td>N</td>
<td>Field Review; ACI 318: 18.20</td>
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<tr>
<td>Grouting of prestress tendons</td>
<td>Field inspection</td>
<td>N</td>
<td>Field Review; ACI 318: 18.18.4</td>
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<tr>
<td>MATERIAL / ACTIVITY</td>
<td>TYPE OF INSPECTION</td>
<td>APPLICABLE TO THIS PROJECT</td>
<td>EXTENT / REFERENCE</td>
<td>AGENT</td>
<td>COMPLETED</td>
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<tr>
<td>PRECAST CONCRETE</td>
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<tr>
<td>Verify fabrication/quality control procedures</td>
<td>In-plant inspection of fabrication/quality control procedures**</td>
<td>N</td>
<td>IBC 1704.2</td>
<td>--</td>
<td>--</td>
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<tr>
<td>Erection and installation</td>
<td>Review submittals and as-built assemblies; Field inspection of in-place precast</td>
<td>N</td>
<td>ACI 318: Ch.16; IBC Table 1704.4</td>
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<td>MASONRY (Level B; Based on Occupancy Category II)</td>
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<tr>
<td>Materials</td>
<td>Review of products supplied versus certificate of compliance and material submitted</td>
<td>Y/P</td>
<td>Submittal &amp; Field Review; ACI 530.1; ASCE 6; TMS 602; IBC 1704.5, 1708</td>
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<tr>
<td>Strength</td>
<td>Testing / review of strength</td>
<td>Y/P</td>
<td>Lab Testing: Submittal &amp; Field Review; ACI 530.1; ASCE 6; TMS 602; IBC 1704.5, 2105.2.2, 2105.3</td>
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</tr>
<tr>
<td>Mortar and grout</td>
<td>Inspection of proportioning, mixing and placement</td>
<td>Y/P</td>
<td>Field Review; IBC 1704.5, ACI 530.1; ASCE 6; TMS 602</td>
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<tr>
<td>Grout placement, including prestressing grout</td>
<td>Verification to ensure compliance</td>
<td>Y/C</td>
<td>Field Review; IBC 1704.5, ACI 530.1; ASCE 6; TMS 602</td>
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<tr>
<td>Grout space</td>
<td>Verification to ensure compliance</td>
<td>Y/P</td>
<td>Field Review; IBC 1704.5, ACI 530.1; ASCE 6; TMS 602</td>
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<tr>
<td>Mortar, grout and prism specimens</td>
<td>Observe preparation</td>
<td>Y/P</td>
<td>Field Review; IBC 1704.5, ACI 530.1; ASCE 6; TMS 602</td>
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<tr>
<td>Reinforcement, prestress, tendons, and connections</td>
<td>Inspection condition, size, location, and spacing</td>
<td>Y/C</td>
<td>Field Review; IBC 1704.5; ACI 530.1; ASCE 5; ASCE 6; TMS 402, 602</td>
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<tr>
<td>Welding of reinforcing bars</td>
<td>Inspection and testing of welds</td>
<td>N</td>
<td>Field Review; IBC 1704.5, ACI 530.1; ASCE 5; TMS 402</td>
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<tr>
<td>Prestressing force</td>
<td>Verify application and measurement</td>
<td>N</td>
<td>Field Review; IBC 1704.5, ACI 530.1; ASCE 6; TMS 602</td>
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<tr>
<td>Protection</td>
<td>Inspect procedures for protection during cold and hot weather</td>
<td>Y/P</td>
<td>Field Review; IBC 1704.5, 2104.3, 2104.4; ACI 530.1; ASCE 6; TMS 602</td>
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<tr>
<td>Anchorage</td>
<td>Inspection of anchorages</td>
<td>Y/C</td>
<td>Field Review; ACI 530.1; ASCE 5, ASCE 6; TMS 402; TMS 602; IBC 1704.5</td>
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<td>Masonry installation</td>
<td>Inspection of placement of masonry and joints</td>
<td>Y/P</td>
<td>Field Review; ACI 530.1; ASCE 6; TMS 602; IBC 1704.5</td>
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<tr>
<td>STRUCTURAL STEEL</td>
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<tr>
<td>Verify fabrication/quality control procedures</td>
<td>In-plant inspection of fabrication/quality control procedures**</td>
<td>N</td>
<td>IBC 1704.2</td>
<td>--</td>
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<tr>
<td>Bolts, nuts, washers - materials</td>
<td>Material identification markings</td>
<td>N</td>
<td>Submittal &amp; Field Review; IBC 1704.3; ASTM; AISC 360, Section A3.3</td>
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<tr>
<td>Bolts, nuts, washers - installations</td>
<td>Inspection of in-place high-strength bolts, snug-tight, joints, pre-tensioned and bearing type, and slip critical connections</td>
<td>N</td>
<td>Submittal &amp; Field Review; IBC 1704.3.3, AISC 360 Section M2.5</td>
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<tr>
<td>MATERIAL / ACTIVITY</td>
<td>TYPE OF INSPECTION</td>
<td>APPLICABLE TO THIS PROJECT</td>
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<td></td>
<td></td>
<td>Y/C/P/N</td>
<td>EXTENT / REFERENCE</td>
<td>AGENT</td>
<td>COMPLETED</td>
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<tr>
<td>Structural steel - materials</td>
<td>Material identification markings and review of Certificate of Compliance</td>
<td>N</td>
<td>Submittal &amp; Field Review; IBC 1704.3, 1708.4, ASTM A6, A568</td>
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<tr>
<td>Structural steel details - installation</td>
<td>Inspection of member locations, structural details for bracing, connections, stiffening</td>
<td>N</td>
<td>Submittal &amp; Field Review; IBC 1704.3.2</td>
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<td>--</td>
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<tr>
<td>Weld filler materials &amp; welder certification</td>
<td>Review of identification markings, certificate of compliance, and welder certifications</td>
<td>N</td>
<td>Submittal &amp; Field Review; AISC 360 A3.5</td>
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<tr>
<td>Welds</td>
<td>Inspection and testing of welds</td>
<td>N</td>
<td>Field Review; IBC 1704.3.1; AWS D1.1, D1.3</td>
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<tr>
<td>Cold-formed steel trusses spanning 60’ or greater</td>
<td>Inspection of temporary and permanent restraints/bracing</td>
<td>N</td>
<td>Field Review; 1704.3.4</td>
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<td>--</td>
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</tbody>
</table>

**WOOD**

| Verify fabrication / quality control procedures         | In-plant inspection of fabrication/quality control procedures**                   | N       | IBC 1704.2, 1704.6 | -- | -- |
| Metal plate connected wood/metal trusses spanning 60’ or more | Approved bracing with submittal                                               | N       | IBC 1704.6.2 | -- | -- |
| High-Load Diaphragms – Installation                     | Review submittal and as-built assemblies; Inspection of sheathing, framing size, nail and staple diameter and length, number of fastener lines, and fastener spacing. | N       | IBC 1704.1, 1704.6.1 | -- | -- |

**SPRAYED CEMENTITIOUS AND MINERAL FIBER FIRE-RESISTIVE MATERIAL**

| Structural member surface conditions                   | Field review of surface conditions prior to application                         | N       | AWCI 12-B; IBC 1704.12 | -- | -- |
| Application/ thickness                                 | Field review of application operations and thickness                           | N       | ASTM E605, AWCI 12-B; IBC 1704.12 | -- | -- |
| Mastic & Intumescent Fire Resistant Coating           | Field review of application operations and thickness                           | N       | AWCI 12-B; IBC 1704.13 | -- | -- |

**EXTERIOR INSULATION AND FINISH SYSTEMS**

| Application                                             | Field review of application / installation                                     | N       | ASTM E2570, IBC 1704.14 | -- | -- |

**SPECIAL CASES**

<p>| Alternative Materials &amp; Systems                         | As requested by Building Official, review system &amp; installation               | N       | IBC 1704.15 | -- | -- |</p>
<table>
<thead>
<tr>
<th>MATERIAL / ACTIVITY</th>
<th>TYPE OF INSPECTION</th>
<th>APPLICABLE TO THIS PROJECT</th>
<th>EXTENT / REFERENCE</th>
<th>AGENT</th>
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<tr>
<td>MAIN WIND FORCE RESISTING SYSTEMS</td>
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<tr>
<td>Wind Requirements</td>
<td>Review of the system components and installation</td>
<td>N</td>
<td>IBC 1609.1.2, 1705.4, 1705.4.1, 1705.4.2, 1710</td>
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<tr>
<td>SEISMIC FORCE RESISTING SYSTEMS</td>
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<tr>
<td>Seismic Requirements</td>
<td>Review of the designated seismic systems and seismic force resistance systems</td>
<td>N</td>
<td>IBC 1613, 1705.3, 1705.3.1, 1707, 1708, 1709; ASCE 7</td>
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<tr>
<td>SMOKE CONTROL</td>
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<tr>
<td>Special inspection of smoke control systems</td>
<td>Leakage testing and recording of device location, pressure difference testing, flow measurement and detection and control verification</td>
<td>N</td>
<td>IBC 1704.14, 1704.14.1, 1704.14.2</td>
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</tbody>
</table>

**INSPECTION AGENTS**

1. Special Inspector  
   Clark Nexsen, Inc.  
   4525 Main Street, Suite 1400, Virginia Beach, VA 23462  
   (757) 455-5800

2. Materials and Testing Laboratory  
   Engineering and Testing Consultants, Inc.  
   509 Viking Drive, Suite B  
   Virginia Beach, VA 23452-7323  
   (757) 486-5522

3. Geotechnical  
   GeoEnvironmental Resources, Inc.  
   2712 Southern Boulevard, Suite 101  
   Virginia Beach, VA 23452  
   (757) 463-3200

4. (Additional Agents?)

**NOTE:**  
* The qualifications of the Special Inspector and Testing Laboratories may be subject to the Approval of the Building Official (ASTM E 329).  
** Inspection of quality control procedures required only if fabricator is not regularly inspected by an independent inspection agency.
# FINAL REPORT OF SPECIAL INSPECTIONS

<table>
<thead>
<tr>
<th>PROJECT</th>
<th>PERMIT APPLICANT</th>
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<tbody>
<tr>
<td>Barraud Park Water and Sewer Project, Phase 1</td>
<td>City of Norfolk</td>
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<tr>
<td>Pump Station #153</td>
<td>810 Union Street, City Hall</td>
</tr>
<tr>
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<td>Norfolk, VA 23510</td>
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<thead>
<tr>
<th>PRIMARY RDP OF RECORD</th>
<th>STRUCTURAL ENGINEER OF RECORD</th>
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<tr>
<td>Clark Nexsen, Inc.</td>
<td>Clark Nexsen, Inc.</td>
</tr>
<tr>
<td>4525 Main Street, Suite 1400</td>
<td>4525 Main Street, Suite 1400</td>
</tr>
<tr>
<td>Virginia Beach, VA 23462</td>
<td>Virginia Beach, VA 23462</td>
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</table>

To the best of my information, knowledge, and belief, the special inspections required for this project, and itemized in the statement of special inspections submitted for permit, have been completed.

The following discrepancies that were outstanding since the last interim report dated____________________, have been corrected:

____________________________
____________________________
____________________________

Interim reports submitted prior to this final report, and numbered _______ to _______, form a basis for, and are to be considered an integral part of this final report.

Respectfully submitted,

________________________________________
Signature

________________________________________
Date

Type or Print Name (Agent 1)  
Seal of SI

Upon completion of all special inspections and testing, the SI shall submit a Final Report of Special Inspections to Building Official for review and approval. The Building Official review and approval is required prior to final building inspection approval or issuance of a Certificate of Occupancy.
Appendix BA/E SEAL ON DRAWINGS

The purpose of these charts and notes is for quick reference to determine in accordance with § 54.1 - 402 of the Code of Virginia if an architect’s or engineer’s (A/E) seal is required on documents for proposed construction.

**CHART A - GENERAL DESIGN**

A proposed structure which is classified within any of the categories marked “Yes” requires an A/E seal on the documents. Separate requirements apply as to when the electrical, plumbing or mechanical systems in such structures require an A/E seal (see Charts B and C).

<table>
<thead>
<tr>
<th>GROUP</th>
<th>BRIEF DESCRIPTION</th>
<th>AREA (SQ. FT.)</th>
<th>HEIGHT (STORIES)</th>
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<td></td>
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<td>5,000 OR LESS</td>
<td>5,001 TO 15,000</td>
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<tr>
<td>A¹</td>
<td>ASSEMBLY</td>
<td>YES</td>
<td>YES</td>
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<tr>
<td>B</td>
<td>BUSINESS</td>
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<tr>
<td>E</td>
<td>SCHOOLS &amp; DAY CARE CENTERS</td>
<td>YES</td>
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<td>F</td>
<td>FACTORY &amp; INDUSTRIAL</td>
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<td>H</td>
<td>HIGH HAZARD</td>
<td>YES</td>
<td>YES</td>
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<tr>
<td>I</td>
<td>INSTITUTIONAL</td>
<td>YES</td>
<td>YES</td>
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<tr>
<td>M</td>
<td>MERCANTILE</td>
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<tr>
<td>R-1</td>
<td>HOTEL, MOTEL &amp; DORMITORY</td>
<td>YES</td>
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<td>R-2⁷</td>
<td>MULTI-FAMILY RESIDENTIAL</td>
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<td>R-3</td>
<td>2 FAMILY ATTACHED</td>
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<tr>
<td>R-4</td>
<td>RESIDENTIAL ASSISTED LIVING</td>
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<td>R-5</td>
<td>1 AND 2 FAMILY DWELLINGS</td>
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<td>STORAGE (NON_FARM)</td>
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Notes: (Apply the following notes to all categories as applicable.)

1. Churches are exempt if building does not exceed 5,000 square feet or three stories, and the occupant load does not exceed 100.
2. A local building code official may require an A/E seal even if not required to do so by this chart.
3. The law requires that, where an A/E seal is not present, the plans must be signed by the individual (not company) responsible for the design, including the individual’s occupation and address.
4. Additions, remodeling or interior design defined under § 54.1-400 of the Code of Virginia might not require an A/E seal. For construction, additions or remodeling resulting in a change in occupancy, occupancy load, modification to the structural system, change in access or egress or an increase in the fire hazard an A/E seal is required in accordance with § 54.1-400, although notes 1 and 2 still apply.
5. Any unique design of structural elements for floors, walls, roofs or foundations requires an A/E seal, regardless of whether or not the remainder of the plans require such certification.
6. Buildings, structures, or electrical and mechanical installations which are not otherwise exempted but which are of standard design, provided they bear the certification of a professional engineer or architect registered or licensed in another state, and provided that the design is adapted for the specific location and conformity with local codes, ordinances and regulations, and is so certified by a professional engineer or architect licensed in Virginia may not require an A/E seal.
7. One exit and three stories or less Group R-2 buildings would normally be exempted from an A/E seal except where required by Note 2. Most all other three stories or less Group R-2 multi-family buildings are required by the building officials to have A/E seals for the construction documents.
APPENDIX L

Storm Water Pollution Prevention Plan
STORM WATER POLLUTION PREVENTION PLAN
(Pursuant to Virginia Regulation 9VAC25-880)

For

Barraud Park Water and Sewer Project, Phase I
Pump Station #153

Department of Utilities
Norfolk, Virginia

Prepared by:

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Virginia Beach, VA 23462
757-455-5800

May 2015
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I. POLICY AND GENERAL PROCEDURES

It is the policy of the City of Norfolk (hereinafter referred to as the Owner) to secure authority to discharge storm water from land disturbing activates of one acre or greater (or 2,500 square feet or greater in Chesapeake Bay Preservation Act (CBPA) Areas) in full conformance with the storm water regulations of the Virginia Department of Environmental Quality (VDEQ) as contained in 4 VAC 50-60-10 et seq. The Owner will secure appropriate coverage pursuant to these regulations.

The Contractor, and all subcontractors involved with grading, drainage, utilities or any other activity that disturbs site soil of one acre or greater (or 2,500 square feet or greater in Chesapeake Bay Preservation Act Areas) or who implement a pollutant control measure identified in the Storm Water Pollution Prevention Plan (SWPPP), must comply with the requirements of the Virginia Storm Water Management Program (VSMP) as contained in the VDEQ VSMP storm water general permit and implementing regulations (4 VAC 50-60-10 et. seq.) and the erosion and sediment control requirements of the VDEQ as published in the Virginia Erosion and Sediment Control Handbook (current edition). These requirements are as follows:

A. The Owner will file a complete Registration Statement for coverage under a VSMP general permit for storm water discharges from construction activities with the Virginia Department of Environmental Quality and verification of coverage received from the Department of Environmental Quality prior to the commencement of land disturbing activities exceeding the thresholds noted above. The appropriate filing fee in check form made out to “Treasurer of Virginia,” must be submitted to the Department of Environmental Quality, Receipts Control before the general permit will be issued.

Remit the General Permit Fee Form with a copy of the Registration Statement to:

Department of Environmental Quality  
Office of Stormwater Management, 10th Floor  
P.O. Box 1105  
Richmond, VA 23218

Send the General Permit Registration Statement with a copy of the Fee Form and fee check to:

Department of Environmental Quality  
Receipts Control  
P.O. Box 1104  
Richmond, VA 23218

B. A copy of the Registration Statement for coverage under the general permit for storm water discharges from construction activities as well as the actual general permit when issued by the VDEQ shall be maintained by the Contractor for inspection at the construction site. Land disturbing activities cannot commence until verification of coverage is received by the Contractor from VDEQ.
C. A complete copy of the SWPPP, including copies of all inspection reports, plan revisions, etc., must be retained by the Contractor at the project site at all times during working hours and kept in the Owner’s permanent project records for at least three years following submission of the Notice of Termination (NOT).

D. The Contractor must provide names and addresses of all subcontractors working on this project who will be involved with all construction activities that disturb site soil. This information must be kept with this SWPPP.

E. The Contractor and all subcontractors involved with land disturbing for this project must sign a copy of the appropriate certification statement included in Appendix B which will be incorporated into the construction contract.

F. As described below, the Contractor shall conduct regular inspections to determine effectiveness of the SWPPP. The SWPPP shall be modified by the Contractor as needed to prevent pollutants from discharging from the site. The Contractor’s inspector must meet the definition of “Qualified Personnel” as contained in the Virginia Stormwater Management Program regulations:

- A Virginia licensed professional engineer; or,
- Virginia certified Responsible Land Disturber; or,
- Other person who holds a certificate of competency from the Virginia Soil and Water Conservation Board in the area as an erosion and sediment control inspector or erosion and sediment control combined administrator.

Additionally, the Contractor’s inspector must either be someone empowered to implement modifications to this SWPPP and the pollutant control devices, if needed, in order to increase effectiveness to an acceptable level, or someone with the authority to cause such things to happen.

This SWPPP shall be updated each time there are modifications to the pollutant prevention system or a change of Contractors working on the project that disturbs site soil. The Contractor shall notify the Owner before these modifications are implemented, unless immediate Contractor action is necessary to prevent unauthorized discharges. If immediate Contractor action is needed, then the Contractor shall notify the Owner of the action as soon as practicable.

G. This SWPPP, including site maps, must be amended as necessary during the course of construction in order to keep them current with the pollutant control measures utilized at the site. Amending the SWPPP does not mean that it has to be reprinted. It is acceptable to add addenda, sketches, new sections, and/or revised drawings. Site maps may be marked up by hand reflecting changes in site conditions and location of storm water pollution prevention measures that have been added, removed or relocated and a date of each change.

H. Discharge of petroleum, oil, lubricants or other hazardous substances with storm water is subject to reporting and cleanup requirements. In general, all petroleum, oil, lubricants or other hazardous substances spilled on site must be cleaned up and disposed of in
accordance with state and federal regulations. Spills of solid materials (powders, mixes, granules) shall be cleaned up, placed in a sealed container and disposed of in accordance with state and federal regulations. All costs associated with the cleanup and disposal of solid materials to soil shall be borne by the contractor.

For liquid spills to soil of less than 25 gallons, the Contractor shall notify the Owner immediately, shall clean up the spilled material completely and then fill out and retain a spill report form found in Appendix H. The Contractor shall be responsible for all costs associated with required clean-up activities including disposal costs.

For liquid spills of 25 gallons or more of petroleum, oil, lubricants or other hazardous substances to soil, the Contractor shall notify the Owner immediately, shall clean up the spilled material completely and then fill out and retain a spill report form found in Appendix H. The Owner shall notify the DEQ in accordance with Part III.G of the VSMP General Permit. The Contractor shall be responsible for all costs associated with required clean-up activities including disposal costs. The Owner shall notify the DEQ within 24 hours discovery of the spill in accordance with Part III.G of the VSMP General Permit. The Contractor shall supply the Owner with any information requested regarding the spill event and shall cooperate fully with any site inspections by the Owner or other regulatory agencies.

For spills of any amount of petroleum, oil, lubricants or other hazardous substances to the storm sewer system or to state waters or wetlands, the Contractor shall notify the Owner immediately and take such measures as necessary to immediately stop the discharge of the material to the storm sewer system, state waters or wetlands. The Owner shall then notify DEQ immediately upon discovery of the spill in accordance with Part III.G of the VSMP General Permit. The Contractor shall furnish all equipment and manpower requested by the Owner or regulatory agencies to clean up the spilled material and shall supply the Owner with any information requested regarding the spill event and shall cooperate fully with the Owner or other regulatory agencies during and after the cleanup activities. The Contractor shall then fill out and retain a spill report form found in Appendix H.

Refer to Part III.G of the VSMP General Permit for additional information on spilled materials. Copies of the VSMP General Permit and the Registration Statement forms are available on the Department of Environmental Quality web site (http://www.deq.virginia.gov/Programs/Water/StormwaterManagement/VSMPPermits/ConstructionGeneralPermit.aspx).

I. Once the site reaches final stabilization, the Contractor shall complete and submit two copies of the NOT form for activities on site. This form is included as Appendix D. If a section or phase of the project reaches final stabilization prior to the entire project reaching final stabilization, then that section may be clearly marked on the site plans and the date of final stabilization recorded in the SWPPP. Areas so marked are no longer required to be inspected as a part of permit compliance.

J. This SWPPP is intended to control water-borne and liquid pollutant discharges by some combination of interception, filtration, and containment. The Contractor and all subcontractors implementing this SWPPP shall remain alert to the need to periodically refine and update the SWPPP in order to accomplish the intended goals.
K. This SWPPP shall be amended as necessary during the course of construction in order to keep it current with the pollutant control measures utilized at the site. Amending the SWPPP does not mean that it has to be reprinted. It is acceptable to handwrite revisions, add addenda, sketches, new sections, and/or revised drawings.

L. A record of the dates when land disturbing activities occur, when construction activities temporarily or permanently cease on a portion of the site, and when stabilization measures are initiated shall be maintained by the Contractor until the NOT is filed. A log for keeping such records is included in the Appendices. A different form for the log may be substituted if it is found to be more useful; such replacement forms must be approved in writing by the Owner prior to its use.

II. INTRODUCTION

This SWPPP has been prepared for land disturbing activities associated with the construction of Barraud Park Water and Sewer Project, Phase I Pump Station #153 in the northwest corner of the intersection of Hanson Avenue and Thistle Street in the Barraud Park neighborhood of Norfolk, Virginia. This SWPPP includes the elements necessary to comply with the Storm Water General Permit issued by the VDEQ under the VSMP and all local governing agency requirements. This SWPPP shall be implemented at the start of construction.

Construction phase pollutant sources anticipated at the site are:
- Disturbed (bare) soil
- Vehicle fuels and lubricants
- Chemicals associated with building construction, and building materials
- Asphalt and asphalt pavement waste; chlorine for water line flushing

Without adequate control there is the potential for each type of pollutant to be transported by storm water.

The project will consist of the following basic activities:
- Paving work
- Building construction
- Installation of utilities

Specifically, the project includes construction of a new sanitary sewer pump station with associated utility connections, a permeable paver service drive, and associated site features within the project site in Norfolk, Virginia. This project will disturb a total of 0.29 acre.

Purpose
A major goal of pollution prevention efforts during project construction is to control soil and pollutants that originate on the site and prevent them from flowing to surface waters of the Commonwealth. The purpose of this SWPPP is to provide requirements for achieving that goal. A successful pollution prevention program also relies upon careful inspection and adjustments during the construction process in order to enhance its effectiveness.

A. Scope

This SWPPP must be implemented when land disturbing activities begin on the site.

The SWPPP Construction Site Notice and copy of the permit coverage letter received from DEQ must be posted conspicuously and readable from a public right-of-way at the job site. The Contractor is responsible for all costs associated with the posting and maintenance of the SWPPP Construction Site Notice and DEQ coverage verification.

This SWPPP primarily addresses the impact of storm rainfall and runoff on areas of the ground surface disturbed during the construction process. In addition, there are recommendations for controlling other sources of pollution that could accompany the major construction activities. This SWPPP will terminate when disturbed areas are stabilized, construction activities covered herein have ceased, and a completed NOT is submitted to the VDEQ. Termination becomes effective at midnight on the date the NOT is filed.

Forms required to implement the SWPPP are included in the Appendices to this document.

The VSMP General Permit for Storm Water Discharges from Construction Activities prohibits most non-storm water discharges during the construction phase. Allowable nonstorm water discharges that may occur during construction on this project, which would therefore be covered by the General Permit, include:

1. Discharges from fire fighting activities
2. Fire hydrant flushings
3. Water used to wash vehicles where detergents are not used
4. Water used to control dust
5. Potable water sources, including uncontaminated waterline flushings
6. Routine external building wash down which does not use detergents
7. Pavement wash waters where spills or leaks of toxic or hazardous materials have not occurred (unless all spilled material has been removed) and where detergents are not used
8. Uncontaminated air conditioning or compressor condensate
9. Uncontaminated ground water or spring water
10. Foundation or footing drains where flows are not contaminated with process materials such as solvents
11. Uncontaminated excavation dewatering
12. Landscape irrigation

The techniques described in this SWPPP focus on providing control of pollutant discharges with practical approaches that utilize readily available expertise, materials, and equipment.
III. PROJECT DESCRIPTION

Described below are the land disturbing construction activities that are the subject of this SWPPP. They are presented in the order (or sequence) they are expected to begin, but each activity will not necessarily be completed before the next begins. Also, these activities could occur in a different order if necessary to maintain adequate erosion and sedimentation control:

A. This project includes construction of a new sanitary sewer pump station in the Barraud Park neighborhood of Norfolk, Virginia.

B. The total area of disturbance is 0.29 acre.

C. Runoff coefficients for the site are included in the design report.

D. The existing site consists of a vacant pervious lot with sparse vegetation.

E. Potential sources of pollution from the construction activities include erosion and sedimentation and the release of petroleum products from vehicles.

F. Water from the site ultimately discharges into the Lafayette River.

G. Sheets C3 and C4 of the approved plan set contain the following features:
   1. Drainage patterns and approximate slopes or contours anticipated after grading activities
   2. Areas of soil disturbance and areas of the site which are not to be disturbed
   3. Location of major structural and non-structural controls
   4. Location of areas where stabilization practices are expected to occur including types of vegetative cover
   5. Locations where storm water is discharged to a closed conduit storm sewer system
   6. Existing and planned paved areas and buildings

It shall be the responsibility of the Contractor to denote on the SWPPP site maps the locations of any on-site vehicle fueling activities, equipment maintenance areas, concrete washout areas, mason’s work areas, portable toilets, dumpsters, chemical storage areas, and material stockpiles to reflect current site conditions. As these areas are added, relocated or removed, the site maps shall be updated by the Contractor accordingly.

The actual schedule for implementing pollutant control measures will be determined by project construction progress. Down slope protective measures must always be in place before soil is disturbed.
IV. SITE DESCRIPTION

Included as part of this SWPPP in Appendix F are selected project construction drawings. Please refer to them for detailed site information.

A. Site Location – The site is located at the northwest end of Hanson Avenue in the Barraud Park neighborhood of Norfolk, Virginia. The closest body of water is the Lafayette River.

B. Site Topography and Coverage – The site has slopes between 1% and 3%. The closest body of water, the Lafayette River, is radially approximately 700 feet away from the site.

C. Rainfall Information – The average annual rainfall for Norfolk, VA is 45.74 inches. A rain gauge shall be installed on site to determine if an inspection triggering rainfall event has occurred. An inspection “triggering rainfall event” is rainfall that equals or exceeds one half inch (0.5”) in a 24-hour period at the construction site.

D. Site Soils – Site soils information is provided in the Geotechnical Report.

E. Total Area and Disturbed Area – 0.29 acre.

F. Quality of Receiving Surface Waters and/or Wetlands – The Lafayette River is located approximately 700 feet downstream of the site and consists of poor water quality conditions. Soil erosion and sediment control protection will be provided for areas disturbed during construction to prevent sediment-laden water from leaving the site.

G. Site Vegetation – The existing site consists of a vacant lot with sparse vegetation.

H. Threatened or Endangered Species or their Critical Habitat – There are no known threatened or endangered species within or near the project limits.

I. Erosion Control Plan – Erosion and sediment controls can be found on sheets C3 and C4.

J. Permanent Storm Water Controls – Permeable pavers and dry swales will be provided to address stormwater quality and quantity control. The project limits are within the City of Norfolk right-of-way and drain to existing storm sewer inlets.

V. STORM WATER POLLUTION PREVENTION MEASURES AND CONTROLS

A variety of storm water pollutant controls (Best Management Practices) are recommended for this project. These controls are reflected in the Erosion and Sediment Control Plans enclosed herein as Appendix F. Some controls are intended to function temporarily and will be used as needed for pollutant control during the construction period. These include temporary sediment barriers such as silt fencing, a rock construction entrance, and inlet protection measures. For most
disturbed areas, permanent stabilization will be accomplished by covering the soil with pavement, buildings, other improvements, and/or vegetation.

A. Erosion and Sediment Controls

1. Short- and Long-Term Goals – All erosion and sediment control measures have been selected, designed and are to be installed in accordance with the Virginia Erosion and Sediment Control Law and Regulations. The short term goal of construction phase stabilization is to minimize the loss of sediment to adjacent waters during construction. The long-term goal is to minimize the loss of sediment from the project once constructed by permanent soil stabilization. These include silt fence and a construction entrance.

2. Soil Stabilization – The purpose of soil stabilization is to prevent soil from leaving the site. In the natural condition, soil is stabilized by existing vegetation. The primary technique to be used at this project for stabilizing site soil will be to provide a protective cover of pavement and permanent stabilization.

(a) Temporary Seeding – Within seven (7) days after construction activity ceases on any particular area, all disturbed ground where there will not be construction for longer than thirty (30) days must be seeded with fast germinating temporary seed suited for the particular climate/season and protected with mulch. Temporary seeding shall be in conformance with the project plans, sheet C15.

(b) Permanent Seeding or Sodding – All areas at final grade must be seeded or sodded within seven (7) days after completion of the land disturbance activity. Except for small level spots, seeded areas shall be protected with mulch. Permanent seeding or Sodding shall be in conformance with the project plans, sheet C15.

(c) Structural Controls – Storm water runoff is to be structurally controlled as depicted on Plan Sheets C3 and C4 of the plan set. Structural controls shall be keyed to land disturbing activities especially on sites with significant topography and shall be completely installed prior to commencement of such land disturbing activities.

(d) Final Stabilization – Final stabilization is not considered established until a ground cover is achieved that is uniform, mature enough to survive, and will inhibit erosion. The Contractor shall stabilize all exposed earth areas with permanent vegetation as described in the project plans on Sheet C12.

B. Storm Water Management Controls

1. Stormwater management measures include permeable pavers and dry swales. These are shown on plan sheet C4 and as details on sheets C11 and C15. Runoff from the site will drain into the municipal storm sewer system which discharges into the Lafayette River.
C. Construction Phase "Best Management Practices"

Control of sediments has been described previously. Other aspects of this SWPPP are listed below:

1. Dust Control – Construction traffic must enter and exit the site at the stabilized construction entrance. The purpose is to trap dust and mud that would otherwise be carried off-site by construction traffic.

   Dust control shall be provided by the Contractor to a degree that is acceptable to the Owner, and in compliance with applicable local and state dust control regulations. After construction, the site will be stabilized (as described elsewhere), which will reduce the potential for dust generation.

2. Effluent from de-watering activities must be filtered or passed through an approved sediment trapping device, or both, before being discharged from the site. No contaminated effluent or groundwater may be discharged to state waters or wetlands or the Owner’s storm drain system without a separate VPDES discharge permit from the VDEQ. Such permit shall be obtained by the Owner, or if directed by the Owner, by the Contractor prior to discharge. No dewatering effluent may be discharged to the sanitary system by the Contractor without prior written authorization of the Owner. The Contractor is responsible for complying with all effluent and/or flow limitations contained in any permits secured relating to dewatering discharges.

3. Solid Waste Disposal – No solid materials, including building materials, are allowed to be discharged from the site with storm water. All solid waste, including disposable materials incidental to the major construction activities, must be collected, removed from the site, and disposed of in a legal manner. The locations of solid waste collection containers must be shown on the SWPPP site maps.

4. Sanitary Facilities – All personnel involved with construction activities must comply with state and local sanitary or septic system regulations. Temporary sanitary facilities where provided at the site throughout the construction phase must be utilized by all construction personnel and shall be serviced by a commercial operator when provided. Their location must be shown on the SWPPP site maps if installed on site.

5. Water Source – Non-storm water components of site discharge must be clean water. Water used for construction which discharges from the site must originate from a public water supply or private well approved by the Virginia Department of Health. Water used for construction that does not originate from an approved public supply must not discharge from the site. It is to be retained in ponds until it infiltrates and/or evaporates.

D. Construction Phase "Best Management Practices"

During the construction phase, the Contractor shall implement the following measures where appropriate:
1. Material resulting from clearing and grubbing shall be stockpiled up slope from adequate sedimentation controls or hauled off-site. All soil stockpile areas shall be annotated on the SWPPP site plans in Appendix F.

2. All soil stockpile areas shall be maintained sufficiently far from water bodies, wetlands, storm water inlets, and storm water conveyances to minimize sediment release to these features and shall be adequately protected from erosion in accordance with Virginia Erosion and Sediment Control Minimum Standard 2 to preclude migration of sediments into these features.

3. The Contractor shall designate areas for equipment cleaning, maintenance, and repair. The Contractor and subcontractor(s) shall utilize those areas. The areas shall be protected by a temporary perimeter berm or filter fabric.

4. Use of detergents for large scale washing is prohibited (e.g., vehicles, buildings, pavement surfaces, etc.)

5. Chemicals, paints, solvents, fertilizers, and other toxic material must be stored in waterproof containers. Except during application, the contents must be kept locked in trucks or within locked storage facilities. Runoff containing such material must be collected, removed from the site, treated, and disposed at an approved solid waste or chemical disposal facility.

6. All on-site fuel tanks shall have fill ports and hose nozzles secured by a lock provided and used by the Contractor at the end of each work day. Each fuel tank shall be of double walled construction or placed in a containment basin designed to hold 110% of the contents of the tank, or both and shall have spill cleanup materials accessible to personnel using filling the tank or dispensing product from the tank.

E. Spill Response Activities

Spills of petroleum, oil, lubricants or other hazardous substances with storm water are subject to documentation, reporting and cleanup requirements. All petroleum, oil, lubricants or other hazardous substances spilled on site must be cleaned up and disposed of in accordance with state and federal regulations. Spills of solid materials (powders, mixes, granules) shall be cleaned up, placed in a sealed container and disposed of in accordance with state and federal regulations. All costs associated with the cleanup and disposal of solid materials to soil shall be borne by the contractor.

For liquid spills to soil of less than 25 gallons, the Contractor shall notify the Owner immediately, shall clean up the spilled material completely and then fill out and retain a spill report form found in Appendix H. The Contractor shall be responsible for all costs associated with required clean-up activities including disposal costs.

For liquid spills of 25 gallons or more of petroleum, oil, lubricants or other hazardous substances to soil, the Contractor shall notify the Owner immediately, shall clean up the spilled material completely and then fill out and retain a spill report form found in Appendix H. The Owner shall notify the DEQ in accordance with Part III.G of the VSMP General Permit. The Contractor shall be responsible for all costs associated with required clean-up activities including disposal costs. The Owner shall notify the DEQ within 24
hours discovery of the spill in accordance with Part III.G of the VSMP General Permit. The Contractor shall supply the Owner with any information requested regarding the spill event and shall cooperate fully with any site inspections by the Owner or other regulatory agencies.

For spills of any amount of petroleum, oil, lubricants or other hazardous substances to the storm sewer system or to state waters or wetlands, the Contractor shall notify the Owner immediately and take such measures as necessary to immediately stop the discharge of the material to the storm sewer system, state waters or wetlands. The Owner shall then notify DEQ immediately upon discovery of the spill in accordance with Part III.G of the VSMP General Permit. The Contractor shall furnish all equipment and manpower requested by the Owner or regulatory agencies to clean up the spilled material and shall supply the Owner with any information requested regarding the spill event and shall cooperate fully with the Owner or other regulatory agencies during and after the cleanup activities. The Contractor shall then fill out and retain a spill report form found in Appendix H.

Refer to Part III.G of the VSMP General Permit for additional information on spilled materials. Copies of the VSMP General Permit and the Registration Statement forms are available on the Department of Environmental Quality web site (http://www.deq.virginia.gov/Programs/Water/StormwaterManagement/VSMPPermits/ConstructionGeneralPermit.aspx). To notify DEQ of a spill call the Pollution Reporting and Environmental Response (PREP) number (757) 518-2077.

VI. LOCAL PLANS

In addition to this SWPPP, construction activities associated with this project must comply with all additional requirements set forth by the City of Norfolk.

VII. INSPECTIONS AND SYSTEM MAINTENANCE

The purpose of site inspections is to assess performance of pollutant controls. The inspections shall be conducted by the Contractor’s designated E&S inspector. The Contractor’s inspector must meet the definition of “Qualified Personnel” as contained in the Virginia Stormwater Management Program regulations:

- A Virginia licensed professional engineer; or,
- Virginia certified Responsible Land Disturber; or,
- Other person who holds a certificate of competency from the Virginia Soil and Water Conservation Board in the area as an erosion and sediment control inspector or erosion and sediment control combined administrator.

Additionally, the Contractor’s inspector must either be someone empowered to implement modifications to this SWPPP and the pollutant control devices, if needed, in order to increase effectiveness to an acceptable level, or someone with the authority to cause such things to happen.
If deficiencies in the erosion and sediment control measures are determined, they shall be recorded on the inspection form by the Contractor and corrective action shall be initiated by the Contractor within the time frame specified below.

Between the time this SWPPP is implemented and final site stabilization is achieved, all disturbed areas and pollutant controls must be inspected at the following intervals:

- not less than once every fourteen (14) calendar days and
- within forty-eight (48) hours following an inspection triggering rainfall event. An inspection “triggering event” is rainfall equaling or exceeding one half inch (0.5”) as measured by the on-site rain gauge within a 24-hour period. The Contractor shall install a rain gauge at the site to determine site specific rainfall conditions.

Based on these inspections, the Contractor shall decide whether it is necessary to modify this SWPPP, add or relocate sediment barriers, or institute other actions required in order to prevent pollutants from leaving the site via storm water runoff. The Contractor has the duty to repair, modify, maintain, or supplement pollutant control measures and take other actions necessary to achieve effective pollutant control.

Examples of particular items to be evaluated during site inspections are listed below. This list is not intended to be comprehensive. During each inspection, the Owner’s and Contractor’s inspectors must evaluate overall pollutant control system performance, as well as the effectiveness of system components. Additional factors should be considered as appropriate to the circumstances.

A. Locations where vehicles enter and exit the site must be inspected for evidence of off-site sediment tracking. A stabilized construction entrance will be constructed where vehicles enter and exit. This entrance will be maintained or supplemented as necessary to prevent sediment from leaving the site on vehicles. Sediment tracked onto public roadways must be shoveled or swept from the roadway and re-deposited on site in a manner that minimizes its off-site release potential.

B. Sediment barriers must be inspected and, if necessary, they must be enlarged or cleaned in order to provide additional capacity. All material excavated from behind sediment barriers shall be stockpiled on the up slope side of the barrier. Additional sediment barriers must be constructed as needed.

C. Inspections will evaluate disturbed areas and areas used for storing materials that are exposed to rainfall for evidence of, or the potential for, pollutants entering the drainage system. If necessary, the materials must be covered or original covers must be repaired or supplemented. Also, protective berms must be constructed, if needed, in order to contain runoff from material storage areas.

D. Grassed areas will be inspected to confirm that a healthy stand of grass is maintained. The site has achieved final stabilization when turf grass cover provides permanent stabilization of the soil surface exclusive of areas that have been paved or covered by building(s). Permanent stabilization is not considered established until a ground cover is achieved that is uniform, mature enough to survive, and will inhibit erosion.
E. All discharge points must be inspected to determine whether erosion control measures are effective in preventing impacts to receiving waters.

Based on inspection results, any modification necessary to increase effectiveness of this SWPPP to an acceptable level shall be made by the Contractor within seven (7) calendar days of the inspection. All modifications to the SWPPP document and approved plan will be noted on the construction plans and communicated to the Owner’s Inspector for the Owner’s Inspector’s written approval prior to implementation. The inspection reports must be completed entirely and additional remarks shall be included if needed to fully describe a situation. An important aspect of the inspection report is the description of additional measures that need to be taken to enhance plan effectiveness. The inspection report must identify whether the site was in compliance with the SWPPP at the time of inspection and specifically identify all incidents of non-compliance.

Inspection reports will be kept on file by the Owner as an integral part of this SWPPP for at least thirty-six (36) months following the month the Notice of Termination is filed with the VDEQ.

It is the responsibility of the Contractor to ensure the adequacy of site storm water pollutant discharge controls. Physical site conditions, weather conditions, or Contractor practices may make it necessary to install more structural controls than are shown on the plans. (For example, localized concentrations of runoff could make it necessary to install additional sediment barriers.) Assessing the need for additional controls and implementing them or adjusting existing controls are key aspects of the effectiveness of this SWPPP until the site achieves final stabilization. The Owner shall be notified by the Contractor should a control fail, be bypassed, or otherwise be ineffective in maintaining sediments on-site and releasing sediment off-site. The Owner will provide notification to the VDEQ in accordance with Part III. G of the VSMP Storm Water General Permit, as necessary.

If it is determined by the Owner’s Inspector that there has been an upset or bypass of the control measures resulting in a release of sediment to State waters, the Owner’s Inspector shall report the bypass or upset to the Virginia Department of Environmental Quality, and Water Conservation Office, and the Regional Office of the Virginia Department of Environmental Quality (VDEQ) within 24 hours of discovery of the unanticipated bypass or upset.

Within five (5) days of making the verbal report to VDEQ, a written report shall be submitted by the Owner containing:

- A description of the noncompliance and its cause
- The period of noncompliance, including exact dates and times
- If the noncompliance has not been corrected, the anticipated time it is expected to continue
- Steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance
APPENDIX A

Registration Statement for Coverage under the VSMP General Permit for Storm Water Discharge from Construction Activities Filed with VDEQ

VSMP Permit Fee Form

Storm Water General Permit for Construction Activities (VAR10)
Registration Statement
General VPDES Permit for Discharges of Stormwater from Construction Activities (VAR10)

(Please Type or Print All Information)

1. Construction Activity Operator: (General permit coverage will be issued to this operator. The Certification in Item #12 must be signed by the appropriate person associated with this operator.)
   Name: ____________________________________________
   Contact: _________________________________________
   Mailing Address: __________________________________
   City: __________________ State: ______ Zip: _______ Phone: __________________________
   Email address (if available): ________________________
   Indicate if DEQ may transmit general permit correspondence electronically: Yes ☐ No ☐

2. Existing General Permit Registration Number (for renewals only): ________________________

3. Name and Location of the Construction Activity:
   Name: Barrada Park Water and Sewer Project, Phase 1 Pump Station #153
   Address (if available): 2500 Hanson Ave
   City: Norfolk State: Virginia Zip: 23504
   County (if not located within a City): __________________________
   Latitude (decimal degrees): __________________________ Longitude (decimal degrees): __________________________

   Name and Location of all Off-site Support Activities to be covered under the general permit:
   Name: ____________________________________________
   Address (if available): _________________________________________
   City: __________________ State: ______ Zip: _______
   County (if not located within a City): __________________________
   Latitude (decimal degrees): __________________________ Longitude (decimal degrees): __________________________

4. Status of the Construction Activity (check only one): Federal ☐ State ☐ Public ☑ Private ☐

5. Nature of the Construction Activity (e.g., commercial, industrial, residential, agricultural, oil and gas, etc.):
   Sanitary sewer pump station

6. Name of the Receiving Water(s) and Hydrologic Unit Code (HUC):
   Name: Lafayette River                       Name: ________________________
   HUC: 02080208                                HUC: ________________________

7. If the discharge is through a Municipal Separate Storm Sewer System (MS4), the name of the MS4 operator:
   City of Norfolk, Virginia

8. Estimated Project Start and Completion Date:
   Start Date (mm/dd/yyyy): 08/2015
   Completion Date (mm/dd/yyyy): 07/2016

9. Total Land Area of Development (to the nearest one-hundredth acre): 0.3
   Estimated Area to be Disturbed (to the nearest one-hundredth acre): 0.3

10. Is the area to be disturbed part of a larger common plan of development or sale? Yes ☐ No ☑

11. A stormwater pollution prevention plan (SWPPP) must be prepared in accordance with the requirements of the General VPDES Permit for Discharges of Stormwater from Construction Activities prior to submitting this Registration Statement. By signing this Registration Statement the operator is certifying that the SWPPP has been prepared.

12. Certification: "I certify under penalty of law that I have read and understand this Registration Statement and that this document and all attachments were prepared in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is to the best of my knowledge and belief true, accurate, and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment for knowing violations."
   Printed Name: __________________________________________
   Signature: __________________________________________
   Title: __________________________________________
   Date: __________________________________________

(Please sign in INK. This Certification must be signed by the appropriate person associated with the operator identified in Item #1.)

07/2014
Instructions for Completing the Registration Statement
General VPDES Permit for Discharges of Stormwater from Construction Activities (VAR10)

GENERAL

A. Coverage Under this General Permit.

Any operator applying for coverage under this general permit who is required to submit a Registration Statement (see Section B below) must submit a complete Registration Statement to the Department. The Registration Statement serves as a Notice of Intent for coverage under the General VPDES Permit for Discharges of Stormwater from Construction Activities (VAR10).

B. Single-family Detached Residential Structures.

Operators with an existing stormwater discharge or proposing a new stormwater discharge associated with the construction of a single-family detached residential structure are not required to submit a Registration Statement or the Department of Environmental Quality (DEQ) portion of the general permit fee.

Operators of these types of discharges are authorized to discharge under this general permit immediately upon the general permit’s effective date of July 1, 2014.

C. To Apply for Permit Coverage.

1. New Construction Activities. Any operator proposing a new stormwater discharge from construction activities shall submit a complete Registration Statement to the Department prior to the commencement of land disturbance, unless exempted by Section B above. Any operator proposing a new stormwater discharge from construction activities in response to a public emergency where the related work requires immediate authorization to avoid imminent endangerment to human health or the environment is immediately authorized to discharge under this general permit and must submit a complete Registration Statement to the Department no later than 30 days after commencing land disturbance; documentation to substantiate the occurrence of the public emergency must accompany the Registration Statement.

2. Existing Construction Activities. Any operator that was authorized to discharge under the general permit issued in 2009, and who intends to continue coverage under this general permit, shall submit a complete Registration Statement to the Department on or before June 1, 2014, unless exempted by Section B above.

D. Where to Submit Registration Statements.

All Registration Statements should be submitted to:

Department of Environmental Quality
Office of Stormwater Management, 10th Floor
P.O. Box 1105
Richmond, VA 23218

LINE-BY-LINE INSTRUCTIONS

Item 1: Construction Activity Operator Information.

"Operator" means the owner or operator of any facility or activity subject to the Stormwater Management Act and regulations. In the context of stormwater associated with a large or small construction activity, operator means any person associated with a construction project that meets either of the following two criteria: (i) the person has direct operational control over construction plans and specifications, including the ability to make modifications to those plans and specifications or (ii) the person has day-to-day operational control of those activities at a project that are necessary to ensure compliance with a stormwater pollution prevention plan for the site or other state permit or VSMP authority permit conditions (i.e., they are authorized to direct workers at a site to carry out activities required by the stormwater pollution prevention plan or comply with other permit conditions).

The entities that are considered operators will commonly consist of the owner or developer of a project (the party with control of project plans and specifications) or the general contractor (the party with day to day operational control of the activities at the project site which are necessary to ensure compliance with the general permit).

Provide the legal name (do not use a colloquial name), contact, mailing address, telephone number, and email address (if available) of the construction activity operator; general permit coverage will be issued to this operator. Indicate if the Department may transmit general permit correspondence electronically.

Item 2: Existing General Permit Registration Number.

For reapplications only, provide the existing general permit registration number for the construction activity. This item does not need to be completed for new construction activities applying for general permit coverage.

Item 3: Name and Location of the Construction Activity Information.

Provide the official name, street address (if available), city or county (if not located within a City) of the construction activity. Also, provide the latitude and longitude in decimal degrees of the approximate center of the construction activity (e.g., N 37.5000, W 77.5000).

Name and Location of Off-site Support Activity Information.

This general permit also authorizes stormwater discharges from support activities (e.g., concrete or asphalt batch plants, equipment staging yards, material storage areas, excavated material disposal areas, borrow areas) located on-site or off-site provided that (i) the support activity is directly related to a construction activity that is required to have general permit coverage; (ii) the support activity is not a commercial operation, nor does it serve multiple unrelated construction activities by different operators; (iii) the support activity does not operate beyond the completion of the construction activity it supports; (iv) the support activity is identified in the registration statement at the time of general permit coverage; (v) appropriate control measures are identified in a SWPPP and implemented to address the discharges from the support activity areas; and (vi) all applicable state, federal, and local approvals are obtained for the support activity.

Provide the official name, street address (if available), City and County (if not located within a City) of all off-site support activities to be covered under this general permit. Also, provide the latitude and longitude in decimal degrees of the approximate center of the off-site support activities (e.g., N 37.5000, W 77.5000). Also, if an off-site support activity is going to be covered under this general permit the total land area of the off-site support activity and the estimated area to be disturbed by the off-site support activity need to be included in Item #9.

Item 4: Status of the Construction Activity.

Indicate the appropriate status (Federal, State, Public, or Private) of the construction activity.

Item 5: Nature of the Construction Activity.

Provide a brief description of the construction activity, such as commercial, residential, agricultural, oil and gas, etc. This list is not all inclusive.

Item 6: Receiving Waters(s) and HUC Information.

Provide the name of the receiving water(s) and corresponding HUC for all stormwater discharges including any stormwater discharges from off-site support activities to be covered under this general permit. Hydrologic Unit Code or HUC is a watershed unit established in the most recent version of Virginia’s 6th order national watershed boundary dataset.

07/2014
Item 7: MS4 Information.

If stormwater is discharged through a municipal separate storm sewer system (MS4), provide the name of the MS4 operator. The name of the MS4 operator is generally the Town, City, County, Institute or Federal facility where the construction activity is located.

Item 8: Construction Activity Start and Completion Date Information.

Provide the estimated start date (month/day/year) of the construction activity. Provide the estimated completion date (month/day/year) of the construction activity.

Item 9: Construction Activity Area Information.

Provide the total area (to the nearest one-hundredth acre) of the development (i.e., the total acreage of the larger common plan of development or sale). Include the total acreage of any off-site support activity to be covered under this general permit.

Provide the estimated area (to the nearest one-hundredth acre) to be disturbed by the construction activity. Include the estimated area of land disturbance that will occur at any off-site support activity to be covered under this general permit.

Item 10: Common Plan of Development or Sale Information.

Indicate if the area to be disturbed by the construction activity is part of a larger common plan of development or sale. Larger common plan of development or sale is defined as a contiguous area where separate and distinct construction may be taking place at different times on different schedules. Plan is broadly defined as any announcement or documentation, including a sign, public notice or hearing, sales pitch, advertisement, drawing, permit application, zoning request, etc., or physical demarcation such as boundary signs, lot stakes, or surveyor markings indicating that construction activities may occur.

Item 11: Stormwater Pollution Prevention Plan (SWPPP).

A Stormwater Pollution Prevention Plan (SWPPP) must be prepared in accordance with the requirements of the General VPDES Permit for Discharges of Stormwater from Construction Activities (VAR10) prior to submitting this Registration Statement. By signing this Registration Statement the operator is certifying that the SWPPP has been prepared.

Item 12: Certification.

A properly authorized individual associated with the operator identified in Item 1 of the Registration Statement is responsible for certifying and signing the Registration Statement. Please sign the Registration Statement in INK.

State statutes provide for severe penalties for submitting false information on the Registration Statement. State regulations require that the Registration Statement be signed as follows:

a. For a corporation: by a responsible corporate officer. For the purpose of this part, a responsible corporate officer means:

   (i) A president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy-making or decision-making functions for the corporation, or

   (ii) the manager of one or more manufacturing, production, or operating facilities, provided the manager is authorized to make management decisions that govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long-term compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

b. For a partnership or sole proprietorship: by a general partner or the proprietor, respectively.

c. For a municipality, state, federal, or other public agency: by either a principal executive officer or ranking elected official. For purposes of this part, a principal executive officer of a public agency includes:

   (i) The chief executive officer of the agency, or

   (ii) A senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency.
Instructions: Applicants for a Construction Activity Individual Permit are required to pay permit application fees. Fees are also required for registration for coverage under a Construction Activity General Permit. Fees must be paid when applications for state permit issuance, reissuance, modification or transfer are submitted. Applications will be considered incomplete if the proper fee is not paid and will not be processed until the fee is received.

The fee schedule for state permits is included with this form. Fees for state permit issuance, reissuance, maintenance, modification and transfer are included. Once you have determined the fee for the type of application you are submitting, complete this form. The original copy of the form and your check or money order payable to “Treasurer of Virginia” should be mailed to:

Department of Environmental Quality
Receipts Control
P.O. Box 1104
Richmond, VA 23218

A copy of this form and a copy of your check or money order should accompany the permit application (or registration statement). You should retain a copy for your records.

Construction Activity Operator:

Name:__________________________________________________________

Contact:_______________________________________________________

Mailing Address:________________________________________________

City:__________________________________ State:________ Zip:_______ Phone:____________________

Email address (if available):_______________________________________

Name and Location of the Construction Activity:

Name:__________________________________________________________

City:________________________________________ State:________ Zip:____________________

County:________________________________________________________

Type of State Permit: ☐ Construction Activity Individual Permit  ☐ Construction Activity General Permit
(from Fee Schedule)

Type of Action: ☐ New Issuance ☐ Reissuance ☐ Maintenance
☐ Modification ☐ Transfer

Amount of Fee Submitted (from Fee Schedule): ______________________________

Existing General Permit Registration Number (if applicable): ____________________________

FOR DEQ USE ONLY

Date: DC #: 
CONSTRUCTION ACTIVITY PERMIT FEE SCHEDULE

A. Individual Permits. The fee for filing a state permit application for a Construction Activity Individual Permit issued by the Board is as follows: (NOTE: Individual permittees pay an annual permit maintenance fee instead of a reapplication fee. The permittee is billed separately by DEQ for the annual permit maintenance fee.)

<table>
<thead>
<tr>
<th>TYPE OF STATE PERMIT</th>
<th>ISSUANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual Permit for Discharges from Construction Activities</td>
<td>$15,000</td>
</tr>
</tbody>
</table>

B. Registration Statements. The fee for filing a state permit application (registration statement) for coverage under a Construction Activity General Permit issued by the Board, including a state or federal agency that does not administer a project in accordance with approved annual standards and specifications, is as follows:

<table>
<thead>
<tr>
<th>TYPE OF STATE PERMIT</th>
<th>ISSUANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>General / Stormwater Management - Small Construction Activity / Land Clearing</td>
<td>$0</td>
</tr>
<tr>
<td>(Single-family detached residential structures within or outside a common plan of development or sale with land-disturbance acreage less than five acres)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>General / Stormwater Management - Small Construction Activity / Land Clearing</td>
<td>$290</td>
</tr>
<tr>
<td>(Areas within common plans of development or sale with land-disturbance acreage less than one acre, except for single-family detached residential structures)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>General / Stormwater Management - Small Construction Activity / Land Clearing</td>
<td>$2,700</td>
</tr>
<tr>
<td>(Sites or areas within common plans of development or sale with land-disturbance acreage equal to or greater than one acre and less than five acres)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>General / Stormwater Management - Large Construction Activity / Land Clearing</td>
<td>$3,400</td>
</tr>
<tr>
<td>(Sites or areas within common plans of development or sale with land-disturbance acreage equal to or greater than five acres and less than 10 acres)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>General / Stormwater Management - Large Construction Activity / Land Clearing</td>
<td>$4,500</td>
</tr>
<tr>
<td>(Sites or areas within common plans of development or sale with land-disturbance acreage equal to or greater than 10 acres and less than 50 acres)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>General / Stormwater Management - Large Construction Activity / Land Clearing</td>
<td>$6,100</td>
</tr>
<tr>
<td>(Sites or areas within common plans of development or sale with land-disturbance acreage equal to or greater than 50 acres and less than 100 acres)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>General / Stormwater Management - Large Construction Activity / Land Clearing</td>
<td>$9,600</td>
</tr>
<tr>
<td>(Sites or areas within common plans of development or sale with land-disturbance acreage equal to or greater than 100 acres)</td>
<td></td>
</tr>
</tbody>
</table>

The fee for filing a state permit application (registration statement) for coverage under a Construction Activity General Permit issued by the Board for a state or federal agency that administers a project in accordance with approved annual standards and specifications is as follows:

<table>
<thead>
<tr>
<th>TYPE OF STATE PERMIT</th>
<th>ISSUANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction General / Stormwater Management - Phase I Land Clearing</td>
<td>$750</td>
</tr>
<tr>
<td>(&quot;Large&quot; Construction Activity - Sites or common plans of development or sale equal to or greater than 5 acres)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction General / Stormwater Management - Phase II Land Clearing</td>
<td>$450</td>
</tr>
<tr>
<td>(&quot;Small&quot; Construction Activity - Sites or common plans of development or sale equal to or greater than 1 acre and less than 5 acres)</td>
<td></td>
</tr>
</tbody>
</table>
C. State Permit Modification or Transfer Fees. The following fees apply to the modification or transfer of a Construction Activity Individual Permit or a Construction Activity General Permit issued by the Board. The fee assessed shall be based on the total disturbed acreage of the construction activity. In addition to the state permit modification fee, modifications resulting in an increase in total disturbed acreage shall pay the difference in the initial Construction Activity General Permit fee paid and the Construction Activity General Permit fee that would have applied for the total disturbed acreage in Section B above.

<table>
<thead>
<tr>
<th>TYPE OF STATE PERMIT</th>
<th>MODIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>General / Stormwater Management - Small Construction Activity / Land Clearing (Single-family detached residential structures within or outside a common plan of development or sale with land-disturbance acreage less than five acres where DEQ is the VSMP authority)</td>
<td>$0</td>
</tr>
<tr>
<td>General / Stormwater Management - Small Construction Activity / Land Clearing (Areas within common plans of development or sale with land disturbance acreage less than one acre, except for single-family detached residential structures)</td>
<td>$20</td>
</tr>
<tr>
<td>General / Stormwater Management - Small Construction Activity / Land Clearing (Sites or areas within common plans of development or sale with land-disturbance acreage equal to or greater than one and less than five acres)</td>
<td>$200</td>
</tr>
<tr>
<td>General / Stormwater Management - Large Construction Activity / Land Clearing (Sites or areas within common plans of development or sale with land-disturbance acreage equal to or greater than five acres and less than 10 acres)</td>
<td>$250</td>
</tr>
<tr>
<td>General / Stormwater Management - Large Construction Activity / Land Clearing (Sites or areas within common plans of development or sale with land-disturbance acreage equal to or greater than 10 acres and less than 50 acres)</td>
<td>$300</td>
</tr>
<tr>
<td>General / Stormwater Management - Large Construction Activity / Land Clearing (Sites or areas within common plans of development or sale with land-disturbance acreage equal to or greater than 50 acres and less than 100 acres)</td>
<td>$450</td>
</tr>
<tr>
<td>General / Stormwater Management - Large Construction Activity / Land Clearing (Sites or areas within common plans of development or sale with land-disturbance acreage equal to or greater than 100 acres)</td>
<td>$700</td>
</tr>
<tr>
<td>Individual Permit for Discharges from Construction Activities</td>
<td>$5,000</td>
</tr>
</tbody>
</table>
D. State Permit Maintenance Fees. The following annual state permit maintenance fees apply to each state permit identified below, including expired permits that have been administratively continued. No annual state permit maintenance fee is required for coverage under a Construction Activity General Permit for a state or federal agency that administers a project in accordance with approved annual standards and specifications.

<table>
<thead>
<tr>
<th>TYPE OF STATE PERMIT</th>
<th>MAINTENANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>General / Stormwater Management - Small Construction Activity / Land Clearing (Single-family detached residential structures within or outside a common plan of development or sale with land-disturbance acreage less than five acres where DEQ is the VSMP authority)</td>
<td>$0</td>
</tr>
<tr>
<td>General / Stormwater Management – Small Construction Activity/Land Clearing (Areas within common plans of development or sale with land disturbance acreage less than one acre, except for single-family detached residential structures)</td>
<td>$50</td>
</tr>
<tr>
<td>General / Stormwater Management – Small Construction Activity/Land Clearing (Sites or areas within common plans of development or sale with land-disturbance acreage equal to or greater than one and less than five acres)</td>
<td>$400</td>
</tr>
<tr>
<td>General / Stormwater Management – Large Construction Activity/Land Clearing (Sites or areas within common plans of development or sale with land-disturbance acreage equal to or greater than five acres and less than 10 acres)</td>
<td>$500</td>
</tr>
<tr>
<td>General / Stormwater Management – Large Construction Activity/Land Clearing (Sites or areas within common plans of development or sale with land-disturbance acreage equal to or greater than 10 acres and less than 50 acres)</td>
<td>$650</td>
</tr>
<tr>
<td>General / Stormwater Management – Large Construction Activity/Land Clearing (Sites or areas within common plans of development or sale with land-disturbance acreage equal to or greater than 50 acres and less than 100 acres)</td>
<td>$900</td>
</tr>
<tr>
<td>General / Stormwater Management – Large Construction Activity/Land Clearing (Sites or areas within common plans of development or sale with land-disturbance acreage equal to or greater than 100 acres)</td>
<td>$1,400</td>
</tr>
<tr>
<td>Individual Permit for Discharges from Construction Activities</td>
<td>$3,000</td>
</tr>
</tbody>
</table>
GENERAL VPDES PERMIT FOR DISCHARGES OF STORMWATER FROM CONSTRUCTION ACTIVITIES

AUTHORIZATION TO DISCHARGE UNDER THE VIRGINIA STORMWATER MANAGEMENT PROGRAM AND THE VIRGINIA STORMWATER MANAGEMENT ACT

In compliance with the provisions of the Clean Water Act, as amended, and pursuant to the Virginia Stormwater Management Act and regulations adopted pursuant thereto, operators of construction activities are authorized to discharge to surface waters within the boundaries of the Commonwealth of Virginia, except those specifically named in State Water Control Board regulations that prohibit such discharges.

The authorized discharge shall be in accordance with this cover page, Part I - Discharge Authorization and Special Conditions, Part II - Stormwater Pollution Prevention Plan, and Part III - Conditions Applicable to All VPDES Permits as set forth herein.
PART I

DISCHARGE AUTHORIZATION AND SPECIAL CONDITIONS

A. Coverage under this general permit.

1. During the period beginning with the date of coverage under this general permit and lasting until the general permit's expiration date, the operator is authorized to discharge stormwater from construction activities.

2. This general permit also authorizes stormwater discharges from support activities (e.g., concrete or asphalt batch plants, equipment staging yards, material storage areas, excavated material disposal areas, borrow areas) located on-site or off-site provided that:
   a. The support activity is directly related to the construction activity that is required to have general permit coverage for discharges of stormwater from construction activities;
   b. The support activity is not a commercial operation, nor does it serve multiple unrelated construction activities by different operators;
   c. The support activity does not operate beyond the completion of the last construction activity it supports;
   d. The support activity is identified in the registration statement at the time of general permit coverage;
   e. Appropriate control measures are identified in a stormwater pollution prevention plan and implemented to address the discharges from the support activity areas; and
   f. All applicable state, federal, and local approvals are obtained for the support activity.

B. Limitations on coverage.

1. Post-construction discharges. This general permit does not authorize stormwater discharges that originate from the site after construction activities have been completed and the site, including any support activity sites covered under the general permit registration, has undergone final stabilization. Post-construction industrial stormwater discharges may need to be covered by a separate VPDES permit.

2. Discharges mixed with nonstormwater. This general permit does not authorize discharges that are mixed with sources of nonstormwater, other than those discharges that are identified in Part I E (Authorized nonstormwater discharges) and are in compliance with this general permit.

3. Discharges covered by another state permit. This general permit does not authorize discharges of stormwater from construction activities that have been covered under an individual permit or required to obtain coverage under an alternative general permit.

4. Impaired waters and TMDL limitation. Discharges of stormwater from construction activities to surface waters identified as impaired in the 2012 § 305(b)/303(d) Water Quality Assessment Integrated Report or for which a TMDL wasteload allocation has been established and approved prior to the term of this general permit for (i) sediment or a sediment-related parameter (i.e., total suspended solids or turbidity) or (ii) nutrients (i.e., nitrogen or phosphorus) are not eligible for coverage under this general permit unless the operator develops, implements, and maintains a SWPPP that minimizes the pollutants of concern and, when applicable, is consistent with the assumptions and requirements of the approved TMDL wasteload allocations. In addition, the operator shall implement the following items:
a. The impaired water(s), approved TMDL(s), and pollutant(s) of concern, when applicable, shall be identified in the SWPPP;

b. Permanent or temporary soil stabilization shall be applied to denuded areas within seven days after final grade is reached on any portion of the site;

c. Nutrients shall be applied in accordance with manufacturer's recommendations or an approved nutrient management plan and shall not be applied during rainfall events; and

d. The applicable SWPPP inspection requirements specified in Part II F 2 shall be amended as follows:

   (1) Inspections shall be conducted at a frequency of (i) at least once every four business days or (ii) at least once every five business days and no later than 48 hours following a measurable storm event. In the event that a measurable storm event occurs when there are more than 48 hours between business days, the inspection shall be conducted on the next business day; and

   (2) Representative inspections used by utility line installation, pipeline construction, or other similar linear construction activities shall inspect all outfalls discharging to surface waters identified as impaired or for which a TMDL wasteload allocation has been established and approved prior to the term of this general permit.

5. Exceptional waters limitation. Discharges of stormwater from construction activities not previously covered under the general permit issued in 2009 to exceptional waters identified in 9VAC25-260-30 A 3 c are not eligible for coverage under this general permit unless the operator implements the following:

   a. The exceptional water(s) shall be identified in the SWPPP;

   b. Permanent or temporary soil stabilization shall be applied to denuded areas within seven days after final grade is reached on any portion of the site;

   c. Nutrients shall be applied in accordance with manufacturer's recommendations or an approved nutrient management plan and shall not be applied during rainfall events; and

   d. The applicable SWPPP inspection requirements specified in Part II F 2 shall be amended as follows:

      (1) Inspections shall be conducted at a frequency of (i) at least once every four business days or (ii) at least once every five business days and no later than 48 hours following a measurable storm event. In the event that a measurable storm event occurs when there are more than 48 hours between business days, the inspection shall be conducted on the next business day; and

      (2) Representative inspections used by utility line installation, pipeline construction, or other similar linear construction activities shall inspect all outfalls discharging to exceptional waters.

6. There shall be no discharge of floating solids or visible foam in other than trace amounts.

C. Commingled discharges. Discharges authorized by this general permit may be commingled with other sources of stormwater that are not required to be covered under a state permit, so long as the commingled discharge is in compliance with this general permit. Discharges authorized by a separate state or VPDES permit may be commingled with discharges authorized by this general permit so long as all such discharges comply with all applicable state and VPDES permit requirements.
D. Prohibition of nonstormwater discharges. Except as provided in Parts I A 2, I C, and I E, all discharges covered by this general permit shall be composed entirely of stormwater associated with construction activities. All other discharges including the following are prohibited:

1. Wastewater from washout of concrete;
2. Wastewater from the washout and cleanout of stucco, paint, form release oils, curing compounds, and other construction materials;
3. Fuels, oils, or other pollutants used in vehicle and equipment operation and maintenance;
4. Oils, toxic substances, or hazardous substances from spills or other releases; and
5. Soaps, solvents, or detergents used in equipment and vehicle washing.

E. Authorized nonstormwater discharges. The following nonstormwater discharges from construction activities are authorized by this general permit when discharged in compliance with this general permit:

1. Discharges from firefighting activities;
2. Fire hydrant flushings;
3. Waters used to wash vehicles or equipment where soaps, solvents, or detergents have not been used and the wash water has been filtered, settled, or similarly treated prior to discharge;
4. Water used to control dust that has been filtered, settled, or similarly treated prior to discharge;
5. Potable water sources, including uncontaminated waterline flushings;
6. Routine external building wash down where soaps, solvents or detergents have not been used and the wash water has been filtered, settled, or similarly treated prior to discharge;
7. Pavement wash waters where spills or leaks of toxic or hazardous materials have not occurred (or where all spilled or leaked material has been removed prior to washing); where soaps, solvents, or detergents have not been used; and where the wash water has been filtered, settled, or similarly treated prior to discharge;
8. Uncontaminated air conditioning or compressor condensate;
9. Uncontaminated ground water or spring water;
10. Foundation or footing drains where flows are not contaminated with process materials such as solvents;
11. Uncontaminated excavation dewatering, including dewatering of trenches and excavations that have been filtered, settled, or similarly treated prior to discharge; and
12. Landscape irrigation.

F. Termination of general permit coverage.

1. The operator of the construction activity shall submit a notice of termination in accordance with 9VAC25-880-60 to the VSMP authority after one or more of the following conditions have been met:
a. Necessary permanent control measures included in the SWPPP for the site are in place and functioning effectively and final stabilization has been achieved on all portions of the site for which the operator is responsible. When applicable, long term responsibility and maintenance requirements shall be recorded in the local land records prior to the submission of a notice of termination;

b. Another operator has assumed control over all areas of the site that have not been finally stabilized and obtained coverage for the ongoing discharge;

c. Coverage under an alternative VPDES or state permit has been obtained; or

d. For residential construction only, temporary soil stabilization has been completed and the residence has been transferred to the homeowner.

2. The notice of termination should be submitted no later than 30 days after one of the above conditions in subdivision 1 of this subsection is met. Authorization to discharge terminates at midnight on the date that the notice of termination is submitted for the conditions set forth in subdivisions 1 b through 1 d of this subsection. Termination of authorizations to discharge for the conditions set forth in subdivision 1 a of this subsection shall be effective upon notification from the department that the provisions of subdivision 1 a of this subsection have been met or 60 days after submittal of the notice of termination, whichever occurs first.

3. The notice of termination shall be signed in accordance with Part III K of this general permit.

G. Water quality protection.

1. The operator must select, install, implement and maintain control measures as identified in the SWPPP at the construction site that minimize pollutants in the discharge as necessary to ensure that the operator's discharge does not cause or contribute to an excursion above any applicable water quality standard.

2. If it is determined by the department that the operator's discharges are causing, have reasonable potential to cause, or are contributing to an excursion above any applicable water quality standard, the department, in consultation with the VSMP authority, may take appropriate enforcement action and require the operator to:

   a. Modify or implement additional control measures in accordance with Part II B to adequately address the identified water quality concerns;

   b. Submit valid and verifiable data and information that are representative of ambient conditions and indicate that the receiving water is attaining water quality standards; or

   c. Submit an individual permit application in accordance with 9VAC25-870-410 B 3.

All written responses required under this chapter must include a signed certification consistent with Part III K.
PART II

STORMWATER POLLUTION PREVENTION PLAN

A stormwater pollution prevention plan (SWPPP) shall be developed prior to the submission of a registration statement and implemented for the construction activity, including any support activity, covered by this general permit. SWPPPs shall be prepared in accordance with good engineering practices. Construction activities that are part of a larger common plan of development or sale and disturb less than one acre may utilize a SWPPP template provided by the department and need not provide a separate stormwater management plan if one has been prepared and implemented for the larger common plan of development or sale.

The SWPPP requirements of this general permit may be fulfilled by incorporating by reference other plans such as a spill prevention control and countermeasure (SPCC) plan developed for the site under § 311 of the federal Clean Water Act or best management practices (BMP) programs otherwise required for the facility provided that the incorporated plan meets or exceeds the SWPPP requirements of Part II A. All plans incorporated by reference into the SWPPP become enforceable under this general permit. If a plan incorporated by reference does not contain all of the required elements of the SWPPP, the operator must develop the missing elements and include them in the SWPPP.

Any operator that was authorized to discharge under the general permit issued in 2009, and that intends to continue coverage under this general permit, shall update its stormwater pollution prevention plan to comply with the requirements of this general permit no later than 60 days after the date of coverage under this general permit.

A. Stormwater pollution prevention plan contents. The SWPPP shall include the following items:

1. General information.
   a. A signed copy of the registration statement, if required, for coverage under the general VPDES permit for discharges of stormwater from construction activities;
   b. Upon receipt, a copy of the notice of coverage under the general VPDES permit for discharges of stormwater from construction activities (i.e., notice of coverage letter);
   c. Upon receipt, a copy of the general VPDES permit for discharges of stormwater from construction activities;
   d. A narrative description of the nature of the construction activity, including the function of the project (e.g., low density residential, shopping mall, highway, etc.);
   e. A legible site plan identifying:
      (1) Directions of stormwater flow and approximate slopes anticipated after major grading activities;
      (2) Limits of land disturbance including steep slopes and natural buffers around surface waters that will not be disturbed;
      (3) Locations of major structural and nonstructural control measures, including sediment basins and traps, perimeter dikes, sediment barriers, and other measures intended to filter, settle, or similarly treat sediment, that will be installed between disturbed areas and the undisturbed vegetated areas in order to increase sediment removal and maximize stormwater infiltration;
      (4) Locations of surface waters;
(5) Locations where concentrated stormwater is discharged;

(6) Locations of support activities, when applicable and when required by the VSMP authority, including but not limited to (i) areas where equipment and vehicle washing, wheel wash water, and other wash water is to occur; (ii) storage areas for chemicals such as acids, fuels, fertilizers, and other lawn care chemicals; (iii) concrete wash out areas; (iv) vehicle fueling and maintenance areas; (v) sanitary waste facilities, including those temporarily placed on the construction site; and (vi) construction waste storage; and

(7) When applicable, the location of the on-site rain gauge or the methodology established in consultation with the VSMP authority used to identify measurable storm events for inspection purposes.

2. Erosion and sediment control plan.

a. An erosion and sediment control plan approved by the VESCP authority as authorized under the Erosion and Sediment Control Regulations (9VAC25-840), an "agreement in lieu of a plan" as defined in 9VAC25-840-10 from the VESCP authority, or an erosion and sediment control plan prepared in accordance with annual standards and specifications approved by the department. Any operator proposing a new stormwater discharge from construction activities that is not required to obtain erosion and sediment control plan approval from a VESCP authority or does not adopt department-approved annual standards and specifications shall submit the erosion and sediment control plan to the department for review and approval.

b. All erosion and sediment control plans shall include a statement describing the maintenance responsibilities required for the erosion and sediment controls used.

c. A properly implemented approved erosion and sediment control plan, "agreement in lieu of a plan," or erosion and sediment control plan prepared in accordance with department-approved annual standards and specifications, adequately:

(1) Controls the volume and velocity of stormwater runoff within the site to minimize soil erosion;

(2) Controls stormwater discharges, including peak flow rates and total stormwater volume, to minimize erosion at outlets and to minimize downstream channel and stream bank erosion;

(3) Minimizes the amount of soil exposed during the construction activity;

(4) Minimizes the disturbance of steep slopes;

(5) Minimizes sediment discharges from the site in a manner that addresses (i) the amount, frequency, intensity, and duration of precipitation; (ii) the nature of resulting stormwater runoff; and (iii) soil characteristics, including the range of soil particle sizes present on the site;

(6) Provides and maintains natural buffers around surface waters, directs stormwater to vegetated areas to increase sediment removal, and maximizes stormwater infiltration, unless infeasible;

(7) Minimizes soil compaction and, unless infeasible, preserves topsoil;

(8) Ensures that stabilization of disturbed areas will be initiated immediately whenever any clearing, grading, excavating, or other land-disturbing activities have permanently ceased on any portion of the site, or temporarily ceased on any portion of the site and will not resume for a period exceeding 14 days; and
(9) Utilizes outlet structures that withdraw stormwater from the surface (i.e., above the permanent pool or wet storage water surface elevation), unless infeasible, when discharging from sediment basins or sediment traps.


a. New construction activities. A stormwater management plan approved by the VSMP authority as authorized under the Virginia Stormwater Management Program (VSMP) Regulation (9VAC25-870), or an "agreement in lieu of a stormwater management plan" as defined in 9VAC25-870-10 from the VSMP authority, or a stormwater management plan prepared in accordance with annual standards and specifications approved by the department. Any operator proposing a new stormwater discharge from construction activities that is not required to obtain stormwater management plan approval from a VSMP authority or does not adopt department-approved annual standards and specifications shall submit the stormwater management plan to the department for review and approval.

b. Existing construction activities. Any operator that was authorized to discharge under the general permit issued in 2009, and that intends to continue coverage under this general permit, shall ensure compliance with the requirements of 9VAC25-870-93 through 9VAC25-870-99 of the VSMP Regulation, including but not limited to the water quality and quantity requirements. The SWPPP shall include a description of, and all necessary calculations supporting, all post-construction stormwater management measures that will be installed prior to the completion of the construction process to control pollutants in stormwater discharges after construction operations have been completed. Structural measures should be placed on upland soils to the degree possible. Such measures must be designed and installed in accordance with applicable VESC P authority, VSMP authority, state, and federal requirements, and any necessary permits must be obtained.

4. Pollution prevention plan. A pollution prevention plan that addresses potential pollutant-generating activities that may reasonably be expected to affect the quality of stormwater discharges from the construction activity, including any support activity. The pollution prevention plan shall:

a. Identify the potential pollutant-generating activities and the pollutant that is expected to be exposed to stormwater;

b. Describe the location where the potential pollutant-generating activities will occur, or if identified on the site plan, reference the site plan;

c. Identify all nonstormwater discharges, as authorized in Part I E of this general permit, that are or will be commingled with stormwater discharges from the construction activity, including any applicable support activity;

d. Identify the person responsible for implementing the pollution prevention practice or practices for each pollutant-generating activity (if other than the person listed as the qualified personnel);

e. Describe the pollution prevention practices and procedures that will be implemented to:

   (1) Prevent and respond to leaks, spills, and other releases including (i) procedures for expeditiously stopping, containing, and cleaning up spills, leaks, and other releases; and (ii) procedures for reporting leaks, spills, and other releases in accordance with Part III G;

   (2) Prevent the discharge of spilled and leaked fuels and chemicals from vehicle fueling and maintenance activities (e.g., providing secondary containment such as spill berms, decks, spill containment pallets, providing cover where appropriate, and having spill kits readily available);
(3) Prevent the discharge of soaps, solvents, detergents, and wash water from construction materials, including the clean-up of stucco, paint, form release oils, and curing compounds (e.g., providing (i) cover (e.g., plastic sheeting or temporary roofs) to prevent contact with stormwater; (ii) collection and proper disposal in a manner to prevent contact with stormwater; and (iii) a similarly effective means designed to prevent discharge of these pollutants);

(4) Minimize the discharge of pollutants from vehicle and equipment washing, wheel wash water, and other types of washing (e.g., locating activities away from surface waters and stormwater inlets or conveyance and directing wash waters to sediment basins or traps, using filtration devices such as filter bags or sand filters, or using similarly effective controls);

(5) Direct concrete wash water into a leak-proof container or leak-proof settling basin. The container or basin shall be designed so that no overflows can occur due to inadequate sizing or precipitation. Hardened concrete wastes shall be removed and disposed of in a manner consistent with the handling of other construction wastes. Liquid concrete wastes shall be removed and disposed of in a manner consistent with the handling of other construction wash waters and shall not be discharged to surface waters;

(6) Minimize the discharge of pollutants from storage, handling, and disposal of construction products, materials, and wastes including (i) building products such as asphalt sealants, copper flashing, roofing materials, adhesives, and concrete admixtures; (ii) pesticides, herbicides, insecticides, fertilizers, and landscape materials; and (iii) construction and domestic wastes such as packaging materials, scrap construction materials, masonry products, timber, pipe and electrical cuttings, plastics, Styrofoam, concrete, and other trash or building materials;

(7) Prevent the discharge of fuels, oils, and other petroleum products, hazardous or toxic wastes, and sanitary wastes;

(8) Address any other discharge from the potential pollutant-generating activities not addressed above; and

f. Describe procedures for providing pollution prevention awareness of all applicable wastes, including any wash water, disposal practices, and applicable disposal locations of such wastes, to personnel in order to comply with the conditions of this general permit. The operator shall implement the procedures described in the SWPPP.

5. SWPPP requirements for discharges to impaired waters, surface waters with an applicable TMDL wasteload allocation established and approved prior to the term of this general permit, and exceptional waters. The SWPPP shall:

a. Identify the impaired water(s), approved TMDL(s), pollutant(s) of concern, and exceptional waters identified in 9VAC25-260-30 A 3 c, when applicable;

b. Provide clear direction that:

(1) Permanent or temporary soil stabilization shall be applied to denuded areas within seven days after final grade is reached on any portion of the site;

(2) Nutrients shall be applied in accordance with manufacturer’s recommendations or an approved nutrient management plan and shall not be applied during rainfall events; and

(3) A modified inspection schedule shall be implemented in accordance with Part I B 4 or Part I B 5.
6. Qualified personnel. The name, phone number, and qualifications of the qualified personnel conducting inspections required by this general permit.

7. Delegation of authority. The individuals or positions with delegated authority, in accordance with Part III K, to sign inspection reports or modify the SWPPP.

8. SWPPP signature. The SWPPP shall be signed and dated in accordance with Part III K.

B. SWPPP amendments, modification, and updates.

1. The operator shall amend the SWPPP whenever there is a change in the design, construction, operation, or maintenance that has a significant effect on the discharge of pollutants to surface waters and that has not been previously addressed in the SWPPP.

2. The SWPPP must be amended if, during inspections or investigations by the operator's qualified personnel, or by local, state, or federal officials, it is determined that the existing control measures are ineffective in minimizing pollutants in discharges from the construction activity. Revisions to the SWPPP shall include additional or modified control measures designed and implemented to correct problems identified. If approval by the VESCP authority, VSMP authority, or department is necessary for the control measure, revisions to the SWPPP shall be completed no later than seven calendar days following approval. Implementation of these additional or modified control measures must be accomplished as described in Part II G.

3. The SWPPP must clearly identify the contractor(s) that will implement and maintain each control measure identified in the SWPPP. The SWPPP shall be amended to identify any new contractor that will implement and maintain a control measure.

4. The operator shall update the SWPPP no later than seven days following any modification to its implementation. All modifications or updates to the SWPPP shall be noted and shall include the following items:

   a. A record of dates when:

      (1) Major grading activities occur;

      (2) Construction activities temporarily or permanently cease on a portion of the site; and

      (3) Stabilization measures are initiated;

   b. Documentation of replaced or modified controls where periodic inspections or other information have indicated that the controls have been used inappropriately or incorrectly and where modified as soon as possible;

   c. Areas that have reached final stabilization and where no further SWPPP or inspection requirements apply;

   d. All properties that are no longer under the legal control of the operator and the dates on which the operator no longer had legal control over each property;

   e. The date of any prohibited discharges, the discharge volume released, and what actions were taken to minimize the impact of the release;

   f. Measures taken to prevent the reoccurrence of any prohibited discharge; and

   g. Measures taken to address any evidence identified as a result of an inspection required under Part II F.
5. Amendments, modifications, or updates to the SWPPP shall be signed in accordance with Part III K.

C. Public Notification. Upon commencement of land disturbance, the operator shall post conspicuously a copy of the notice of coverage letter near the main entrance of the construction activity. For linear projects, the operator shall post the notice of coverage letter at a publicly accessible location near an active part of the construction project (e.g., where a pipeline crosses a public road). The operator shall maintain the posted information until termination of general permit coverage as specified in Part I F.

D. SWPPP availability.

1. Operators with day-to-day operational control over SWPPP implementation shall have a copy of the SWPPP available at a central location on-site for use by those identified as having responsibilities under the SWPPP whenever they are on the construction site.

2. The operator shall make the SWPPP and all amendments, modifications, and updates available upon request to the department, the VSMP authority, the EPA, the VESCP authority, local government officials, or the operator of a municipal separate storm sewer system receiving discharges from the construction activity. If an on-site location is unavailable to store the SWPPP when no personnel are present, notice of the SWPPP's location must be posted near the main entrance of the construction site.

3. The operator shall make the SWPPP available for public review in an electronic format or in hard copy. Information for public access to the SWPPP shall be posted and maintained in accordance with Part II C. If not provided electronically, public access to the SWPPP may be arranged upon request at a time and at a publicly accessible location convenient to the operator or his designee but shall be no less than once per month and shall be during normal business hours. Information not required to be contained within the SWPPP by this general permit is not required to be released.

E. SWPPP implementation. The operator shall implement the SWPPP and subsequent amendments, modifications, and updates from commencement of land disturbance until termination of general permit coverage as specified in Part I F.

1. All control measures must be properly maintained in effective operating condition in accordance with good engineering practices and, where applicable, manufacturer specifications. If a site inspection required by Part II F identifies a control measure that is not operating effectively, corrective action(s) shall be completed as soon as practicable, but no later than seven days after discovery or a longer period as established by the VSMP authority, to maintain the continued effectiveness of the control measures.

2. If site inspections required by Part II F identify an existing control measure that needs to be modified or if an additional control measure is necessary for any reason, implementation shall be completed prior to the next anticipated measurable storm event. If implementation prior to the next anticipated measurable storm event is impracticable, then alternative control measures shall be implemented as soon as practicable, but no later than seven days after discovery or a longer period as established by the VSMP authority.

F. SWPPP Inspections.

1. Personnel responsible for on-site and off-site inspections. Inspections required by this general permit shall be conducted by the qualified personnel identified by the operator in the SWPPP. The operator is responsible for insuring that the qualified personnel conduct the inspection.

2. Inspection schedule.

   a. Inspections shall be conducted at a frequency of:
(1) At least once every five business days; or

(2) At least once every 10 business days and no later than 48 hours following a measurable storm event. In the event that a measurable storm event occurs when there are more than 48 hours between business days, the inspection shall be conducted no later than the next business day.

b. Where areas have been temporarily stabilized or land-disturbing activities will be suspended due to continuous frozen ground conditions and stormwater discharges are unlikely, the inspection frequency may be reduced to once per month. If weather conditions (such as above freezing temperatures or rain or snow events) make discharges likely, the operator shall immediately resume the regular inspection frequency.

c. Representative inspections may be utilized for utility line installation, pipeline construction, or other similar linear construction activities provided that:

(1) Temporary or permanent soil stabilization has been installed and vehicle access may compromise the temporary or permanent soil stabilization and potentially cause additional land disturbance increasing the potential for erosion;

(2) Inspections occur on the same frequency as other construction activities;

(3) Control measures are inspected along the construction site 0.25 miles above and below each access point (i.e., where a roadway, undisturbed right-of-way, or other similar feature intersects the construction activity and access does not compromise temporary or permanent soil stabilization); and

(4) Inspection locations are provided in the report required by Part II F.

3. Inspection requirements.

a. As part of the inspection, the qualified personnel shall:

(1) Record the date and time of the inspection and when applicable the date and rainfall amount of the last measurable storm event;

(2) Record the information and a description of any discharges occurring at the time of the inspection;

(3) Record any land-disturbing activities that have occurred outside of the approved erosion and sediment control plan;

(4) Inspect the following for installation in accordance with the approved erosion and sediment control plan, identification of any maintenance needs, and evaluation of effectiveness in minimizing sediment discharge, including whether the control has been inappropriately or incorrectly used:

(a) All perimeter erosion and sediment controls, such as silt fence;

(b) Soil stockpiles, when applicable, and borrow areas for stabilization or sediment trapping measures;

(c) Completed earthen structures, such as dams, dikes, ditches, and diversions for stabilization;
(d) Cut and fill slopes;

(e) Sediment basins and traps, sediment barriers, and other measures installed to control sediment discharge from stormwater;

(f) Temporary or permanent channel, flume, or other slope drain structures installed to convey concentrated runoff down cut and fill slopes;

(g) Storm inlets that have been made operational to ensure that sediment laden stormwater does not enter without first being filtered or similarly treated; and

(h) Construction vehicle access routes that intersect or access paved roads for minimizing sediment tracking;

(5) Inspect areas that have reached final grade or that will remain dormant for more than 14 days for initiation of stabilization activities;

(6) Inspect areas that have reached final grade or that will remain dormant for more than 14 days for completion of stabilization activities within seven days of reaching grade or stopping work;

(7) Inspect for evidence that the approved erosion and sediment control plan, "agreement in lieu of a plan," or erosion and sediment control plan prepared in accordance with department-approved annual standards and specifications has not been properly implemented. This includes but is not limited to:

   (a) Concentrated flows of stormwater in conveyances such as rills, rivulets or channels that have not been filtered, settled, or similarly treated prior to discharge, or evidence thereof;

   (b) Sediment laden or turbid flows of stormwater that have not been filtered or settled to remove sediments prior to discharge;

   (c) Sediment deposition in areas that drain to unprotected stormwater inlets or catch basins that discharge to surface waters. Inlets and catch basins with failing sediments controls due to improper installation, lack of maintenance, or inadequate design are considered unprotected;

   (d) Sediment deposition on any property (including public and private streets) outside of the construction activity covered by this general permit;

   (e) Required stabilization has not been initiated or completed on portions of the site;

   (f) Sediment basins without adequate wet or dry storage volume or sediment basins that allow the discharge of stormwater from below the surface of the wet storage portion of the basin;

   (g) Sediment traps without adequate wet or dry storage or sediment traps that allow the discharge of stormwater from below the surface of the wet storage portion of the trap; and

   (h) Land disturbance outside of the approved area to be disturbed;

(8) Inspect pollutant generating activities identified in the pollution prevention plan for the proper implementation, maintenance and effectiveness of the procedures and practices;

(9) Identify any pollutant generating activities not identified in the pollution prevention plan; and
(10) Identify and document the presence of any evidence of the discharge of pollutants prohibited by this general permit.

4. Inspection report. Each inspection report shall include the following items:

   a. The date and time of the inspection and when applicable, the date and rainfall amount of the last measurable storm event;
   
   b. Summarized findings of the inspection;
   
   c. The location(s) of prohibited discharges;
   
   d. The location(s) of control measures that require maintenance;
   
   e. The location(s) of control measures that failed to operate as designed or proved inadequate or inappropriate for a particular location;
   
   f. The location(s) where any evidence identified under Part II F 3 a (7) exists;
   
   g. The location(s) where any additional control measure is needed that did not exist at the time of inspection;
   
   h. A list of corrective actions required (including any changes to the SWPPP that are necessary) as a result of the inspection or to maintain permit compliance;
   
   i. Documentation of any corrective actions required from a previous inspection that have not been implemented; and
   
   j. The date and signature of the qualified personnel and the operator or its duly authorized representative.

The inspection report and any actions taken in accordance with Part II must be retained by the operator as part of the SWPPP for at least three years from the date that general permit coverage expires or is terminated. The inspection report shall identify any incidents of noncompliance. Where an inspection report does not identify any incidents of noncompliance, the report shall contain a certification that the construction activity is in compliance with the SWPPP and this general permit. The report shall be signed in accordance with Part III K of this general permit.

G. Corrective actions.

1. The operator shall implement the corrective action(s) identified as a result of an inspection as soon as practicable but no later than seven days after discovery or a longer period as approved by the VSMP authority. If approval of a corrective action by a regulatory authority (e.g., VSMP authority, VESCP authority, or the department) is necessary, additional control measures shall be implemented to minimize pollutants in stormwater discharges until such approvals can be obtained.

2. The operator may be required to remove accumulated sediment deposits located outside of the construction activity covered by this general permit as soon as practicable in order to minimize environmental impacts. The operator shall notify the VSMP authority and the department as well as obtain all applicable federal, state, and local authorizations, approvals, and permits prior to the removal of sediments accumulated in surface waters including wetlands.
PART III
CONDITIONS APPLICABLE TO ALL VPDES PERMITS

NOTE: Discharge monitoring is not required for this general permit. If the operator chooses to monitor stormwater discharges or control measures, the operator must comply with the requirements of subsections A, B, and C, as appropriate.

A. Monitoring.

1. Samples and measurements taken for the purpose of monitoring shall be representative of the monitoring activity.

2. Monitoring shall be conducted according to procedures approved under 40 CFR Part 136 or alternative methods approved by the U.S. Environmental Protection Agency, unless other procedures have been specified in this general permit. Analyses performed according to test procedures approved under 40 CFR Part 136 shall be performed by an environmental laboratory certified under regulations adopted by the Department of General Services (1VAC30-45 or 1VAC30-46).

3. The operator shall periodically calibrate and perform maintenance procedures on all monitoring and analytical instrumentation at intervals that will ensure accuracy of measurements.

B. Records.

1. Monitoring records and reports shall include:
   a. The date, exact place, and time of sampling or measurements;
   b. The individual(s) who performed the sampling or measurements;
   c. The date(s) and time(s) analyses were performed;
   d. The individual(s) who performed the analyses;
   e. The analytical techniques or methods used; and
   f. The results of such analyses.

2. The operator shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this general permit, and records of all data used to complete the registration statement for this general permit, for a period of at least three years from the date of the sample, measurement, report or request for coverage. This period of retention shall be extended automatically during the course of any unresolved litigation regarding the regulated activity or regarding control standards applicable to the operator, or as requested by the board.

C. Reporting monitoring results.

1. The operator shall update the SWPPP to include the results of the monitoring as may be performed in accordance with this general permit, unless another reporting schedule is specified elsewhere in this general permit.

2. Monitoring results shall be reported on a discharge monitoring report (DMR); on forms provided, approved or specified by the department; or in any format provided that the date, location, parameter, method, and result of the monitoring activity are included.
3. If the operator monitors any pollutant specifically addressed by this general permit more frequently than required by this general permit using test procedures approved under 40 CFR Part 136 or using other test procedures approved by the U.S. Environmental Protection Agency or using procedures specified in this general permit, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the DMR or reporting form specified by the department.

4. Calculations for all limitations which require averaging of measurements shall utilize an arithmetic mean unless otherwise specified in this general permit.

D. Duty to provide information. The operator shall furnish, within a reasonable time, any information which the board may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this general permit or to determine compliance with this general permit. The board, department, EPA, or VSMP authority may require the operator to furnish, upon request, such plans, specifications, and other pertinent information as may be necessary to determine the effect of the wastes from his discharge on the quality of surface waters, or such other information as may be necessary to accomplish the purposes of the CWA and the Virginia Stormwater Management Act. The operator shall also furnish to the board, department, EPA, or VSMP authority, upon request, copies of records required to be kept by this general permit.

E. Compliance schedule reports. Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this general permit shall be submitted no later than 14 days following each schedule date.

F. Unauthorized stormwater discharges. Pursuant to § 62.1-44.5 of the Code of Virginia, except in compliance with a state permit issued by the department, it shall be unlawful to cause a stormwater discharge from a construction activity.

G. Reports of unauthorized discharges. Any operator who discharges or causes or allows a discharge of sewage, industrial waste, other wastes or any noxious or deleterious substance or a hazardous substance or oil in an amount equal to or in excess of a reportable quantity established under either 40 CFR Part 110, 40 CFR Part 117, 40 CFR Part 302, or § 62.1-44.34:19 of the Code of Virginia that occurs during a 24-hour period into or upon surface waters or who discharges or causes or allows a discharge that may reasonably be expected to enter surface waters, shall notify the Department of Environmental Quality of the discharge immediately upon discovery of the discharge, but in no case later than within 24 hours after said discovery. A written report of the unauthorized discharge shall be submitted to the department and the VSMP authority within five days of discovery of the discharge. The written report shall contain:

1. A description of the nature and location of the discharge;
2. The cause of the discharge;
3. The date on which the discharge occurred;
4. The length of time that the discharge continued;
5. The volume of the discharge;
6. If the discharge is continuing, how long it is expected to continue;
7. If the discharge is continuing, what the expected total volume of the discharge will be; and
8. Any steps planned or taken to reduce, eliminate and prevent a recurrence of the present discharge or any future discharges not authorized by this general permit.
Discharges reportable to the department and the VSMP authority under the immediate reporting requirements of other regulations are exempted from this requirement.

H. Reports of unusual or extraordinary discharges. If any unusual or extraordinary discharge including a "bypass" or "upset," as defined herein, should occur from a facility and the discharge enters or could be expected to enter surface waters, the operator shall promptly notify, in no case later than within 24 hours, the department and the VSMP authority by telephone after the discovery of the discharge. This notification shall provide all available details of the incident, including any adverse effects on aquatic life and the known number of fish killed. The operator shall reduce the report to writing and shall submit it to the department and the VSMP authority within five days of discovery of the discharge in accordance with Part III I 2. Unusual and extraordinary discharges include but are not limited to any discharge resulting from:

1. Unusual spillage of materials resulting directly or indirectly from processing operations;
2. Breakdown of processing or accessory equipment;
3. Failure or taking out of service of some or all of the facilities; and
4. Flooding or other acts of nature.

I. Reports of noncompliance. The operator shall report any noncompliance which may adversely affect surface waters or may endanger public health.

1. An oral report to the department and the VSMP authority shall be provided within 24 hours from the time the operator becomes aware of the circumstances. The following shall be included as information that shall be reported within 24 hours under this subdivision:
   a. Any unanticipated bypass; and
   b. Any upset that causes a discharge to surface waters.

2. A written report shall be submitted within five days and shall contain:
   a. A description of the noncompliance and its cause;
   b. The period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and
   c. Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

   The department may waive the written report on a case-by-case basis for reports of noncompliance under Part III I if the oral report has been received within 24 hours and no adverse impact on surface waters has been reported.

3. The operator shall report all instances of noncompliance not reported under Part III I 1 or 2 in writing as part of the SWPPP. The reports shall contain the information listed in Part III I 2.

NOTE: The reports required in Part III G, H and I shall be made to the department and the VSMP authority. Reports may be made by telephone, email, or by fax. For reports outside normal working hours, leaving a recorded message shall fulfill the immediate reporting requirement. For emergencies, the Virginia Department of Emergency Management maintains a 24-hour telephone service at 1-800-468-8892.
4. Where the operator becomes aware of a failure to submit any relevant facts, or submittal of incorrect information in any report, including a registration statement, to the department or the VSMP authority, the operator shall promptly submit such facts or correct information.

J. Notice of planned changes.

1. The operator shall give notice to the department and the VSMP authority as soon as possible of any planned physical alterations or additions to the permitted facility or activity. Notice is required only when:
   a. The operator plans an alteration or addition to any building, structure, facility, or installation that may meet one of the criteria for determining whether a facility is a new source in 9VAC25-870-420;
   b. The operator plans an alteration or addition that would significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants that are not subject to effluent limitations in this general permit; or

2. The operator shall give advance notice to the department and VSMP authority of any planned changes in the permitted facility or activity, which may result in noncompliance with state permit requirements.

K. Signatory requirements.

1. Registration statement. All registration statements shall be signed as follows:
   a. For a corporation: by a responsible corporate officer. For the purpose of this chapter, a responsible corporate officer means: (i) a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy-making or decision-making functions for the corporation; or (ii) the manager of one or more manufacturing, production, or operating facilities, provided the manager is authorized to make management decisions that govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long-term compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for state permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;
   b. For a partnership or sole proprietorship: by a general partner or the proprietor, respectively; or
   c. For a municipality, state, federal, or other public agency: by either a principal executive officer or ranking elected official. For purposes of this chapter, a principal executive officer of a public agency includes: (i) the chief executive officer of the agency or (ii) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency.

2. Reports, etc. All reports required by this general permit, including SWPPPs, and other information requested by the board or the department shall be signed by a person described in Part III K 1 or by a duly authorized representative of that person. A person is a duly authorized representative only if:
   a. The authorization is made in writing by a person described in Part III K 1;
   b. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the operator. (A duly authorized
representative may thus be either a named individual or any individual occupying a named position); and

c. The signed and dated written authorization is included in the SWPPP. A copy must be provided to the department and VSMP authority, if requested.

3. Changes to authorization. If an authorization under Part III K 2 is no longer accurate because a different individual or position has responsibility for the overall operation of the construction activity, a new authorization satisfying the requirements of Part III K 2 shall be submitted to the VSMP authority as the administering entity for the board prior to or together with any reports or information to be signed by an authorized representative.

4. Certification. Any person signing a document under Part III K 1 or 2 shall make the following certification:

"I certify under penalty of law that I have read and understand this document and that this document and all attachments were prepared in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

L. Duty to comply. The operator shall comply with all conditions of this general permit. Any state permit noncompliance constitutes a violation of the Virginia Stormwater Management Act and the Clean Water Act, except that noncompliance with certain provisions of this general permit may constitute a violation of the Virginia Stormwater Management Act but not the Clean Water Act. Permit noncompliance is grounds for enforcement action; for state permit termination, revocation and reissuance, or modification; or denial of a state permit renewal application.

The operator shall comply with effluent standards or prohibitions established under § 307(a) of the Clean Water Act for toxic pollutants within the time provided in the regulations that establish these standards or prohibitions or standards for sewage sludge use or disposal, even if this general permit has not yet been modified to incorporate the requirement.

M. Duty to reapply. If the operator wishes to continue an activity regulated by this general permit after the expiration date of this general permit, the operator shall submit a new registration statement at least 90 days before the expiration date of the existing general permit, unless permission for a later date has been granted by the board. The board shall not grant permission for registration statements to be submitted later than the expiration date of the existing general permit.

N. Effect of a state permit. This general permit does not convey any property rights in either real or personal property or any exclusive privileges, nor does it authorize any injury to private property or invasion of personal rights, or any infringement of federal, state or local law or regulations.

O. State law. Nothing in this general permit shall be construed to preclude the institution of any legal action under, or relieve the operator from any responsibilities, liabilities, or penalties established pursuant to any other state law or regulation or under authority preserved by § 510 of the Clean Water Act. Except as provided in general permit conditions on "bypassing" (Part III U) and "upset" (Part III V), nothing in this general permit shall be construed to relieve the operator from civil and criminal penalties for noncompliance.

P. Oil and hazardous substance liability. Nothing in this general permit shall be construed to preclude the institution of any legal action or relieve the operator from any responsibilities, liabilities, or penalties to which the operator is or may be subject under §§ 62.1-44.34:14 through 62.1-44.34:23 of the State Water Control Law or § 311 of the Clean Water Act.
Q. Proper operation and maintenance. The operator shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances), which are installed or used by the operator to achieve compliance with the conditions of this general permit. Proper operation and maintenance also includes effective plant performance, adequate funding, adequate staffing, and adequate laboratory and process controls, including appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems, which are installed by the operator only when the operation is necessary to achieve compliance with the conditions of this general permit.

R. Disposal of solids or sludges. Solids, sludges or other pollutants removed in the course of treatment or management of pollutants shall be disposed of in a manner so as to prevent any pollutant from such materials from entering surface waters and in compliance with all applicable state and federal laws and regulations.

S. Duty to mitigate. The operator shall take all steps to minimize or prevent any discharge in violation of this general permit that has a reasonable likelihood of adversely affecting human health or the environment.

T. Need to halt or reduce activity not a defense. It shall not be a defense for an operator in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this general permit.

U. Bypass.

1. "Bypass," as defined in 9VAC25-870-10, means the intentional diversion of waste streams from any portion of a treatment facility. The operator may allow any bypass to occur that does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to ensure efficient operation. These bypasses are not subject to the provisions of Part III U 2 and 3.

2. Notice.
   a. Anticipated bypass. If the operator knows in advance of the need for a bypass, the operator shall submit prior notice to the department, if possible at least 10 days before the date of the bypass.
   b. Unanticipated bypass. The operator shall submit notice of an unanticipated bypass as required in Part III I.

3. Prohibition of bypass.
   a. Except as provided in Part III U 1, bypass is prohibited, and the board or department may take enforcement action against an operator for bypass unless:
      (1) Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage. Severe property damage means substantial physical damage to property, damage to the treatment facilities that causes them to become inoperable, or substantial and permanent loss of natural resources that can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production;
      (2) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass that occurred during normal periods of equipment downtime or preventive maintenance; and
      (3) The operator submitted notices as required under Part III U 2.
b. The department may approve an anticipated bypass, after considering its adverse effects, if the department determines that it will meet the three conditions listed in Part III U 3 a.

V. Upset.

1. An "upset," as defined in 9VAC25-870-10, means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based state permit effluent limitations because of factors beyond the reasonable control of the operator. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

2. An upset constitutes an affirmative defense to an action brought for noncompliance with technology-based state permit effluent limitations if the requirements of Part III V 4 are met. A determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is not a final administrative action subject to judicial review.

3. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventative maintenance, or careless or improper operation.

4. An operator who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs or other relevant evidence that:
   a. An upset occurred and that the operator can identify the cause(s) of the upset;
   b. The permitted facility was at the time being properly operated;
   c. The operator submitted notice of the upset as required in Part III I; and
   d. The operator complied with any remedial measures required under Part III S.

5. In any enforcement proceeding, the operator seeking to establish the occurrence of an upset has the burden of proof.

W. Inspection and entry. The operator shall allow the department as the board's designee, the VSMP authority, EPA, or an authorized representative of either entity (including an authorized contractor), upon presentation of credentials and other documents as may be required by law to:

1. Enter upon the operator's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this general permit;

2. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this general permit;

3. Inspect and photograph at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this general permit; and

4. Sample or monitor at reasonable times, for the purposes of ensuring state permit compliance or as otherwise authorized by the Clean Water Act or the Virginia Stormwater Management Act, any substances or parameters at any location.

For purposes of this section, the time for inspection shall be deemed reasonable during regular business hours, and whenever the facility is discharging. Nothing contained herein shall make an inspection unreasonable during an emergency.
X. State permit actions. State permits may be modified, revoked and reissued, or terminated for cause. The filing of a request by the operator for a state permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any state permit condition.

Y. Transfer of state permits.

1. State permits are not transferable to any person except after notice to the department. Except as provided in Part III Y 2, a state permit may be transferred by the operator to a new operator only if the state permit has been modified or revoked and reissued, or a minor modification made, to identify the new operator and incorporate such other requirements as may be necessary under the Virginia Stormwater Management Act and the Clean Water Act.

2. As an alternative to transfers under Part III Y 1, this state permit may be automatically transferred to a new operator if:
   a. The current operator notifies the department at least 30 days in advance of the proposed transfer of the title to the facility or property;
   b. The notice includes a written agreement between the existing and new operators containing a specific date for transfer of state permit responsibility, coverage, and liability between them; and
   c. The department does not notify the existing operator and the proposed new operator of its intent to modify or revoke and reissue the state permit. If this notice is not received, the transfer is effective on the date specified in the agreement mentioned in Part III Y 2 b.

3. For ongoing construction activity involving a change of operator, the new operator shall accept and maintain the existing SWPPP, or prepare and implement a new SWPPP prior to taking over operations at the site.

Z. Severability. The provisions of this general permit are severable, and if any provision of this general permit or the application of any provision of this state permit to any circumstance, is held invalid, the application of such provision to other circumstances and the remainder of this general permit shall not be affected thereby.
APPENDIX B

Contractor Certification Forms
CERTIFICATIONS

Barraud Park Water and Sewer Project, Phase I Pump Station #153
Norfolk, Virginia

The Contractor and subcontractor(s) that will implement the pollutant control measures described in the SWPPP must be identified below. Each must sign a statement certifying that they understand the VSMP general permit authorizing storm water discharges during construction. These statements must be maintained in the SWPPP file on site.

Contractor or subcontractor implementing the SWPPP:

________________________________________________________________________
Business Name

________________________________________________________________________
Business Address

________________________________________________________________________
Business Telephone Number

Activities contractor or subcontractor responsible for:

CERTIFICATION:

"I certify under penalty of law that I understand the terms and conditions of the VSMP General Permit for Discharges of Storm water from Construction Activities (VAR 10) and the SWPPP that authorizes storm water discharges associated with land disturbing activities from the construction site identified as part of this certification."

__________________________________________    ______________________
Signature         Date

Printed Name
APPENDIX C

Inspection Reports
CONSTRUCTION SITE STORM WATER GENERAL PERMIT
LAND DISTURBANCE INSPECTION REPORT

Project Name: ___________________________ CIP#: ___________________________

Location: ________________________________________________________________

Contractor/Operator: ___________________________ Anticipated Completion Date: __________

Inspection Date/Time: ___________________________ Inspector: ___________________________

Inspector DEQ Certification Type/#: ___________________________ Weather: ___________________________

Stage of Construction: _____ Pre-Construction Conference _____ Clearing and Grubbing _____ Rough Grading
_____ Finish Grading _____ Construction of SWM Facilities _____ Maintenance of SWM _____ Final Stabilization
_____ Excavation _____ Other Land Disturbance Activity – please specify: ___________________________

Reason for Inspection: _____ Regular _____ Pre-Storm Event _____ During Storm Event _____ Post-Storm Event

Has a sediment discharge occurred since the last inspection? YES/NO  Is the site in compliance? YES/NO

<table>
<thead>
<tr>
<th>ITEM #</th>
<th>POLLUTANT CONTROL</th>
<th>IMPLEMENTED</th>
<th>IN COMPLIANCE</th>
<th>DATE CORRECTED</th>
<th>ACTION TO BE TAKEN/NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SWPPP located on-site with all E&amp;S changes documented?</td>
<td>YES/NO/NA</td>
<td>YES/NO/NA</td>
<td>YES/NO/NA</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Construction entrance</td>
<td>YES/NO/NA</td>
<td>YES/NO/NA</td>
<td>YES/NO/NA</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Sediment barriers</td>
<td>YES/NO/NA</td>
<td>YES/NO/NA</td>
<td>YES/NO/NA</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Storage/ disposal areas</td>
<td>YES/NO/NA</td>
<td>YES/NO/NA</td>
<td>YES/NO/NA</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Sediment traps</td>
<td>YES/NO/NA</td>
<td>YES/NO/NA</td>
<td>YES/NO/NA</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Check dams</td>
<td>YES/NO/NA</td>
<td>YES/NO/NA</td>
<td>YES/NO/NA</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Inlet protection</td>
<td>YES/NO/NA</td>
<td>YES/NO/NA</td>
<td>YES/NO/NA</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Silt Fence</td>
<td>YES/NO/NA</td>
<td>YES/NO/NA</td>
<td>YES/NO/NA</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Diversion Dike(s)</td>
<td>YES/NO/NA</td>
<td>YES/NO/NA</td>
<td>YES/NO/NA</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Tree Protection</td>
<td>YES/NO/NA</td>
<td>YES/NO/NA</td>
<td>YES/NO/NA</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Temporary stabilization of denuded areas?</td>
<td>YES/NO/NA</td>
<td>YES/NO/NA</td>
<td>YES/NO/NA</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Stockpiles stabilized or BMPs in place?</td>
<td>YES/NO/NA</td>
<td>YES/NO/NA</td>
<td>YES/NO/NA</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Permanent stabilization provided within 14 days of activity?</td>
<td>YES/NO/NA</td>
<td>YES/NO/NA</td>
<td>YES/NO/NA</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Is permanent stabilization adequate?</td>
<td>YES/NO/NA</td>
<td>YES/NO/NA</td>
<td>YES/NO/NA</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Turbidity curtains installed and maintained?</td>
<td>YES/NO/NA</td>
<td>YES/NO/NA</td>
<td>YES/NO/NA</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Public roadways free of debris?</td>
<td>YES/NO/NA</td>
<td>YES/NO/NA</td>
<td>YES/NO/NA</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Discharge points free of sediment deposits at receiving waters?</td>
<td>YES/NO/NA</td>
<td>YES/NO/NA</td>
<td>YES/NO/NA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Question</td>
<td>YES/NO/NA</td>
<td>YES/NO/NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>--------------------------------------------------------------------------</td>
<td>-----------</td>
<td>-----------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Natural resources protected with BMPs?</td>
<td>YES/NO/NA</td>
<td>YES/NO/NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Trash/Litter collected &amp; dumpsters covered?</td>
<td>YES/NO/NA</td>
<td>YES/NO/NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Vehicle and equipment fueling, cleaning, &amp; maintenance areas free of spills, leaks, and other deleterious material?</td>
<td>YES/NO/NA</td>
<td>YES/NO/NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Fuel tanks in accordance with SWPPP, permit, containment and spill control requirements?</td>
<td>YES/NO/NA</td>
<td>YES/NO/NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Any spills since last inspection?</td>
<td>YES/NO/NA</td>
<td>YES/NO/NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Washout facilities clearly marked and maintained?</td>
<td>YES/NO/NA</td>
<td>YES/NO/NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Wash water dewatering discharges properly controlled?</td>
<td>YES/NO/NA</td>
<td>YES/NO/NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Dewatering structures/sediment trapping devices in place?</td>
<td>YES/NO/NA</td>
<td>YES/NO/NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Are all applicable regulations for working in or crossing live watercourses being met?</td>
<td>YES/NO/NA</td>
<td>YES/NO/NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>Are utility trenches stabilized properly?</td>
<td>YES/NO/NA</td>
<td>YES/NO/NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Have all temporary control structures that are no longer needed been removed?</td>
<td>YES/NO/NA</td>
<td>YES/NO/NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>Have all control structure repairs and sediment removal been performed?</td>
<td>YES/NO/NA</td>
<td>YES/NO/NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>Is a sign located near the site entrance displaying the permit cover letter?</td>
<td>YES/NO/NA</td>
<td>YES/NO/NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>Is a rain gauge located on-site?</td>
<td>YES/NO/NA</td>
<td>YES/NO/NA</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
CORRECTIVE ACTIONS TO BE TAKEN: (Explain each "NO" circled above)

COMMENTS:

Based on the results of the inspection, if any existing controls need modified, or if any new controls need to be installed, implementation shall be completed before the next anticipated storm event or within 7 calendar days of inspection. This report will be kept on file for at least 3 years from the date of completion and submission of the Notice of Termination.

Certification Statement

I certify under penalty of law that I have read and understand this document and the document and all attachments were prepared in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Print Name and Title: _________________________________________________________________
(Contractor)

Signature: ___________________________ Date/Time: ________________________________
(Contractor)

Print Name and Title Certification Type and Number: ________________________________
(Inspector)

Signature: ___________________________ Date/Time: ________________________________
(Inspector)

Notice Given To: ____________________________ Date/Time (A.M. /P.M.): ___________________
Name / Title

Notice Given By: ____________________________
Name / Title / Department

Corrections Performed by Contractor: ____________________________
Name / Title / Date

Corrections Accepted by Inspector: ____________________________
Name / Title / Department / Date

Corrections Accepted by Project Manager: ____________________________
Name / Title / Department / Date
APPENDIX D

Notice of Termination (NOT) Form
Notice of Termination
General VPDES Permit for Discharges of Stormwater from Construction Activities (VAR10)

(Please Type or Print All Information)

1. Construction Activity Operator:

Name: __________________________________________________________
Contact: _________________________________________________________
Mailing Address: _________________________________________________
City: ___________________________ State: _______ Zip: ___________ Phone: _____________________________
Email address (if available): ______________________________________

2. Name and Location of the Construction Activity: (As listed on the Registration Statement.)

Name: _________________________________________________________
Address (if available): ____________________________________________
City: ___________________________ State: _______ Zip: ___________
County (if not located within a City): _______________________________________________________________________
Latitude (decimal degrees): ___________________ Longitude (decimal degrees): __________________________

3. General Permit Registration Number:

______________________________________________________________

4. Reason for Terminating Coverage Under the General Permit: (The operator shall submit a Notice of Termination after one or more of the following conditions have been met.)

☐ A. Necessary permanent control measures included in the SWPPP for the site are in place and functioning effectively and final stabilization has been achieved on all portions of the site for which the operator is responsible. When applicable, long-term responsibility and maintenance requirements for permanent control measures shall be recorded in the local land records prior to the submission of a notice of termination;

☐ B. Another operator has assumed control over all areas of the site that have not been finally stabilized and obtained coverage for the ongoing discharge;

☐ C. Coverage under an alternative VPDES or state permit has been obtained; or

☐ D. For residential construction only, temporary soil stabilization has been completed and the residence has been transferred to the homeowner.

The notice of termination should be submitted no later than 30 days after one of the above conditions being met. Authorization to discharge terminates at midnight on the date that the notice of termination is submitted for the conditions set forth in subsections B through D above, unless otherwise notified by the VSMP authority or the Department. Termination of authorizations to discharge for the conditions set forth in subsection A above shall be effective upon notification from the Department that the provisions of subsection A have been met or 60 days after submittal of the notice of terminations, whichever occurs first.

5. Permanent Control Measures Installed: (When applicable, a list of the on-site and off-site permanent control measures (both structural and nonstructural) that were installed to comply with the stormwater management technical criteria. Attach a separate list if additional space is needed.)

Permanent Control Measure #1

Type of Permanent Control Measure: _________________________________
Date Functional: _________________________________________________
Address (if available): ____________________________________________
City: ___________________________ State: __________ Zip: ___________
County (if not located within a City): ________________________________
Latitude (decimal degrees): ___________________ Longitude (decimal degrees): ______________________
Receiving Water: __________________________________________________
Total Acres Treated: __________________ Impervious Acres Treated: __________________
Permanent Control Measure #2
Type of Permanent Control Measure: ____________________________
Date Functional: ____________________________
Address (if available): ______________________________________
City: ____________________________ State: ____________________________ Zip: ____________________________
County (if not located within a City): ____________________________
Latitude (decimal degrees): ____________________________ Longitude (decimal degrees): ____________________________
Receiving Water: ____________________________
Total Acres Treated: ____________________________ Impervious Acres Treated: ____________________________

Permanent Control Measure #3
Type of Permanent Control Measure: ____________________________
Date Functional: ____________________________
Address (if available): ______________________________________
City: ____________________________ State: ____________________________ Zip: ____________________________
County (if not located within a City): ____________________________
Latitude (decimal degrees): ____________________________ Longitude (decimal degrees): ____________________________
Receiving Water: ____________________________
Total Acres Treated: ____________________________ Impervious Acres Treated: ____________________________

6. Participation in a Regional Stormwater Management Plan: (When applicable, information related to the participation in a regional stormwater management plan. Attach a separate list if additional space is needed.)

Regional Stormwater Management Facility
Type of Regional Stormwater Management Facility: ____________________________
Address (if available): ______________________________________
City: ____________________________ State: ____________________________ Zip: ____________________________
County (if not located within a City): ____________________________
Latitude (decimal degrees): ____________________________ Longitude (decimal degrees): ____________________________
Total Site Acres Treated: ____________________________ Impervious Site Acres Treated: ____________________________

7. Perpetual Nutrient Credits: (When applicable, information related to perpetual nutrient credits that were acquired in accordance with § 62.1-44.15:35 of the Code of Virginia. Attach a separate list if additional space is needed.)

Nonpoint Nutrient Credit Generating Entity
Name: ____________________________
Perpetual Nutrient Credits Acquired (lbs/acre/year): ____________________________

8. Certification: "I certify under penalty of law that I have read and understand this Notice of Termination and that this document and all attachments were prepared in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is to the best of my knowledge and belief true, accurate, and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment for knowing violations."

Printed Name: ____________________________ Title: ____________________________
Signature: ____________________________ Date: ____________________________

(Please sign in INK. This Certification must be signed by the appropriate person associated with the operator identified in Item #1.)
Instructions for Completing the Notice of Termination
General VDPES Permit for Discharges of Stormwater from Construction Activities (VAR10)

GENERAL

A Notice of Termination must be submitted when an operator no longer wishes to be covered under the General VPDES Permit for Discharges of Stormwater from Construction Activities (VAR10).

All Notice of Terminations should be submitted to:

Department of Environmental Quality
Office of Stormwater Management, 10th Floor
P.O. Box 1105
Richmond, VA 23218

LINE-BY-LINE INSTRUCTIONS

Item 1: Construction Activity Operator Information.

Provide the legal name (do not use a colloquial name), contact, mailing address, telephone number, and email address (if available) of the construction activity operator that was issued general permit coverage.

Item 2: Name and Location of the Construction Activity Information.

Provide the official name, street address (if available), city or county (if not located within a City) of the construction activity. Also, provide the latitude and longitude in decimal degrees of the approximate center of the construction activity (e.g., N 37.5000, W 77.5000). NOTE: This information can be obtained from the previously submitted Registration Statement.

Item 3: General Permit Registration Number.

Provide the existing general permit registration number for the construction activity identified in Item 2.

Item 4: Reason for Termination.

Indicate the appropriate reason for submitting this Notice of Termination. The Notice of Termination may only be submitted after one or more of the following conditions have been met:

- a. Necessary permanent control measures included in the SWPPP for the site are in place and functioning effectively and final stabilization has been achieved on all portions of the site for which the operator is responsible. When applicable, long-term responsibility and maintenance requirements for permanent control measures shall be recorded in the local land records prior to the submission of a notice of termination;
- b. Another operator has assumed control over all areas of the site that have not been finally stabilized and obtained coverage for the ongoing discharge;
- c. Coverage under an alternative VPDES or state permit has been obtained; or
- d. For residential construction only, temporary soil stabilization has been completed and the residence has been transferred to the homeowner.

The Notice of Termination should be submitted no later than 30 days after one of the above conditions being met.

Item 5: Permanent Control Measures (when applicable).

For each on-site and off-site permanent control measure (both structural and non-structural) that was installed to comply with the stormwater management technical criteria provide the following information:

- a. The type of permanent control measure;
- b. The date that the permanent control measure became functional as a post-development stormwater management control;
- c. The street address (if available), City or County (if not located within a City) of the permanent control measure;
- d. The latitude and longitude in decimal degrees of the approximate center of the permanent control measure;
- e. The receiving water of the permanent control measure; and
- f. The number of total and impervious acres treated by the permanent control measure (to the nearest one-tenth of an acre).

Attach a separate list if additional space is needed.

Item 6: Participation in a Regional Stormwater Management Plan (when applicable).

For each Regional Stormwater Management Facility provide the following information:

- a. The type of regional facility to which the site contributes;
- b. The street address (if available), City or County (if not located within a City) of the regional facility;
- c. The latitude and longitude in decimal degrees of the approximate center of the regional facility; and
- d. The number of total and impervious site acres treated by the regional facility (to the nearest one-tenth of an acre).

Attach a separate list if additional space is needed.

Item 7: Perpetual Nutrient Credits (when applicable).

Provide the following information related to perpetual nutrient credits that were acquired in accordance with § 62.1-44.15:35 of the Code of Virginia:

- a. The name of the nonpoint nutrient credit generating entity from which perpetual nutrient credits were acquired; and
- b. The number of perpetual nutrient credits acquired (lbs. per acre per year).

Attach a separate list if additional space is needed.

Item 8: Certification.

A properly authorized individual associated with the operator identified in Item 1 of the Registration Statement is responsible for certifying and signing the Registration Statement. Please sign the Registration Statement in INK.

State statutes provide for severe penalties for submitting false information on the Registration Statement. State regulations require that the Registration Statement be signed as follows:

- a. For a corporation: by a responsible corporate officer. For the purpose of this part, a responsible corporate officer means:
  - (i) A president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy-making or decision-making functions for the corporation, or
  - (ii) the manager of one or more manufacturing, production, or operating facilities, provided the manager is authorized to make management decisions that govern the operation of the regulated
facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long-term compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

b. For a partnership or sole proprietorship: by a general partner or the proprietor, respectively.

c. For a municipality, state, federal, or other public agency: by either a principal executive officer or ranking elected official. For purposes of this part, a principal executive officer of a public agency includes:

(i) The chief executive officer of the agency, or

(ii) A senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency.
APPENDIX E

Record of Stabilization and Construction Activity Dates
APPENDIX F

Selected Approved Erosion and Sediment Control Site Plan Sheets
CIETY OF NORFOLK EROSION AND SEDIMENT CONTROL NOTES:

1. Prevent stormwater runoff, all pesticide and construction debris, and any other materials from entering the stream channel or any other receptor of water quality. Properly dispose of all construction debris, including materials used in the construction of the project, in a manner that will not create an environmental hazard.

2. The contractor shall not discharge any stormwater or sediment into any public body of water or any other receptor of water quality, including, but not limited to, any stream, river, or lake. The contractor shall ensure that all stormwater runoff is directed to the appropriate drainage facility, and that all sediment is removed from the site before completion of the project.

3. The contractor shall not discharge any stormwater or sediment into any public body of water or any other receptor of water quality, including, but not limited to, any stream, river, or lake. The contractor shall ensure that all stormwater runoff is directed to the appropriate drainage facility, and that all sediment is removed from the site before completion of the project.

LAND DISTURBANCE NOTES:

1. Preliminary and final site plans shall be submitted to the City of Norfolk for review and approval. The plans shall include, but not be limited to, a site plan, a grading plan, and a construction plan. The plans shall be reviewed by the City of Norfolk to ensure compliance with all applicable regulations.

2. The contractor shall comply with all applicable regulations governing the removal and stockpiling of materials, including, but not limited to, regulations governing the storage and disposal of materials.

3. The contractor shall provide temporary fencing and protection around all stockpiles, including, but not limited to, stockpiles located near streams or other receptors of water quality.

4. The contractor shall provide temporary protection for all stockpiles, including, but not limited to, stockpiles located near streams or other receptors of water quality.

5. The contractor shall provide temporary protection for all stockpiles, including, but not limited to, stockpiles located near streams or other receptors of water quality.

EROSION AND SEDIMENT CONTROL NARRATIVE:

1. The project is located in the City of Norfolk, Virginia. The project area is characterized by a mix of developed and undeveloped areas. The project area is located in a temperate climate zone, with a predominant wind direction from the northeast.

2. The contractor shall ensure that all stormwater runoff is directed to the appropriate drainage facility, and that all sediment is removed from the site before completion of the project.

3. The contractor shall ensure that all stormwater runoff is directed to the appropriate drainage facility, and that all sediment is removed from the site before completion of the project.

CONSTRUCTION ENTRANCE:

1. The construction entrance shall be located at the southern end of the project area. The construction entrance shall be designed and constructed in accordance with the City of Norfolk's construction entrance standards.

2. The construction entrance shall be located at the southern end of the project area. The construction entrance shall be designed and constructed in accordance with the City of Norfolk's construction entrance standards.

3. The construction entrance shall be located at the southern end of the project area. The construction entrance shall be designed and constructed in accordance with the City of Norfolk's construction entrance standards.

SILT FENCE DETAIL:

1. The silt fence shall be constructed of material that will not allow sediment to escape. The silt fence shall be constructed in such a manner that it will not create a safety hazard to workers or the public.

2. The silt fence shall be constructed of material that will not allow sediment to escape. The silt fence shall be constructed in such a manner that it will not create a safety hazard to workers or the public.

3. The silt fence shall be constructed of material that will not allow sediment to escape. The silt fence shall be constructed in such a manner that it will not create a safety hazard to workers or the public.

INLET PROTECTION:

1. The inlet protection shall be designed to prevent the movement of sediment and other materials into the storm drain system. The inlet protection shall be designed in accordance with the City of Norfolk's inlet protection standards.

2. The inlet protection shall be designed to prevent the movement of sediment and other materials into the storm drain system. The inlet protection shall be designed in accordance with the City of Norfolk's inlet protection standards.

3. The inlet protection shall be designed to prevent the movement of sediment and other materials into the storm drain system. The inlet protection shall be designed in accordance with the City of Norfolk's inlet protection standards.
APPENDIX G

SWPPP Construction Site Notice
## SWPPP CONSTRUCTION SITE NOTICE

FOR THE
VSMP GENERAL PERMIT

<table>
<thead>
<tr>
<th>City Project Name and Number:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>City Project Inspector Contact Information:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
</tr>
<tr>
<td>Cell Phone Number</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Contractor Name &amp; Number: (both Site Superintendents)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Project Description:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>
APPENDIX H

Blank Spill Report Form / Sample Completed Spill Report Form
Spill Report Form

Spill Reported by: ________________________________

Date/Time Spill: ____________________________ Date/Time Spill PW Engineering: ______________________

Describe spill location and events leading to spill: ________________________________________________
______________________________________________
______________________________________________

Material spilled: __________________________________________________

Source of spill: __________________________________________________

Amount spilled (gallons): ______________ Amount spilled to drain/waterway: ______________

Containment or clean up action: ________________________________________________________________

Approximate depth of soil excavation: __________________________________________________________

List Injuries or Personal Contamination: ______________________________________________________

Action to be taken to prevent future spills: _____________________________________________________

______________________________________________

Modifications to the SWPPP, including required sampling, necessary due to this spill: ______________

______________________________________________

Agencies notified of the spill: _________________________________________________________________

If required, date letter sent to notified agencies: _______________________________________________

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

______________________________________________

SWPPP Program Administrator

Date
Spill Report Form

Spill Reported by: [I. M. Sorry]

Date/Time Spill: 5.27.2011 / 3:30pm Date/Time Spill PW Engineering: 5.27.2011 / 4:00pm

Describe spill location and events leading to spill: Beside Sediment Basin #1. Fueling excavator and accidentally overfilled fuel tank.

Material spilled: [Diesel Fuel]

Source of spill: [Mobile tanker truck]

Amount spilled (gallons): 15 gallons Amount spilled to drain/waterway: 0 gallons

Containment or clean up action: Stopped fueling equipment. Used absorbent pads to clean up excavator. Dug up stained soil and placed in 55 gallon drum for offsite disposal. Drum at laydown area awaiting pickup.

Approximate depth of soil excavation: 1.5 feet

List Injuries or Personal Contamination: Fuel truck operator splashed by diesel fuel / injury.

Action to be taken to prevent future spills: Remind operators to personally monitor all refueling of their equipment. Perform fueling at designated fueling area.

Modifications to the SWPPP, including required sampling, necessary due to this spill: No sampling required. Spill form added to Appendix H. Keep oil absorbents closer to fuel sites.

Agencies notified of the spill: City of Virginia Beach Dept. of Public Works

If required, date letter sent to notified agencies: N/A

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

__________________________  __________________
SWPPP Program Administrator  Date
TECHNICAL SPECIFICATIONS
Department of Utilities Supplemental Specifications
SUPPLEMENTAL SPECIFICATIONS

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Manually Cleaned Bar Screens .......................................................... SCR-1
Dry Pit Submersible Sewage Pumps .................................................. DPP-1
Adjustable Frequency Drives .............................................................. AFD-1
Magnetic Flow Meter .................................................................. MAG-1
Pressure Gauges ....................................................................... GAG-1
Supports and Anchors ................................................................. SUP-1
Operation and Maintenance Manuals ........................................ O&M-1
Bypass Pump ............................................................................ BPP-1
MANUALLY CLEANED BAR SCREENS

1. GENERAL

1.1 DESCRIPTION OF WORK

A. This section includes the requirements for furnishing and installing a manually cleaned bar screen and furnishing bar rake as specified or required for a complete installation. Locate the screens as shown on the Contract Drawings.

B. Codes and standards referred to in this section are:

1. ASTM A 276 - Specification for Stainless and Heat Resisting Steel Bars and Shapes
2. ASTM A 36/A36M - Specification for Carbon Structural Steel

1.2 SUBMITTALS

Submit working drawings including arrangement and erection drawings of the equipment.

2. PRODUCTS

2.1 BAR SCREENS

Provide bar racks consisting of 3/8- by 2-1/2-inch rectangular 304 stainless steel bars conforming to ASTM A 276 fastened top and bottom to provide the clear spacing between the bars as shown. Provide bars which are straight and firmly anchor them to the channel floor and at the top. Provide stainless steel anchors, bolts and nuts as shown.

2.2 CLEANING RAKES

Provide cleaning rakes constructed of heavy 304 stainless plate conforming to ASTM A 276 of the dimensions as shown. Provide cleaning teeth with a penetration of 2 inches in the bar screen spacing. Provide a 12 foot long aluminum handle made of 1-1/4-inch Schedule 40 aluminum pipe. The weight of the rake shall not exceed 15 pounds.
3. EXECUTION

3.1 INSTALLATION

Install bar racks as shown in the channel at the indicated angle of inclination. Countersink bolts or flat head screws used for attachment at the top for a flush finish.

END OF SECTION
DRY PIT SUBMERSIBLE SEWAGE PUMPS

1. GENERAL

1.1 DESCRIPTION OF WORK

A. This section includes the requirements for furnishing and installing submersible sewage pumping units, and all appurtenances necessary for a complete installation. Locate the submersible sewage pumping units as shown in the dry pit.

B. Codes and standards referred to in this section are:

1. ASTM A 48 - Specification for Grey Iron Castings
2. Hydraulic Institute Standards
3. IEEE 82 - Test Procedure for Impulse Voltage Tests on Insulated Conductors
4. NEC - National Electric Code
5. AFBMA 9 - Load Ratings and Fatigue Life for Ball Bearings
6. AFBMA 11 - Load Ratings and Fatigue Life for Roller Bearings

C. Provide pumps of the vertical, centrifugal, heavy duty, non-clog, close-coupled, submersible type driven by an electric motor. Provide motors suitable for dry-pit and submersible pump operation and mounted as an integral part of the pump. Design the pumping units to pump raw wastewater. Arrange the pumping equipment in the spaces shown on the Contract Drawings and in accordance with approved shop drawings.

D. Provide pumps to operate at the capacities and heads and over the range of operating conditions specified without overloading, cavitation, undue noise or vibration. Pumps shall be capable of full reverse rotational speed with no damage occurring to the motor or pump. Furnish the pumps in accordance with the following requirements:

<table>
<thead>
<tr>
<th>Items</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit 1</td>
<td>Unit 2</td>
</tr>
<tr>
<td>Capacity at rating point, gpm</td>
<td>425</td>
</tr>
<tr>
<td>Total head at rating point, feet</td>
<td>208</td>
</tr>
<tr>
<td>Items</td>
<td>Requirements</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>--------------</td>
</tr>
<tr>
<td>Overall efficiency, wire to water, at rating point, minimum, percent</td>
<td>49%</td>
</tr>
<tr>
<td></td>
<td>49%</td>
</tr>
<tr>
<td>Shutoff head, feet</td>
<td></td>
</tr>
<tr>
<td>Maximum Speed</td>
<td>243</td>
</tr>
<tr>
<td>Minimum Speed</td>
<td>64</td>
</tr>
<tr>
<td>Capacity at secondary rating point, minimum, gpm</td>
<td>600</td>
</tr>
<tr>
<td>Total head at secondary rating point, feet</td>
<td>210</td>
</tr>
<tr>
<td>Overall efficiency, wire to water, at secondary head, minimum, percent</td>
<td>61%</td>
</tr>
<tr>
<td></td>
<td>61%</td>
</tr>
<tr>
<td>Capacity at reduced speed rating point, gpm</td>
<td>425</td>
</tr>
<tr>
<td>Total head at reduced speed rating point, feet</td>
<td>43</td>
</tr>
<tr>
<td>Diameter of sphere that will pass through pump, minimum, inches</td>
<td>3”</td>
</tr>
<tr>
<td></td>
<td>3”</td>
</tr>
<tr>
<td>Pump discharge diameter, minimum, inches</td>
<td>4”</td>
</tr>
<tr>
<td></td>
<td>4”</td>
</tr>
<tr>
<td>Pump speed, maximum, rpm</td>
<td>1782</td>
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<tr>
<td></td>
<td>1782</td>
</tr>
<tr>
<td>Low water elevation for continuous operation, feet</td>
<td>-16.05</td>
</tr>
<tr>
<td></td>
<td>-16.05</td>
</tr>
<tr>
<td>Wet well floor elevation, feet</td>
<td>-19.30</td>
</tr>
<tr>
<td></td>
<td>-19.30</td>
</tr>
<tr>
<td>Motor horsepower, hp</td>
<td></td>
</tr>
<tr>
<td>Minimum</td>
<td>125</td>
</tr>
<tr>
<td>Maximum</td>
<td>125</td>
</tr>
<tr>
<td>Motor efficiency at full load, minimum, percent</td>
<td>91.0</td>
</tr>
<tr>
<td></td>
<td>91.0</td>
</tr>
<tr>
<td>Motor power factor at full load, minimum, percent</td>
<td>87.2</td>
</tr>
<tr>
<td></td>
<td>87.2</td>
</tr>
<tr>
<td>Locked rotor kVa/hp, maximum, (Motor) (NEMA) code letter</td>
<td>G</td>
</tr>
<tr>
<td></td>
<td>G</td>
</tr>
</tbody>
</table>

E. Design each pump to have a continuously rising characteristic curve from the rating point to shutoff which passes through the rating point, and which meets or exceeds the specified heads and capacities, all within the Hydraulic Institute tolerances.
F. Provide pumping units capable of sustaining full reverse runaway speed without damage.

G. Furnish pumping units that do not exceed 0.35 inches per second peak velocity filtered vibration when operating over the range of specified conditions.

1.2 SUBMITTALS

Submittals shall be made by the Contractor in accordance with the procedures set forth in Section 105 – Control of Work, and as described below. The Contractor shall submit the following information for review and approval.

A. Certificates

Provide a certificate of compliance and compatibility from the submersible sewage pump manufacturer-supplier for the pumps, motors and adjustable frequency drives.

B. Drawings

Contractor’s Drawings.

Submit working drawings, including arrangement and erection drawings of the equipment and equipment operating characteristics. Include the following:

a. Pump performance curves. Draw the curves for the specified conditions including those at reduced speed. Include head, input kilowatts, required NPSH, and overall efficiency, as a function of capacity from zero to maximum capacity.

b. General arrangement drawing of pumping unit and support system. Include equipment weight and anchor methods and materials.

c. Cross section drawing of pumping unit.

C. Data

Pump information

a. Parts list with materials of construction identified.
b. Motor performance characteristics.
c. Spare parts list.
d. Painting procedure.
D. Reports

Submit the following test reports:

a. Shop test procedures.
b. Six (6) certified copies of the Shop Test results for the pumping units.
c. Six (6) certified copies of the Manufacturer's Field Test Reports.

E. Statements

Pump unit qualification report as specified in paragraph 1.3 Quality Assurance.

F. Instructions

Submit the Operation and Maintenance manuals for the pumping equipment. Pumps shall be UL listed for Class 1, Division 1, Group C and D, as defined by the National Electrical Code.

1.3 QUALITY ASSURANCE

Provide pumping equipment produced by a manufacturer who has regularly engaged in the design, manufacture, assembly and production of submersible sewage pumping equipment of the size and application as specified for not less than the last five years. In addition, the manufacturer shall submit a report documenting successful operation of three or more facilities within the USA of at least equal horsepower and speed that are similar in design and function to those being furnished for this contract; applicable to pumps in excess of 150 horsepower only. Each facility shall have units which have been operated a minimum of 10,000 hours over five years. Provide the names and telephone numbers of the users within the documentation report for verification. Failure to submit the report with adequate documentation will be cause for rejection of the pumping equipment.

1.4 SPARE PARTS

A. Provide the following spare parts for each size and type of pump:

1. One set of cable entry grommets
2. One set of "O"-rings
3. Two spare seals
4. One spare Impeller
5. Touch Up Paint

B. Furnish a complete set of special wrenches, spanners, eye bolts and other special tools sufficient to completely dismantle and reassemble each kind and size of pumping unit. Provide tools of forged steel, case hardened, and full
1.5 SERVICE

The pump manufacturer shall have a local authorized factory service center located within 300 miles of the project site capable of completely servicing the proposed pumps. This facility must routinely stock spare parts (mechanical seals, bearings, O-rings, etc.) on the shelf. The service facility must be established and factory recognized for at least three years prior to bid. In addition, the pump manufacturer shall have a direct factory service center/stocking facility capable of completely servicing and providing spare parts within 24 hours for the proposed pumps within 800 miles of the project site.

1.6 WARRANTY

The pump manufacturer shall warranty the units supplied to the Owner, in writing, against defects in material and workmanship for a period of at least five years or 10,000 operating hours under normal use, operation, and service for the operating conditions presented by this project. The warranty shall cover parts and labor and shall be in printed form and apply to all units. Products repaired or replaced under warranty will be returned freight prepaid by pump manufacturer.

2. PRODUCTS

2.1 GENERAL CONSTRUCTION

A. Provide stainless steel fasteners, bolts, nuts and washers where exposed to the pumped liquid.

B. Provide machined metal-to-metal joints on component parts that are assembled together. Fit with an "O" ring seal where watertight joints are required. Do not use flat gaskets or sealing compounds to obtain watertight joints. Furnish machined rabbet fits on component joints as required to provide automatic alignment of rotating parts.

C. Provide eye bolts or lugs for lifting and handling the equipment. Provide suitable feet with anchor bolts for each pump. Design the feet for the pump to support the entire weight of the equipment of the foundation, without strain on the suction or discharge flanges.

D. Provide flanged suction and discharge connections with drilling and dimensions meeting the requirements of ANSI B16.1, Class 125
E. Provide each pump with two (2) corrosion resistant metal name plates that indicate the pump serial number and rated capacity, head, speed, horsepower, voltage, and full load amps. Mount nameplates on the pumps and their AFD or MCC.

F. Pumps shall be UL listed for Class I, Division I, Group C and D, as defined by the National Electrical Code.

2.2 CASING

A. Provide pump casing of the centrifugal single volute with integral suction and discharge nozzle arranged for centerline discharge. Do not use diffusion vanes. Furnish smooth water passages that are able to withstand the abrasive action of solids.

B. Provide handholes with covers of ample size to permit inspection and cleaning of impeller and wear rings. Locate one handhole in the suction fittings or elbow ahead of the impeller. Provide each cover with its inside surface contoured to match the adjacent surfaces.

C. Construct pump casing of ASTM A48 cast iron, Class 30.

D. Construct renewable wear rings of stainless steel.

E. Provide pump sized to fit within the allotted space as shown on the plans.

2.3 IMPELLER

A. Design impeller of the enclosed nonclog type. Provide pump-out vanes or a back ring, arranged with minimum clearances so as to preclude solids and stringy material from damaging the mechanical seal, on the back of the impeller.

B. Construct the impeller of ASTM A48 cast iron, Class 30.

C. Provide impellers that are statically and dynamically balanced.

D. Provide impellers with a renewable Series 416 stainless steel wear ring with a minimum 350 BHN.

E. Secure the impeller to the shaft with a stainless steel key and lock nut in such a way that it cannot unscrew or become loosened due to rotation in either direction. Cover locknut for protection from the pumped fluid.
2.4 OIL CHAMBER

A. Provide an oil chamber to function as a buffer between the pumped liquid in the casing and the motor. Arrange the oil chamber to accommodate thermal expansion of the oil. Furnish an oil chamber drain plug that is accessible from outside the pump unit and permits changing oil without dismantling pump components.

B. Construct the oil chamber of the same material as the pump casing.

C. Provide the oil chamber with a moisture sensor to initiate an alarm upon contamination of the oil by the pumped liquid.

2.5 MECHANICAL SEAL

Provide each pump with dual mechanical seal. Design the upper seal unit, between the oil chamber and motor housing, with one stationary silicon-carbide face and one positively driven rotating tungsten-carbide face. Provide the lower seal unit, between the pump casing and oil chamber, with one stationary face made of silicon-carbide and one positively driven rotating face of tungsten-carbide. Use stainless steel for metal parts. Protect the spring element of the lower seal from solids contained in the pumped liquid. Seals must be capable of rotation in either direction without damage.

2.6 MOTOR

A. Provide submersible pump motor of 460-volt, 3-phase, 60-hertz. Motors shall be of the dry pit type designed for continuous duty, submerged or unsubmerged.

B. Ratings:

- Voltage/phase/cycles: 460/3/60
- NEMA design type: B
- NEMA code letter: G
- Maximum rated full load current: 118 HP: 139.4 amperes
- Minimum rated power factor at full load: 87.2 percent
- Minimum rated efficiency: 91.0 percent

C. Design the motor to have suitable output torque and speed characteristic to start and operate the pump over the range of specified conditions without exceeding the nameplate rating. Base the nameplate horsepower rating on an 80 degrees
C temperature rise above an ambient temperature of 40 degrees C when operating with the AFD. Design the motor for continuous on-off cycling of ten starts per hour minimum without exceeding the 80 degree C temperature rise.

D. Provide the motor with a minimum of NEMA Class H (155 degrees C) moisture resistant insulation. Construct stator coils with NEMA Class H (180 degrees C) insulated winding wire. Motors shall meet NEMA MG 1, Part 31 requirements. Apply impregnation resin to stator assembly in three dip and bake steps.

E. Provide each motor with three high temperature sensors, one per each phase, to protect against overheating. Provided thrust bearing with high temperature sensors to protect against overheating. The high temperature sensors shall be monitored by the motor protection monitoring system.

F. Provide the motor with an ASTM A48 cast iron stator housing. For motors that employ cooling water jackets, design the water jacket passages to preclude clogging by solids contained in the pumped liquid. Provision for external cooling shall be provided. Provide the coolant passages with a vent arranged to allow escape of any air entrained into the pump. The cooling system shall provide sufficient cooling such that the motor can run under full load and at reduced speed in a totally unsubmerged condition.

G. Provide the motor cable entry with a mechanical locking ring or compression type cord grip to protect the cable jacket from being pulled out of the motor. Do not use epoxy for this purpose. Arrange the cable entry so as to provide a watertight seal. Isolate the cable entry leads from the internal motor leads to prevent entry of water into the motor chamber by leakage or wicking. Provide cables suitable for submersible pump application and conforming to NEC specifications for cable sizing. Provide sufficient cable to run from the power terminal box and control terminal box to the pumps.

H. Shaft

1. Provide a one piece, fully machined pump and motor shaft. Design the shaft to limit shaft deflection under maximum pumping load to .002 inches at the lower mechanical seal face and to obtain a rotating assembly first critical speed of not less than 150 percent of the rated speed.
2. Provide shafts of stainless steel

I. Bearings

1. Provide two antifriction bearing assemblies. Design one assembly to carry only radial loads and to be free to float axially within the frame.
Design the other assembly to carry both radial and axial loads and to be restrained from axial movement.

2. Select bearings in accordance with AFBMA 9 and 11 Load Ratings and Fatigue Life for Ball and Roller Bearings, to have a 100,000 hours minimum L10 bearing life at maximum pumping load that occurs under the specified operating conditions.

2.7 PROTECTION MONITORING SYSTEM

A. Provide each pumping unit with a monitoring system to protect critical machine functions during operation. Critical machine functions shall include seal failure and motor over temperature limit.

B. Initiate alarm and motor shutdown upon sensing moisture in the oil chamber.

C. Provide monitoring devices to detect moisture in the stator chamber and seal cavity. Locate monitoring devices on the front door of the AFD controller.

2.8 MOUNTING ACCESSORIES

Provide anchor bolts, nuts, washers, and accessories and other adapter equipment necessary for mounting the pumping equipment and appurtenances. Provide anchor bolts, nuts, washers, accessories and adaptor equipment made of Series 300 stainless steel. For bolts or studs engaging tapped holes in pump components, use silicon bronze or Series 300 stainless steel, as required for strength. Obtain approval from the ENGINEER for details of pump mountings before starting work on any structure for this equipment.

2.9 ACCESSORIES

A. Provide each pump with suction and discharge gauges having a minimum of 4-1/2-inch diameter dials plainly marked. Provide suction gauges of the compound type to indicate both vacuum and pressure. Discharge gauge shall be pressure type. Locate gauges as close as possible to the nozzles of the pumps. Connect each gauge with stainless steel pipe, fittings and isolating stopcocks. Equip each gauge with a snubber and threaded protective diaphragm seal made of stainless steel. Provide the scale range of each gauge as specified.

B. Provide inline three-way valve prior to gauge and pressure switch connections to allow for flushing of accumulated solids. Provide 10 feet of hose directed to a common drain point from the flushing connection.

C. Provide each pump with a sewage air release valve mounted at the top of the motor's coolant passage and arranged to allow entrained air to escape. Provide separate piping of the valve's discharge to the wet well.
D. Provide a differential pressure switch for each pump discharge valve.

2.10 SOURCE QUALITY CONTROL

A. Perform a certified shop test on each pumping unit in accordance with the test code of the Hydraulic Institute, except as modified herein. Test the pumps with their suction elbows in a dry pit and in the position that they will be installed. Furnish the certified shop test curves along with the raw test data, calculated results and sufficient information for computation and plotting of the curves.

B. Test at rated speed to determine the curves of head, brake horsepower, NPSH required, electric input kilowatts, and overall efficiency, wire to water, as a function of capacity. Take a minimum of ten points, including one at shutoff head. Take one point as near as possible to each specified condition of head and capacity and take one at the lowest head specified. Take the remaining points at capacities necessary to provide a uniform distribution of data. Express capacity in gallons per minute and express head in feet.

3. EXECUTION

3.1 INSTALLATION

Install all equipment in accordance with the manufacturer's recommendations and approved shop drawings. Complete all wiring and piping and make all necessary adjustments to equipment to provide a complete operational pumping installation.

3.2 FIELD QUALITY CONTROL

A. Furnish the services of a qualified representative of the manufacturer of the pumps and the drive units to inspect the completed installation, make any necessary adjustments, participate in the startup of the equipment, participate in the field testing of the equipment, place the equipment in trouble-free operation, and instruct the operating personnel in its operation and maintenance.
C. After installation of the pumping units, control equipment and all appurtenances, subject each unit to a field running test as specified in Division 1, under actual operating conditions. Perform the field tests in the presence of and as directed by the ENGINEER. Demonstrate that under all conditions of operation each unit:

1. Has not been damaged by transportation or installation.
2. Has been properly installed.
3. Has no mechanical defects.
4. Has been properly connected.
5. Is free of overheating of any parts.
6. Is free of overloading of any parts.
7. Is free of all objectionable vibration.

D. Test the pumps to demonstrate that the pumps and control system operate as specified. Promptly correct any defects in the equipment or failure to meet the requirements of the Specifications.

END OF SECTION
ADJUSTABLE FREQUENCY DRIVES

1. GENERAL

1.1 DESCRIPTION OF WORK

A. This section includes the requirements for providing, installing and testing the 480-volt adjustable frequency drives. Provide drives in individual free standing enclosures, wall mounted enclosures, or incorporated into motor control centers, as shown. Furnish harmonic studies as specified.

B. Codes and standards referred to in this Section are:

1. NEMA ICS 1 - General Standards for Industrial Control and Systems
2. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Not More than 2000 Volts AC or 750 Volts DC.
3. NEMA ICS 3 - Industrial Control and Systems Factory Built Assemblies
4. NEMA ICS 7 - Industrial Control and Systems: Adjustable Speed Drives
5. NEMA ICS 7.1 - Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable Speed Drive Systems
6. NEMA 250 - Enclosures for Electrical Equipment
7. NFPA 70 - National Electrical Code
8. IEEE 85 - Test Procedure for Airborne Sound Measurements on Rotating Electric Machinery
9. IEEE 519 - IEEE Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems
10. UL 845 - Motor Control Centers
C. Design Requirements:

1. Provide adjustable frequency drives to vary the speed of NEMA standard, 3-phase, 460-volt, induction motors and driven equipment by varying the frequency and voltage applied to the motors.
2. Provide adjustable frequency drives that fit in the space shown. Units exceeding the dimensions shown will not be acceptable.
3. Provide adjustable frequency drives that automatically restart when power is restored after a power outage. Provide control logic so the drive is allowed to restart when power is restored.

D. Provide adjustable frequency drives with an output that is at least 3 percent greater than the driven motor’s full nameplate rating.

E. Provide variable torque or constant torque output drives as required by driven equipment.

F. Provide adjustable frequency drives serving motors 75 HP or smaller that utilize 6-pulse drive technology.

G. Provide adjustable frequency drives serving motors 100 HP or larger that utilize 18-pulse drive technology.

H. Provide adjustable frequency drives to meet the following requirements of IEEE 519:

1. Total harmonic distortion THD (Voltage): Maximum of five percent for general distribution systems as measured at the point of common coupling.

2. Total current harmonic distortion: Not to exceed the values in Table 10.3, Current Distortion Limits for General Distribution Systems (120 V through 69000 V) of IEEE-519 at the point of common coupling.

3. Capacitor traps for controlling harmonics that require tuning to the power system are not acceptable.

4. Operate at a minimum efficiency of 95 percent at rated load.

5. Operate from a 480-volt, 3-phase, 60-hertz supply with a voltage variation of plus 10-percent or minus 20-percent and a frequency variation of plus or minus 2-hertz.
6. Input power factor: Maintain a 95 percent minimum power factor over a 20 to 100 percent speed range.

7. Operate an induction motor as specified, including a high-efficiency, high-power factor, premium-duty motor, with no detriment to motor life.

8. Operate an induction motor without exceeding a motor sound and power level of 96-decibels, A-weighted, when measured in accordance with IEEE 85.

9. Operate under the following ambient conditions:
   a. Ambient Temperature: 0 to 40 degrees C
   b. Humidity: 0 to 95 percent

1.2 SUBMITTALS

Submittals shall be made by the Contractor in accordance with the procedures set forth in Section 105 – Control of Work, and as described below. The Contractor shall submit the following information for review and approval.

A. Furnish catalog data including rating and descriptive literature of all components and systems.

B. Furnish the following shop drawings customized for the project:
   1. Bill of materials including manufacturers name and catalog number
   2. Outline drawings showing dimensions, arrangement, elevations, identification of components and nameplate schedule for all units
   3. Interconnection wiring diagrams
   4. Individual schematic control diagrams for each unit
   5. One line diagrams
   6. Obtain and enter full performance data for all motors shown
   7. Certification that the adjustable frequency drives are compatible with the motors and the equipment loads to be driven.
C. Furnish a system harmonic distortion study as follows:

1. Obtain data on utility services, plant loads and plant operation. Verify electrical service rating including transformer size, short circuit capacity and X/R ratio.

2. Prepare a harmonic distortion study of plant electrical system to determine voltage and current harmonics at the point of common coupling for worst case speed and load settings.

3. Confirm that the submitted adjustable frequency drives limit the electrical disturbances below the 5 percent THD (voltage) and below the harmonic current distortion per Table 10.3 as established by IEEE 519.

4. Point of Common Coupling: The point of common coupling is the motor control center or switchgear directly upstream of the adjustable frequency drive.

5. Include analysis of all data with recommendations.

D. Furnish test reports, certificates of inspection and manufacturer's instructions.

E. Furnish Operation and Maintenance manuals for the AFD unit(s).

1.3 QUALITY ASSURANCE

A. Provide all adjustable frequency drives manufactured in accordance with referenced standards.

B. Provide a UL Inc. Label or certification of listing by C.S.A. or other recognized testing organization for each adjustable frequency drive.

C. Manufacture and install each adjustable frequency drive in accordance with the NEC and local codes.

D. Failure to meet the harmonic requirement as determined by field measurement: If the installed adjustable frequency drives fail to meet the harmonic limits specified, modify the adjustable frequency drives as follows:

1. Perform work at no additional cost to the OWNER

2. Install additional harmonic reduction equipment until the specified limit is achieved.
3. In the event that harmonic distortion limits cannot be achieved, replace the adjustable frequency drive equipment with equipment that conforms to this specification.

1.4 SPARE PARTS

A. Furnish the following spare parts per (each type of drive) (each group of similar sized units)

1. All parts recommended by the manufacturer in published literature as spare parts. As a minimum, provide the following:

   a. Six of all sizes and types of power and control fuses
   b. Six LED displays of each color
   c. One speed indicator meter relay
   d. Two of each type of push button and selector switch used
   e. Two keypads of each type used
   f. Two printed circuit boards of each type used
   g. Four filter capacitors of each size used
   h. Four diodes of each type used
   i. Four transistors, gate turn off thyristors IGBT’s or SCRs of each type used
   j. Three 12-ounce spray cans of the final finish for touch-up

B. Package spare parts in containers bearing labels and identify all spare parts for reordering. Deliver spare parts in original factory packages.

2. PRODUCTS

2.1 MANUFACTURERS

A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for review.

1. Robicon
2. Cutler-Hammer
3. Toshiba
4. Danfoss

2.2 DESIGN

A. Provide an input circuit breaker with an interrupting rating of 65,000 rms symmetrical amperes.

B. Provide input reactor or isolation transformer, if required, as determined by system harmonic distortion analysis.
C. Provide input section that converts 480-volts, 60-hertz, 3-phase input to a fixed dc voltage using diodes, bridged rectifiers or SCR’s.

D. Provide dc link reactor and filter capacitors as required.

E. Provide adjustable frequency drive inverter section that converts the fixed dc voltage to an adjustable frequency output utilizing a pulse-width modulation inverter. Maintain a constant volts per hertz ratio on the output with voltage boost for startup as required.

F. Provide a digital operator keypad located on the front door to allow setting of all programmable parameters and the following control functions:

1. Start push button
2. Stop push button
3. "Local-Remote" control selection
4. Speed control settings
5. Speed meter with hertz and 0-100 percent scales
6. Output ammeter
7. Elapsed time meter
8. Diagnostics package with fault indication and reset push button

G. Provide a control system for each drive that allows the following functions:

1. Remote, isolated 4-20 ma speed control input
2. Isolated 4-20 ma speed output
3. Alarm outputs
4. ON/OFF status output
5. Additional features and controls as specified with the driven equipment

H. Include the following control adjustments for each drive:

1. Acceleration time, 4 to 60 seconds
2. Deceleration time, 4 to 60 seconds
3. Minimum speed limit
4. Maximum speed limit
5. Inverter current limit
6. Supply undervoltage trip

I. Protection Features: Provide the following drive protection features:

1. Input line current limiting fuses rated 200,000 rms symmetrical amperes short circuit current.
2. Electronic overcurrent protection for instantaneous overload
3. AC input line undervoltage protection, adjustable from 60-100 percent nominal voltage with time delay adjustment and low speed override.
4. Overfrequency protection
5. Phase loss protection
6. DC overvoltage protection
7. Logic supply voltage low level protection
8. Line-to-line and line-to-ground output short circuit protection
9. Line-to-line and line-to-ground surge arresters sized for 480-volt 3-phase grounded wye system
10. Overload capability of 110% of the motor FLA based on the NEC ratings for 60 seconds
11. Control circuit fuses
12. Overtemperature protection
13. Diagnostics module to indicate protection trip conditions

J. Communications: Provide an addressable communication card capable of transmitting the following data over a two-wire network to the Plant SCADA System:

1. Status (ON, OFF, TRIPPED, NO RESPONSE)
2. Input and output current in each phase
3. Output frequency
4. Input and output kW
5. Cause of trip

2.3 COMPONENTS

A. Provide circuit breakers, fuses, transformers, push buttons, switches, indicating lights, relays and timers as specified in Division 26.
B. Provide power solid state switching components with a one minute current rating greater than 110 percent of rated current for variable torque drives or 150 percent of rated current for constant torque drives.

C. Provide programmable controller as specified in Division 26.

D. Furnish a constant voltage control power transformer to maintain control power with supply voltage variations from 70-110 percent nominal.

E. Apply a clear conformal coating of acrylic to all printed circuit boards.

2.4 ENCLOSURES

Provide adjustable frequency drive drives in NEMA 1 filtered and gasketed enclosures with full rear cover plates.

2.5 IDENTIFICATION

A. Provide identification of the adjustable frequency drives and their components.

B. Install nameplates for devices located on doors so they are readable to a person 5'-8” tall standing 3'-0" in front of the equipment.

C. Locate nameplates so that they are readily associated with items labeled.

D. Where nameplates are installed on removable relay or device doors, install an additional nameplate within the relay or device.

E. Where nameplates are located on other compartments than those served, add additional engraving to identify units served.

2.6 WIRING

A. Provide internal wiring with stranded switchboard wire having 600-volt rated, flame-resistant, type SIS insulation. Use No. 14 AWG wire for control interconnections. Provide power connections as required for the service.

B. Provide wire markers at each end of all wires.

C. Where wiring connections are made to equipment mounted on hinged doors, provide connections with extra flexible wires suitably cabled together and cleated.
D. Provide wiring of all control connections to all external connections through individual, positive-latch, pull-apart type control terminal blocks rated 600-volts. Locate terminal blocks for front access.

E. Provide sufficient terminals for all devices external to the adjustable frequency drive.

2.7 SOURCE QUALITY CONTROL

A. Shop test each adjustable frequency drive in accordance with IEEE and NEMA standards, including high potential tests and other standard tests for that particular class of equipment. Notify the OWNER fourteen (14) days prior to start of factory testing so that the OWNER, at his option, may witness the testing.

1. After final assembly, test each adjustable frequency drive at full load with application of line-to-line and line-to-ground bolted faults and show that the adjustable frequency drive trips electronically without device failure.

2. After all tests have been performed, burn-in each adjustable frequency drive for 40 hours at 100 percent inductive or motor load.

3. After the burn-in cycle is complete, subject each adjustable frequency drive to a 30 minute cycling motor load test before inspection and shipping.

B. After the equipment has been completely assembled, perform operational test to determine operating conditions and circuit continuity. Provide pushbuttons and selector switches to simulate all control input contacts and indicating lights to indicate all control outputs. Provide a 4-20 ma signal generator to simulate analog signals.

C. Provide all equipment, devices, instrumentation, and personnel required to perform the tests. Upon satisfactory completion of the test, submit two (2) certified copies of the test report to the ENGINEER. Component failure during testing will require repeating any test associated with the failure or modified components to demonstrate proper operation.

3. EXECUTION

3.1 INSTALLATION

A. Install all equipment in accordance with the manufacturer's recommendations and approved shop drawings.
B. Set all circuit breakers per the approved short circuit and coordination study.

C. Set all operational devices for proper system operation.

D. Terminate and label all field wiring per approved drawings.

3.2 FIELD QUALITY CONTROL

A. Inspect, adjust and check the installation for physical alignment, cable terminations and ventilation.

B. Perform the following field tests:

1. Close and open each circuit breaker to test operation

2. When site conditions permit, energize and de-energize each equipment item served by each drive, testing the complete control sequence of each item including acceleration and deceleration over complete operating range.

3. Perform a harmonic system analysis to demonstrate full compliance with IEEE 519 voltage and current harmonic distortion requirements specified. Accurately measure the amplitude of the harmonic current imposed on the 60-hertz sine wave with a harmonic spectrum analyzer. Provide additional harmonic reduction equipment to meet the specified limits. If the harmonic distortion limits are not achieved, replace the adjustable frequency drive equipment with equipment that conforms to this specification.

4. Operate each adjustable frequency drive with driven equipment at full load and test for hot spots.

5. Furnish detailed test reports of all tests indicating test performed, discrepancies found, and corrective action taken.

C. Manufacturer’s Field Services Representative: Provide the services of a factory-trained service engineer, specifically trained on the adjustable frequency equipment to assist in installation, start-up, testing, calibration, placing into operation, and provide training.

1. Provide a service engineer when each drive is placed into operation.
2. Provide a service engineer at the jobsite as often as necessary until all problems are corrected and the equipment installation and operation are satisfactory.

3. Following completion of installation and field-testing provide training for 12 employees of the OWNER in the proper operation, troubleshooting and maintenance of the equipment as outlined below. All training will be at the OWNER’S facilities at a time agreeable to the OWNER:

   a. A minimum of two 4-hour sessions combining both classroom and hands-on instruction, excluding travel time.

   b. A minimum of two 4-hour sessions combining both classroom and hands-on instruction, excluding travel time.

4. Provide service engineer at the job site as often as necessary to assist in the programming of the SCADA system in accessing the memory map of each device.

END OF SECTION
MAGNETIC FLOW METER

1. GENERAL

1.1 DESCRIPTION OF WORK

This section includes the requirements for furnishing and installing magnetic flow meters as specified or required for a complete installation. Locate the magnetic flow meters as shown on the Contract Drawings.

1.2 SUBMITTALS

1. Complete detailed drawings of all flow meter.

2. Working drawings, including arrangement and erection drawings of the flow meters; schematic control diagrams, electrical connection diagrams, and complete description of the control system.

3. Certified calibration data as required by subsection 2.1, paragraph A.8 below.

2. PRODUCTS

2.1 MAGNETIC FLOW METERS

A. Flow Elements

1. Electromagnetic type with pulsed dc coil excitation for zero stability. Suitable for aqueous solutions with minimum conductivity of 5 micromhos/cm. Insensitive to changes in fluid viscosity and density.

2. Flanged body design for 150 pound ANSI flanged pipe connections.

3. Sensor flow tube material: 304 stainless steel pipe, with 2 electromagnetic coils mounted on the exterior surface of the tube.

4. Furnish meter tube with a laying length of at least 1.3 times the nominal meter size.

5. Provide meter with hard rubber or polyurethane liner and type 316 stainless steel electrodes.

6. Enclosure classification: NEMA 4 / IP67 and capable of accidental submergence in 30 feet of water for up to 48 hours.
7. Electrical terminal boxes for flow sensors located in underground vaults, shall be backfilled with non-setting transparent potting material.

8. Hydraulically calibrate each meter at a flow facility against a master meter or other device which is traceable to the United States NIST. Submit certified calibration data and a calibration curve substantiating the stated accuracy. Submit information regarding the location of the flow facility and procedure being used to calibrate the meter.

9. Furnish and install meter with stainless steel grounding rings. Grounding electrodes will not be acceptable.

10. Meter accuracy: ±0.5 percent of actual flow rate for a range of 10 to 100 percent of maximum calibrated flow. Guarantee accuracy with no more than five pipe diameters of straight pipe run upstream from the meter.

11. Manufacturer: ABB (Fischer and Porter) Mag-XE, Endress+Hauser ProMag 53 series or equal.

B. Signal Converter:

1. Smart "Hart" protocol.

2. Provide remote mounted flow transmitter/ converter, microprocessor based. Provide transmitter with integral LCD display of flow rate.

3. Provide input of configuration data, stored in EEPROM memory without need for battery backup.

4. Output:

   a. 4-20 mAdc into 0-600 ohm load linearly proportional to flow, calibrated as scheduled.

   b. Scaled Pulse totalizer output, suitable for 24 Vdc switching at 250 mA. Pulse width to be adjustable. Calibrate the pulse rate for 1,000 gallons per pulse.

5. Accuracy: ±0.5 percent of actual flow over 10:1 flow range.

6. Provide input span adjustment from 1.5-30 feet per second at full-scale flow. Meters requiring circuit or component changes to effect calibration changes will not be acceptable.

7. Operating ambient temperature: -4 to 140 degrees F.
8. Power requirement: 115 volts ac, 60 hertz.


3. EXECUTION

3.1 INSTALLATION

Install magnetic flow meters where shown in the Contract Drawings and in accordance with approved shop drawings and manufacturer’s recommendations.

END OF SECTION
PRESSURE GAUGES

1. GENERAL

1.1 DESCRIPTION OF WORK

A. This section includes the requirements for furnishing and installing gauges and isolating devices as shown and specified.

B. Codes and standards referred to in this Section are:

ASME B40.1 - Gages - Pressure, Indicating Dial Type - Elastic Element

1.2 SUBMITTALS

Provide all submittals, including the following, as specified in Division 105 – Control of Work.

2. PRODUCTS

2.1 MANUFACTURERS

Acceptable manufacturers for gauges are listed below. Other manufacturers of equivalent products may be submitted.


2. Supergauge by U. S. Gauge, a Division of Ametek, Inc.

3. Duragauge by Ashcroft, Industrial Valve and Instrument Division, Dresser Industries.

4. Helicoid Gauges by Helicoid Gauge Division, ACCO (American Chain and Cable Company, Inc.)

2.2 DESIGN

A. Provide gauges to include pressure, vacuum, and compound gauges of the dial-indicating bourdon tube type. Manufacture gauges to the requirements of ASME B40.1, Gauges, Pressure and Vacuum, Indicating Dial Type - Elastic Element, except as modified herein. Locate gauges as shown or specified.
B. Provide Grade 2A pressure gauges with a range of (0 to 60) (0 to 100) psig, with an accuracy of 0.5 percent of the maximum scale reading.

C. Provide Grade 2A compound vacuum and pressure gauges a vacuum range of 0 to 30 inches of mercury and a pressure range of (0 to 60) (0 to 100) (etc.) psig with an accuracy of 0.5 percent of the maximum scale reading,

2.3 CONSTRUCTION

Construct gauges with a nominal size of (4 1/2) (6) inches. Provide (bottom) (rear) located pressure connection, 1/4-inch or 1/2-inch NPT, male fitting extending a minimum of 1-1/4 inches beyond the case and with large wrench flats. Construct the bourdon tube and fitting of (brass) (Type 316 stainless steel). Provide a weatherproof case of the (stem) (wall) (flush) mounted type, constructed of (shock-resistant plastic) (steel with a corrosion-resistant paint coating) (epoxy coated cast aluminum). Design the movement to be rotary gear or helical roller type designed to minimize wear and maintain accuracy. Make provisions for adjustment of zero reading. Manufacture dials white (black) faces with black (white) numerals and markings. Provide gasket sealed glass windows to prevent moisture and dust from entering the gauge case.

2.4 DIAPHRAGM SEALS

A. Furnish diaphragm seals to isolate the process fluid from the pressure gauge. Provide Grade 2A gauge (0.5 percent) seal and gauge combined accuracy of 1.0 percent of the maximum scale reading. Equip the seal with a 1/4-inch NPT pressure device connection and a 1/2-inch NPT process connection. Design the 2-1/2 inches minimum diameter seal for continuous duty, fitted with a 1/4-inch NPT flushing connection, and of the cleanout type. Manufacture the diaphragm of Type 316 stainless steel. Construct the lower and upper case of (steel with a rust resistant coating) (Type 316 stainless steel) (PVC plastic) (Viton) (Teflon). Make all wetted parts corrosion resistant to the process liquid. Provide liquid filled case as recommended by the manufacturer. Factory assemble and calibrate all liquid filled pressure gauge-diaphragm seal units at the point of manufacturer and ship and install as a unit.

B. Provide sintered metal snubbers or orifice plate restrictors for pulsation dampening, and of (brass) (Type 316 stainless steel) construction. Locate pulsation-dampening devices adjacent to the pressure device.

C. Provide shutoff cocks, for each gauge, constructed of (brass) (Type 316 stainless steel) (plastic).
3. EXECUTION

3.1 INSTALLATION

Install pressure gauges in accordance with the manufacturer's recommendations and approved shop drawings.

3.2 SCHEDULE

Provide gauges as scheduled below indicated on drawings:

END OF SECTION
SUPPORTS AND ANCHORS

1. GENERAL

1.1 DESCRIPTION OF WORK

A. This section includes the requirements for providing all hanging and supporting devices of construction shown, specified, or required for pipelines, apparatus, and equipment other than electrical equipment.

B. Codes and standards referred to in this Section are:

1. ASME B 16.1 - Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, 800
2. ASME B31.1 - Power Piping (Includes Revision Service)
3. ASTM A 307 - Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength
4. MSS SP-58 - Pipe Hangers and Supports - Materials, Design and Manufacture
5. MSS SP-69 - Pipe Hangers and Supports - Selection and Application
6. MSS SP-89 - Pipe Hangers and Supports - Fabrication and Installation Practices
7. MSS SP-90 - Guidelines on Terminology for Pipe Hangers and Supports

1.2 SUBMITTALS

Submit shop drawings to show the quantity, type, design and location of all supports, hangers and anchors required.

1.3 SYSTEM DESCRIPTION

A. System includes supporting devices adequate to maintain the pipelines, apparatus, and equipment in proper position and alignment under all operating and testing conditions with due allowance for expansion and contraction.
B. Design supporting devices in accordance with the best practice and provide supporting devices that are not unnecessarily heavy. Design supporting devices to accommodate loads imposed during leakage tests for the test pressures specified. Base the required strength of supporting devices on the combined weight of the piping and connected equipment, the weight of the denser of the fluids used in operations or testing and the weight of insulation where applicable. Install supports with a working safety factor of not less than 5.

C. Provide springs where necessary. Make hangers and supports of standard design where possible and best suited for the service required. Include proper pipe protection saddles for hangers and supports on pipes which are covered with insulation. Where required, make supports screw adjustable after installation unless approved otherwise.

D. Design all supporting devices so as to minimize interference with access and movement. Eliminate the potential for injuries due to protruding supporting devices.

E. Provide base piping support, hanger rod size, brackets and spacing meeting the requirements of ASME B31.1, MSS SP-58, SP-69, SP-89 and SP-90 except as modified herein.

Modify hangers for plastic pipes to increase the bearing area by inserting a protective sleeve of medium-gauge aluminum sheet metal between the pipe and the hanger.

   a. Align hangers such that no sharp edges come in contact with the pipe.

   b. Provide a wooden or thermoplastic pad between the plastic pipe and any concrete or masonry surface.

   c. Use supports for vertical lines of a type which do not exert a compressive strain on the pipe. Riser-type clamps that squeeze the pipe will not be permitted.

2. PRODUCTS

2.1 MANUFACTURERS

Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted.

   1. Pipe hangers and supports
a. Grinnell Corporation, Cranston, RI  
b. Globe Pipe Hanger Products, Inc., Cleveland, OH

2. Sheet metal shield  
"Thermal-Hanger Shields" by Pipe Shields Incorporated, Vacaville, CA

2.2 MATERIALS

A. Use structural and miscellaneous steel, metal castings, ductile iron pipe and fittings, steel pipe and fittings.

B. Support overhead hangers using threaded rods properly fastened in place by suitable screws, clamps, inserts, or bolts, or by welding. Subject hangers to tensile loading only. Where lateral or axial movement may occur, provide suitable linkage to permit sway.

C. Suspended Piping: Support suspended piping by adjustable ring or clevis hangers and threaded rods from heavy-duty concrete inserts or other fastening devices, except as otherwise specified or noted.

D. Brackets: Make brackets of welded steel and designed for the following load classifications.

<table>
<thead>
<tr>
<th>Load Classification</th>
<th>Maximum Load per Bracket</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light</td>
<td>750 pounds</td>
</tr>
<tr>
<td>Medium</td>
<td>1,500 pounds</td>
</tr>
<tr>
<td>Heavy</td>
<td>3,000 pounds</td>
</tr>
</tbody>
</table>

1. When medium or heavy brackets are bolted to vertical surfaces, furnish and install backplates of adequate size and thickness to distribute the load against the vertical surfaces.

2. When the use of backplates is not practicable, fasten the brackets to the vertical surfaces in such a manner that the safe bearing strength of the vertical surfaces will not be exceeded.

E. Chairs and Pipe Rolls: Use cast-iron pipe rolls or chairs. Provide pipe rolls with threaded nuts or with sockets to take threaded rods.

F. Saddle Stands: Use adjustable saddle stands.
1. Provide each stand with a length of steel pipe fitted at the base with standard threaded cast-iron flange or steel base plate and at the top with an adjustable saddle or roll. Bolt the base flange or plate to the floor, foundation or concrete base.

2. Use stanchions of construction similar to the saddle stand, except fit them at the top with cast-iron pipe saddle supports or with pipe stanchion saddles with yokes and nuts.

G. Insulation Support Requirements: At support points, protect insulated pipes by a 360-degree insert of high density, 100 psi, waterproofed calcium silicate encased in a 360-degree sheet metal shield.

1. Make inserts of the same thickness as the adjoining pipe insulation.

2. Provide the shield length, minimum galvanized sheet metal gauge and installation procedure in accordance with the manufacturer's recommendations.

3. Extend insulation inserts one inch beyond the sheet metal shields on cold water lines, and jacket and vapor seal as required when the abutting insulation is installed.

H. Expansion: Connect, support and guide piping to permit and control pipe expansion and contraction and to accommodate building expansion, contraction and settling without damage to the piping or support system.

1. Furnish and install anchors when specified, shown, or required for holding the pipelines and equipment in position or alignment. Design anchors for rigid fastening to the structures, either directly or through brackets.

2. Provide cast-iron chair type anchors for piping with steel straps, except where anchors form an integral part of pipe fittings or where an anchor of special design is required.

3. Inserts: Provide galvanized concrete inserts.
   a. Design inserts to permit the rods to be adjusted horizontally in one plane and to lock the rod nut or head automatically.
   b. Recess inserts near the upper flange to receive reinforcing rods.
c. Design inserts so that they may be held in position during concrete placing operations. Design inserts to carry safely the maximum load that can be imposed by the rod which they engage.

3. EXECUTION

3.1 INSTALLATION

Install hanger and supports in accordance with the manufacturer's recommendations and approved shop drawings.

END OF SECTION
1. GENERAL

1.1 DESCRIPTION OF WORK

Furnish to the OWNER (4) hard copies and (2) electronic copies on CD-ROM of an Operation and Maintenance Manual for all equipment and associated control systems furnished and installed.

1.2 QUALITY ASSURANCE

In addition to the requirements herein, Operation and Maintenance Manuals shall conform to the requirements of the Virginia Department of Health where applicable.

1.3 SUBMITTALS

A. Prior to the Work Reaching 80 percent completion, submit to the OWNER for approval two hard copies of the manual with all specified material. Within 30 days after the OWNER's approval of the two-copy submittal, furnish to the OWNER the remaining (2) hard copies of the manual. Provide space in the manual for additional material. Submit any missing material for the manual prior to requesting certification of substantial completion.

B. After approval of the hard copy manuals, submit with the remaining hard copies, (2) electronic copies on CD-ROM organized in the same manner as the hard copy manual. All files shall be in AutoCad (.dwg), Adobe Acrobat (.pdf), or any Microsoft Office product.

1.4 FORMAT AND CONTENTS

Prepare and arrange each copy of the manual as follows:

1. One copy of an equipment data summary (see attached sample form) for each item of equipment.

2. One copy of an equipment preventive maintenance data summary (see attached sample form) for each item of equipment.

3. One copy of the manufacturer's operating and maintenance instructions. Operating instructions include equipment start-up, normal operation, shutdown, emergency operation and troubleshooting. Maintenance instructions include equipment installation, calibration and adjustment,
preventive and repair maintenance, lubrication, troubleshooting, parts list and recommended spare parts.

4. List of electrical relay settings and control and alarm contact settings.

5. Electrical interconnection wiring diagram for equipment furnished including all control and lighting systems.

6. One valve schedule giving valve number, location, fluid, and fluid destination for each valve installed. Group all valves in same piping systems together in the schedule. Obtain a sample of the valve numbering system from the OWNER.

7. Furnish all O&M Manual material on 8-1/2 by 11 commercially printed or typed forms or an acceptable alternative format.

8. Provide space for a reduced set of record Contract Drawings, size approximately 11 by 17 inches and folded to 8-1/2 by 11 inches. Drawings will be furnished by the OWNER.

B. Organize each manual into sections paralleling the equipment specifications. Identify each section using heavy section dividers with reinforced holes and numbered plastic index tabs. Use 3-ring, hard-back binders Type AVE-87784 as manufactured by Avery Dennison, or equal. Punch all loose data for binding. Arrange composition and printing so that punching does not obliterate any data. Print on the cover and binding edge of each manual the project title, and manual title, as furnished and approved by the OWNER.

C. Leave all operating and maintenance material that comes bound by the equipment manufacturer in its original bound state. Cross-reference the appropriate sections of the CONTRACTOR's O&M manual to the manufacturers' bound manuals.

D. Label binders Volume 1, 2, and so on, where more than one binder is required. Include the table of contents for the entire set, identified by volume number, in each binder.

END OF SECTION
City of Norfolk Department of Utilities

Project XX

Equipment Data Summary

Equipment Name: Specification Reference:

Manufacturer:

Name:

Address:

Telephone:

Number Supplied: Location/Service:

Model No: Serial No:

Type:

Size/Speed/Capacity/Range (as applicable):

Power Requirement (Phase/Volts/Hertz):

Local Representative:

Name:

Address:

Telephone:

NOTES:
City of Norfolk Department of Utilities

Project XX

Preventive Maintenance Summary

<table>
<thead>
<tr>
<th>Equipment Name</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturer:</td>
<td></td>
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<tr>
<td>Name:</td>
<td></td>
</tr>
<tr>
<td>Address:</td>
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<tr>
<td>Telephone:</td>
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<table>
<thead>
<tr>
<th>Model No</th>
<th>Serial No</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Maintenance Task</th>
<th>Lubricant/Part</th>
<th>D W M Q SA A</th>
<th>O&amp;M Manual Reference</th>
</tr>
</thead>
</table>

NOTES:

PART ONE - GENERAL

1.1 PROJECT SCOPE:

1.1.1 Requirements for providing permanently installed Dri-Prime Back-up System.

1.1.2 The pump shall be delivered to the owner within 12 weeks of contract commencement or as stated in the notice to proceed.

1.2 SYSTEM DESCRIPTION

1.2.1 The pump set specified in this section will be used to pump unscreened sewage.

1.2.2 The pump and accessories shall be supplied by the pump manufacturer.

1.2.3 The pump shall be fitted with a fully-automatic priming system incorporating an air compressor, air ejector assembly, and an air/water separation tank. The priming system shall be capable of priming the pump from a completely dry pump casing. The air ejector shall operate on the discharge side of the compressor, eliminating the possibility of water being drawn into the air source. The pump must be capable of running totally dry for periods up to twenty-four hours, then automatically re-priming and returning to normal pumping volumes without need for any adjustment.

1.2.4 The priming system shall not use a vacuum or diaphragm pump, nor require the use of a "Foot"-type valve. It shall contain no moving parts or protective float gear. Priming systems that require manual water additions to facilitate pump priming are not acceptable. A demonstration of the pump’s ability to repeatedly cycle from dry suction / pump / snore / repriming / pump shall be required. This will necessitate the draining of all residual water from the pump case to initiate a dry suction starting condition.

1.2.5 Pump and priming system shall be fully automatic, needing no form of adjustment or manual addition of water for the priming system. The pump shall be capable of static suction lifts to twenty-eight vertical feet, at sea level. It shall also be capable of operation using extended suction lines.

1.2.6 Equipment acceptance shall be contingent upon the pumps ability to run continuously at full speed in a completely dry condition for periods up to twenty-four hours. This may require the draining of all residual water in the pump casing to simulate a dry suction/case condition. A demonstration may be required by the engineer.

1.2.7 The engine and pump shall be completely enclosed with fourteen-gauge sheet metal panels backed with one inch and two-inch layers of polydamp acoustical sound-deadening material. The acoustical enclosure shall reduce pump and engine noise to sixty-eight dBA or less at a distance of thirty feet. The enclosure shall be removable.
for easy access to the engine / pump for maintenance and repair. The enclosure doors shall all be equipped with latches that are keyed alike. For maintenance and service needs, the enclosure sides shall have hinged doors for quick access to the engine oil fill, fuel fill port, oil dipstick, and filters.

1.3 SYSTEM DESCRIPTION

1.3.5 OPERATING SPEED (Maximum) 2000 RPM
MINIMUM SOLIDS HANDLING SIZE 3 INCHES
IMPELLER DIAMETER 14” (345 mm)
SHAFT DIAMETER (at seal) 50 MM
SUCTION SIZE 4 INCHES
DISCHARGE SIZE 4 INCHES
MAXIMUM SUCTION LIFT 28 FEET
PUMP SHUT-OFF HEAD 250 FEET
MAXIMUM DUTY POINT 425 GPM AT 218’ TDH
(SECOND DUTY POINT 425 GPM AT 48’ TDH
(INCLUDING A 15’ SUCTION LIFT)
(INCLUDING A 25’ SUCTION LIFT)

1.4 REFERENCES

1.5.1 ANSI B16.1 - Standard for Cast Iron Pipe Flanges and Flanged Fittings.

PART TWO - PRODUCTS

2.1 ACCEPTABLE MANUFACTURER

2.1.1 The pump shall be Model CD140M, size 4” as manufactured by GODWIN PUMPS, Bridgeport, New Jersey or approved equal.

2.2 EQUIPMENT

2.2.1 VOLUTE, SUCTION COVER, SEPARATION TANK: Pump castings shall be cast iron. Pump design shall incorporate a direct suction flow path that is in axial alignment with the impeller eye. There shall be no turns, chambers, or valves between the suction flange and the impeller eye.

2.2.2 IMPELLERS: The pump impeller shall be of open non-clog type with pump out vanes on the back shroud. The impeller shall be two-bladed of hardened cast chromium steel construction. Shrouded or semi-shrouded (non-clog) impellers will not be accepted.

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Barraud Park, Pump Station #153, Phase I
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2.2.3 WEARPLATES: Shall be fully adjustable and replaceable, fabricated of cast iron. Wearplate clearances shall have no relationship to the ability of the pump to achieve a prime. The pump wearplates shall be of a diameter equal to or greater than the impeller diameter, to ensure maximum protection to the pump casing. Under no circumstances will wear rings be accepted.

2.2.4 BEARINGS AND SHAFTS: Pump shall be fitted with a bearing bracket that contains the shaft and heavy duty ball or tapered roller bearings of adequate size to withstand imposed loads. Minimum I.S.O. L10 bearing life to be 100,000 hours. Impeller shaft shall be of 1½% chromium alloy and have a minimum diameter of 50-mm at the pump seal.

2.2.5 SEALS: Seals shall be high pressure, back-to-back double mechanical self-adjusting type with solid silicon carbide faces capable of withstand suction pressures to 58 psi. The mechanical seal shall be cooled and lubricated in an oil bath reservoir, requiring no maintenance or adjustment. Pump shall be capable of running dry, with no damage, for periods up to 24 hours. All metal parts shall be of stainless steel. Elastomers shall be Viton.

2.2.6 PUMP SUCTION AND DISCHARGE FLANGES: Shall be cast iron ANSI (B16.1) Class 150, flat faced.

2.2.7 PUMP GASKETS: Shall be compressed fiber and/or Teflon.

2.2.8 PUMP O-RINGS: Shall be Nitrile & Viton.

2.2.9 PRIMING SYSTEM: Automatic priming system incorporates a twin-cylinder compressor and air ejector assembly, no vacuum pump. The compressor shall be installed on the engine auxiliary drive and shall be gear driven, lubricated and cooled from the engine. The priming system shall require no fail-safe protection float gear or any adjusting at high or low suction lifts. Pumps with self-priming chambers modified with vacuum priming systems shall not be accepted as equal. The pump must be capable of running totally dry for periods up to 24 hours, then re-priming and returning to normal pumping volumes. Pump and priming system is capable of priming the pump from a completely dry pump casing. The pump shall be capable of static suction lifts to 28 vertical feet, at sea level. It shall also be capable of operation using extended suction lines. Equipment acceptance shall be contingent upon the pump’s ability to run continuously at full speed in a completely dry condition for periods up to 24 hours. The engineer may require a demonstration.

2.2.10 CHECK VALVE: Pump shall be supplied with an integral flap check valve mounted on the discharge flange of the pump, allowing unrestricted flow into the impeller. The check valve shall prevent in-line return of flow when the pump is shut off. Non-return valve elastomers shall be Nitrile rubber, and shall be field replaceable.
2.2.11 DRIVE UNIT: The drive unit shall be water-cooled natural gas engine. Engine shall drive pump by use of direct connected intermediate drive plate. Starter shall be 12 volt electric. Safety shut down switches for low oil pressure and high temperature shall be an integral component of this engine control panel provided. Battery shall have 180 Amp hour rating. Unit shall include a tachometer and an hour meter. Unit shall be a GM 5.7 Liter Natural Gas or equal, rated at 103 hp (continuous) at 2200 RPM. A certified continuous duty engine curve shall be supplied to the owner/engineer.

2.2.12 FUEL SOURCE: Natural Gas flow of 830ft³/hr at 14 inH₂O column (870,000 BTU/hour) at engine supply fitting is required. The natural gas must have an energy density of at least 1050 BTU/ft³. Installation contractor shall supply all pressure regulators and piping up to the engine set to meet the required flow and engine at the engine set. Contractor shall also co-ordinate with local gas regulator and supplier to ensure the specified natural gas requirements is met.

2.2.13 ENGINE CONTROL PANEL: Engine speed shall be adjustable to operate the pump between maximum and minimum design operation speeds in manual mode. See section 2.3 for Automatic mode.

2.2.14 EXHAUST: Exhaust system shall include a hospital grade muffler housed in a separate chamber within the enclosure. All exhaust piping and manifolds shall be encased in fitted acoustic blankets. They shall be constructed of high-density fiberglass material with waterproof jacketing.

2.2.15 SOUND ATTENUATED ENCLOSURE: The engine and pump shall be completely enclosed with 14 gauge sheet metal panels backed with 1” and 2” layers of polydamp acoustical sound deadening material. The acoustical enclosure shall reduce pump and engine noise to sixty-eight dBA or less at a distance of 30 feet. The panels shall be removable for easy access to the engine/pump for maintenance and repair. The engine control panel shall have a locking door with window for visual inspection. For maintenance and service needs, the pump discharge side of the trailer shall have a hinged door for quick access to the engine oil fill, fuel fill port, oil dipstick and filters.

2.2.16 FACTORY PAINTING: Pump, engine, base, trailer, and sound attenuated enclosure shall be shop primed and finish painted at the place of manufacturer. Materials and thickness for priming shall be in accordance with manufacturer's standards.

2.2.17 PUMP BASE: The pump and engine shall be fully enclosed and skid mounted on a structural steel frame suitable for installation on a concrete mounting pad.

2.3 AUTOMATIC STARTING CONTROL SYSTEM

2.3.1 The engine shall be equipped with a factory installed PrimeGuard
2.3.2 ENGINE / PUMP CONTROL SPECIFICATIONS

The engine shall be started, stopped, and controlled by a PrimeGuard high performance state of the art digital controller as supplied by Godwin Pumps of America, Inc. The controller shall be weather proof enclosed, and contain an external weatherproof 12-position keypad accessible without the need to remove or open any protective cover or enclosure. It shall be designed to start/stop the engine at a signal supplied by high and low level floats or a 4-20 mA transducer. The PrimeGuard controller shall provide the following functions without modification, factory recalibration, or change of chips or boards, by simply accessing the keypad.

2.3.2.1 The keypad shall be a capacitive touch sensing system. No mechanical switches will be acceptable. The keypad shall operate in extreme temperatures, with gloves, through ice, snow, mud, grease, etc. and maintain complete weather-tight sealing of the PrimeGuard controller.

2.3.2.2 In automatic mode, the unit shall conserve energy and go to “sleep” while pump is not running.

2.3.2.3 The PrimeGuard controller shall function interchangeably from float switches, pressure switch, or transducer, as well as manual start/stop by selection at the keypad. No other equipment or hardware changes are required.

2.3.2.4 The PrimeGuard controller shall be capable of varying the engine speed to maintain a constant level in a process without a change to the controller other than via the keypad.

2.3.2.5 The start function can be programmed to provide three separate functions each day for seven days (i.e. a start, warm up, exercise cycle on two separate days at different times and for a varying length of time all via the keypad).

2.3.2.6 The panel shall include a Manual-Automatic Button to switch between modes of operation.

2.3.2.6.1 In Manual Mode, manual “Start” button starts engine and runs until “Stop” button is depressed or an emergency shutdown occurs.

2.3.2.6.2 In Automatic Mode, start/stop sequencing is initiated by either two normally-open narrow angler float switches, pressure switch, transducer, or a signal from a digital input.

2.3.2.7 The controller shall integrate the engine safety shut-off for low and high engine oil
temperature, and provide over-speed protection.

2.3.2.8 The controller shall include standard, field-adjustable parameters for engine cycle crank timer, shutdown time delay, warm-up time delay, and cool-down time delay.

2.3.2.9 The PrimeGuard controller shall have only one circuit board with eight built-in relays. Each relay can be named to provide any function, all via the keypad without changing relays, chips, printed circuits, or any hardware or software.

2.3.2.10 Standard components shall consist of (24) digital inputs, (7) analog inputs, (1) magnetic pick-up input, (8) 20-amp form “C” relays, (1) RS232 port, (1) RS485 port, (1) RS232/RS485 port, (1) J1939 port, and (1) 64X128 pixel full graphic LCD display with backlight.

2.3.2.11 The industrially-hardened PrimeGuard Controller shall withstand Vibration of 3 g, 3 axis, frequency swept 10-1000 Hz, in an operating temperature Range of 4° to 176°F (-20° to 80°C) and an operating humidity range of 0-95% Non-Condensing.

2.4 ACCESSORIES

2.4.1 FULLY AUTOMATIC TRICKLE CHARGER: The unit shall include a fully automatic trickle charger powered by 2-amps, 115 VAC. It shall be hardwired into the enclosure with a weather-sealed external plug and cover.

2.4.2 ENGINE BLOCK/COOLANT HEATER: The drive unit shall be supplier with an integral, thermostatically controlled engine block heater (15-amp, 115 VAC required).

2.4.3 ELECTRICAL JUNCTION BOX: The unit shall include a duplex GFCI outlet (junction box) for a single point 115 VAC, 30-amp electrical connection circuit to power the engine coolant heater.

2.4.4 DRY-CONTACT: The unit(s) shall include two (2) N/O or N/C dry contacts for integration with Lift Station SCADA system.

2.4.5 LEVEL TRANSDUCER: The unit shall be supplied with (1) one sewage compatible level transducer assembly including a single 4-20 mA level transducer (0-15 psig), which shall integrate with the engine control panel via a single multi-pin plug.

PART THREE - EXECUTION

3.1 MANUFACTURER’S SERVICES
3.1.1 The manufacturer shall furnish the services of a competent factory representative to do the following:

3.1.1.1 Inspect the system prior to delivery, supervise the start up and testing of the system, and certify the system has been properly furnished and is ready for operation.

3.1.1.2 Instruct the owner’s operating personnel in the proper operation and maintenance of the system for a period of not less than one half day.

3.2 TOOLS AND SPARE PARTS

3.2.1 The manufacturer shall furnish the following with the sewage pump system:

3.2.2 A recommended list of spare parts.

3.3.3 A complete set of engine and pump manuals.

3.3 WARRANTY

3.3.1 The manufacturer shall furnish the following to the owner:

3.3.1.1 A copy of the engine manufacturer’s parts and labor warranty.

3.3.1.2 A One year Parts and Labor Warranty issued by the manufacturer on the sewage pump system. This warranty must cover all pump parts, including the mechanical seal.

End of Section
SECTION 014100 – SPECIAL INSPECTION SERVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for Special Inspection services.

B. Certain structural components of the Project will be subject to the requirements for Special Inspections. Special Inspections will be applicable to the following specification sections:

1. Section 312000 Earth Moving
2. Section 033000 Cast-In-Place Concrete
3. Section 042000 Unit Masonry
4. Section 055000 Metal Fabrications
5. Section 061053 Rough Carpentry

C. The Owner will procure and bear all costs of the Special Inspector and the independent 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.

D. Requirements for Special Inspections are outlined in the Statement and Schedule of Special Inspections included in Appendix K.

1. Specific quality-assurance and control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality-assurance and control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

E. Special Inspections are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with Contract Document requirements.
1.3 RESPONSIBILITIES

A. Contractor Responsibilities: Contractor shall provide and include in the Contract Sum, inspections, tests, and other similar quality-control services specified elsewhere in the Contract Documents and required by authorities having jurisdiction except where they are specifically indicated to be the Owner's responsibility, or are provided by another identified entity.

1. Retesting: The Contractor is responsible for retesting where results of inspections, tests, or other quality-control services prove unsatisfactory and indicate noncompliance with Contract Document requirements, regardless of whether the original test was Contractor’s responsibility.

a. The Contractor shall correct deficiencies in work that inspections and laboratory test reports have indicated to be not in compliance with requirements.

b. The cost of retesting construction, revised or replaced by the Contractor, is the Contractor's responsibility where required tests performed on original construction indicated noncompliance with Contract Document requirements.

2. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

a. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.

3. Associated Services: The Contractor shall cooperate with agencies performing required inspections, tests, and similar services, and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include, but are not limited to, the following:

a. Provide access to the Work.

b. Furnish incidental labor and facilities necessary to facilitate inspections and tests.

c. Take adequate quantities of representative samples of materials that require testing or assist the agency in taking samples.

d. Provide and maintain for the sole use of the Special Inspector or Special Inspectors adequate facilities for safe storage and proper curing of test samples on the Project Site.

e. Provide the agency with a preliminary design mix proposed for use for materials mixes that require control by the testing agency.

f. Provide security and protection of samples and test equipment at the Project Site.

g. The Contractor shall designate a representative (the superintendent or an assistant to the superintendent) who shall be the direct point-of-contact with the Special Inspector during each phase of the work. Discrepancies noted during the progress of the work will be reported to the Contractor's representative for corrective action. Communications given by the Special Inspector to the Contractor's representative shall be as binding as if given to the Contractor.

B. Special Inspector Responsibilities:
1. The Special Inspector shall conduct and interpret tests, state in each report whether test specimens comply with requirements, specifically state any deviations therefrom, and record work required and performed to correct deficiencies.

2. The Special Inspector will keep records of all inspection and tests which will be furnished to the Building Official, the Architect, and the Structural Engineer of Record.

3. The Special Inspector shall notify the Architect, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services. All discrepancies will be brought to the immediate attention of the Contractor for correction. If discrepancies are not corrected, the discrepancies will be brought to the attention of the Building Official and the Structural Engineer of Record.

4. A final report documenting completion of all required special inspections and corrections of any discrepancies noted will be submitted to the Building Official by the Special Inspector prior to, and as a condition of, issuance of the Certificate of Use and Occupancy.

5. The Special Inspector shall not perform any duties of the Contractor.

6. The Special Inspector shall not release, revoke, alter, decrease or increase the Contract Document requirements.

C. Independent Testing Laboratory Responsibilities: The independent agency engaged to perform inspections, sampling, and testing of materials and construction specified in individual Sections shall cooperate with the Architect and the Contractor in performance of the agency's duties. The testing agency shall provide qualified personnel to perform required inspections and tests.

1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.

2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.

3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.

4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.

5. Shall not release, revoke, alter, decrease or increase the Contract Document requirements or approve or accept any portion of the Work.

D. Coordination: The Contractor and each agency engaged to perform inspection, tests and similar services shall coordinate the sequence of activities to accommodate required services with a minimum of delay. In addition the Contractor and each agency shall coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.

1. The Contractor is responsible for scheduling times for inspections, tests, taking samples, and similar activities.

1.4 SUBMITTALS

A. The Special Inspector and the Independent Testing Lab shall submit a certified written report, in duplicate, of each inspection, test, or similar service to the Architect.

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 or 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.

1.5 QUALITY ASSURANCE

   A. Qualification for Special Inspector: The Special Inspector shall be a Registered Professional Engineer, Licensed in the State of Virginia, experienced in performing special inspections and shall be approved by the Building Official and the Architect. The credentials of all Inspectors and testing technicians shall be provided if requested.

   B. Qualifications for Independent Testing Lab: Engage independent inspection and 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 requirements shall be as follows:

         a. Reinforced Concrete testing- ACI or NICET.
         b. Reinforced Concrete Inspection - ACI, ICBO, BOCA and SBCCI.
         d. Structural Masonry- ICC.
         e. Structural Steel and Welding- ICC.
         f. Soils Testing- NICET.
PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

A. General: Upon completion of inspection, testing, sample taking and similar services, repair damaged construction and restore substrates and finishes.

B. Protect construction exposed by or for quality-control service activities, and protect repaired construction.

C. Repair and protection is Contractor’s responsibility, regardless of the assignment of responsibility for inspection, testing, or similar services.

END OF SECTION 014100
SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY
   A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

1.2 ACTION SUBMITTALS
   A. Product Data: For each type of product indicated.
   B. Design Mixtures: For each concrete mixture.
   C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement.

1.3 INFORMATIONAL SUBMITTALS
   A. Welding certificates.
   B. Material certificates.
   C. Material test reports.

1.4 QUALITY ASSURANCE
   A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
      1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
   B. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
   C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M, "Structural Welding Code - Reinforcing Steel."
   D. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
      1. ACI 301, "Specifications for Structural Concrete."
      2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
E. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

F. Preinstallation Conference: Conduct conference at Project site.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

2.2 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

B. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets.


D. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice.

2.3 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, Type II or Type I/II, gray. Supplement with the following:

   a. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

2. Blended Hydraulic Cement: ASTM C 595, Type IS (MS), portland blast-furnace slag cement.

3. The use of fly ash is not allowed.

B. Normal-Weight Aggregates: ASTM C 33, graded.

1. Maximum Coarse-Aggregate Size: 1 inch nominal.

2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

2.4 ADMIXTURES


B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
   1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
   2. Retarding Admixture: ASTM C 494/C 494M, Type B.
   3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
   4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
   5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
   6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.5 WATERSTOPS

A. Flexible PVC Waterstops: CE CRD-C 572, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

2.6 VAPOR RETARDERS

A. Sheet Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.

B. Sheet Vapor Retarder: Polyethylene sheet, ASTM D 4397, not less than 10 mils thick.

2.7 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, nondissipating.
2.8 RELATED MATERIALS


2.9 CONCRETE MIXTURES

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, according to ACI 301.

B. Cementitious Materials: Use ground granulated blast-furnace slag as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.

C. Admixtures: Use admixtures according to manufacturer's written instructions.
   1. Use water-reducing, high-range water-reducing, or plasticizing admixture in concrete, as required, for placement and workability.
   2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
   3. Use water-reducing admixture in pumped concrete, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.

D. Proportion normal-weight concrete mixture as follows:
   1. Minimum Compressive Strength: As indicated.
   2. Maximum Water-Cementitious Materials Ratio: 0.40
   3. Slump Limit: 4 inches or 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
   4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.
   5. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

2.10 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.11 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.
   1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.
PART 3 - EXECUTION

3.1  FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Chamfer exterior corners and edges of permanently exposed concrete.

3.2  EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.3  VAPOR RETARDERS

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.

1. Lap joints 6 inches and seal with manufacturer's recommended tape.

3.4  STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

3.5  JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Engineer.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as foundation walls, grade beams, and other locations, as indicated.

E. Waterstops: Install in construction joints and at other joints indicated according to manufacturer's written instructions.

3.6 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

C. Cold-Weather Placement: Comply with ACI 306.1.

D. Hot-Weather Placement: Comply with ACI 301.

3.7 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view.

C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform
color and texture. Do not apply cement grout other than that created by the rubbing process.

2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.

3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix one part portland cement and one part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.8 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.

1. Apply scratch finish to surfaces to receive concrete floor toppings or to receive mortar setting beds for bonded cementitious floor finishes.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces to receive trowel finish or to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.

2. Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.-long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/4 inch.
E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.

1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.

3.9 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

   a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer.

3.10 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Engineer. Remove and replace concrete that cannot be repaired and patched to Engineer's approval.

3.11 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
END OF SECTION 033000
Division 04 - Masonry
SECTION 042000 - UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Concrete masonry units.
   2. Face brick.
   3. Mortar and grout.
   4. Steel reinforcing bars.
   5. Masonry joint reinforcement.
   6. Ties and anchors.
   7. Embedded flashing.
   8. Miscellaneous masonry accessories.

B. Related Sections:
   1. Section 033000 "Cast-in-Place Concrete" for installing dovetail slots for masonry anchors.
   2. Section 055000 "Metal Fabrications" for furnishing steel lintels and shelf angles for unit masonry.
   3. Section 076200 "Sheet Metal Flashing and Trim" for sheet metal flashing and for furnishing manufactured reglets installed in masonry joints.

1.2 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.3 PERFORMANCE REQUIREMENTS

A. Provide unit masonry that develops indicated net-area compressive strengths at 28 days.
   1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.
   2. Determine net-area compressive strength of masonry by testing masonry prisms according to ASTM C 1314.
1.4 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Owner will engage a qualified independent testing agency to perform preconstruction testing indicated below. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

1. Clay Masonry Unit Test: For each type of unit required, according to ASTM C 67 for compressive strength.
2. Concrete Masonry Unit Test: For each type of unit required, according to ASTM C 140 for compressive strength.
4. Mortar Test (Property Specification): For each mix required, according to ASTM C 780 for compressive strength.
5. Grout Test (Compressive Strength): For each mix required, according to ASTM C 1019.
6. Prism Test: For each type of construction required, according to ASTM C 1314.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Verification: For each type and color of the following:

1. Face brick.
2. Pigmented and colored-aggregate mortar. Make Samples using same sand and mortar ingredients to be used on Project.

1.6 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each type and size of the following:

1. Masonry units.
   a. Include data on material properties.
   b. For brick, include size-variation data verifying that actual range of sizes falls within specified tolerances.
   c. For exposed brick, include test report for efflorescence according to ASTM C 67.
   d. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.

2. Cementitious materials. Include brand, type, and name of manufacturer.
3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
4. Grout mixes. Include description of type and proportions of ingredients.
5. Reinforcing bars.
7. Anchors, ties, and metal accessories.

B. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.

2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

C. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

D. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.

B. Source Limitations 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 single source from single manufacturer for each product required.

C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

D. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.

E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination."

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weatherproof dispensing silos.
E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.9 PROJECT CONDITIONS

A. Protection of Masonry: During construction, 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 of walls 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. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.

C. 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 from mortar splatter by spreading coverings 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 onto completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

2.1 MASONRY UNITS, GENERAL
A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.

2.2 CONCRETE MASONRY UNITS
A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
   1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
   2. Provide square-edged units for outside corners unless otherwise indicated.
B. CMUs: ASTM C 90.
   1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi.
   2. Density Classification: Lightweight.
   3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.

2.3 CONCRETE AND MASONRY LINTELS
A. General: Provide one of the following:
B. Concrete Lintels: ASTM C 1623, matching CMUs in color, texture, and density classification; and with reinforcing bars indicated. Provide lintels with net-area compressive strength not less than CMUs.
C. Concrete Lintels: Precast or formed-in-place concrete lintels complying with requirements in Section 033000 “Cast-in-Place Concrete,” and with reinforcing bars indicated.
D. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.4 BRICK
A. Regional Materials: Brick shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
B. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units:
1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

C. Face Brick: Facing brick complying with ASTM C 216.
   1. Grade: SW.
   2. Type: FBX.
   3. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 3350 psi.
   4. Initial Rate of Absorption: Less than 30 g/30 sq. in. per minute when tested per ASTM C 67.
   5. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
   7. Application: Use where brick is exposed unless otherwise indicated.

2.5 MORTAR AND GROUT MATERIALS

A. Regional Materials: Aggregate for mortar and grout, cement, and lime shall be extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

B. 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.

C. Hydrated Lime: ASTM C 207, Type S.

D. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

E. Masonry Cement: ASTM C 91.

1. Products: Subject to compliance with requirements, provide one of the following:
   b. Cemex S.A.B. de C.V.; Citadel Type S Dixie Type S.
   c. Essroc, Italcementi Group; Brixment.
   d. Holcim (US) Inc.; Mortamix Masonry Cement.
   e. Lafarge North America Inc.; Magnolia Masonry Cement.
   f. Lehigh Cement Company; Lehigh Masonry Cement.
F. Mortar Cement: ASTM C 1329.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

G. Aggregate for Mortar: ASTM C 144.
   1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
   2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
   3. White-Mortar Aggregates: Natural white sand or crushed white stone.
   4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.


I. Epoxy Pointing Mortar: ASTM C 395, epoxy-resin-based material formulated for use as pointing mortar for structural-clay tile facing units (and approved for such use by manufacturer of units); in color indicated or, if not otherwise indicated, as selected by Architect from manufacturer's colors.

J. Refractory Mortar Mix: Ground fireclay or non-water-soluble, calcium aluminate, medium-duty refractory mortar that passes ASTM C 199 test; or an equivalent product acceptable to authorities having jurisdiction.

K. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Euclid Chemical Company (The); Accelguard 80.
      c. Sonneborn Products, BASF Aktiengesellschaft; Trimix-NCA.

L. Water: Potable.

2.6 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.

B. Masonry Joint Reinforcement, General: ASTM A 951/A 951M.
   1. Exterior Walls: Hot-dip galvanized, carbon steel.
   2. Wire Size for Side Rods: 0.148-inch diameter.
5. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
6. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

C. Masonry Joint Reinforcement for Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.

2.7 TIES AND ANCHORS

A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated.

6. Stainless-Steel Sheet: ASTM A 666, Type 304.
7. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
8. Stainless-Steel Bars: ASTM A 276 or ASTM a 666, Type 304.

B. Corrugated Metal Ties: Metal strips not less than 7/8 inch wide with corrugations having a wavelength of and an amplitude of 0.06 to 0.10 inch made from 0.030-inch- thick, steel sheet, galvanized after fabrication.

C. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches parallel to face of veneer.

D. Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches wide.

1. Z-shaped ties with ends bent 90 degrees to provide hooks not less than 2 inches long may be used for masonry constructed from solid units.
2. Where wythes do not align, use adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches.

E. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Connector Section: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from 0.060-inch- thick, steel sheet, galvanized after fabrication.
2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.187-inch- diameter, hot-dip galvanized steel wire.
3. Corrugated Metal Ties: Metal strips not less than 7/8 inch wide with corrugations having a wavelength of 0.3 to 0.5 inch and an amplitude of 0.06 to 0.10 inch made from 0.060-inch- thick, steel sheet, galvanized after fabrication with dovetail tabs for inserting into dovetail slots in concrete and sized to extend to within 1 inch of masonry face.
F. Partition Top anchors: 0.105-inch-thick metal plate with 3/8-inch-diameter metal rod 6 inches long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.

G. Rigid Anchors: Fabricate from steel bars 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches or with cross pins unless otherwise indicated.
   1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M.

H. Adjustable Masonry-Veneer Anchors:
   1. General: Provide anchors that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to wood or metal studs, and as follows:
      a. Structural Performance Characteristics: Capable of withstanding a 100-lbf load in both tension and compression without deforming or developing play in excess of 0.05 inch.
   2. Fabricate sheet metal anchor sections and other sheet metal parts from 0.075-inch-thick steel sheet, galvanized after fabrication.
   3. Wire Ties: Triangular-, rectangular-, or T-shaped wire ties fabricated from 0.187-inch-diameter, hot-dip galvanized-steel wire unless otherwise indicated.

2.8 MISCELLANEOUS ANCHORS

A. Unit Type Inserts in Concrete: Cast-iron or malleable-iron wedge-type inserts.

B. Dovetail Slots in Concrete: Furnish dovetail slots with filler strips, of slot size indicated, fabricated from 0.034-inch, galvanized steel sheet.

C. Anchor Bolts: Headed steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153/A 153M, Class C; of dimensions indicated.

D. Postinstalled Anchors: Torque-controlled expansion anchors.
   1. Load Capacity: Capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
   2. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5 unless otherwise indicated.
2.9 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Provide metal flashing complying with Section 076200 "Sheet Metal Flashing and Trim" and as follows:

1. Stainless Steel: ASTM A 240/A 240M, Type 304, 0.016 inch thick.
2. Copper: ASTM B 370, Temper H00, cold-rolled copper sheet, 16-oz./sq. ft. weight or 0.0216 inch thick or ASTM B 370, Temper H01, high-yield copper sheet, 12-oz./sq. ft. weight or 0.0162 inch thick.
3. Fabricate continuous flashings in sections 96 inches long minimum, but not exceeding 12 feet. Provide splice plates at joints of formed, smooth metal flashing.
4. Fabricate through-wall metal flashing embedded in masonry from stainless steel, with ribs at 3-inch intervals along length of flashing to provide an integral mortar bond.
   a. Products: Subject to compliance with requirements, provide one of the following:
      1) Cheney Flashing Company; Cheney Flashing (Dovetail).
      3) Sandell Manufacturing Co., Inc.; Mechanically Keyed Flashing.
5. Fabricate through-wall flashing with snaplock receiver on exterior face where indicated to receive counterflushing.
6. Fabricate through-wall flashing with drip edge unless otherwise indicated. Fabricate by extending flashing 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.
7. Fabricate through-wall flashing with sealant stop unless otherwise indicated. Fabricate by bending metal back on itself 3/4 inch at exterior face of wall and down into joint 1/4 inch to form a stop for retaining sealant backer rod.
8. Fabricate metal drip edges and sealant stops for ribbed metal flashing from plain metal flashing of same metal as ribbed flashing and extending at least 3 inches into wall with hemmed inner edge to receive ribbed flashing and form a hooked seam. Form hem on upper surface of metal so that completed seam will shed water.
9. Metal Drip Edge: Fabricate from stainless steel. Extend at least 3 inches into wall and 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.
10. Metal Sealant Stop: Fabricate from stainless steel. Extend at least 3 inches into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for 3/4 inch and down into joint 1/4 inch to form a stop for retaining sealant backer rod.
11. Metal Expansion-Joint Strips: Fabricate from stainless steel to shapes indicated.

B. Flexible Flashing: Use the following unless otherwise indicated:

1. Rubberized-Asphalt Flashing: Composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.030 inch.
   a. Products: Subject to compliance with requirements, provide one of the following:
      1) Advanced Building Products Inc.; Peel-N-Seal.
      2) Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.
3) Dayton Superior Corporation, Dur-O-Wal Division; Dur-O-Barrier Thru-Wall Flashing.
5) Heckmann Building Products Inc.; No. 82 Rubberized-Asphalt Thru-Wall Flashing.
6) Hohmann & Barnard, Inc.; Textroflash.
7) W. R. Meadows, Inc.; Air-Shield Thru-Wall Flashing.

b. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.

C. Application: Unless otherwise indicated, use the following:

1. Where flashing is indicated to receive counterflashing, use metal flashing.
2. Where flashing is indicated to be turned down at or beyond the wall face, use metal flashing.
3. Where flashing is partly exposed and is indicated to terminate at the wall face, use metal flashing with a drip edge.
4. Where flashing is fully concealed, use flexible flashing.

D. Single-Wythe CMU Flashing System: System of CMU cell flashing pans and interlocking CMU web covers made from high-density polyethylene incorporating chemical stabilizers that prevent UV degradation. Cell flashing pans have integral weep spouts that are designed to be built into mortar bed joints and weep collected moisture to the exterior of CMU walls and that extend into the cell to prevent clogging with mortar.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. Mortar Net USA, Ltd.; Blok-Flash.

E. Solder and Sealants for Sheet Metal Flashings:

1. Solder for Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.
2. Solder for Copper: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead.
3. Elastomeric Sealant: ASTM C 920, chemically curing urethane sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

F. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.10 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.
B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

D. Weep/Vent Products: Use the following unless otherwise indicated:

1. Wicking Material: Absorbent rope, made from cotton or UV-resistant synthetic fiber, 1/4 to 3/8 inch in diameter, in length required to produce 2-inch exposure on exterior and 18 inches in cavity. Use only for weeps.


4. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch less than depth of outer wythe, in color selected from manufacturer's standard.

5. Mesh Weep/Vent: Free-draining mesh; made from polyethylene strands, full height and width of head joint and depth 1/8 inch less than depth of outer wythe; in color selected from manufacturer's standard.

6. Aluminum Weep Hole/Vent: One-piece, L-shaped units made from sheet aluminum, designed to fit into a head joint and consisting of a vertical channel with louvers stamped in web and with a top flap to keep mortar out of the head joint; painted before installation to comply with Section 099113 "Exterior Painting" and Section 099123 "Interior Painting" in color selected by Architect.

E. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.

1. Provide one of the following configurations:

   a. Strips, full-depth of cavity and 10 inches high, with dovetail shaped notches 7 inches deep that prevent clogging with mortar droppings.

F. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.

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. Use portland cement-lime mortar unless otherwise indicated.

3. For exterior masonry, use portland cement-lime mortar.
4. For reinforced masonry, use portland cement-lime mortar.
5. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C 270, Property Specification. Provide the following types of mortar for applications stated unless another type is indicated.
1. For all masonry use Type M or Type S.

D. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.
1. Mix to match Architect's sample.
2. Application: Use colored aggregate mortar for exposed mortar joints with the following units:
   a. Decorative CMUs.
   b. Pre-faced CMUs.
   c. Concrete facing brick.
   d. Face brick.
   e. Hollow brick.
   f. Glazed brick.
   g. Glazed structural-clay facing tile.
   h. Stone trim units.
   i. Cast stone trim units.

E. Grout for Unit Masonry: Comply with ASTM C 476.
1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
2. Proportion grout in accordance with ASTM C 476, paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi.
3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
2. Verify that foundations are within tolerances specified.
3. Verify that reinforcing dowels are properly placed.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.

B. Build chases and recesses to accommodate items specified in this and other Sections.

C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.

D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
   1. Mix units from several pallets or cubes as they are placed.

F. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

3.3 TOLERANCES

A. Dimensions and Locations of Elements:
   1. For dimensions in cross section or elevation do not vary by more than plus 1/2 inch or minus 1/4 inch.
   2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch.
   3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

B. Lines and Levels:
   1. For bed joints and top surfaces of bearing walls do not vary from level by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

3.4 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

C. 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.

D. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.

H. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

I. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.
   1. Install compressible filler in joint between top of partition and underside of structure above.
   2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c. unless otherwise indicated.
   3. Wedge non-load-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.
   4. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 078446 "Fire-Resistive Joint Systems."

3.5 MORTAR BEDDING AND JOINTING

A. Lay hollow CMUs as follows:
   1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
   2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
   3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
   4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.

B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

3.6 CAVITY WALLS

A. Bond wythes of cavity walls together using one of the following methods:
      a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes.
      b. Where bed joints of wythes do not align, use adjustable (two-piece) type reinforcement with continuous horizontal wire in facing wythe attached to ties.
c. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable (two-piece) type reinforcement with continuous horizontal wire in facing wythe attached to ties to allow for differential movement regardless of whether bed joints align.

2. Header Bonding: Provide masonry unit headers extending not less than 3 inches into each wythe. Space headers not over 12 inches clear horizontally and 16 inches clear vertically.

B. Bond wythes of cavity walls together using bonding system indicated on Drawings.

C. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.

D. Parge cavity face of backup wythe in a single coat approximately 3/8 inch thick. Trowel face of parge coat smooth.

E. Coat cavity face of backup wythe to comply with Section 071113 "Bituminous Dampproofing."

3.7 MASONRY JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.

1. Space reinforcement not more than 16 inches o.c.
2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
3. Provide reinforcement not more than 8 inches above and below wall openings and extending 24 inches beyond openings.

B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at corners by using prefabricated L-shaped units.

E. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.8 CONTROL AND EXPANSION JOINTS

A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

B. Form control joints in concrete masonry as follows:
1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
2. Install preformed control-joint gaskets designed to fit standard sash block.
3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake out joint for application of sealant.
4. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.

C. Form expansion joints in brick as follows:
   1. Build flanges of metal expansion strips into masonry. Lap each joint 4 inches in direction of water flow. Seal joints below grade and at junctures with horizontal expansion joints if any.
   2. Build flanges of factory-fabricated, expansion-joint units into masonry.
   3. Build in compressible joint fillers where indicated.
   4. Form open joint full depth of brick wythe and of width indicated, but not less than 3/8 inch for installation of sealant and backer rod specified in Section 079200 "Joint Sealants."

D. Provide horizontal, pressure-relieving joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in Section 079200 "Joint Sealants," but not less than 3/8 inch.
   1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.9 LINTELS
   A. Install steel lintels where indicated.
   B. Provide concrete or masonry lintels where shown and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are shown without structural steel or other supporting lintels.
   C. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.10 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS
   A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.
   B. Install flashing as follows unless otherwise indicated:
      1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
2. At masonry-veneer walls, extend flashing through veneer, across air space behind veneer, and up face of sheathing at least 8 inches; with upper edge tucked under building paper or building wrap, lapping at least 4 inches.

3. At lintels and shelf angles, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.

4. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Section 079200 "Joint Sealants" for application indicated.

5. Install metal drip edges with ribbed sheet metal flashing by interlocking hemmed edges to form hooked seam. Seal seam with elastomeric sealant complying with requirements in Section 079200 "Joint Sealants" for application indicated.

6. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal drip edge.

7. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal flashing termination.

8. Cut flexible flashing off flush with face of wall after masonry wall construction is completed.

C. Install single-wythe CMU flashing system in bed joints of CMU walls where indicated to comply with manufacturer's written instructions. Install CMU cell pans with upturned edges located below face shells and webs of CMUs above and with weep spouts aligned with face of wall. Install CMU web covers so that they cover upturned edges of CMU cell pans at CMU webs and extend from face shell to face shell.

D. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

E. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:

1. Use specified weep/vent products or open head joints to form weep holes.
2. Use wicking material to form weep holes above flashing under brick sills. Turn wicking down at lip of sill to be as inconspicuous as possible.
3. Space weep holes 24 inches o.c. unless otherwise indicated.
4. Space weep holes formed from plastic tubing or wicking material 16 inches o.c.
5. Cover cavity side of weep holes with plastic insect screening at cavities insulated with loose-fill insulation.
6. Trim wicking material flush with outside face of wall after mortar has set.

F. Place pea gravel in cavities as soon as practical to a height equal to height of first course above top of flashing, but not less than 2 inches, to maintain drainage.

1. Fill cavities full height by placing pea gravel in cavities as masonry is laid so that at any point masonry does not extend more than 24 inches above top of pea gravel.

G. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.
H. Install vents in head joints in exterior wythes at spacing indicated.
   1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

3.11 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

B. Inspections: Level 1 special inspections according to the "International Building Code."
   1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
   2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
   3. Place grout only after inspectors have verified proportions of site-prepared grout.

C. Testing Prior to Construction: One set of tests.

D. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.

E. Clay Masonry Unit Test: For each type of unit provided, according to ASTM C 67 for compressive strength.

F. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.

G. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.

H. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for compressive strength.

I. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

3.12 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, 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 sealant application, where indicated.
C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before 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 stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
6. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
7. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.
8. Clean stone trim to comply with stone supplier's written instructions.
9. Clean limestone units to comply with recommendations in ILI's "Indiana Limestone Handbook."

3.13 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.

1. Crush masonry waste to less than 4 inches in each dimension.
2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Section 312000 "Earth Moving."
3. Do not dispose of masonry waste as fill within 18 inches of finished grade.

C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042000
Division 05 - Metals
SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Miscellaneous Steel.
2. Steel framing and supports for mechanical and electrical equipment.
3. Steel framing and supports for applications where framing and supports are not specified in other Sections.
4. Shelf angles.
5. Metal ladders.
6. Metal floor plate and supports.
7. Miscellaneous steel trim.
8. Metal bollards.
10. Loose bearing and leveling plates for applications where they are not specified in other Sections.
11. Aluminum stair treads.

B. Products furnished, but not installed, under this Section include the following:

1. Loose steel lintels.
2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
3. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

C. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts, and other items cast into concrete.
2. Section 042000 "Unit Masonry" for installing loose lintels, anchor bolts, and other items built into unit masonry.

1.2 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of metal fabrications that are anchored to or that receive other work. 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.
1.3 ACTION SUBMITTALS

A. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:

1. Miscellaneous steel framing and supports.
2. Steel framing and supports for mechanical and electrical equipment.
3. Steel framing and supports for applications where framing and supports are not specified in other Sections.
4. Shelf angles.
5. Metal ladders.
6. Metal floor plate and supports.
7. Miscellaneous steel trim.
8. Metal bollards.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer.

B. Mill Certificates: Signed by stainless-steel manufacturers, certifying that products furnished comply with requirements.

C. Welding certificates.

D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

E. Research/Evaluation Reports: For post-installed anchors, from ICC-ES.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.6 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.
PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Stainless-Steel Sheet, Strip, and Plate: ASTM A 240/A 240M or ASTM A 666, Type 304.

D. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.

E. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.

F. Rolled-Stainless-Steel Floor Plate: ASTM A 793.

G. Abrasive-Surface Floor Plate: Steel plate with abrasive granules rolled into surface.

H. Steel Tubing: ASTM A 500/A 500M, cold-formed steel tubing.

I. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.

J. Zinc-Coated Steel Wire Rope: ASTM A 741.

1. Wire-Rope Fittings: Hot-dip galvanized-steel connectors with capability to sustain, without failure, a load equal to minimum breaking strength of wire rope with which they are used.

K. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.

2. Material: Galvanized steel, ASTM A 653/A 653M, commercial steel, Type B, with G90 coating; 0.079-inch nominal thickness.

L. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.


P. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.

2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

1. Provide stainless-steel fasteners for fastening aluminum.
2. Provide stainless-steel fasteners for fastening stainless steel.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and flat washers.

C. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 325, Type 3; with hex nuts, ASTM A 563, Grade C3; and flat washers.

D. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593; with hex nuts, ASTM F 594; and flat washers; Alloy Group 1.

E. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and flat washers.

1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

F. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.

G. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.

H. Post-Installed Anchors: Torque-controlled expansion anchors.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.

I. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches by length indicated with anchor straps or studs not less than 3 inches long at not more than 8 inches o.c. Provide with temporary filler and tee-head bolts,
complete with washers and nuts, all zinc-plated to comply with ASTM B 633, Class Fe/Zn 5, as needed for fastening to inserts.

2.4 MISCELLANEOUS MATERIALS

A. Shop Primers: Provide primers that comply with Section 099600 "High-Performance Coatings."

B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
   1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

C. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.

D. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.

E. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

G. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.5 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
   1. Fabricate units from slotted channel framing where indicated.
   2. Furnish inserts for units installed after concrete is placed.

C. Galvanize miscellaneous framing and supports where indicated.

D. Prime miscellaneous framing and supports with primer specified in Section 099600 "High-Performance Coatings" where indicated.

2.7 SHELF ANGLES

A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends and 24 inches o.c., unless otherwise indicated.
   1. Provide mitered and welded units at corners.
   2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches larger than expansion or control joint.
B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.

C. Galvanize and prime shelf angles located in exterior walls.

D. Prime shelf angles located in exterior walls with primer specified in Section 099600 "High-Performance Coatings."

E. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.8 METAL LADDERS

A. General:

1. Comply with ANSI A14.3.

B. Stainless Steel Ladders:

1. Space siderails **16 inches** apart unless otherwise indicated.
2. Siderails: Continuous, **1/2-by-2-1/2-inch** stainless steel flat bars, with eased edges.
3. Rungs: **1-inch-diameter** steel bars.
4. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
5. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.
6. Provide nonslip surfaces on top of each rung by coating with abrasive material metallically bonded to rung.

   a. **Products:** Subject to compliance with requirements, **available products that may be incorporated into the Work include, but are not limited to, the following:**

      1) HarSCO Industrial IKG, a division of HarSCO Corporation; Mebac.
      2) SlipNOT Metal Safety Flooring, a division of W. S. Molnar Company; SlipNOT.

7. Provide platforms as indicated fabricated from welded or pressure-locked stainless steel bar grating, supported by stainless steel angles. Limit openings in gratings to no more than **1/2 inch** least dimension.

8. Support each ladder **at top and bottom and not more than 60 inches o.c.** with welded or bolted stainless steel brackets.

2.9 METAL FLOOR PLATE

A. Fabricate from rolled-steel floor plate of thickness indicated below:

1. Thickness: **1/8 inch**.

B. Provide grating sections where indicated fabricated from welded or pressure-locked steel bar grating. Limit openings in gratings to no more than **1/2 inch** in least dimension.
C. Provide steel angle supports as indicated.
D. Include steel angle stiffeners, and fixed and removable sections as indicated.
E. Provide flush steel bar drop handles for lifting removable sections, one at each end of each section.

2.10 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.
B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
   1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.
C. Galvanize miscellaneous steel trim.
D. Prime exterior miscellaneous steel trim with primer specified in Section 099600 "High-Performance Coatings."

2.11 ABRASIVE METAL NOSINGS

A. Cast-Metal Units: Cast, with an integral-abrasive, as-cast finish consisting of aluminum oxide, silicon carbide, or a combination of both. Fabricate units in lengths necessary to accurately fit openings or conditions.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. American Safety Tread Co., Inc.
      b. Balco, Inc.
      c. Barry Pattern & Foundry Co., Inc.
   2. Nosings: Cross-hatched units, 4 inches wide.

2.12 ALUMINIUM STAIR TREADS

A. Stair Tread: Aluminum tread with carrier angle or plate and 1-1/4 inch checkered plate nosing conforming to NAAMM metal bar grating manual.
   1. Bearing and Cross Bars: Aluminum alloy 6063-T6 conforming to ASTM B221.
   2. Bar Spacing:
b. Cross Bars: 4 inches center to center.

3. Bar Connection: Mechanically lock cross bars to bearing bars.

2.13 LOOSE STEEL LINTELS

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.

B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span, but not less than 8 inches unless otherwise indicated.

C. Galvanize and prime loose steel lintels located in exterior walls.

D. Prime loose steel lintels located in exterior walls with primer specified in Section 099600 "High-Performance Coatings."

2.14 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.15 FINISHES, GENERAL

A. Finish metal fabrications after assembly.

B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.16 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.

C. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.

1. Shop prime with primers specified in Section 099600 "High-Performance Coatings".
2.17 ALUMINUM FINISHES

A. As-Fabricated Finish: AA-M12.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:

1. Cast Aluminum: Heavy coat of bituminous paint.
2. Extruded Aluminum: Two coats of clear lacquer.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
B. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.

1. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified in "Installing Bearing and Leveling Plates" Article.

C. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in "Installing Bearing and Leveling Plates" Article.

1. Grout baseplates of columns supporting steel girders after girders are installed and leveled.

3.3 INSTALLATION

A. Expansion Anchor Installation:

1. General: In general, install expansion anchors in strict accordance with manufacturer's instructions and in accordance with the following.
2. Drilling Holes: Use rotary hammer type drill and make drill holes to the required diameter and depth as consistent with anchor manufacturer's instructions for size of anchors being installed.
3. Minimum Embedment: Embed expansion anchors to six bolt diameters minimum, unless otherwise indicated on Drawings.

B. Adhesive Anchor Installation:

1. General: In general, install adhesive anchors in strict accordance with manufacturer's instructions and in accordance with the following.
2. Drilling Holes: Use rotary hammer type drill and make drill holes to the required diameter and depth as consistent with anchor manufacturer's instructions for size of anchors being installed.
   a. Prior to setting cartridge and anchor stud clean drilled holes free of loose material. Clean holes by blowing from the back of the borehole with oil-free compressed air (min. 90 psi at 3.5 CFM), fully retracting the air extension twice. Brush twice with properly sized round steel brush. Blow twice again with compressed air or until return air stream is free of noticeable dust.
3. Anchor Rod Installation: Following cartridge installations in prepared drill holes, set anchor rod to the required depth. Set the anchor rod truly perpendicular (normal) to the base plate of the item that is being anchored.
4. Minimum Embedment Table:

<table>
<thead>
<tr>
<th>Adhesive Anchor Diam. (Inches)</th>
<th>3/8</th>
<th>1/2</th>
<th>5/8</th>
<th>3/4</th>
<th>7/8</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Embedment Depth (Inches)</td>
<td>3-1/2</td>
<td>4-1/4</td>
<td>5</td>
<td>6-5/8</td>
<td>7-1/2</td>
<td>8</td>
</tr>
</tbody>
</table>

METAL FABRICATIONS 055000 - 11
3.4 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION 055000
SECTION 055213 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Aluminum tube railings.
   2. Stainless-steel tube railings.

1.2 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for 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.

C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:
   1. Manufacturer's product lines of mechanically connected railings.
   2. Railing brackets.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Welding certificates.

C. Mill Certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.

D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.
E. Product Test Reports: For pipe and tube railings, for tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.

F. Evaluation Reports: For post-installed anchors, from ICC-ES.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
2. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

1.7 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Aluminum Pipe and Tube Railings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Blum, Julius & Co., Inc.
   b. Hollaender Manufacturing Company.
   c. Kee Industrial Products, Inc.
   d. Thompson Fabricating, LLC.

B. Stainless-Steel Pipe and Tube Railings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Blum, Julius & Co., Inc.
   b. Paragon Aquatics.
   c. Stainless Fabricators, Inc.
2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design railings, including attachment to building construction.

B. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails and Top Rails of Guards:
   a. Uniform load of 50 lbf/ft applied in any direction.
   b. Concentrated load of 200 lbf applied in any direction.
   c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Infill of Guards:
   a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.
   b. Infill load and other loads need not be assumed to act concurrently.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

   1. Temperature Change: 120 deg F, ambient; 180 deg F.

2.3 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

   1. Provide type of bracket with predrilled hole for exposed bolt anchorage and that provides 1-1/2-inch clearance from inside face of handrail to finished wall surface.

2.4 ALUMINUM

A. Aluminum, General: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of alloy and temper designated below for each aluminum form required.

B. Extruded Bars and Tubing: ASTM B 221, Alloy 6063-T5/T52.


   1. Provide Standard Weight (Schedule 40) pipe unless otherwise indicated.

D. Drawn Seamless Tubing: ASTM B 210, Alloy 6063-T832.

2.5 STAINLESS STEEL

A. Tubing: ASTM A 554, Grade MT 304.
B. Pipe: ASTM A 312/A 312M, Grade TP 304.
C. Castings: ASTM A 743/A 743M, Grade CF 8 or CF 20.
D. Plate and Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304.
E. Expanded Metal: ASTM F 1267, Type I (expanded, Class 3 (corrosion-resistant steel), made from stainless-steel sheet, ASTM A 240/A 240M or ASTM A 666, Type 304Type 316.

2.6 FASTENERS

A. General: Provide the following:
   1. Aluminum Railings: Type 304 stainless-steel fasteners.
   2. Stainless-Steel Railings: Type 304stainless-steel fasteners.
   3. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.
B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.
C. Fasteners for Interconnecting Railing Components:
   1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.
   2. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.
   3. Provide Phillips flat-head machine screws for exposed fasteners unless otherwise indicated.
D. Post-Installed Anchors: Torque-controlled expansion anchors capable of sustaining, without failure, a load equal to 6 times the load imposed when installed in unit masonry and 4 times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.
1. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.

2.7 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

1. For aluminum and stainless-steel railings, provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.

B.

C. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

D. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.

1. Water-Resistant Product: At exterior locations provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.8 FABRICATION

A. General: Fabricate 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. Shop assemble railings 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. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

E. Fabricate connections that are exposed to weather in a manner that excludes water. Provide weep holes where water may accumulate.

F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
G. Connections: Fabricate railings with either welded or nonwelded connections unless otherwise indicated.

H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove flux immediately.
   4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

I. Welded Connections for Aluminum Pipe: Fabricate railings to interconnect members with concealed internal welds that eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.

J. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
   1. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.

K. Form Changes in Direction as Follows:
   1. By bending or by inserting prefabricated elbow fittings.

L. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

M. Close exposed ends of railing members with prefabricated end fittings.

N. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.

O. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
   1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.

P. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

Q. For railing posts set in concrete, provide stainless-steel sleeves not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, with metal plate forming bottom closure.
R. Toe Boards: Where indicated, provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.

2.9 ALUMINUM FINISHES

A. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are unacceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

B. Mill Finish: AA-M12, nonspecular as fabricated.

C. Clear Anodic Finish: AAMA 611.

2.10 STAINLESS-STEEL FINISHES

A. Remove tool and die marks and stretch lines, or blend into finish.

B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches

C. Polished and Buffed Finish: Oil-ground, 180-grit finish followed by buffing.

D. Dull Satin Finish: No. 6.

E. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Fit exposed connections together to form tight, hairline joints.

B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

1. Do not weld, cut, or abrade surfaces of railing components that are 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 variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.

C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
1. Coat, with a heavy coat of bituminous paint, concealed surfaces of aluminum that are in contact with grout, concrete, masonry, wood, or dissimilar metals.

D. Adjust railings before anchoring to ensure matching alignment at abutting joints.

E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.2 RAILING CONNECTIONS

A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of 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.

3.3 ANCHORING POSTS

A. Use metal sleeves preset and anchored into concrete for installing posts. After posts are inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.

B. Leave anchorage joint exposed with anchoring material flush with adjacent surface.

C. 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 using fittings designed and engineered for this purpose.
2. For stainless-steel pipe railings, weld flanges to post and bolt to supporting surfaces.

D. Install removable railing sections, where indicated, in slip-fit metal sockets cast in concrete.

3.4 ATTACHING RAILINGS

A. Anchor railing ends at walls with round flanges anchored to wall construction and connected to railing ends using nonwelded connections.

B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and connected to railing ends using nonwelded connections.
C. Attach railings to wall with wall brackets, except where end flanges are used. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

D. Secure wall brackets and railing end flanges 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.

3.5 ADJUSTING AND CLEANING

A. Clean aluminum and stainless steel by washing thoroughly with clean water and soap and rinsing with clean water.

B. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up shop-painted surfaces.
   1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

C. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in

D. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A 780/A 780M.

3.6 PROTECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

END OF SECTION 055213
SECTION 055313 - BAR GRATINGS

PART 1 - GENERAL

1.1 SUMMARY
   A. Section includes metal bar gratings and metal frames and supports for gratings.
   B. Related Requirements:
      1. Section 055213 "Pipe and Tube Railings" for metal pipe and tube handrails and railings.

1.2 COORDINATION
   A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.
   B. Coordinate installation of anchorages for gratings, grating frames, and supports. 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.

1.3 ACTION SUBMITTALS
   A. Product Data: For the following:
      2. Paint products.
   B. Shop Drawings: Include plans, sections, details, and attachments to other work.

1.4 INFORMATIONAL SUBMITTALS
   A. Mill Certificates: Signed by manufacturers of stainless steel certifying that products furnished comply with requirements.
   B. Welding certificates.
   C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

1.5 QUALITY ASSURANCE
   A. Welding Qualifications: Qualify procedures and personnel according to the following:
1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

1.6 FIELD CONDITIONS
A. Field Measurements: Verify actual locations of walls and other construction contiguous with gratings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Ohio Gratings, Inc.; 195GF Series
   2. Seidelhuber Metal Products; Division of Brodhead Steel Products.
   3. Intertec Corp..

2.2 PERFORMANCE REQUIREMENTS
A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design gratings.
B. Structural Performance: Gratings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
   1. Floors: Uniform load of 125 lbf/sq. ft. or concentrated load of 2000 lbf, whichever produces the greater stress.
   2. Floors: Uniform load of 250 lbf/sq. ft. or concentrated load of 3000 lbf, whichever produces the greater stress.
   3. Walkways and Elevated Platforms Other Than Exits: Uniform load of 60 lbf/sq. ft..
   4. Walkways and Elevated Platforms Used as Exits: Uniform load of 100 lbf/sq. ft..
   5. Sidewalks and Vehicular Driveways, Subject to Trucking: Uniform load of 250 lbf/sq. ft. or concentrated load of 8000 lbf, whichever produces the greater stress.
   6. Limit deflection to L/360 or 1/4 inch, whichever is less.

2.3 METAL BAR GRATINGS
A. Metal Bar Grating Standards: Comply with NAAMM MBG 531, "Metal Bar Grating Manual."
B. Pressure-Locked, Rectangular-Bar Aluminum Grating: Fabricated by pressing rectangular flush-top crossbars into slotted bearing bars or swaging crossbars between bearing bars.
   1. Bearing Bar Spacing: 1-3/16 inches o.c.
   2. Bearing Bar Depth: As required to comply with structural performance requirements.
   4. Crossbar Spacing: 4 inches o.c.

2.4 ALUMINUM

A. General: Provide alloy and temper recommended by aluminum producer for type of use indicated, with not less than the strength and durability properties of alloy, and temper designated below for each aluminum form required.

B. Extruded Bars and Shapes: ASTM B 221, alloys as follows:
   1. 6061-T6 or 6063-T6, for bearing bars of gratings and shapes.
   2. 6061-T1, for grating crossbars.

C. Aluminum Sheet: ASTM B 209, Alloy 5052-H32.

2.5 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

   1. Provide stainless-steel fasteners for fastening aluminum.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563 and, where indicated, flat washers.

C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, nuts, and, where indicated, flat washers; ASTM F 593 for bolts and ASTM F 594 for nuts, Alloy Group 1.

D. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563 and, where indicated, flat washers.

   1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

E. Post-Installed Anchors: Torque-controlled expansion anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.

   1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.

2.6 MISCELLANEOUS MATERIALS

A. Shop Primers: Provide primers that comply with Section 099600 "High-Performance Coatings."
B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

2.7 FABRICATION

A. Shop Assembly: Fabricate grating sections in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch material cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form from materials of size, thickness, and shapes indicated, but not less than that needed to support indicated loads.

D. Fit exposed connections accurately together to form hairline joints.

E. Welding: Comply with AWS recommendations and the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.

F. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space the anchoring devices to secure gratings, frames, and supports rigidly in place and to support indicated loads.
   1. Fabricate toeplates to fit grating units and weld to units in shop unless otherwise indicated.
   2. Fabricate toeplates for attaching in the field.
   3. Toeplate Height: 4 inches unless otherwise indicated.

G. Removable Grating Sections: Fabricate with banding bars attached by welding to entire perimeter of each section. Include anchors and fasteners of type indicated or, if not indicated, as recommended by manufacturer for attaching to supports.
   1. Provide no fewer than four weld lugs for each heavy-duty grating section, with each lug shop welded to two bearing bars.
   2. Provide no fewer than four saddle clips for each grating section containing rectangular bearing bars 3/16 inch or less in thickness and spaced 15/16 inch or more o.c., with each clip designed and fabricated to fit over two bearing bars.
   3. Provide no fewer than four weld lugs for each grating section containing rectangular bearing bars 3/16 inch or less in thickness and spaced less than 15/16 inch o.c., with each lug shop welded to three or more bearing bars. Interrupt intermediate bearing bars as necessary for fasteners securing grating to supports.
4. Furnish threaded bolts with nuts and washers for securing grating to supports.
5. Furnish galvanized malleable-iron flange clamp with galvanized bolt for securing grating to supports. Furnish as a system designed to be installed from above grating by one person.

H. Fabricate cutouts in grating sections for penetrations indicated. Arrange cutouts to permit grating removal without disturbing items penetrating gratings.
1. Edge-band openings in grating that interrupt four or more bearing bars with bars of same size and material as bearing bars.

I. Do not notch bearing bars at supports to maintain elevation.

2.8 GRATING FRAMES AND SUPPORTS
A. Fabricate from metal shapes, plates, and bars of welded construction to sizes, shapes, and profiles indicated and as necessary to receive gratings. Miter and weld connections for perimeter angle frames. Cut, drill, and tap units to receive hardware and similar items.
1. Unless otherwise indicated, fabricate from same basic metal as gratings.
2. Equip units indicated to be cast into concrete or built into masonry with integrally welded anchors. Unless otherwise indicated, space anchors 24 inches o.c. and provide minimum anchor units in the form of steel straps 1-1/4 inches wide by 1/4 inch thick by 8 inches long.

B. Galvanize steel frames and supports in the following locations:
1. Exterior.
2. Interior.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL
A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing gratings to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing gratings. Set units accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete or masonry.

D. Fit exposed connections accurately together to form hairline joints.
1. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

E. Attach toeplates to gratings by welding at locations indicated.

F. Field Welding: Comply with AWS recommendations and the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.

G. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

3.2 INSTALLING METAL BAR GRATINGS

   A. General: Install gratings to comply with recommendations of referenced metal bar grating standards that apply to grating types and bar sizes indicated, including installation clearances and standard anchoring details.

   B. Attach removable units to supporting members with type and size of clips and fasteners indicated or, if not indicated, as recommended by grating manufacturer for type of installation conditions shown.

   C. Attach nonremovable units to supporting members by welding where both materials are same; otherwise, fasten by bolting as indicated above.

3.3 ADJUSTING AND CLEANING

   A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up shop-painted surfaces.

      1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

   B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099600

   C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION 055313
Division 06 – Wood Plastics and Composites
SECTION 061053 - MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Framing with dimension lumber.
   2. Wood blocking and nailers.
   3. Plywood backing panels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1.3 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For the following, from ICC-ES:
   1. Preservative-treated wood.
   2. Power-driven fasteners.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Certified Wood: Lumber and plywood shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

B. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

   1. Factory mark each piece of lumber with grade stamp of grading agency.
   2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece or omit grade stamp and provide certificates of grade compliance issued by grading agency.
   3. Provide dressed lumber, S4S, unless otherwise indicated.

C. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.
2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat all miscellaneous carpentry unless otherwise indicated.

2.3 DIMENSION LUMBER FRAMING

A. Framing: No. 2 grade and any of the following species:

1. Hem-fir (north); NLGA.
2. Southern pine; SPIB.
3. Douglas fir-larch; WCLIB or WWPA.
4. Mixed southern pine; SPIB.
5. Spruce-pine-fir; NLGA.
6. Douglas fir-south; WWPA.
7. Hem-fir; WCLIB or WWPA.
8. Douglas fir-larch (north); NLGA.
9. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

2.4 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.

B. For items of dimension lumber size, provide No. 2 grade lumber of any species.

C. For concealed boards, provide lumber with 19 percent maximum moisture content and any of the following species and grades:

1. Mixed southern pine, No. 2 grade; SPIB.
2. Eastern softwoods, No. 2 Common grade; NELMA.
3. Northern species, No. 2 Common grade; NLGA.
4. Western woods, No. 2 Common grade; WCLIB or WWPA.
2.5 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: DOC PS 1, Exterior, AC, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

1. Plywood shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.6 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.


C. Screws for Fastening to Metal Framing: ASTM C 1002 or ASTM C 954, length as recommended by screw manufacturer for material being fastened.

2.7 MISCELLANEOUS MATERIALS

A. Flexible Flashing: Self-adhesive butyl rubber or rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit.

B. Where wood-preservative-treated lumber is installed adjacent to metal, install continuous flexible flashing separator between wood and metal.

C. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

D. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels.

E. Do not splice structural members between supports unless otherwise indicated.

F. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
G. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.
3. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.

3.2 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061053
SECTION 061600 - SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wall sheathing.
2. Roof sheathing.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements.

1.3 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For following products, from ICC-ES:

1. Preservative-treated plywood.

PART 2 - PRODUCTS

2.1 WOOD PANEL PRODUCTS

A. Emissions: Products shall meet the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Certified Wood: For the following wood products, provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship":

1. Plywood.

C. Plywood: DOC PS 1.
2.2 PRESERVATIVE-TREATED PLYWOOD

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction, Use Category UC3b for exterior construction.

B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.

C. Application: Treat all plywood unless otherwise indicated.

2.3 WALL SHEATHING


2.4 ROOF SHEATHING

A. Plywood Roof Sheathing: Exterior, Structural I sheathing.

2.5 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. For roof and wall sheathing, provide fasteners of Type 304 stainless steel.

2.6 MISCELLANEOUS MATERIALS

A. Adhesives for Field Gluing Panels to Framing: Formulation complying with APA AFG-01 or ASTM D 3498 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.

1. Adhesives shall have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:
   1. NES NER-272 for power-driven fasteners.
   2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."
   3. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's "International Residential Code for One- and Two-Family Dwellings."

D. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

3.2 WOOD STRUCTURAL PANEL INSTALLATION


B. Fastening Methods: Fasten panels as indicated below:
   1. Wall and Roof Sheathing:
      a. Nail to wood framing using annular ring or screw shank nails.
      b. Space panels 1/8 inch apart at edges and ends.

END OF SECTION 061600
SECTION 061753 - SHOP-FABRICATED WOOD TRUSSES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wood roof trusses.
2. Wood truss bracing.
3. Metal truss accessories.

B. Allowances: Provide wood truss bracing under the Metal-Plate-Connected Truss Bracing Allowance as specified in other sections.

1.2 ACTION SUBMITTALS

A. Product Data: For metal-plate connectors, metal truss accessories, and fasteners.

B. Shop Drawings: Show fabrication and installation details for trusses.

1. Show location, pitch, span, camber, configuration, and spacing for each type of truss required.
2. Indicate sizes, stress grades, and species of lumber.
3. Indicate locations of permanent bracing required to prevent buckling of individual truss members due to design loads.
4. Indicate locations, sizes, and materials for permanent bracing required to prevent buckling of individual truss members due to design loads.
5. Indicate type, size, material, finish, design values, orientation, and location of metal connector plates.
6. Show splice details and bearing details.

C. Delegated-Design Submittal: For metal-plate-connected wood trusses indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 INFORMATIONAL SUBMITTALS

A. Product certificates.

B. Evaluation Reports: For the following, from ICC-ES:

1. Metal-plate connectors.
2. Metal truss accessories.
1.4 QUALITY ASSURANCE

A. Metal Connector-Plate Manufacturer Qualifications: A manufacturer that is a member of TPI and that complies with quality-control procedures in TPI 1 for manufacture of connector plates.

1. Manufacturer's responsibilities include providing professional engineering services needed to assume engineering responsibility.
2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

B. Fabricator Qualifications: Shop that participates in a recognized quality-assurance program that complies with quality-control procedures in TPI 1 and that involves third-party inspection by an independent testing and inspecting agency acceptable to Engineer and authorities having jurisdiction and is certified for chain of custody by an FSC-accredited certification body.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Handle and store trusses to comply with recommendations in TPI BCSI, "Building Component Safety Information: Guide to Good Practice for Handling, Installing, Restraining, & Bracing Metal Plate Connected Wood Trusses."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer to design metal-plate-connected wood trusses.

B. Structural Performance: Provide metal-plate-connected wood trusses capable of withstanding design loads within limits and under conditions indicated. Comply with requirements in TPI 1 unless more stringent requirements are specified below.

2.2 DIMENSION LUMBER

A. Certified Wood: For metal-plate-connected wood trusses and permanent bracing, provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

B. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Provide dry lumber with 19 percent maximum moisture content at time of dressing.
C. Permanent Bracing: Provide wood bracing that complies with requirements for miscellaneous lumber in Section 061053 "Miscellaneous Rough Carpentry."

2.3 METAL CONNECTOR PLATES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Alpine Engineered Products, Inc.; an ITW company.
2. Cherokee Metal Products, Inc.; Masengill Machinery Company.
3. CompuTrus, Inc.
4. Eagle Metal Products.
6. MiTek Industries, Inc.; a subsidiary of Berkshire Hathaway Inc.
7. Robbins Engineering, Inc.
8. Truswal Systems Corporation; an ITW company.

B. General: Fabricate connector plates to comply with TPI 1.

C. Hot-Dip Galvanized-Steel Sheet: ASTM A 653/A 653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 coating designation.

2.4 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Provide fasteners for use with metal framing anchors that comply with written recommendations of metal framing manufacturer.
2. Where trusses are exposed to weather, in ground contact, made from pressure-preservative treated wood, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.

B. Nails, Brads, and Staples: ASTM F 1667.

2.5 METAL FRAMING ANCHORS AND ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following.

1. Cleveland Steel Specialty Co.
2. KC Metals Products, Inc.
3. Phoenix Metal Products, Inc.
4. Simpson Strong-Tie Co., Inc.
5. USP Structural Connectors.

C. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those of basis-of-design products. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.


2.6 FABRICATION

A. Assemble truss members in design configuration indicated; use jigs or other means to ensure uniformity and accuracy of assembly with joints closely fitted to comply with tolerances in TPI 1. Position members to produce design camber indicated.

1. Fabricate wood trusses within manufacturing tolerances in TPI 1.

B. Connect truss members by metal connector plates located and securely embedded simultaneously in both sides of wood members by air or hydraulic press.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install wood trusses only after supporting construction is in place and is braced and secured.

B. If trusses are delivered to Project site in more than one piece, assemble trusses before installing.

C. Hoist trusses in place by lifting equipment suited to sizes and types of trusses required, exercising care not to damage truss members or joints by out-of-plane bending or other causes.

D. Install and brace trusses according to TPI recommendations and as indicated.

E. Anchor trusses securely at bearing points; use metal truss tie-downs or floor truss hangers as applicable. Install fasteners through each fastener hole in metal framing anchors according to manufacturer's fastening schedules and written instructions.

F. Securely connect each truss ply required for forming built-up girder trusses.

G. Install and fasten permanent bracing during truss erection and before construction loads are applied. Anchor ends of permanent bracing where terminating at walls or beams.

1. Install bracing to comply with Section 061053 "Miscellaneous Rough Carpentry."
2. Install and fasten strongback bracing vertically against vertical web of parallel-chord trusses at centers.

H. Install wood trusses within installation tolerances in TPI 1.
I. Do not alter trusses in field. Do not cut, drill, notch, or remove truss members.

J. Replace wood trusses that are damaged or do not meet requirements.

END OF SECTION 061753
SECTION 062013 - EXTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Exterior cellular PVC and foam plastic trim.

B. Related Requirements:
   1. Section 061053 “Miscellaneous Rough Carpentry” for furring, blocking, and other carpentry work not exposed to view.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.
   1. Include data for wood-preservative treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained. Include chemical-treatment manufacturer's written instructions for finishing treated material.
   2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced before shipment to Project site to levels specified.
   3. Include copies of warranties from chemical-treatment manufacturers for each type of treatment.

B. Samples for Initial Selection: For each type of product involving selection of colors, profiles, or textures.

C. Samples for Verification:
   1. For cellular PVC trim, with 1/2 of exposed surface finished; 50 sq. in..
   2. For foam plastic moldings, with 1/2 of exposed surface finished; 50 sq. in..

1.3 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For the following, from ICC-ES:
   1. Cellular PVC trim.
   2. Foam plastic moldings.

B. Sample Warranties: For manufacturer's warranties.
1.4 **DELIVERY, STORAGE, AND HANDLING**

A. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation. Protect materials from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

1.5 **FIELD CONDITIONS**

A. Weather Limitations: Proceed with installation only when existing and forecast weather conditions permit work to be performed and at least one coat of specified finish can be applied without exposure to rain, snow, or dampness.

1. For exterior ornamental wood columns, comply with manufacturer's written instructions and warranty requirements.

B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.

1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

1.6 **WARRANTY**

A. Manufacturer's Warranty for Cellular PVC Trim: Manufacturer agrees to repair or replace trim that fails due to defects in manufacturing within specified warranty period. Failures include, but are not limited to, deterioration, delamination, and excessive swelling from moisture.

1. Warranty Period: 25 years from date of Substantial Completion.
2. Warranty Period for Factory-Applied Finish: Five years from date of Substantial Completion.

**PART 2 - PRODUCTS**

2.1 **EXTERIOR TRIM**

A. Cellular PVC Trim: Extruded, expanded PVC with a small-cell microstructure, recommended by manufacturer for exterior use, made from UV- and heat-stabilized, rigid material.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. CertainTeed Corporation; CertainTeed Restoration Millwork.
   b. Ex-Cel Manufacturing, Inc.; Plasticlad.
   c. Fypon Ltd.; Fypon PVC.
   e. Kleer Lumber, LLC; Kleer Trimboard.
   f. Kommerling USA, Inc.; Koma.
g. Ply-Trim, Inc.; DuraBoard.
h. Royal Mouldings Limited; Pro Series Exterior Mouldings.
i. Vi-Lux Plastics Inc.; Cellular PVC.
j. Vycom Corp.; Azek.
k. Wolfpac Technologies, Inc.; Versatex.

2. Density: Not less than 31 lb/cu. ft.
3. Heat Deflection Temperature: Not less than 130 deg F, according to ASTM D 648.
4. Coefficient of Thermal Expansion: Not more than $4.5 \times 10^{-5}$ inches/inch x deg F.
5. Water Absorption: Not more than 1 percent, according to ASTM D 570.
6. Flame-Spread Index: 75 or less, according to ASTM E 84.

B. Foam Plastic Moldings: Molded product of shapes indicated, recommended by manufacturer for exterior use, with a tough outer skin on exposed surfaces; factory primed. Exposed surfaces shall not be shaped after molding.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Apex Urethane Millwork.
   b. Architectural Moldings Ltd.; Balmer Architectural Mouldings Division.
   c. Architectural Ornament, Inc.
   d. Artistic Architectural Ornaments, Inc.
   e. Carter Millwork, Inc.
   f. Century Architectural Specialties LLC.
   g. Chemcrest Architectural Products.
   h. Diamond Mfg., Inc.
   i. Focal Point Architectural Products.
   j. Fypon Ltd.
   k. Melton Classics Incorporated.
   l. Vintage Mouldings Manufacturing Ltd.
   m. Worthington Millwork.

2. Density: Not less than 20 lb/cu. ft.
3. Flame-Spread Index: Not more than 75 when tested according to ASTM E 84.
4. Thickness: Not more than 1/2 inch.
5. Width: Not more than 8 inches.
6. Patterns: As indicated by manufacturer's designations.

2.2 MISCELLANEOUS MATERIALS

A. Fasteners for Exterior Finish Carpentry: Provide nails or screws, in sufficient length to penetrate not less than 1-1/2 inches into wood substrate.

1. For prefinished items, provide matching prefinished aluminum fasteners where face fastening is required.

B. Adhesive for Cellular PVC Trim: Product recommended by trim manufacturer.
C. Flashing: Comply with requirements in Section 076200 "Sheet Metal Flashing and Trim" for flashing materials installed in exterior finish carpentry.

D. Insect Screening for Soffit Vents: Aluminum, 18-by-16-inch mesh.

E. Continuous Soffit Vents: Aluminum hat channel shape with perforations, 2 inches wide and in lengths not less than 96 inches.
   1. Net Free Area: 4 sq. in./linear ft.
   2. Finish: Mill finish.

F. Sealants: Latex, complying with ASTM C 834 Type OP, Grade NF and with applicable requirements in Section 079200 "Joint Sealants," recommended by sealant manufacturer and manufacturer of substrates for intended application.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. BASF Building Systems; Sonolac.
      c. July National Associates, Inc.;
      d. Pecora Corporation; AC-20+.
      e. Schnee-Morehead, Inc., an ITW company; SM 8200.
      f. Tremco Incorporated; Tremflex 834.

2.3 FABRICATION

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

B. Prime lumber and moldings to be painted, including both faces and edges, unless factory primed. Cut to required lengths and prime ends. Comply with requirements in Section 099113 "Exterior Painting."
3.3 INSTALLATION, GENERAL

A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.

1. Do not use manufactured units with defective surfaces, sizes, or patterns.

B. Install exterior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.

1. Scribe and cut exterior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
2. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining exterior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
3. Coordinate exterior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate exterior finish carpentry.

3.4 STANDING AND RUNNING TRIM INSTALLATION

A. Install cellular PVC trim to comply with manufacturer's written instructions.

B. Install trim with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches long except where necessary.

1. Use scarf joints for end-to-end joints.
2. Stagger end joints in adjacent and related members.

C. Fit exterior joints to exclude water. Cope at returns and miter at corners to produce tight-fitting joints with full-surface contact throughout length of joint. Plane backs of casings to provide uniform thickness across joints, where necessary for alignment.

D. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.

3.5 ADJUSTING

A. Replace exterior finish carpentry that is damaged or does not comply with requirements. Exterior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

3.6 CLEANING

A. Clean exterior finish carpentry on exposed and semiexposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.
3.7 PROTECTION

A. Protect installed products from damage from weather and other causes during construction.

B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.
   1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 062013
Division 07 – Thermal and Moisture Protection
SECTION 071326 - SELF-ADHERING SHEET WATERPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Modified bituminous sheet waterproofing.
2. Blindside sheet waterproofing.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, and tested physical and performance properties of waterproofing.
2. Include manufacturer's written instructions for evaluating, preparing, and treating substrate.

B. Samples: For each exposed product and for each color and texture specified, including the following products:

1. 8-by-8-inch square of waterproofing and flashing sheet.
2. 8-by-8-inch square of insulation.
3. 4-by-4-inch square of drainage panel.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by waterproofing manufacturer.

1.5 FIELD 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.
1.6 WARRANTY

A. Manufacturer's Warranty: Manufacturer's standard materials-only warranty in which manufacturer agrees to furnish replacement waterproofing material for waterproofing that does not comply with requirements or that fails to remain watertight within specified warranty period.

1. Warranty Period: Three years from date of Substantial Completion.
2. Warranty includes removing and reinstalling protection board, drainage panels, insulation, pedestals, and pavers on plaza decks.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Source Limitations for Waterproofing System: Obtain waterproofing materials, protection course, and molded-sheet drainage panels from single source from single manufacturer.

2.2 MODIFIED BITUMINOUS SHEET WATERPROOFING

A. Modified Bituminous Sheet: Minimum 60-mil nominal thickness, self-adhering sheet consisting of 56 mils of rubberized asphalt laminated on one side to a 4-mil- thick, polyethylene-film reinforcement, and with release liner on adhesive side.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. American Hydrotech, Inc; VM75.
   b. Carlisle Coatings & Waterproofing Inc; CCW MiraDRI 860/861.
   c. Grace Construction Products; W.R. Grace & Co. -- Conn; Bituthene 3000/Low Temperature.
   d. Henry Company; Blueskin WP 100/200.

2. Physical Properties:
   a. Tensile Strength, Membrane: 250 psi minimum; ASTM D 412, Die C, modified.
   b. Ultimate Elongation: 300 percent minimum; ASTM D 412, Die C, modified.
   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. Water Absorption: 0.2 percent weight-gain maximum after 48-hour immersion at 70 deg F; ASTM D 570.
   g. Water Vapor Permeance: 0.05 perms maximum; ASTM E 96/E 96M, Water Method.
   h. Hydrostatic-Head Resistance: 200 feet minimum; ASTM D 5385.

2.3 BLINDSIDE SHEET WATERPROOFING

A. Bonded HDPE Sheet for Blindside Vertical Applications: Uniform, flexible, multilayered-composite sheet membrane consisting of either a HDPE film coated with a pressure-sensitive adhesive and protective release liner, total 32-mil thickness, or an HDPE film coated with a modified asphalt layer and a nonwoven geotextile-fabric final layer, total 73-mil thickness; with the following physical properties:

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Grace Construction Products; W.R. Grace & Co. -- Conn; Preprufe 160R.
   b. Polyguard Products, Inc; Underseal Blindside Membrane.

2. Tensile Strength, Film: 4000 psi minimum; ASTM D 412.
4. Peel Adhesion to Concrete: 5 lbf/in. minimum; ASTM D 903, modified.
5. Lap Adhesion: 2.5 lbf/in. minimum; ASTM D 1876, modified.
8. Water Vapor Permeance: 0.01 perms maximum; ASTM E 96/E 96M, Water Method.
9. Water Absorption: 0.5 percent maximum; ASTM D 570.

B. Mastic, Adhesives, and Detail Tape: Liquid mastic and adhesives, and adhesive tapes recommended by waterproofing manufacturer.

2.4 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 solvent-borne primer recommended for substrate by sheet-waterproofing material manufacturer.

C. Surface Conditioner: Liquid, waterborne surface conditioner recommended for substrate by sheet-waterproofing material manufacturer.

D. Liquid Membrane: Elastomeric, two-component liquid, cold fluid applied, of trowel grade or low viscosity.

E. Substrate Patching Membrane: Low-viscosity, two-component, modified asphalt coating.

F. Metal Termination Bars: Aluminum bars, approximately 1 by 1/8 inch thick, predrilled at 9-inch centers.
2.5 INSULATION

A. Insulation, General: Comply with Section 072100 "Thermal Insulation."

B. Board Insulation: Extruded-polystyrene board insulation complying with ASTM C 578, square edged.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. DiversiFoam Products.
   b. Dow Chemical Company (The); STYROFOAM Brand CAVITYMATE Plus Insulation.
   c. Owens Corning Insulating Systems LLC.

2. Type VI, 40-psi minimum compressive strength.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the waterproofing.

1. Verify that concrete has cured and aged for minimum time period recommended in writing by waterproofing manufacturer.
2. Verify that substrate is visibly dry and within the moisture limits recommended in writing by manufacturer. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
3. Verify that compacted subgrade is dry, smooth, sound, and ready to receive waterproofing sheet.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 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 of width according to manufacturer's written instructions and center over treated construction and contraction joints and cracks exceeding a width of 1/16 inch.

F. Bridge and cover isolation joints, expansion joints and discontinuous deck-to-wall and deck-to-deck joints with overlapping sheet strips of widths according to manufacturer's written instructions.
   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 in each direction from corner or install membrane strip centered over corner.

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.

3.3 MODIFIED BITUMINOUS SHEET-WATERPROOFING APPLICATION

A. Install modified bituminous sheets according to waterproofing manufacturer's written instructions and recommendations in ASTM D 6135.

B. Apply primer to substrates at required rate and allow it 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. Two-Ply Application: Install sheets to form a membrane with lap widths not less than 50 percent of sheet widths, to provide a minimum of two thicknesses of sheet membrane over areas to receive waterproofing.

E. Horizontal Application: Apply sheets from low to high points of decks to ensure that laps shed water.

F. Apply continuous sheets over already-installed sheet strips, bridging substrate cracks, construction, and contraction joints.
G. Seal edges of sheet-waterproofing terminations with mastic.

H. Install sheet-waterproofing and auxiliary materials to tie into adjacent waterproofing.

I. 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.

J. Immediately install protection course with butted joints over waterproofing membrane.

   1. Board insulation may be used in place of a separate protection course to vertical applications when approved by waterproofing manufacturer and installed immediately.

3.4 BLINDSIDE SHEET-WATERPROOFING APPLICATION

A. Install bonded blindside sheet waterproofing according to manufacturer's written instructions.

B. Place and secure molded-sheet drainage panels over substrate. Lap edges and ends of geotextile to maintain continuity.

C. Vertical Applications: Install sheet with face against substrate. Accurately align sheets and maintain uniform side and end laps of minimum dimensions required by membrane manufacturer. Overlap and seal seams, and stagger and tape end laps to ensure watertight installation. Mechanically fasten to substrate.

   1. Securely fasten top termination of membrane with continuous metal termination bar anchored into substrate and cover with detailing tape.

D. Horizontal Applications: Install sheet with face against substrate. Accurately align sheets and maintain uniform side and end laps of minimum dimensions required by membrane manufacturer. Overlap and seal seams, and stagger and tape end laps to ensure watertight installation.

E. Corners: Seal lapped terminations and cut edges of sheet waterproofing at inside and outside corners with detail tape.

F. Seal penetrations through sheet waterproofing to provide watertight seal with detail tape patches or wraps and a liquid-membrane troweling.

G. Install sheet-waterproofing and auxiliary materials to produce a continuous watertight tie into adjacent waterproofing.

H. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Tape perimeter of damaged or nonconforming area extending 6 inches beyond repaired areas in all directions. Apply a patch of sheet waterproofing and firmly secure with detail tape.
3.5 INSULATION INSTALLATION
   A. Install one or more layers of board insulation to achieve required thickness over waterproofed surfaces. Cut and fit to within 3/4 inch of projections and penetrations.
   B. On vertical surfaces, set insulation units in adhesive or tape applied according to manufacturer's written instructions.
   C. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

3.6 INSULATION DRAINAGE-PANEL INSTALLATION
   A. Install insulation drainage panels over waterproofed surfaces; cut and fit to within 3/4 inch of projections and penetrations.
   B. Ensure that drainage channels are aligned and free of obstructions.
   C. On vertical surfaces, set insulation drainage panels in adhesive or tape applied according to manufacturer's written instructions.
   D. On horizontal surfaces, loosely lay insulation drainage panels according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

3.7 PROTECTION, REPAIR, 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 from damage due to UV light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.
   D. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.
   E. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 071326
SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY
   A. Section Includes:
      1. Glass-fiber blanket insulation.

1.2 ACTION SUBMITTALS
   A. Product Data: For each type of product indicated.

1.3 INFORMATIONAL SUBMITTALS
   A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.

1.4 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.

1.5 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.

PART 2 - PRODUCTS

2.1 GLASS-FIBER BLANKET INSULATION
   A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1. CertainTeed Corporation.
      2. Guardian Building Products, Inc.
      5. Owens Corning.
B. Polypropylene-Scrim-Kraft-Faced, Glass-Fiber Blanket Insulation: ASTM C 665, Type II (non-reflective faced), Class A (faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier).

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates of substances that are harmful to insulation or that interfere with insulation attachment.

3.2 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.

3.3 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

A. Glass-Fiber or Mineral-Wool Blanket Insulation: Install in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.

2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.

3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.

4. Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.

5. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.

6. For wood-framed construction, install blankets according to ASTM C 1320 and as follows:
a. With faced blankets having stapling flanges, secure insulation by inset, stapling flanges to sides of framing members.
b. With faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to maintain continuity of vapor retar der once finish material is installed over it.

7. Vapor-Retarder-Faced Blankets: Tape joints and ruptures in vapor-retarder facings, and seal each continuous area of insulation to ensure airtight installation.

a. Exterior Walls: Set units with facing placed toward exterior of construction.

B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:

1. Loose-Fill Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft..

3.4 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.
SECTION 072500 - WEATHER BARRIERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Building paper.
   2. Building wrap.
   3. Flexible flashing.

B. Related Requirements:

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. For building wrap, include data on air and water-vapor permeance based on testing according to referenced standards.

PART 2 - PRODUCTS

2.1 WATER-RESISTIVE BARRIER

A. Building Paper: ASTM D 226, Type 1 (No. 15 asphalt-saturated organic felt), unperforated.

2.2 MISCELLANEOUS MATERIALS

A. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch.

   1. Products: Subject to compliance with requirements, provide one of the following:
      a. DuPont (E. I. du Pont de Nemours and Company); DuPont Flashing Tape.
      c. Protecto Wrap Company; BT-25 XL.
      d. Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.

B. Primer for Flexible Flashing: Product recommended by manufacturer of flexible flashing for substrate.
PART 3 - EXECUTION

3.1 WATER-RESISTIVE BARRIER INSTALLATION

A. Cover exposed exterior surface of sheathing with water-resistive barrier securely fastened to framing immediately after sheathing is installed.

B. Cover sheathing with water-resistive barrier as follows:
   1. Cut back barrier 1/2 inch on each side of the break in supporting members at expansion- or control-joint locations.
   2. Apply barrier to cover vertical flashing with a minimum 4-inch overlap unless otherwise indicated.

C. Building Paper: Apply horizontally with a 2-inch overlap and a 6-inch end lap; fasten to sheathing with galvanized staples or roofing nails.

3.2 FLEXIBLE FLASHING INSTALLATION

A. Apply flexible flashing where indicated to comply with manufacturer's written instructions.
   1. Prime substrates as recommended by flashing manufacturer.
   2. Lap seams and junctures with other materials at least 4 inches except that at flashing flanges of other construction, laps need not exceed flange width.
   3. Lap flashing over water-resistive barrier at bottom and sides of openings.
   4. Lap water-resistive barrier over flashing at heads of openings.
   5. After flashing has been applied, roll surfaces with a hard rubber or metal roller to ensure that flashing is completely adhered to substrates.

END OF SECTION 072500
SECTION 072726 - FLUID-APPLIED MEMBRANE AIR BARRIERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes fluid-applied, vapor-permeable membrane air barriers.

B. Related Requirements:

1. Section 061600 "Sheathing" for wall sheathings and wall sheathing joint-and-penetration treatments.
2. Section 072500 "Weather Barriers" for weather barriers, including building paper and flexible flashing.

1.2 DEFINITIONS

A. Air-Barrier Material: A primary element that provides a continuous barrier to the movement of air.

B. Air-Barrier Accessory: A transitional component of the air barrier that provides continuity.

C. Air-Barrier Assembly: The collection of air-barrier materials and accessory materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of products.

B. Shop Drawings: For air-barrier assemblies.

1. Show locations and extent of air barrier. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
2. Include details of interfaces with other materials that form part of air barrier.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: From air-barrier manufacturer, certifying compatibility of air barriers and accessory materials with Project materials that connect to or that come in contact with the barrier.
B. Product Test Reports: For each air-barrier assembly, for tests performed by a qualified testing agency.

1.5 DELIVERY, STORAGE, AND HANDLING
A. Remove and replace liquid materials that cannot be applied within their stated shelf life.
B. Protect stored materials from direct sunlight.

1.6 FIELD CONDITIONS
A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended by air-barrier manufacturer.
   1. Protect substrates from environmental conditions that affect air-barrier performance.
   2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL
A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS
A. General: Air barrier shall be capable of performing as a continuous vapor-permeable air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

2.3 VAPOR-PERMEABLE MEMBRANE AIR-BARRIER
A. Fluid-Applied, Vapor-Permeable Membrane Air Barrier: Synthetic polymer membrane.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Synthetic Polymer Membrane:
         1) Carlisle Coatings & Waterproofing Inc.; Barritech VP.
         2) Grace, W. R., & Co. - Conn.; Perm-A-Barrier VP.
         3) Henry Company; Air-Bloc 31.
         4) Tremco Incorporated, an RPM company; ExoAir 230.
2. **Physical and Performance Properties:**
   a. **Air Permeance:** Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E 2178.
   b. **Vapor Permeance:** Minimum; ASTM E 96/E 96M.
   c. **Ultimate Elongation:** Minimum 200 percent; ASTM D 412, Die C.

2.4 **ACCESSORY MATERIALS**

A. **General:** Accessory materials recommended by air-barrier manufacturer to produce a complete air-barrier assembly and compatible with primary air-barrier material.

B. **Primer:** Liquid waterborne primer recommended for substrate by air-barrier material manufacturer.

C. **Counterflashing Strip:** Modified bituminous, 40-mil- thick, self-adhering sheet consisting of 32 mils of rubberized asphalt laminated to an 8-mil- thick, cross-laminated polyethylene film with release liner backing.

D. **Butyl Strip:** Vapor retarding, 30 to 40 mils thick, self-adhering; polyethylene-film-reinforced top surface laminated to layer of butyl adhesive with release liner backing.

E. **Modified Bituminous Strip:** Vapor retarding, 40 mils thick, smooth surfaced, self-adhering; consisting of 36 mils of rubberized asphalt laminated to a 4-mil- thick polyethylene film with release liner backing.

F. **Joint Reinforcing Strip:** Air-barrier manufacturer's glass-fiber-mesh tape.

G. **Substrate-Patching Membrane:** Manufacturer's standard trowel-grade substrate filler.

H. **Adhesive and Tape:** Air-barrier manufacturer's standard adhesive and pressure-sensitive adhesive tape.

I. **Sprayed Polyurethane Foam Sealant:** One- or two-component, foamed-in-place, polyurethane foam sealant, 1.5- to 2.0-lb/cu. ft density; flame-spread index of 25 or less according to ASTM E 162; with primer and noncorrosive substrate cleaner recommended by foam sealant manufacturer.

J. **Modified Bituminous Transition Strip:** Vapor retarding, 40 mils thick, smooth surfaced, self-adhering; consisting of 36 mils of rubberized asphalt laminated to a 4-mil- thick polyethylene film with release liner backing.

K. **Adhesive-Coated Transition Strip:** Vapor-permeable, 17-mil- thick, self-adhering strip consisting of an adhesive coating over a permeable laminate with a permeance value of 37 perms.

L. **Elastomeric Flashing Sheet:** ASTM D 2000, minimum 50- to 65-mil- thick, cured sheet neoprene with manufacturer-recommended contact adhesives and lap sealant with aluminum termination bars and stainless-steel fasteners.
M. Preformed Silicone-Sealant Extrusion: Manufacturer's standard system consisting of cured low-modulus silicone extrusion, sized to fit opening widths, with a single-component, neutral-curing, Class 100/50 (low-modulus) silicone sealant for bonding extrusions to substrates.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Dow Corning Corporation; 123 Silicone Seal.
   c. Pecora Corporation; Sil-Span.
   d. Tremco Incorporated, an RPM company; Spectrem Simple Seal.

N. Joint Sealant: ASTM C 920, single-component, neutral-curing silicone; Class 100/50 (low modulus), Grade NS, Use NT related to exposure, and, as applicable to joint substrates indicated, Use O. Comply with Section 079200 "Joint Sealants."

O. Termination Mastic: Air-barrier manufacturer's standard cold fluid-applied elastomeric liquid; trowel grade.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
2. Verify that concrete has cured and aged for minimum time period recommended by air-barrier manufacturer.
3. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
4. Verify that masonry joints are flush and completely filled with mortar.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

A. Clean, prepare, treat, and seal substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air-barrier application.

B. Mask off adjoining surfaces not covered by air barrier 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 in concrete with substrate-patching membrane.
E. Remove excess mortar from masonry ties, shelf angles, and other obstructions.

F. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.

G. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

3.3 JOINT TREATMENT

A. Concrete and Masonry: Prepare, treat, rout, and fill joints and cracks in substrate according to ASTM C 1193 and air-barrier manufacturer's written instructions. Remove dust and dirt from joints and cracks complying with ASTM D 4258 before coating surfaces.

1. Prime substrate and apply a single thickness of air-barrier manufacturer's recommended preparation coat extending a minimum of 3 inches along each side of joints and cracks. Apply a double thickness of fluid air-barrier material and embed a joint reinforcing strip in preparation coat.

B. Gypsum Sheathing: Fill joints greater than 1/4 inch with sealant according to ASTM C 1193 and air-barrier manufacturer's written instructions. Apply first layer of fluid air-barrier material at joints. Tape joints with joint reinforcing strip after first layer is dry. Apply a second layer of fluid air-barrier material over joint reinforcing strip.

3.4 TRANSITION STRIP INSTALLATION

A. General: Install strips, transition strips, and accessory materials according to air-barrier manufacturer's written instructions to form a seal with adjacent construction and maintain a continuous air barrier.

1. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.

2. Install butyl strip on roofing membrane or base flashing so that a minimum of 3 inches of coverage is achieved over each substrate.

B. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by fluid air-barrier material on same day. Reprime areas exposed for more than 24 hours.

C. Connect and seal exterior wall air-barrier material continuously to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.

D. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.
E. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

F. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply adhesive-coated transition strip so that a minimum of 3 inches of coverage is achieved over each substrate. Maintain 3 inches of full contact over firm bearing to perimeter frames with not less than 1 inch of full contact.

   1. Adhesive-Coated Transition Strip: Roll firmly to enhance adhesion.

G. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air-barrier material with foam sealant.

H. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.

I. Seal top of through-wall flashings to air barrier with an additional 6-inch-wide, counterflashing strip.

J. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.

K. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches beyond repaired areas in strip direction.

3.5 FLUID AIR-BARRIER MEMBRANE INSTALLATION

A. General: Apply fluid air-barrier material to form a seal with strips and transition strips and to achieve a continuous air barrier according to air-barrier manufacturer's written instructions. Apply fluid air-barrier material within manufacturer's recommended application temperature ranges.

   1. Apply primer to substrates at required rate and allow it to dry.
   2. Limit priming to areas that will be covered by fluid air-barrier material on same day. Reprime areas exposed for more than 24 hours.
   3. Prime glass-fiber-surfsaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.

B. Membrane Air Barriers: Apply a continuous unbroken air-barrier membrane to substrates according to the following thickness. Apply air-barrier membrane in full contact around protrusions such as masonry ties.

   1. Vapor-Permeable Membrane Air Barrier: Total dry film thickness as recommended in writing by manufacturer to meet performance requirements, but not less than 40-mil dry film thickness, applied in one or more equal coats.

C. Apply strip and transition strip a minimum of 1 inch onto cured air-barrier material according to air-barrier manufacturer's written instructions.
D. Do not cover air barrier until it has been tested and inspected by Owner's testing agency.

E. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

### 3.6 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements. Inspections may include the following:

1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.
2. Continuous structural support of air-barrier system has been provided.
3. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.
4. Site conditions for application temperature and dryness of substrates have been maintained.
5. Maximum exposure time of materials to UV deterioration has not been exceeded.
6. Surfaces have been primed, if applicable.
7. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.
8. Termination mastic has been applied on cut edges.
9. Strips and transition strips have been firmly adhered to substrate.
10. Compatible materials have been used.
11. Transitions at changes in direction and structural support at gaps have been provided.
12. Connections between assemblies (air-barrier and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
13. All penetrations have been sealed.

### 3.7 CLEANING AND PROTECTION

A. Protect air-barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

1. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer.
2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.

B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.

C. Remove masking materials after installation.
1.1 SUMMARY

A. Section includes metal soffit panels.

B. Related Sections:
   1. Section 076100 "Sheet Metal Roofing".

1.2 ACTION 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 type of panel and accessory.

B. Shop Drawings:
   1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorage systems, attachment system, trim, flashings, closures, and accessories; and special details.
   2. Accessories: Include details of flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches.

C. Samples for Initial Selection: For each type of metal panel indicated with factory-applied color finishes.
   1. Include similar Samples of trim and accessories involving color selection.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
   1. Metal Panels: 12 inches long by actual panel width. Include fasteners, closures, and other metal panel accessories.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each product, tests performed by a qualified testing agency.

C. Sample Warranties: For special warranties.
1.4 CLOSEOUT SUBMITTALS
   A. Maintenance Data: For metal panels to include in maintenance manuals.

1.5 QUALITY ASSURANCE
   A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING
   A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.
   B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.
   C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.
   D. Retain strippable protective covering on metal panels during installation.
   E. Copper Panels: Wear gloves when handling to prevent fingerprints and soiling of surface.

1.7 FIELD CONDITIONS
   A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.8 COORDINATION
   A. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of walls, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.9 WARRANTY
   A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
      1. Failures include, but are not limited to, the following:
         a. Structural failures including rupturing, cracking, or puncturing.
         b. Deterioration of metals and other materials beyond normal weathering.
2. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

   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: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:

   1. Wind Loads: As indicated on Drawings.
   2. Other Design Loads: As indicated on Drawings.
   3. Deflection Limits: For wind loads, no greater than 1/180 of the span.

2.2 METAL SOFFIT PANELS

A. General: Provide metal soffit panels designed to be installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners in side laps. Include accessories required for weathertight installation.

B. V-Groove-Profile Metal Soffit Panels: Perforated panels formed with vertical panel edges and intermediate stiffening ribs symmetrically spaced between panel edges; with a V-groove joint between panels.

   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

      a. ATAS International, Inc.
      b. Berridge Manufacturing Company.
      c. Englert, Inc.
      d. Fabral.
      e. Innovative Metals Company, Inc.
      f. Petersen Aluminum Corporation.

   2. Material: Same material, finish, and color as metal roof panels.
3. Aluminum Sheet: Coil-coated sheet, ASTM B 209, alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.
   a. Thickness: 0.032 inch.
   b. Surface: Smooth, flat finish.
   d. Color: As selected by Architect from manufacturer’s full range.

5. Panel Height: 0.50 inch.

2.3 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C 645, cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 coating designation or ASTM A 792/A 792M, Class AZ50 aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
   1. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Finish flashing and trim with same finish system as adjacent metal panels.

D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.

E. Panel Sealants: Provide sealant types recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.
   1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
   2. Joint Sealant: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
2.4  FABRICATION

A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

C. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

D. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
4. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.

   a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal soffit panel manufacturer for application but not less than thickness of metal being secured.

2.5  FINISHES

A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in 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.

C. Aluminum Panels and Accessories:
1. 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.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.

1. Examine framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal panel manufacturer.

2. Examine sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal panel manufacturer.

B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

1. Soffit Framing: Wire tie or clip furring channels to supports.

3.3 METAL PANEL INSTALLATION

A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Shim or otherwise plumb substrates receiving metal panels.

2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.

3. Install screw fasteners in predrilled holes.

4. Locate and space fastenings in uniform vertical and horizontal alignment.

5. Install flashing and trim as metal panel work proceeds.
6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
7. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners:

1. Steel Panels: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.
2. Aluminum Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.
3. Copper Panels: Use copper, stainless-steel, or hardware-bronze fasteners.

C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.

D. Lap-Seam Metal Panels: Fasten metal panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.

1. Apply panels and associated items true to line for neat and weathertight enclosure.
2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal panels.
3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.

E. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal panel system including trim, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.

F. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.

1. Install exposed flashing and trim that is without buckling, and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to achieve waterproof performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).
3.4 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

B. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

C. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074213.53
SECTION 076100 - SHEET METAL ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Standing-seam metal roofing, custom fabricated.

B. Related Sections:
   1. Division 06 Section "Rough Carpentry"
   2. Division 07 Section "Thermal Insulation" for roof insulation and sheet vapor retarders separate from self-adhering underlayments.
   3. Division 07 Section "Joint Sealants" for field-applied sealants adjoining sheet metal roofing.

1.2 PERFORMANCE REQUIREMENTS

A. General Performance: Sheet metal roofing system including, but not limited to, metal roof panels, cleats, clips, anchors and fasteners, sheet metal flashing integral with sheet metal roofing, fascia panels, trim, underlayment, and accessories shall comply with requirements indicated without failure due to defective manufacture, fabrication, installation, or other defects in construction. Sheet metal roofing shall remain watertight.

B. Thermal Movements: Provide sheet metal roofing that allows for thermal movements from ambient and surface temperature changes. Base calculations 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.

C. Energy Performance: Provide metal roofing with solar reflectance index not less than 78 when calculated according to ASTM E 1980 based on testing identical products by a qualified testing agency.

1.3 SUBMITTALS

A. Shop Drawings: Show fabrication and installation layouts of sheet metal roofing, including plans, elevations, expansion joint locations, and keyed details. Distinguish between shop- and field-assembled work. Include the following:
   1. Details for forming sheet metal roofing, including seams and dimensions.
   2. Details for joining and securing sheet metal roofing, including layout of fasteners, cleats, clips, and other attachments. Include pattern of seams.
   3. Details of termination points and assemblies, including fixed points.
   4. Details of expansion joints, including showing direction of expansion and contraction.
   5. Details of roof penetrations.
6. Details of edge conditions, including eaves and counter flashings.
7. Details of connections to adjoining work.
8. Detail the following accessory items, at a scale of not less than 1-1/2 inches per 12 inches:
   a. Flashing and trim.

B. Coordination Drawings: Roof plans drawn to scale with coordinated details. Show the following:
   1. Sheet metal roofing and attachments.
   2. Roof-mounted items including roof hatches, equipment supports, pipe supports and penetrations, lighting fixtures, snow guards, and items mounted on roof curbs.

C. Maintenance Data: For roofing sheet metals and accessories to include in maintenance manuals.

D. Warranties: Sample of special warranties.

1.4 QUALITY ASSURANCE

A. Custom-Fabricated Sheet Metal Roofing Fabricator Qualifications: Shop that employs skilled workers who custom fabricate sheet metal roofing similar to that required for this Project and whose products have a record of successful in-service performance.

B. Sheet Metal Roofing Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal roofing materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal roofing materials away from uncured concrete and masonry.

B. Protect strippable protective covering on sheet metal roofing from exposure to sunlight and high humidity, except to the extent necessary for the period of sheet metal roofing installation.

1.6 COORDINATION

A. Coordinate sheet metal roofing with rain drainage work, flashing, trim, and construction of metal decks, parapets, walls, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.7 WARRANTY

A. Special Warranty: Warranty form at the end of this Section in which Installer agrees to repair or replace components of sheet metal roofing that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
   a. Structural failures, including but not limited to rupturing, cracking, or puncturing.
   b. Wrinkling or buckling.
   c. Loose parts.
   d. Failure to remain weathertight, including uncontrolled water leakage.
   e. Deterioration of metals, metal finishes, and other materials beyond normal weathering, including non-uniformity of color or finish.
   f. Galvanic action between sheet metal roofing and dissimilar materials.

2. Warranty Period: Two years from date of Substantial Completion.
   
B. Special Warranty on Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal roofing 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: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 ROOFING SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a 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.

1. Manufacturers: Provide from one of the following:
   a. Tremco
   b. Fabral
   c. PAC-CLAD (Petersen Aluminum)

2. Thickness: 0.040 inch unless otherwise indicated.
3. Panel Width: 12 inches
4. Panel Seam Height: 1 ½ inches.
5. Surface: Smooth, flat.
6. 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.
7. Color: As indicated on the Drawings.
8. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

2.2 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.

2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F.
3. Products: available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Carlisle Coatings & Waterproofing Inc.; CCW WIP 300HT.
   c. Henry Company; Blueskin PE200 HT.
   d. Metal-Fab Manufacturing, LLC; MetShield.
   e. Owens Corning; WeatherLock Metal High-Temperature Underlayment.

2.3 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for a complete roofing system and as recommended by primary sheet metal manufacturer 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.

1. General:
   a. Exposed Fasteners: Heads matching color of sheet metal roofing using plastic caps or factory-applied coating.
   b. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
   c. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.

2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.

C. Sealant Tape: Pressure-sensitive, 100 percent solids, gray 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. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

E. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.4 ACCESSORIES

A. Sheet Metal Accessories: Provide components required for a complete sheet metal roofing assembly including trim, copings, fasciae, corner units, clips, flashings, sealants, gaskets, fillers, metal closures, closure strips, and similar items. Match material and finish of sheet metal roofing unless otherwise indicated.

1. Cleats: For mechanically seaming into joints and formed from the following materials:
   a. Aluminum Roofing: 0.025-inch-thick stainless steel.

2. Backing Plates: Plates at roofing splices, fabricated from material recommended by SMACNA.

3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin foam or closed-cell laminated polyethylene; minimum 1-inch-thick, flexible-closure strips; cut or premolded to match sheet metal roofing profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

4. Flashing and Trim: Formed from same material and with same finish as sheet metal roofing, minimum thickness matching the sheet metal roofing.

2.5 FABRICATION

A. General: Custom fabricate sheet metal roofing to comply with details shown and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions (panel width and seam height), geometry, metal thickness, and other characteristics of installation indicated. Fabricate sheet metal roofing and accessories at the shop to greatest extent possible.

1. Standing-Seam Roofing: Form standing-seam panels with finished seam height of 1-1/2 inches.

B. Fabrication Tolerances: Fabricate sheet metal roofing that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

C. Fabrication Tolerances: Fabricate sheet metal roofing that is capable of installation to tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

D. Form exposed sheet metal work to fit substrates without excessive oil canning, buckling, and tool marks; true to line and levels indicated; and with exposed edges folded back to form hems.

1. Lay out sheet metal roofing so transverse seams, if required, are made in direction of flow with higher panels overlapping lower panels.
2. Offset transverse seams from each other 12 inches minimum.
3. Fold and cleat eaves and transverse seams in the shop.
4. Form and fabricate sheets, seams, strips, cleats, valleys, ridges, edge treatments, integral flashings, and other components of metal roofing to profiles, patterns, and drainage arrangements shown on Drawings and as required for leakproof construction.

E. Expansion Provisions: Fabricate sheet metal roofing to allow for expansion in running works sufficient to prevent leakage, damage, and deterioration of the Work. Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.

F. Sealant Joints: Where movable, nonexpansion-type joints are indicated or required to produce weathertight seams, form metal to provide for proper installation of elastomeric sealant in compliance with SMACNA standards.

G. Metal Protection: Where dissimilar metals will contact each other, protect against galvanic action by painting contact surfaces with bituminous coating, by applying self-adhering sheet underlayment to each contact surface, or by other permanent separation as recommended by fabricator of sheet metal roofing or manufacturers of the metals in contact.

H. Sheet Metal Accessories: Custom fabricate flashings and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated. Obtain field measurements for accurate fit before shop fabrication.

1. Form exposed sheet metal accessories without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
2. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
3. Fabricate cleats and attachment devices of sizes as recommended by SMACNA's "Architectural Sheet Metal Manual" for application, but not less than thickness of metal being secured.

I. Do not use graphite pencils to mark metal surfaces.

PART 3 - EXECUTION

3.1 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. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking, that tops of fasteners are flush with surface, and that installation is within flatness tolerances required for finished roofing installation.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and completely anchored, and that provision has been made for drainage, flashings, and penetrations through sheet metal roofing.

B. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Examine roughing-in for components and systems penetrating sheet metal roofing to verify actual locations of penetrations relative to seam locations of sheet metal roofing before installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

A. Install flashings to cover underlayment to comply with requirements in Division 07 Section "Sheet Metal Flashing and Trim."

B. Apply slip sheet before installing sheet metal roofing.

3.3 INSTALLATION, GENERAL

A. General: Anchor sheet metal roofing and other components of the Work securely in place, with provisions for thermal and structural movement. Install fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for a complete roofing system and as recommended by fabricator for sheet metal roofing.

1. Field cutting of sheet metal roofing by torch is not permitted.
2. Provide metal closures at eaves and each side of ridge caps.
3. Flash and seal sheet metal roofing with closure strips at eaves, rakes, and perimeter of all openings. Fasten with self-tapping screws.
4. Locate and space fastenings in uniform vertical and horizontal alignment. Predrill panels for fasteners.
5. Install ridge caps as sheet metal roofing work proceeds.
6. Locate roofing splices over, but not attached to, structural supports. Stagger roofing splices and end laps to avoid a four-panel lap splice condition. Install backing plates at roofing splices.
7. Install sealant tape where indicated.
8. Lap metal flashing over sheet metal roofing to allow moisture to run over and off the material.
9. Do not use graphite pencils to mark metal surfaces.

B. Thermal Movement. Rigidly fasten metal roof panels to structure at only one location for each panel. Allow remainder of panel to move freely for thermal expansion and contraction.

1. Point of Fixity: Fasten each panel along a single line of fixing located at eave center of panel length.
2. Avoid attaching accessories through roof panels in a manner that will inhibit thermal movement.
C. Fasteners: Use fasteners of sizes that will penetrate metal decking not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

D. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating, by applying self-adhering sheet underlayment to each contact surface, or by other permanent separation as recommended by SMACNA.

1. Coat back side of sheet metal roofing with bituminous coating where roofing will contact wood, ferrous metal, or cementitious construction.

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. Fasciae: Align bottom of sheet metal roofing and fasten with blind rivets, bolts, or self-tapping screws. Flash and seal sheet metal roofing with closure strips where fasciae meet soffits, along lower panel edges, and at perimeter of all openings.

3.4 CUSTOM-FABRICATED SHEET METAL ROOFING INSTALLATION

A. Fabricate and install work with lines and corners of exposed units true and accurate. Form exposed faces flat and free of buckles, excessive waves, and avoidable tool marks, considering temper and reflectivity of metal. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant. Fold back sheet metal to form a hem on concealed side of exposed edges unless otherwise indicated.

1. Install cleats to hold sheet metal panels in position. Attach each cleat with two fasteners to prevent rotation.
2. Fasten cleats not more than 12 inches o.c. Bend tabs over fastener head.
3. Provide expansion-type cleats and clips for roof panels that exceed 30 feet in length.

B. Seal joints as shown and as required for watertight construction. For roofing with 3:12 slopes or less, use cleats at transverse seams.

1. Where sealant-filled joints are used, 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 moderate, 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 Division 07 Section "Joint Sealants."

C. Rivets: Rivet joints where indicated and where necessary for strength.

D. Standing-Seam Roofing: Attach standing-seam metal panels to substrate with cleats, double fastened at 12 inches o.c. Install panels reaching from eave to ridge before moving to adjacent panels. Before panels are interlocked, apply continuous bead of sealant to top of flange of
lower panel. Lock standing seams by folding over twice so cleat and panel edges are completely engaged.

1. Lock each panel to panel below with sealed transverse seam.
2. Loose-lock panels at eave edges to continuous cleats and flanges at roof edge.
3. Leave seams upright after locking at ridges and hips.

3.5 ACCESSORY INSTALLATION

A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete sheet metal roofing assembly including trim, copings, seam covers, flashings, sealants, gaskets, fillers, metal closures, closure strips, and similar items.
2. Install accessories integral to sheet metal roofing that are specified in Division 07 Section "Sheet Metal Flashing and Trim" to comply with that Section's requirements.

B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers.
2. Install exposed flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
3. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, and filled with butyl sealant concealed within joints.

3.6 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal roofing within installed tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.


3.7 CLEANING AND PROTECTION
A. Clean off excess sealants.

B. Remove temporary protective coverings and strippable films as sheet metal roofing is installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal roofing installation, clean finished surfaces as recommended by sheet metal roofing manufacturer. Maintain sheet metal roofing in a clean condition during construction.

C. Replace sheet metal roofing components that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

3.8 ROOFING INSTALLER'S WARRANTY

A. WHEREAS ____________ of __________________, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:

1. Owner: __________________________________________________
2. Address: __________________________________________________
3. Building Name/Type: ________________________________________
4. Address: __________________________________________________
5. Area of Work: ______________________________________________
6. Acceptance Date: ____________________________________________
7. Warranty Period: ____________________________________________
8. Expiration 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 120 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 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________________ day of____________________,_______.

1. Authorized Signature: __________________________
2. Name: ________________________
3. Title: ________________________

END OF SECTION 076100
SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

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

1.2 SUMMARY
   A. Section Includes:
      1. Manufactured through-wall flashing with counterflashing.
      2. Formed steep-slope roof sheet metal fabrications.
   B. Related Requirements:
      1. Section 061053 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.

1.3 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.

1.4 ACTION 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 details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and
         counterflashings as applicable.

1.5 INFORMATIONAL SUBMITTALS
   A. Qualification Data: For fabricator.
   B. Sample Warranty: For special warranty.
1.6 CLOSEOUT SUBMITTALS
   A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

1.7 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.

1.8 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: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 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. SPRI Wind Design Standard: Manufacture and install copings and roof edge flashings tested according to SPRI ES-1 and capable of resisting the following design pressure:
      1. Design Pressure: As indicated on Drawings.
D. 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.

2.2 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: As selected by Architect from manufacturer's full range.

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.

2.3 UNDERLAYMENT MATERIALS

A. Felt: ASTM D 226/D 226M, Type II (No. 30), asphalt-saturated organic felt; nonperforated.

2.4 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 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.

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.

3. Fasteners for Stainless-Steel Sheet: 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 C920, elastomeric polyurethane polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

E. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

F. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.

G. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.


2.5 MANUFACTURED SHEET METAL FLASHING AND TRIM

A. Through-Wall, Ribbed, Sheet Metal Flashing: Manufacture through-wall sheet metal flashing for embedment in masonry, with ribs at 3-inch intervals along length of flashing to provide integral mortar bond. Manufacture through-wall flashing with snaplock receiver on exterior face to receive counterflashing.

1. Stainless Steel: 0.016 inch thick.

   a. Products: Subject to compliance with requirements, provide one of the following:

      1) Cheney Flashing Company; Cheney Flashing.
      2) Hohmann & Barnard, Inc.; STF Sawtooth Flashing.
      4) Sandell Manufacturing; Pre-Formed Metal Flashing.

2.6 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. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

D. 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.

E. 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.

F. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

G. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard for application, but not less than thickness of metal being secured.

H. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.

I. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use.

J. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer.

K. Do not use graphite pencils to mark metal surfaces.

2.7 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, Rake and Ridge Flashing: Fabricate from the following materials:
   1. Aluminum: 0.032 inch thick.

D. Counterflashing: Shop fabricate interior and exterior corners fabricate from the following materials:
   1. Stainless Steel: 0.019 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.

PART 3 - EXECUTION

3.1 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.

3.2 UNDERLAYERMENy 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. Synthetic Underlayment: Install synthetic underlayment, wrinkle free, according to manufacturers' written instructions, and using adhesive where possible to minimize use of mechanical fasteners under sheet metal.

C. 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.

D. Apply slip sheet, wrinkle free, over underlayment before installing sheet metal flashing and trim.

3.3 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 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 079200 "Joint Sealants."

G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets with solder to width of 1-1/2 inches; however, reduce pre-tinning where pre-tinned surface would show in completed Work.
   1. Do not solder metallic-coated steel and aluminum sheet.
   2. Do not use torches for soldering.
   3. Heat surfaces to receive solder, and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
   5. Copper Soldering: Tin edges of uncoated sheets, using solder for copper.
   6. Copper-Clad Stainless-Steel Soldering: Tin edges of uncoated sheets, using solder for copper-clad stainless steel.

H. Rivets: Rivet joints where necessary for strength.

3.4 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. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for FM Approvals' listing for required windstorm classification.

D. Copings: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated.
1. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at 24-inch centers.
2. Anchor interior leg of coping with washers and screw fasteners through slotted holes at 24-inch centers.

E. Copings: Anchor to resist uplift and outward forces according to recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for specified FM Approvals' listing for required windstorm classification.

F. 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.

G. 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.

H. 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.

3.5 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Through-Wall Flashing: Installation of through-wall flashing is specified in Section 042000 "Unit Masonry."

C. Reglets: Installation of reglets is specified in Section 033000 "Cast-in-Place Concrete" and or Section 042000 "Unit Masonry."

D. Opening Flashings in Frame Construction: Install continuous head, sill, and similar flashings to extend 4 inches beyond wall openings.

3.6 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.

B. Overhead-Piping Safety Pans: Suspend pans from structure above, independent of other overhead items such as equipment, piping, and conduit, unless otherwise indicated on Drawings. Pipe and install drain line to plumbing waste or drainage system.
3.7 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.

B. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

3.8 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 076200
SECTION 078413 - PENETRATION FIRESTOPPING

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

1.2 SUMMARY
A. Section Includes:
   1. Penetrations in fire-resistance-rated walls.
   2. Penetrations in horizontal assemblies.

B. Related Requirements:
   1. Section 078443 "Joint Firestopping" for joints in or between fire-resistance-rated construction.

1.3 ALLOWANCES
A. Penetration firestopping Work is part of an allowance.

1.4 UNIT PRICES
A. Work of this Section is affected by unit prices.

1.5 PREINSTALLATION MEETINGS
A. Preinstallation Conference: Conduct conference at Project site

1.6 ACTION SUBMITTALS
A. Product Data: For each type of product.

B. LEED Submittals:
   1. Product Data for Credit IEQ 4.1: For penetration firestopping sealants and sealant primers, documentation including printed statement of VOC content.
   2. Laboratory Test Reports for Credit IEQ 4.1: For penetration firestopping sealants and sealant primers, documentation indicating that products comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
C. **Product Schedule:** For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.

   1. **Engineering Judgments:** Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping system, submit illustration, with modifications marked, approved by penetration firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly. Obtain approval of authorities having jurisdiction prior to submittal.

1.7 **INFORMATIONAL SUBMITTALS**

   A. Qualification Data: For Installer.

   B. Product Test Reports: For each penetration firestopping system, for tests performed by a qualified testing agency.

1.8 **CLOSEOUT SUBMITTALS**

   A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.9 **QUALITY ASSURANCE**

   A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

1.10 **PROJECT CONDITIONS**

   A. Environmental Limitations: Do not install penetration firestopping system when ambient or substrate temperatures are outside limits permitted by penetration firestopping system manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

   B. Install and cure penetration firestopping materials per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.11 **COORDINATION**

   A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems can be installed according to specified firestopping system design.

   B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping systems.
PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:
   1. Perform penetration firestopping system tests by a qualified testing agency acceptable to
      authorities having jurisdiction.
   2. Test per testing standards referenced in "Penetration Firestopping Systems" Article.
      Provide rated systems complying with the following requirements:
      a. Penetration firestopping systems shall bear classification marking of a qualified
         testing agency.
         1) UL in its "Fire Resistance Directory."
         2) Intertek Group in its "Directory of Listed Building Products."
         3) FM Global in its "Building Materials Approval Guide."

2.2 PENETRATION FIRESTOPPING SYSTEMS

A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other
   gases, and maintain original fire-resistance rating of construction penetrated. Penetration
   firestopping systems shall be compatible with one another, with the substrates forming
   openings, and with penetrating items if any.
   1. Hilti, Inc.
   2. Specified Technologies Inc.
   3. 3M Fire Protection Products

B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings
   determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of
   0.01-inch wg.
   1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings
   determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of
   0.01-inch wg.
   1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions
      penetrated.
   2. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions
      penetrated except for floor penetrations within the cavity of a wall.
   3. W-Rating: Provide penetration firestopping systems showing no evidence of water
      leakage when tested according to UL 1479.
D. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E 84.

E. VOC Content: Penetration firestopping sealants and sealant primers shall comply with the following limits for VOC content:

   1. Sealants: 250 g/L.
   2. Sealant Primers for Nonporous Substrates: 250 g/L.
   3. Sealant Primers for Porous Substrates: 775 g/L.

F. Low-Emitting Materials: Penetration firestopping sealants and sealant primers shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

G. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.

   1. Permanent forming/damming/backing materials.
   2. Substrate primers.
   3. Collars.
   4. Steel sleeves.

2.3 FILL MATERIALS

A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer sleeve lined with an intumescent strip, a flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.

C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced intumescent elastomeric sheet bonded to galvanized-steel sheet.

E. Intumescent Putties: Nonhardening, water-resistant, intumescent putties containing no solvents or inorganic fibers.

F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.
H. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.

I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.


2.4 MIXING

A. Penetration Firestopping Materials: For those products requiring mixing before application, comply with penetration firestopping system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Before installing penetration firestopping systems, clean out openings immediately to comply with manufacturer's written instructions and with the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping materials.

2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping materials. Remove loose particles remaining from cleaning operation.

3. Remove laitance and form-release agents from concrete.

B. Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
3.3 INSTALLATION

A. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.

B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.

C. Install fill materials by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches high and with minimum 0.375-inch strokes.

1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet from end of wall and at intervals not exceeding 30 feet.

B. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of penetration firestopping system edge so labels are visible to anyone seeking to remove penetrating items or firestopping systems. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing and inspecting agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.
3.5 FIELD QUALITY CONTROL

A. Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E 2174.

B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.

C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping material and install new materials to produce systems complying with specified requirements.

3.7 PENETRATION FIRESTOPPING SYSTEM SCHEDULE

A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHEZ.

B. Where Intertek Group-listed systems are indicated, they refer to design numbers in Intertek Group's "Directory of Listed Building Products" under "Firestop Systems."

C. Where FM Global-approved systems are indicated, they refer to design numbers listed in FM Global's "Building Materials Approval Guide" under "Wall and Floor Penetration Fire Stops."

D. Penetration Firestopping Systems with No Penetrating Items:
   1. UL-Classified Systems: C-AJ-0082, W-L-0015 or approved equal.

E. Penetration Firestopping Systems for Metallic Pipes, Conduit, or Tubing:
   1. UL-Classified Systems: C-AJ-1149, W-L-1148 or approved equal.

F. Penetration Firestopping Systems for Nonmetallic Pipe, Conduit, or Tubing:
   1. UL-Classified Systems: C-AJ-2371 or approved equal.

G. Penetration Firestopping Systems for Electrical Cables:
   1. UL-Classified Systems: C-AJ-3152, W-L-3224 or approved equal.
H. Penetration Firestopping Systems for Cable Trays with Electric Cables:
   1. UL-Classified Systems: C-AJ-4054, W-L-4038 or approved equal.

I. Penetration Firestopping Systems for Insulated Pipes:
   1. UL-Classified Systems: C-AJ-5096, W-L-5240 or approved equal.

END OF SECTION 078413
SECTION 078446 - FIRE-RESISTIVE JOINT SYSTEMS

PART 1 - GENERAL

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

1.2 SUMMARY
   A. Section Includes:
      1. Joints in or between fire-resistance-rated constructions.
   B. Related Sections:
      1. Section 078413 "Penetration Firestopping" for penetrations in fire-resistance-rated walls, horizontal assemblies, and smoke barriers.

1.3 ACTION SUBMITTALS
   A. Product Data: For each type of product indicated.
   B. Product Schedule: For each fire-resistive joint system. Include location and design designation of qualified testing agency.

1.4 INFORMATIONAL SUBMITTALS
   A. Qualification Data: For qualified Installer.
   B. Installer Certificates: From Installer indicating fire-resistive joint systems have been installed in compliance with requirements and manufacturer's written recommendations.
   C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for fire-resistive joint systems.
1.5 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements."

B. Installer Qualifications: A firm experienced in installing fire-resistive joint systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its fire-resistant joint system products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

C. Fire-Test-Response Characteristics: Fire-resistant joint systems shall comply with the following requirements:

1. Fire-resistant joint system tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.

2. Fire-resistant joint systems are identical to those tested per testing standard referenced in "Fire-Resistive Joint Systems" Article. Provide rated systems complying with the following requirements:

   a. Fire-resistant joint system products bear classification marking of qualified testing agency.

   b. Fire-resistant joint systems correspond to those indicated by reference to designations listed by the following:

      1) UL in its "Fire Resistance Directory."

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install fire-resistant joint systems when ambient or substrate temperatures are outside limits permitted by fire-resistant joint system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Install and cure fire-resistant joint systems per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

1.7 COORDINATION

A. Coordinate construction of joints to ensure that fire-resistant joint systems are installed according to specified requirements.

B. Coordinate sizing of joints to accommodate fire-resistant joint systems.

C. Notify Owner's testing agency at least seven days in advance of fire-resistant joint system installations; confirm dates and times on day preceding each series of installations.
PART 2 - PRODUCTS

2.1 FIRE-RESISTIVE JOINT SYSTEMS

A. Where required, provide fire-resistant joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which fire-resistant joint systems are installed. Fire-resistant joint systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.

B. Joints in or between Fire-Resistance-Rated Construction: Provide fire-resistant joint systems with ratings determined per ASTM E 1966 or UL 2079:

1. Joints include those installed in or between fire-resistance-rated walls.
2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of construction they will join.

C. Exposed Fire-Resistive Joint Systems: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

D. VOC Content: Fire-resistant joint system sealants 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.

E. Low-Emitting Materials: Fire-resistant joint system sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

F. Accessories: Provide components of fire-resistant joint systems, including primers and forming materials, that are needed to install fill materials and to maintain ratings required. Use only components specified by fire-resistant joint system manufacturer and approved by the qualified testing agency for systems indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.
3.2 PREPARATION

A. Surface Cleaning: Clean joints immediately before installing fire-resistive joint systems to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:

1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of fill materials.
2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with fill materials. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by fire-resistive joint system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent fill materials of fire-resistive joint system from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing fire-resistive joint system's seal with substrates.

3.3 INSTALLATION

A. General: Install fire-resistive joint systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming materials and other accessories of types required to support fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.

C. Install fill materials for fire-resistive joint systems by proven techniques to produce the following results:

1. Fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
2. Apply fill materials so they contact and adhere to substrates formed by joints.
3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Identify fire-resistive joint systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of joint edge so labels will be visible to anyone seeking to remove or penetrate joint system. Use mechanical fasteners or self-adhering-
type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

2. Contractor's name, address, and phone number.
3. Designation of applicable testing agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.5 FIELD QUALITY CONTROL

A. Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Where deficiencies are found or fire-resistive joint systems are damaged or removed due to testing, repair or replace fire-resistive joint systems so they comply with requirements.

C. Proceed with enclosing fire-resistive joint systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTING

A. Clean off excess fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are approved in writing by fire-resistive joint system manufacturers and that do not damage materials in which joints occur.

B. Provide final protection and maintain conditions during and after installation that ensure fire-resistive joint systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

3.7 FIRE-RESISTIVE JOINT SYSTEM SCHEDULE

A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHBN.

B. Where Intertek ETL SEMKO-listed systems are indicated, they refer to design numbers in Intertek ETL SEMKO's "Directory of Listed Building Products" under product category Firestop Systems.

C. Floor-to-Wall, Fire-Resistive Joint Systems FRJS:

1. UL-Classified Systems: FW-D 0000-0999.
2. Assembly Rating: 1 hour.
3. Nominal Joint Width: 1 inch.
4. Movement Capabilities: **Class I**.
5. L-Rating at Ambient: Less than 1 $\text{cfm/ft}$. 
6. L-Rating at 400 deg F: Less than 1 $\text{cfm/ft}$.

END OF SECTION 078446
SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Nonstaining silicone joint sealants.
   2. Urethane joint sealants.
   3. Latex joint sealants.

1.3 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product.

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.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.5 FIELD 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.

1.6 WARRANTY

A. Special Installer's Warranty: 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 agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Five 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 stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
   2. Disintegration of joint substrates from 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

2.1 JOINT SEALANTS, 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. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

2.3 NONSTAINING SILICONE JOINT SEALANTS

A. Nonstaining Joint Sealants: No staining of substrates when tested according to ASTM C 1248.

B. Silicone, Nonstaining, S, NS, 50, NT: Nonstaining, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.
1. Products: Subject to compliance with requirements, provide one of the following:
   a. Dow Corning Corporation; 795.
   b. Pecora Corporation; 864NST.
   c. Tremco Incorporated; Spectrem 3.
   d. Or approved equal.

2.4 URETHANE JOINT SEALANTS

A. Urethane, M, P, 25, T, NT: Multicomponent, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade P, Class 25, Uses T and NT.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Bostik, Inc.; Chem-Calk 555-SL.
   b. Pecora Corporation; Urexpan NR 200
   c. Tremco Incorporated; THC 900/901.
   d. Or approved equal.

2.5 LATEX JOINT SEALANTS

A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. BASF Construction Chemicals, LLC, Building Systems; Sonolac.
   b. Pecora Corporation; AC-20.
   c. Tremco Incorporated; Tremflex 834.
   d. Or approved equal.

2.6 JOINT-SEALANT BACKING

A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. BASF Construction Chemicals, LLC, Building Systems.
   b. Construction Foam Products, a division of Nomaco, Inc.
   c. Or approved equal.

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.

2.7 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

3.1 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 performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 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.
   c. Porcelain enamel.

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.

3.3 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 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.

3.4 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.

3.5 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, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION 079200
SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes hollow-metal work.

B. Related Requirements:

1. Section 087100 "Door Hardware" for door hardware for hollow-metal doors.

1.3 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.4 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.

1.5 ACTION 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.
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.

1.6 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each type of hollow-metal door and frame assembly, for tests performed by a qualified testing agency.

1.7 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 nonvented 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

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Amweld International, LLC.
2. Apex Industries, Inc.
3. Ceco Door Products; an Assa Abloy Group company.
4. Commercial Door & Hardware Inc.
5. Concept Frames, Inc.
6. Curries Company; an Assa Abloy Group company.
7. Republic Doors and Frames.
8. Steelcraft; an Ingersoll-Rand company.

B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

2.2 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.

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: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core at manufacturer's discretion.
   f. Core: Polystyrene.

3. Frames:
   a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A40 coating.
   b. Construction: Full profile welded.


2.3 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. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
3. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.
4. 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.

B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch, and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.

2.4 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.

2.5 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.
   3. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets.
   4. Bottom Edge Closures: Close bottom edges of doors where required for attachment of weather stripping with end closures or channels of same material as face sheets.
   5. 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.
   6. 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. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
2. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
3. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
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. Compression Type: Not less than two anchors in each frame.
   c. 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. Head Anchors: Two anchors per head for frames more than 42 inches wide and mounted in metal-stud partitions.
6. 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.
7. Terminated Stops: Terminate stops 6 inches above finish floor with a 90-degree angle cut, and close open end of stop with steel sheet closure. Cover opening in extension of frame with welded-steel filler plate, with welds ground smooth and flush with frame.

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 nontemplated, 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.

2.6 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.

B. Factory Finish: Clean, pretreat, and apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat, complying with SDI A250.3.

1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 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.

3.2 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.

3.3 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. 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.
b. Install frames with removable stops located on secure side of opening.
c. Install door silencers in frames before grouting.
d. Remove temporary braces necessary for installation only after frames have been properly set and secured.
e. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
f. Field apply bituminous coating to backs of frames that will be filled with grout containing antifreezing agents.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
   a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.

3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.

4. Concrete Walls: Solidly fill space between frames and concrete with mineral-fiber insulation.

5. 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.

6. 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 Jams 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.

3.4 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. Factory-Finish Touchup: Clean abraded areas and repair with same material used for factory finish according to manufacturer's written instructions.

F. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 081113
SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes:

1. Mechanical door hardware for the following:
   a. Swinging doors.

2. Cylinders for door hardware specified in other Sections.

B. Related Sections:

1. Section 081113 "Hollow Metal Doors and Frames.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Other Action Submittals:

1. Door Hardware Schedule: Prepared by or under the supervision of Installer, detailing fabrication and assembly of door hardware, as well as installation procedures and diagrams. Coordinate final door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

   a. Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate the fabrication of other work that is critical in Project construction schedule.

   b. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule." Double space entries, and number and date each page.

   c. Content: Include the following information:

      1) Identification number, location, hand, fire rating, size, and material of each door and frame.
2) Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
3) Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
4) Fastenings and other pertinent information.
5) Explanation of abbreviations, symbols, and codes contained in schedule.
6) Mounting locations for door hardware.
7) List of related door devices specified in other Sections for each door and frame.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.
B. Product Test Reports: For compliance with accessibility requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for door hardware on doors located in accessible routes.
C. Warranty: Special warranty specified in this Section.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of door hardware to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers and an Architectural Hardware Consultant who is available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.

1. Warehousing Facilities: In Project's vicinity.
2. Scheduling Responsibility: Preparation of door hardware and keying schedules.
3. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

B. Source Limitations: Obtain each type of door hardware from a single manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.
B. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.
C. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

D. Deliver keys and permanent cores to Owner by registered mail or overnight package service.

1.8 COORDINATION

A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.

B. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.

D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

E. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Structural failures including excessive deflection, cracking, or breakage.
   b. Faulty operation of doors and door hardware.
   c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.

2. Warranty Period: Three years from date of Substantial Completion, unless otherwise indicated.
   a. Exit Devices: Two years from date of Substantial Completion.
   b. Manual Closers: 10 years from date of Substantial Completion.

1.10 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.
B. Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door and door hardware operation. Provide parts and supplies that are the same as those used in the manufacture and installation of original products.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. Provide door hardware for each door as scheduled in Part 3 "Door Hardware Schedule" Article to comply with requirements in this Section.

1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturers' products.

B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Part 3 "Door Hardware Schedule" Article. Products are identified by using door hardware designations, as follows:

1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in Part 3 "Door Hardware Schedule" Article.

2.2 HINGES


D. Or Approved Equal.

2.3 MORTISE LOCKS

A. Arrow Lock and Door Hardware: www.arrowlock.com.


C. Yale Security, Inc.

D. Or Approved Equal.

2.4 CLOSERS

A. Arrow Lock and Door Hardware: www.arrowlock.com.
D. Or Approved Equal.

2.5 OVERHEAD HOLDERS
A. Assa Abloy Rixson or Sargent: www.assaabloydss.com.
D. Or Approved Equal.

2.6 MANUAL BOLTS
C. H. B. Ives
D. Or Approved Equal.

2.7 GASKETING
D. Or Approved Equal.

2.8 PROTECTION PLATES
C. Rockwood Manufacturing Company.
D. Or Approved Equal.
2.9 THRESHOLDS

A. Assa Abloy McKinney:  www.assaabloydss.com
B. Pemko Manufacturing. Co.
C. National Guard Products, Inc.
D. Or Approved Equal.

2.10 GENERAL REQUIREMENTS FOR DOOR HARDWARE PRODUCTS

A. Provide products that comply with the following:
   1. Applicable provisions of Federal, State, and local codes.
B. Finishes: Identified in schedule at end of section.

2.11 KEYING

A. Door Locks: Grand master keyed.
   1. Include construction keying and control keying with removable core cylinders.

B. Supply keys in the following quantities:
   1. 5 master keys.
   2. 5 construction keys.

2.12 FINISHES

A. Provide finishes complying with BHMA A156.18.
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.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.

B. Wood Doors: Comply with DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."

3.3 INSTALLATION

A. Mounting Heights: Mount door hardware units at heights to comply with the following unless otherwise indicated or required to comply with governing regulations.

2. Custom Steel Doors and Frames: HMMA 831.

B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing. Do not install surface-mounted items until finishes have been completed on substrates involved.

1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

C. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
D. Intermediate Offset Pivots: Where offset pivots are indicated, provide intermediate offset pivots in quantities indicated in door hardware schedule but not fewer than one intermediate offset pivot per door and one additional intermediate offset pivot for every 30 inches of door height greater than 90 inches.

E. Lock Cylinders: Install construction cores to secure building and areas during construction period.
   1. Replace construction cores with permanent cores as directed by Owner.
   2. Furnish permanent cores to Owner for installation.

F. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.

G. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Section 079200 "Joint Sealants."

H. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.

I. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

J. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

K. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.4 FIELD QUALITY CONTROL

A. Independent Architectural Hardware Consultant: Owner will engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.
   1. Independent Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
   1. Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 30 degrees.
   2. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
   3. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
B. Occupancy Adjustment: Approximately three months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.6 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items as necessary to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes.

3.8 DOOR HARDWARE SCHEDULE

A. Hardware Set:

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Item Description</th>
<th>Supplier</th>
<th>Model/Size/Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Hinges</td>
<td>McKinney</td>
<td>TA2314 4 ½ x 4 ½ NRP 32D</td>
</tr>
<tr>
<td>1</td>
<td>Lockset</td>
<td>Arrow</td>
<td>BM x 19 x NH 32D</td>
</tr>
<tr>
<td></td>
<td>(Active Leaf)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Mortise Cylinder</td>
<td>Arrow</td>
<td>C16-CR-27 with thumb turn 26D</td>
</tr>
<tr>
<td></td>
<td>(Active Leaf)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Closer</td>
<td>Arrow</td>
<td>900N Series Hold Open 689</td>
</tr>
<tr>
<td></td>
<td>(Active Leaf)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Astragal</td>
<td>McKinney</td>
<td>MCK356AV (Active Leaf)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Flush Bolts</td>
<td>McKinney</td>
<td>FB14 26D (Inactive Leaf)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Overhead Holder</td>
<td>Rixson</td>
<td>9 Series 26D (Inactive Leaf)</td>
</tr>
<tr>
<td></td>
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</tr>
<tr>
<td>1</td>
<td>Threshold</td>
<td>McKinney</td>
<td>MCK2005AT (Inactive Leaf)</td>
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</table>

Perimeter gasketing furnished by the frame supplier.

END OF SECTION 087100
SECTION 089119 - FIXED LOUVERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Fixed, extruded-aluminum louvers.
   2. Roof equipment screens.

1.2 DEFINITIONS

A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.

B. Horizontal Louver: Louver with horizontal blades (i.e., the axes of the blades are horizontal).

C. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.

B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.
   1. Show weep paths, gaskets, flashing, sealant, and other means of preventing water intrusion.

C. Samples: For each type of metal finish required.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed according to AMCA 500-L by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency, for each type of louver and showing compliance with performance requirements specified.
1.5 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 LOUVER MANUFACTURERS

A. Source Limitations:

1. Obtain louvers from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.
2. Obtain roof equipment screens from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

2.2 LOUVER PERFORMANCE REQUIREMENTS

A. Structural Performance: Louvers and equipment screens shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver-blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.

1. Wind Loads: Determine loads based on pressures as indicated on structural drawings.

B. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

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


2.3 FIXED, EXTRUDED-ALUMINUM LOUVERS

A. Horizontal, Drainable-Blade Louver:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Airolite Company, LLC (The).
   b. Carnes Company, Inc.
2. Louver Depth: 4 inches.
3. Frame and Blade Nominal Thickness: Not less than 0.080 inch.
4. Louver Performance Ratings:
   a. Free Area: Not less than 8.0 sq. ft. for 48-inch-wide by 48-inch-high louver.
   b. Point of Beginning Water Penetration: Not less than 870 fpm.
   c. Air Performance: Not more than 0.10-inch wg static pressure drop at 700-fpm free-area intake velocity.
5. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.4 LOUVER SCREENS

A. General: Provide screen at each exterior louver.
   1. Screen Location for Fixed Louvers: Interior face.
   2. Screening Type:
      a. Bird screening.
      b. Insect screening.

B. Secure screen frames to louver frames with stainless-steel machine screws, spaced a maximum of 6 inches from each corner and at 12 inches o.c.

C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.
   1. Metal: Same type and form of metal as indicated for louver to which screens are attached.
   2. Finish: Mill finish unless otherwise indicated.
   3. Type: Non-rewirable, U-shaped frames.

D. Louver Screening for Aluminum Louvers:
   1. Bird Screening: Aluminum, 1/2-inch-square mesh, 0.063-inch wire.
   2. Insect Screening: Aluminum, 18-by-16 mesh, 0.012-inch wire.

2.5 MATERIALS

A. Aluminum Extrusions: ASTM B 221, Alloy 6063-T5, T-52, or T6.

B. Fasteners: Use types and sizes to suit unit installation conditions.
   1. Use tamper-resistant screws for exposed fasteners unless otherwise indicated.
   2. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.
3. For color-finished louvers, use fasteners with heads that match color of louvers.

C. Postinstalled Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, made from stainless-steel components, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6 times the load imposed for masonry, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.6 FABRICATION

A. Factory assemble louvers and equipment screens.

B. Maintain equal blade spacings to produce uniform appearance.

C. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

1. Frame Type: Channel unless otherwise indicated.

D. Include supports, anchorages, and accessories required for complete assembly.

E. Provide subsills made of same material as louvers or extended sills for recessed louvers.

F. Join frame members to each other and to fixed blades with fillet welds concealed from view, threaded fasteners, or both, as standard with louver manufacturer unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

1. Equipment Screens: Join frame members to each other and to blades by welding.

2.7 ALUMINUM FINISHES

A. Finish louvers and equipment screens after assembly.

B. Anodic Finish as indicated on drawings: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.
3.2 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.

3.3 INSTALLATION

A. Locate and place louvers and equipment screens level, plumb, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide stainless steel or EPDM 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. Protect unpainted nonferrous-metal surfaces that are in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.

F. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Section 079200 "Joint Sealants" for sealants applied during louver installation.

3.4 ADJUSTING AND CLEANING

A. Clean exposed surfaces that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.

B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

C. Restore louvers and equipment screens damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, 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 089119
Division 09 - Finishes
SECTION 092216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

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

1.2 SUMMARY
   A. Section Includes:
      1. Non-load-bearing steel framing systems for interior gypsum board assemblies.

1.3 ACTION SUBMITTALS
   A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS
   A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.

2.2 FRAMING SYSTEMS
   A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
   B. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
      1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
   C. Studs and Runners: ASTM C 645. Use either steel studs and runners
      1. Steel Studs and Runners:
         a.
2.3 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.

1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754.

1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

C. Install bracing at terminations in assemblies.

D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.3 INSTALLING FRAMED ASSEMBLIES

A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

1. Single-Layer Application: 16 inches o.c. unless otherwise indicated.

B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

C. Install studs so flanges within framing system point in same direction.
D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.

E. Direct Furring:
   1. Screw to wood framing.
   2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

END OF SECTION 092216
SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Interior gypsum board.

B. Related Requirements:
   1. Section 092216 "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board panels.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.
PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. Low-Emitting Materials: For ceiling and wall assemblies, provide materials and construction identical to those tested in assembly and complying with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.2 GYPSUM BOARD, GENERAL

A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. Gypsum Wallboard: ASTM C 1396/C 1396M.

B. Gypsum Board, Type X: ASTM C 1396/C 1396M.

   1. Thickness: 5/8 inch.
   2. Long Edges: Tapered and featured for prefilling.

2.4 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

   1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
   2. Shapes:

      a. Cornerbead.

2.5 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

   1. Interior Gypsum Board: Paper.

C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
1. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping or drying-type, all-purpose compound.
   a. Use setting-type compound for installing paper-faced metal trim accessories.

2. Fill Coat: For second coat, use setting-type, sandable topping compound.

3. Finish Coat: For third coat, use setting-type, sandable topping compound.

2.6 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members or provide control joints to counteract wood shrinkage.

J. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

K. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:
1. Type X: Vertical and ceiling surfaces unless otherwise indicated.

B. Single-Layer Application:
1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
2. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
   a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
   b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.
3.4 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840.

3.5 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.

   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.

   2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900
SECTION 099600 - HIGH-PERFORMANCE COATINGS

PART 1 - GENERAL

1.1 SUMMARY
   A. Section includes surface preparation and application of high-performance coating systems on the following substrates:
      1. Substrates:
         a. Concrete, vertical and horizontal surfaces.
         b. Concrete masonry units (CMU).
         c. Steel.
         d. Galvanized metal.
         e. Aluminum (not anodized or otherwise coated).
         f. Wood.
         g. Gypsum Board

1.2 DEFINITIONS
   A. The term "paint" as used in this Section means coating system materials, including pretreatments, primers, emulsions, enamels, stain, sealers, fillers, and other applied materials whether used as prime, intermediate or finish coats.
   B. The term "exposed" as used in this Section means all exposed to view items not covered with concrete, masonry, wallboard or similar building material.

1.3 SYSTEM DESCRIPTION
   A. Design Requirements:
      1. Ensure surfaces are properly prepared, proper primer applied to correct mil thickness, and finish coat is compatible with primer coat and applied to correct mil thickness. This requirement applies to all equipment and material, whether the total process is done in the shop, in the field, or partially in shop and partially in field.
      2. Provide paint products supplied by one manufacturer unless otherwise approved by Engineer.

1.4 SUBMITTALS
   A. Product Data:
      1. Submit material manufacturer's technical information, including paint label analysis and application instructions for each material proposed.
a. Submit paint schedule in same format as indicated in this section. Include surface preparation with schedule. List each material and cross-reference to specific paint and finish system and application. Identify by manufacturer's catalog number and general classification.
b. Submit copies of manufacturer's complete color charts for each coating system. Owner to make color selections.
c. Provide certifications from manufacturers verifying that factory applied prime coats are compatible with specified finish coatings.

B. Quality Assurance/Control Submittals:

1. Applicator Qualifications: Submit qualifications as specified under Quality Assurance Article below.

C. Closeout Submittals:

1. Paint manufacturer's direct factory representative is to certify in writing to the Engineer, of the painting and coating compliance with the following:

a. Submit certificate stating Work was properly prepared and painted in accordance with Specifications and including the following
   1) Factory representative's initial site inspection of conditions pertinent to painting and surface preparation work with Contractor or his authorized painting representative.
   2) Factory representative's second site inspection at completion of painting and coating work to check proper application and actual mil thickness compliance with these Specifications.
   3) Submit manufacturer's certificate stating quantity of paint furnished was sufficient to properly coat all surfaces.

b. Certification issued to Engineer only following unacceptable painting and coating work being rectified to Engineer's satisfaction.

c. Make factory representative’s services available to the Engineer for immediate consultation in regard to the painting and coating work, and make above stated inspections in the Engineer's presence

2. Maintenance Manual: Upon completion of work, furnish copies of a detailed maintenance manual including following information:

a. Product name, number and technical data sheet.
b. Name, address and telephone number of manufacturer and local distributor.
c. Detailed procedures for routine maintenance and cleaning.
d. Detailed procedures for light repairs such as dents, scratches and staining.

1.5 QUALITY ASSURANCE

A. Applicator Qualifications:

1. Has successfully painted utility or industrial installations for at least five years. Submit name and experience record of painting applicator to Engineer. Include a list of at least
five utility or industrial installations painted within last five years, along with responsible officials, architects or engineers concerned with project, and the approximate contract price.

2. Painting applicators whose submissions indicate a lack of experience required to perform the work, or have performed work in an unsatisfactory manner, will not be approved.

B. Pre-Installation Meeting: Prior to any painting, arrange a meeting between a representative of the paint manufacturer, the Engineer, and the Contractor's personnel involved in painting. Purpose of meeting is to have paint manufacturer's representative address the following:

1. Define surface preparation requirements for the different items which are to receive paint.
2. Review which paint is used on which items and summarize application procedures.
3. Answer questions.

C. Field Samples:

1. One (1) room or area will be selected by Engineer to represent typical job surfaces and conditions. Blast clean, clean, paint and finish this room or area in accordance with the schedule and as specified. After finishes are accepted, this room or area will be used for comparison in evaluation of other blast cleaning, painting and finishing of a similar nature.

D. Regulatory Requirements

1. In accordance with VADEP requirements, provide coatings and associated components of water systems coming in contact with potable water conforming to NSF/ANSI Standard 61.

1.6 DELIVERY, STORAGE AND HANDLING

A. Delivery of Materials:

1. Deliver materials to job site in original, new, and unopened packages and containers bearing manufacturer's name and label with following information:
   a. Name or title of material.
   b. Manufacturer's stock number and date of manufacture.
   c. Manufacturer's name.
   d. Contents by volume, for major pigment and vehicle constituents.
   e. Thinning instructions where recommended.
   f. Application instructions.
   g. Color name and number.

B. Storage of Materials:

1. Store only acceptable project materials on project site.
2. Store in a suitable location approved by Engineer. Keep area clean and accessible.
3. Restrict storage to paint materials and related equipment.
4. Comply with health and fire regulations including the Occupational Safety and Health Act of 1970.
5. Keep temperature of storage area above 50 degrees F or manufacturer's recommended storage temperature, whichever is higher.

1.7 PROJECT CONDITIONS

A. Environmental Requirements:

1. Adhere to manufacturer's data on air and surface temperature limits and relative humidity during application and curing of coatings.
2. Do not spray apply paint when wind velocity is above 15 mph.
3. Schedule coating work to avoid dust and airborne contaminants.
4. Apply exterior finishes during daylight hours only.
5. When painting in confined spaces, or because of unfavorable ambient conditions, longer drying times will be necessary.
6. Provide supplementary ventilation such as fans and blowers in confined or enclosed areas to carry off solvents during evaporation stage.

B. Existing Conditions:

1. Broom clean area before painting is started. Remove dirt and dust.
   a. After painting operations begin, broom cleaning will not be allowed. Clean only with commercial vacuum cleaning equipment.

1.8 SCHEDULING

A. Coordinate the field painting work to coincide with the Construction Progress Schedule.

B. Schedule Repaint Work Surface Preparation operations specified herein so that the work to be installed over prepared surfaces will be installed after such surface preparation work is performed.

C. Schedule final paint coating applications to occur only after the other work to be performed on structure surfaces and equipment surfaces has been completed. However, primer coatings may be applied to repaint surfaces where the paint manufacturer's primer maximum recoat time period will not be exceeded by the scheduling.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Tnemec Co., Inc.

B. Carboline Company

C. Sherwin Williams.

D. MAB Paints, M. A. Bruder & Sons Inc.
2.2 Materials

A. Paint: Provide new and unused paint materials of the various types specified in the Paint Schedule at the end of this Section.

B. Provide primers produced by the same manufacturer as the finish coats.

C. Thinners: Use only thinners recommended by the paint manufacturer, and use only to recommended limits.

D. Colors and Finishes:

1. Provide surface treatments and finishes as specified in Painting Schedule at end of this Section.

2. Color Schedule: Except as specified herein, colors for painted surfaces will be selected by Owner after Contract is awarded.

3. Piping Band and Lettering Color Code: Colors for lettering and bands will be selected by the Owner after Contract is awarded.

4. Use representative colors when preparing samples for Engineer's review. Final acceptance of colors will be from samples applied on the job.

5. Color Pigments: Pure, nonfading, applicable types to suit substrates and service indicated.

   a. Lead: Do not exceed lead content amount permitted by federal, state and local government laws and regulations at time of paint application.

   b. Provide approvals by the governing health and safety codes for paints specified for application on submerged metal in contact with potable water.

E. Piping Markers:

1. Color code all pipelines and conduits. The exceptions are that flexible connectors, flexible tubing, stainless steel, uninsulated copper tubing, and valve operators and appurtenances are not painted.

2. Paint valves the same color as the pipeline. Exceptions are that brass, bronze, copper, stainless steel, PVC, valve operators, and any flexible portions of these valves are not to be painted.

3. Labels on pipelines are required, and should be the plastic wrap around type, or self-sticking type, which are commercially available as specified in Section 220553. Painting with stencils is as specified in Part 3.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions where painting work is to be performed. Notify Engineer in writing of conditions detrimental to proper and timely completion of Work. Do not proceed with Work until unsatisfactory conditions have been corrected in a manner acceptable to Engineer.
3.2 SURFACE PREPARATION

A. Perform all preparation and cleaning procedures as specified and in strict accordance with paint manufacturer’s instructions for each particular substrate and atmospheric condition.

B. Remove hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items not to be finish painted, or provide surface applied protection prior to surface preparation and painting operations. Following completion of painting of each space or area, reinstall removed items by workers skilled in the trades involved or remove applied protection, if applicable.

C. Clean sand, dirt, dust and all other foreign matter from surfaces to be painted before applying paint or surface treatments. Remove oil and grease with clean cloths and cleaning solvents prior to mechanical cleaning. Program cleaning and painting so that dust and other contaminants from cleaning process will not fall in wet, newly painted surfaces.

D. Prepare surfaces, which were not shop painted or were improperly shop painted or damaged, and all abraded or rusted surfaces, which are to be painted, as specified for the appropriate condition under this Section.

E. Apply prime coat to any prepared surface within 24 hours and before rust bloom develops.

F. Primed surfaces, exposed to sunlight for 60 days or more, must be scarified by lightly sanding or whip blasting to assure proper adhesion of final coat(s).

G. If there is a time period in excess of five (5) months from application of a shop or field primer coat to proposed date to apply the first field finished coat, first field finished coat will not be applied. Instead, blast clean primer completely off to obtain the SSPC-SP surface specified for particular application in Painting Systems. Then, reapply primer and finish paint as specified. Cost of removing primer by blast cleaning and reapplying primer will be at no expense to Owner.

H. Terminate shop prime coats on steel six inches from edges that are to be field welded.

I. Ferrous Metal:

1. Shop or Field Primed for Submerged or Intermittently Submerged in Liquid Service:
   a. Grind smooth to a rounded contour sharp edges and welds, and remove weld splatter.
   b. Except for insides of pipes, blast clean in accordance with SSPC SP 10 or pickle in accordance with SSPC SP 8 (if applicable and approved by the Engineer).
   c. After blast cleaning, remove dust and spent media from surface by brushing or vacuum cleaning.
   d. Apply prime coat before surface starts to rust or within 24-hours, whichever is earlier.
   e. Do not allow blast cleaned surface to stand overnight before coating.

2. Not Shop Primed and Non-Submerged:
a. Grind smooth to a rounded contour sharp edges and welds, and remove weld splatter.
b. Blast clean in accordance with SSPC SP 6.
c. After blast cleaning, remove dust and spent sand from surface by brushing or vacuum cleaning.
d. Apply prime coat before surface starts to rust or within 24-hours, whichever is earlier.
e. Do not allow blast cleaned surface to stand overnight before coating.

3. Shop Primed:
   a. Immediately before paint application, clean sand, dust, mud, dirt and other foreign matter from shop coat.
   b. Touch-up damaged or destroyed shop paint.
   c. Surface preparation of surfaces to be touched-up must be as effective as those specified for shop painting.

J. Galvanized Metal Including Pipes and Conduits:
   1. Solvent clean in accordance with SSPC SP 1 all surfaces free of oil and contaminants with a non-petroleum based solvent recommended by the coating manufacturer.
   2. Remove white rust by hand, power tool cleaning or power washing in accordance with SSPC SP 2 or SSPC SP 3. Pretreat with conditioner recommended by manufacturer.
   3. Allow to dry before application of paint.

K. Copper Pipe:
   1. Solvent clean with steel wool in accordance with SSPC SP 1.
   2. Pretreat with conditioner recommended by manufacturer.
   3. Allow to dry before application of paint.

L. Shop Bituminous Coated Pipe:
   1. Hand tool clean in accordance with SSPC SP 2.
   2. Wipe or brush clean.
   3. Recoat with compatible bituminous coating.

M. Polyvinyl Chloride Pipe:
   1. Lightly sand off sheen and clean.
   2. Remove dust and sand by wiping with a dry cloth.

N. Concrete:
   1. Remove oil, grease, dirt, etc. by steam cleaning or scrubbing with a strong commercial type detergent and flushed with water.
   2. Remove fins, projections, and abrupt irregularities, including those under 1/8-inch, by grinding so unnoticeable transitions are achieved.
   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.
O. Masonry, Cast Stone and Precast Concrete
   1. Clean out cracks, loose mortar, chips, indentations and open pores.
   2. Patch with mortar all depressions.
   3. Perform work only on cured, dry and dust free masonry surfaces.
   4. Apply surfercer recommended by paint manufacturer in accordance with manufacturer's procedures.

P. Wood:
   1. Surfaces must be dry and sanded to a smooth, even finish and wiped clean of dust.
   2. Seal knots with two (2) coats of shellac.
   3. Fill nail holes and other defects with wood filler similar to DAP No. 33 after prime coat has dried. Use color matched putty to fill holes and defects on clear finished wood.

Q. Pipe and Equipment Insulation:
   1. Clean free of dirt, dust, oil, grease, or other foreign matter as recommended by the coating manufacturer for substrate and application required.
   2. Do not cut or damage the insulation in any way.

R. High Temperature Surfaces: New Emergency Generator Exhaust and Support Work (Both in Shop Preparation and Field Preparation)
   1. Remove rust by power tool cleaning or power washing in accordance with SSPC SP 3.

3.3 MATERIALS PREPARATION

A. Mix and prepare painting materials in strict accordance with manufacturer's directions.

B. Do not mix coating materials produced by different manufacturers.

C. Store materials not in actual use in tightly covered containers. Maintain containers used in storage, mixing, and application of paint in a clean condition, free of foreign materials and residue.

D. Stir all materials before application to produce a mixture of uniform density, and as required during application of materials. Do not stir any film which may form on surface into material. Remove film and, if necessary, strain material before using.

E. If material has thickened or must be diluted for application, buildup coating to same film thickness achieved with undiluted material. Do not use thinner to extend coverage of paint.

F. Paint all exposed surfaces, except where natural finish of material is specifically noted as a surface not to be painted. See Part 3, Paint Schedule, for painting requirements.

G. Where items or surfaces are not specifically mentioned, paint these the same as adjacent similar materials or areas.

H. Do not paint the following:
1. Stainless steel, chromium plate, anodized aluminum and similar finished materials.
2. Aluminum, except where in contact with dissimilar materials.
3. Fiberglass items such as tanks, and troughs.
4. Prefinished Items.
   a. Unless otherwise shown or specified, factory finishing such as baked-on factory porcelain, polyvinylfluoride or other similar finish is specified for such items as, but not limited to, mechanical and electrical equipment such as instruments, light fixtures and distribution cabinets. Touch up factory finished items with paint supplied by the item manufacturer. As directed by Engineer, field paint damaged prefinished items or return them to the factory for repair and repainting.
   b. Return to the factory, any prefinished item not having the specified type of paint or proper mil thickness for painting or have additional coats applied in the field.
5. Concealed Surfaces:
6. Unless otherwise shown or specified, nonmetallic wall or ceiling surfaces in concealed from view areas and generally inaccessible areas, such as pipe spaces, duct shafts, and above acoustical and plaster ceilings, do not require field painting as applicable to this Project.
   a. Ducts, conduits and other materials with corrosion-resistant surfaces, not a paint, which are above finished ceilings, do not require field painting.
   b. Structural and miscellaneous metals covered or concealed with an acoustical ceiling, plaster ceiling, fireproof insulation, concrete, masonry, or similar material will receive a primer, shop or field, compatible with the covering material before they are covered.
   c. Field painting is not required for pipe and conduits in concealed from view areas, unless they are non-galvanized ferrous metal. Paint non-galvanized ferrous pipe and conduit in accordance with Painting Schedule. Label for identification all concealed from view pipe and conduits.

I. Operating Parts and Labels
1. Moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sensing devices, motor and fan shafts do not require finish painting unless otherwise specified.
2. Do not paint over any code-required labels, such as UL and Factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates.
3. Remove all paint, coating or splatter inadvertently placed on these surfaces.

J. Review installation procedures under other Sections and coordinate the installation of items that must be field painted in this Section.

K. Provide finish coats, which are compatible with the prime paints used. Review other Sections of these Specifications in which prime paints are to be provided to ensure compatibility of the total coatings system for the various substrates. Contractor responsible for the compatibility of all shop primed and field painted items in this Contract. Furnish information on the characteristics of the finish materials proposed to use, to ensure that compatible prime coats are used. As directed by the Engineer, provide barrier coats over incompatible primers or remove and reprime. Notify the Engineer in writing of anticipated problems using the coating systems.
as specified with substrates primed by others. This requirement does not apply to fully factory finished items. This is items having both primer and finish coatings except as specified in Painting Factory Finished Items paragraph.

L. Painting Factory-Finished Items: Equipment, such as motors, pumps and similar items, which when installed become an integral part of a system and which may be delivered fully factory-finished (that is, having finish coatings in addition to the prime coating) will not require repainting in the field unless the factory-finish is damaged. The Engineer will be the sole judge as to whether the items are to be touched-up or totally repainted.

1. When repainting factory-finished items perform the necessary surface preparation to profile the existing coating, apply a proper barrier coating if necessary, and then repaint the item in the finish system Scheduled for its installed location.

2. Factory finished building structure components, both exterior and interior and fully factory finished general construction products, appliances and panels will not require field painting. If the factory-finish is damaged, touch-up in accordance with each product manufacturer's recommendations.

3. Process equipment, including motors, pumps, controls, etc. as mounted thereon, furnished from the factory in a primer paint finish only will require field finishing in the proper finish versus location requirements as specified under the PAINT SCHEDULE. Where the process equipment manufacturer will furnish the equipment in a customer specific finish, comply with the proper finish versus location requirements as specified under the PAINT SCHEDULE.

M. Tinting:

1. Tint undercoats to match color of finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat. Provide code number that identifies material tinted by manufacturer.

N. Protection: Protect those surfaces not being painted both during and after the painting work, and protect adjacent work and materials from accidental drops, splashes over-spray, etc., using impervious material coverings.

1. Clean up and perform the remedial work necessary to restore surfaces damaged by misplaced paint and coatings.

2. Provide in-place protection for fully factory finished construction products, appliances, including lighting fixtures, fire detection systems, sprinkler heads, and prefinished building panels.

3. Provide DUST-TIGHT in-place protective coverings (masking where possible) to seal openings in items such as motors, controls, bearings and similar areas which may be damaged internally by the inclusion of debris and dust created by surface preparation operations.

3.4 APPLICATION

A. Strictly follow paint manufacturer's label instructions for proper application, spreading rate and drying time.
B. Apply paint by brush, roller, air spray, or airless spray in accordance with manufacturer's directions, and recommendations of Paint Application Specifications No. 1 in SSPC Vol. 2, where applicable. Use brushes best suited for type of material being applied. Use rollers of carpet, velvet back, or high pile sheep’s wool as recommended by paint manufacturer for material and texture required. Do not use rollers having nap exceeding 3/8-inch.

1. Apply by brush to newly welded seams.
2. Apply prime coats by roller, brush, or spray.

C. Apply paints only when temperature of surfaces to be painted and surrounding air temperatures are between 50 and 95 degrees F, and will remain in this range during curing, unless otherwise permitted by paint manufacturer's printed instructions.

D. Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or to damp or wet surfaces.

E. Painting may be continued during inclement weather only if areas and surfaces to be painted are enclosed and heated within temperature limits specified by paint manufacturer during application and drying periods.

F. Provide adequate illumination and ventilation in areas where painting operations are in progress.

G. No substitutions will be considered that decrease film thickness, number of coats, surface preparation or generic type of coating specified. Furnish same color selection of substituted manufacturers as manufacturers specified, including accent colors in coating systems.

H. Maintain number of coats and minimum paint film thickness per coat required regardless of application method. Do not apply succeeding coats until previous coat has completely dried or the minimum time recommended by manufacturer elapsed, whichever is longer.

I. Apply additional coats when undercoats, stains, or other conditions show through the final coat of paint, and until paint film is of uniform finish, color and appearance. This requirement is of particular importance regarding intense primary accent colors. Ensure surfaces, including edges, corners, crevices, welds, and exposed fasteners receive a film thickness equivalent to that of flat surfaces.

J. Color code all pipelines and conduits. The exceptions are that flexible connectors, flexible tubing, stainless steel, uninsulated copper tubing, and valve operators and appurtenances are not painted.

1. Paint valves the same color as the pipeline. Exceptions are that brass, bronze, copper, stainless steel, PVC, valve operators, and any flexible portions of these pumps or valves are not be painted.
2. Surfaces not exposed to view do not require color coding and in some cases do not require painting. See Materials Preparation paragraph.

K. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint as specified, before final installation of equipment.

1. Paint backs of access panels, and removable or hinged covers to match exposed surfaces.
2. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces, unless otherwise specified.

3. Do not apply paint over sealants and caulking compounds until integral solvents have been released from compound. Conform to sealant and caulking manufacturer's recommendations.

4. Paint existing structural steel to match new structural steel.

5. Spray painting of sound-absorbing concrete masonry units containing sound insulation material is prohibited. This requirement prevents insulation material from being sprayed, resulting in a consequent loss of sound attenuation effectiveness. Apply paint on sound-absorbing masonry by rolling or brushing.

6. Sprayed Finishes: Spray paint finish doors, frames and windows, where required. Brush or roller finishes will not be acceptable.

7. Install piping markers only after painting and finish work is completed.

L. Minimum Coating Thickness: Apply each material at not less than the manufacturer's recommended spreading rate, and provide total dry film thickness as specified. In no case allow area coverage per gallon to exceed manufacturer's recommendations. Apply extra coat at no additional expense to obtain specified total dry film thickness.

M. Scheduling Painting:

1. Apply first-coat material to surfaces that have been cleaned, pretreated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

   a. Apply primers before rust bloom forms but in no case allow cleaned steel to be exposed for more than 24-hours.

2. Allow sufficient time between successive coatings to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and application of another coat of paint does not cause lifting or loss of adhesion of undercoat. In no case apply an additional coat until manufacturer's minimum recommended drying time between coats has elapsed.

N. Prime Coats: Recoat primed and sealed walls and ceilings where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects caused by insufficient sealing.

O. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance, and coverage.

P. Brush Application:

1. Brush-out and work all brush coats onto surfaces in an even film. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections are not acceptable. Neatly draw all glass and color break lines.

2. Brush apply all primer or first coats, unless otherwise permitted to use mechanical applicators.

Q. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not in compliance with specified requirements as required by Engineer.
R. Placing Into Service: Do not place painted items into service until paints and coatings are fully cured (dry-hard).

3.5 REPAIR/RESTORATION

A. Assume complete responsibility for quality of repaint work insofar as proper surface preparation will affect finished appearance. Quality of finishes is subject to Engineer's approval or rejection. Recoat work as a result of rejection will be at no expense to Owner.

B. Prepare previously painted surface where rust, powdering, scaling, peeling or flaking is present by wirebrushing, scraping, sanding and blast cleaning to solid material. Sand solid edges smooth.

C. Prepare hard, glossy, repaint surfaces for paint adhesion by sandpapering, followed by surface washing and rinsing. When a de-glosser is used, washing and rinsing may be eliminated.

D. To avoid rust showing from nails' heads in repaint wood surfaces, countersink nails and fill holes, together with all other crevices, with wood filler similar to DAP 33 after priming coat has dried. Lightly sand wood filler to a smooth surface. Coat knots and sappy spots with shellac before painting.

E. Just prior to application of paint or coatings, re-paint surfaces must be dry, clean and free of loose dirt, dust and grit.

F. At completion of work of other trades, touch up and restore damaged or defaced painted surfaces as determined by Engineer.

G. Patch test unknown old coatings for compatibility.

3.6 FIELD QUALITY CONTROL

A. Engineer reserves right to invoke following material testing procedure at any time, and any number of times during the period of field painting:

1. Engage the service of an independent testing laboratory to sample any paint being used. Samples of materials delivered to Project site will be taken, identified and sealed, and certified in presence of Contractor.

2. Have independent testing laboratory perform appropriate tests for any or all of following characteristics: abrasion resistance, apparent reflectivity, flexibility, washability, absorption, accelerated weathering, dry opacity, accelerated yellowness, recoating, skinning, color retention, alkali resistance, quantitative materials analysis, and compatibility of coatings.

3. If test results show that material being used does not comply with specified requirements, a directive may be made, at no expense to Owner, to stop painting work and remove noncomplying paint; pay for testing; repaint surfaces coated with rejected paint; remove rejected paint from previously painted surfaces if, upon repainting with specified paint, the two (2) coatings are noncompatible.
B. Notify Engineer after completion of each coat of paint. After inspection, checking of film thickness, and approval by Engineer, proceed with succeeding coat. Supply Engineer for his use a Gardner dry-film thickness gage.

C. During application of painting, have manufacturer's representative check dry mil thickness of each coating and certify to Engineer in writing that thickness is in compliance with Specifications. If deficiencies in dry mil thickness of any coat is found, correct by application of an additional coat(s) to deficient area at no additional expense. Manufacturer's representative is also to certify that all surfaces were properly cleaned prior to application of paint, specified meetings and inspections were made; quantity of paint was applied in accordance with their recommendations, and all other requirements stated in this Section were satisfactorily completed.

3.7 CLEANING

A. During progress of Work, remove from site all discarded paint materials, rubbish, cans and rags at end of each work day.

B. Upon completion of painting work, clean window glass and other paint-spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.

C. Remove paint from existing structures, road surfaces, piping and other facilities, which were not to be painted.

3.8 PROTECTION

A. Protect work of other trades against damage caused by painting and finishing work. Correct damages by cleaning, removing paint splatter, repairing or replacing, and repainting, as acceptable to Engineer.

B. Provide "Wet Paint" signs as required to protect newly painted finishes. Remove temporary protective wrappings provided after completion of painting operations.

C. Protect painted surfaces from damage. Touch up and restore damaged or defaced painted surfaces as determined by Engineer.

3.9 PAINT SCHEDULE

A. General Requirements: The Engineer will select the proper painting systems from the Paint Schedule for such surfaces, items, apparatus, materials and equipment, which are not specifically named in the Schedule, but requiring paint according to the Engineer's direction in the field. The Owner will make final color selections. The anachronism ‘dft’ stands for dry film thickness.

B. Concrete:

1. All interior exposed cast in place concrete walls.
a. Prime Coat: Apply a single coat of Tnemec N69 or N69F to dft of 4.0 - 6.0 mils.
b. Finish Coat: Apply a single coat of Tnemec N69 or N69F to dft of 4.0 - 6.0 mils.

2. Interior concrete walls in contact with water on one side and exposed to an occupied room or area on the other side.

a. Prime Coat: Apply a single coat of Tnemec N140 to dft of 4.0-6.0 mils.
b. Coatings must be NSF61 approved.
c. Finish Coat: Apply a single coat of Tnemec N140 to dft of 4.0-6.0 mils.

d. Coatings must be NSF61 approved.

d. Apply coatings to water bearing walls on side in contact with water only.

3. Concrete floors and walls in chemical containment areas: See Section 09967 - Chemical-Resistant Coatings.

C. Masonry:

1. All interior exposed masonry wall surfaces.

a. Filler Coat: Apply a single coat of Tnemec 54-562 at 75-90 square feet per gallon.
b. Prime Coat: Apply a single coat of Tnemec N69 or N69F to dft of 3.0-4.0 mils.
c. Finish Coat: Apply a single coat of Tnemec N69 or N69F to dft of 3.0-4.0 mils.

D. Cast stone and masonry:

1. Cast stone and masonry surfaces exposed to chemical gas permeation (inside chimney).

a. Filler Coat: Apply a single coat of Tnemec Mortarclad Series 218 at 1/16-inch to 1/4-inch per lift; maximum 1/2-inch thickness.
b. Finish Coat: Apply two coats of Tnemec Perma-Shield MCU Series 446 to dft of 5.0-10.0 mils per coat.

E. Interior, Non-Insulated, Non-Submerged Metal:

1. All exposed ferrous metals inside structure including, but not necessarily limited to, mechanical equipment; pumps; motors; piping; valves; fittings; supports; hangers; exposed structural steel; gratings; stairs; windows; doors; and exposed electrical conduit and HVAC ducts located on walls and ceilings.

a. Shop Prime Coat: Apply a single coat of Tnemec N69 or N69F to dft of 3.0 – 5.0 mils.
b. Field Prime Coat: Apply a single coat of Tnemec N69 or N69F to dft of 3.0 – 4.0 mils.
c. Finish Coat: Apply single coat of Tnemec N69 or N69F to dft of 3.0 – 4.0 mils.

2. Provide galvanized metal to receive one (1) coat of Great Lakes Clean N’Etch or approved equal pretreatment prior to the application of the primer and finish coats. Copper tubing and other non-ferrous metals to receive one (1) coat of Great Lakes Clean N’Etch or approved equal product, prior to being cleaned with steel wool and the...
application of the primer and finish coats. Include applying the Great Lakes Clean N’Etch with wash treatment and wiping it off in accordance with the manufacturer's instructions. Apply the primer within 24 hours after the wash treatment.

3. Interior Equipment:

   a. Equipment and Apparatus not Exposed to Liquid, having Operating Temperature of 200 F, and Furnished Prime Painted:
      1) Spot Prime: Use same primer as applied in factory.
      2) Finish Coat: Apply two coats of Tnemec Series 28 at dft of 2.0 to 3.0 mils each coat.

F. Exterior, Non-Submerged Metal:

   1. All exposed ferrous metals outside structure including, but not necessarily limited to, doors; and exposed valve operators.
      a. Shop Prime Coat: Apply a single coat of Tnemec N69 or N69F to dft of 3.0 – 5.0 mils
      b. Field Prime Coat: Apply a single coat of Tnemec N69 or N69F to dft of 3.0 – 4.0 mils
      c. Intermediate Coat: Apply single coat of Tnemec N69 or N69F to dft of 3.0 – 4.0 mils

   2. Finish Coat: Apply single coat of Tnemec 1075 to dft of 2.0 – 3.0 mils
   3. Provide galvanized metal to receive one (1) coat of Great Lakes Clean N’Etch or approved equal pretreatment prior to the application of the primer and finish coats. Copper tubing and other non-ferrous metals to receive one (1) coat of Great Lakes Clean N’Etch or approved equal product, prior to being cleaned with steel wool and the application of the primer and finish coats. Include applying the Great Lakes Clean N’Etch with wash treatment and wiping it off in accordance with the manufacturer's instructions. Apply the primer within 24 hours after the wash treatment.

G. Concealed Structural Steel:

   1. Shop Prime Coat: Apply a single coat of Tnemec 37H-77 to dft of 1.5 – 2.0 mils
   2. Field Prime Coat: Apply two coats of Tnemec 46-465 to dft of 6.0 – 8.0 mils per coat
   3. The contact surface of the dissimilar metal may be given two brush coats of N69 or N69F primer instead of the two (2) coats of coal-tar.

H. Aluminum (Contact Surface):

   1. Aluminum surfaces in contact with concrete, masonry, or dissimilar metals. All exposed aluminum surfaces are not to be painted.
      a. Prime Coat: Apply two coats of Tnemec 46-465 to dft of 3.0 – 4.0 mils
      b. The contact surface of the dissimilar metal may be given two brush coats of N69 or N69F primer instead of the two (2) coats of coal-tar.

I. Copper Pipe:
1. Apply two coats of McCloskey’s Man-O-War Marine Spar Varnish at dft of 2.0 – 3.0 mils
2. Copper tubing and other non-ferrous metals to receive one (1) coat of Great Lakes Clean N’Etch or approved equal product, prior to being cleaned with steel wool and the application of the primer and finish coats. Include applying the Great Lakes Clean N’Etch with wash treatment and wiping it off in accordance with the manufacturer’s instructions. Apply the primer within 24 hours after the wash treatment.

J. Submerged Metal:

1. All submerged ferrous metal including piping and mechanical equipment, including, but not limited to, pipe, and valves.
   a. Shop Prime Coat: Apply a single coat of Tnemec Series 1 to dft of 2.5 – 3.5 mils
   b. Field Touch-Up Prime Coat: Field touch-up prime coat all damaged or missed shop coat areas. Prepare and coat these areas per the shop coat requirements. Apply a single coat of Tnemec Series 1 to dft of 2.5 – 3.5 mils
   c. Finish Coat: Apply two coats of Tnemec N140 to dft of 4.0 – 6.0 mils per coat
   d. Coatings must be NSF61 approved

2. All submerged ferrous metal including piping and mechanical equipment, including, but not limited to, pipe, and valves.
   a. Shop Prime Coat: Apply a single coat of Tnemec N69 or N69F to dft of 3.0 – 5.0 mils
   b. Field Prime Coat: Apply a single coat of Tnemec N69 or N69F to dft of 3.0 – 5.0 mils
   c. Finish Coat: Apply a single coat of Tnemec N69 or N69F to dft of 8.0 – 10.0 mils

3. New Treatment Process Apparatus Moving Parts (i.e., chains, sprockets, open gears, and similar items):
   a. Prime Coat: Apply single coat of Tnemec Series N69 High-Solids Epoxy at dft of 3.0 to 5.0 mils.
   b. Following coating full cure apply a coating of Texaco Brand or equal Automotive type grease.

K. Insulated Piping and Equipment:

1. Non-galvanized ferrous metal piping including, but not limited to, pipe, fittings, and valves (Valve Operators are per interior non-submerged.)
   a. Apply two coats of Tnemec 46-465 to dft of 8.0 - 12.0 mils per coat

2. Insulation material: Latex paint system approved by insulation manufacturer.

L. Buried Metals:

1. Outside surface of all ferrous metals embedded in earth, excluding pipe, fittings, and valves.
a. Apply two coats of Tnemec 46-465 to dft of 8 mils minimum per coat

M. Outside Surface of Buried Piping, Fittings and Valves:
   1. Ductile iron pipe and fittings: Apply asphaltic coating in accordance with ANSI/AWWA C151 to dft of 1 mil minimum per coat.
   2. Valves: Apply epoxy coating in accordance with ANSI/AWWA C550

N. Inside Surface of All Piping, Valves and Meters (unless specified otherwise for a particular type of pipe, valve or meter):
   1. All ferrous pipe and fittings whether it is or is not cement lined: Apply asphaltic coating in accordance with ANSI/AWWA C104 to dft of 1 mil minimum per coat.
   2. Valves and meters: Apply epoxy coating in accordance with ANSI/AWWA C550
   3. Coatings must be NSF61 approved.

O. Polyvinyl Chloride (PVC) Pipe:
   1. Apply single coat of Tnemec N69 or N69F to dft of 2.0 to 3.0 mils

P. Wood (Interior):
   1. Prime Coat: Apply single coat of Tnemec 151 to dft of 1.0 to 1.5 mils
   2. Finish Coat: Apply two coats of Tnemec 28 or 29 to dft of 2.0 to 3.0 mils per coat.

Q. High Temperature Surfaces:
   1. New Emergency Generator Exhaust and Support Work
      a. Apply two coats of Tnemec 39-1261 at dft of 0.7 to 1.5 mils per coat.

R. Finish Coat Piping Color Table:

<table>
<thead>
<tr>
<th>PIPING COLOR SCHEDULE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potable Water - Cold</td>
</tr>
<tr>
<td>Potable Water - Hot</td>
</tr>
<tr>
<td>Suction Piping</td>
</tr>
<tr>
<td>Discharge Piping</td>
</tr>
</tbody>
</table>

S. Finish Coat Equipment Color Table:

<table>
<thead>
<tr>
<th>EQUIPMENT COLOR SCHEDULE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valve Hand Wheel and T Wrenches</td>
</tr>
</tbody>
</table>
T. Architectural Finishes

1. Doors, door frames, shutters and other surfaces designated by the Owner:
   
   a. Sherwin Williams “Griffin”, # SW 7026

END OF SECTION 099600
SECTION 099670 - CHEMICAL RESISTANT COATINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Workmanship, materials and quality requirements for wet well lining work. Provide and apply resinous (epoxy) lining system as specified and as indicated on drawings. System consists of base coat and topcoat.

B. Related Work Specified Elsewhere:

1. Section 03300 - Cast-in-Place Concrete

1.2 QUALITY ASSURANCE

A. Applicator Qualifications: Applicator shall submit evidence of acceptability as a qualified applicator by the products Manufacturer. Include such evidence in submittals.

1. The Contractor is responsible for the workmanship and quality of the lining system work. Inspections by the Engineer, Owner or Inspector shall not relieve the Contractor from Liability to perform the work in accordance with the contract documents.

2. If any requirements of this specification are contradicted by a referenced standard, the more stringent requirement shall apply.

3. The Contractor shall perform the lining system work so that the lining system is installed as specified herein. The Contractor shall inspect his work continually to ensure that the lining system is installed as specified herein. The Inspector will inspect the work for conformance with the contract documents. Any nonconforming work, as determined by the Owner, shall be corrected by the Contractor as specified herein at no cost to the Owner.

4. The Contractor shall be responsible for obtaining the services of a qualified and authorized technical representative, approved by the Manufacturer of the protective lining system. The technical representative shall continuously provide field inspection and instruction to the Contractor during all the installation of the protective lining system to insure that the work, including but not limited to, the surface preparation and application procedures, is performed in accordance with the Manufacturer’s recommendations

B. Reference Standards:

1. American Society for Testing and Materials:


b. ASTM D 3960, Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings.

c. ASTM D 4259, Practice for Abrading Concrete.

2. National Association of Corrosion Engineers:
   a. NACE Publication TPC2, Coatings and Linings for Immersion Service: Chapter 1 Safety, Chapter Surface Preparation, Chapter 3 Curing, and Chapter 4 Inspection.
   b. NACE RP0892-2 Standard Recommended Practice, Lining over Concrete in Immersion Service.
   c. NACE RP0288-88 Standard Recommended Practice, Inspection of Linings on Steel and Concrete.
   d. NACE Publication 6D-173, A Manual for Painter Safety
   e. NACE Publication 6G-164, Surface Preparation Abrasives for Industrial Maintenance Painting.
   f. NACE Publication 6F-163, Surface Preparation of Steel or Concrete Tank Interiors.
   g. NACE RP0188, Standard Recommended Practice, Discontinuity (Holiday) Testing of Protective Coatings.

3. International Concrete Restoration Institute
   a. Guideline No. 03732 Selecting and Specifying Concrete Surface preparation for Sealers, coatings, and Polymer Overlays.

4. The Society for Protective Coatings
   a. SSPC-SP12, Surface Preparation and Cleaning of steel and other Hard Materials by High and Ultrahigh Pressure Water jetting Prior to Recoating.
   b. SSPC-SP13, Surface Preparation of Concrete.
   c. SSPC-PA-3, A Guide to Safety in Paint Application
   d. SSPC-Guide 12, Guide for Illumination of Industrial Painting Project.

5. American National Standards Institute

1.3 SUBMITTALS

A. Samples: Include in submission an individual sample of lining materials presented in the Product Data submission.

B. Product Data:
   1. Manufacturer's current printed recommendations and product data sheets for all coating system products supplied under this section including performance criteria, surface preparation and applications, volatile organic compound (VOC) data, and safety requirements.
   2. Material Safety Data Sheets (MSDS) for any materials brought on-site including all lining system materials, solvents, and abrasive blast media.
3. Storage requirements including temperature, humidity, and ventilation for lining system materials.

4. Manufacturer's requirements, including application procedures for lining materials, shall be in writing and shall be followed in detail. All safety precautions recommended by the Manufacturer shall be strictly adhered to at all times when work is in progress.

5. Submit applicator’s certification that lining materials comply with Federal, State, and Local regulations for VOC (Volatile Organic Compounds).

6. Submit daily reports that contain the following information: substrate conditions, ambient conditions, application procedures, work completed and location thereof. Mark-up drawings that show location of work.

7. Submit letter(s) with associated product data signed by Manufacturer certifying that submitted products are suitable for application on the surfaces to be lined and for the service conditions.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

Materials shall be stored in accordance with Manufacturer's recommendations in enclosed structures and shall be protected from weather and adverse temperature conditions. Flammable materials shall be stored in accordance with state and local codes. Materials exceeding storage life recommended by the Manufacturer shall be removed from the site.

A. Store all materials only in area or areas designated by the Engineer solely for this purpose. Confine mixing, thinning, clean-up and associated operations, and storage of materials-related debris before authorized disposal, to these areas. All materials are to be stored on pallets or similar storage/handling skids off the ground in sheltered areas in which the temperature is maintained between 50°F and 90°F.

B. Mix all lining materials in an enclosed mixing area designated by the Engineer. This enclosed area must protect the mixing operation and materials from direct sunlight, inclement weather, freezing, or other means of damage or contamination. Protect all other concrete and metallic surfaces and finishes from any spillage of material(s) within the mixing area.

C. Do not use floor drains, dikes or storm drains for disposal of lining system materials.

D. The Contractor shall take all precautions and implement all measures necessary to avert potential hazards associated with the lining system materials as described on the pertinent Material Safety Data Sheets or container labels.

E. Deliver all materials to the jobsite in their original, unopened containers. Each container shall bear the Manufacturer's name and label.

1. Labels on all material containers must show the following information:

   a. Name or title of product.
   b. Federal Specification Number if applicable.
   c. Manufacturer's batch number and date of manufacture.
   d. Manufacturer's name.
   e. Generic type of material.
   f. Application and mixing instructions.
   g. Hazardous material identification label.
2. All containers shall be clearly marked indicating any personnel safety hazards associated with the use of or exposure to the materials.
3. All materials shall be handled and stored to prevent damage or loss of label.
4. Lining material storage and mixing areas shall be designated by the Engineer.
5. Do not use or retain contaminated, outdated, prematurely opened, diluted materials, or materials which have exceeded their shelf life.

PART 2 - PRODUCTS

2.1 MATERIALS

A. EPOXY LINING SYSTEM

1. Materials specified herein are the only approved standard coating systems unless an "or equal" is approved in writing by the Engineer in accordance with this document.
2. The following list specifies the material requirements for lining systems. The approved products are as follows:
   a. Surfacer: MortarClad – Series 218
   b. Lining: Perma-Shield H2S – Series 434
   c. Topcoat/gelcoat: Perma-Glaze – Series 435

3. Performance Criteria: Material submitted shall meet the following performance criteria:

   Chemical Resistance

   Method: ASTM C 868 (Atlas Cell)
   System: Series 434 Perma-Shield H2S/Series 435 Perma-Glaze applied to SSPC-SP10 Near White Metal Blast Cleaned steel and cured 14 days at 75°F(24°C).
   Requirement: No blistering, cracking, erosion, softening, swelling, loss of adhesion or gloss loss after 98 days continuous immersion at 100°F (38°C) in 25% sulfuric acid.

   Method: Continuous Immersion at 75°F (24°C)
   System: Series 434 Perma-Shield/Series 435 Perma-Glaze applied to brush-off blast cleaned concrete and cured 14 days at 57°F (24°C).
   Requirement: No blistering, cracking, erosion, swelling or loss of adhesion after 6 months continuous immersion at 75°F (24°C) in 6% Sodium Hypochlorite or 1% Sodium Hydroxide.

Severe Accelerated Wastewater Test (EIS)
Method: H₂S Autoclave: 65°C, 536 ppm H₂S, 4000 ppm NaCl, 10% H₂SO₄

System: Series 434 Perma-Shield/Series 435 Perma-Glaze applied to NACE No.1/SSPC-SP5 White Blast cleaned steel and cured 30 days at 75°F (24°C).

Requirement: Initial impedance of 10 log Z (Z in ohms cm² @ 0.1 Hz.). No blistering, cracking, checking or loss of adhesion. Final electrical impedance of 9 Log Z (Z in ohms cm² @ 0.1 Hz.) after 28 days exposure.

2.2 ABRASIVE BLAST MEDIA

A. If dry or wet abrasive blast cleaning is the selected method of surface preparation, provide slag grit of a sieve size, gradation, and quality necessary to produce the degree of cleanliness and surface profile required herein (ICRI Guideline 03732, CSP-5 and SSPC-SP13/NACE No. 6).

PART 3 - EXECUTION

3.1 INSPECTION

A. Close inspection must be maintained throughout application of the system.

B. It is the responsibility of the Contractor to inspect and repair unacceptable concrete substrate surface conditions prior to the commencement of surface preparation activities. Unacceptable surface conditions are defined as the presence of cracked surfaces or concrete defects to a depth of greater than ¼” or otherwise being unable to withstand surface preparation as specified herein.

C. Inspection by the Engineer or others does not limit the Contractor's responsibilities for quality control inspection and testing as specified herein or as required by the Manufacturer's instructions.

D. Final Inspection: Perform a final inspection to determine whether the lining system work meets the requirements of the specifications. The Engineer and the Engineer’s representative will conduct final inspection with the Contractor.

3.2 PREPARATION

A. Concrete shall cure at least 28 days prior to surface preparation. Verify dryness by testing for moisture with a “plastic film tape-down test” (Reference ASTM D 4263). If necessary for testing horizontal surfaces, perform “Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride” (Reference ASTM F 1869). Moisture content not to exceed three pounds per 1,000 sq ft in a 24 hour period. Shot-blast or mechanically abrade to remove laitance, form release agents, curing compounds, sealers and other contaminants and to provide surface profile (Reference SSPCSP13/ NACE 6, ICRI CSP5 or greater). Large voids, bug holes and other cavities shall be filled with MortarClad – Series 218.
B. Surface Preparation:
   a. All specified surface preparation shall be performed in accordance with the latest version of the SSPC, NACE, ICRI and other standards referenced in this section.
   b. Where the coating is specified to be terminated, the Contractor shall prepare and apply materials as outlined in Tnemec Drawing TLS-02 (included at end of Section).
   c. For applications around penetrations and/or drains, the contractor shall prepare and apply coatings as detailed on Tnemec Drawing TLS-01 (included at end of Section).
   d. When the floor area is scheduled to receive a mortar application to pitch the floor, the walls above the floor shall be sawcut to a depth of 1/2 inch at a height from 0'-0" to 0'-6" above the floor. The cut shall be straight and level.
   e. The Contractor shall notify the Engineer should jobsite conditions prevent the above operations and/or applications.

3.3 APPLICATION

A. GENERAL:

1. Ensure straight, even termination of lining/topcoat materials on wall edges and flush with embedded steel.
2. The Contractor must follow the minimum and maximum recoat limitation times and related temperature range restrictions between successive lifts for all products specified herein per Manufacturer's stated requirements.
3. All equipment and procedures used for lining system application shall be as recommended by the Manufacturer.
4. Unless specified elsewhere herein, the Contractor shall comply with the Manufacturer's most recent written instructions with respect to the following:
   a. Mixing of All Materials.
   b. Protection and Handling of All Materials.
   c. Recoat Limitation and Cure Times.
   d. Minimum Ambient and Substrate Temperatures, Substrate's Degree of Dryness, Relative Humidity, and Dew Point of Air.
   e. Application.
   f. Final Curing.
   g. Use of Proper Application Equipment.
   h. Curing of Lining System:

5. The applied lining system shall be protected from damage during curing and shall be cured as recommended by the Manufacturer. Ambient conditions shall be controlled by the Contractor during curing to ensure the minimum air temperature and minimum relative humidity as required by the Manufacturer is maintained.

B. CHEMICAL RESISTANT LINING

1. General Note: The Contractor is advised that with all thick-film, quick curing materials applied to concrete surfaces, outgassing of the concrete may occur. Possible remedies include applying materials when the temperature of the concrete surfaces is descending, or applying a thin (1/16") layer of the specified surfacing material. Other remedies may exist, and may be submitted for the Engineer’s approval.
2. Fill all voids, bugholes and other surface imperfections with Tnemec Series 218 MortarClad. Apply a 1/16” layer over entire area to be coated.

3. Apply Tnemec Series 434 Perma-Shield H2S chemical resistant mortar to all floor areas, walls, slabs, ceilings, beams and appurtenances scheduled to be coated at a nominal thickness of 125 mils. Application shall be either by trowel or spray. If spray-applied, material shall be finish-troweled and finish-rolled (Reference Manufacturers application guides for explicit instructions).

4. Series 435 Perma-Glaze shall be a minimum of 15.0 mils thick upon cure regardless of the number of coats required.

3.4 ACCEPTANCE CRITERIA

A. ACCEPTANCE CRITERIA FOR SURFACE PREPARATION WORK:

B. All surfaces shall be prepared in accordance with the specification and referenced standards therein.

C. Acceptance Criteria for Coating System Application Work

1. Acceptable coating work will be based upon the following:

   a. No pock-marks, trowel marks, depressions, unconsolidated areas, waviness or ridges, pinholes or holidays in either size or frequency.
   
   b. No intercoat bond failures between lifts.
   
   c. Proper curing of coatings.

2. Floor areas (if any) areas shall pitch to drains.

3. There shall be no areas that puddle when flood tested.

4. The Engineer or Engineer's representative will, at their discretion, inspect the following:

   a. Profile and degree of cleanliness of substrate.
   
   b. Thickness of materials/coverage rate confirmation.
   
   c. Ambient temperature and humidity requirements and substrate temperature.
   
   d. Curing and recoat times.
   
   e. Proper curing of the lining materials.

5. Rework required on any holidays or any other inadequacies found by the Engineer or the Engineer's representative in the quality of the coating work shall be marked. Such areas shall be recleaned and reworked by the Contractor according to these specifications and the Manufacturer's recommendations at no additional cost to the Owner.

6. The Contractor is responsible for keeping the Engineer informed of all progress so that inspection for quality can be achieved.

7. The Contractor is ultimately responsible for the quality performance of the applied materials and workmanship. Inspections by the Engineer or the Engineer's representative do not limit this responsibility.

END OF SECTION 099670
Division 10 - Specialties
SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Washroom accessories.

1.2 ACTION SUBMITTALS
A. Product Data: For each type of product indicated. Include the following:
   1. Construction details and dimensions.
   2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
   3. Material and finish descriptions.
   4. Features that will be included for Project.
   5. Manufacturer's warranty.

1.3 QUALITY ASSURANCE
A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.

1.4 COORDINATION
A. Coordinate accessory locations with other work to prevent interference with clearances required and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
A. Products listed are made by American Specialties, Inc.; 441 Saw Mill River Road, Yonkers, NY 10701-9986; Telephone (914) 476-9000, Fax (914) 476-0688 www.americanspecialties.com.
B. Other Acceptable Manufacturers:

C. All items of each type to be made by the same manufacturer.

2.2 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.

1. Grind welded joints smooth.
2. Fabricate units made of metal sheet of seamless sheets, with flat surfaces

B. Stainless Steel Sheet: ASTM A 666, Type 304.

C. Fasteners, Screws, and Bolts: Hot dip galvanized, tamper-proof, security type.

D. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.3 FINISHES

A. Stainless Steel: No. 4 satin brushed finish, unless otherwise noted.

2.4 TOILET ROOM ACCESSORIES

A. Toilet Paper Dispenser: Double roll, surface mounted bracket type, stainless steel, spindleless type for tension spring delivery designed to prevent theft of tissue roll.

1. Product: Model 0030.

B. Paper Towel Dispenser: Folded paper type, stainless steel, semi-recessed, with viewing slots on sides as refill indicator and tumbler lock.

1. Capacity: 300 C-fold minimum.

C. Waste Receptacle: Stainless steel, freestanding style with swing top.

1. Liner: Removable, heavy-duty vinyl liner, attached at a minimum of 4 points with stainless steel grommets and hooks.
3. Product: Model 0810

D. Soap Dispenser: Liquid soap dispenser, wall-mounted, surface, with stainless steel cover and horizontal stainless steel tank and working parts; push type soap valve, check valve, and window gage refill indicator, tumbler lock.

1. Minimum Capacity: 40 ounces.
2. Product: Model 0343.
E. Mirrors: Stainless steel framed, 6 mm thick tempered glass mirror.
   1. Size: As indicated on the drawings.
   2. Frame: 0.375 inch channel shapes, with mitered and welded and ground corners, and tamperproof hanging system; No.4 finish.
   3. Backing: Full-mirror sized, minimum 0.03 inch galvanized steel sheet and non-absorptive filler material.

2.5 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION 102800
SECTION 104400 - CITY EMBLEM

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. The Contractor shall provide all labor, materials and equipment necessary to furnish and install one City Emblem as indicated on the drawings and as specified herein. This section includes the provision of a City of Norfolk emblem. The installation of the emblem is to be coordinated with other work in progress. A sample of the emblem is shown at the end of this section.

1.2 VERIFICATION OF CONDITIONS

A. Prior to proceeding with any work, the Contractor shall verify all graphics and pertinent dimensions and assume full responsibility for fitting the component to the structure.

B. The Contractor shall verify that the components will fit the building's structural dimensions and conform to the design dimensions without materially altering profiles and alignments.

1.3 SUBMITTALS

A. Submit the following:

B. Shop Drawings: Provide shop drawings for fabrication and erection of the City Emblem. Show layout, anchors and installation details.

   1. Provide setting drawings, templates and directions for installation of anchor to be installed.

C. Samples: Provide the following for final selection of color and for verification of compliance with requirements indicated.

   1. For final selection of color provide the manufacturer's color chart showing the full range of colors available.

   2. For verification of compliance with requirements indicated provide a sample panel not less than 8 inches by 10 inches. The panel shall show actual color, texture, finish and a representation of the graphics image process required.

PART 2 - PRODUCTS

2.1 SOLID POLYMER MATERIALS

A. Acceptable product: E.I. Du Pont de Nemours & Co., Inc. CORIAN.

C. Superficial damage to a depth of 0.10" (2.5 mm) shall be repairable by sanding or polishing.

D. Plaque: 3/4" (19 mm) thick CORIAN, square edge, laser engraved, raised copy. Color to be selected by Owner.

E. Finished components shall be true to line in the shapes indicated on the drawings, free of warps, twists, waves, or distortion. Components shall have a texture approved by the Owner.

2.2 DIMENSIONS

A. Diameter of seal shall be 1’- 6”.

B. Location shall be as shown on the contract drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Mount plaque using the standard method recommended by the manufacturer for the type of wall surface indicated.

1. Concealed Mounting: Mount the plaque by inserting thread bolts into brackets on the back of the plaque. Set in predrilled holes filled with quick setting cement.

B. Plaque is to be mounted 1/2" back from face brick, level, plumb, free from distortion or other defects in appearance.

3.2 CLEANING AND PROTECTION

A. At completion of the installation, clean the surface in accordance with the manufacturer's instructions. Protect City Emblem from damage until acceptance by Owner.

3.3 GUARANTEE

A. The component shall be guaranteed in writing against defects of materials and workmanship and to meet the specified requirements for a period of one (1) year from the date of the final acceptance of the entire project.
Division 11 – Equipment
SECTION 115000

ODOR CONTROL UNIT

1.0 GENERAL

2.02 SYSTEM DESCRIPTION

A. The work includes all labor, materials, equipment, appurtenances and services to provide complete Purafil odor control units, or approved equal, as shown or specified. The word “Provide” shall mean “Furnish and Install Complete and Ready for Use”. Note that this project has been designed around the Drum Scrubber as manufactured by Purafil, Inc. located in Doraville, Georgia. The work described in this specification includes but is not limited to the following:

1. Purafil Odor Control Unit, or approved equal

B. A Purafil Odor Control drum scrubber, model DS-300 design air flow rate of 300 cfm will be installed at Pump Station # 152 in the Bruce’s Park Neighborhood.

2.03 SUBMITTALS

A. Product Data: For each product indicated. Include the following:

1. Construction details and dimensions.
2. Anchoring and mounting requirements
3. Material and finish requirements
4. Manufacturer’s warranty

2.0 PRODUCTS

2.01 GENERAL

B. Drum Scrubber - (DS-300).

1. The DS-300 consists of dry-scrubbing media contained in a 150-gallon, linear, low density, polyethylene drum with a blower mounted on top of a fiberglass reinforced plastic (FRP) lid.

2. The DS-300 shall contain 7 ft³ (0.20 m³) of Odorcarb Ultra and 3 ft³ (0.08 m³) of Odormix SP media.

3. The DS-300 shall be designed to operate at 99.5+% hydrogen sulfide (H2S) removal efficiencies.

4. The configuration shall be arranged so that the contaminated air shall flow into the
bottom inlet plenum and be drawn upwards through the media bed. Treated air shall discharge out the top of the vessel through a centrifugal air ventilator.

5. Components of the DS-300 shall include but not to be limited to:
   a) 150-gallon, linear, low density, polyethylene drum and FRP lid
   b) 10 ft³ of dry-scrubbing media.
   c) Aluminum blower section with slide gate damper
   d) Fernco 8” Inlet
   e) PVC Media Sample Ports

6. The Drum shall have the following characteristics:
   a) Shall be linear, low density polyethylene, 1/4" (6.4 mm) in thickness.
   b) Have a capacity of 150 gallons and measure 31" (78.7 cm) in diameter and 48" (121.9 cm) in height.
   c) Latches shall be stainless steel and rubber.
   d) Fasteners shall be stainless steel.
   e) The drum shall contain 7 ft³ (0.20 m³) of Odorcarb Ultra, and 3 ft³ (0.08 m³) Odormix SP media as manufactured by Purafil, Inc.
   f) The drum shall be provided with two media sampling ports, each measuring one inch in diameter
   g) The media shall be supported by a high density polyethylene (HPDE) column surrounded by thermoplastic packing for air diffusion purposes.
   h) Polymedia filters shall be used to separate the packing from the Odorcarb Ultra media, and the blower from the Odormix SP media
   i) The inlet shall have a 8" (203.2 mm) FERNCO flexible coupling
   j) The drum shall have a 0.75" (19 mm) diameter drain pipe
   k) Provide hardware and brackets for mounting Drum scrubber to concrete pad.

7. Blower Section:
   a) The blower shall be sized to deliver a minimum of 290 cfm.
   b) The blower shall consist of a direct drive motor-fan assembly.
   c) The motor shall be a 1 hp, 3450 rpm, 230 volt, 1 phase, 60 Hz TEFC motor.
   d) The unit shall come pre-wired with a power cord.

C. Dry Scrubbing Media
   1. The Odorcarb Ultra Media shall consist of manufactured, generally spherical porous pellets. The pellets shall be formed from a combination of powdered activated carbon, alumina, and other binders with chemicals to enhance the capacity for removal of odorous gases. The pellets shall also chemically react to produce solid reaction products within the media. Reactive Components shall be applied during pellet formation to insure uniform distribution throughout the entire pellet volume.

   2. Odorcarb Ultra Media shall have the following physical properties:
      a) Moisture content: 35% maximum
b) Average crush strength: 35% minimum - 70% maximum  
c) Average abrasion: 4.5% maximum  
d) H₂S Removal Capacity: 0.30 g/cc minimum  
e) Nominal pellet diameter: 1/16" – 1/4" (1.6 mm – 6.4 mm)

3. Odorcarb Ultra Media shall be UL Class 2 listed.

4. Odorcarb Ultra Media shall be capable of absorbing and removing odorous gases throughout the entire pellet.

5. Purafil ESD’s Odormix™ SP Media shall consist of an equal mix (by volume) of Purafil ESD’s Odoroxidant™ SP Media and Odorkol™ Media. Odoroxidant™ SP Media shall be manufactured of generally spherical, porous pellets formed from a combination of powdered activated alumina and other binders, suitably impregnated with sodium permanganate to provide optimum adsorption, absorption and oxidation of a wide variety of gaseous contaminants. The sodium permanganate shall be applied during pellet formation, such that the impregnant is uniformly distributed throughout the pellet volume and is totally available for reaction. The Odorkol™ Media shall be a premium grade, activated carbon with a high surface area available for adsorption.

6. Odormix SP Media shall be UL Classified Class 1 with a bulk density of 40 lbs/ft³ (0.64 g/cc) +5% and have the following physical properties:

   a) Odoroxidant SP Media  
      i) Moisture content: 35% maximum  
      ii) Average crush strength: 35% minimum - 70% maximum  
      iii) Average abrasion: 4.5% maximum  
      iv) Bulk density: 50 lbs/ft³ (0.8 g/cc) +5%  
      v) Nominal pellet diameter: 1/16" – 1/4" (1.6 mm – 6.4 mm)  
      vi) Sodium permanganate content: 12% minimum

   b) Odorkol Media  
      i) Moisture content: 2%  
      ii) Carbon Tetrachloride Activity (CTC): 60% Minimum  
      iii) Base material: Activated Carbon  
      iv) Bulk density: 30 lbs/ft³ (0.48 g/cc) +5%  
      v) Pellet diameter: 4 mm

7. Media must be non-hazardous before and after it is spent.

8. Purafil media or approved equal will be accepted due to the high level of capacity.

9. Only UL certified media will be accepted in this LDPE vessel with companies that contain additional product liability on their systems. Companies lacking this liability and UL certification will not be accepted.

10. All media must have proof that is made and produced in the United States for additional verification of product performance.

11. The general contractor is responsible for all design cost changes, engineer review time, and testing verification for media not listed and previously approved.
2.02 ANALYTICAL SERVICES

A. Media Sampling and Analysis

1. The manufacturer shall, after start up, provide a service to periodically analyze media samples to predict the remaining service life of system media. Such service will be provided as needed at the manufacturer's expense for a period of at least ten (10) years. Purafil will provide all sampling bags and kits and it will be the City’s responsibility to sample this media at their discretion or based off a derived plan by Purafil.

2. Manufacturer or manufacturer’s representative shall provide a minimum of one (1) eight hour day for startup and training on all units.

2.03 MANUFACTURERS

Manufacturer shall be Purafil, Inc. or an approved equal.

2.04 WARRANTY

Equipment must be warranted for a period of no less than one (1) year from final completion date. Warranty shall include all hardware, motor, and blower. Warranty does not include media.

3.0 EXECUTION

3.01 MANUFACTURER’S RECOMMENDATIONS

A. Installation procedures shall be in accordance with the recommendations of the manufacturer of the equipment being furnished.

END OF SECTION
Division 14 – Conveying Equipment
SECTION 146000 - MONORAIL HOIST

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. The Contractor shall provide a new electric-motor powered chain hoist and manual trolley complete, tested and ready for operation.

1.2 GENERAL REQUIREMENTS

A. Equipment, materials, installation and workmanship shall be in accordance with the applicable provision of ANSI B30.11, Monorail Systems and Underhung Cranes, ANSIB30.16 Overhead Hoists, except as modified herein.

1.3 SUBMITTALS

A. Manufacturer's Data: Hoist and trolley assemblies

B. Certified Test Reports: Non-destructive test of hooks.

C. Wiring Diagrams

1.4 WELDING

A. Factory welding on hoist and trolley shall conform to AWS D14.1, Welding Industrial and Mill Cranes.

1.5 CLEARANCES

A. A minimum clearance of 2 inches shall be provided between the hoist and any lateral or overhead obstruction.

PART 2 - PRODUCTS

2.1 HOIST AND TROLLEY

A. Hoist and trolley shall be provided, designed and rated for load capacities specified herein. Trolley and wheels shall be suitable for operation on the steel beam provided, and shall have not less than four wheels. Trolley shall be a manual trolley; hoist shall be motorized and suspended from the trolley from at least two points or lugs. A festoon system shall be supplied along with hoist and trolley. Hoist shall be provided, meeting the requirements and having the accessories specified as follows.
B. Class 2
   1. Hoist manufactured from lightweight materials and provided complete with load chain containers.

C. Hoist, Trolley, Lift and Chains
   1. Capacity: 2 ton (4,000 pounds)
      Hook Lift Range: As indicated on drawings (measured from the lowest point of Pump Room to underside of trolley approx. 40’)
      Electric motor powered hoist with pendant controls at 4’-6” AFF
      Lifting Speed: 16 fpm (single speed)
      Power Supply: 230/460-3-60
      Trolley: Low head room manual trolley with rigid lug suspension for attaching hoist.
   2. Manufacturer:
      a. Columbus-McKinnon Lodestar Model L electric chain hoist with Series 635 low headroom trolley.
      b. Or Approved Equal

D. Load Hook and Hook Components
   1. Hook
      a. Forged steel, swivel type, complete with spring-loaded steel throat opening safety device.
   2. Disassembly
      a. Hooks and hook nuts shall be capable of complete disassembly that enables access to all surfaces of hook, including shank and hook nut for inspection purposes. Provisions shall be made for hook nut, or other hook-to-block fastener, to be keyed to hook shank by means of a set screw or similar, easily removable, securing device.
   3. Hook Non-Destructive Test
      a. Each hook, including shank and hook nut, shall be inspected over the entire surface areas by magnetic particle inspection. If hook nut is not used, any device that functions the same as the hook nut shall be inspected by magnetic particle inspection.
         1) Procedure: Magnetic particle inspection shall be conducted in accordance with ASTM A 275, "Magnetic Particle Examination of Steel Forgings". This inspection shall be conducted at the factory of the hook manufacturer or hoist manufacturer. Alternately, a recognized independent testing organization may conduct the inspection if equipped and competent to perform such a service, and if approved by the Engineer.
         2) Acceptance Criteria: Defects found on the hook or hook nut shall result in rejection of these items for use on furnished hoist. For this inspection, a defect is defined as a linear or nonlinear indication for which the largest
dimension is greater than 1/8 inch. Weld repairs or defects on hook or hook nut will not be permitted.

3) Test Report: A certified test report of the magnetic particle inspection of each hook and hook nut finished shall be submitted to and approved by the Engineer prior to final inspection of hoist installation.

b. An equivalent Quality Control procedure, in lieu of magnetic particle testing, may be used with the permission of the Engineer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install per manufacturer's written recommendations.

3.2 TEST

A. Upon completion and before final acceptance, the hoist and trolley system shall be tested. Verify that each component of the system operated as specified, is properly installed and adjusted, and is free from defects in material, manufacture, installation and workmanship.

3.3 NO CONSTRUCTION USE

A. The contractor shall not use the trolley hoist or any of its components during construction.

END OF SECTION 146000
SECTION 220513 - COMMON MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY
A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.2 COORDINATION
A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:
   1. Motor controllers.
   2. Torque, speed, and horsepower requirements of the load.
   3. Ratings and characteristics of supply circuit and required control sequence.
   4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS
A. Comply with NEMA MG 1 unless otherwise indicated.

2.2 MOTOR CHARACTERISTICS
A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.
B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS
A. Description: NEMA MG 1, Design B, medium induction motor.
B. Efficiency: Energy efficient, as defined in NEMA MG 1.
C. Service Factor: 1.15.
D. Multispeed Motors: Variable torque.
   1. For motors with 2:1 speed ratio, consequent pole, single winding.
   2. For motors with other than 2:1 speed ratio, separate winding for each speed.


F. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.

G. Temperature Rise: Match insulation rating.

H. Insulation: Class F.

I. Code Letter Designation:
   1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
   2. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.

J. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

B. Motors Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.
   1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
   2. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.
   3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
   4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

2.5 SINGLE-PHASE MOTORS

A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:
   1. Permanent-split capacitor.
   2. Split phase.
   3. Capacitor start, inductor run.
   4. Capacitor start, capacitor run.

B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.
C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

D. Motors 1/20 HP and Smaller: Shaded-pole type.

E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 220513
SECTION 220517 - SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Sleeves.
   2. Sleeve-seal systems.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

B. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

2.2 SLEEVE-SEAL SYSTEMS

A. Manufacturers: Pipeline Seal and Insulator, Inc. or equal.

B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.

   1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
   2. Pressure Plates: Composite.
   3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.
B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide the required annular clear space between piping and ID of pipe sleeve to provide a complete sealed system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves as indicated on drawings.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.3 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Piping Smaller Than 6” Galvanized-steel wall sleeves with sleeve-seal system, Galvanized-steel-pipe sleeves with sleeve-seal system.

2. Piping 6” and Larger: Galvanized-steel-pipe sleeves with sleeve-seal system.

   a. Select sleeve size to allow for annular clear space between piping and sleeve for installing sleeve-seal system. As per manufacturer’s recommendations.

END OF SECTION 220517
SECTION 220518 - ESCUTCHEONS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Escutcheons.
   2. Floor plates.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.

2.2 FLOOR PLATES

A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

   1. Escutcheons for New Piping:

      a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
      b. Chrome-Plated Piping: One-piece, cast-brass type with polished, chrome-plated finish.
      c. Insulated Piping: One-piece, stamped-steel type.
      d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.

f. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished, chrome-plated finish.

g. Bare Piping in Equipment Rooms: One-piece, cast-brass type with polished, chrome-plated finish.

C. Install floor plates for piping penetrations of equipment-room floors.

D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. New Piping: One-piece, floor-plate type.

3.2 FIELD QUALITY CONTROL

A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION 220518
SECTION 220523.12 - BALL VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY
   A. Section Includes:
      1. Brass ball valves.
      2. Bronze ball valves.

1.2 ACTION SUBMITTALS
   A. Product Data: For each type of valve.
      1. Certification that products comply with NSF 61 and NSF 372.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES
   A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
   B. ASME Compliance:
      1. ASME B1.20.1 for threads for threaded end valves.
      2. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
      4. ASME B31.9 for building services piping valves.
   C. NSF Compliance: NSF 61 and NSF 372 for valve materials for potable-water service.
   D. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.
   E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
   F. Valve Sizes: Same as upstream piping unless otherwise indicated.
   G. Valve Actuator Types:
      1. Gear Actuator: For quarter-turn valves NPS 4 and larger.
      2. Handlever: For quarter-turn valves smaller than NPS 4.
H. Valves in Insulated Piping:
   1. Include 2-inch stem extensions.
   2. Extended operating handles of nonthermal-conductive material and protective sleeves that allow operation of valves without breaking vapor seals or disturbing insulation.
   3. Memory stops that are fully adjustable after insulation is applied.
      a. Port: Regular.

2.2 BRONZE BALL VALVES

A. One-Piece, Bronze Ball Valves:
   1. Description:
      b. CWP Rating: 400 psig.
      c. Body Design: One piece.
      d. Body Material: Bronze.
      e. Ends: Threaded.
      f. Seats: PTFE.
      g. Stem: Bronze.
      h. Ball: Chrome-plated brass.
      i. Port: Reduced.

B. Two-Piece, Bronze Ball Valves with Full Port, and Bronze or Brass Trim:
   1. Description:
      b. CWP Rating: 600 psig.
      c. Body Design: Two piece.
      d. Body Material: Bronze.
      e. Ends: Threaded and soldered.
      f. Seats: PTFE.
      g. Stem: Bronze or brass.
      h. Ball: Chrome-plated brass.
      i. Port: Full.

C. Two-Piece, Bronze Ball Valves with Regular Port and Bronze or Brass Trim:
   1. Description:
      b. CWP Rating: 600 psig.
      c. Body Design: Two piece.
      d. Body Material: Bronze.
      e. Ends: Threaded.
      f. Seats: PTFE.
      g. Stem: Bronze or brass.
PART 3 - EXECUTION

3.1 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

3.2 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.

B. Select valves with the following end connections:

   1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
   2. For Steel Piping, NPS 2 and Smaller: Threaded ends.

3.3 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:

   1. Bronze Valves: July be provided with solder-joint ends instead of threaded ends.
   2. One piece, bronze ball valve with bronze trim.
   3. Two-piece, bronze ball valves with full port and bronze or brass trim.

END OF SECTION 220523.12
SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Metal pipe hangers and supports.
   2. Fastener systems.
   3. Equipment supports.

B. Related Sections:
   1. Section 055000 "Metal Fabrications" for structural-steel shapes and plates for hangers for pipe and equipment supports.

1.2 DEFINITIONS

A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

   1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
   2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following; include Product Data for components:

   1. Metal framing systems.
   2. Pipe stands.
   3. Equipment supports.
1.5 INFORMATIONAL SUBMITTALS
   A. Welding certificates.

1.6 QUALITY ASSURANCE
   A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
   B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS
   A. Carbon-Steel Pipe Hangers and Supports:
      1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
      2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
      3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
      4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
   B. Copper Pipe Hangers:
      1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.

2.2 FASTENER SYSTEMS
   A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
   B. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.3 PIPE POSITIONING SYSTEMS
   A. Description: IAPMO PS 42, positioning system of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.
2.4 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.5 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
   2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Fastener System Installation:
   1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
   2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

C. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.

D. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.


F. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

G. Install lateral bracing with pipe hangers and supports to prevent swaying.

H. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger.
and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

I. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

J. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

K. Insulated Piping:
   1. Attach clamps and spacers to piping.
      a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
      b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
      c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
   2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
   3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
   4. Shield Dimensions for Pipe: Not less than the following:
      a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.

3.2 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for equipment supports.

B. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 PAINTING

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

3.6 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.
C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
E. Use carbon-steel pipe hangers and supports and attachments for general service applications.
F. Use copper-plated pipe hangers and copper attachments for copper piping and tubing.
G. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
H. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.

I. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
10. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
11. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:

   a. Light (MSS Type 31): 750 lb.
   b. Medium (MSS Type 32): 1500 lb.

J. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

K. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

L. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION 220529
SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Equipment labels.
   2. Pipe labels.
   3. Valve tags.

1.2 ACTION SUBMITTALS
A. Product Data: For each type of product indicated.
B. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.
C. Valve numbering scheme.
D. Valve Schedules: For each piping system to include in maintenance manuals.

1.3 COORDINATION
A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
B. Coordinate installation of identifying devices with locations of access panels and doors.
C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS
A. Metal Labels for Equipment:
   1. Material and Thickness: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
   2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
   3. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering.
for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

2.2 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches high.

2.3 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.

1. Tag Material: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Fasteners: Brass beaded chain.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 25 feet along each run. Reduce intervals to 10 feet in areas of congested piping and equipment.

B. Pipe Label Color Schedule:

1. Domestic Water Piping:
   a. Background Color: Green.

2. Sanitary Waste Piping:
   a. Background Color: Green.
3.4 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience and lawn-watering hose connections; and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and with captions similar to those indicated in the following subparagraphs:

1. Valve-Tag Size and Shape:

2. Valve-Tag Color:
   b. Hot Water: Natural.

END OF SECTION 220553
SECTION 220716 - PLUMBING EQUIPMENT INSULATION

PART 1 - GENERAL

1.1 SUMMARY
A. Related Sections:
   1. Section 220719 "Plumbing Piping Insulation."

1.2 ACTION SUBMITTALS
A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory and field applied, if any).

1.3 QUALITY ASSURANCE
A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
   1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
   2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.4 DELIVERY, STORAGE, AND HANDLING
A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.5 COORDINATION
A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Norfolk Department of Utilities, Supplemental Specification, “Supports and Anchors”.
B. Coordinate clearance requirements with equipment Installer for equipment insulation application.
PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Products shall not contain asbestos, lead, mercury, or mercury compounds.

B. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

C. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Aeroflex USA, Inc.; Aerocel.
      b. Armacell LLC; AP Armaflex.
      c. K-Flex USA; Insul-Sheet and K-FLEX LS.

2.2 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Flexible Elastomeric Adhesive: Comply with MIL-A-24179A, Type II, Class I.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Aeroflex USA, Inc.; Aeroseal.
      b. Armacell LLC; Armaflex 520 Adhesive.
      d. K-Flex USA; R-373 Contact Adhesive.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
   1. Verify that systems and equipment to be insulated have been tested and are free of defects.
   2. Verify that surfaces to be insulated are clean and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.
3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Keep insulation materials dry during application and finishing.

F. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

G. Install insulation with least number of joints practical.

H. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
   1. Install insulation continuously through hangers and around anchor attachments.
   2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
   3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

I. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

J. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

K. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

L. For above ambient services, do not install insulation to the following:
   1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.

3.4 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.5 FINISHES

A. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect field-insulated equipment, randomly selected by Architect, by removing insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each type of equipment defined in the "Equipment Insulation Schedule" Article. For large equipment, remove only a portion adequate to determine compliance.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.7 EQUIPMENT INSULATION SCHEDULE

A. Insulation materials and thicknesses are identified below. If more than one material is listed for a type of equipment, selection from materials listed is Contractor's option.

B. Insulate indoor and outdoor equipment that is not factory insulated.

END OF SECTION 220716
SECTION 220719 - PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes insulating the following plumbing piping services:

1. Domestic cold-water piping.
2. Domestic hot-water piping.
3. Sanitary waste piping exposed to freezing conditions.
4. Supplies and drains for handicap-accessible lavatories and sinks.

B. Related Sections:

   1. Section 220716 "Plumbing Equipment Insulation."

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied, if any).

1.3 INFORMATIONAL SUBMITTALS

A. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and with requirements indicated. Include dates of tests and test methods employed.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

   1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

C. Comply with the following applicable standards and other requirements specified for miscellaneous components:

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.6 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Norfolk Department of Utilities, Supplemental Specification, “Supports and Anchors’.

B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and finishes and for space required for maintenance.

1.7 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing. Insulation application may begin on segments that have satisfactory test results.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Aeroflex USA, Inc.; Aerocel.
   b. Armacell LLC; AP Armaflex.
   c. K-Flex USA; Insul-Lock, Insul-Tube, and K-FLEX LS.
2.2 ADHESIVES

A. Materials shall be compatible with insulation materials, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Flexible Elastomeric Adhesive: Comply with MIL-A-24179A, Type II, Class I.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Aeroflex USA, Inc.; Aeroseal.
   b. Armacell LLC; Armaflex 520 Adhesive.
   d. K-Flex USA; R-373 Contact Adhesive.

2.3 FIELD-APPLIED JACKETS

A. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

1. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

2.4 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Engineered Brass Company.
   b. Insul-Tect Products Co.; a subsidiary of MVG Molded Products.
   c. McGuire Manufacturing.
   d. Plumberex.
   e. Truebro; a brand of IPS Corporation.
   f. Zurn Industries, LLC; Tubular Brass Plumbing Products Operation.

2. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

B. Protective Shielding Piping Enclosures:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Truebro; a brand of IPS Corporation.
   b. Zurn Industries, LLC; Tubular Brass Plumbing Products Operation.
2. Description: Manufactured plastic enclosure for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with ADA requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders and thicknesses required for each item of pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

F. Keep insulation materials dry during application and finishing.

G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

H. Install insulation with least number of joints practical.

I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.

3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

J. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

K. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

L. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

M. For above-ambient services, do not install insulation to the following:
   1. Vibration-control devices.
   2. Testing agency labels and stamps.
   3. Nameplates and data plates.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
   1. Seal penetrations with flashing sealant.
   2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.

B. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

C. Insulation Installation at Floor Penetrations:
   1. Pipe: Install insulation continuously through floor penetrations.

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.

2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.

3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.

4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.

5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.

6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.

7. Label the outside insulation of each union with the word "union." Match size and color of pipe labels.

3.6 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.7 FINISHES


B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

3.8 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, for each pipe service defined in the "Piping Insulation Schedule, General" Article.

D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.9 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.
2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.10 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Cold Water:

1. NPS 1 and Smaller: Insulation shall be the following:
a. Flexible Elastomeric: 1 inch thick.

B. Domestic Hot Water:

1. NPS 1 and Smaller: Insulation shall be the following:
   a. Flexible Elastomeric: 1 inch thick.

2. All Pipe Sizes: Insulation shall be the following:
   a. Flexible Elastomeric: 1 inch thick.

C. Exposed Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures for People with Disabilities:

1. All Pipe Sizes: Insulation shall be the following:
   a. Flexible Elastomeric: 1 inch thick.

END OF SECTION 220719
SECTION 221116 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Under-building-slab and aboveground domestic water pipes, tubes, and fittings inside buildings.
   2. Encasement for piping.

B. Related Requirements:
   1. Regional Construction Standards Section 801, “Water Distribution Systems”.

1.2 ACTION SUBMITTALS

A. Product Data: For transition fittings and dielectric fittings.

1.3 INFORMATIONAL SUBMITTALS

A. System purging and disinfecting activities report.

B. Field quality-control reports.

1.4 FIELD CONDITIONS

A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:
   1. Notify Construction Manager no fewer than two days in advance of proposed interruption of water service.
   2. Do not interrupt water service without Construction Manager's written permission.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

B. Potable-water piping and components shall comply with NSF 14 and NSF 61.
2.2 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.

B. Soft Copper Tube: ASTM B 88, Type K water tube, annealed temper.


D. Copper Unions:
   1. MSS SP-123.
   4. Solder-joint or threaded ends.

E. Copper-Tube, Extruded-Tee Connections:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

2.3 PIPING JOINING MATERIALS

A. Solder Filler Metals: ASTM B 32, lead-free alloys.

B. Flux: ASTM B 813, water flushable.

2.4 TRANSITION FITTINGS

A. General Requirements:
   1. Same size as pipes to be joined.
   2. Pressure rating at least equal to pipes to be joined.
   3. End connections compatible with pipes to be joined.

B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

2.5 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
c. Watts; a division of Watts Water Technologies, Inc.
d. Wilkins; a Zurn company.


PART 3 - EXECUTION

3.1 EARTHWORK
A. Comply with requirements in Section 312000 "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING INSTALLATION
A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."

C. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance. Comply with requirements for pressure gages in Norfolk Supplemental Specifications, "Pressure Gauges" and with requirements for drain valves and strainers in Section 221119 "Domestic Water Piping Specialties."

D. Install shutoff valve immediately upstream of each dielectric fitting.

E. Install domestic water piping level without pitch and plumb.

F. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

G. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

H. Install piping to permit valve servicing.

I. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.

J. Install piping free of sags and bends.

K. Install fittings for changes in direction and branch connections.
L. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

M. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

N. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

O. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Soldered Joints for Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."

D. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.4 TRANSITION FITTING INSTALLATION

A. Install transition couplings at joints of dissimilar piping.

B. Transition Fittings in Underground Domestic Water Piping:

1. Fittings for NPS 1-1/2 and Smaller: Fitting-type coupling.

3.5 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric unions.

3.6 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hanger, support products, and installation in Norfolk Department of Utilities, Supplemental Specification, “Supports and Anchors”.

B. Vertical Piping: MSS Type 8 or 42, clamps.

1. Individual, Straight, Horizontal Piping Runs:
a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.

C. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
   1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
   2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.

D. Install supports for vertical copper tubing every 10 feet.

E. Support piping and tubing not listed in this article according to MSS SP-58 and manufacturer's written instructions.

3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:
   1. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
   2. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.
   3. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection.

3.8 IDENTIFICATION

A. Identify system components. Comply with requirements for identification materials and installation in Section 220553 "Identification for Plumbing Piping and Equipment."

B. Label pressure piping with system operating pressure.

3.9 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
   1. Piping Inspections:
      a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.

2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.

c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.

d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

2. Piping Tests:

a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.

b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.

c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.

d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.

e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.

f. Prepare reports for tests and for corrective action required.

B. Domestic water piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.10 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.
4. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
5. Remove and clean strainer screens. Close drain valves and replace drain plugs.
6. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
7. Check plumbing specialties and verify proper settings, adjustments, and operation.
3.11 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
   a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
   b. Fill and isolate system according to either of the following:
      1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
      2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.
   c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
   d. Repeat procedures if biological examination shows contamination.
   e. Submit water samples in sterile bottles to authorities having jurisdiction.

B. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.

C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.12 PIPING SCHEDULE

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

3.13 VALVE SCHEDULE

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:


B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

END OF SECTION 221116
SECTION 221119 - DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Backflow preventers.
   2. Strainers.
   3. Hose bibbs.
   4. Drain valves.
   5. Water-hammer arresters.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

A. Potable-water piping and components shall comply with NSF 61.

2.2 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

2.3 BACKFLOW PREVENTERS

A. Reduced-Pressure-Principle Backflow Preventers:
2. Operation: Continuous-pressure applications.
3. Pressure Loss: 12 psig maximum, through middle third of flow range.
4. Size: 3/4 NPS.
5. Design Flow Rate: 10 gpm.
6. Selected Unit Flow Range Limits: 0 – 40 gpm.
7. Pressure Loss at Design Flow Rate: 12 psig for sizes NPS 2 and smaller.
10. Configuration: Designed for horizontal, straight-through flow.
11. Accessories:
   a. Valves NPS 2 and Smaller: Ball type with threaded ends on inlet and outlet.

2.4 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:
   1. Pressure Rating: 125 psig minimum unless otherwise indicated.
   2. Body: Bronze for NPS 2 and smaller.
   3. End Connections: Threaded for NPS 2 and smaller.
   4. Screen: Stainless steel with round perforations unless otherwise indicated.
   5. Perforation Size:
      a. Strainers NPS 2 and Smaller: 0.033 inch.

2.5 HOSE BIBBS

A. Hose Bibbs:
   5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
   8. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
   10. Finish for Finished Rooms: Chrome or nickel plated.
   14. Include operating key with each operating-key hose bibb.
   15. Include wall flange with each chrome- or nickel-plated hose bibb.
2.6 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves:

2. Pressure Rating: 400-psig minimum CWP.
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
8. Inlet: Threaded or solder joint.

2.7 WATER-HAMMER ARRESTERS

A. Water-Hammer Arresters:

2. Type: Metal bellows.
3. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.

1. Locate backflow preventers in same room as connected equipment or system.
2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe-to-floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are unacceptable for this application.
3. Do not install bypass piping around backflow preventers.

B. Install Y-pattern strainers for water on supply side of backflow preventer.

C. Install water-hammer arresters in water piping according to PDI-WH 201.

3.2 CONNECTIONS

A. Comply with requirements for ground equipment in Section 260526 "Grounding and Bonding for Electrical Systems."
3.3 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Test each reduced-pressure-principle backflow preventer according to authorities having jurisdiction and the device's reference standard.

B. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

END OF SECTION 221119
SECTION 221316 - SANITARY WASTE AND VENT PIPING

1.1 SUMMARY

A. Section Includes:
   1. Pipe, tube, and fittings.
   2. Specialty pipe fittings.
   3. Encasement for underground metal piping.

1.2 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For waste and vent piping, accessories, and components, from manufacturer.
   1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
   2. Detailed description of piping anchorage devices on which the certification is based and their installation requirements.

B. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

1.6 PROJECT CONDITIONS

A. Interruption of Existing Sanitary Waste Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Construction Manager no fewer than 5 days in advance of proposed interruption of sanitary waste service.
2. Do not proceed with interruption of sanitary waste service without Construction Manager's written permission.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISPI 301.

B. Sovent Stack Fittings: ASME B16.45 or ASSE 1043, hubless, cast-iron aerator and deaerator drainage fittings.

C. CISPI, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. ANACO-Husky.
   b. Fernco Inc.
   c. Mission Rubber Company; a division of MCP Industries, Inc.

3. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.3 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type L and Type M, water tube, drawn temper.

B. Soft Copper Tube: ASTM B 88, Type L, water tube, annealed temper.

C. Copper Pressure Fittings:

2. Copper Unions: MSS SP-123, copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

D. Solder: ASTM B 32, lead free with ASTM B 813, water-flushable flux.

2.4 PVC PIPE AND FITTINGS

A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.

B. Cellular-Core PVC Pipe: ASTM F 891, Schedule 40.

C. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.

D. Adhesive Primer: ASTM F 656.

1. Adhesive primer shall have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

E. Solvent Cement: ASTM D 2564.

1. PVC solvent cement shall have a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.5 SPECIALTY PIPE FITTINGS

A. Transition Couplings:

1. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.

2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

3. Unshielded, Nonpressure Transition Couplings:

   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

      1) Fernco Inc.
      2) Mission Rubber Company; a division of MCP Industries, Inc.
      3) Plastic Oddities; a division of Diverse Corporate Technologies, Inc.


   c. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.

   d. Sleeve Materials:

2) For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
3) For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

K. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

L. Install soil and waste drainage and vent piping at the following minimum slopes unless otherwise indicated:
1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
2. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

M. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
   1. Install encasement on underground piping according to ASTM A 674 or AWWA C105/A 21.5.

N. Install steel piping according to applicable plumbing code.

O. Install aboveground ABS piping according to ASTM D 2661.

P. Install aboveground PVC piping according to ASTM D 2665.

Q. Install underground PVC piping according to ASTM D 2321.

R. Install engineered soil and waste drainage and vent piping systems as follows:
   2. Sovent Drainage System: Comply with ASSE 1043 and sovent fitting manufacturer's written installation instructions.
   3. Reduced-Size Venting: Comply with standards of authorities having jurisdiction.

S. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

T. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

U. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

V. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.2 JOINT CONSTRUCTION

A. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.

B. Join copper tube and fittings with soldered joints according to ASTM B 828. Use ASTM B 813, water-flushable, lead-free flux and ASTM B 32, lead-free-alloy solder.

C. Plastic, Nonpressure-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 Appendixes.

### 3.3 VALVE INSTALLATION

#### A. General valve installation requirements are specified in Section 220523.12 "Ball Valves for Plumbing Piping."

#### B. Shutoff Valves:
1. Install full-port ball valve for piping NPS 2 and smaller.

### 3.4 HANGER AND SUPPORT INSTALLATION

#### A. Comply with requirements for pipe hanger and support devices and installation specified in Norfolk Department of Utilities, Supplemental Specification, “Supports and Anchors”.

#### B.
1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
2. Install fiberglass pipe hangers for horizontal piping in corrosive environments.
3. Vertical Piping: MSS Type 8 or Type 42, clamps.
4. Install individual, straight, horizontal piping runs:
   a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.

#### C. Support horizontal piping and tubing within 12 inches of each fitting, valve, and coupling.

#### D. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
2. NPS 3: 60 inches with 1/2-inch rod.
3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
4. Spacing for 10-foot lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.

#### E. Install supports for vertical stainless-steel piping every 10 feet.

#### F. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 1-1/4: 72 inches with 3/8-inch rod.
2. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
3. NPS 2-1/2: 108 inches with 1/2-inch rod.
4. NPS 3 and NPS 5: 10 feet with 1/2-inch rod.
5. NPS 6: 10 feet with 5/8-inch rod.
6. NPS 8: 10 feet with 3/4-inch rod.
G.  Install supports for vertical copper tubing every 10 feet.

H.  Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:

1.  NPS 4 and NPS 5: 48 inches with 5/8-inch rod.

I.  Support piping and tubing not listed above according to MSS SP-58 and manufacturer's written instructions.

3.5 CONNECTIONS

A.  Drawings indicate general arrangement of piping, fittings, and specialties.

B.  Connect drainage and vent piping to the following:

1.  Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
2.  Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
3.  Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
4.  Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
5.  Comply with requirements for cleanouts specified in Section 221319 "Sanitary Waste Piping Specialties."
6.  Equipment: Connect drainage piping as indicated. Provide shutoff valve if indicated and union for each connection. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

C.  Make connections according to the following unless otherwise indicated:

1.  Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.

3.6 IDENTIFICATION

A.  Identify exposed sanitary waste and vent piping. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.7 FIELD QUALITY CONTROL

A.  During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1.  Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.

2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.

3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping except outside leaders on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.

4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.

5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.

6. Prepare reports for tests and required corrective action.

3.8 CLEANING AND PROTECTION

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

D. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

3.9 PIPING SCHEDULE

A. Aboveground, soil and waste piping NPS 4 and smaller shall be the following:
1. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.

B. Aboveground, vent piping NPS 4 and smaller shall be the following:

1. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.

END OF SECTION 221316
SECTION 221429 - SUMP PUMPS

1.1 SUMMARY

A. Section Includes:
   1. Submersible sump pumps.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Wiring Diagrams: For power, signal, and control wiring.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For pumps and controls, to include in operation and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. UL Compliance: Comply with UL 778 for motor-operated water pumps.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Retain shipping flange protective covers and protective coatings during storage.

B. Protect bearings and couplings against damage.

C. Comply with pump manufacturer's written rigging instructions for handling.

PART 2 - PRODUCTS

2.1 SUBMERSIBLE SUMP PUMPS

A. Submersible, Fixed-Position, Single-Seal Sump Pumps:
   1. Acceptable Manufacturers:
a. Gould Pumps, Inc.
b. Model ST 51 AV.
c. Built-in Vertical Float Switch.
d. 40’ power cord.
e. Or approved equal.

2. Description: Factory-assembled and -tested sump-pump unit.
3. Pump Type: Submersible, end-suction, single-stage, close-coupled, overhung-impeller, centrifugal sump pump as defined in HI 1.1-1.2 and HI 1.3.
4. Pump Casing: Cast iron, with strainer inlet, legs that elevate pump to permit flow into impeller, and vertical discharge for piping connection.
5. Impeller: Statically and dynamically balanced, ASTM A 48/A 48M, Class No. 25 A cast iron, design for clear wastewater handling, and keyed and secured to shaft.
7. Seal: Mechanical.
8. Motor: Hermetically sealed, capacitor-start type; with built-in overload protection; lifting eye or lug; and three-conductor, waterproof power cable of length required and with grounding plug and cable-sealing assembly for connection at pump.

a. Motor Housing Fluid: Oil.

9. Controls:
   a. Enclosure: NEMA 250, Type 4X; wall-mounted.
   b. Switch Type: Mechanical-float type, in NEMA 250, Type 6 enclosures with mounting rod and electric cables.
   c. Automatic Alternator: Start pumps on successive cycles and start multiple pumps if one cannot handle load.
   d. High-Water Alarm: Rod-mounted, NEMA 250, Type 6 enclosure with mercury-float, pressure switch matching control and electric bell; 120-V ac, with transformer and contacts for remote alarm bell.

10. Control-Interface Features:
   b. Building Automation System Interface: Auxiliary contacts in pump controls for interface to building automation system and capable of providing the following:
      1) On-off status of pump.
      2) Alarm status.

11. Accessories
   b. 40’ power cord.

2.2 SUMP PUMP CAPACITIES AND CHARACTERISTICS

A. Number of Pumps: One.
B. Pump:

2. Total Dynamic Head: 20 feet.
3. Speed: 3500 rpm.
4. Discharge Size: 1 ½”.
5. Electrical Characteristics:
   d. Hertz: 60.

C. Unit Electrical Characteristics:

1. Full-Load Amperes: 7.5.

2.3 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 220513 "Common Motor Requirements for Plumbing Equipment."

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

B. Motors for submersible pumps shall be hermetically sealed.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for plumbing piping to verify actual locations of storm drainage piping connections before sump pump installation.

3.2 INSTALLATION

A. Pump Installation Standards: Comply with HI 1.4 for installation of sump pumps.

3.3 CONNECTIONS

A. Install piping adjacent to equipment to allow service and maintenance.
3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections.
   1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Tests and Inspections:
   1. Perform each visual and mechanical inspection.
   2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
   3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
   4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Pumps and controls will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

3.5 STARTUP SERVICE

A. Perform startup service.
   1. Complete installation and startup checks according to manufacturer's written instructions.

3.6 ADJUSTING

A. Adjust pumps to function smoothly, and lubricate as recommended by manufacturer.

B. Adjust control set points.

3.7 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain pumps.

END OF SECTION 221429
SECTION 223300 - ELECTRIC, DOMESTIC-WATER HEATERS

PART 1 - GENERAL

1.1 SUMMARY
   A. Section Includes:
      1. Thermostat-control, electric, tankless, domestic-water heaters.

1.2 ACTION SUBMITTALS
   A. Product Data: For each type and size of domestic-water heater indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
   B. Shop Drawings:
      1. Wiring Diagrams: For power, signal, and control wiring.

1.3 INFORMATIONAL SUBMITTALS
   A. Product Certificates: For each type of tankless, electric, domestic-water heater, from manufacturer.
   B. Domestic-Water Heater Labeling: Certified and labeled by testing agency acceptable to authorities having jurisdiction.
   C. Source quality-control reports.
   D. Field quality-control reports.
   E. Warranty: Sample of special warranty.

1.4 CLOSEOUT SUBMITTALS
   A. Operation and Maintenance Data: For electric, domestic-water heaters to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE
   A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   B. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1.
C. ASME Compliance: Where ASME-code construction is indicated, fabricate and label commercial, domestic-water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

D. NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61, "Drinking Water System Components - Health Effects."

1.6 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of electric, domestic-water heaters that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Faulty operation of controls.
   b. Deterioration of metals, metal finishes, and other materials beyond normal use.

2. Warranty Periods: From date of Substantial Completion.
   a. Electric, Tankless, Domestic-Water Heaters: Five year(s).

PART 2 - PRODUCTS

2.1 ELECTRIC, TANKLESS, DOMESTIC-WATER HEATERS

A. Thermostat-Control, Electric, Tankless, Domestic-Water Heaters:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   b. Chronomite Laboratories, Inc.
   c. E-Tankless Water Heaters Corp.
   d. Keltech, Inc.
   e. Niagara Industries, Inc.

2. Standard: UL 499 for electric, tankless, (domestic-water heater) heating appliance.

3. Construction: Copper piping or tubing complying with NSF 61 barrier materials for potable water, without storage capacity.
   b. Pressure Rating: 150 psig.
   c. Heating Element: Resistance heating system.
d. Temperature Control: Thermostat.
e. Safety Control: High-temperature-limit cutoff device or system.
f. Jacket: Aluminum or steel with enameled finish or plastic.

5. Capacity and Characteristics:
   a. Flow Rate: .5 at 48 deg F temperature rise.
   b. Temperature Setting: 110 deg F.
   c. Power Demand: 3.5 kw.
   d. Electrical Characteristics:
      1) Volts: 240.
      2) Phases: One.
      3) Hertz: 60.
      4) Maximum Overcurrent Protection: 15 amperes.

PART 3 - EXECUTION

3.1 DOMESTIC-WATER HEATER INSTALLATION

A. Electric, Tankless, Domestic-Water Heater Mounting: Install electric, tankless, domestic-water heaters at least 18 inches above floor on wall bracket.
   1. Maintain manufacturer's recommended clearances.
   2. Arrange units so controls and devices that require servicing are accessible.
   3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   4. Install anchor bolts to elevations required for proper attachment to supported equipment.
   5. Anchor domestic-water heaters to substrate.

B. Install electric, domestic-water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.
   1. Install shutoff valves on domestic-water-supply piping to domestic-water heaters and on domestic-hot-water outlet piping. Comply with requirements for shutoff valves.

3.2 CONNECTIONS

A. Comply with requirements for piping specified in Section 221116 "Domestic Water Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where installing piping adjacent to electric, domestic-water heaters, allow space for service and maintenance of water heaters. Arrange piping for easy removal of domestic-water heaters.
3.3 IDENTIFICATION

A. Identify system components. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Electric, domestic-water heaters will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.5 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain tankless, electric, domestic-water heaters.

END OF SECTION 223300
SECTION 224100 - RESIDENTIAL PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Faucets.
2. Lavatories.
3. Water closets.
4. Toilet seats.
5. Supply fittings.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for lavatories.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

1.3 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Faucet Cartridges and O-Rings: Equal to 100 percent of amount of each type and size installed.

PART 2 - PRODUCTS

2.1 LAVATORIES

A. Lavatories: Vitreous china.

1. Vitreous-China Lavatories: (Wall Hung)

   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

      1) American Standard America.
      2) Crane Plumbing, L.L.C.
2. Fixture:
   b. Rectangular Nominal Size: 20 by 18 inches.
   c. Faucet-Hole Punching: Three holes, 4-inch centers.


2.2 LAVATORY FAUCETS

A. NSF Standard: Comply with NSF/ANSI 61, "Drinking Water System Components - Health Effects," for faucet materials that will be in contact with potable water.

B. Lavatory Faucets: Single-control mixing valve.

1. General-Duty, Solid-Brass Faucets:
   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

2. General-Duty, Copper- or Brass-Underbody Faucets:
   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

      1) American Standard America.
      2) Briggs Plumbing Products, Inc.
      3) Delta Faucet Company.
      4) Eljer, Inc.
      5) Ferguson Enterprises, Inc.
      6) Gerber Plumbing Fixtures LLC.
      7) Wolverine Brass, Inc.

4. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture holes; coordinate outlet with spout and fixture receptor.
7. Maximum Flow Rate: .5 gpm.
9. Valve Handle(s): Lever.
10. Inlet(s): NPS 1/2 male shank.

2.3 WATER CLOSETS

A. Water Closets: Floor mounted, floor outlet, close coupled (gravity tank), vitreous china.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   b. Crane Plumbing, L.L.C.
   c. Eljer, Inc.
   d. Ferguson Enterprises, Inc.; ProFlo Brand.
   e. Gerber Plumbing Fixtures LLC.
   f. Mansfield Plumbing Products LLC.

2. Bowl:
   b. Bowl Type: Siphon jet.
   c. Height: Standard.
   d. Rim Contour: Elongated.
   e. Water Consumption: Water saving.

3. Supply Fittings:
   b. Supply Piping: Chrome-plated-brass pipe or chrome-plated-copper tube matching water-supply piping size. Include chrome-plated wall flange.
   c. Stop: Chrome-plated-brass, one-quarter-turn, ball-type or compression stop with inlet connection matching water-supply piping type and size.
      1) Operation: Loose key.
   d. Riser:
      1) Size: NPS 1/2.
      2) Material: Chrome-plated, soft-copper flexible tube riser.

2.4 TOILET SEATS

A. Toilet Seats:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
b. Bemis Manufacturing Company.
c. Church Seats.
d. Eljer, Inc.
e. Ferguson Enterprises, Inc.; ProFlo Brand.
f. Olsonite Seat Co.

4. Type: Commercial (Standard).
5. Shape: Elongated rim (Open front).
6. Configuration: Open front with cover.
7. Size: Elongated.
8. Hinge Type: Check.

2.5 SUPPLY FITTINGS

A. NSF Standard: Comply with NSF/ANSI 61, "Drinking Water System Components - Health Effects," for faucet materials that will be in contact with potable water.

B. Standard: ASME A112.18.1/CSA B125.1.

C. Lavatory Supply Fittings:
   1. Supply Piping: Chrome-plated-brass pipe or chrome-plated-copper tube matching water-supply piping size. Include chrome-plated wall flange.
   2. Stops: Chrome-plated-brass, one-quarter-turn, ball-type or compression stop with inlet connection matching water-supply piping type and size.
      a. Operation: Loose key.

3. Risers:
   a. Size: NPS 1/2 for lavatories.
   b. Material: Chrome-plated, soft-copper flexible tube riser.

2.6 WASTE FITTINGS

A. Standard: ASME A112.18.2/CSA B125.2.

B. Drain: Grid type with NPS 1-1/4 offset tailpiece for accessible lavatories.

C. Trap:
   1. Size: NPS 1-1/4 for lavatories.
   2. Material: Chrome-plated, and chrome-plated-brass or -steel wall flange.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine rough-in of water-supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before plumbing-fixture installation.

B. Examine walls, floors for suitable conditions where fixtures will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install plumbing fixtures level and plumb according to roughing-in drawings.

B. Install floor-mounted water closets on closet flange attachments to drainage piping.

C. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.

1. Exception: Use ball, valves if supply stops are not specified with fixture. Comply with valve requirements, specified in Section 220532.12 “Ball Valves for Plumbing Piping.”

D. Install tanks for accessible, tank-type water closets with lever handle mounted on wide side of compartment.

E. Install toilet seats on water closets.

F. Install faucet flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

G. Install traps on fixture outlets.

H. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories. Comply with requirements in Section 220719 "Plumbing Piping Insulation."

I. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."

J. Seal joints between plumbing fixtures, counters, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."
3.3 CONNECTIONS

A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

D. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories. Comply with requirements in Section 220719 "Plumbing Piping Insulation."

3.4 ADJUSTING

A. Operate and adjust plumbing fixtures and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

B. Adjust water pressure at faucets to produce proper flow.

3.5 CLEANING AND PROTECTION

A. After completing installation of plumbing fixtures, inspect and repair damaged finishes.

B. Clean plumbing fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.

C. Provide protective covering for installed plumbing fixtures and fittings.

D. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 224100
SECTION 226500 – KNIFE VALVE

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes provisions for pipe, valves and accessories for wastewater process piping to be furnished and installed under this Contract.

B. Valves and accessories for sanitary drain and vent service are specified in Division 22.

1.2 REFERENCES

A. American National Standards Institute
   2. ANSI B1.1, Unified Inch Screw Threads.
   3. ANSI B16.21, Nonmetallic Flat Gaskets for Pipe Flanges.
   4. ANSI B18.2.1 Square and Hex Bolts and Screws, Including Askew Head Bolts Hex Cap Screws, and Lag Screws.
   5. ANSI B18.2.2, Square and Hex Nuts

B. American Society for Testing and Materials:
   2. ASTM A 153, Specification for Zinc Coating (Hot-Dipped) on Iron and Steel Hardware.

1.3 SUBMITTALS

A. Shop Drawings and Product Data: Submit completely dimensioned shop drawings, catalog cuts or other data as required to provide a complete description of piping, valves, and accessories.

B. Certificates: Submit certified records or reports of the results of shop tests, such records or reports to contain a sworn statement the shop tests have been made as specified.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Transport, handle and store valves, pipe, fittings and other products in a manner recommended by the respective manufacturers to prevent damage and defects.
1.5 JOB CONDITIONS

A. Inspection:

1. All items of material furnished by the Contractor under this Section shall be inspected prior to installation.

PART 2 - PRODUCTS

2.1 VALVES

A. General:

1. Provide valves of the same type by same manufacturer; suitable for the intended service.
2. Markings shall be factory cast on the bonnet or body of each valve, indicating manufacturer's name or mark, year of valve casting, size of valve, directional flow arrow and designation of working water pressure.
3. Valve pressure-temperature ratings shall be of not less than the design criteria applicable to system components.
4. Valves shall open to the left (counterclockwise). Valves shall be operated by nut, hand-wheel, lever, floor-stand or otherwise as indicated on the Drawings. Operating nuts or wheels shall have cast thereon an arrow indicating the direction of opening.
5. Valve ends shall be as indicated on the Drawings and unless indicated otherwise shall conform to ANSI B16.1.

B. Knife Gate Valves

1. Knife Gate Valves shall be bonnetless, wafer-type gate valves, with a cast iron body. Port areas shall be 100% of the full pipe areas throughout the entire length. The valve shall meet MSS SP-81 face-to-face dimensions and ANSI B16.5 Class 150 drilling dimensions. Flush port(s) shall be located in the base of the valve, and shall be drilled, tapped and plugged.
2. Valve shall have two full-port elastomer cartridge seat halves that shall be supported and compressed between the flanges. The seat halves shall be steel reinforced molded rubber and shall act as wiper blades to clean the gate as it strokes. The seats shall provide bi-directional sealing. Elastomer material shall be EPDM.
3. Packing box shall be of the inverted type, compressed by a weir cast into the valve body. Three (3) layers of packing material shall be supplied as standard.
4. The gate shall be of sufficient thickness to prevent permanent deformation at 1.2 times the rated working pressure. The gate shall be ASTM A240 Type-316 Stainless Steel. The stem shall be ASTM A276 Type-304 Stainless Steel and shall have single pitch acme threads. The stem nut shall be acid-resistant bronze.
5. Valves shall be chain-wheel operator. The chain shall have a drop to where the bottom of the chain loop is 4 feet above the finish floor.
6. Acceptable Manufacturers:

a. Red Valve Co., Inc. of Carnegie, PA.
b. DeZurik
c. Or approved equal
PART 3 - EXECUTION

3.1 RESPONSIBILITY FOR MATERIAL

A. Carefully examine material for defects, and do not install material that is known to be defective.

B. Replace all material found defective in manufacture or damaged in transit or by handling at the Contractor's expense.

C. Remove all defective material from the job site.

3.2 HANDLING OF MATERIAL

A. Handling of Pipe and Fittings:

1. Handle pipe, fittings, valves, and appurtenances in accordance with AWWA C600. If damage or coating abrasion occurs and is deemed repairable, repair as directed by the Engineer, in accordance with manufacturer's recommendations. If damage is not repairable in the opinion of the Engineer, remove items from the project site and replace at no additional cost.

2. Keep valves drained and stored before installation in a manner that protects them from damage due to freezing of trapped water.

3.3 CLEANING PIPE AND FITTINGS

A. Clean and remove all foreign matter from each valve before placing. Should foreign material or contaminants be observed in previously installed pipe, cease work until foreign material or contaminated pipe is decontaminated or removed.

3.4 VALVE INSTALLATION

A. Examination of Material: Prior to installation, inspect valves for direction of opening, freedom of operation, tightness of bolting, cleanliness of valve ports and seating surfaces, handling damage and cracks. Correct all defects.

B. Following installation, demonstrate proper valve operation and adjust valves as required.

END OF SECTION 226500
SECTION 230513 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

1.1 SUMMARY

A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.2 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:
   1. Motor controllers.
   2. Torque, speed, and horsepower requirements of the load.
   3. Ratings and characteristics of supply circuit and required control sequence.
   4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

A. Comply with NEMA MG 1 unless otherwise indicated.

B. Comply with IEEE 841 for severe-duty motors.

2.2 MOTOR CHARACTERISTICS

A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: Energy efficient, as defined in NEMA MG 1.

C. Service Factor: 1.15.

D. Multispeed Motors: Variable torque.
1. For motors with 2:1 speed ratio, consequent pole, single winding.
2. For motors with other than 2:1 speed ratio, separate winding for each speed.

E. Multispeed Motors: Separate winding for each speed.

F. Rotor: Random-wound, squirrel cage.

G. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.

H. Temperature Rise: Match insulation rating.

I. Insulation: Class F.

J. Code Letter Designation:
   1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
   2. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.

K. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

B. Severe-Duty Motors: Comply with IEEE 841, with 1.15 minimum service factor.

2.5 SINGLE-PHASE MOTORS

A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:
   1. Permanent-split capacitor.
   2. Split phase.
   3. Capacitor start, inductor run.
   4. Capacitor start, capacitor run.

B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.

C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

D. Motors 1/20 HP and Smaller: Shaded-pole type.

E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.
PART 3 - EXECUTION (Not Applicable)

END OF SECTION 230513
SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Metal framing systems.
3. Fastener systems.
4. Equipment supports.

B. Related Sections:

1. Section 055000 "Metal Fabrications" for structural-steel shapes and plates for hangers for pipe and equipment supports.
2. Section 233116 "Nonmetal Ducts" for duct hangers and supports.

1.2 DEFINITIONS

A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Hangers and supports for HVAC equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following; include Product Data for components:

1. Metal framing systems.
2. Equipment supports.
1.5 INFORMATIONAL SUBMITTALS
   A. Welding certificates.

1.6 QUALITY ASSURANCE
   A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS
   A. Carbon-Steel Pipe Hangers and Supports:
      1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
      2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
      3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
      4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
   
   B. Stainless-Steel Pipe Hangers and Supports: (Wet Well)
      1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
      2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.

2.2 METAL FRAMING SYSTEMS
   A. MFMA Manufacturer Metal Framing Systems:
      1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
         a. Allied Tube & Conduit.
         b. Cooper B-Line, Inc.
         c. Flex-Strut Inc.
         d. GS Metals Corp.
         e. Thomas & Betts Corporation.
         f. Unistrut Corporation; Tyco International, Ltd.
         g. Wesanco, Inc.

      2. Description: Shop- or field-fabricated pipe-support assembly for supporting multiple parallel pipes.
4. Channels: Continuous slotted steel channel with inturned lips.
5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
8. Plastic Coating: PVC.

B. Non-MFMA Manufacturer Metal Framing Systems:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   a. Anvil International; a subsidiary of Mueller Water Products Inc.
   b. Empire Industries, Inc.
   c. ERICO International Corporation.
   d. Haydon Corporation; H-Strut Division.
   e. NIBCO INC.
   f. PHD Manufacturing, Inc.
   g. PHS Industries, Inc.

2. Description: Shop- or field-fabricated pipe-support assembly made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.
4. Channels: Continuous slotted steel channel with inturned lips.
5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.

2.3 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.4 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.5 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.

B. Fastener System Installation:
   1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
   2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

C. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.


E. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

F. Install lateral bracing with pipe hangers and supports to prevent swaying.

G. Install building attachments within concrete slabs or attach to structural steel.

H. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

I. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

3.2 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.
3.3 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

3.5 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-58 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports metal trapeze pipe hangers and metal framing systems and attachments for general service applications.

F. Use stainless-steel pipe hangers and attachments for hostile environment applications.

G. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
2. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
3. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
4. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
5. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
6. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.

H. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

I. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

J. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. **Welded-Steel Brackets**: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
   a. Light (MSS Type 31): 750 lb.
   b. Medium (MSS Type 32): 1500 lb.
   c. Heavy (MSS Type 33): 3000 lb.

13. **Side-Beam Brackets (MSS Type 34)**: For sides of steel or wooden beams.
14. **Plate Lugs (MSS Type 57)**: For attaching to steel beams if flexibility at beam is required.
15. **Horizontal Travelers (MSS Type 58)**: For supporting piping systems subject to linear horizontal movement where headroom is limited.

K. **Comply with MFMA-103** for metal framing system selections and applications that are not specified in piping system Sections.

L. **Use powder-actuated fasteners instead of building attachments where required in concrete construction.**

END OF SECTION 230529
SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Equipment labels.
   2. Warning signs and labels.
   3. Duct labels.
   4. Stencils.
   5. Valve tags.
   6. Warning tags.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.
   B. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

1.3 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Plastic Labels for Equipment:
   1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
   2. Letter Color: Black.
   4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
   5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
   6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: Black.

C. Background Color: White.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.


H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 DUCT LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: Black.

C. Background Color: White.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.


H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings, duct size, and an arrow indicating flow direction.
   1. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions, or as separate unit on each duct label to indicate flow direction.
   2. Lettering Size: At least 1-1/2 inches high.

2.4 STENCILS

A. Stencils: Prepared with letter sizes according to ASME A13.1 for piping; minimum letter height of 1-1/4 inches for ducts.
   2. Stencil Paint: Exterior, gloss, acrylic enamel black unless otherwise indicated. Paint may be in pressurized spray-can form.
   3. Identification Paint: Exterior, acrylic enamel in colors according to ASME A13.1 unless otherwise indicated.

2.5 WARNING TAGS

A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.
   1. Size: 3 by 5-1/4 inches minimum.
   2. Fasteners: Reinforced grommet and wire or string.
   3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
PART 3 - EXECUTION

3.1 PREPARATION
A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION
A. Install or permanently fasten labels on each major item of mechanical equipment.
B. Locate equipment labels where accessible and visible.

3.3 DUCT LABEL INSTALLATION
A. Install plastic-laminated duct labels with permanent adhesive on air ducts in the following color codes:
   1. Green: For exhaust air ducts.
   2. ASME A13.1 Colors and Designs: For hazardous material exhaust.
B. Stenciled Duct Label Option: Stenciled labels, showing service and flow direction, may be provided instead of plastic-laminated duct labels, at Installer's option, if lettering larger than 1 inch high is needed for proper identification because of distance from normal location of required identification.
C. Locate labels near points where ducts enter into concealed spaces and at maximum intervals of 50 feet in each space where ducts are exposed or concealed by removable ceiling system.

3.4 WARNING-TAG INSTALLATION
A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 230553
SECTION 232520 - PROCESS CONTROL SYSTEM

PART 1 - GENERAL

1.1 SCOPE

A. This section describes the requirements for monitoring and control of the wastewater pumping station.

PART 2 - MATERIALS

2.1 GENERAL

A. Overview of the Process

1. Wastewater flows into the station wet well by gravity.
2. The wastewater is pumped out of the wet well by two Adjustable Frequency Drive (AFD) operated pumps. Pumps shall be located in a pump room dry well, which is separate from the wet well. Pump operation can be manual or automatic. For automatic pump operation, starts and stops will be controlled by the PLC based on wet well level. The pump control scheme shall be based upon variable speed normal pump operation with constant speed backup operation.
3. Primary Pumps shall be locked out when the Emergency Pump is in operation.
4. Water level sensing shall be via a pressure level transducer and backup float switches.

B. Process Equipment

1. Two wastewater pumps (variable speed),
2. Wastewater pump discharge force main pressure transmitter,
3. Submersible water level transducer in wet well,
4. High wet well level and low wet well level float switches,
5. Sump pump system,
6. Pump room flood float switches,
7. Power failure relays,
8. Door switches to monitor station entry,
9. Flow switch(s) on wastewater pump force main.
10. Pump Control Panel,
11. Local Operator Interface Station(LOI)
12. Adjustable Frequency Drive (AFD) for pump speed controls.

C. Overview of Process Control

1. The process control system monitors the wet well level as measured by the submersible level transmitter. The lead pump is started when the wet well level has reached a preset level. If the wet well level continues to rise to a second preset level, the lag pump will be started. Whenever the wet well water level decreases to a preset low level, both pumps shall be automatically stopped.
2. The Process Control System (PCS) shall consist of a Programmable Logic Controller (PLC), a Local Operator Interface (LOI) and Adjustable Frequency Drives. The contractor is responsible for furnishing, installing and wiring all equipment.

3. The Local Operator Interface Station, provided as part of the process control system, allows entry of operator passwords to authorize entry into the pump station, the entry of set points, and accommodates local monitoring of process conditions. All alarms will be displayed on the local operator interface station and, unless otherwise stated, will be self clearing when the condition that caused the alarm is clear for more than 5 minutes.

2.2 DISPLAYS

A. Local Operator Interface (LOI) Station

1. The Local Operator Interface Station shall be interfaced with the Pump Control PLC. The Local Operator Interface Station displays will be built in a hierarchy. Function keys or paging keys will allow the logical progression from one screen to another. The function provided on each display will be individually password protected. The local operator interface station will only permit moving to a display, other than the password entry display, if a valid password has been entered.

2. Operator Password Entry and Log-out Displays

a. The first display will be a default display. It will be the operator password entry display. The operator will enter his password into the local operator interface station after he enters the pump station. The password will be a four digit number entered from the numeric keypad location on the operator interface.

b. A log-out display will be provided. The operator will log-out before leaving the station.

3. Set-point Entry Displays

a. Displays will be provided integral with the PLC to allow the review and entry of all set-points and ranges in engineering units. Default set-point values will be input by the City of Norfolk prior to pump station start-up. The following is a preliminary list of set-points and ranges:

b. Wet well level set points for pump start and stop and for level alarms

c. Wet well submersible level transducer range

d. Adjustable Frequency Drive speed range values for single and two pump operation.

e. Wet well level alarms

f. All timer presets including:

1) Level transducer disagree timer

2) Level transducer failure timer

3) Unauthorized entry timer

4) Authorized entry timer

5) Power "On" delay timer

g. Pump run times (allow reset to zero)

h. Wastewater pump discharge pressure range

4. Monitoring Displays
a. Displays will be provided integral with the PLC to allow the monitoring of the following in engineering units:

1) Wet well level
2) Discharge pressure
3) Station power and VARS
4) Pump run time for each pump within the station

b. Displays will be provided integral with the PLC to allow the monitoring of the following:

1) Pump run status, AFD output speed values, seal failure alarm, motor failure alarm, high temperature alarm, out-of-service status, Hand/Off or Auto status
2) Status of each float switch level alarm; low level, high level, flood
3) Status of each submersible level transmitter level alarm: high level
4) Level transducer disagree
5) Pump failed to start or stop
6) Sump pump run status
7) Emergency Pump run status
8) Emergency Pump failed to start
9) Power failure alarm
10) Intrusion alarm (pump station entry without entering proper password)
11) Low flow alarm (with pump running)

2.3 CONTROL SYSTEM OPERATION

A. Manual Pump Control:

1. Controls shall be provided to allow each wastewater pump to be started from the Pump Control Panel (PCP) by placing a HAND/OFF/AUTO switch in the "HAND" position. The PLC will not control the pump when the "HAND" position has been selected.
2. Each wastewater pump shall stop when the HAND/OFF/AUTO switch located at the PCP is placed in the "OFF" position or when the lock-out switch near the pump is placed in the “STOP” position.
3. When the "HAND" mode of control is selected, neither the submersible level transmitter nor the float switches shall be capable of controlling the pumps.
4. When the "AUTO" mode of control is selected, the PLC will immediately assume automatic control of pumps based on wet well level. The PLC will only cease automatic control of the 2 pumps when the H-O-A switch is switched out of the "AUTO" mode.

B. Automatic Pump Control: The automatic wastewater pumping water level control strategy employs both the submersible level transmitter and the back-up float level switches.

1. Programmable Logic Controller Control (PLC)
   a. When the PLC calls for a pump start, by closing a pump RUN contact for a preset period of time (initially set to 3 seconds), a second timer in the PLC will be started. If the status of the pump has not changed to "run" within the second timeout period (initially set to 10 seconds), the PLC will retry the pump start twice more; each time repeating the same procedure. If the pump still fails to start, a "failed to start" alarm will be generated and the motor failure alarm output will be activated. The
PLC will not try to start the failed pump; but, it will call for the other pump to start if it is available. The "failed" pump will be cleared of the failure when the PLC detects the HAND/OFF/AUTO switch being switched out of the "AUTO" mode. If the start failure occurs during a power failure, a return of power will clear the failure.

b. The PLC pump stop procedure will be similar to the pump start procedure. When the PLC calls for a pump to stop by opening the pump RUN contact for a preset period of time (initially set to 5 seconds), a second timer in the PLC will be started. If the status of the pump has not changed to "OFF" within second timeout period (initially set to 10 seconds), the PLC will retry the pump stop twice more, each time repeating the same procedure. If the pump still fails to stop, a "failed to stop" alarm will be generated and displayed. The PLC will not try to stop the failed pump, but will call for the other pump to stop if it is running in auto. The "failed" pump will be cleared of the failure when the PLC detects the HAND/OFF/AUTO switch being switched out of the "AUTO" mode.

c. If there is a motor overload, the pump will be stopped and the motor failure alarm output will be activated. The pump will be prevented from restarting until the overload has been reset.

d. If a pump is in an "out of service" condition, sensed by a switch contact on the circuit breaker feeding power to the pump starter, PLC commands to the pump will be prohibited.

e. The PLC will automatically alternate the start of the pumps.

f. The PLC shall automatically alternate the continuous running of pumps at an adjustable time interval; the default interval shall be 8 hours. This alternation will be required whenever water flow rates over long intervals demand the continuous operation of one pump. This feature shall also include a minimum timeout period between the stop and start of a pump to prevent overheating. The timeout period shall be based upon the pump manufacturer's recommendations.

g. The PLC will automatically control the pump speeds based upon standard pumping station control algorithms with user selected set-points.

h. If a pump is not available because it is out of service, has failed, has an overload alarm or a seal failure alarm, the other pump will automatically become the lead pump.

i. Run-times for each wastewater pump and for the sump pumps will be calculated based on pump run status. The run-time for a pump will roll over whenever 10,000 hours of running has been tallied.

2. Wet Well Level Control

a. During normal automatic operation of the adjustable speed wastewater pumps, speed, starts and stops will be based on the level measured by the submersible level transducer system. Pump interlocks and manual modes of operation are described above. All pumps will be provided with timeout periods between each stop and start procedure to prevent overheating due to repeated starts with time periods based on the pump manufacturer's recommendations.

b. As measured by the submersible level transducer, when the level exceeds the "lead pump start" level set point, the lead pump will be started. The lead pump’s speed will initially be set and subsequently adjusted and controlled based upon standard pump speed control algorithms. If the wet well level continues to rise to a level above the "lag pump start" level set-point, the lag pump will be started. The lag pump speed will initially be set and subsequently adjusted and controlled based
upon standard pump speed control algorithms. Whenever both pumps are running simultaneously, their speeds shall be equal. If the water level continues to rise above "high wet well level" set point, the high wet well level alarm output will be activated. When the level falls below the high wet well level set point, the high wet well level alarm output will be cleared. When the level falls below a "pump stop" level set point, the pumps shall be automatically stopped.

c. As a back-up to the submersible level transducer system, high wet well level and low wet well level float switches will be used. In the event of a disagreement of level information provided by the submersible level transducer and the level float switches, the float switches will override the information provided by the submersible level transducer system. In the event that a failure is detected in the submersible level transducer, the float switches will override the submersible level transducer. A "level transducer disagrees" alarm will also be generated.

d. If during an adjustable time period (up to 5 minutes initially set by the City of Norfolk), the high wet well level condition remains in effect, both lead and lag pumps will be started. When the level falls below the actuation point of the low level float switch, both pumps will be stopped. If the low level condition remains in effect for more than 5 minutes, a low level alarm will be generated. On the first few actuations of a high level float switch, the PLC can also continue to respond to the submersible level transducer for control of the pumps. If, during a preset time period that is adjustable from 1 to 60 minutes, repeated float switch actuation occurs, the PLC will assume that the level transducer has failed and will henceforth ignore the submersible level transducer and will only respond to the level switches until the problem is cleared by an operator. A "Level transmitted disagree" alarm will also be generated.

2.4 ALARMS

A. Authorized/Unauthorized Entry Alarms

1. Immediately after entering the station, the operator will enter his four-digit password on the Local Operator Interface Station. A table of up to ten valid passwords will be stored in the process control system. If a valid password is not entered within an adjustable time period (up to 10 minutes initially set by the City of Norfolk) after a door switch has been opened, the unauthorized entry alarm output will be activated. If a valid password is entered, the authorized entry status output will be activated for an adjustable time period (several seconds initially set by the City of Norfolk) and an entry time permitted timer will begin (adjustable duration up to 60 minutes initially set by the City of Norfolk). While this timer is running, and while the operator is still logged in, he can enter and exit the station as often as desired without setting the authorized or unauthorized entry alarms. Once the time has expired or if the operator has logged out, the timer will be reset, the operator will automatically be logged-out, and the password display will automatically be displayed. The operator will have to re-enter his password to avoid setting off the unauthorized entry alarm output upon exiting the station.

2. Before leaving the station, the operator will indicate that he is about to leave the station by logging out on the log-out display. Logging out will disable the unauthorized entry alarm for an adjustable time period (up to 30 minutes initially set by the City of Norfolk). Logging out will also automatically display the password entry display. When the door switch is opened, the authorized entry status output will be activated.
B. Other Alarm Outputs

1. If the power failure relay detects a power failure, the power failure alarm output will be activated. On resumption of power, an adjustable (1-10 second) on-delay timer (initially set by the City of Norfolk) will prevent both pumps from automatically restarting at the same time and the power failure alarm output will be de-activated.

2. While the pump room flood switches (floats) are activated the pump room flood alarm output will be activated. Two float switches shall be provided:
   a. “High/Normal” – Indicates a nominal amount of water on the pump room floor. Coordinate elevation of this float with City.
   b. “High Water” – Indicates water level is encroaching on electrical and other equipment. Coordinate elevation of this float with City.

3. Refer to Telemetry Equipment Specification Section 272750 for additional required alarms, status conditions, and monitored signals.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The contractor shall install all equipment; connect all devices as indicated on the Instrumentation Drawings and as specified.

B. Installation shall be supervised, checked and tested by the City of Norfolk and their representative prior to station start-up.

C. Field test shall be performed by the City of Norfolk after installation has been completed. The Contractor shall provide the necessary personnel to verify connection at field devices, PLC and LOI as deemed necessary by the City of Norfolk.
SECTION 233116 - NONMETAL DUCTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. PVC ducts and fittings.

B. Related Sections:
   1. Section 233300 "Air Duct Accessories" for dampers, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.2 PERFORMANCE REQUIREMENTS

A. Delegated Duct Design: Duct construction, including duct closure, reinforcements, and hangers and supports, shall comply with SMACNA's "PVC Duct Construction Standards" and performance requirements and design criteria indicated.
   1. Static-Pressure Classes:

B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions to comply with ASCE/SEI 7.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of the following products:
   1. PVC duct materials.

B. Shop Drawings:
   1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
   2. Duct layout indicating sizes and pressure classes.
   3. Elevation of top of ducts.
   4. Dimensions of main duct runs from building grid lines.
   5. Fittings.
   6. Reinforcement and spacing.
   7. Seam and joint construction.
   8. Penetrations through fire-rated and other partitions.
   9. Equipment installation based on equipment being used on Project.
10. Hangers and supports, including methods for duct and building attachment and vibration isolation.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
2. Structural members to which duct will be attached.
3. Size and location of initial access modules for acoustical tile.

B. Field quality-control reports.

PART 2 - PRODUCTS

2.1 CPVC DUCTS AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Harvel Plastics, Inc.
2. Plastinetics Inc.

B. Duct and Fittings:

1. Round Duct: Comply with cell Classification 23447 in ASTM D 1784, with external loading properties of ASTM D 2412.
2. Round Fittings: Socket end molded of same material, pressure class, and joining method as duct.


D. Fabrication:


2.2 HANGERS AND SUPPORTS

A. Refer to Section 230529 – “Hangers and Supports for HVAC Equipment”.
PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Install ducts with fewest possible joints.
B. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
C. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
D. Install ducts with a clearance of 1 inch.
E. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct with sheet metal flanges. Overlap openings on four sides by at least 1-1/2 inches.
F. Protect duct interiors from the moisture, construction debris and dust, and other foreign materials.
G. Install CPVC ducts and fittings to comply with SMACNA’s "Thermoplastic Duct (PVC) Construction Manual."

3.2 HANGER AND SUPPORT INSTALLATION

A. Refer to Section 230529 – “Hangers and Supports for HVAC Equipment”.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.
   a. Total installed duct area for each designated pressure class.
B. Prepare test and inspection reports.

3.4 DUCT CLEANING

A. Clean new duct system(s) before testing, adjusting, and balancing.

END OF SECTION 233116
SECTION 233300 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:


PART 2 - PRODUCTS

2.1 MATERIALS

A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

2. Exposed-Surface Finish: Mill phosphatized.

B. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches.

2.2 MANUAL VOLUME DAMPERS

A. Standard, Steel, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Air Balance Inc.; a division of Mestek, Inc.
   b. American Warming and Ventilating; a division of Mestek, Inc.
   c. Flexmaster U.S.A., Inc.
   d. McGill AirFlow LLC.
   e. Nailor Industries Inc.
   f. Pottorff.
   g. Ruskin Company.
   h. Trox USA Inc.
   i. Vent Products Company, Inc.

2. Standard leakage rating, with linkage outside airstream.
3. Suitable for horizontal or vertical applications.
4. Frames:

   a. Frame: Hat-shaped, 0.094-inch- thick, galvanized sheet steel.
   b. Mitered and welded corners.
   c. Flanges for attaching to walls and flangeless frames for installing in ducts.
5. Blades:
   a. Multiple or single blade.
   b. Parallel- or opposed-blade design.
   c. Stiffen damper blades for stability.
   d. Galvanized-steel, 0.064 inch thick.


7. Bearings:
   a. Stainless-steel sleeve.
   b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

8. Tie Bars and Brackets: Galvanized steel.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in "PVC Duct Construction Standards," for PVC ducts.

B. Install duct accessories of materials suited to duct materials.

C. Install backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.

D. Set dampers to fully open position before testing, adjusting, and balancing.

E. Install test holes at fan inlets and outlets and elsewhere as indicated.

END OF SECTION 233300
SECTION 233413 - AXIAL HVAC FANS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Tubeaxial fans.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include rated capacities, furnished specialties, and accessories for each fan.
   2. Certified fan performance curves with system operating conditions indicated.
   3. Certified fan sound-power ratings.
   4. Motor ratings and electrical characteristics, plus motor and electrical accessories.
   5. Material thickness and finishes.
   6. Dampers, including housings, linkages, and operators.
   7. Fan speed controllers.

B. Shop Drawings:
   1. Include plans, elevations, sections, and attachment details.
   2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   3. Include diagrams for power, signal, and control wiring.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. AMCA Compliance:
   1. Comply with AMCA performance requirements and bear the AMCA-Certified Ratings Seal.
   2. Operating Limits: Classify according to AMCA 99.
   3. Construction: Type “B” as defined by AMCA 99-0401.

B. Unusual Service Conditions:
   1. High humidity.
   2. Corrosive and explosion proof.
C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Capacities and Characteristics: (See Design Drawings)

2.2 TUBEAXIAL FANS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

2. Aerovent; a Twin City Fan company.
3. Breidert Air Products.
5. Chicago Blower Corporation.
9. Howden Buffalo Inc.
10. Lau Industries.
11. Loren Cook Company.
15. Strobic Air Corporation.

B. Description: Fan wheel and housing, factory-mounted motor with belt drive, an inlet cone section, and accessories.

C. Housings: Fiberglass-reinforced plastic with flanged inlet and outlet connections.

D. Wheel Assemblies: Fiberglass-reinforced plastic cured under pressure with airfoil-shaped blades keyed to stainless-steel shaft.

E. Belt Drives:

1. Factory mounted, with adjustable alignment and belt tensioning.
2. Service Factor Based on Fan Motor Size: 1.5.
3. Fan Shaft: Turned, ground, and polished steel designed to operate at no more than 70 percent of first critical speed at top of fan's speed range.
4. Fan Pulleys: Cast iron with split, tapered bushing; dynamically balanced at factory.
5. Motor Pulleys: Adjustable pitch for use with motors through 5 hp; fixed pitch for use with larger motors. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions.
6. Belts: Oil resistant, nonsparking, and nonstatic; matched sets for multiple belt drives.

   a. Ball-Bearing Rating Life: ABMA 9, L10 of 50,000 hours.
b. Extend lubrication lines to outside of casing and terminate with grease fittings.

F. Accessories:

1. Companion Flanges: Rolled flanges of same material as housing.
2. Inspection Door: Bolted door allowing limited access to internal parts of fan, of same material as housing.
3. Propeller Access Section Door: Short duct section bolted to fan inlet and outlet allowing access to internal parts of fan for inspection and cleaning, of same material as housing.
4. Swingout Construction: Assembly allowing entire fan section to swing out from duct for cleaning and servicing, of same material as housing.
5. Mounting Clips: Vertical mounting clips welded to fan housing, of same material as housing.
6. Vertical Support: Short duct section with welded brackets bolted to fan housing, of same material as housing.
7. Outlet Screen: Wire-mesh screen on fans not connected to ductwork, of same material as housing.
8. Backdraft Dampers: Butterfly style, for bolting to the discharge of fan or outlet cone, of same material as housing.
9. Shaft Seal: Elastomeric seal and Teflon wear plate, suitable for up to 300 deg F.
10. Motor Cover: Cover with side vents to dissipate motor heat, of same material as housing.
11. Inlet Bell: Curved inlet for when fan is not attached to duct, of same material as housing.
12. Inlet Cone: Round-to-round transition of same material as housing.
13. Outlet Cone: Round-to-round transition, of same material as housing.
14. Stack Cap: Vertical discharge assembly with backdraft dampers, of same material as housing.

G. Factory Finishes:

1. Sheet Metal Parts: Prime coat before final assembly.
2. Exterior Surfaces: Baked-enamel finish coat after assembly.
3. Coatings: Epoxy on fan wheels/blades, housing, brackets and all other non-rotating parts factory applied to 30 mils thickness (all fans).

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install axial fans level and plumb.

B. Disassemble and reassemble units, as required for moving to the final location, according to manufacturer's written instructions.

C. Lift and support units with manufacturer's designated lifting or supporting points.

D. Install units with clearances for service and maintenance.

E. Label fans according to requirements specified in Section 230553 "Identification for HVAC Piping and Equipment."
3.2 CONNECTIONS

A. Drawings indicate general arrangement of ducts and duct accessories.

B. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
   1. Verify that shipping, blocking, and bracing are removed.
   2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
   3. Verify that cleaning and adjusting are complete.
   4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
   5. Adjust belt tension.
   6. Adjust damper linkages for proper damper operation.
   7. Verify lubrication for bearings and other moving parts.
   8. Verify that manual volume control damper in connected ductwork systems are in fully open position.
   9. Remove and replace malfunctioning units and retest as specified above.

D. Test and adjust controls and safeties. Controls and equipment will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

3.4 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Lubricate bearings.

END OF SECTION 233413
SECTION 233423 - HVAC POWER VENTILATORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Propeller fans.

1.2 PERFORMANCE REQUIREMENTS

A. Project Altitude: Base fan-performance ratings on sea level.

B. Operating Limits: Classify according to AMCA 99.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Also include the following:

1. Certified fan performance curves with system operating conditions indicated.
2. Certified fan sound-power ratings.
3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
4. Dampers, including housings, linkages, and operators.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: For power, signal, and control wiring.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. AMCA Compliance: Fans shall have AMCA-Certified performance ratings and shall bear the AMCA-Certified Ratings Seal.

1.5 COORDINATION

A. Coordinate size and location of structural-steel support members.

B. Coordinate sizes and locations of concrete bases with actual equipment provided.
C. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

PART 2 - PRODUCTS

2.1 PROPELLER FANS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Acme Engineering & Manufacturing Corporation.
2. Aerovent; a division of Twin City Fan Companies, Ltd.
3. Airmaster Fan Company.
5. Ammerman; Millennium Equipment.
7. Broan-NuTone LLC; NuTone Inc.
8. Carnes Company.
11. Hartzell Fan Incorporated.
12. Howden Buffalo Inc.
14. King Company; part of Mestek, Inc.
15. Loren Cook Company.
17. Moffitt Corporation Inc.
19. PennBarry.
20. Quietaire Inc.
23. Greenheck.

B. Housing: Galvanized-steel sheet with flanged edges and integral orifice ring with baked-enamel finish coat applied after assembly.

C. Steel Fan Wheels: Formed-steel blades riveted to heavy-gage steel spider bolted to cast-iron hub.

D. Fan Wheel: Replaceable, cast-aluminum, airfoil blades fastened to cast-aluminum hub; factory set pitch angle of blades.

E. Fan Drive: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing.

F. Fan Drive:

   1. Resiliently mounted to housing.
2. Statically and dynamically balanced.
3. Selected for continuous operation at maximum rated fan speed and motor horsepower, with final alignment and belt adjustment made after installation.
4. Extend grease fitting to accessible location outside of unit.
5. Service Factor Based on Fan Motor Size: 1.4.
6. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
   a. Ball-Bearing Rating Life: ABMA 9, L₁₀ of 100,000 hours.

G. Accessories:
   1. Gravity Shutters: Aluminum blades in aluminum frame; interlocked blades with nylon bearings.
   3. Wall Sleeve: Galvanized steel to match fan and accessory size.
   4. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted inside fan housing, factory wired through an internal aluminum conduit.

H. Capacities and Characteristics: (See Design Drawings)

2.2 MOTORS
A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
   1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

B. Enclosure Type: Totally enclosed, fan cooled.

2.3 SOURCE QUALITY CONTROL
A. Certify sound-power level ratings according to AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Certify fan performance ratings, including flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests according to AMCA 210, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating." Label fans with the AMCA-Certified Ratings Seal.
PART 3 - EXECUTION

3.1 INSTALLATION
   A. Install power ventilators level and plumb.
   B. Equipment Mounting:
      1. Install power ventilators as shown on drawings and in accordance with manufacturer’s
         written instructions.
   C. Install units with clearances for service and maintenance.
   D. Label units according to requirements specified in Section 230553 "Identification for HVAC
      Piping and Equipment."

3.2 CONNECTIONS
   A. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical
      Systems."

3.3 FIELD QUALITY CONTROL
   A. Perform tests and inspections.
      1. Manufacturer’s Field Service: Engage a factory-authorized service representative to
         inspect components, assemblies, and equipment installations, including connections, and
         to assist in testing.
   B. Tests and Inspections:
      1. Verify that shipping, blocking, and bracing are removed.
      2. Verify that unit is secure on mountings and supporting devices. Verify that proper
         thermal-overload protection is installed in motors, starters, and disconnect switches.
      3. Verify that cleaning and adjusting are complete.
      4. Adjust damper linkages for proper damper operation.
      5. Verify lubrication for bearings and other moving parts.
      6. Remove and replace malfunctioning units and retest as specified above.
   C. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and
      equipment.
   D. Prepare test and inspection reports.

3.4 ADJUSTING
   A. Adjust damper linkages for proper damper operation.
B. Replace fan and motor as required to achieve design airflow.

C. Lubricate bearings.

END OF SECTION 233423
SECTION 238239.19 - WALL UNIT HEATERS

PART 1 - GENERAL

1.1 SUMMARY
   A. Section includes wall heater with propeller fans and electric-resistance heating coils.

1.2 ACTION SUBMITTALS
   A. Product Data: Electric Unit Heater.
   B. Shop Drawings:
      1. Include equipment schedules to indicate rated capacities, operating characteristics, furnished specialties, and accessories.
      2. Wiring Diagrams: Power, signal, and control wiring.

1.3 CLOSEOUT SUBMITTALS
   A. Operation and Maintenance Data: For wall and ceiling unit heater to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
   A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      1. Berko; Marley Engineered Products.
      2. Chromalox, Inc.
      3. Indeeco.
      5. Marley Engineered Products.
      6. Ouellet Canada Inc.
      7. QMark; Marley Engineered Products.
      8. Trane Inc.

2.2 DESCRIPTION
   A. Assembly including chassis, electric heating coil, fan, motor, and controls. Comply with UL 2021.
B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 CABINET

A. Front Panel: Stamped-steel louver, with removable panels fastened with tamperproof fasteners.

B. Finish: Baked enamel over baked-on primer with manufacturer's standard color selected by Architect, applied to factory-assembled and -tested wall and ceiling heaters before shipping.

C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

D. Surface-Mounted Cabinet Enclosure: Steel with finish to match cabinet.

2.4 COIL


2.5 FAN AND MOTOR

A. Fan: Aluminum propeller directly connected to motor.

B. Motor: Permanently lubricated. Comply with requirements in Section 230513 "Common Motor Requirements for HVAC Equipment."

2.6 CONTROLS

A. Controls: Wall-mounted thermostat.

B. Electrical Connection: Factory wire motors and controls for a single field connection with disconnect switch.

2.7 CAPACITIES AND CHARACTERISTICS – See Design Drawings

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive wall and ceiling unit heaters for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
B. Examine roughing-in for electrical connections to verify actual locations before unit-heater installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install wall and ceiling unit heaters to comply with NFPA 90A.

B. Install wall and ceiling unit heaters level and plumb.

C. Install wall-mounted thermostats and switch controls in electrical outlet boxes at heights to match lighting controls. Verify location of thermostats and other exposed control sensors with Drawings and room details before installation.

D. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

END OF SECTION 238239.19
Division 26 – Electrical
SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

A.

1.2 SUMMARY

A. Section Includes:
   1. Building wires and cables rated 600 V and less.
   2. Connectors, splices, and terminations rated 600 V and less.

B. Related Requirements:
   1. Section 260523 "Control-Voltage Electrical Power Cables" for control systems communications cables and Classes 1, 2 and 3 control cables.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Belden Inc.
   2. General Cable Technologies Corporation.
   4. The Okonite Company.

B. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.

C. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THW-2 and Type THHN-2/THWN-2.
2.2 CONNECTORS AND SPLICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
3. Ideal Industries, Inc.
4. Ilsco; a branch of Bardes Corporation.
5. O-Z/Gedney; a brand of the EGS Electrical Group.
6. 3M; Electrical Markets Division.
7. Tyco Electronics.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger, except VFC cable, which shall be extra flexible stranded.

3.2 CONDUCTOR INSULATION AND WIRING METHODS

A. Service Entrance: Type THHN-2-THWN-2, single conductors in raceway.

B. Exposed Feeders: Type THHN-2-THWN-2, single conductors in raceway.

C. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-2-THWN-2, single conductors in raceway.

D. Exposed Branch Circuits: Type THHN-2-THWN-2, single conductors in raceway.

E. Branch Circuits Concealed in Walls: Type THHN-2-THWN-2, single conductors in raceway.

F. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-2-THWN-2, single conductors in raceway.
3.3 INSTALLATION OF CONDUCTORS AND CABLES
   A. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.
   B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
   C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
   D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
   E. Support cables according to City of Norfolk Department of Utilities Supplemental Specifications SectionSUP-1 Supports and Anchors.

3.4 CONNECTIONS
   A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.
   B. Make splices, terminations, and taps that are compatible with conductor material.
   C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.5 IDENTIFICATION
   A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."
   B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 FIELD QUALITY CONTROL
   A. Perform the following tests and inspections:
      1. After installing conductors and cables and before electrical circuitry has been energized, test conductor for compliance with the following requirements.
   B. Test and Inspection Reports: Prepare a written report to record the following:
      1. Procedures used.
2. Results that comply with requirements.
3. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

C. Cables will be considered defective if they do not pass tests and inspections.
SECTION 260523 - CONTROL-VOLTAGE ELECTRICAL POWER CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Low-voltage control cabling.
   2. Control-circuit conductors.
   3. Identification products.

1.2 DEFINITIONS

A. EMI: Electromagnetic interference.

B. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control and signaling power-limited circuits.

C. UTP: Unshielded twisted pair.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Source quality-control reports.

B. Field quality-control reports.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 LOW-VOLTAGE CONTROL CABLE

A. Paired Cable: NFPA 70, Type CMG.
   1. Multi-pair, twisted, No. 18 AWG, stranded (19x30) tinned-copper conductors.
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with UL 1685.

2.3 CONTROL-CIRCUIT CONDUCTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Encore Wire Corporation.
   2. General Cable Technologies Corporation.

B. Class 1 Control Circuits: Stranded copper, Type THHN-2-THWN-2, in raceway, complying with UL 83.

C. Class 2 Control Circuits: Stranded copper, Type THHN-2-THWN-2, in raceway, complying with UL 83.

D. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type THHN-2-THWN-2, in raceway, complying with UL 83.

PART 3 - EXECUTION

3.1 INSTALLATION OF RACEWAYS AND BOXES

A. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems" for raceway selection and installation requirements for boxes, conduits, and wireways as supplemented or modified in this Section.
   1. Outlet boxes shall be no smaller than 2 inches wide, 3 inches high, and 2-1/2 inches deep.
   2. Flexible metal conduit shall not be used.

B. Install manufactured conduit sweeps and long-radius elbows if possible.

3.2 INSTALLATION OF CONDUCTORS AND CABLES

A. Comply with NECA 1 and NFPA 70.

B. Installation of Control-Circuit Conductors:
   1. Install wiring in raceways. Comply with requirements specified in Section 260533 "Raceways and Boxes for Electrical Systems."
3.3 CONTROL-CIRCUIT CONDUCTORS

A. Minimum Conductor Sizes:

1. Class 1 remote-control and signal circuits; No 14 AWG.
2. Class 2 low-energy, remote-control, and signal circuits; No. 16 AWG.
3. Class 3 low-energy, remote-control, alarm, and signal circuits; No 12 AWG.

3.4 GROUNDING

A. For low-voltage control wiring and cabling, comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

3.5 IDENTIFICATION

A. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

END OF SECTION 260523
SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes grounding and bonding systems and equipment.

B. Section includes grounding and bonding systems and equipment, plus the following special applications:
   1. Ground bonding common with lightning protection system.
   2. Foundation steel electrodes.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.3 INFORMATIONAL SUBMITTALS

A. As-Built Data: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article, including the following:
   1. Ground rods.
   2. Ground rings.
   3. Grounding arrangements and connections for separately derived systems.

B. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.

   1. In addition to items specified in “Operation and Maintenance Manual” O&M-1 City of Norfolk Department of Utilities Supplemental Specifications, include the following:

      a. Instructions for periodic testing and inspection of grounding features at grounding connections for separately derived systems based on NETA MTS.

      1) Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
      2) Include recommended testing intervals.
1.5 QUALITY ASSURANCE

A. Testing Qualifications: Member company of NETA or an NRTL.
   1. Testing Field Supervisor: Certified by NETA to supervise on-site testing.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:
   1. Burndy; Part of Hubbell Electrical Systems.
   2. ERICO International Corporation.
   3. Fushi Copperweld Inc.
   5. ILSCO.
   7. Robbins Lightning, Inc.

2.2 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

2.3 CONDUCTORS

A. Insulated Conductors: Copper or tinned-copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

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

2.4 CONNECTORS
   A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
   B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.
   C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.5 GROUNDING ELECTRODES
   A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet.

PART 3 - EXECUTION

3.1 APPLICATIONS
   A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
   B. Underground Grounding Conductors: Install bare tinned-copper conductor, No. 2/0 AWG minimum.
      1. Bury at least 24 inches below grade.
   C. Conductor Terminations and Connections:
      1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
      2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
      3. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING AT THE SERVICE
   A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.3 EQUIPMENT GROUNDING
   A. Install insulated equipment grounding conductors with all feeders and branch circuits.
B. Water Heater: Install a separate insulated equipment grounding conductor to each electric water heater. Bond conductor to heater units, piping, connected equipment, and components.

3.4 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

C. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.

   1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
   2. For grounding electrode system, install rods spaced at least two-rod length from each other and connect to the service grounding electrode conductor.

D. Grounding and Bonding for Piping:

   1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
   2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
   3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

E. Ground Ring: Install a grounding conductor, electrically connected to each ground rod and to lightning protection system down conductors as indicated, extending around the perimeter of building.

   1. Install tinned-copper conductor not less than No. 2/0 AWG for ground ring and for taps to building steel.
   2. Bury ground ring not less than 24 inches (600 mm) from building's foundation.

F. Concrete-Encased Grounding Electrode (Ufer Ground): Fabricate according to NFPA 70; use a minimum of 20 feet of bare copper conductor not smaller than No. 4 AWG.
1. If concrete foundation is less than 20 feet long, coil excess conductor within base of foundation.
2. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building's grounding grid or to grounding electrode external to concrete.

3.5 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at individual ground rods. Make tests at ground rods before any conductors are connected.
   a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
   b. Perform tests by fall-of-potential method according to IEEE 81.
4. Prepare dimensioned Drawings locating each ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

B. Grounding system will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

D. Report measured ground resistances that exceed the following values:

   1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.

E. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526
SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Metal conduits, tubing, and fittings.
   2. Nonmetal conduits, tubing, and fittings.

1.2 DEFINITIONS
A. GRC: Galvanized rigid steel conduit.
B. IMC: Intermediate metal conduit.

1.3 INFORMATIONAL SUBMITTALS
A. Source quality-control reports.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS
A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Allied Tube & Conduit.
   2. Anamet Electrical, Inc.
   3. Electri-Flex Company.
   5. Southwire Company.
   7. Wheatland Tube Company.
   8. Plasti-Bond
   9. Perma-Cote
   10. KorKap

B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. GRC: Comply with ANSI C80.1 and UL 6.
D. IMC: Comply with ANSI C80.6 and UL 1242.

E. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit
   1. Comply with NEMA RN 1.
   2. Coating Thickness: 0.040 inch, minimum.
   3. Interior conduit coating of urethane, minimum 2 mil thickness.
   4. Conduit must bear ETL Verified PVC-001 label to signify compliance with adhesion performance standard.

F. EMT: Comply with ANSI C80.3 and UL 797.

G. FMC: Comply with UL 1; zinc-coated steel.

H. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

I. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
   1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
   2. Fittings for EMT:
      a. Material: Steel.
      b. Type: Compression.
   3. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.

J. Joint Compound for IMC, or GRC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. AFC Cable Systems, Inc.
   2. Anamet Electrical, Inc.
   3. Arnco Corporation.
   4. CANTEX Inc.
   5. CertainTeed Corporation.
   7. Lamson & Sessions; Carlon Electrical Products.
   8. RACO; Hubbell.

B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
C. ENT: Comply with NEMA TC 13 and UL 1653.

D. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

E. LFNC: Comply with UL 1660.

F. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

G. Fittings for LFNC: Comply with UL 514B.

H. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

I. Solvent cements and adhesive primers shall comply with the testing and product requirements of the California Department of Health Services’ “Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers.”

2.3 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Adalet.
2. Cooper Technologies Company; Cooper Crouse-Hinds.
3. EGS/Appleton Electric.
5. Hoffman.
7. Milbank Manufacturing Co.
9. RACO; Hubbell.
10. Robroy Industries.
11. Spring City Electrical Manufacturing Company.
14. Wiremold / Legrand.

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

E. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.
F. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.

G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

H. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, galvanized, cast iron with gasketed cover.

I. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

J. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.

K. Gangable boxes are allowed.

L. Cabinets:
   1. NEMA 250, Type 1 galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
   2. Hinged door in front cover with flush latch and concealed hinge.
   3. Key latch to match panelboards.
   4. Metal barriers to separate wiring of different systems and voltage.
   5. Accessory feet where required for freestanding equipment.
   6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
   1. Exposed Conduit: GRC or IMC.
   2. Concealed Conduit, Aboveground: IMC or RNC, Type EPC-40-PVC.
   4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
   5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Indoors: Apply raceway products as specified below unless otherwise indicated:
   1. Exposed, Not Subject to Physical Damage: EMT.
   2. Exposed and Subject to Physical Damage: GRC IMC. Raceway locations include the following:
      a. Mechanical rooms.
      b. Dry and wet wells.
3. Concealed in Interior Walls: RNC, Type EPC-40-PVC.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
5. Damp or Wet Locations: GRC or IMC.
7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 nonmetallic in damp or wet locations.

C. Minimum Raceway Size: 1/2-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.
   1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
   2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
   4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

E. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

3.2 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Comply with requirements of the City of Norfolk Department of Utilities Supplemental Specifications Section SUP-1 “Supports and Anchors”.

E. Arrange stub-ups so curved portions of bends are not visible above finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.

G. Support conduit within 12 inches of enclosures to which attached.

H. Raceways Embedded in Slabs:
1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot intervals.

2. Arrange raceways to keep a minimum of 2 inches of concrete cover in all directions.

3. Do not embed threadless fittings in concrete.

I. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

J. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

K. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

L. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

M. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

N. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

O. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

P. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

Q. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound.

R. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit forequipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.

2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

S. Mount boxes at heights indicated on Drawings. Install boxes with height measured to center of box unless otherwise indicated.

T. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.
U. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

3.3 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533
SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Identification of power and control cables.
   2. Identification for conductors.
   3. Warning labels and signs.
   4. Instruction signs.
   5. Equipment identification labels.

1.2 ACTION SUBMITTALS

A. Product Data: For each electrical identification product indicated.

1.3 QUALITY ASSURANCE

A. Comply with ANSI A13.1.

B. Comply with NFPA 70.


D. Comply with ANSI Z535.4 for safety signs and labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.4 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.
PART 2 - PRODUCTS

2.1 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each cable size.

B. Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.

C. Self-Adhesive, Self-Laminating Polyester Labels: Preprinted, 3-mil-thick flexible label with acrylic pressure-sensitive adhesive that provides a clear, weather- and chemical-resistant, self-laminating, protective shield over the legend. Labels sized to fit the cable diameter such that the clear shield overlaps the entire printed legend.

2.2 CONDUCTOR IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

B. Self-Adhesive, Self-Laminating Polyester Labels: Preprinted, 3-mil-thick flexible label with acrylic pressure-sensitive adhesive that provides a clear, weather- and chemical-resistant, self-laminating, protective shield over the legend. Labels sized to fit the conductor diameter such that the clear shield overlaps the entire printed legend.

C. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

2.3 FLOOR MARKING TAPE

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

2.4 WARNING LABELS AND SIGNS


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

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

1. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 42 INCHES."
2.5 EQUIPMENT IDENTIFICATION LABELS

A. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with black letters on a white background. Minimum letter height shall be 3/8 inch.

2.6 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self extinguishing, one piece, self locking, Type 6/6 nylon.
   2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
   3. Temperature Range: Minus 40 to plus 185 deg F.

2.7 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

F. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:
   1. Outdoors: UV-stabilized nylon.
   2. In Spaces Handling Environmental Air: Plenum rated.

3.2 IDENTIFICATION SCHEDULE

A. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors.
   
a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
   
b. Colors for 120/240 Circuits:
      1) Phase A: Black.
      2) Phase B: Red.
   
c. Colors for 480/277-V Circuits:
      1) Phase A: Brown.
      2) Phase B: Orange.
      3) Phase C: Yellow.
   
d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
   
B. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.
   
C. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes use self-adhesive, self-laminating polyester labels with the conductor or cable designation, origin, and destination.
   
D. Control-Circuit Conductor Termination Identification: For identification at terminations provide self-adhesive, self-laminating polyester labels with the conductor designation.
   
      1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
      2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
   
F. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.
   
G. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.
      2. Identify system voltage with black letters on an orange background.
3. Apply to exterior of door, cover, or other access.
4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:
   a. Power transfer switches.
   b. Controls with external control power connections.
5. Provide field installed signs for electrical equipment required to have such signs, in accordance with NEC paragraph 110.16, to warn qualified persons of potential electric arc flash hazards when warning signs are not provided by the manufacturer.

H. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch-high letters for emergency instructions at equipment used for power transfer.

I. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:
   a. Indoor Equipment: Self-adhesive, engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on 1-1/2-inch-high label; where two lines of text are required, use labels 2 inches high.
   b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
   c. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

2. Equipment to Be Labeled:
   a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be self-adhesive, engraved, laminated acrylic or melamine label.
   b. Enclosures and electrical cabinets.
   c. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
   d. Enclosed circuit breakers.
   e. Enclosed controllers.
   f. Adjustable frequency drives.
   g. Push-button stations.
   h. Power transfer equipment.

END OF SECTION 260553
SECTION 260923 - LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Photoelectric switches.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 OUTDOOR PHOTOELECTRIC SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper Industries, Inc.
2. Intermatic, Inc.
3. NSi Industries LLC; TORK Products.
4. Tyco Electronics; ALR Brand.

B. Description: Solid state, with SPST dry contacts rated for 1800 VA, to operate connected load, complying with UL 773.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Light-Level Monitoring Range: 1.5 to 10 fc, with an adjustment for turn-on and turn-off levels within that range.
3. Time Delay: Thirty-second minimum, to prevent false operation.
5. Mounting: Twist lock complying with NEMA C136.10, with base.
2.2 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side Photoelectric Switch: Not smaller than No. 12 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 SENSOR INSTALLATION

A. Install and aim Photoelectric switch in accordance with manufacturer's written instructions.

3.2 WIRING INSTALLATION

A. Wiring Method: Comply with Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 1/2 inch.

B. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.

C. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Operational Test: After installing photoelectric switch, and after electrical circuitry has been energized, start units to confirm proper unit operation.

B. Lighting control devices will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.4 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices.

END OF SECTION 260923
SECTION 262200 - LOW-VOLTAGE TRANSFORMERS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following types of dry-type transformers rated 600 V and less, with capacities up to 1000 kVA:

1. Distribution transformers.

1.2 ACTION SUBMITTALS

A. Product Data: Include rated nameplate data, capacities, weights, dimensions, minimum clearances, installed devices and features, and performance for each type and size of transformer indicated.

1.3 INFORMATIONAL SUBMITTALS

A. Source quality-control test reports.

B. Field quality-control test reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For transformers to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each transformer type through one source from a single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with IEEE C57.12.91, "Test Code for Dry-Type Distribution and Power Transformers."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Temporary Heating: Apply temporary heat according to manufacturer's written instructions within the enclosure of each ventilated-type unit, throughout periods during which equipment is
not energized and when transformer is not in a space that is continuously under normal control of temperature and humidity.

1.7 COORDINATION

A. Coordinate size and location of concrete bases with actual transformer provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Sector; Eaton Corporation; Cutler-Hammer Products.
2. General Electric Company.
3. Square D Co./Groupe Schneider NA; Schneider Electric.

2.2 GENERAL TRANSFORMER REQUIREMENTS

A. Description: Factory-assembled and -tested, air-cooled units for 60-Hz service.

B. Cores: Grain-oriented, non-aging silicon steel.

C. Coils: Continuous windings without splices except for taps.

   1. Internal Coil Connections: Brazed or pressure type.
   2. Coil Material: Copper.

2.3 DISTRIBUTION TRANSFORMERS

A. Comply with NEMA ST 20, and list and label as complying with UL 1561.

B. Cores: One leg per phase.

C. Enclosure: Ventilated, NEMA 250, Type 2.

D. Transformer Enclosure Finish: Comply with NEMA 250.

   1. Finish Color: Gray.

E. Taps for Transformers 7.5 to 24 kVA: Two 5 percent taps below rated voltage.

F. Insulation Class: 220 deg C, UL-component-recognized insulation system with a maximum of 150 deg C rise above 40 deg C ambient temperature.
G. Energy Efficiency for Transformers Rated 15 kVA and Larger:
   1. Complying with NEMA TP 1, Class 1 efficiency levels.
   2. Tested according to NEMA TP 2.

2.4 IDENTIFICATION DEVICES
   A. Nameplates: Engraved, laminated-plastic or metal nameplate for each distribution transformer, mounted with corrosion-resistant screws. Nameplates and label products are specified in Section 260553 "Identification for Electrical Systems."

2.5 SOURCE QUALITY CONTROL
   A. Test and inspect transformers according to IEEE C57.12.91.

PART 3 - EXECUTION

3.1 EXAMINATION
   A. Examine conditions for compliance with enclosure- and ambient-temperature requirements for each transformer.
   B. Verify that field measurements are as needed to maintain working clearances required by NFPA 70 and manufacturer's written instructions.
   C. Examine walls, and concrete bases for suitable mounting conditions where transformers will be installed.
   D. Verify that ground connections are in place and requirements in Section 260526 "Grounding and Bonding for Electrical Systems" have been met. Maximum ground resistance shall be 5 ohms at location of transformer.
   E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION
   A. Construct concrete bases and anchor floor-mounting transformers according to manufacturer's written instructions and requirements in Section 260529 "Hangers and Supports for Electrical Systems."

3.3 CONNECTIONS
   A. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
B. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL
A. Perform tests and inspections and prepare test reports.
B. Tests and Inspections:
   1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
C. Remove and replace units that do not pass tests or inspections and retest as specified above.

3.5 ADJUSTING
A. Record transformer secondary voltage under normal operational loading. Adjust transformer taps to provide optimum voltage conditions at secondary terminals. Optimum is defined as not exceeding nameplate voltage plus 10 percent and not being lower than nameplate voltage minus 3 percent at maximum load conditions. Submit recording and tap settings as test results.
B. Output Settings Report: Prepare a written report recording output voltages and tap settings.

3.6 CLEANING
A. Vacuum dirt and debris; do not use compressed air to assist in cleaning.

END OF SECTION 262200
SECTION 262416 - PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Distribution panelboards.
   2. Lighting and appliance branch-circuit panelboards.

1.2 DEFINITIONS

A. SVR: Suppressed voltage rating.

B. TVSS: Transient voltage surge suppressor. (Otherwise referred to in other sections of this specification as Surge Protective Device (SPD)).

1.3 ACTION SUBMITTALS

A. Product Data: For each type of panelboard, switching and overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.
   1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
   2. Detail enclosure types and details for types other than NEMA 250, Type 1.
   3. Detail bus configuration, current, and voltage ratings.
   4. Short-circuit current rating of panelboards and overcurrent protective devices.
   5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Field Quality-Control Reports:
   1. Test procedures used.
   2. Test results that comply with requirements.
   3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
C. Panelboard Schedules: For installation in panelboards.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Manuals: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in "Operation and Maintenance Manual” O&M-1 City of Norfolk Department of Utilities Supplemental Specifications, include the following:

1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Keys: Two spares for each type of panelboard cabinet lock.
2. Circuit Breakers Including GFCI and Ground Fault Equipment Protection (GFEP) Types: One spare for each panelboard.

1.7 QUALITY ASSURANCE

A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NEMA PB 1.

D. Comply with NFPA 70.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Handle and prepare panelboards for installation according to NEMA PB 1.

1.9 PROJECT CONDITIONS

A. Environmental Limitations:

1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
   a. Ambient Temperature: Not exceeding 23 deg F to plus 104 deg F.
   b. Altitude: Not exceeding 6600 feet.

B. Service Conditions: NEMA PB 1, usual service conditions, as follows:
   1. Ambient temperatures within limits specified.
   2. Altitude not exceeding 6600 feet.

1.10 COORDINATION
A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS
A. Enclosures: Surface-mounted cabinets.
   1. Rated for environmental conditions at installed location.
      a. Damp Indoor Locations: NEMA 250, Type 4.
      b. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.
   2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
   3. Finishes:
      a. Panels and Trim: Steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.

B. Incoming Mains Location: Top or bottom.

C. Phase, Neutral, and Ground Buses:
2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.

D. Conductor Connectors: Suitable for use with conductor material and sizes.
   2. Main and Neutral Lugs: Mechanical type.
   3. Ground Lugs and Bus-Configured Terminators: Mechanical type.

E. Service Equipment Label: NRTL labeled for use as service equipment for panelboards or load centers with one or more main service disconnecting and overcurrent protective devices.

F. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.


2.2 DISTRIBUTION PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
   3. Square D; a brand of Schneider Electric.

B. Panelboards: NEMA PB 1, power and feeder distribution type.

C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
   1. For doors more than 36 inches high, provide two latches, keyed alike.

D. Mains: Lugs only.


F. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
   3. Square D; a brand of Schneider Electric.
B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

C. Mains: Circuit breaker.

D. Branch Overcurrent Protective Devices: Plug-in circuit breakers, replaceable without disturbing adjacent units.

E. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
3. Square D; a brand of Schneider Electric.

B. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.

2. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
4. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:

   a. Standard frame sizes, trip ratings, and number of poles.
   b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
   c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
   d. Multipole units enclosed in a single housing to operate as a single unit.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Receive, inspect, handle, and store panelboards according to NEMA PB 1.1.

B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.
C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install panelboards and accessories according to NEMA PB 1.1.

B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.

C. Mount top of trim 84 inches above finished floor unless otherwise indicated.

D. Mount panelboard cabinet plumb and rigid without distortion of box.

E. Install overcurrent protective devices and controllers not already factory installed.

F. Install filler plates in unused spaces.

G. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

H. Comply with NECA 1.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Section 260553 "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

A. Acceptance Testing Preparation:

   1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.

   2. Test continuity of each circuit.

B. Tests and Inspections:

   1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

C. Panelboards will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable component to function smoothly, and lubricate as recommended by manufacturer.

3.6 PROTECTION

A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION 262416
SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Receptacles, receptacles with integral GFCI, and associated device plates.
   2. Twist-locking receptacles.
   3. Weather-resistant receptacles.
   4. Snap switches and wall-box dimmers.

1.2 DEFINITIONS

A. EMI: Electromagnetic interference.
B. GFCI: Ground-fault circuit interrupter.
C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
D. RFI: Radio-frequency interference.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
   1. Cooper Wiring Devices; Division of Cooper Industries, Inc. (Cooper).
   2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
B. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

2.3 STRAIGHT-BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Cooper; 5351 (single), CR5362 (duplex).
   b. Hubbell; HBL5351 (single), HBL5352 (duplex).
   c. Leviton; 5891 (single), 5352 (duplex).
   d. Pass & Seymour; 5361 (single), 5362 (duplex).

2.4 GFCI RECEPTACLES

A. General Description:

1. Straight blade, non-feed-through type.
2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Cooper; VGF20.
   b. Hubbell; GFR5352L.
   c. Pass & Seymour; 2095.
   d. Leviton; 7590.

2.5 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. Switches, 120/277 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:
1) **Single Pole:**
   
   2) Cooper; AH1221.
   3) Hubbell; HBL1221.
   4) Leviton; 1221-2.
   5) Pass & Seymour; CSB20AC1.

6) **Two Pole:**

7) Cooper; AH1222.
8) Hubbell; HBL1222.
9) Leviton; 1222-2.
10) Pass & Seymour; CSB20AC2.

11) **Three Way:**

12) Cooper; AH1223.
13) Hubbell; HBL1223.
14) Leviton; 1223-2.
15) Pass & Seymour; CSB20AC3.

16) **Four Way:**

17) Cooper; AH1224.
18) Hubbell; HBL1224.
19) Leviton; 1224-2.
20) Pass & Seymour; CSB20AC4.

C. **Pilot-Light Switches, 20 A:**

1. **Products:** Subject to compliance with requirements, provide one of the following:
   
   a. Cooper; AH1221PL for 120 and 277 V.
   b. Hubbell; HBL1201PL for 120 and 277 V.
   c. **Leviton; 1221-LH1.**
   d. Pass & Seymour; PS20AC1RPL for 120 V, PS20AC1RPL7 for 277 V.

2. Description: Single pole, with neon-lighted handle, illuminated when switch is "on."

2.6 **WALL PLATES**

A. Single and combination types shall match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
3. Material for Damp Locations: Thermoplastic with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant thermoplastic as described in Material for Damp Locations.
2.7 FINISHES

A. Device Color:

1. Wiring Devices Connected to Normal Power System: Gray unless otherwise indicated or required by NFPA 70 or device listing.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:

1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes.
2. Keep outlet boxes free of mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.

D. Device Installation:

1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.
E. Receptacle Orientation:
   1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

3.2 IDENTIFICATION
   A. Comply with Section 260553 "Identification for Electrical Systems."

3.3 FIELD QUALITY CONTROL
   A. Tests for Convenience Receptacles:
      1. Line Voltage: Acceptable range is 105 to 132 V.
      2. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
      3. Using the test plug, verify that the device and its outlet box are securely mounted.

   B. Wiring device will be considered defective if it does not pass tests and inspections.

   C. Prepare test and inspection reports.

END OF SECTION 262726
SECTION 262813 - FUSES

1.1 SUMMARY
A. Section Includes:
   1. Cartridge fuses rated 600-V ac and less for use in control circuits and enclosed switches.

1.2 ACTION SUBMITTALS
A. Product Data: For each type of product indicated. Include construction details, material, dimensions, and descriptions of individual components. Include the following for each fuse type indicated:
   1. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
   2. Current-limitation curves for fuses with current-limiting characteristics.

1.3 QUALITY ASSURANCE
A. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.
B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
C. Comply with NEMA FU 1 for cartridge fuses.
D. Comply with NFPA 70.

1.4 COORDINATION
A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Cooper Bussmann, Inc.
   2. Ferraz Shawmut, Inc.
   3. Littelfuse, Inc.
2.2 CARTRIDGE FUSES
   
   A. Characteristics: NEMA FU 1, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

PART 3 - EXECUTION

3.1 EXAMINATION
   
   A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.
   
   B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.
   
   C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.
   
   D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FUSE APPLICATIONS
   
   A. Cartridge Fuses:

      1. Service Entrance: Class L, time delay.
      2. Control Circuits: Class CC, time delay.

3.3 INSTALLATION
   
   A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

3.4 IDENTIFICATION
   
   A. Install labels complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems" and indicating fuse replacement information on inside door of each fused switch and adjacent to each fuse block, socket, and holder.

END OF SECTION 262813
SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Fusible switches.
   2. Nonfusible switches.
   3. Molded-case circuit breakers (MCCBs).
   4. Enclosures.

1.2 DEFINITIONS

A. NC: Normally closed.
B. NO: Normally open.
C. SPDT: Single pole, double throw.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
   1. Enclosure types and details for types other than NEMA 250, Type 1.
   2. Current and voltage ratings.
   3. Short-circuit current ratings (interrupting and withstand, as appropriate).
   4. Include evidence of NRTL listing for series rating of installed devices.
   5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.
   1. Test procedures used.
   2. Test results that comply with requirements.
   3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

B. Manufacturer's field service report.
1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in “Operation and Maintenance Manual” O&M-1 City of Norfolk Department of Utilities Supplemental Specifications, include the following:

1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NFPA 70.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:

1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
2. Altitude: Not exceeding 6600 feet.

1.8 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
3. Square D; a brand of Schneider Electric.

B.

C. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

D. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Hookstick Handle: Allows use of a hookstick to operate the handle.
4. Lugs: Mechanical type, suitable for number, size, and conductor material.
5. Service-Rated Switches: Labeled for use as service equipment.

2.2 NONFUSIBLE SWITCHES

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following: Eaton Electrical Inc.; Cutler-Hammer Business Unit.
3. Square D; a brand of Schneider Electric.

B. Type HD, Heavy Duty, Single Throw, 240 or 600-V ac, as indicated, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Type HD, Heavy Duty, Double Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

D. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Hookstick Handle: Allows use of a hookstick to operate the handle.
4. Lugs: Mechanical type, suitable for number, size, and conductor material.

2.3 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
PART 3 - EXECUTION

3.1 EXAMINATION
A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION
A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
C. Comply with NECA 1.

3.3 IDENTIFICATION
A. Comply with requirements in Section 260553 "Identification for Electrical Systems."
   1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
   2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL
A. Acceptance Testing Preparation:
   1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
   2. Test continuity of each circuit.
B. Tests and Inspections:
   1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
   2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
C. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.
D. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.
END OF SECTION 262816
SECTION 262913 - ENCLOSED CONTROLLERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes the following enclosed controllers rated 600 V and less:
   1. Full-voltage manual.
   2. Full-voltage magnetic.

B. Related Section:
   1. Section AFD - “Adjustable Frequency Drives”, part of City of Norfolk, Department of Utilities Supplemental Specifications for general-purpose, ac, adjustable-frequency, pulse-width-modulated controllers for use on variable torque loads in ranges up to 200 hp.

1.2 DEFINITIONS

A. CPT: Control power transformer.

B. MCCB: Molded-case circuit breaker.

C. MCP: Motor circuit protector.

D. N.C.: Normally closed.

E. N.O.: Normally open.

F. OCPD: Overcurrent protective device.

G. SCR: Silicon-controlled rectifier.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of enclosed controller. Include manufacturer's technical data on features, performance, electrical characteristics, ratings, and enclosure types and finishes.

B. Shop Drawings: For each enclosed controller.
   1. Show tabulations of the following:
   2. Wiring Diagrams: For power, signal, and control wiring.
1.4 INFORMATIONAL SUBMITTALS
   A. Field quality-control reports.
   B. Load-Current and Overload-Relay Heater List: Compile after motors have been installed, and arrange to demonstrate that selection of heaters suits actual motor nameplate full-load currents.

1.5 CLOSEOUT SUBMITTALS
   A. Operation and Maintenance Data: For enclosed controllers to include in emergency, operation, and maintenance manuals. In addition to items specified in “Operation and Maintenance Manual” O&M-1 City of Norfolk Department of Utilities Supplemental Specifications, include the following:
      1. Routine maintenance requirements for enclosed controllers and installed components.

1.6 QUALITY ASSURANCE
   A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   B. Comply with NFPA 70.

1.7 DELIVERY, STORAGE, AND HANDLING
   A. Store enclosed controllers indoors in clean, dry space with uniform temperature to prevent condensation. Protect enclosed controllers from exposure to dirt, fumes, water, corrosive substances, and physical damage.

1.8 PROJECT CONDITIONS
   A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
      1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
      2. Altitude: Not exceeding 6600 feet.

1.9 COORDINATION
   A. Coordinate layout and installation of enclosed controllers with other construction including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
PART 2 - PRODUCTS

2.1 FULL-VOLTAGE CONTROLLERS

A. General Requirements for Full-Voltage Controllers: Comply with NEMA ICS 2, general purpose, Class A.

B. Fractional Horsepower Manual Controllers: "Quick-make, quick-break" toggle or push-button action; marked to show whether unit is off, on, or tripped.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
      d. Square D; a brand of Schneider Electric.

2. Configuration: Nonreversing.
3. Overload Relays: Inverse-time-current characteristics; NEMA ICS 2, Class 10 tripping characteristics; heaters matched to nameplate full-load current of actual protected motor; external reset push button; bimetallic type.
4. Surface mounting.
5. Red pilot light.

C. Magnetic Controllers: Full voltage, across the line, electrically held.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
   d. Square D; a brand of Schneider Electric.

2. Configuration: Nonreversing.
   a. Operating Voltage: Depending on contactor NEMA size and line-voltage rating, manufacturer's standard matching control power or line voltage.
4. Power Contacts: Totally enclosed, double-break, silver-cadmium oxide; assembled to allow inspection and replacement without disturbing line or load wiring.
5. Control Circuits: 120-V ac; obtained from integral CPT, with primary and secondary fuses of sufficient capacity to operate integral devices and remotely located pilot, indicating, and control devices.
   a. CPT Spare Capacity: 150 percent of connected burden.
6. Melting Alloy Overload Relays:
ENCLOSED CONTROLLERS

2.2 ENCLOSURES
A. Enclosed Controllers: NEMA ICS 6, to comply with environmental conditions at installed location.
   1. Other Wet or Damp Indoor Locations: Type 4.

2.3 ACCESSORIES
A. General Requirements for Control Circuit and Pilot Devices: NEMA ICS 5; factory installed in controller enclosure cover unless otherwise indicated.
      a. Push Buttons: Lockable types; momentary as indicated.
      b. Pilot Lights: Neon types; colors as indicated; push to test.
      c. Selector Switches: Rotary type.

B. Reversible N.C./N.O. auxiliary contact(s).

PART 3 - EXECUTION

3.1 EXAMINATION
A. Examine areas and surfaces to receive enclosed controllers, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
B. Examine enclosed controllers before installation. Reject enclosed controllers that are wet, moisture damaged, or mold damaged.
C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION
A. Wall-Mounted Controllers: Install enclosed controllers on walls with tops at uniform height unless otherwise indicated, and by bolting units to wall or mounting on lightweight structural-steel channels bolted to wall.
B. Install fuses in control circuits if not factory installed. Comply with requirements in Section 262813 "Fuses."
C. Install heaters in thermal overload relays. Select heaters based on actual nameplate full-load amperes after motors have been installed.

D. Comply with NECA 1.

3.3 IDENTIFICATION

A. Identify enclosed controllers, components, and control wiring. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved nameplate.

3.4 CONTROL WIRING INSTALLATION

A. Install wiring between enclosed controllers and remote devices. Comply with requirements in Section 260523 "Control-Voltage Electrical Power Cables."

B. Bundle, train, and support wiring in enclosures.

C. Connect selector switches and other automatic-control selection devices where applicable.

1. Connect selector switches to bypass only those manual- and automatic-control devices that have no safety functions when switch is in manual-control position.

3.5 FIELD QUALITY CONTROL

A. Acceptance Testing Preparation:

1. Test insulation resistance for each enclosed controller, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

B. Tests and Inspections:

1. Inspect controllers, wiring, components, connections, and equipment installation.
2. Test insulation resistance for each enclosed-controller element, component, connecting motor supply, feeder, and control circuits.
3. Test continuity of each circuit.
4. Verify that voltages at controller locations are within plus or minus 10 percent of motor nameplate rated voltages. If outside this range for any motor, notify Owner before starting the motor(s).
5. Test each motor for proper phase rotation.
7. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
C. Enclosed controllers will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports including a certified report that identifies enclosed controllers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.6 PROTECTION

A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions until enclosed controllers are ready to be energized and placed into service.

B. Replace controllers whose interiors have been exposed to water or other liquids prior to Substantial Completion.

3.7 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain enclosed controllers.

END OF SECTION 262913
SECTION 262920 - PUMP CONTROL PANEL WITH PLC

PART 1 - GENERAL

1.1 QUALITY ASSURANCE

A. Design Concept: The Drawings and Specifications for the Pump Control Panel with PLC specify the design of the Pump Control Panel, define the pump controls, operator interfaces and alarms, define the modes of operation, and various external system interfaces. They also specify other features and functions which are to be provided.

B. Related Sections:

1. Process Control System: Section 232520
2. Level Control System: Section 232520

1.2 REFERENCES

A. National Electric Manufacturer's Association (NEMA) Standards of Construction on specified Products.

B. Underwriter's Laboratories (UL) Listings and Approvals on specified Products.

1.3 SUBMITTALS

A. Pump Control Panel Product Data: submittals required for the following items:

1. Entire Pump Control Panel with contents
2. Main Circuit Breaker
3. Feeder Circuit Breakers
4. TVSS Unit
5. Power Monitors
6. Internal Branch Circuit Panel board
7. Logic and control circuit diagrams
8. PLC For Pump Control
9. Indicating Lights
10. Power Supplies
11. Relays
12. Contactors
13. Intrinsically safe relays
14. Intrinsically safe barriers
15. Contacts
16. Enclosures
17. Switches
18. Hand Selectors
19. Operator Pushbuttons
20. Flow Chart Recorder
21. Timers
22. Elapsed Time Meters

B. Equipment Parts List: Submit component manufacturing data sheets giving the following information:

1. Identifying each component by the item number.
2. Listing appropriate model numbers.
3. Indicating the individual component locations within the system.
4. Indicating the quantity required.

C. D. Shop Drawings: As specified by City of Norfolk supplemental specifications; shop drawings required for the following:

1. Device layout drawings showing dimensions, mounting and external connection details.
2. Integration wiring schematic indicating the PLC system components and the integration of the PLC with other equipments including motor starters, water level detectors, emergency diesel pump controls, automatic dialing equipment, telemetry equipment, and gas detector panel. Provide a complete description of system operation.

D. Maintenance Tools: Provide special tools, in duplicate, with the communication equipment. Provide these tools in a kit which contains special size wrenches and other types of tools, not normally available, which are necessary for assembling, disassembling, aligning and calibrating the equipment.

E. Operations and Maintenance Data:

1. In addition to operation and maintenance manual requirements requested by City of Norfolk supplemental specifications, provide system schematics which reflect any "as-built" modifications which will affect operations and maintenance. Also include such special maintenance requirements concerning calibration and test procedures of the Pump Control Panel Equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Basic Electrical Materials: Those Products such as conduit, wire-ways, wire and connectors, cable (other than that as specified in this Section), support devices, fasteners, and similar devices, as required for the Work of this Section are as specified in Division 26.

2.2 PROGRAMMABLE LOGIC CONTROLLER REQUIREMENTS

A. Programmable Logic Controller Requirements:

1. Provide pumping station system with an Allen-Bradley SLC-5/04 PLC. PLC shall have a communications card installed. The PLC shall be installed with a minimum of 2 spare
rack slots for future I/O modules. Provide as a minimum 30% spare I/O of each type as a percentage of total I/O available for use for each type.

2. Provide battery backup for PLC.
3. Provide a Local Operator Interface Station (LOI) which shall be an Allen-Bradley Panelview Plus 600 with keypad and connect to PLC as shown on the contract drawings.
4. The PLC components shall be provided by one supplier who shall provide equipment and appurtenances and shall be responsible to the Contractor for satisfactory operation of the entire systems. Substitutions on functions specified will not be accepted.
5. The PLC equipment provided under this Project must be completely compatible with the existing equipment in the existing facilities of the City of Norfolk.
6. The Contractor shall be responsible for all startup, programming, testing and integration services required to successfully integrate the PLC. This work shall include providing the field services of factory representatives as required.
7. Provide and mount push buttons, selector switches, relays, pilot lights and wire associated with the PLC and other Pump Control Panel functions as indicated in this and Related Specification Sections and on the Electrical and Instrumentation Drawings. Additional Pilot lights may be mounted per Pump Control Panel manufacturers recommendations where not specified in Specifications and on Drawings. Include all pushbuttons, selector switches, relays, wiring, pilot lights and annunciator lights shown on Electrical and Instrumentation Drawings.
8. Provide and install all additional control relays, intrinsically safe relays, intrinsically safe barriers required for a safe and functional system.

B. PLC Programming:

1. Provide programming software and all soft or hard keys associated with programming software.
2. The contractor shall be responsible for a finished working system at checkout that conforms to the sequence of operations as defined in the Specifications and Drawings. All system functionality shall be demonstrated in the presence of the Engineer for local and remote control.
3. The contractor shall program the Pump Control Panel PLC to perform all functions described in the Process Control System Specification, Section 232520.
4. The City has identified required alarms, status conditions, and monitored signals for transmission by the pump station Telemetry Equipment (Specification Section 272750) and an addressing system that is to be used for programming the Telemetry Equipment. A list of required alarms, status conditions, and monitored signals and the addressing system is summarized in Table 1 through Table 4, appended to the Telemetry Equipment Specification Section 272750. The PLC programming that is required as part of this contract shall be compatible with the addressing system identified by the City.
5. The PLC will provide to the Telemetry Equipment all applicable alarms, status conditions and monitored signals that are derived by and are contained within the Pump Control Panel PLC.

C. PLC Power Supply: The PLC’s power supply should be sized to accommodate a full rack of I/O. All I/O points, whether utilized or spare, shall be wired back to terminal blocks contained within the PLC panel. No direct wiring from field device to rack-mounted PLC modules is permitted. Inputs and outputs, at a minimum, shall be protected by fuses as shown on the drawings.
D. Operator Interface: The Local Operator Interface (LOI) functions and requirements are described in the Process Control System Specification Section 232520. The LOI shall provide the operator interface with the Pump Control System PLC.

2.3 PUMP CONTROL PANEL GENERAL REQUIREMENTS

A. In addition to the PLC and LOI, the Pump Control Panel shall include the following items:

1. Main Circuit Breaker with Auxiliary Contact.
2. Feeder Circuit Breakers with Auxiliary Contacts.
4. Freestanding Enclosure, NEMA 12, 60"x60"x12" Min, Hoffman A-606012 LP or approved equal.
5. All wiring, terminals, control relays, intrinsically safe relays, and intrinsically safe barriers.

PART 3 - EXECUTION

3.1 INSPECTION

A. Verify other construction work is complete to the extent that substrates on which electrical apparatus is to be installed is ready to receive same.

3.2 INSTALLATION

A. General: Install or mount the equipment of this Specification Section, at locations indicated, square and plumb with respect to visible structures lines, with power connections made, and with such equipment left in proper operating condition.

B. Methods of Wiring: Perform wiring as specified in Division 26.

C. Equipment Installation: Install PLC equipment as a completely integrated system complete with any required accessories (not specified herein or in the drawings) to insure the proper functioning of the entire system.

1. Do not apply any form of energy to any part of the system until the Contractor furnishes the Engineer with a certified statement of approval of the installation from the system supplier which specifically authorizes applying energy to the system.
2. Provide the supervisory service of a factory-trained serviceman (who is specifically trained on the types of equipment herein specified) for a minimum period of one 8-hour day for adjustment, calibration and startup of the equipment. The serviceman shall also provide a formal training class (4 hours minimum), in order to thoroughly instruct personnel in the basic operation and maintenance of the equipment. The formal training class shall not be conducted on the same day as the above-mentioned supervisory service.
3. The Contractor shall be responsible for all startup, programming, testing and integration services required to successfully integrate the new Pumping Station Control Panel and its accompanying PLC into the existing City Telemetry System.

3.3 FIELD QUALITY CONTROL

A. Refer to all Electrical Systems Tests:

END OF SECTION - 262920
SECTION 264113 - LIGHTNING PROTECTION FOR STRUCTURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes lightning protection for structures.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For air terminals and mounting accessories.
   1. Layout of the lightning protection system, along with details of the components to be used in the installation.
   2. Include indications for use of raceway, data on how concealment requirements will be met, and calculations required by NFPA 780 for bonding of grounded and isolated metal bodies.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer and manufacturer. Include data on listing or certification by UL.

B. Certification, signed by Contractor, that roof adhesive is approved by manufacturer of roofing material.

C. Field quality-control reports.

D. Comply with recommendations in NFPA 780, Annex D, "Inspection and Maintenance of Lightning Protection Systems," for maintenance of the lightning protection system.

E. Other Informational Submittals: Plans showing dimensioned as-built locations of grounding features, including the following:
   1. Ground rods.
   2. Ground loop conductor.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Certified by LPI as a Master Installer/Designer, trained and approved for installation of units required for this Project.

B. System Certificate:
1. UL Master Label.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 780, "Definitions" Article.

1.5 COORDINATION

A. Coordinate installation of lightning protection with installation of other building systems and components, including electrical wiring, supporting structures and building materials, metal bodies requiring bonding to lightning protection components, and building finishes.

B. Coordinate installation of air terminals attached to roof systems with roofing manufacturer and Installer.

C. Flashings of through-roof assemblies shall comply with roofing manufacturers' specifications.

PART 2 - PRODUCTS

2.1 LIGHTNING PROTECTION SYSTEM COMPONENTS

A. Comply with UL 96 and NFPA 780.

B. Roof-Mounted Air Terminals: NFPA 780, Class I, aluminum unless otherwise indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Harger.
   c. Robbins Lightning, Inc.
   d. Thompson Lightning Protection, Inc.

2. Air Terminals More than 24 Inches Long: With brace attached to the terminal at not less than half the height of the terminal.

C. Main and Bonding Conductors: Aluminum.

D. Ground Loop Conductor: Bare stranded tinned copper #2/0 AWG minimum.

E. Ground Rods: Copper-clad steel; 3/4 inch in diameter by 10 feet long.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install lightning protection components and systems according to UL 96A and NFPA 780.
B. Install conductors with direct paths from air terminals to ground connections. Avoid sharp bends.

C. Conceal the following conductors:
   1. System conductors.
   2. Down conductors.
   3. Interior conductors.
   4. Conductors within normal view of exterior locations at grade within 200 feet of building.

D. Cable Connections: Use crimped or bolted connections for all conductor splices and connections between conductors and other components. Use exothermic-welded connections in underground portions of the system.

E. Cable Connections: Use exothermic-welded connections for all conductor splices and connections between conductors and other components.

F. Bond extremities of vertical metal bodies exceeding 60 feet in length to lightning protection components.

G. Ground Loop: Install ground-level, potential equalization conductor and extend around the perimeter of structure.
   1. Bury ground ring not less than 24 inches from building foundation.
   2. Bond ground terminals to the ground loop.
   3. Bond grounded building systems to the ground loop conductor within 12 feet of grade level.

3.2 CORROSION PROTECTION

A. Do not combine materials that can form an electrolytic couple that will accelerate corrosion in the presence of moisture unless moisture is permanently excluded from junction of such materials.

B. Use conductors with protective coatings where conditions cause deterioration or corrosion of conductors.

3.3 FIELD QUALITY CONTROL

A. Notify Architect at least 48 hours in advance of inspection before concealing lightning protection components.

B. UL Inspection: Meet requirements to obtain a UL Master Label for system.

END OF SECTION 264113
SECTION 264313 - SURGE PROTECTION FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes field-mounted SPDs for low-voltage (120 to 600 V) power distribution and control equipment.

1.2 DEFINITIONS

A. Inominal: Nominal discharge current.
B. MCOV: Maximum continuous operating voltage.
C. Mode(s), also Modes of Protection: The pair of electrical connections where the VPR applies.
D. MOV: Metal-oxide varistor; an electronic component with a significant non-ohmic current-voltage characteristic.
E. OCPD: Overcurrent protective device.
F. SCCR: Short-circuit current rating.
G. SPD: Surge protective device.
H. VPR: Voltage protection rating.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
   2. Copy of UL Category Code VZCA certification, as a minimum, listing the tested values for VPRs, nominal ratings, MCOVs, type designations, OCPD requirements, model numbers, system voltages, and modes of protection.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.
B. Sample Warranty: For manufacturer's special warranty.
1.5 CLOSEOUT SUBMITTALS
   A. Maintenance Data: For SPDs to include in maintenance manuals.

1.6 WARRANTY
   A. Manufacturer's Warranty: Manufacturer agrees to replace or replace SPDs that fail in materials or workmanship within specified warranty period.
      1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL SPD REQUIREMENTS
   A. SPD with Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   B. Comply with NFPA 70.
   C. Comply with UL 1449, 3rd edition.
   D. MCOV of the SPD shall be the nominal system voltage.

2.2 SERVICE ENTRANCE SUPPRESSOR
   A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1. Eaton Corporation.
      2. Emerson Electric Co.
      3. Leviton Manufacturing Co., Inc.
   B. SPDs: Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 1449, Type I
      1. SPDs with the following features and accessories:
         a. Integral disconnect switch.
         b. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.
         c. Indicator light display for protection status.
   C. Comply with UL 1283.
D. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 480 kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.

E. Protection modes and UL 1449 VPR for grounded wye circuits with 480Y/277 V, three-phase, four-wire circuits shall not exceed the following:

1. Line to Neutral: 1200 V for 480Y/277 V.
2. Line to Ground: 1200 V for 480Y/277 V.
3. Neutral to Ground: 1200 V for 480Y/277 V.

F. SCCR: Equal or exceed 100 kA

G. Nominal Rating: 20 kA.

2.3 BRANCH CIRCUIT PANEL SUPPRESSORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Corporation.
2. Emerson Electric Co.
3. Leviton Manufacturing Co., Inc.

B. SPDs: Comply with UL 1449, Type 2.

1. Include LED indicator lights for power and protection status.
2. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.
3. Include Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status.

C. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 200 kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.

D. Comply with UL 1283.

E. Protection modes and UL 1449 VPR for 120/240, single-phase, three-wire circuits shall not exceed the following:

1. Line to Neutral: 700 V.
2. Line to Ground: 700 V.
3. Neutral to Ground: 700 V.

2.4 ENCLOSURES

A. Indoor Enclosures: NEMA 250, Type 1.
2.5 CONDUCTORS AND CABLES

A. Power Wiring: Same size as SPD leads, complying with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1.

B. Install an OCPD as required to comply with the UL listing of the SPD.

C. Install SPDs with conductors between suppressor and points of attachment as short and straight as possible, and adjust circuit-breaker positions to achieve shortest and straightest leads. Do not splice and extend SPD leads unless specifically permitted by manufacturer. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.

D. Use crimped connectors and splices only. Wire nuts are unacceptable.

E. Wiring:
   1. Power Wiring: Comply with wiring methods in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
   2. Controls: Comply with wiring methods in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.2 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative.
   1. Compare equipment nameplate data for compliance with Drawings and Specifications.
   2. Inspect anchorage, alignment, grounding, and clearances.
   3. Verify that electrical wiring installation complies with manufacturer's written installation requirements.

B. An SPD will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.3 STARTUP SERVICE

A. Complete startup checks according to manufacturer's written instructions.

B. Do not perform insulation-resistance tests of the distribution wiring equipment with SPDs installed. Disconnect SPDs before conducting insulation-resistance tests, and reconnect them immediately after the testing is over.
C. Energize SPDs after power system has been energized, stabilized, and tested.

3.4 DEMONSTRATION

A. Train Owner's maintenance personnel to operate and maintain SPDs.

END OF SECTION 264313
SECTION 265100 - INTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Interior lighting fixtures, lamps, and ballasts.
   2. Lighting fixture supports.

B. Related Sections:
   1. Section 260923 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.
   2. Section 262726 "Wiring Devices" for manual wall-box dimmers for incandescent lamps.

1.2 DEFINITIONS

A. BF: Ballast factor.

B. CCT: Correlated color temperature.

C. CRI: Color-rendering index.

D. LER: Luminaire efficacy rating.

E. Lumen: Measured output of lamp and luminaire, or both.

F. Luminaire: Complete lighting fixture, including ballast housing if provided.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:
   1. Physical description of lighting fixture including dimensions.
   2. Emergency lighting units including battery and charger.
   3. Ballast, including BF.
   5. Life, output (lumens, CCT, and CRI), and energy-efficiency data for lamps.
   6. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing & Calculation Guides, of each lighting fixture type. The adjustment factors shall be for lamps, ballasts, and accessories identical to those indicated for the lighting fixture as applied in this Project.
a. Testing Agency Certified Data: For indicated fixtures, photometric data shall be certified by a qualified independent testing agency. Photometric data for remaining fixtures shall be certified by manufacturer.

b. Manufacturer Certified Data: Photometric data shall be certified by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Installation instructions.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified agencies providing photometric data for lighting fixtures.

B. Field quality-control reports.

C. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: In addition to items specified in “Operation and Maintenance Manual” O&M-1 City of Norfolk Department of Utilities Supplemental Specifications, include the following:

1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps: 5 for every 100 of each type and rating installed. Furnish at least one of each type.

2. Ballasts: One of each type and rating installed.

3. Globes and Guards: One of each type and rating installed.

1.7 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910, complying with the IESNA Lighting Measurements Testing & Calculation Guides.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NFPA 70.
D. FM Global Compliance: Lighting fixtures for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

1.8 COORDINATION

A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide product indicated on Drawings or approved equal. Products shall be similar in size, energy usage, photometric performance, quality of materials and ratings.

2.2 GENERAL REQUIREMENTS FOR LIGHTING FIXTURES AND COMPONENTS

A. Fluorescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5 and NEMA LE 5A as applicable.

B. Metal Parts: Free of burrs and sharp corners and edges.

C. Sheet Metal Components: Steel unless otherwise indicated. Form and support to prevent warping and sagging.

D. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

E. Diffusers and Globes:

1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
   a. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.
   b. UV stabilized.

2. Glass: Annealed crystal glass unless otherwise indicated.

F. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps and ballasts. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

1. Label shall include the following lamp and ballast characteristics:
a. "USE ONLY" and include specific lamp type.
b. Lamp diameter code (T-4, T-5, T-8, T-12, etc.), tube configuration (twin, quad, triple, etc.), base type, and nominal wattage for fluorescent and compact fluorescent luminaires.
c. Start type (preheat, rapid start, instant start, etc.) for fluorescent and compact fluorescent luminaires.
d. CCT and CRI for all luminaires.

2.3 BALLASTS FOR LINEAR FLUORESCENT LAMPS

A. General Requirements for Electronic Ballasts:
   1. Comply with UL 935 and with ANSI C82.11.
   2. Designed for type and quantity of lamps served.
   3. Ballasts shall be designed for full light output unless another BF, dimmer, or bi-level control is indicated.
   4. Sound Rating: Class A.
   5. Total Harmonic Distortion Rating: Less than 20 percent.
   6. Transient Voltage Protection: IEEE C62.41.1 and IEEE C62.41.2, Category A or better.
   7. Operating Frequency: 42 kHz or higher.
   8. Lamp Current Crest Factor: 1.7 or less.
   9. BF: 0.88 or higher.
   10. Power Factor: 0.95 or higher.
   11. Parallel Lamp Circuits: Multiple lamp ballasts shall comply with ANSI C82.11 and shall be connected to maintain full light output on surviving lamps if one or more lamps fail.

B. Luminaires controlled by occupancy sensors shall have programmed-start ballasts.

C. Electronic Programmed-Start Ballasts for T8 Lamps: Comply with ANSI C82.11 and the following:
   1. Lamp end-of-life detection and shutdown circuit for T5 diameter lamps.
   2. Automatic lamp starting after lamp replacement.

D. Ballasts for Low-Temperature Environments:
   1. Temperatures 0 Deg F and Higher: Electronic type rated for 0 deg F starting and operating temperature with indicated lamp types.

2.4 BALLASTS FOR COMPACT FLUORESCENT LAMPS

A. Description: Electronic-programmed rapid-start type, complying with UL 935 and with ANSI C 82.11, designed for type and quantity of lamps indicated. Ballast shall be designed for full light output unless dimmer or bi-level control is indicated:
   1. Lamp end-of-life detection and shutdown circuit.
   2. Automatic lamp starting after lamp replacement.
   3. Sound Rating: Class A.
   4. Total Harmonic Distortion Rating: Less than 20 percent.
   5. Transient Voltage Protection: IEEE C62.41.1 and IEEE C62.41.2, Category A or better.
6. Operating Frequency: 20 kHz or higher.
7. Lamp Current Crest Factor: 1.7 or less.
8. BF: 0.95 or higher unless otherwise indicated.
9. Power Factor: 0.95 or higher.

2.5 FLUORESCENT LAMPS

A. T8 rapid-start lamps, rated 32 W maximum, nominal length of 48 inches, 2800 initial lumens (minimum), CRI 75 (minimum), color temperature 3500 K, and average rated life 20,000 hours unless otherwise indicated.

B. Compact Fluorescent Lamps: 4-Pin, CRI 80 (minimum), color temperature 3500 K, average rated life of 10,000 hours at three hours operation per start unless otherwise indicated.

1. 13 W: T4, double or triple tube, rated 900 initial lumens (minimum).
2. 18 W: T4, double or triple tube, rated 1200 initial lumens (minimum).
3. 26 W: T4, double or triple tube, rated 1800 initial lumens (minimum).
4. 32 W: T4, triple tube, rated 2400 initial lumens (minimum).
5. 42 W: T4, triple tube, rated 3200 initial lumens (minimum).

2.6 LIGHTING FIXTURE SUPPORT COMPONENTS

A. Comply with Section 260529 "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Lighting fixtures:

1. Set level, plumb, and square with ceilings and walls unless otherwise indicated.
2. Install lamps in each luminaire.

B. Suspended Lighting Fixture Support:

1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.
4. Do not use grid as support for pendant luminaires. Connect support wires or rods to building structure.
3.2 IDENTIFICATION

   A. Install labels with panel and circuit numbers on concealed junction and outlet boxes. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.3 FIELD QUALITY CONTROL

   A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.

   B. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.4 STARTUP SERVICE

   A. Burn-in all lamps that require specific aging period to operate properly, prior to occupancy by Owner.

END OF SECTION 265100
Division 27 – Communications
SECTION 272750 - TELEMETRY EQUIPMENT

PART 1 - GENERAL

1.1 QUALITY ASSURANCE

A. Products for, and the execution of, the work of this Section shall satisfy the applicable requirements and regulations of the City of Norfolk Department of Utilities (City) Supervised Control and Data Acquisition (SCADA) System.

1.2 TELEMETRY REQUIREMENTS

A. Wastewater Pumping Stations:

1. The Contractor shall furnish new GE MDS entraNet 900 MHZ radio Subscriber unit, PLC, GE ClearWave Antenna, antenna, cables and enclosure. Items in this Section, Telemetry Equipment, are to be purchased by the Contractor and delivered to the City, 1316 Ballentine Boulevard, Norfolk, VA 23504. The SCADA PLC materials and equipment will be installed by the City.

2. The Contractor shall provide detailed submittals with equipment model numbers, terminals, and wiring information as required by this Specification Section and shown in lists 1 and 3.

3. The Contractor shall provide all wiring and interface of signals as shown in the Lists 1 through 3 as appended to this Specification Section.

4. Coordinate mounting elevations and location of all transducers and floats with City.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Radio Materials and Equipment: The Contractor shall provide the materials and equipment including wire and cable as illustrated in lists 1 and 3.

B. Contractor Provided Materials and Equipment:

1. Basic Electrical Materials: Conduit, electrical wire and cable, support devices and fasteners.

2. NEMA 4 Aluminum Single Door Enclosure, 36"X36"X8"

3. Radio communication equipment: GE MDS entraNet 900 MHZ Subscriber unit or approved equal.

4. Lightning surge protector: As shown in List 1.

5. 120 volt electrical power to communication equipment enclosure.
6. PLC equipment will be sole-sourced from National Instruments due to the necessity to maintain the integrity and operation of existing installed components of the entire City Wastewater SCADA system. This equipment as shown in List 1 will be provided by the Contractor, including the NEMA-4 cabinet, for the wastewater pump station.

List 1

<table>
<thead>
<tr>
<th>Item Description</th>
<th>EA</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>NI cFP-2120 Network Module</td>
<td>EA 1</td>
<td>National Instruments</td>
</tr>
<tr>
<td>NI cFP-Backplane 4-Slot</td>
<td>EA 1</td>
<td>National Instruments</td>
</tr>
<tr>
<td>NI cFP-AIO-600 Module</td>
<td>EA 1</td>
<td>National Instruments</td>
</tr>
<tr>
<td>NI cFP-DI-301 Module</td>
<td>EA 1</td>
<td>National Instruments</td>
</tr>
<tr>
<td>NI cFP-CB-1 Connector Block</td>
<td>EA 2</td>
<td>National Instruments</td>
</tr>
<tr>
<td>NI cFP Blank Slot, 778625-01</td>
<td>EA 2</td>
<td>National Instruments</td>
</tr>
<tr>
<td>NI cFP DIN Rail Mount,745557-03</td>
<td>EA 1</td>
<td>National Instruments</td>
</tr>
<tr>
<td>NI PS-15 Power Supply</td>
<td>EA 1</td>
<td>National Instruments</td>
</tr>
<tr>
<td>Controller: Dual pump, 4-20 mA DC</td>
<td>EA 1</td>
<td>Mercoid Pump Controller- MPC</td>
</tr>
<tr>
<td>Transducer Submersible 10 PSI</td>
<td>EA 1</td>
<td>Blue Ribbon Bird Cage BC-10-40,</td>
</tr>
<tr>
<td>Surge Arrestor: gas tube, 0-2500mhz</td>
<td>EA 1</td>
<td>Andrew APG-BNFNF-090 Order</td>
</tr>
<tr>
<td>Enclosure 36”x36”x8” NEMA 4</td>
<td>EA 1</td>
<td>Austin-Aluminum w/lock hasp &amp;</td>
</tr>
<tr>
<td>MDS entraNet 900mhz Radio Remote Kit</td>
<td>EA 1</td>
<td>GE-MDS entraNet 900mhz-</td>
</tr>
<tr>
<td>Uninterruptible Power Supply</td>
<td>EA 1</td>
<td>Eaton Powerware-PW5110-1500</td>
</tr>
<tr>
<td>Float Ball</td>
<td>EA 2</td>
<td>MICRO SEPTIC 2903-B1-S1-25</td>
</tr>
<tr>
<td>FM Pressure Transmitter</td>
<td>EA 1</td>
<td>Dwyer Model 626-09GH-P1-E6-</td>
</tr>
</tbody>
</table>

7. Antenna Pole- The antenna pole, foundation and conduit from the SCADA enclosure to the antenna pole shall be:

a. Round, tapered aluminum with alloy shoe base with aluminum alloy bolt covers or base cover.
b. Shall have a hand hole 18 inches above the base foundation.
c. Shall range in height 20 feet to 35 feet.
d. Anchor bolts shall be per ASTM A576 and hot dip galvanized.
e. The antenna pole shall be catalog number RTA8L35AA as manufactured by Cooper lighting, or an approved equal.
f. The antenna and antenna pole position on the wastewater pump station site will be determined by an empirical field test conducted the City. NOTE: The antenna position shown on the plans is for information only and may/will change as a result of the empirical field test performed by the City.
g. Shall be furnished and installed by the pump station Contractor.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The Contractor shall provide and install all SCADA support materials and equipment including conduit and wire to in-out origination points, wet well float and level transmitters as shown on plans, antenna conduit and cable, and antenna and foundation as shown on the plans and as located by the empirical field test conducted the City. NOTE: Antenna location as shown on the plans is for information only and the location may/will change as a result of the empirical field test.

B. The City has identified required alarms, status conditions, and monitored signals for transmission by the Telemetry Equipment and an addressing system that is to be used for programming the SCADA equipment. A list of required alarms, status conditions, and monitored signals and the addressing system is summarized in List 2, appended to this specification. The PLC programming that is required as part of this contract shall be performed by the City.

1. The run signals from the pump station controller shall be call-to-run ahead of anything which disables the pump, i.e., over temperature, seal failure, etc.

List 2

<table>
<thead>
<tr>
<th>Description</th>
<th>Status</th>
<th>Origination Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump 1 Run</td>
<td>Call to Run/Stop</td>
<td>Controller</td>
</tr>
<tr>
<td>Pump 2 Run</td>
<td>Call to Run/Stop</td>
<td>Controller</td>
</tr>
<tr>
<td>Power Fail</td>
<td>Normal/Fail</td>
<td>Phase Monitor</td>
</tr>
<tr>
<td>Fixed Bypass Pump Run</td>
<td>Run/Stop</td>
<td>Fixed Bypass Pump</td>
</tr>
<tr>
<td>Backup Wet Well High</td>
<td>High/Normal</td>
<td>Float Placed in Wet Well</td>
</tr>
<tr>
<td>(Float)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drywell Float</td>
<td>High/Normal</td>
<td>Float Placed in Dry Well</td>
</tr>
<tr>
<td>Authorized Entry key</td>
<td></td>
<td>Door</td>
</tr>
<tr>
<td>Door Switch</td>
<td></td>
<td>Door</td>
</tr>
</tbody>
</table>
Analog Inputs

<table>
<thead>
<tr>
<th>Description</th>
<th>Status</th>
<th>Origination Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wet Well Level</td>
<td>4-20 mA</td>
<td>Level Transducer in wet well</td>
</tr>
<tr>
<td>Force Main Pressure</td>
<td>4-20 mA</td>
<td>Dry well Riser Pressure Transmitter (2)</td>
</tr>
</tbody>
</table>

C. The City has identified a secondary (back-up) telemetry of required alarms of monitored signals for transmission. Items in List 3 are to be provided by the Contractor and delivered to the City at 1316 Ballentine Boulevard, Norfolk, VA 23504. The programming that is required as part of this contract shall be performed by the City.

List 3

<table>
<thead>
<tr>
<th>Description</th>
<th>Qty</th>
<th>Origin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Com1000-E Simple COMM Tools Internet Appliance</td>
<td>EA 1</td>
<td>Simple COMM Tools</td>
</tr>
<tr>
<td>2.4 Ghz In line Arrestor LABH2400NN</td>
<td>EA 1</td>
<td>TESSCO</td>
</tr>
<tr>
<td>Cell/PCS Phantom Antenna BK TRAB821/18503P</td>
<td>EA 1</td>
<td>TESSCO</td>
</tr>
<tr>
<td>In Line Mounting Bracket</td>
<td>EA 2</td>
<td>TESSCO</td>
</tr>
<tr>
<td>DC 100 Alarm Interface Board</td>
<td>EA 1</td>
<td>Dominion Controls-Ireland Electric Co.</td>
</tr>
<tr>
<td>Sierra Wireless Airlink LS300</td>
<td>EA 1</td>
<td>Verizon Wireless</td>
</tr>
<tr>
<td>Sierra Wireless Airlink Bracket</td>
<td>EA 1</td>
<td>Sierra Wireless</td>
</tr>
<tr>
<td>STA-4112C Stancor power supply</td>
<td>EA 2</td>
<td>Stancor</td>
</tr>
<tr>
<td>6’ Dual Fitting Shielded Serial cable with DB9 male to DB9 female connectors</td>
<td>EA 1</td>
<td>TESSCO</td>
</tr>
<tr>
<td>UPS Eaton Powerware PW5110-1500</td>
<td>EA 1</td>
<td>Eaton- Powerware</td>
</tr>
<tr>
<td>Float Balls MICRO SEPTIC 2903-B1-S1-25</td>
<td>EA 2</td>
<td>VAMAC (Explosion Proof, Class I, Div. 1)</td>
</tr>
<tr>
<td>3’ Dual Fitting RG Cable: RG58 Coax cable, 1@ N Male-RG58/141/142 RFX and 1@ TNC Male Crimp RG58</td>
<td>EA 1</td>
<td>TESSCO</td>
</tr>
<tr>
<td>3” Dual Fitting Cable: RG 58 Coax cable with 2@ N Male-RG 58/141/142 RFX</td>
<td>EA 1</td>
<td>TESSCO</td>
</tr>
<tr>
<td>2 x 4 Handi Box-cast</td>
<td>EA 1</td>
<td>Leviton, or approved equal</td>
</tr>
<tr>
<td>15Amp 125V Ivory duplex receptacle</td>
<td>EA 1</td>
<td>Leviton, or approved equal</td>
</tr>
<tr>
<td>Ivory Duplex Receptacle cover</td>
<td>EA 1</td>
<td>Leviton, or approved equal</td>
</tr>
</tbody>
</table>

END OF SECTION 272750
Division 31 - Earthwork
SECTION 312000 - EARTH MOVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Preparing subgrades for slabs-on-grade, pavements turf and grasses.
   2. Excavating and backfilling for buildings and structures.
   3. Drainage course for concrete slabs-on-grade.
   4. Subbase course for concrete pavements.
   5. Excavating and backfilling trenches for utilities and pits for buried utility structures.
   6. Refer to HRPDC section 303 for earthwork related to pipe installation.

B. Related Sections:
   1. Section 312319 "Dewatering" for lowering and disposing of ground water during construction.
   2. Section 315000 "Excavation Support and Protection" for shoring, bracing, and sheet piling of excavations.

1.2 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.
   1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
   2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
   1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Inspector. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices.
   2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.
   3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Inspector. Unauthorized excavation, as well as remedial work directed by Inspector, shall be without additional compensation.
F. Fill: Soil materials used to raise existing grades.

G. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

H. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

I. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

J. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of the following manufactured products required:
   1. Geotextiles.
   2. Warning tapes.

B. Samples for Verification: For the following products, in sizes indicated below:
   2. Warning Tape: 12 inches long; of each color.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:
   1. Classification according to ASTM D 2487.
   2. Laboratory compaction curve according to ASTM D 698.

1.5 QUALITY ASSURANCE

A. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E 329 and ASTM D 3740 for testing indicated.

B. Preexcavation Conference: Conduct conference at Project site.
1.6 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth moving operations.
   1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
   2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
   1. Do not proceed with work on adjoining property until directed by Inspector.

C. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth moving operations.

D. Do not commence earth moving operations until temporary erosion- and sedimentation-control measures are in place.

E. Do not commence earth moving operations until plant-protection measures specified are in place.

F. The following practices are prohibited within protection zones:
   1. Storage of construction materials, debris, or excavated material.
   2. Parking vehicles or equipment.
   3. Foot traffic.
   4. Erection of sheds or structures.
   5. Impoundment of water.
   6. Excavation or other digging unless otherwise indicated.
   7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

G. Do not direct vehicle or equipment exhaust towards protection zones.

H. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.
   1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a (1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.

F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

H. Drainage Course: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.

I. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and 0 to 5 percent passing a No. 4 sieve.

J. Sand: ASTM C 33; fine aggregate.

K. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.2 GEOTEXTILES

A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

   1. Survivability: Class 2; AASHTO M 288.
   2. Grab Tensile Strength: 200 lbf; ASTM D 4632.
   3. Tear Strength: 75 lbf; ASTM D 4533.
   4. Puncture Strength: 90 lbf; ASTM D 4833.
   5. Apparent Opening Size: No. 50 sieve, maximum; ASTM D 4751.
   6. Permittivity: 0.5 per second, minimum; ASTM D 4491.
7. UV Stability: 70 percent after 500 hours' exposure; ASTM D 4355.

2.3 ACCESSORIES

A. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:

2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.

B. Soil Erosion Control: perform soil erosion control work in accordance with requirements of HRPDC section 303 – Earth and the contract documents.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.3 EXPLOSIVES

A. Explosives: Do not use explosives.
3.4 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.5 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.

2. Pile Foundations: Stop excavations 6 to 12 inches above bottom of pile cap before piles are placed. After piles have been driven, remove loose and displaced material. Excavate to final grade, leaving solid base to receive concrete pile caps.

3. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.

B. Excavations at Edges of Tree- and Plant-Protection Zones:

1. Excavate by hand to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.

2. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.6 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.7 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches per HRPDC section 303 for Earthwork related to pipe installation.

3.8 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation.
1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

3.9 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.10 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for Record Documents.
3. Testing and inspecting underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring and bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.11 UTILITY TRENCH BACKFILL

A. Shall be accomplished per HRPDC Section 303 for Earthwork.

3.12 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use satisfactory soil material.
2. Under walks and pavements, use satisfactory soil material.
3. Under steps and ramps, use engineered fill.
4. Under building slabs, use engineered fill.
5. Under footings and foundations, use engineered fill.

C. Place soil fill on subgrades free of mud, frost, snow, or ice.
3.13 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.14 COMPACTING OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698:

1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.
2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 92 percent.
3. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 85 percent.

3.15 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

1. Walks: Plus or minus 1 inch.

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.
3.16 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:

1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
2. Determine that fill material and maximum lift thickness comply with requirements.
3. Determine, at the required frequency, that in-place density of compacted fill complies with requirements.

B. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.

C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

D. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.

E. Testing agency will test compaction of soils in place according to ASTM D1556, ASTM D2167, ASTM D2922, and ASTM D2937, as applicable. Tests will be performed at the following locations and frequencies:

1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 1000 sq. ft. or less of paved area or building slab, but in no case fewer than three tests.
2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for every 50 feet or less of wall length, but no fewer than two tests.
3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet or less of trench length, but no fewer than two tests.

F. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.17 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.
C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.18 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 312000
SECTION 312319 - DEWATERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes construction dewatering.

B. Related Requirements:
   1. Section 312000 "Earth Moving" for excavating, backfilling, site grading, and controlling surface-water runoff and ponding.

1.3 ALLOWANCES

A. Dewatering observation wells are part of dewatering allowance.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Verify availability of Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   2. Review condition of site to be dewatered including coordination with temporary erosion-control measures and temporary controls and protections.
   3. Review geotechnical report.
   4. Review proposed site clearing and excavations.
   5. Review existing utilities and subsurface conditions.
   6. Review observation and monitoring of dewatering system.

1.5 ACTION SUBMITTALS

A. Shop Drawings: For dewatering system, prepared by or under the supervision of a qualified professional engineer.
   1. Include plans, elevations, sections, and details.
   2. Show arrangement, locations, and details of wells and well points; locations of risers, headers, filters, pumps, power units, and discharge lines; and means of discharge, control of sediment, and disposal of water.
3. Include layouts of piezometers and flow-measuring devices for monitoring performance of dewatering system.
4. Include written plan for dewatering operations including sequence of well and well-point placement coordinated with excavation shoring and bracings and control procedures to be adopted if dewatering problems arise.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer land surveyor and professional engineer.
B. Field quality-control reports.
C. Record Drawings: Identify locations and depths of capped wells and well points and other abandoned-in-place dewatering equipment.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer that has specialized in design of dewatering systems and dewatering work.

1.8 FIELD CONDITIONS

A. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of a geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by a geotechnical engineer. Owner is not responsible for interpretations or conclusions drawn from this data.
1. Make additional test borings and conduct other exploratory operations necessary for dewatering according to the performance requirements.
2. The geotechnical report is included elsewhere in Project Manual.
B. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.
1. Design dewatering system, including comprehensive engineering analysis by a qualified professional engineer.
2. Continuously monitor and maintain dewatering operations to ensure erosion control, stability of excavations and constructed slopes, prevention of flooding in excavation, and prevention of damage to subgrades and permanent structures.

3. Prevent surface water from entering excavations by grading, dikes, or other means.

4. Accomplish dewatering without damaging existing buildings, structures, and site improvements adjacent to excavation.

5. Remove dewatering system when no longer required for construction.

B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning dewatering. Comply with water- and debris-disposal regulations of authorities having jurisdiction.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by dewatering operations.

1. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding site or surrounding area.

2. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.

B. Install dewatering system to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

C. Provide temporary grading to facilitate dewatering and control of surface water.

D. Protect and maintain temporary erosion and sedimentation controls, during dewatering operations.

3.2 INSTALLATION

A. Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.

1. Space well points or wells at intervals required to provide sufficient dewatering.

2. Use filters or other means to prevent pumping of fine sands or silts from the subsurface.
B. Place dewatering system into operation to lower water to specified levels before excavating below ground-water level.

C. Provide sumps, sedimentation tanks, and other flow-control devices as required by authorities having jurisdiction.

D. Provide standby equipment on-site, installed and available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails.

3.3 OPERATION

A. Operate system continuously until drains, sewers, and structures have been constructed and fill materials have been placed or until dewatering is no longer required.

B. Operate system to lower and control ground water to permit excavation, construction of structures, and placement of fill materials on dry subgrades. Drain water-bearing strata above and below bottom of foundations, drains, sewers, and other excavations.

1. Do not permit open-sump pumping that leads to loss of fines, soil piping, subgrade softening, and slope instability.
2. Reduce hydrostatic head in water-bearing strata below subgrade elevations of foundations, drains, sewers, and other excavations.

C. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water and sediment in a manner that avoids inconvenience to others.

D. Remove dewatering system from Project site on completion of dewatering. Plug or fill well holes with sand.

3.4 FIELD QUALITY CONTROL

A. Observation Wells: Provide observation wells or piezometers, take measurements, and maintain at least the minimum number indicated; additional observation wells may be required by authorities having jurisdiction.

1. Observe and record daily elevation of ground water and piezometric water levels in observation wells.
2. Repair or replace, within 24 hours, observation wells that become inactive, damaged, or destroyed. In areas where observation wells are not functioning properly, suspend construction activities until reliable observations can be made. Add or remove water from observation-well risers to demonstrate that observation wells are functioning properly.
3. Fill observation wells, remove piezometers, and fill holes when dewatering is completed.

B. Survey-Work Benchmarks: Resurvey benchmarks regularly during dewatering and maintain an accurate log of surveyed elevations for comparison with original elevations. Promptly notify Architect if changes in elevations occur or if cracks, sags, or other damage is evident in adjacent construction.
C. Provide continual observation to ensure that subsurface soils are not being removed by the dewatering operation.

D. Prepare reports of observations.

3.5 PROTECTION

A. Protect and maintain dewatering system during dewatering operations.

B. Promptly repair damages to adjacent facilities caused by dewatering.

END OF SECTION 312319
SECTION 315000 - EXCAVATION SUPPORT AND PROTECTION

PART 1 - GENERAL

1.1 SUMMARY
A. Section includes temporary excavation support and protection systems.

1.2 PREINSTALLATION MEETINGS
A. Preinstallation Conference: Conduct conference at Project site.

1.3 INFORMATIONAL SUBMITTALS
A. Contractor Calculations: For excavation support and protection system. Include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
B. Record Drawings: Identify locations and depths of capped utilities, abandoned-in-place support and protection systems, and other subsurface structural, electrical, or mechanical conditions.

1.4 FIELD CONDITIONS
A. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS
A. Provide, design, monitor, and maintain excavation support and protection system capable of supporting excavation sidewalls and of resisting earth and hydrostatic pressures and superimposed and construction loads.
1. Design excavation support and protection system, including comprehensive engineering analysis by a qualified professional engineer.
3.1 SOLDIER PILES AND LAGGING

A. Install steel soldier piles before starting excavation. Extend soldier piles below excavation grade level to depths adequate to prevent lateral movement. Space soldier piles at regular intervals not to exceed allowable flexural strength of wood lagging. Accurately align exposed faces of flanges to vary not more than 2 inches from a horizontal line and not more than 1:120 out of vertical alignment.

B. Install wood lagging within flanges of soldier piles as excavation proceeds. Trim excavation as required to install lagging. Fill voids behind lagging with soil, and compact.

C. Install wales horizontally at locations indicated on Drawings and secure to soldier piles.

3.2 SHEET PILING

A. Before starting excavation, install one-piece sheet piling lengths and tightly interlock vertical edges to form a continuous barrier.

B. Accurately place the piling, using templates and guide frames unless otherwise recommended in writing by the sheet piling manufacturer. Limit vertical offset of adjacent sheet piling to 60 inches. Accurately align exposed faces of sheet piling to vary not more than 2 inches from a horizontal line and not more than 1:120 out of vertical alignment.

C. Cut tops of sheet piling to uniform elevation at top of excavation.

3.3 TIEBACKS

A. Drill, install, grout, and tension tiebacks.

B. Test load-carrying capacity of each tieback and replace and retest deficient tiebacks.

1. Have test loading observed by a qualified professional engineer responsible for design of excavation support and protection system.

C. Maintain tiebacks in place until permanent construction is able to withstand lateral earth and hydrostatic pressures.

3.4 BRACING

A. Bracing: Locate bracing to clear walls, floor framing construction, and other permanent work. If necessary to move brace, install new bracing before removing original brace.

1. Do not place bracing where it will be cast into or included in permanent concrete work unless otherwise approved by Engineer.

2. Install internal bracing if required to prevent spreading or distortion of braced frames.
3. Maintain bracing until structural elements are supported by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.

3.5 FIELD QUALITY CONTROL

A. Survey-Work Benchmarks: Resurvey benchmarks regularly during installation of excavation support and protection systems, excavation progress, and for as long as excavation remains open. Maintain an accurate log of surveyed elevations and positions for comparison with original elevations and positions. Promptly notify Engineer if changes in elevations or positions occur or if cracks, sags, or other damage is evident in adjacent construction.

3.6 REMOVAL AND REPAIRS

A. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and earth and hydrostatic pressures. Remove in stages to avoid disturbing underlying soils and rock or damaging structures, pavements, facilities, and utilities.

1. Remove excavation support and protection systems to a minimum depth of 48 inches below overlying construction and abandon remainder.

END OF SECTION 315000