ROANOKE

P R O J E C T M A N U A L

ROANOKE CITY PARK IMPROVEMENTS- HUFF LANE AND FISHBURN PARKS
ROANOKE, VIRGINIA

Invitation to Bid No. 16-02-04

Issue Date: August 21, 2015
Opening Date: September 11, 2015

Issued By:

Purchasing Division
Monica Cole, Senior Buyer
215 Church Avenue, S.W., Room 202
Roanoke, Virginia 24011
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CITY OF ROANOKE, VIRGINIA

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ROANOKE CITY PARK IMPROVEMENTS-HUFF LANE AND FISHBURN PARKS

ROANOKE, VIRGINIA

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INVITATION TO BID

CITY OF ROANOKE, VIRGINIA

Sealed Bids for:

ROANOKE CITY PARK IMPROVEMENTS-HUFF LANE AND FISHBURN PARKS

ROANOKE, VIRGINIA

This project is generally described as the construction of Park Improvements at two park locations. Huff Lane and Fishburn Parks will receive new toilet structures and pavilions. The projects will include utility connections, sidewalks and minor earthwork. Work at Fishburn Park may include demolition of existing facilities.

INVITATION TO BID NO. 16-02-04

Sealed bids will be received by the City of Roanoke by Monica Cole, Senior Buyer, Purchasing Division, Noel C. Taylor Municipal Building, 215 Church Avenue, S.W., Room 202, Roanoke, Virginia 24011, at or before 2:00 p.m., local time, on September 11, 2015, at which time all bids received will be publicly opened and read. Bids received after 2:00 p.m. will not be accepted or considered. The time of receipt shall be determined by the time clock stamp in the Purchasing Office, or if it is not working, such time shall be determined by the Purchasing official who is to open the bids. This project is generally described as set forth above.

The Instructions to Bidders, plans, specifications, the Contract, and other Contract Documents are incorporated herein by reference. Copies of these items may be examined during business hours in the Purchasing Division, Noel C. Taylor Municipal Building, 215 Church Avenue, S.W., Room 202, Roanoke, Virginia 24011 (Phone: 540-853-2871). Bidders are cautioned to review bid documents thoroughly before submitting a bid. Copies of the documents may be downloaded from the City Vendor Self Service website at https://VSS.roanoke.gov. The City will not be responsible for documents obtained from any other source.

All Contract Documents prepared and/or furnished by the City shall be the exclusive property of the City of Roanoke, Virginia, and shall not be used for any other project(s).

Each bidder is solely responsible for ensuring that such bidder has the current complete version of the Bid Documents prepared for the project, including any addenda issued by the City, before submitting a bid.

A non-mandatory pre-bid conference will be conducted on September 3, 2015, at 10:00 a.m., local time, at 215 Church Avenue, SW, Room 350, Roanoke, Virginia 24011, in the Engineering Conference Room. It is strongly recommended that Bidders attend this conference.

Bidders and all subcontractors are required to comply with all applicable city, state, and federal laws, ordinances, and regulations; and are required to be properly licensed under Sections 54.1-1100, et seq., Code of Virginia (1950), as amended. Bidders shall deposit with their bid a Bid Security executed in the amount and form stipulated in the Instructions to Bidders.

The City expressly reserves the right to cancel this ITB and/or reject any or all bids, to waive any informality or irregularity in the bids received, and to accept a bid from the lowest responsive and responsible bidder which is deemed to be in the best interest of the City.

If an award of a contract is made, notice of the award, or the announcement of the decision to award, will be made by posting a notice of such award or announcement in the foyer area of the second floor of the Noel C. Taylor Municipal Building at 215 Church Avenue, S.W., Roanoke, Virginia 24011.

To determine the lowest responsive and responsible bidder who may be awarded a Contract for the Work, the criteria set forth in or requested pursuant to the Instructions to Bidders or in the Bid Documents may be considered.

By submitting a bid, each bidder agrees that this is a solicitation of bids and each bidder agrees to be solely responsible for the cost or expense of its bid and the City shall have no responsibility for such costs or expenses.

Direct contact with any City employee, City consultant/architect, without the expressed permission of the Purchasing Manager, or her designated representative, on the subject of this solicitation is strictly forbidden. Violation of this instruction may result in disqualification of bid.

If a certain brand, make, item or manufacturer is specifically and exclusively required or called for in the plans, specifications, or other contract documents, then that brand, make, item, or manufacturer shall be used unless otherwise agreed to by the City, in its sole discretion.

If the bid by the lowest responsive and responsible bidder exceeds available funds, the City reserves the right to negotiate with the apparent low bidder pursuant to Section 2.2-4318 of the Code of Virginia. The conditions and procedures under which such negotiation may be undertaken are set forth in Section 2.2-4318, and Section 14.3 of Instructions to Bidders. Any such negotiated Contract shall be subject to final approval by the City in its sole discretion.

Bids may not be withdrawn for a period of sixty (60) calendar days after the opening of bids unless the bid is substantially lower than the other bids because of a clerical error as defined in Section 2.2 - 4330, of the Code of Virginia (1950), as amended. Pursuant to Section 2.2 - 4330 (A)(i), the bidder shall give notice in writing and shall submit the original work papers with such notice to the City of its claim of right to withdraw the bid within two (2) business days after the opening of bids.

The Successful Bidder shall comply with the Code of Virginia nondiscrimination provisions of Section 2.2-4311 and the Drug-free workplace provisions of Section 2.2-4312.

Pursuant to Code of Virginia, Section 2.2 - 4343.1, be advised that the City of Roanoke does not discriminate against faith-based organizations.

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CITY OF ROANOKE, VIRGINIA

INSTRUCTIONS TO BIDDERS

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CITY OF ROANOKE, VIRGINIA

INSTRUCTIONS TO BIDDERS

SECTION 1. DEFINITIONS

Definitions contained in Section 1 of the General Conditions are incorporated herein by reference. The bidder should refer to the General Conditions for definitions used in the Contract Documents. Whenever used in the General Conditions or in the Contract Documents, the following terms have the meanings indicated, which are applicable to both the singular and plural and the male and female gender thereof, and where applicable to any other legal entity such as a corporation, partnership, limited liability company, etc.

The section and paragraph headings are inserted for convenience only.

Architect, Engineer, Architect/Engineer or A/E: The term used to designate the Architect and/or the Engineer who contracts with the City to provide the Architectural and Engineering services for the project. The Architect/Engineer is a separate Contractor and is referred to herein as the Architect/Engineer or abbreviated as A/E. The term includes any associates or consultants employed by the firm to assist in providing the A/E services.

Bidder: The person, firm, corporation, or other entity interested in submitting a bid for the Work to be performed.

Change Order: A document issued by Director of Parks and Recreation on or after the effective date of the Contract which is agreed to by the Contractor and approved by the City, and which authorizes an addition, deletion, or revision in the Work, including any adjustment in the Contract Price and/or the Contract Time.

City or Owner: The City of Roanoke, Virginia, or its authorized representative.

City Code: Refers to the Code of the City of Roanoke (1979), as amended.

Director of Parks and Recreation: Director of Parks and Recreation or his authorized representative.

City Manager: The City Manager or his authorized representative.

Code of Virginia: Refers to the Code of Virginia (1950), as amended. (Sometimes referred to as Va. Code or Virginia Code.)

Contract Documents: These documents include, but are not limited to, the Project Manual, Invitation to Bid, the Instructions to Bidders, the Bid Form, the Contract, the Bonds or other Bid Security, the Escrow Agreement, the General Conditions, Supplementary General Conditions, Special Conditions, the Specifications, Addenda or

Change Orders, the Plans and Drawings, any Supplemental Drawings, and any additional documents incorporated by reference in the above.

Contract: The written agreement between the parties concerning the performance of the Work and consisting of the Contract Documents.

Contractor: The person, firm, corporation, or other entity entering into a contractual agreement with the City to perform the Work.

Defect, Defective, or Deficient: An adjective or noun which when modifying or referring to the word Work refers to Work or any part thereof that is unsatisfactory, faulty, or does not conform to the Contract Documents, or does not meet the requirements of any inspections, standards, tests, or approvals referred to in the Contract Documents.

Document(s): This term includes, but is not limited to: writings, drawings, items on which words, symbols, or marks are recorded; electronic data of any type; videotapes, recordings, photographs and negatives, digital or otherwise; and any other form of data, writing, or information compilation, however recorded or stored, and regardless of physical form or characteristics.

Field Order: A written order issued by Director of Parks and Recreation which clarifies the requirements of the Contract by giving a more complete expression of the drawings or specifications or other documents without any change in the design, the Contract price, or the Contract time.

Final Acceptance: The City's acceptance of the project from the Contractor upon confirmation from Director of Parks and Recreation and the Contractor that the project is apparently complete in accordance with the Contract requirements.

Notice: All written notices, demands, instructions, claims, approvals, and disapprovals required to obtain compliance with the Contract requirements. Any written notice by either party to the Contract 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 Contract, or to his, her, their, or its authorized agent, representative, or officer.

Notice to Proceed: A written notice given by the City at the City's discretion to the Contractor fixing the date on which the Contract time will commence for the Contractor to begin the prosecution of the Work in accordance with the requirements of the Contract Documents.

Project Inspector: One or more individuals employed by the City to inspect the Work and/or to act as Resident Inspector to the extent required by the City. The City shall notify the Contractor of the appointment of such Project Inspector(s).

Provide: Shall mean to furnish and install ready for its intended use.

Subcontractor: A person, firm, partnership, corporation, or other entity having a direct contract with the Contractor or with any other Subcontractor for the performance of the Work. It includes one who provides on-site labor, but does not include one who only furnishes or supplies material for the project.

Submittals: All drawings, diagrams, illustrations, brochures, schedules, samples, electronic data and other data required by the Contract Documents which are specifically prepared by or for the Contractor, Subcontractor, or Supplier, and submitted by the Contractor to illustrate the material, equipment, or layouts, or some other portion of the Work.

Substantial Completion: The date certified by Director of Parks and Recreation when construction is sufficiently complete, in accordance with the Contract Documents, so the City can occupy or utilize the Work or designated portion thereof for the purposes for which it is intended.

Successful Bidder: The bidder to whom the City makes an award.

Supplier: A manufacturer, fabricator, distributor, material man, or vendor who provides only material or supplies for the project, but does not provide on-site labor.

Work or Project: The entire completed construction or the various separately identifiable parts thereof as required by the Contract Documents. Work is the result of performing services, furnishing labor, and furnishing and incorporating material and equipment into the construction.

SECTION 2. EXAMINATION OF SITE AND CONTRACT DOCUMENTS

2.1 Each bidder is responsible for examining carefully the site of the Work and the Contract and Bid Documents relating to the Work. By submitting a bid, the bidder acknowledges and agrees that it has examined and considered the conditions to be encountered at and adjacent to the site, the character, quality, and quantities of work to be performed, the material to be furnished, other requirements of the Contract Documents, and to have waived any claim or objection based thereon. Claims as a result of failure to have done such examination will not be considered by the City. See Section 8 of the General Conditions entitled "Conditions at Site."

2.2 Each bidder shall promptly notify, in writing, the Purchasing Division of any ambiguity, inconsistency, or error which may be discovered upon examination of the Invitation to Bid, any Bid Documents, and/or any related documents.

SECTION 3. CLARIFICATION AND ADDENDA

3.1 **Questions on Contract Documents:** All questions about the meaning or intent of the Contract Documents shall be directed to the Purchasing Division.

Questions received less than seven (7) calendar days prior to the date for opening bids may not be answered. Bidders may only rely upon written addenda issued by the Purchasing Division and no other communication or interpretation, whether oral or written, shall have any effect or efficacy.

3.2 **Addenda:** Any changes, interpretations, or clarifications that may be made to the Contract Documents will be in the form of an addendum. Receipt by the bidder of such addendum shall be acknowledged on the Bid Form. **However, all bidders are solely responsible for making sure that they have received and reviewed any and all addenda that may have been issued for this ITB.**

3.3 **Interpretation:** All decisions made in good faith by the Purchasing Manager on the meaning or interpretation of the Contract Documents shall be final.

3.4 **Bidders Responsibility:** All bidders are responsible for ensuring that they have received and examined all addenda that may have been issued before submitting their bid.

If you download this Invitation to Bid from the City website and intend to submit a bid, you should notify Purchasing. The City is not responsible for any Invitation to Bid obtained from any source other than the City. Contact Purchasing by telephone at (540) 853-5268, by fax at (540) 853-1513 or by email at monica.cole@roanokeva.gov.

3.5 **Quantities:** Where the bid documents stipulate a unit price, the quantities of the work and material set forth in the proposal form or on the plans approximately represent the work to be performed and material to be furnished and are for the purpose of comparing the bids on a uniform basis. Payment shall be made to the Contractor only for the actual quantities of work performed or material furnished in accordance with the plans and specifications and it is understood that the quantities may be increased or decreased as provided in the General Conditions without in any way invalidating the bid prices.

SECTION 4. TIME FOR COMPLETION

4.1 **Time for Completion:** Unless otherwise stated or a specific time period is set forth on the Bid Form, each bidder shall indicate in the appropriate blank the number of consecutive calendar days required by such bidder to substantially complete the specified Work, within one hundred and twenty (120) consecutive calendar days, with Final Acceptance to be achieved within thirty (30) consecutive calendar days thereafter. However, no such time period may exceed the number of consecutive calendar days set forth in the Bid Form.

4.2 **Weather:** The bidder, in preparing and submitting its bid, is required to take into consideration normal weather conditions. Normal weather means a range of

weather conditions which might be anticipated, based on weather data for the past ten years. Unusual weather is weather which could not be anticipated based on such data. Normal weather conditions shall be determined from the public historical records available from the National Weather Service. The data sheets to be used shall be for the locality or localities closest to the site of the Work. No additional compensation will be paid to the Contractor because of unusual weather conditions; however, an extension of time for unusual weather may be considered by the City as indicated in the General Conditions.

4.3 Liquidated Damages: The amounts indicated on the Bid Form as step one and step two liquidated damages as described in the General Conditions (Section 21) shall be due from and paid by the Contractor to the City for each consecutive calendar day of delay in excess of the stated time required to complete the Work, unless modified by Change Order.

SECTION 5. CONTRACTORS' LICENSES, PERMITS, FEES, AND TAXES

5.1 State License: Bidders and all subcontractors are required to comply with all applicable city, state, and federal laws, ordinances, and regulations, including, but not limited to, registration with the Virginia State Corporation Commission if required by law; and are required to be properly licensed in accordance with Sections 54.1-1100, et seq., of the Code of Virginia, which presently requires one to be licensed as a "Class A Contractor" before submitting a bid of One Hundred Twenty Thousand Dollars ($120,000) or more; or to be licensed as a "Class B Contractor" before submitting a bid of Seven Thousand Five Hundred Dollars to One Hundred Twenty Thousand Dollars ($7,500 to $120,000); or to be licensed as a "Class C Contractor" before submitting a bid of One Thousand Dollars to Seven Thousand Five Hundred Dollars ($1,000 to $7,500). There are also cumulative total amounts which can require a certain class of license and bidders should check these requirements as well. Bidders shall show evidence of being properly licensed and supply the documents required in Section 14.4 of these Instructions to Bidders. (See also Section 7 of the General Conditions.)

5.2 Other Licenses, Permits, Fees, and Taxes: Successful Bidder is responsible for paying for all licenses, permits, fees, and taxes applicable to the project. Such charges and fees include, but are not limited to the applicable building permits, mechanical and electrical permits, hauling and dumping of material, and if work performed in the City of Roanoke during a calendar year exceeds Twenty-five Thousand Dollars ($25,000), such bidder will have to possess a City business license and be responsible for paying City of Roanoke business license taxes. See Section 3 of the General Conditions.

5.3 Virginia State Corporation Commission: Each Bidder who is a stock or nonstock corporation, limited liability company, business trust, or a limited partnership or other business entity shall be authorized to transact business in

the Commonwealth of Virginia as a domestic or foreign business entity if required by law. Each such Bidder shall include in its bid response the Identification Number issued to it by the Virginia State Corporation Commission (SCC) and should list its business entity name as it is listed with the SCC. Any Bidder that is not required to be authorized to transact business in the Commonwealth as a domestic or foreign business entity as required by law shall include in its bid response a statement describing why the Bidder is not required to be so authorized. (See Va. Code Section 2.2-4311.2).

SECTION 6. PREPARATION AND SUBMISSION OF BIDS

6.1 Bid Form: Bids shall be submitted on the Bid Form furnished, or copy thereof, and shall be completed and signed in ink. A copy of the Bid Form is provided in these specifications for the information of bidders only. Except as may be otherwise stated, all blank spaces in the Bid Form should be filled in and under no conditions shall any changes be made in the phraseology of the Bid Form. Erasures or other changes in a bid amount must be explained or noted over the initials of the bidder. Bids containing any conditions, omissions, unexplained erasures, alterations or items not called for in the bid documents, or irregularities of any kind, may be rejected by the City as being incomplete and/or non-responsive. NO CHANGES MADE TO THE BID FIGURES BY NOTATIONS ON THE OUTSIDE OF THE ENVELOPE WILL BE CONSIDERED IN THE REVIEW AND TABULATION OF BIDS OR FOR ANY OTHER PURPOSE.

6.2 Escrow: In accordance with Section 2.2 - 4334, of the Code of Virginia, for bids of $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, the Bid Form will include a space for the bidder to indicate an option to use the escrow account procedure in order to have retained funds paid to an escrow agent. Otherwise, unless stated in the Supplemental General Conditions, no escrow will be provided.

6.3 Signatures: Each bid must give the full business address of the bidder and be signed by bidder with its usual signature. Bids by partnerships must furnish the full name of all partners and must be signed in the partnership name by one of the members of the partnership or an authorized representative, followed by the signature and designation of the person signing. Bids by corporations must be signed with the legal name of the corporation followed by the name of the state in which they are incorporated and by the signature and designation of the president or other person authorized to bind it in the matter. The name of each person signing shall also be typed or printed below each signature. A bid by a person who affixes to his signature the word "President," "Authorized Agent," or other designation without disclosing such principal firm or employer, may be held to be the bid of the individual signing. Satisfactory evidence of the authority of the

president or authorized agent signing on behalf of the corporation shall be furnished upon request by the City.

6.4 Bid Amounts: Bidders shall indicate in the appropriate blank spaces on the Bid Form the amounts for the base bid and any alternates, written with ink or typed, in both words and figures. In the event of a discrepancy between the words and figures expressed in the base bid or alternates, the word amount shall govern. Any unit prices for separate items as called for on the Bid Form shall be written with ink or typed in figures in the appropriate blanks.

6.5 NOT USED

6.6 Bid Package Checklist: Bidders shall deposit with their bid the documents or information set forth in the Bid Package Checklist. See Section 16.

SECTION 7. RECEIPT AND OPENING OF BIDS

7.1 Delivery of Bid: It is the responsibility of the bidder to assure that its bid is delivered to the place designated for receipt of bids and prior to the time set for receipt of bids. No bids received after the time designated for receipt of bids will be considered.

7.2 Receipt of Bid: The Bid Form, the Bid Security, and all other documents required to be submitted with the bid shall be enclosed in a sealed opaque envelope and addressed as follows:

Monica Cole, Senior Buyer
Purchasing Division
Noel C. Taylor Municipal Building
215 Church Avenue, S.W., Room 202
Roanoke, Virginia 24011

Place on front of the envelope the project title and bid number as indicated at the top of the Invitation to Bid. Place on front of the envelope the bidder's name, mailing address, and Virginia Contractor number.

7.3 Opening of Bid: Bids will be opened and read at the time and place stated in the Invitation to Bid. The contents may be made public in accordance with Section 2.2-4342 of the Code of Virginia. The officer or agent of the City, whose duty it is to open them, will decide when the specified time has arrived. No responsibility will be attached to any officer or agent for the premature opening of a bid not properly addressed and identified.

7.4 Withdrawing Bid: After the date of opening of bids, no bid may be withdrawn for at least sixty (60) calendar days after such opening date, except as provided in Section 12 of these Instructions to Bidders.

SECTION 8. BID SECURITY

Each bid must be accompanied by a Bid Security in an amount equal to five (5%) percent of the maximum possible bid price in accordance with Sections 2.2-4336 and 4338 of the Code of Virginia. The Bid Security shall be furnished in one of the following forms:

a. Bid Bond, in a form substantially as provided in the Contract Documents, made payable to the City of Roanoke and properly executed by the bidder as Principal and a Corporate Surety authorized to transact business in the Commonwealth of Virginia. Attorneys-in-fact who execute Bid Bonds must file with the bond a certified copy of their Power of Attorney.

b. Certified Check or cash deposited with the City of Roanoke Treasurer in the face amount required for the Bid Security and made payable to the City of Roanoke.

c. Personal Bond or Letter of Credit issued by an authorized financial institution in the face amount required for the Bid Security, made payable to the City of Roanoke. These forms of security shall be submitted for review and must be approved by the City Attorney, in his sole discretion, at least three (3) working days prior to receipt of bids. Approval will be based upon a determination that the form of security offered will adequately protect the interests of the City as equivalent to a corporate surety's bond.

d. For return of Bid Security, see Sections 13 and 14 of these Instructions to Bidders. (See pages 18-21, Sections 13.2, 13.3, 14.5, and 14.7)

SECTION 9. INTENT

9.1 Work Required: The City requires that the successful bidder perform a complete and satisfactory job in accordance with the Contract Documents.

9.2 Conflicts in Contract Documents: Anything called for by one of the Contract Documents and not called for by the others shall be of like effect as if required or called for by all Contract Documents. In the case of conflict between the Contract Documents, the Contract Documents shall take precedence in the following order: The Contract; addenda starting with the last issued addendum; the Supplemental General Conditions; the General Conditions; the Special Conditions; the specifications with attachments; and the drawings.

9.3 Work Not Described: All work not specifically described in the Contract Documents, yet required to produce a fully functional and properly operating project shall be provided even though every item or minor detail for the proper installation or successful operation of the entire Work is not mentioned in the Contract Documents.

9.4 Completion of Work: The Successful Bidder acknowledges and agrees that it has taken into account in its bid the requirements of the bid and Contract Documents, local conditions, availability of material, equipment, labor, and any other factors which may affect the performance of the Work. The Successful Bidder agrees and warrants that it will complete the Work not later than the time period or date indicated for completion.

SECTION 10. MATERIAL AND WORKMANSHIP

10.1 "Or Equal" Clause: The particular brand, make of material, device, or equipment described in the Contract Documents establishes a standard of required function, economy of operation, dimension, appearance, and quality to be met by any proposed substitution. No substitution will be considered unless a written request for approval has been submitted by the bidder and has been received by the Purchasing Division at least ten (10) calendar days prior to the date for receipt of bids. Each such request shall include the name of the material or equipment for which it is to be substituted and a complete description of the proposed substitute including drawings, cuts, performance and test data, and any other information necessary or required by the City of Roanoke Parks and Recreation Department for an evaluation. A statement setting forth any changes in other material, equipment, or work that incorporation of the substitute would require shall be included. The burden of proof of merit of the proposed substitute is upon the bidder.

10.2 Approval of Substitution: The City of Roanoke Parks and Recreation Department’s decision of approval or disapproval of a proposed substitution shall be in its sole discretion and shall be final. If the City of Roanoke Parks and Recreation Department approves any proposed substitution, such approval will be set forth in an addendum issued to all recorded bidders. Bidders shall not rely on approvals made in any other manner.

10.3 Adaptation Due to Substitution: The Successful Bidder shall be responsible for making all changes in the Work necessary to adapt and accommodate any equivalent product or item which it uses. The necessary changes shall be made at the Successful Bidder's sole expense.

SECTION 11. STATEMENT OF QUALIFICATIONS

Each bidder shall be prepared to submit evidence of qualifications, experience, and financial ability to perform the Work set forth in the Contract Documents, should such be required by the Contract Documents or requested by the Purchasing Division. Furthermore, each bidder must notify the Purchasing Division if bidder has been terminated from any contract or job in the last three (3) years and/or if bidder has been during the last three (3) years debarred from bidding on or performing any federal, state or local procurement or job. If so, bidder must supply details of such matters by separate written statements included with bidder's response. Any bidder who is currently debarred will not be eligible to bid on this project.

SECTION 12. ERRORS IN BIDS

12.1 Withdrawal of Bid: A bidder may withdraw its bid from consideration if the price bid was substantially lower than the other bids due 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 material used in the preparation of the bid sought to be withdrawn.

12.2 Withdrawal Procedure: The bidder shall give notice in writing and shall submit the original work papers with such notice to the City of its claim of right to withdraw its bid within two (2) business days after the conclusion of the opening of bids as set forth in part (i) of Section 2.2 - 4330 (A), of the Code of Virginia.

12.3 Withdrawal Requirements: Other applicable provisions of Section 2.2 - 4330, of the Code of Virginia shall apply to any errors in bids or any requested withdrawal due to errors in bids.

SECTION 13. REJECTION OF BIDS

13.1 Rejection of Bids: The City reserves the right to cancel the Invitation to Bid, to reject any or all bids, to reject the bid of a bidder who is not in a position to perform the contract, or to waive any informalities in any bid.

13.2 Bid Security Return for Rejected Bids: The Bid Security will be returned to all rejected bidders after the City has issued and posted an Award.

13.3 Bid Security Return for Unsuccessful Bids: Should a bid not be accepted by the City within sixty (60) consecutive calendar days after the opening of bids, or

within such other time specified in the Bid Documents, each bidder may obtain its Bid Security from the City.

SECTION 14. ACCEPTANCE OF BIDS, EVALUATION OF BIDS, AWARD OF CONTRACT, AND SECURITY REQUIREMENTS

14.1 Acceptance of Bids: Each bidder should submit with its bid documentation of bidder's legal name and indicate the type of business entity bidder is operating under; i.e., if a corporation, bidder should enclose a copy of the Certificate of Incorporation issued by the State Corporation Commission; if a partnership, bidder should enclose a copy of the relevant portions of the Partnership Agreement; if a limited liability company, bidder should enclose a copy of the Certificate of Organization.

14.2 Evaluation and Award to Lowest Responsive and Responsible Bidder: To determine the lowest responsive and responsible bidder with respect to this bid, the following items may be considered so as to protect the interest of the City:

a. The total base bid price plus the price of any alternates (aka- additive bid item) the City elects to accept, if any. (This is where a lump sum amount is required.) The City reserves the right to accept alternates in any order or combination.

b. If a unit price contract is requested, the total amount based on the estimated quantities as set forth in the Bid Form will be considered. (The listed unit prices for each item will control and any multiplication errors may be adjusted by the Purchasing Division using the proper estimated quantities.)

c. The ability, capacity and skill of the bidder to perform the contract or provide the services and/or items required.

d. Whether the bidder can perform the contract promptly and within the time specified, without delay or interference.

e. The character, integrity, reputation, judgment, experience and efficiency of the bidder.

f. The quality of performance of previous contracts or services.

g. The previous and existing compliance by the bidder with laws and ordinances relating to the contract, purchase or service.

h. The equipment and facilities available to the bidder to perform the contract or provide the services and/or items.

i. The sufficiency of the financial resources and ability of the bidder to perform the contract or provide the services and/or items.

j. The quality, availability and adaptability of the supplies, materials, equipment or services to the particular use required.

k. The ability of the bidder to provide future maintenance, parts and service for the use of the subject of the purchase or contract, if required.

l. Bids shall be evaluated based on the requirements set forth in this Invitation to Bid, and other criteria to determine acceptability such as inspection, testing, quality, workmanship, delivery, suitability for a particular purpose and life cycle cost. The City, in its sole discretion, may elect to waive an informality in any bid.

Should a Contract be awarded to a bidder, it will be awarded to the lowest responsive and responsible bidder. If an award of a contract is made, notice of the award, or the announcement of the decision to award, will be made by posting a notice of such award or announcement in the foyer area of the second floor of the Noel C. Taylor Municipal Building at 215 Church Avenue, S.W., Roanoke, Virginia 24011.

14.3 Negotiation of Bid: If the bid by the lowest responsive and responsible bidder exceeds available funds, the City reserves the right to negotiate with the apparent low bidder pursuant to Section 2.2-4318 of the Code of Virginia. The conditions and procedures under which such negotiation may be undertaken are that the appropriate City officials shall determine that the lowest responsive and responsible bid exceeds available funds and notify such bidder in writing of its desire to negotiate. Thereafter, negotiations with the apparent low bidder may be held to obtain a Contract within available funds involving discussions of reduction of quantity, quality, or other cost saving mechanisms. Any such negotiated Contract shall be subject to final approval of the City, in the sole discretion of the City.

14.4 Contract Execution: The Successful Bidder shall be required, within ten (10) consecutive calendar days after receipt of the Contract, to return the signed Contract, and furnish to the City all other documents as enumerated hereinafter:

a. Performance Security (if applicable)

b. Labor and Material Payment Security (if applicable)

c. Certificate of Insurance

d. Escrow Agreement (if applicable)

e. Contractor's Certification as to Licensure of Subcontractors Form

f. Employment Projection Form (if applicable):

The Successful Bidder for a project requiring at least thirty (30) calendar days work will be required to submit a completed Employment Projection Form along with the signed Contract. A copy of this form is included in these bid documents. Completion of the form does not create an obligation on the part of the bidder to hire any referred applicant.

14.5 Security: A Performance Security and a Labor and Material Payment Security each in the amount of one hundred percent (100%) of the contract amount for all contracts in accordance with Sections 2.2-4337 and 4338 of the Code of Virginia, shall be furnished by the Successful Bidder in one of the following forms:

a. A Performance Bond and a Labor and Material Payment Bond, on forms as provided in the Contract Documents, made payable to the City of Roanoke, properly executed by the successful bidder as Principal and a Corporate Surety authorized to transact business in the Commonwealth of Virginia. Attorneys-in-fact who execute the bonds must file with each bond a certified copy of their Power of Attorney.

b. Certified Checks or Cash Escrow in the face amount required for the Performance Security and the Labor and Material Payment Security each made payable to the City of Roanoke.

c. Personal Bond or Letter of Credit issued by an authorized financial institution in the face amount required for the Performance Security and the Labor and Material Payment Security, made payable to the City of Roanoke. These forms of security must be approved by the City Attorney, in his/her sole discretion. Approval will be based upon a determination that the form of security offered will adequately protect the interests of the City as equivalent to a corporate surety's bond.

14.6 Escrow Agreement Form: In the event the Contract meets the requirements as stipulated in Section 6.2 of these Instructions to Bidders and the Successful Bidder elects to use the escrow account procedure, the Escrow Agreement Form, as provided in the Contract Documents, shall be executed and submitted to the City within fifteen (15) calendar days after receipt of written notification of bid acceptance. If the executed Escrow Agreement Form is not submitted within the fifteen-day period, the Successful Bidder shall forfeit and waive the rights to the use of the escrow account procedure.

14.7 Bid Security Return for Successful Bid: Upon the execution of the Contract and approval of the Performance and Payment Securities, the Bid Security shall be returned to the Successful Bidder. Should the successful bidder fail or refuse to execute the Contract or furnish the required Performance and Payment Securities within the stipulated time, the Bid Security shall be due and paid to the City and the City shall be entitled to collect the Bid Security. In addition, the City may pursue any and all other remedies available to it at law or in equity against said bidder.

SECTION 15. ETHICS IN PUBLIC CONTRACTING

The provisions, requirements, and prohibitions as contained in Sections 2.2 - 4367 through 2.2-4377, of the Code of Virginia, pertaining to bidders, offerors, contractors, and subcontractors are applicable to this project.

SECTION 16. BID PACKAGE CHECKLIST

The following items must be completed and included in your bid package. Failure to include all required forms may result in rejection of the bid. If any of these documents were not included with your Project Manual, please contact the Purchasing Division at (540) 853-2871.

a. Completed Bid Form (all pages)

b. Properly Executed Bid Security (Bid Bond, Certified or Cashier's Check, etc., if applicable)

c. In addition to the above items, bidder should submit documentation verifying bidder's proper legal name.

SECTION 17. PROTESTS

Any bidder who wishes to protest or object to any award made or other decisions made pursuant to the Invitation to Bid may do so only in accordance with the provisions of Sections 2.2-4357, 4358, 4359, 4360, 4363, and 4364 of the Code of Virginia, and only if such is provided for in such Code section.

SECTION 18. MISCELLANEOUS

a. No bidder shall confer on any public employee having official responsibility for a purchasing transaction any payment, loan, subscription, advance, deposit or money, service, or anything of more than nominal value, present or promised, unless consideration of substantially equal or greater value is exchanged.

b. The City may make investigations to determine the ability of the bidder to perform or supply the services or items as described in this Invitation to Bid. The City reserves the right to reject any bid if the bidder fails to satisfy the City that it is qualified to carry out the obligations of the proposed contract.

c. The Successful Bidder must comply with the nondiscrimination provisions of Section 2.2-4311 of the Code of Virginia, which are incorporated herein by reference.

d. The Successful Bidder must comply with the drug-free workplace provisions of Section 2.2-4312 of the Code of Virginia, which are incorporated herein by reference.

e. It is the policy of the City of Roanoke to maximize participation by minority and women owned business enterprises, small businesses and veteran-owned businesses in all aspects of City contracting opportunities.

f. The Successful Bidder shall comply with all applicable City, State, and Federal laws, codes, provisions, and regulations.

g. Providers of any outside services shall be subject to the same conditions and requirements as the Successful Bidder in regards to law, code or regulation compliance. The City reserves the right of approval for any subcontract work, including costs thereof.

h. This Invitation to Bid and all responses are subject to Section 2.2-4342 of the Code of Virginia regarding public inspection of records and the procedures a bidder must follow to protect trade secrets and proprietary information.

i. Conflict of Interests Act. The provisions, requirements and prohibitions as contained in Sections 2.2-3100, et. seq. of the Code of Virginia are applicable to this Invitation to Bid.

j. The procurement provisions of the Code of the City of Roanoke (1979), as amended, Sections 23.2-1, et. seq., as well as the City Procurement Manual, apply to this Invitation to Bid, unless specifically modified herein. The City's Procurement Manual can be reviewed at the Purchasing office.

k. Insurance. Successful Bidder, and any of its subcontractors, shall, at its or their sole expense, obtain and maintain during the life of the resulting contract the insurance policies and bonds required. Any required insurance policies and bonds shall be effective prior to the beginning of any work or other performance by Successful Bidder, or any of its subcontractors, under any resultant contract. The policies and coverages required are those as may be referred to in the

sample contract and/or the general conditions or other documents of this Invitation to Bid.

I. Each bidder is to notify the Purchasing Division if any of bidder's owners, officers, employees, or agents, or their immediate family members, is currently, or has been in the past year, an employee of the City of Roanoke or has any responsibility or authority with the City that might affect the procurement transaction or any claim resulting therefrom. If so, please provide the Purchasing Division with the complete name and address of each such person and their connection to the City of Roanoke. Each bidder is advised that the Ethics in Public Contracting and Conflict of Interests Act of the Code of Virginia, as set forth in this Invitation to Bid, apply to this Invitation to Bid. Such information should be provided in writing before the bid opening date or may also be provided with the bid response.

SECTION 19. NOT USED.

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ADOPTED FEBRUARY 22, 2005

CITY OF ROANOKE, VIRGINIA

Plan for Participation in Procurement
Transactions of Small Businesses and
Businesses Owned by Women and Minorities

1. POLICY STATEMENT

It is the policy of the City of Roanoke to encourage participation by small businesses and minority-owned and women-owned business enterprises in all aspects of City contracting opportunities. In order to demonstrate its commitment to this policy, the procedures set forth in this document shall be followed whenever possible.

2. DEFINITIONS

A minority business enterprise ("MBE" or "MBES" in the plural form) is a business that is both owned and controlled by minorities. This means that minorities must own fifty-one percent of the business, and that they must control the management and daily operations of the business.

A women business enterprise ("WBE" or "WBES" in the plural form) is a business that is both owned and controlled by women. This means that women must own fifty-one percent of the business, and that they must control the management and daily operations of the business.

A small business ("SB" or "SBS" in the plural form) is a United States business that does not exceed fifty employees, is independently owned and operated, and is not dominant in its field or operation or an affiliate or subsidiary of a business dominant in its field of operation.

A minority is an individual who is a citizen or lawful resident of the United States and is Black, Hispanic, Asian American, American Indian, Alaskan Native or a member of another group who the Small Business Administration has determined is economically and socially disadvantaged under Section 8 (a) of the Small Business Act.

3. EMPLOYMENT DISCRIMINATION PROHIBITED

Every contract of over ten thousand dollars ($10,000.00) to which the City is a party shall contain the provisions in subparagraphs (a) and (b) herein:

(a) During the performance of this contract, the contractor agrees as follows:

1. The 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 reasonably necessary to the normal operation of the contractor. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the provisions of this nondiscrimination clause.

2. The contractor, in all solicitations or advertisements for employees placed by or on behalf of the contractor, will state that such contractor is an equal opportunity employer.

3. Notices, advertisement and solicitations placed in accordance with federal law, rule or regulation shall be deemed sufficient for the purpose of meeting the requirements of this section.

(b) The contractor will include the provisions of the foregoing subparagraphs (a)(1), (2) and (3) in every subcontract or purchase order of over ten thousand dollars ($10,000), with regard to the contract with the City, so that the provisions will be binding upon each subcontractor or vendor.

4. <u>LIST OF MBEs, WBEs AND SBs</u>

The City's Purchasing Division will establish and maintain a list of minority-owned and women-owned business enterprises. As appropriate, this list may include vendors at regional, state and national levels. A separate list of local MBES and WBES shall be established and, when established, be made available or the master list shall be searchable for local vendors. The local area shall consist of the Roanoke Valley, which shall include those areas included in the metropolitan statistical area as defined by the United States Office of Management and Budget for Census Bureau data purposes. The regional area shall include all cities, counties and towns, within the Commonwealth of Virginia, any part of which fall within a 50 mile radius of the City of Roanoke.

The City's Purchasing Division will establish and maintain a list of small businesses at the regional level.

The Purchasing Division shall serve as the primary contact for businesses to request to be added to the MBE/WBE list or the small business list and for businesses, organizations or individuals desiring access to the lists.

In maintaining these lists, the City's Purchasing Division will cooperate with the Virginia Department of Minority Business Enterprise, the United States Small Business Administration and other public or private agencies.

The Purchasing Division will maintain a list of agencies and organizations that provide assistance and/or education to MBES, WBES and SBS and inform such businesses of the resources available to them. The list will contain the types of services offered and contact information. The Purchasing Division will assist other organizations in publicizing training opportunities for MBES, WBES and SBS.

5. ALL CONTRACTS

In procuring goods and services for the City, all City employees shall follow the guidelines and mandates contained in the Purchasing Division's Procurement Manual with regard to solicitation of MBES and WBES.

When bids or proposals are solicited directly from potential contractors, solicitations shall include, when possible, appropriate businesses from the lists maintained by and/or available to the Purchasing Division, including but not limited to the list from the Virginia Department of Minority Business Enterprise.

All solicitation, addenda and award actions over $30,000 shall be posted on the City of Roanoke's web site http://www.roanokeva.gov.

Invitation to Bid solicitation notices over $50,000 and Requests for Proposals estimated to be over $30,000 shall be advertised in both The Roanoke Times and The Roanoke Tribune whenever possible. Such Invitation to Bid solicitation notices and Requests for Proposals shall also be advertised on RVTV.

6. CONSTRUCTION CONTRACTS

This paragraph shall apply to all construction contracts whenever advertising of the Invitation to Bid is required.

The bid documents will contain a list of, or a reference to a list of, MBES, WBES and SBS. The list will be provided to assist and encourage the general contractors' use of the listed businesses as subcontractors.

The City will provide a copy of the plans and specifications for all construction projects to the Southwest Virginia Community Development Fund, F. W. Dodge of Roanoke, and Valley Construction News plan room(s) so that MBES, WBES and SBS can review the documents. The documents will also be available for review, at no charge, at the Office of Director of Parks and Recreation.

Director of Parks and Recreation, the Purchasing Manager and the Project Engineer will require that general contractors make a “best or good faith effort” to seek the participation of and utilize MBES, WBES and SBS as suppliers and subcontractors. General contractors will be required to show that they have made efforts to recruit MBES, WBES and SBS by incorporating into the bid or proposal form:

a. Statements indicating efforts to negotiate with MBES, WBES and SBS and the results of such efforts. Bidders will be required to list those MBES, WBES and SBS from whom quotations for labor, materials, and/or services have been solicited, and state which MBES, WBES and SBS, if any, the contractor will use on the project if awarded the bid; and

b. A certification that the contractor has made a good faith effort to utilize MBES, WBES and SBS whenever possible.

A bid response that does not contain such statements and certification will be deemed non-responsive and will be rejected.

If the contractor listed MBES, WBES and/or SBS that it would use on the project if awarded the bid and the contractor is awarded the bid, the contractor will be required to use his or her best efforts to utilize the MBES, WBES and SBS identified by the contractor unless the contractor can demonstrate a nondiscriminatory, sound, business reason for not using the MBE, WBE or SB. Director of Parks and Recreation, in his or her sole discretion, will determine whether or not the contractor has demonstrated a nondiscriminatory, sound, business reason.

The contractor, in every monthly request for payment, shall submit a status report of MBE, WBE, and SB participation in the project to date. Payment shall not be issued to the contractor until such status report is submitted.

The Purchasing Manager will closely monitor the requirements of this section.

7. RACIAL DISCRIMINATION IN CONSTRUCTION CONTRACT BONDING AND INSURANCE

In construction contracting, if any person is found by the City Manager or a designee to have engaged in discrimination on the basis of race or gender in the granting of bonds or insurance to persons who contract with or desire to contract with the City, or to persons who receive subcontracts or desire to receive a subcontract in connection with a City contract, the person shall be deemed unqualified to submit a bond or insurance for any City construction contract unless and until the City Manager or designee determines that the discrimination has been purged and that adequate assurances have been made that it will not recur. Any determination by the City Manager of a violation of this section shall be reported in writing to City Council.

8. FEDERAL, STATE OR OTHER GRANT REQUIREMENTS

In addition to the provisions of this Plan, when the City is using funds subject to federal, state or other grant requirements with regard to MBES, WBES and/or SBS, the City's Department managing the specific solicitation will take all necessary affirmative steps to assure that the requirements of the grant or program are met.

9. ECONOMIC DEVELOPMENT

The Department of Economic Development will assist the Purchasing Division by providing MBES, WBES and SBS with information regarding the resources available to them and by referring such businesses to the Purchasing Division for additional information.

The Department of Economic Development will also include MBES, WBES and SBS in any programs it has to introduce and familiarize businesses with opportunities in the City.

1 10. DEBARMENT

Any offeror or bidder, or any principal thereof or person associated therewith, found to have engaged in substantial and intentional misrepresentation concerning either good faith MBE, WBE and/or SB participation efforts or its status as a minority owned, women owned or small business shall be debarred from any City contracting for a period of two (2) years. This debarment shall also extend to any successor firm substantially controlled or managed, whether directly or indirectly, by any debarred individual. This determination shall be made by the City Manager or a designee; and any debarment shall be reported in writing to Council.

11. REPORTING

The Purchasing Manager shall, at the conclusion of each fiscal year, report to the City Manager for report to City Council on the Purchasing Division's compliance with this Plan and efforts made pursuant to the Plan. The report shall also include the level of participation by MBES, WBES and SBS in contracts that have been awarded by the City through formal solicitations during that fiscal year.

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CITY OF ROANOKE, VIRGINIA

BID FORM

DATE:_____

SUBMITTED BY:_____
(Exact Legal Name of Bidder)

NOTE: ALL PAGES OF THE BID FORM ARE TO BE INCLUDED IN THE COMPLETED BID. ALSO, BIDS CONTAINING ANY CONDITIONS, OMISSIONS, UNEXPLAINED ERASURES, ALTERATIONS OR ITEMS NOT CALLED FOR IN THE BID, OR IRREGULARITIES OF ANY KIND, MAY BE REJECTED BY THE CITY AS BEING NON-RESPONSIVE. NO CHANGES ARE TO BE MADE TO THE BID FORM. ANY CHANGES TO A BID AMOUNT MUST BE INITIALED BY THE AUTHORIZED PERSON SIGNING THE BID FORM.

The undersigned hereby proposes and agrees, if this bid is accepted by the City of Roanoke, to enter into a Contract with the City of Roanoke, Virginia, (hereafter - City or Owner) to furnish all equipment, materials, labor, and services necessary to **provide construction of park improvements at Huff Lane and Fishburn Parks, consisting of toilet facilities and pavilions, all related site work, utilities, landscaping, and associated Work**, Invitation to Bid No. 16-02-04, in accordance with the Contract Documents as prepared by or for the City of Roanoke. **Work at Fishburn Park may include demolition of existing facilities.**

The undersigned agrees that the following Lump Sum Price will become a part of the Contract.. The Lump Sum Price shall include all labor, materials, equipment, services, overhead, profit, insurance, bonds, taxes, etc., to cover the finished work of the several kinds called for in place.

BASE BID

DESCRIPTION	LUMP SUM BID PRICE
Construction Improvements at Huff Lane and Fishburn Parks as described herein. (Work as described herein, **excluding** demolition of existing facilities at Fishburn Park)	$_____

ALTERNATE #1

DESCRIPTION	LUMP SUM BID PRICE
Construction Improvements at Huff Lane and Fishburn Parks as described herein. (Work as described herein, **including** demolition of existing facilities at Fishburn Park)	$_____

The City reserves the right to award to the lowest responsive and responsible bidder, with or without inclusion of the alternate bid item described herein.

The undersigned acknowledges the receipt of the following addenda to the Contract Documents:

Addendum Number _____ Dated _____
Addendum Number _____ Dated _____
Addendum Number _____ Dated _____

The undersigned hereby agrees, if this bid is accepted by the City, to commence work with an adequate force and equipment on the date stipulated in the written "Notice to Proceed" from the Director of Parks and Recreation and, unless otherwise directed by the Director of Parks and Recreation to complete all park improvements as identified herein within one hundred fifty (150) consecutive calendar days from the date stipulated in the written "Notice to Proceed" and to pay as liquidated damages the sum of Two Hundred and 00/100 Dollars ($200.00) per day as step one liquidated damages and the sum of One Hundred and 00/100 Dollars ($100.00) per day as step two liquidated damages to the City of Roanoke for each consecutive calendar day in excess of the time indicated to fully and satisfactorily complete the Work.

By submitting a bid, the undersigned agrees it will not withdraw its bid during the time period provided for in the Invitation to Bid, except as provided for therein.

The Bidder, by submission of this bid, hereby certifies that such Bidder has read all of the bid documents and such Bidder is making the certifications contained in, required by, and/or referred to in the bid documents and agrees to be bound by such certifications. Such Bidder further agrees that Bidder, if awarded a contract for this Project, shall provide the work, services, materials, and any other items as required by the bid documents and in compliance with such bid documents, Federal, state, and/or local rules, regulations, and/or procedures contained in the bid documents and/or any resultant contract, or referred to therein. Furthermore, if there is any conflict in any of the documents, the more stringent provisions shall take precedence unless otherwise required by Federal, State, and/or local laws, documents, regulations, rules, and/or

procedures, in which case they will take precedence in that order unless otherwise required by law.

The undersigned agrees that if this bid is accepted by the City, the failure or refusal of the undersigned to execute the Contract with the City and furnish to the City the required bonds and certificates of insurance within ten (10) consecutive calendar days from receipt of the Contract Documents may result in a payment of the Bid Security to the City as liquidated damages.

The attention of each bidder is directed to Code of Virginia, Sections 54.1-1100, et. seq., which requires certain licenses for contractors, tradesmen, and others. Each bidder is required to determine which license, if any, it is required to have under such sections. Complete the following:

Bidder _____ does have _____ does not have a Virginia Contractor's License. (Check appropriate blank.)

If bidder has a Virginia Contractor's License, circle the class bidder has and list the number.
Licensed "Class A", "Class B", or "Class C" Virginia Contractor Number _____
Identify Specialty _____

If bidder has another type of Virginia License, please list the type and number:
Type of license: _____ Number: _____

Bidder is a _____ resident or _____ nonresident of Virginia. (Check appropriate blank. See Code of Virginia, Sections 54.1-1100, et. seq.)

The attention of each Bidder is directed to Virginia Code Section 2.2-4311.2 (effective July 1, 2010) which requires a bidder organized or authorized to transact business in the Commonwealth of Virginia pursuant to Title 13.1 or Title 50 of the Code of Virginia, as amended, or as otherwise required by law, shall include in its bid the Identification Number issued to such bidder by the Virginia State Corporation Commission (SCC). Furthermore, any bidder that is not required to be authorized to transact business in the Commonwealth of Virginia as a domestic or foreign business entity under Title 13.1 or Title 50 or as otherwise required by law shall include in its bid a statement describing why the bidder is not required to be so authorized. Please complete the following by checking the appropriate line that applies and providing the requested information:

A._____ Bidder is a Virginia business entity organized and authorized to transact business in Virginia by the SCC and such bidder's Identification Number issued to it by the SCC is _____.

B._____ Bidder is an out-of-state (foreign) business entity that is authorized to transact business in Virginia by the SCC and such bidder's Identification Number issued to it by the SCC is _____.

C._____ Bidder does not have an Identification Number issued to it by the SCC and such bidder is not required to be authorized to transact business in Virginia by the SCC for the following reason(s):

_____
_____
_____
_____

Please attach additional sheets of paper if you need more space to explain why such bidder is not required to be authorized to transact business in Virginia.

The undersigned states and certifies that it has made a best or good faith effort to seek the participation of and utilize MBES, WBES, SBS and VBS as suppliers and subcontractors whenever possible for this Project.

State the complete legal name of the bidder, exactly as it is recorded with the State Corporation Commission, if recorded there.

LEGAL NAME_____

BY_____ TITLE_____
(TYPED NAME:)

SIGNED NAME_____
State Corporation Commission Identification No. _____
DELIVERY ADDRESS_____

MAILING ADDRESS_____

CITY_____ STATE _____ ZIP CODE _____

TELEPHONE_____FAX_____

CONTACT EMAIL ADDRESS
_____

ESCROW ACCOUNT REQUESTED (if applicable): YES _____ NO _____
DELIVERY OF BIDS: See Section 7.1 of the Instructions to Bidders.

Monica Cole, Senior Buyer
Purchasing Division
Noel C. Taylor Municipal Building
215 Church Avenue, S.W., Room 202,
Roanoke, Virginia 24011

Place on front of the envelope the project title as indicated at the top of the Invitation to Bid. Place on front of the envelope the bidder's name, mailing address, and Invitation to Bid No.

ROANOKE CITY PARK IMPROVEMENTS-HUFF LANE AND FISHBURN PARKS
ROANOKE, VIRGINIA
ITB# 16-02-04

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CITY OF ROANOKE, VIRGINIA
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 City or Owner, in the penal sum of _____ _____($_____) for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns. Signed, sealed, and delivered this _____ day of_____, 20____.

The condition of the above obligation is such that whereas the Principal has submitted to the _____ a certain bid, attached hereto and hereby made a part hereof, to enter a contract in writing for the _____ _____ _____.

NOW, THEREFORE, if the bid shall be rejected, or if the bid shall be accepted and the Principal shall execute and deliver to the City a Contract in the Form of Contract contained in the proposed Contract Documents, properly completed in accordance with the bid, and shall furnish bond for his faithful performance of the Contract and for the payment of all persons performing labor or furnishing materials in connection herewith within the specified time period, and shall in all other respects perform the agreement created by the acceptance of the bid, 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 the Surety and its bond shall be in no way impaired or affected by any extension of the time within which the City may accept such bid; and the Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have hereunder 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 first set forth above.

Attest: _____(SEAL)
Principal

_____ By_____
Title

Witness to signature of
Attorney-in-Fact: _____(SEAL)
Surety

_____ By_____
Witness Attorney-in-Fact

(Attorneys-in-fact affix seal and attach current original or certified copy of power of attorney.)

CITY OF ROANOKE, VIRGINIA
ESCROW AGREEMENT

(ONLY IF APPLICABLE)

THIS AGREEMENT ("Agreement"), made and entered into this _____ day of _____, 20_____ by, between and among the City of Roanoke, Virginia ("City" or "Owner"), _____ _____ ("Contractor"),

_____
(Name of Escrow Agent)

_____
(Address of Escrow Agent)

a trust company, bank, or savings and loan institution (hereinafter referred to collectively as "Escrow Agent") with its principal office located in the Commonwealth of Virginia ("Commonwealth") and _____ _____ ("Surety") provides:

I.

The City and the Contractor have entered into a contract dated _____ _____ with respect to City of Roanoke Invitation to Bid No. _____, for _____ _____ _____ ("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. Payments should be made to _____ _____and mailed to_____ _____ _____ (Name and Address of Escrow Agent).

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 Escrow Agent. This agreement sets forth the terms of the escrow. The Escrow Agent 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 Escrow Agent 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 Escrow Agent for the payment of funds retained under the contract and paid by the City to the Escrow Agent.

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

Funds and securities held by the Escrow Agent 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 drawn by the City and made payable to it as escrow agent, the Escrow Agent 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 Escrow Agent invest the escrowed funds in any security not approved, as set forth in Section V. below.

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 the City of Roanoke, Virginia, if such bonds carried, at the time of purchase by the Escrow Agent or deposit by the Contractor, a Standard and Poor's or Moody's Investor 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 Escrow Agent 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 Escrow Agent 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 Escrow Agent approved securities as set forth in Section V. above 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 of par or market value, the latter as determined by the Escrow Agent. 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 Escrow Agent shall pay the principal of the fund, or any specified amount thereof, to the City or the Contractor as the City may direct. If payment is to be made to the City, it shall be made in cash. However, if payment has been authorized to be made to the Contractor, the Contractor may specify to the Escrow Agent if payment is to be made in cash or in kind. Such payment and delivery shall be made as soon as is practicable after receipt of the direction.

VII.

For its services hereunder the Escrow Agent shall be entitled to a reasonable fee in accordance with its published schedule of fees or as may be agreed upon by the Escrow Agent and the Contractor. Such fee and any other costs of administration of this 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 Escrow Agent'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.

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

	_____ Typed Name of Contractor
Attest: (if corporation) Witness: (if individual)	
_____	_____ President/Vice-President; Partner or Owner (Seal)
	_____ Typed Name of Escrow Agent
Attest:	
_____ Bank Officer	_____ Vice President
	_____ Typed Name of Surety Company
Witness:	
_____	By:_____ Attorney-In-Fact
	City of Roanoke, Virginia
Attest:	
_____ City Clerk/Deputy City Clerk	_____ City Manager
Approved as to form:	Approved as to execution:
_____ City Attorney/Assistant City Attorney	_____ City Attorney/Assistant City Attorney

CITY OF ROANOKE, VIRGINIA

SAMPLE CONTRACT

THIS CONTRACT, is dated this _____ day of _____, 20____, between _____ _____, hereinafter referred to as the "Contractor", and the City of Roanoke, Virginia, a municipal corporation, chartered under the laws of the Commonwealth of Virginia, hereinafter referred to as the "City" or "Owner";

W I T N E S S E T H:

THAT, WHEREAS, the Contractor has been awarded a contract by the City for furnishing all equipment, materials, goods, labor, and services necessary for providing park improvements at Huff Lane and Fishburn Parks and associated Work, all in a proper and timely manner and in accordance with the Contract Documents, hereinafter and in the Contract Documents referred to as the "Work";

WHEREAS, the Contractor has entered into a performance and a payment bond, with surety, each in the penalty of One Hundred Percent (100%) of the Contract sum, payable to the City of Roanoke as required by the Contract Documents;

NOW, THEREFORE, THIS AGREEMENT WITNESSETH:

ARTICLE 1. That, for and in consideration of the sums of money hereinafter specified to be paid by the City to the Contractor for the Work provided in the Contract Documents to be performed by the Contractor, the Contractor hereby covenants and agrees with the City to fully construct, perform, and complete the Work in a good and workmanlike manner in accordance with the Contract Documents to produce a fully functional and properly operating project within the time stipulated, time being made of the essence of this Contract; it being agreed by the parties hereto that the Contract Documents consist of this Contract and those items set forth in the definition of Contract Documents in Section 1 of the General Conditions and includes the following, all of which are and constitute a part of this Contract as if attached hereto or set out in full herein, viz:

Invitation to Bid contained in the Project Manual dated August 21, 2015

Instructions to Bidders dated August 21, 2015

General Conditions dated August 21, 2015

Supplemental General Conditions, if any, as contained in the Project Manual dated

August 21, 2015

Insurance Requirements (Exhibit 1)

Plans and Drawings as contained or listed in the Project Manual dated August 21, 2015

Specifications as contained in the Project Manual dated August 21, 2015

Special Conditions or similar documents, if any, as may be contained in the Project Manual dated _____

Bid Form completed by Contractor for this project

Contractor's Performance Security

Contractor's Labor and Material Payment Security

Escrow Agreement, if any

ARTICLE 2. CONTRACT SUM: The City covenants and agrees to pay the Contractor for the Contractor's complete and satisfactory performance of the Work, in the manner and at the times set out in the Contract Documents, in current funds, the Contract Sum of _____ Dollars ($_____), as provided for in the Contract Documents and as the Contract Sum may be increased or decreased by additions and/or reductions in the Work or as the Contract Sum may be decreased by the City's assessment of liquidated damages against Contractor, or by setoff or as provided for in the Contract Documents or as allowed by law.

ARTICLE 3. TIME OF COMMENCEMENT AND COMPLETION: The Contractor shall commence the Work to be performed under this Contract on such date as is established and fixed for such commencement by written notice to proceed given by the Director of Parks and Recreation to the Contractor, and the Contractor covenants and agrees to fully construct, perform, and complete the Work within one hundred fifty (150) consecutive calendar days after the date of commencement fixed and established by such notice. The Contractor further agrees that the Work shall be started promptly upon receipt of such notice and shall be prosecuted regularly, diligently, and uninterruptedly at a rate of progress that will ensure full completion thereof in the shortest length of time consistent with the Contract Documents.

ARTICLE 4. LIQUIDATED DAMAGES: City and Contractor recognize that time is of the essence in the completion of the Work and that City will suffer loss or damages if the Work is not completed within the period of time stipulated above, plus any extensions thereof allowed in accordance with the General Conditions. The parties also recognize the delays, expense, and difficulties involved in proving the actual loss or damages suffered by City if the Work is not completed on time. Accordingly, if such

Work is not fully and satisfactorily completed within the period of time set forth in Article 3, the Contractor agrees it shall owe to and pay to City as liquidated damages for loss of City's full use or occupancy of the Work, but not as a penalty, the sum of two hundred and 00/100 Dollars ($200.00) as step one liquidated damages and the sum of one hundred and 00/100 Dollars ($100.00) as step two liquidated damages for each consecutive calendar day during which full and satisfactory completion of the Work is delayed or exceeds the number of days provided for in this Contract to complete the Work. Steps one and two being defined in Section 21 of the General Conditions. Contractor further agrees that any liquidated damages City assesses against Contractor may also be withheld by City from any retainage or other sums City may otherwise owe to Contractor. Contractor hereby waives any defense as to the validity of any liquidated damages stated herein on the grounds such liquidated damages could be void as penalties or are not reasonably related to actual damages. All such liquidated damages are in addition to any other damages the City may be entitled to recover from Contractor.

ARTICLE 5. PAYMENT FOR WORK: Construction estimates for payment, including the final payment request, submitted by the Contractor shall be in accordance with the provisions of Sections 20, 21, and 22 of the General Conditions and such other provisions of the Contract Documents that may be applicable. Final payment will not be made until the Work has been fully and satisfactorily completed, the Contract duly performed, and Certificate of Final Acceptance has been issued by the Director of Parks and Recreation, all as provided for in the Contract Documents.

ARTICLE 6. NONWAIVER: Contractor agrees that the City's waiver or failure to enforce or require performance of any term or condition of this Contract or the City's waiver of any particular breach of this Contract by the Contractor extends to that instance only. Such waiver or failure is not and shall not be a waiver of any of the terms or conditions of this Contract or a waiver of any other breaches of the Contract by the Contractor and does not bar the City from requiring the Contractor to comply with all the terms and conditions of the Contract and does not bar the City from asserting any and all rights and/or remedies it has or might have against the Contractor under this Contract or by law.

ARTICLE 7. FORUM SELECTION AND CHOICE OF LAW: By virtue of entering into this Contract, the Contractor submits itself to a court of competent jurisdiction in the City of Roanoke, Virginia, and further agrees that this Contract is controlled by the laws of the Commonwealth of Virginia and that all claims, disputes, and other matters shall only be decided by such court according to the laws of the Commonwealth of Virginia.

ARTICLE 8. SEVERABILITY: If any provision of this Contract, or the application of any provision hereof to a particular entity or circumstance, shall be held to be invalid or unenforceable by a court of competent jurisdiction, the remaining

provisions of the Contract shall not be affected and all other terms and conditions of the Contract shall be valid and enforceable to the fullest extent permitted by law.

ARTICLE 9. NONDISCRIMINATION:

A. During the performance of this Contract, the Contractor agrees as follows:

1. The Contractor will not discriminate against any Subcontractor, 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 reasonably necessary to the normal operation of the Contractor. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the provisions of this nondiscrimination clause.

2. The Contractor, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, will state that such Contractor is an equal employment opportunity employer.

3. Notices, advertisements, and solicitations placed in accordance with federal law, rule, or regulation shall be deemed sufficient for the purpose of meeting the requirements of this section.

B. The Contractor will include the provisions of the foregoing Subsections A (1), (2), and (3) in every subcontract or purchase order of over $10,000, so that the provisions will be binding upon each subcontractor or vendor.

ARTICLE 10. Pursuant to the Code of Virginia, Section 2.2 - 4343.1, be advised that the City of Roanoke does not discriminate against faith-based organizations.

ARTICLE 11. COMPLIANCE WITH FEDERAL IMMIGRATION LAW: Contractor agrees that Contractor does not, and shall not during the performance of this Contract, knowingly employ an unauthorized alien as defined in the federal Immigration Reform and Control Act of 1986.

ARTICLE 12. COMPLIANCE WITH STATE LAW, FOREIGN AND DOMESTIC BUSINESSES AUTHORIZED TO TRANSACT BUSINESS IN THE COMMONWEALTH OF VIRGINIA: Contractor shall comply with the provisions of Virginia Code Section 2.2-4311.2, as amended, which provides that a contractor organized as a stock or nonstock corporation, limited liability company, business trust, or limited partnership or registered as a registered limited liability partnership shall be

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. Contractor shall not allow its existence to lapse or its certificate of authority or registration to transact business in the Commonwealth, if so required under Title 13.1 or Title 50, to be revoked or cancelled at any time during the term of the Contract. The City may void the Contract if the Contractor fails to remain in compliance with the provisions of this section.

ARTICLE 13. CONTRACT SUBJECT TO FUNDING: This Contract is subject to funding and/or appropriations from federal, state, and/or local governments and/or agencies. If any such funding is not provided, withdrawn, or otherwise not made available for this Contract, the Contractor agrees that the City may terminate this Contract on seven (7) days written notice to Contractor, without any penalty or damages being incurred by the City. Contractor further agrees to comply with any applicable requirements of any grants and/or agreements providing such funding.

ARTICLE 14. NOTICES: All notices must be given in writing and shall be validly given if sent by certified mail, return receipt requested, or by a nationally recognized overnight courier, with a receipt, addressed as follows (or any other address that the party to be notified may have designated to the sender by like notice):

To City:	City of Roanoke _____ _____ _____ Roanoke, Virginia 24011
Facsimile:	(540) 853-XXXX
Copy to:	City of Roanoke Purchasing Division Attn: Purchasing Manager Noel C. Taylor Municipal Building, Room 202 215 Church Avenue, SW Roanoke, Virginia 24011
Facsimile:	(540) 853-1513
If to Contractor:	_____ Attn:_____,President/CEO _____ _____
Facsimile:	_____

Notices shall be deemed to be effective one day after sending if sent by overnight courier or three (3) days after sending it by certified mail, return receipt requested.

ARTICLE 15. ENTIRE CONTRACT: This Contract is an entire and integrated contract and is not severable, except as set forth in Article 8, and may be modified only by written agreement properly executed by the parties.

SIGNATURE PAGE WILL FOLLOW

IN WITNESS WHEREOF, the parties hereto have signed this Contract by their authorized representatives.

Witness:

_____
Typed Name of Contractor

_____

By _____
President/Vice-President; Partner or Owner

_____
Typed or Printed Name and Title

_____
Typed or Printed Name and Title

(Contractor's Corporate Seal)

Witness:

CITY OF ROANOKE, VIRGINIA

_____

By _____

_____
Typed or Printed Name and Title

_____
Typed or Printed Name and Title

Appropriation and Funds Required
for this Contract Certified

_____
Director/Deputy Director of Finance

Date: _____

Account #: _____
CT#: _____

Approved as to form:

_____
City Attorney/Assistant City Attorney

Approved as to execution:

_____
City Attorney/Assistant City Attorney

CITY OF ROANOKE, VIRGINIA

CONTRACTOR'S PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS:

that _____

_____

_____

(Insert full name or legal title and address of Contractor)

as Principal, (hereinafter referred to as "Contractor"),

and _____

_____

_____

(Insert full name or legal title and address of Surety)

Telephone: _____ Fax: _____

as Surety (hereinafter referred to as "Surety"), are held and firmly bound unto the City of Roanoke, Virginia, a municipal corporation, 215 Church Avenue, S.W., Noel C. Taylor Municipal Building, Room 350, Roanoke, Virginia 24011, as Obligee (hereinafter referred to as "City" or "Owner"), in the amount of _ _____ Dollars ($_____), for the payment whereof Contractor and Surety bind themselves, their heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents to the terms of this bond.

WHEREAS, Contractor has entered into a Contract with the City dated _____, 20_____, incorporating certain specifications and drawings prepared by:

_____

_____

_____

(Insert full name or legal title and address)

(which Contract, specifications, drawings, and other Contract Documents are hereinafter referred to collectively as the "Contract") for a fully functional and properly operating project, namely _____ _____ _____, all in a proper and timely manner and in accordance with the Contract Documents, which Contract is expressly incorporated herein by reference and made a part of this bond.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that if the Contractor shall promptly and faithfully perform the Contract, in strict conformity with each and every requirement of the Contract, then this obligation shall be null and void; otherwise, this Performance Bond shall remain in full force and effect and is subject to the following conditions:

a. Any alteration which may be made in the terms of the Contract, including, without limitation, the amount to be paid or the work to be done under it, or the giving by the City of any extension of time for the performance of the Contract or any other forbearance of any nature whatsoever on the part of either the City or the Contractor to the other shall not in any way release the Contractor and the Surety, or either of them, their heirs, executors, administrators, successors, or assigns from their liability hereunder, and notice of such alteration, extension, or forbearance is hereby expressly waived by Surety.

b. IT IS NOT INTENDED BY ANY OF THE PROVISIONS OF ANY PART OF THIS BOND TO CONFER A BENEFIT UPON ANY OTHER PERSON OR ENTITY NOT A PARTY TO THIS PERFORMANCE BOND OR TO AUTHORIZE ANY PERSON OR ENTITY NOT A PARTY TO THIS BOND TO MAINTAIN A SUIT PURSUANT TO THE TERMS OR PROVISIONS OF THIS BOND OTHER THAN THE CITY OR ITS SUCCESSORS OR ASSIGNS.

c. The Surety hereby submits itself to a court of competent jurisdiction in Roanoke, Virginia, and agrees that any suit or action hereunder shall be brought only in a Virginia court of competent jurisdiction in the City of Roanoke or in the United States District Court for the Western District of Virginia, Roanoke Division, and not elsewhere.

d. Any suit under this bond must be instituted within two (2) years after (i) completion of the Contract, including the expiration of all warranties and guarantees, or (ii) discovery of the defect or breach of warranty, if the action be for such, in all other cases.

e. The provisions of this bond shall be governed by and interpreted to be consistent with the laws of the Commonwealth of Virginia.

SIGNED AND SEALED this ____ day of _____, 20_____, in the presence of:

WITNESS: _____
CONTRACTOR

By:_____ (Seal)

_____ _____
(Type Name and Title)

WITNESS: _____
SURETY

By:_____ (Seal)
Attorney-in-Fact

_____ _____
(Type Name and Title)

(Attorneys-in-fact affix seal and attach original or certified copy of current power of attorney.)

CITY OF ROANOKE, VIRGINIA

CONTRACTOR'S LABOR AND MATERIAL PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS:

that _____

_____

_____

(Insert full name or legal title and address of Contractor)

as Principal, (hereinafter referred to as "Contractor"),

and _____

_____

_____

(Insert full name or legal title and address of Surety)

Telephone: _____ Fax: _____

as Surety (hereinafter referred to as "Surety"), are held and firmly bound unto the City of Roanoke, Virginia, a municipal corporation, 215 Church Avenue, S.W., Noel C. Taylor Municipal Building, Room 350, Roanoke, Virginia 24011, as Obligee (hereinafter referred to as "City" or "Owner"), for the use and benefit of Claimants as herein below defined, in the amount of _____ _____ Dollars ($_____), for the payment whereof Contractor and Surety bind themselves, their heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents to the terms of this bond.

WHEREAS, Contractor has entered into a Contract with the City dated _____, 20_____, incorporating certain specifications and drawings prepared by:

_____

_____

_____

(Insert full name or legal title and address)

(which Contract, specifications, drawings, and other Contract Documents are hereinafter referred to collectively as the "Contract") for providing a fully functional and properly operating project, namely _____ _____ _____,

all in a proper and timely manner and in accordance with the Contract Documents, which Contract is expressly incorporated herein by reference and made a part of this bond.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that if the Contractor shall promptly make payment to all Claimants, as hereinafter defined, for all material furnished or labor supplied or performed in the prosecution of the work provided for in the Contract, then this obligation shall be void; otherwise this Labor and Material Payment Bond shall remain in full force and effect and is subject to the following conditions:

a. Any alteration which may be made in the terms of the Contract, including, without limitation, the amount to be paid or the work to be done under it, or the giving by the City of any extension of time for the performance of the Contract or any other forbearance of any nature whatsoever on the part of either the City or the Contractor to the other shall not in any way release the Contractor and the Surety, or either of them, their heirs, executors, administrators, successors, or assigns from their liability hereunder, and notice of such alteration, extension, or forbearance is hereby expressly waived by Surety.

b. A Claimant is defined as one who has and fulfills a contract to supply labor or materials, or both, to the Contractor or to any of the Contractor's subcontractors, in the prosecution of work provided for in the Contract, labor and material being construed to include, without limitation, public utility services and reasonable rentals of equipment, but only for periods when the equipment rented is actually used at the site, or who may otherwise be allowed by law to file a claim against the Contractor and/or Surety.

c. The Contractor and Surety hereby jointly and severally agree with City that every Claimant, as defined in paragraph b, **who has a direct contractual relationship with the Contractor and** who has performed labor or furnished material in accordance with the Contract in the prosecution of the work provided for in the Contract and who has not been paid in full therefore before the expiration of ninety (90) days after the day on which such Claimant performed the last such labor or furnished the last of such materials for which Claimant claims payment, or as may otherwise be allowed by law, may bring an action on this payment bond to recover any amount due Claimant for such labor or material, and may prosecute such action to final judgment and have execution on the judgment. The Contractor and Surety expressly agree that City shall not be liable for the payment of any judgment, costs, or expenses resulting from any such suit and that neither Contractor nor Surety shall cause City to be named as a party in any such suit.

d. The Contractor and Surety hereby jointly and severally agree with City that every Claimant, as defined in paragraph b, who has direct contractual relationship with any subcontractor, but who has no contractual relationship, express or implied, with such Contractor, may bring an action on this bond only if the Claimant has given written notice to the Contractor within **ninety (90)** days from the day on which the Claimant performed the last of the labor or furnished the last of the materials for which payment is claimed, stating with substantial accuracy the amount claimed and the name of the person for whom the work was performed or to whom the material was furnished, or as may otherwise be allowed by law. **Notice to the Contractor shall be given as set forth in Virginia Code §2.2-4341 and Claimants are advised to review such Code Section.** The Contractor and Surety expressly agree that City shall not be liable for the payment

of any judgment, costs, or expenses resulting from any such suit and that neither Contractor nor Surety shall cause City to be named as a party in any such suit.

e. The Surety hereby submits itself to a court of competent jurisdiction in Roanoke, Virginia, and agrees that any suit or action hereunder by any Claimant shall be brought only in a Virginia court of competent jurisdiction in and for the City of Roanoke, or in the United States District Court for the Western District of Virginia, Roanoke Division, and not elsewhere.

f. Any suit or action hereunder shall be brought within one year after the day on which the person bringing such action last performed labor or last furnished or supplied materials.

g. The provisions of this bond shall be governed by and interpreted to be consistent with the laws of the Commonwealth of Virginia, including, but not limited to Virginia Code §2.2-4341.

SIGNED AND SEALED this ____ day of _____, 20_____, in the presence of:

_____
CONTRACTOR

WITNESS:

By:_____ (Seal)

_____ _____
(Type Name and Title)

_____
SURETY

WITNESS:

By:_____(Seal)
Attorney-In-Fact

_____ _____
(Type Name and Title)

(Attorneys-in-fact affix seal and attach current original or certified copy of power of attorney.)

CITY OF ROANOKE, VIRGINIA

CERTIFICATE OF SUBSTANTIAL COMPLETION

The Date of Substantial Completion of the Work or designated portion thereof is the Date certified by the Project Manager when construction is sufficiently complete, in accordance with the Contract Documents, so the City of Roanoke, Virginia (City or Owner) can occupy or utilize the Work or designated portion thereof for the use for which it is intended, as expressed in the Contract Documents.

PROJECT MANAGER: _____
BID NUMBER: _____ DATE OF ISSUANCE: _____
PROJECT: _____
CONTRACTOR: _____
PROJECT OR DESIGNATED PORTION SHALL INCLUDE: _____
_____
_____.

The Work or portion thereof designated above performed under this Contract has been reviewed and found to be substantially complete. The Date of Substantial Completion of the Project or portion thereof designated above is hereby established as _____. The City will assume possession thereof at _____ a.m./p.m. on that date.

A list of items ("punch list"), prepared by the Project Manager, to be completed or corrected by the Contractor, is attached hereto. The failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. The Contractor will complete any portion of the Work that is not substantially complete and will complete or correct the work on the punch list in accordance with the Contract Documents.

The establishment of a date of substantial completion and/or the acceptance of the Work or designated portion thereof does not relieve the Contractor of any responsibility for any faulty materials or workmanship or operate to relieve the Contractor or its Surety from any obligation under the Contract with the City or the Performance Bond or Labor and Material Payment Bond.

This Certificate is subject to the terms and conditions of the Contract Documents, including but not limited to Section 20.8 of the General Conditions.

_____	_____	_____
Project Manager	By	Date
_____	_____	_____
Contractor	By	Date
_____	_____	_____
Director of Parks and Recreation	By	Date

CITY OF ROANOKE, VIRGINIA

AFFIDAVIT OF PAYMENT OF CLAIMS

By: _____

_____

_____
(Insert Exact Name and Address of Firm)

This day _____ personally appeared before me, _____, a Notary Public in and for the City (County) of _____, and, being by me first duly sworn states that all subcontractors and suppliers of labor and materials have been paid all sums due them for work performed or materials furnished in the performance of the Contract between the City of Roanoke, Virginia, and _____
_____
_____
or arrangements have been made by the Contractor satisfactory to such subcontractors and suppliers with respect to the payment of such sums as may be due from the Contractor to the subcontractors and suppliers.

CONTRACTOR:_____
BY:_____
PRINTED OR TYPED NAME AND TITLE:_____

Commonwealth of Virginia at Large:
Subscribed and sworn to before me this ____ day of _____,20_____.
My commission expires on the ____ day of _____, _____.

_____
Notary Public

_____
Printed Name of Notary Public

CITY OF ROANOKE, VIRGINIA

CERTIFICATE OF FINAL ACCEPTANCE

This Certificate is subject to the terms and conditions of the Contract Documents, including but not limited to Section 20.8 of the General Conditions. The City, Contractor, and Project Manager, if applicable, hereby agree that the date fixed for Final Acceptance of the Work by the City is _____.

The establishment of a date of Final Acceptance and/or the acceptance of the Work does not relieve the Contractor of any responsibility for any faulty materials or workmanship or operate to relieve the Contractor or its Surety from any obligation under the Contract with the City or the Performance Bond or Labor and Material Payment Bond.

PROJECT MANAGER: _____

PROJECT NUMBER: _____

PROJECT: _____

_____

CONTRACTOR: _____

Project Manager	By	Date
Contractor	By	Date
Director of Parks and Recreation	By	Date

CITY OF ROANOKE, VIRGINIA
GENERAL CONDITIONS

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CITY OF ROANOKE, VIRGINIA

GENERAL CONDITIONS

SECTION 1. DEFINITIONS

Whenever used in these General Conditions or in the Contract Documents, the following terms have the meanings indicated, which are applicable to both the singular and plural and the male and female gender thereof, and where applicable to any other legal entity such as a corporation, partnership, limited liability company, etc.

The section and paragraph headings are inserted for convenience only.

Architect, Engineer, Architect/Engineer or A/E: The term used to designate the Architect and/or the Engineer who contracts with the City to provide the Architectural and Engineering services for the project. The Architect/Engineer is a separate Contractor and is referred to herein as the Architect/Engineer or abbreviated as A/E. The term includes any associates or consultants employed by the firm to assist in providing the A/E services.

Bidder: The person, firm, corporation, or other entity interested in submitting a bid for the Work to be performed.

Change Order: A document issued by Director of Parks and Recreation on or after the effective date of the Contract which is agreed to by the Contractor and approved by the City, and which authorizes an addition, deletion, or revision in the Work, including any adjustment in the Contract Price and/or the Contract Time.

City or Owner: The City of Roanoke, Virginia, or its authorized representative.

City Code: Refers to the Code of the City of Roanoke (1979), as amended.

Director of Parks and Recreation: Director of Parks and Recreation or his authorized representative.

City Manager: The City Manager or his authorized representative.

Code of Virginia: Refers to the Code of Virginia (1950), as amended. (Sometimes referred to as Va. Code or Virginia Code.)

Contract Documents: These documents include, but are not limited to, the Project Manual, Invitation to Bid, the Instructions to Bidders, the Bid Form, the Contract, the Bonds or other Bid Security, the Escrow Agreement, the General Conditions, Supplementary General Conditions, Special Conditions, the Specifications, Addenda or Change Orders, the Plans and Drawings, any Supplemental Drawings, and any additional documents incorporated by reference in the above.

Contract: The written agreement between the parties concerning the performance of the Work and consisting of the Contract Documents.

Contractor: The person, firm, corporation, or other entity entering into a contractual agreement with the City to perform the Work.

Defect, Defective, or Deficient: An adjective or noun which when modifying or referring to the word Work refers to Work or any part thereof that is unsatisfactory, faulty, or does not conform to the Contract Documents, or does not meet the requirements of any inspections, standards, tests, or approvals referred to in the Contract Documents.

Document(s): This term includes, but is not limited to: writings, drawings, items on which words, symbols, or marks are recorded; electronic data of any type; videotapes, recordings, photographs and negatives, digital or otherwise; and any other form of data, writing, or information compilation, however recorded or stored, and regardless of physical form or characteristics.

Field Order: A written order issued by Director of Parks and Recreation which clarifies the requirements of the Contract by giving a more complete expression of the drawings or specifications or other documents without any change in the design, the Contract price, or the Contract time.

Final Acceptance: The City's acceptance of the project from the Contractor upon confirmation from Director of Parks and Recreation and the Contractor that the project is apparently complete in accordance with the Contract requirements.

Notice: All written notices, demands, instructions, claims, approvals, and disapprovals required to obtain compliance with the Contract requirements. Any written notice by either party to the Contract 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 Contract, or to his, her, their, or its authorized agent, representative, or officer.

Notice to Proceed: A written notice given by the City at the City's discretion to the Contractor fixing the date on which the Contract time will commence for the Contractor to begin the prosecution of the Work in accordance with the requirements of the Contract Documents.

Project Inspector: One or more individuals employed by the City to inspect the Work and/or to act as Resident Inspector to the extent required by the City. The City shall notify the Contractor of the appointment of such Project Inspector(s).

Provide: Shall mean to furnish and install ready for its intended use.

Subcontractor: A person, firm, partnership, corporation, or other entity having a direct contract with the Contractor or with any other Subcontractor for the performance of the Work. It includes one who provides on-site labor, but does not include one who only furnishes or supplies material for the project.

Submittals: All drawings, diagrams, illustrations, brochures, schedules, samples, electronic data and other data required by the Contract Documents which are specifically prepared by or for the Contractor, Subcontractor, or Supplier, and submitted by the Contractor to illustrate the material, equipment, or layouts, or some other portion of the Work.

Substantial Completion: The date certified by Director of Parks and Recreation when construction is sufficiently complete, in accordance with the Contract Documents, so the City can occupy or utilize the Work or designated portion thereof for the purposes for which it is intended.

Successful Bidder: The bidder to whom the City makes an award.

Supplier: A manufacturer, fabricator, distributor, material man, or vendor who provides only material or supplies for the project, but does not provide on-site labor.

Work or Project: The entire completed construction or the various separately identifiable parts thereof as required by the Contract Documents. Work is the result of performing services, furnishing labor, and furnishing and incorporating material and equipment into the construction.

SECTION 2. INDEMNITY PROVISION

2.1 Indemnity: Contractor shall indemnify and hold harmless City and its officers, agents, and employees against any and all liability, losses, damages, claims, causes of action, suits of any nature, costs, and expenses, including reasonable attorney's fees, resulting from or arising out of Contractor's or its employees, agents, or subcontractors actions, activities, or omissions, negligent or otherwise, on or near City's property or easement or arising in any way out of or resulting from any of the work to be provided under this Contract, and this includes, without limitation, any fines or penalties, violations of federal, state, or local laws or regulations, personal injury, wrongful death, or property damage claims or suits, breach of contract claims, indemnity claims, and any other damages, losses, and/or claims of any type.

2.2 Hazardous Material: While on City's property or easement and in its performance of this Contract, Contractor shall not transport, dispose of or release any hazardous substance, material, or waste, except as necessary in performance of its Work under this Contract and in any event Contractor shall comply with all federal, state, and local laws, rules, regulations, and ordinances controlling air, water, noise, solid wastes, and other pollution, and relating to the storage, transport, release, or disposal of hazardous material, substances or waste. Regardless of City's acquiescence, Contractor shall indemnify and hold City, it officers, agents, and employees harmless from all costs, claims, damages, causes of action, liabilities, fines or penalties, including reasonable attorney's fees, resulting from Contractor's violation of this paragraph and agrees to reimburse City for all costs and expenses incurred by City in eliminating or remedying such violations. Contractor also agrees to reimburse City

and hold City, its officers, agents, and employees harmless from any and all costs, expenses, attorney's fees and all penalties or civil judgments obtained against the City as a result of Contractor's use or release of any hazardous substance or waste onto the ground, or into the water or air from or upon City's premises. (See also Section 13.2 of these General Conditions.)

2.3 Patents: The Contractor shall protect, indemnify, and hold harmless the City from any and all demands for fees, claims, suits, actions, causes of action, or judgments based on the alleged infringement or violation of any patent, invention, article, trademark, arrangement, or other apparatus that may be used in the performance of the Contract or the Work.

SECTION 3. LAWS, REGULATIONS, PERMITS, AND IMMIGRATION LAW

3.1 Regulations: The Contractor shall fully comply with all local, state, and federal ordinances, laws, and regulations, including without limitation all applicable building and fire code sections of the Occupational Safety and Health Act (OSHA), and the Virginia Uniform Statewide Building Code, and obtain all required licenses and permits, including business license, building permits, and pay all charges and expenses connected therewith. Contractor further agrees that Contractor does not, and shall not during the performance of this Contract; knowingly employ an unauthorized alien as defined in the federal Immigration Reform and Control Act of 1986.

3.2 Permits: The Contractor shall, at its sole cost, obtain all required permits from the appropriate authorities, including the City of Roanoke. This includes, but is not limited to, all permits for any excavations in any public right-of-way. No delay or extension of time or any claim for additional compensation of any type shall be granted for failure to obtain any required permits.

3.3 Litter: In accordance with the Virginia Anti-Litter Law, receptacles sufficient to contain workmen's litter and construction wastes capable of being spread by wind or water shall be located on the construction site. The number and size of receptacles required shall be determined by the Contractor.

3.4 Asbestos License: The Contractor, if not licensed as an asbestos abatement contractor or a Roofing, Flooring, and Siding (RFS) contractor in accordance with Section 54.1-514, of the Code of Virginia, shall have all asbestos related work performed by subcontractors who are duly licensed as asbestos contractors or RFS contractors as appropriate for the work required.

SECTION 4. CONTRACTOR'S AND SUBCONTRACTOR'S INSURANCE

Neither the Contractor nor any subcontractor shall commence work under this Contract until the Contractor has obtained and provided proof of the required insurance under this Section to the City. The Contractor confirms that all subcontractors have provided the Contractor with proof of insurance. Contractor further warrants that proof of coverage as provided to the City responds on a primary basis in the event of an

uninsured or underinsured subcontractor. All such insurance shall be primary and non-contributory to any insurance or self-insurance the City may have in force.

4.1 **For All Contracts,** the following minimum insurance requirements apply:

a. Workers' Compensation and Employers' Liability:

The Contractor shall obtain and maintain the following limits:

Workers' Compensation: Statutory

Employers' Liability: $100,000 bodily injury by accident each occurrence

$500,000 bodily injury by disease (policy limit)

$100,000 bodily injury by disease each employee

b. Commercial General Liability:

Coverage is to be written on an "occurrence" basis and such coverage shall include broad form extension endorsements for both liability and property damage.

Completed Operations coverage will be required to be maintained for the life of the Contract.

For Limits of Liability see Sections 4.2 and 4.3 of these General Conditions.

c. Automobile Liability:

Limits for vehicles owned, non-owned, hired or borrowed shall not be less than:

- $1,000,000 Bodily Injury and Property Damage combined single limit per occurrence.

d. Additional Insurance Requirements:

Additional specific insurance coverage minimum requirements to be provided by Contractor may include the following as detailed in the Supplemental General Conditions:

1) Builders Risk: At the discretion of the City, the Contractor, at its cost, shall obtain and maintain in the names of the City and the Contractor "all-risk" builders risk insurance (if approved by the City) upon the entire structure or structures on which the Work of this Contract is to be done and upon all material in or adjacent thereto or those that are “off-site” but which are

intended for use thereon, to one hundred percent (100%) of the completed value thereof.

2) Property Coverage: Installation Floater (and Rigger's Form, if applicable) will be required for the installation of contents or equipment; coverage will begin with supplier and continue until equipment/contents have been fully installed. Floater will be valued for the replacement cost value of equipment/contents including all costs. The Contractor shall provide coverage for portions of the work stored off-site after written approval of the City at the value established in the approval and for portions of the work in transit.

3) Special Hazards: In the event special hazards are evident in the work contemplated, or if required by the Contract Documents, the Contractor shall obtain and maintain during the life of the Contract a rider to the policy or policies required, in an amount not less than that stipulated under the above Paragraphs. Should any unexpected special hazards be encountered during the performance of this Contract, the Contractor shall, prior to performing any work involving the special hazard, immediately obtain this insurance as instructed by the City. In the event the special hazard requiring the additional coverage was not a part of the original bid, the expense of such insurance shall be reimbursed to the Contractor by the City, otherwise the Contractor shall assume full responsibility for the purchase with no charge back to the City.

4) Deductible: Deductible/self-insured retention amounts shall be reduced or eliminated upon written request from City. The insurer's cost of defense (and appeal), including attorney's fees, shall not be included within the coverages provided but shall remain the insurer's responsibility.

5) Term: Insurance shall remain in effect until final payment and at all times thereafter when Contractor may be correcting, removing, or replacing defective work.

6) Limit of Liability: Nothing contained in these insurance requirements is to be construed as limiting the liability of Contractor or Contractor's insurance carriers. City does not in any way represent that the coverage's or the limits of insurance specified is sufficient or adequate to protect Contractor's interests or liabilities, but are merely minimums. The obligation of the Contractor to purchase insurance herein shall not in any way limit the obligation of the Contractor in any event and/or in the event that the City should suffer an injury or loss in excess of the amount recoverable through insurance.

4.2 Contracts of $100,000 or More: The following minimum insurance requirements apply in addition to the above requirements:

a. Limits of Liability: For the Commercial General Liability policy:

- $2,000,000 general aggregate
- $1,000,000 products/completed operations aggregate
- $1,000,000 personal and advertising injury
- $1,000,000 each occurrence

Coverage is to be written on an "occurrence" and "per project" basis and such coverage shall include:

b. Umbrella Liability Insurance:

This coverage shall be written for minimum limit of:

- $5,000,000 each occurrence for Personal and Bodily Injury and Property Damage

This Policy shall apply in excess and follow form of employer's liability, commercial general liability, and auto liability.

4.3 Contracts Less Than $100,000: The following minimum insurance limits apply unless specified otherwise in the Supplemental General Conditions:

a. Limits of Liability: For the Commercial General Liability policy:

- $1,000,000 general aggregate
- $1,000,000 products/completed operations aggregate
- $1,000,000 personal and advertising injury
- $1,000,000 each occurrence

4.4 Proof of Insurance Coverage: The policies of insurance required by Sections 4.1, 4.2, or 4.3 shall be purchased from a reputable insurer licensed to do business in Virginia and maintained for the life of the Contract by the Contractor. Other insurance requirements include the following:

a. The Contractor shall furnish the City with the required certificates of insurance showing the insurer, type of insurance, policy number, policy term, deductible, and the amount insured for property coverage's and the limits for liability coverage's.

b. The Contractor shall notify Director of Parks and Recreation and Risk Manager in writing within thirty (30) consecutive calendar days if any of the insurance coverage's or policies are cancelled or materially altered and Contractor shall immediately replace such policies and provide documentation of such to Director of Parks and Recreation and Risk Manager.

c. The required insurance policies and coverages, excluding those for Workers Compensation and Professional Liability, shall name the City of Roanoke, its officers, agents, volunteers and employees as additional insured's and the certificate of insurance shall show if the policies provide such coverage. Waiver of subrogation is required with respect to any policy of workers' compensation and employers' liability insurance required under this Section. The certificate of insurance shall show if the policies provide such waiver. Additional insured and waiver endorsements shall be received by the City's Risk Manager from the insurer with the certificate of insurance unless the City's Risk Manager agrees to another process. The City's Risk Manager may approve other documentation of such insurance coverages.

d. Insurance coverage shall be in a form and with an insurance company approved by the City which approval shall not be unreasonably withheld. Any insurance company providing coverage under this Contract shall be authorized to do business in the Commonwealth of Virginia.

SECTION 5. EMPLOYMENT AND CONDUCT OF PERSONNEL

5.1 City Residents: Pursuant to the provisions of Resolution Number 10610 of the Roanoke City Council it is required that in the employment of labor, on work performed for the City, that the Contractor shall give preference to residents of the City and give secondary preference to residents of the area within a radius of fifty (50) miles of the City, when such labor is available.

5.2 Employee Qualifications: Only skilled and reliable workers shall be employed for the Work. Should any person employed on the Work by the Contractor appear to Director of Parks and Recreation to be incompetent, unable to perform the Work, or disorderly, such person shall be removed from the Work immediately upon proper notice to the Contractor from Director of Parks and Recreation and such person shall not again be used for this Contract.

5.3 Superintendence: The Contractor shall have a competent foreman or superintendent, satisfactory to Director of Parks and Recreation, on the jobsite at all times during the progress of the Work. The Contractor shall notify the City, in writing, of any proposed change in the foreman or superintendent including the reason therefore prior to making such change.

5.4 Drug-free Workplace: During the performance of this Contract, the Contractor agrees to (i) provide a drug-free workplace for the Contractor's employees; (ii) 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 the Contractor's workplace and specifying the actions that will be taken against

employees for violations of such prohibition; (iii) state in all solicitations or advertisements for employees placed by or on behalf of the Contractor that the Contractor maintains a drug-free workplace; and (iv) include the provisions of the foregoing clauses in every subcontract or purchase order over $10,000, so that the provisions will be binding upon each subcontractor or vendor.

For the purpose 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 who 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.

The Contractor shall post a copy of the policy in a conspicuous place at the jobsite and assure that all Contractor, subcontractor, and supplier personnel entering the jobsite are informed of the policy.

SECTION 6. EMPLOYMENT DISCRIMINATION BY CONTRACTOR PROHIBITED

Every Contract of over $10,000 to which the City is a party shall contain the provisions in Sections 6.1 and 6.2 herein:

6.1 Nondiscrimination: During the performance of this Contract, the Contractor agrees as follows:

a. The Contractor will not discriminate against any Subcontractor, 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 reasonably necessary to the normal operation of the Contractor. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the provisions of this nondiscrimination clause.

b. The Contractor, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, will state that such Contractor is an equal employment opportunity employer.

c. Notices, advertisements, and solicitations placed in accordance with federal law, rule, or regulation shall be deemed sufficient for the purpose of meeting the requirements of this section.

6.2 Nondiscrimination by Subcontractor or Vendor: The Contractor will include the provisions of the foregoing Subsections 6.1 (a), (b), and (c) in every subcontract or purchase order of over $10,000, so that the provisions will be binding upon each subcontractor or vendor.

SECTION 7. SUBCONTRACTORS

7.1 Licensure: The Contractor shall comply with Title 54.1, Chapter 11, of the Code of Virginia, with respect to licensure of itself and all subcontractors employed to work on the project. The Contractor represents that it has verified that all subcontractors hold all required state and local licenses, including State Contractor's license and City business license. The Contractor shall verify that any additional subcontractors employed to work on the project, subsequent to the initial verification, hold all required state and local licenses, including State Contractor's license and City business license. The Contractor is required to submit the Contractor's Certification as to Licensure of Subcontractors Form to Director of Parks and Recreation. This constitutes a material part of the Contractor's Contract with the City.

7.2 Change of Subcontractors: Subcontractors shall not be changed without the written approval of Director of Parks and Recreation.

7.3 Responsibility for Subcontractors: The Contractor shall not employ for the project any subcontractor that the City may, within a reasonable time, object to as unsuitable. The Contractor further agrees that it is as fully responsible to the City for the acts and omissions of its subcontractors, suppliers, and invitees on the jobsite and of persons either directly or indirectly employed by them, as the Contractor is for the acts and omissions of persons directly employed by it.

SECTION 8. CONDITIONS AT SITE

8.1 Existing Conditions: The Contractor shall have visited the site prior to bidding and is responsible for having ascertained pertinent local conditions such as location, accessibility, and general character of the site, and the character and extent of existing improvements and work within or adjacent to the site. Claims as a result of failure to have done so will not be considered by the City and will be the sole responsibility of the Contractor.

8.2 Hidden Conditions: If, in the performance of the Contract, hidden physical conditions of a building being modified are exposed revealing unusual or materially different conditions than those ordinarily encountered or inherent in work of this nature, or if subsurface or latent conditions at the site are found which are materially different from those frequently present in the locality, from those indicated in the Contract Documents, or from those inherent in work of the character required by the Contract, the Contractor must report such conditions to Director of Parks and Recreation before the conditions are disturbed. Upon such notice, or upon his own observation of such conditions, Director of Parks and Recreation will make such changes in the Contract Documents as he finds necessary to conform to the different conditions. Any change in the cost of the

Work or the time needed for completion must be requested pursuant to Section 19 of these General Conditions.

8.3 Suspected Hazardous Material: If the Contractor, during the course of the project, observes the existence of any material which it suspects or knows to be hazardous to human health or the environment, the Contractor shall promptly notify Director of Parks and Recreation. Director of Parks and Recreation will provide the Contractor with instructions regarding the situation. The Contractor shall not perform any work involving the material or any work causing the material to be less accessible prior to receipt of special instructions from Director of Parks and Recreation.

SECTION 9. SURVEYS AND LAYOUT

9.1 Surveying Services: All necessary drawings showing the location of property lines, buildings, and other appropriate information shall be furnished to the Contractor through the drawings and specifications. The Contractor shall provide competent surveying and engineering services to verify the given information and to execute the Work in accordance with the Contract requirements and shall be responsible for the accuracy of Contractor's surveying and engineering services. The Contractor shall immediately notify Director of Parks and Recreation of any discrepancies and confirm such notice in writing within five (5) calendar days.

9.2 Survey Control: Such general reference points and bench marks on the building site as will enable the Contractor to proceed with the Work will be established in the drawings and specifications. If the Contractor finds that any previously established reference points have been lost or destroyed, Contractor shall promptly notify Director of Parks and Recreation.

9.3 Damage to Survey Control: The Contractor shall protect and preserve the established bench marks and monuments and shall make no changes in locations without written notice to and approval from Director of Parks and Recreation. 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 from Director of Parks and Recreation, be replaced and accurately located by the Contractor.

SECTION 10. DRAWINGS AND SPECIFICATIONS

10.1 Drawings and Specifications: The general character and scope of the Work are illustrated by the drawings and specifications. Where on any of the drawings a portion of the Work is drawn out and the remainder is indicated in outline, the parts drawn out shall apply also to all other like portions of the Work. If the Contractor deems additional detail or information to be needed, Contractor may request the same in writing from Director of Parks and Recreation. The Contractor shall carry out the Work in accordance with the drawings and specifications and any additional detail drawings and instructions as issued by

Director of Parks and Recreation. However, Contractor shall immediately notify Director of Parks and Recreation of any discrepancies in such drawings and/or specifications and confirm such notice in writing within five (5) calendar days.

10.2 Discrepancies in Drawings: In case of difference between small and large scale drawings, the large scale drawings shall govern, unless otherwise directed in writing by Director of Parks and Recreation.

10.3 "Similar": Where the word "similar" appears on the drawings, it shall be interpreted in its general sense and not as meaning identical, and all details shall be worked out in relation to their location and their connection with other parts of the Work.

10.4 Division of Specifications: The specifications are divided into several parts for convenience only, since the entire specifications must be considered as a whole. The divisions of the specifications are not intended to control the Contractor in dividing the work among subcontractors or to limit the work performed by any trade. The Contractor shall be responsible for the coordination of the trades, subcontractors, and vendors engaged upon this Work.

10.5 Dimension Accuracy: Measurements or dimensions shown on the drawings for site features, utilities, and structures shall be verified at the site by the Contractor. The location of underground utilities indicated on the plans is diagrammatic and were plotted from available records and field survey information and shall be considered approximate only, and the City makes no representations with regard to their accuracy. The Contractor shall not scale measurements or dimensions from the drawings. Where there are discrepancies, Director of Parks and Recreation shall be consulted. Where new work is to connect to, match with, or be provided for existing work, the Contractor shall verify the actual existing conditions and related dimensions prior to ordering or fabrication, so that such new work will properly fit with existing work.

10.6 As-Built Drawings: The Contractor shall maintain at the site for the City one copy of all drawings, specifications, addenda, approved shop or setting drawings, change orders, field deviations, and other documents or modifications (referred to herein as "As-Built Drawings") in good order and marked to record all changes as they occur during construction. These shall be available to Director of Parks and Recreation, the Project Inspector, and the City's testing personnel. These "As-Built Drawings" shall be neatly and clearly marked in color during construction to record all variations from the drawings made during construction. The representation of such variations shall include such supplementary notes, symbols, legends, documents, and details as may be necessary to clearly show the as-built construction.

10.7 Record Drawings: Upon completion of the Work and prior to Final Acceptance, the Contractor shall deliver to Director of Parks and Recreation, for preparation of

the Record Drawings, one complete set of "As-Built Drawings" and documents referred to in Section 10.6.

SECTION 11. SCHEDULE OF THE WORK

11.1 Scheduling: The Contractor is responsible for the sequencing, scheduling, and coordinating of the Work, for monitoring the progress of the Work, and for taking appropriate action to keep the Work on schedule. The Contractor is responsible for coordinating Contractor's work on the Project with any other work being carried on by the City or by other City consultants or contractors at the site or for the Project. The Contractor shall prepare and submit to Director of Parks and Recreation a schedule for accomplishing the Work based upon the completion time stated in the Contract and submit such to Director of Parks and Recreation at the pre-construction conference. No progress payments will be made to the Contractor until after Contractor has submitted a schedule which is acceptable to Director of Parks and Recreation. All schedules under Section 11 shall be in both paper and electronic form unless otherwise directed by Director of Parks and Recreation.

11.2 Progress: The Contractor shall review the progress of the Work not less than each month, but as often as necessary to properly manage the project and stay on schedule. The Contractor shall collect and preserve information on Change Orders, including extensions of time. The Contractor shall evaluate this information and update the schedule monthly to finish within the contractually allowed time. The Contractor shall submit the updated schedule with each progress payment request. The scheduled completion date shall be within the period of time allowed by the Contract for completion of construction, except as amended by any Change Orders.

11.3 Delay and Recovery Schedule: Should there be any delay; Director of Parks and Recreation may require the Contractor to prepare, at no extra cost to the City, a plan of action and a recovery schedule for completing the Work by the contractual completion date. The plan of action and recovery schedule shall explain and display how the Contractor intends to regain compliance with the original schedule. The plan of action and recovery schedule, when required, shall be submitted and approved by Director of Parks and Recreation prior to Contractor's submission of the next monthly construction estimate. The City may withhold progress payments until such schedule is submitted and approved.

SECTION 12. CONSTRUCTION SUPERVISION

The Contractor shall be solely responsible to supervise and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract. The

Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction. The Contractor is solely responsible to the City that the finished Work complies with the Contract Documents. The Contractor shall be solely responsible for health and safety precautions and programs for workers and others in connection with the Work. No inspection by, knowledge on the part of, or acquiescence by the City, or any other entity whatever shall relieve the Contractor from its sole responsibility for compliance with the requirements of the Contract or responsibility for health and safety programs and precautions.

SECTION 13. STANDARDS FOR MATERIAL INSTALLATION AND WORKMANSHIP

13.1 Material and Equipment: Unless otherwise specifically provided in this Contract, all equipment, material, and accessories incorporated in the Work are to be new and in first class condition. The Contractor shall furnish to Director of Parks and Recreation for approval the name of the manufacturer, the model number, and other identifying data and information respecting the performance, capacity, nature, and rating of the machinery and mechanical and other equipment which the Contractor contemplates incorporating in the Work. Machinery, equipment, material, and articles installed or used without required approval may be subject to subsequent rejection by the City.

13.2 Hazardous Substances: Unless specifically approved by the City or required by the specifications, the Contractor shall not incorporate any material into the Work containing asbestos or any material known by the Contractor to contain a substance known to be hazardous to health when the building and/or site is occupied by the City. If the Contractor becomes aware that a material required by the specifications contains asbestos or other hazardous substances, it shall notify the City and Director of Parks and Recreation immediately and shall take no further steps to acquire or install any such material without first obtaining City approval. (See also Sections 2.2 and 8.3 of these General Conditions.)

13.3 Workmanship: The workmanship shall be of the highest quality found in the building industry in every respect. All items of Work shall be done by workmen skilled in the particular task to which they are assigned. In the acceptance or rejection of work, no allowance will be made for lack of skill on the part of workmen. Poor or inferior workmanship (as determined by Director of Parks and Recreation, the City, or other inspecting authorities) shall be removed and replaced to conform to the highest quality standards of the trades concerned, or otherwise corrected to the satisfaction of Director of Parks and Recreation, the City, or other inspecting authority all at the Contractor's sole expense.

13.4 Instructions for Installation: Under the various sections of the specifications, where specified items are supplied with the manufacturer's printed instructions, recommendations, or directions for installation, or where such instructions, recommendations, or directions are available, installation of the specified items shall be in strict accordance with the manufacturer's printed instructions unless those instructions contradict the drawings or specifications, in which case

Director of Parks and Recreation will be notified by Contractor for an interpretation and decision.

13.5 Installation Procedures Without Instructions: Where neither the manufacturer's printed instructions are available for installation of specific items, nor are specific code or standards given by reference to govern the installation of specific items; and where there is doubt concerning the installation procedures to be followed or the quality of workmanship to be maintained in the installation of specific items, the Contractor shall consult Director of Parks and Recreation for approval of the installation procedures Contractor proposes to follow or the specific standards governing the quality of workmanship Contractor proposes to maintain during the installation of the items in question.

13.6 Codes and Standards: Under the various sections of the specifications, where reference is made to specific codes or standards governing the installation of specified items, installation shall in all cases be in strict accordance with the referenced codes and standards. Where no reference is made to specific codes or standards, installation shall conform to the generally recognized applicable standards for first-class installation of the specific item to be installed. Contractors are expected to be proficient and skilled in their respective trades and knowledgeable of the National Fire Protection Association (NFPA), the current edition of the Virginia Uniform Statewide Building Code (USBC) and its referenced technical codes and standards, Occupational Safety and Health Act (OSHA) and other codes and standards applicable to installations and associated work by its trade and/or that are applicable to the Work.

SECTION 14. SUBMITTALS

14.1 General: The Contractor shall submit for the approval of Director of Parks and Recreation all submittals required by the specifications or requested by Director of Parks and Recreation. All such submissions shall be made with such promptness as to cause no delay in this or any other part of the project, and to allow reasonable time for checking, correcting, resubmitting, and re-correcting. No part of the Work dealt with by a submittal shall be fabricated by the Contractor, save at Contractor's own risk, until such approval has been given. The Contractor shall maintain one (1) set of approved submittals at the jobsite at all times.

14.2 Format: Submittals shall be made in such number of copies that two (2) approved copies may be retained by Director of Parks and Recreation. Each submission shall be accompanied by a letter of transmittal listing the contents of the submission and identifying each item by reference to specification section or drawings. All submittals shall be clearly labeled with the name of the project and other necessary information. Catalog plates and other similar material that cannot be so labeled conveniently, shall be bound in suitable covers bearing the identifying data.

14.3 Supporting Material: Submittals shall be accompanied by all required certifications and other such supporting material and documents, and shall be submitted in such sequence or in such groups that all related items may be checked together. When submittals cannot be checked because the submission is not complete, or because submittals on related items have not been received, then such submittals will be returned without action or will be held, not checked, until the material which was lacking is received.

14.4 Coordination: Submittals shall have been reviewed by the Contractor and coordinated with all other related or affected work before they are submitted for approval, and shall bear the Contractor's certification that it has checked and approved them as complying with the information given in the Contract Documents. Submittals made without such certification and coordination will be returned to the Contractor without action, and will not be considered a formal submission. The Contractor shall be responsible for checking all dimensions and coordinating all material and trades to ensure that the material proposed will fit in the space available and be compatible with other material provided.

14.5 Variations: If the submittals show variations from the Contract Documents because of standard shop practice or other reasons, the Contractor shall make specific mention of such variation in Contractor's letter of transmittal in order that, if acceptable, suitable action may be taken for proper adjustment; otherwise the Contractor will not be relieved of the responsibility for executing the Work in accordance with the Contract Documents even though such submittals have been approved.

14.6 "Or Equal": The drawings and/or specifications may indicate that Director of Parks and Recreation designed or detailed a portion of the plans around a particular product (most commonly a piece of equipment). Should a different product be proposed by the Contractor and accepted, all modifications, rerouting, relocations, and variations required for proper installation and coordination to comply with the design concept and requirements of the Contract Documents shall be the sole responsibility of the Contractor and shall be made at no extra cost to the City. This naming of a particular product, around which the plans were designed or detailed, is not intended to preclude the use of other products or favor the product named when a "brand name or equal" specification has been used. (See also Section 10 of Instructions to Bidders.) Rather it is only intended to acknowledge the reality that in many instances Director of Parks and Recreation must design around the dimensions and characteristics of a particular product.

14.7 Review by Director of Parks and Recreation: Director of Parks and Recreation will review and respond to the submittals within fourteen (14) calendar days. Checking and/or approval of submittals will be for general conformance with the design concept of the project and compliance with the information given in the Contract Documents, and will not include verification of

quantities, detailed dimensions, nor adjustments of dimensions to actual field conditions. Approval shall not be construed as permitting any departure from Contract requirements, authorizing any increase in price or time for completion or relieving the Contractor of the responsibility for any error in details, dimensions, or otherwise that may exist.

14.8 The Work shall be in accordance with approved submittals.

SECTION 15. INSPECTION AND INDEPENDENT TESTING

15.1 Inspection and Testing: All material and workmanship shall be subject to inspection, examination, and testing by Director of Parks and Recreation at any and all times during manufacture and/or construction. Director of Parks and Recreation shall have authority to reject defective material and workmanship and require its correction. Rejected workmanship shall be satisfactorily corrected and rejected material shall be satisfactorily replaced with proper material without charge therefore, and the Contractor shall promptly segregate and remove the rejected material from the premises. If the Contractor fails to proceed at once with replacement of rejected material and/or the correction of defective workmanship, the City may, by contract or otherwise, replace such material and/or correct such workmanship and charge the cost to the Contractor, and/or may terminate the right of the Contractor to proceed as provided in Sections 26 or 27 of these General Conditions, the Contractor and surety being liable for any damage to the same extent as provided for in those Sections.

15.2 Payment for Inspection, Testing, and Certification:

a. Jobsite inspections, tests conducted on site, or tests of material gathered on site which the Contract requires to be performed by independent testing entities shall be contracted and paid for by the City. The Contractor shall promptly furnish, without additional charge, all reasonable facilities, labor, and material necessary for making such tests. Except as provided in Section 15.3 below, whenever such examination and testing finds defective material, equipment, or workmanship, the Contractor shall reimburse the City for the cost of reexamination and retesting.

b. Although conducted by independent testing entities, the City will not contract and pay for tests or certifications of material, manufactured products or assemblies which the Contract, codes, standards, etc. require to be tested and/or certified for compliance with industry standards such as Underwriters Laboratories, Factory Mutual or ASTM. If there are any fees to be paid for such tests and certifications, they shall be paid by the Contractor.

c. The Contractor shall also pay for all inspections, tests, and certifications which the Contract specifically requires it to perform or pay, together with

any inspections and tests which it chooses to perform for its own quality control purposes.

15.3 Examination of Completed Work: Should it be considered necessary or advisable by City or Director of Parks and Recreation at any time before final acceptance of the entire Work to make an examination of any part of the Work already completed, by removing or tearing out portions of the Work, the Contractor shall on request promptly furnish all necessary facilities, labor, and material to expose the Work to be tested to the extent required. If such Work is found to be defective in any respect, due to the fault of the Contractor or its Subcontractors, Contractor shall pay for all the expenses of uncovering the Work, of examination and testing, and of satisfactory reconstruction. If, however, such Work is found to meet the requirements of the Contract, the actual cost of the Contractor's labor and material necessarily involved in uncovering the Work, the cost of examination and testing and Contractor's cost of material and labor necessary for replacement shall be paid to the Contractor and it shall, in addition, if completion of the Work has been delayed thereby, be granted a suitable extension of time.

15.4 Suspension of Work: The City may suspend the Work when in its judgment the drawings and specifications are not being followed. Any such suspension shall be issued in writing and continued only until the matter in question is resolved to the satisfaction of the City. The cost of any such Work stoppage shall be borne by the Contractor unless it is later determined that no fault existed in the Contractor's Work.

15.5 Project Inspector: Failure of the Project Inspector to note or require correction of improper or defective work does not relieve the Contractor from its responsibility to correct such improper or defective work. The Project Inspector has no authority to and shall not:

a. Enter into the area of responsibility of the Contractor's superintendent;

b. Issue directions relative to any aspect of construction means, methods, techniques, sequences or procedures, or in regard to safety precautions and programs in connection with the Work;

c. Authorize or suggest that the City occupy the project, in whole or in part; or

d. Issue a certificate for payment.

SECTION 16. USE OF PREMISES AND REMOVAL OF DEBRIS

16.1 Jobsite Coordination: The Contractor shall perform the Contract in such a manner as not to interrupt or interfere with the operation of any existing activity on the premises or with the work of any other contractor.

16.2 Storage of Material: The Contractor shall store apparatus, material, supplies, and equipment in such orderly fashion at the site of the Work as will not unduly interfere with the progress of its Work or the work of any other contractor.

16.3 Jobsite Appearance: The Contractor expressly undertakes, either directly or through its Subcontractor(s), to clean up frequently all refuse, rubbish, scrap material, and debris caused by his operations, to the end that at all times the jobsite shall present a neat, orderly, and workmanlike appearance. No such refuse, rubbish, scrap material, and debris shall be left within the completed Work nor buried on the building site, but shall be properly protected and removed from the site and properly disposed of in a licensed landfill or otherwise as required by law.

16.4 Final Cleaning: The Contractor expressly undertakes, either directly or through its Subcontractor(s), before final payment, to remove all surplus material, false work, temporary structures, including foundations thereof, and debris of every nature resulting from its operations and to put the site in a neat, orderly condition, to thoroughly clean and leave reasonably dust free all finished surfaces including all equipment, piping, etc., on the interior of all buildings included in the Contract; and to thoroughly clean all glass installed under the Contract including the removal of all paint and mortar splatter and other defacements. If a Contractor fails to clean up at the completion of the Work, the City may do so and charge for costs thereof to the Contractor in accordance with these General Conditions.

16.5 Erosion Control: During and at completion of the Work, the Contractor shall prevent site soil erosion, the runoff of silt and/or debris carried by water from the site, and the blowing of dust or debris off the site in accordance with the applicable requirements and standards of the Virginia Erosion and Sediment Control Handbook, latest edition, and of the Contract Documents.

SECTION 17. PROTECTING PERSONS AND PROPERTY

17.1 Protection on Site: The Contractor expressly undertakes both directly and through its Subcontractor(s), to take every reasonable precaution at all times for the protection of all persons and property which may come on the jobsite or be affected by the Contractor's operation in connection with the Work.

17.2 Safety and Health Precautions: The Contractor shall be solely responsible for initiating, maintaining, and supervising all safety and health precautions and programs in connection with the Work, including but not limited to provision of appropriate sanitation facilities, if applicable.

17.3 Protecting the Public: The Contractor shall in all cases protect the public and the Work, during its execution, by posting and maintaining, at its expense, appropriate signs, barricades, barriers, lights, flagmen, and other safety devices in accordance with the current edition of the "Virginia Work Area Protection Manual".

17.4 Protecting the Work and Adjacent Property: The Contractor shall continuously maintain adequate protection of all the Work from damage and shall protect the City's property from injury or loss arising in connection with this Contract. The Contractor shall adequately protect adjacent property to prevent any damage to it or loss of use and enjoyment by its owners. The Contractor shall provide and maintain all passageways, guard fences, lights, and other facilities for protection required by public authority, local conditions, any of the Contract Documents or erected for the fulfillment of its obligations for the protection of persons and property.

17.5 Emergencies: In an emergency affecting the safety or life of persons or of the Work, or of the adjoining property, the Contractor, without special instruction or authorization from Director of Parks and Recreation, shall act, at Contractor's discretion, to prevent such threatened loss or injury. Also, should Contractor, to prevent threatened loss or injury, be instructed or authorized to act by Director of Parks and Recreation, Contractor shall so act immediately, without appeal.

SECTION 18. DAMAGES TO THE WORK AREA

18.1 Damage to the Work: The Contractor shall have charge of and be solely responsible for the entire Work and be liable for all damages to the Work including, but not limited to any of the damages hereafter mentioned, and to any property in the vicinity of the Work, until its completion and acceptance by Director of Parks and Recreation.

a. Where the work involves alterations, renovations, or modifications to any existing building, the Contractor shall familiarize itself with the structural condition of such building before proceeding with any work. It shall be the Contractor's responsibility to take all necessary safeguards to protect and maintain all parts of the building in a safe condition at all times during the process of construction and to protect from damage those portions of the building that are to remain.

b. Under no condition shall any load be placed on any part of a building, whether new or existing, in excess of the load the structure will safely support, and no structural member(s) shall be cut or altered without the written consent of Director of Parks and Recreation.

c. The Contractor shall conduct all operations in such a manner as to avoid damage to existing work and surfaces within any existing building that are to remain. Any and all damaged work and surfaces shall be repaired, replaced, or restored to their original condition at the time when this work was started, and the expense of such work shall be borne by the Contractor.

18.2 Damage to Utilities: The respective Utility Company shall be given a minimum of forty-eight (48) hours notice prior to any adjustment of utilities, and the

Contractor shall comply with the provisions of the Virginia Underground Utilities Damage Prevention Act, Section 56-265.14 et seq., of the Code of Virginia. Damages that may occur to the utilities during the Work shall be the sole responsibility of the Contractor.

18.3 Relocation of Utilities: Should any utilities require adjustment during the Work, it shall be the Contractor's responsibility to have such utilities relocated as a part of the Work and to contact and cooperate with the respective Utility Company in performance of such operations.

18.4 Damage to Other Work and Existing Structures: The Contractor shall take into account all other work which shall be done by other parties on the jobsite, either now known or which may become necessary during the progress of the Work, and shall be responsible for any damage done to the other work. Damage to concrete curbs, gutters, sidewalks, or any existing facility that may occur during the construction shall be repaired or replaced by the Contractor, at its sole expense, as directed by and to the satisfaction of Director of Parks and Recreation.

18.5 Weather Damage: Damage with respect to the Work caused by the weather shall be the responsibility of the Contractor.

18.6 Blasting: Any damage that may occur due to blasting shall be the sole responsibility of the Contractor.

SECTION 19. CHANGES IN THE WORK

19.1 Changes in Drawings and Specifications: The City reserves the right to make such changes in the drawings and specifications and in the character of the Work as may be necessary or desirable to ensure completion in the most satisfactory manner, provided such changes do not materially alter the original plans and specifications or change the general nature of the Work as a whole. Such changes shall not be considered as waiving or invalidating any condition or provision of the Contract and Bonds. Such changes shall be issued by Director of Parks and Recreation to Contractor.

19.2 Changes in Quantities: The City reserves the right to make changes in the quantities of the Work, as may be considered necessary or desirable and such changes shall not be considered as waiving or invalidating any conditions or provisions of the Contract or Bonds. The Contractor shall perform the Work as altered, whether increased or decreased, and no allowances shall be made for anticipated profits. Payment to the Contractor for the changes in the quantities of work shall be made only for the actual quantities of work performed and material furnished at the unit prices set forth in the Contract, except as provided below.

a. When the quantity of work to be done or of material to be furnished under any item of the Contract is more than 125 percent of the quantity stated in the Contract, then either party to the Contract, upon demand, shall be

entitled to negotiate for revised consideration on the portion of work above 125 percent of the quantity stated in the Contract.

b. When the quantity of work to be done or of material to be furnished under any item of the Contract is less than 75 percent of the quantity stated in the Contract, then either party to the Contract, upon demand, shall be entitled to negotiate for revised consideration on the Work performed.

c. Any consideration after that as set forth above shall be paid for as is hereinafter provided under Section 19.7. The foregoing notwithstanding, the quantity of work to be done or of material to be furnished under any item of the Contract, or the total original Contract shall not be increased more than 25 percent or reduced by more than 25 percent without the written consent of the Contractor and City.

19.3 Changes in the Work: No change with respect to the Work, except in an emergency situation threatening life or property, shall be made by the Contractor without the prior written approval of the City. The Contractor shall deliver any request for a change in the Work, Contract price, and/or completion time in writing to Director of Parks and Recreation within ten (10) calendar days of the occurrence requiring the change. The Contractor shall be required to certify the cause of the change order and, if appropriate, length of time involved. Payment for such changes approved by Director of Parks and Recreation shall be as set forth in Section 19.7. This written request is a condition precedent to the consideration of any such request by the City.

19.4 Delays:

a. In the event a delay is caused by the City, Director of Parks and Recreation, any other separate contractor employed by the City, or any party for whom the Contractor deems the City responsible, or the agents and employees of any of them, the Contractor shall inform the City and Director of Parks and Recreation immediately at the time of the occurrence by the fastest means available and shall give written notice within a reasonable time, not to exceed ten (10) calendar days. The Contractor's notice to Director of Parks and Recreation shall specify the nature of the delay claimed by the Contractor, the cause of the delay, and the impact of the delay on the Contractor's work schedule to the fullest extent possible. The City will, within a reasonable time, not to exceed ten (10) calendar days, respond to the Contractor's notice with a resolution, remedy, or direction to alleviate the delay or with a notice rejecting the claim for delay alleged to be caused by the City or parties for whom the City is responsible. If the delay is not then resolved, the Contractor may then submit a request for change order in accordance with Sections 19.3 and 19.5. In the event of other delays, the Contractor shall give the City and Director of Parks and Recreation written notice within ten (10) calendar days of the occurrence causing the delay.

b. No extension of time or compensation shall be allowed for a delay if the Contractor failed to give notice in the manner and within the time prescribed in Subsection 19.4 (a). Furthermore, no extension of time shall be given or additional compensation allowed for any delay unless a claim therefore is made in writing to the City, with a copy to Director of Parks and Recreation, within ten (10) calendar days of the occurrence causing the delay. The claim shall state the cause of the delay, the number of days of extension requested, and any compensation requested by the Contractor. The Contractor shall report the termination of the delay to the City and Director of Parks and Recreation not less than ten (10) calendar days after such termination. Failure to give notice of either the inception or the termination of the cause of delay or failure to present a claim for extension of time and/or monetary compensation within the times prescribed are conditions precedent to the assertion of any such claims by Contractor and shall constitute a waiver by Contractor of any such claims for compensation or extension based upon that cause.

c. Requests for compensation for delays must be substantiated by itemized data and records clearly showing that the work delayed were progressing according to the approved schedule and that the costs are directly attributable to the delay in the Work claimed. The Contractor shall provide written schedules demonstrating how the Work being delayed affects the approved schedule.

d. No extension of time, additional compensation, or change in the Contract price shall be allowed for any delays caused in whole or in part by the Contractor, any subcontractors, or any supplier. (For unavoidable justified delays, see Section 19.9 of these General Conditions.)

19.5 Change Orders: All change orders must indicate that the Contract Time for Completion is not changed or is either increased or decreased by a specific number of days. Any change or requested change in the Contract price shall also be included in the change order. The Contractor must provide written justification for an extension of the Time for Completion to Director of Parks and Recreation and to the City. The written justification must demonstrate an anticipated actual increase in the time required to complete the Work beyond that allowed by the Contract as adjusted by prior change orders or amendments to the Contract, not just an increase or decrease in the time needed to complete some portion of the total Work. When a Critical Path Method (CPM) schedule is required by the Contract, or is used for the convenience of the Contractor, no increase to the Time for Completion shall be allowed unless, and then only to the extent that, the additional or changed Work increases the length of the critical path. Approved increases in time required to complete the Work shall be added to the Time for Completion. Decreases in time as a result of the change order shall be demonstrated by a decrease in the critical path of the work if CPM scheduling is properly used and updated by the Contractor. If not, the City shall

determine the appropriate decrease by the best means possible. Approved decreases in the time needed to complete the Work shall be deducted from the Contract completion date. The change to time or Contract price allowed by each change order shall include all time and monetary impacts of the change, whether the change order is considered alone or with all other changes during the course of the project. Failure to include a change to time and/or Contract price in a change order shall waive any claims the Contractor may have for any change to the time and/or Contract price unless the parties mutually agree in writing to postpone a determination of the change to time and price resulting from the change order. Such a determination may be postponed not more than forty-five (45) calendar days to give the Contractor an opportunity to demonstrate a change in the time and/or price needed to complete the Work. However, the Contractor shall continue with the Work as may be directed by Director of Parks and Recreation and shall not stop work on the Project unless directed to do so by Director of Parks and Recreation.

19.6 Extra Work: The City reserves the right to make alterations or changes in the Work as the Work progresses. When any work is necessary to the proper completion of the project which was not provided for in the Contract, the Contractor shall do such work, but only when and as ordered in writing by Director of Parks and Recreation. Payment for such extra work shall be made as hereinafter provided in Section 19.7.

19.7 Payment Methods for Extra Work: The extra work done by the Contractor as authorized and approved by Director of Parks and Recreation shall be paid for in the manner hereinafter described; and the compensation thus provided shall be accepted by the Contractor as payment in full for all labor, material, tools, equipment, incidentals, all superintendents' and timekeepers' services, all insurance, bonds, and all other reasonable overhead expenses incurred in the performance of the extra work. Payment for extra work may be made by one of the following methods, as agreed on in writing by Director of Parks and Recreation and the Contractor before said extra work is commenced, subject to all other conditions of the Contract:

a. Unit prices; or

b. Lump sum price; or

c. The cost of change in work plus ten percent (10%) of allowable costs. Allowable costs for purposes of this paragraph shall only include labor, material, sales tax, the rental of power tools and equipment actually used, or a reasonable price for the use of power tools and equipment owned by the Contractor based upon their life expectancy and purchase price, utilities, pro rata charges for foremen, and all payroll charges such as employer's FICA contribution, Public Liability and Workers' Compensation Insurance, but only if all such costs are incurred as the direct result of the changes in the Work. The change in cost for labor and material bonds and

for performance bonds relative to the value of the extra work shall be allowable cost but shall not be marked up. If any subcontractor at any tier does all or part of the Work, the subcontractor's markup on that Work shall be fixed at fifteen percent (15%) of the allowable cost as defined herein.

19.8 Disputed Claims for Extra Work: If one of the payment methods set forth in Section 19.7 is not agreed on by Director of Parks and Recreation, the City may retain either an independent contractor to perform such extra work or use its own forces to perform such extra work and the Contractor shall cooperate fully with the independent contractor or City in its performance of the extra work. However, Director of Parks and Recreation may also direct Contractor to perform such extra work and any dispute will be handled as set forth in Section 31 of these General Conditions.

19.9 Change in Contract Time or Contract Price: The Contractor may request an extension of time or change in the Contract price should the Work be obstructed or delayed by any justified unavoidable delays not caused in whole or in part by the Contractor, any subcontractor, or suppliers. However, delays caused by weather conditions will not be considered justified unavoidable delays unless they are caused by unusual weather as set forth in Section 4.2 of the Instructions to Bidders, in which case only an extension of time may be considered by City, but no additional compensation will be allowed for unusual weather. Furthermore, Contractor agrees that for any delays not caused by the City or any delays beyond the control of the City, no additional compensation will be due the Contractor and no change in the Contract price will be allowed by the City, only an extension of the Contract time will be considered by the City. The Contractor shall deliver requests for changes in the Contract price and/or completion time in writing to Director of Parks and Recreation within ten (10) calendar days of the occurrence requiring the change. Approved changes that alter the time of the Contract shall extend the completion time by a period equivalent to the certified time lost by such occurrence. No change in Contract price and/or completion time shall be allowed if the above notice has not been properly given, such notice being a condition precedent to any such request by the Contractor. However, the Contractor shall continue with the Work as may be directed by Director of Parks and Recreation and shall not stop work on the Project unless directed to do so by Director of Parks and Recreation.

SECTION 20. PAYMENT FOR WORK

20.1 Monthly Construction Estimates: Monthly construction estimates shall be submitted to Director of Parks and Recreation, 1802 Courtland Road, N.E., Roanoke, Virginia 24012, no more than once every thirty (30) calendar days.

20.2 Preparing Progress Payment Requests: In preparing construction estimates, the Contractor may request a progress payment based on the actual percentage of work completed during the preceding month. The estimate shall contain a breakdown of the total Contract amount; to include a separate breakdown of all

approved change orders, into principal items of construction, showing the estimated quantity, unit price, and total for each item. In preparing progress payment requests, the material delivered on the site and preparatory work done may be taken into consideration, if properly documented, or as may be required by Director of Parks and Recreation so that quantities can be verified. In addition to material delivered on the site, material such as large pieces of equipment and items purchased specifically for the project, but stored off the site, may be considered for payment, provided prior written approval is given by Director of Parks and Recreation.

20.3 Progress Payments: The City will make a progress payment to the Contractor on the basis of a duly certified and approved progress payment request for the work performed under the Contract. In the event that the City disagrees with the monthly construction progress payment request submitted by the Contractor, or in the event the As-Built Drawings are not being kept current, the City may withhold all or a portion of the progress payment until such dispute is resolved to the satisfaction of the City. If there are any objections or problems with the progress payment request, the City will notify the Contractor of such matters. If the progress payment request is approved by the City, payment will be made by the City to the Contractor not more than thirty (30) calendar days after such request has been approved. However, if there is an objection or problem with a progress payment request, the Contractor shall continue with the Work as may be directed by Director of Parks and Recreation and shall not stop work on the Project unless directed to do so by Director of Parks and Recreation. Any such disputes shall be handled as set forth in Section 31 of these General Conditions.

20.4 Retainage: To ensure proper performance of the Contract, the City shall retain, unless stipulated otherwise, five percent (5%) of each progress payment until Final Acceptance of all work covered by the Contract. The Contractor may request that such retainage be paid into an escrow account on certain Contracts, pursuant to Section 2.2-4334 of the Code of Virginia. (See also Sections 6.2 and 14.6 of Instructions to Bidders.)

20.5 Ownership of Material and Work: All material and work covered by progress payments shall become the property of the City. This provision shall not relieve the Contractor from the responsibility for all material and to maintain all completed work and to repair all damaged work. The Contractor shall not deem a progress payment as a waiver to complete the terms of the Contract or shift the risk of loss from the Contractor to the City. The Contractor warrants that Contractor has good title to all material, equipment, and supplies which Contractor uses in the Work or for which Contractor accepts payment in whole or in part.

20.6 Payments to Others by Contractor: The Contractor agrees that Contractor will comply with the requirements of Section 2.2-4354 of the Code of Virginia regarding Contractor's payment to other entities and that Contractor will take one

of the two actions permitted therein within seven (7) calendar days after receipt of amounts paid to Contractor by the City. The Contractor agrees that Contractor shall indemnify and hold the City harmless for any lawful claims resulting from failure of the Contractor to make prompt payments to all persons supplying him equipment, labor, tools, or material in prosecution and completion of the Work provided for in the Contract. In the event of such claims, the City may, after providing written notice to the Contractor, withhold from any progress and/or final payment the unpaid sum of money deemed sufficient to pay all lawful claims and associated costs in connection with the Contract.

20.7 Final Payment: Within thirty (30) calendar days after the Final Acceptance of the Work, the City shall pay the Contractor the Final Payment, less all prior payments, damages, setoffs, liquidated damages, any amounts withheld from retainage, or any other amounts Contractor may owe the City for any reason whatever.

20.8 Payment and Acceptance: No payment, final or otherwise, nor partial or entire use, occupancy, or acceptances of the Work by the City shall be an acceptance of any work or material not in accordance with the Contract, nor shall the same relieve the Contractor of any responsibility for any faulty material or workmanship or operate to release the Contractor or its surety from any obligation under the Contract or the Performance Bond or the Labor and Material Payment Bond.

20.9 Right to Audit: The Contractor agrees that the City, and any approving Federal or State Agency or any of their duly authorized representatives, shall have access to any books, documents, papers, records, schedules and electronic data of the Contractor which are pertinent to this Project for the purpose of making an audit, examinations, excerpts, copies or transcriptions and that Contractor will provide copies of such items to City upon City's request, at no cost to City.

SECTION 21. LIQUIDATED DAMAGES

If liquidated damages are provided by the Contract, the following provisions shall apply:

a. Subject to the provisions of the General Conditions granted for extension of time allowed for completion of the Work, if the Work is not substantially completed by the date required in the Contract, the Contractor shall owe to the City, not as a penalty but as step one liquidated damages, the sum stated in the Contract for step one liquidated damages for each and every calendar day of delay in substantial completion.

b. Once the Work is substantially complete, the accrual of step one liquidated damages shall stop and the Contractor shall have thirty (30) calendar days in which to achieve Final Acceptance of the Work.

c. If Final Acceptance of the Work is not achieved by the thirtieth (30th) calendar day after substantial completion, and if any extension of time is not granted by the City, the Contractor shall owe to the City, not as a penalty but as step two

liquidated damages, the sum stated in the Contract as step two liquidated damages for each and every calendar day of delay in Final Acceptance. All such liquidated damages set forth in this Section 21 are in addition to any other damages the City may be entitled to recover from the Contractor.

SECTION 22. INSPECTION FOR SUBSTANTIAL COMPLETION AND FINAL ACCEPTANCE

22.1 Substantial Completion: The Contractor shall notify the City, in writing, that the Work will be ready for inspection to determine if it is substantially complete and ready for testing on or after a certain date, which date shall be stated in the notice. The notice shall be given at least ten (10) calendar days in advance of said date and shall be forwarded through Director of Parks and Recreation. Inspection and testing shall take place at a time mutually agreeable to the Contractor, City, and Director of Parks and Recreation. The inspection shall determine if substantial completion has been accomplished. If so, Director of Parks and Recreation will issue a Certificate of Substantial Completion and attach a written list of unfinished Work and defective Work, commonly referred to as a "punch list", which must be finished and corrected to obtain Final Acceptance.

22.2 Request for Final Acceptance: The Contractor shall notify Director of Parks and Recreation, in writing, that the Work will be ready for final inspection and testing on or after a certain date, which date shall be stated in the notice. That inspection and any necessary testing shall be conducted in the same manner as the inspection for substantial completion. When the Work is finally and totally complete, including the elimination of all known deficiencies, the Work shall be finally accepted by the City and final payment shall be made in accordance with Section 20.7 of these General Conditions.

22.3 Final Inspection: Director of Parks and Recreation will conduct the final inspection, and may elect to have other persons of its choosing also participate in the inspection. If one or more re-inspection is required, the Contractor shall reimburse the City for all costs of re-inspection or, at the City's option, the costs may be deducted from payments due to the Contractor.

22.4 As-Built Drawings: No Contract retainage will be released prior to receipt of all approved As-Built Drawings.

22.5 Final Acceptance: Upon successful completion of the final inspection and all Work required by the Contract, including but not limited to the delivery of the following documents and items; As-Built drawings, operation and maintenance manuals, written warranties, Certificate of Substantial Completion, Affidavit of Payment of Claims, and MBE/WBE/SB/VB Usage Status Form, Director of Parks and Recreation will furnish a written Certificate of Final Acceptance of the Work to the Contractor. Director of Parks and Recreation may accept the Work for occupancy or use while asserting claims against the Contractor, disputing the

amount of compensation due to the Contractor, disputing the quality of the Work, its completion, or its compliance with the Contract Documents, and the like.

22.6 **Release By Contractor:** The acceptance by the Contractor of the final payment or a payment designated as such shall be and does operate as a release by the Contractor of all claims by the Contractor against City and of all other liability of the City to the Contractor whatever, including liability for all things done or furnished in connection with the Work or the Contract.

SECTION 23. WARRANTY OF MATERIAL AND WORKMANSHIP

23.1 The Contractor warrants that, unless otherwise specified, all material and equipment incorporated in the Work under the Contract shall be new, in first class condition, and in accordance with the Contract Documents. The Contractor further warrants that all workmanship shall be of the highest quality and in accordance with the Contract Documents and shall be performed by persons qualified at their respective trades.

23.2 Work not conforming to these warranties shall be considered defective.

23.3 These warranties of material and workmanship are separate and independent from and in addition to any of the Contractor's other guarantees or obligations in this Contract or that may arise by law.

SECTION 24. GUARANTEE OF WORK

24.1 **Two Year Warranty:** The Contractor does warrant and guarantee the Work against defects or deficiencies in the Work and in all material, equipment, and workmanship for a period of two (2) years from the date of Final Acceptance.

24.2 **Defective Work:** The Contractor agrees it shall repair or replace, at Contractor's sole expense, and to the satisfaction of Director of Parks and Recreation, any work, material, equipment, or part that is found, by Director of Parks and Recreation, to be defective.

24.3 **Repairs:** If, within any guarantee period, defects are noticed by Director of Parks and Recreation which require repairs or changes in connection with the guaranteed work, those repairs or changes being in the determination of Director of Parks and Recreation rendered necessary as the result of the use of material, equipment, or workmanship which is defective, inferior, or not in accordance with the terms of the Contract, then the Contractor shall, promptly upon receipt of notice from Director of Parks and Recreation, such notice being given not more than four weeks after the expiration of any such guarantee period, and without any expense to the City:

a. Place in satisfactory condition all guaranteed work and correct all defects therein; and

b. Make good all damage to the structure, site, equipment, or contents thereof, which in the determination of Director of Parks and Recreation is the result of the use of material, equipment, or workmanship which are inferior, defective, or not in accordance with the terms of the Contract; and

c. Make good any work or material or the equipment and contents of structures or the site disturbed in fulfilling any such guarantee.

24.4 Warranty Extension: In any case, where in fulfilling the requirements of the Contract or any guarantee embraced in or required thereby, the Contractor disturbs, damages or repairs any work guaranteed under the Contract, Contractor shall restore such work to a condition satisfactory to Director of Parks and Recreation and guarantee such restored work to the same extent and for a like additional period of time as it was originally guaranteed under this Contract.

24.5 Correction of Defects: If the Contractor, after notice, fails to proceed promptly, but in no event longer than thirty (30) calendar days after such notice, unless otherwise agreed to by Director of Parks and Recreation, to comply with the terms of the guarantee and/or correct the Work, the City may have the defects corrected by its own forces or another contractor and the Contractor and its surety shall be liable for all costs and expenses incurred in doing so.

24.6 Nothing contained in this section shall be construed to establish a period of limitation with respect to any other obligation which the Contractor might have under the Contract Documents or the law of Virginia, including liability for defective work.

SECTION 25. STOP WORK ORDER

In the event that conditions exist such that no work can or should continue, other than the routine closing of the site, the Contractor may submit to Director of Parks and Recreation a request to stop work or Director of Parks and Recreation on his/her own may issue a Stop Work Order. Director of Parks and Recreation will, if he/she approves the request or issues the order himself/herself, deliver a written "Stop Work Order" to the Contractor stipulating the effective date and the Contract time remaining. The Work, other than the routine closing of the site, and Contract time shall not again be started until a written "Resume Work Order" is received by the Contractor from Director of Parks and Recreation. When the Work is stopped at the request of the Contractor and through no fault of the Contractor, the Contractor may only recover from the City payment for the cost of the Work actually performed, together with reasonable overhead and profit thereon up to that time, but profit shall be recovered only to the extent that the Contractor can demonstrate that it would have had profit on the entire Contract if it had completed the Work. The Contractor may not receive profit or any other type of compensation for parts of the Work not performed, including, but not limited to, home office overhead or any other such costs. The Contractor may also recover the actual cost of physically closing down the jobsite, but no other costs of the Stop Work Order. The City may offset any claims it may have against the Contractor against the amounts

due to the Contractor. In no event shall the Stop Work Order to the Contractor relieve in any way the obligations of the Contractor's surety on its payment and performance bonds. When work is stopped by Director of Parks and Recreation due to any fault of the Contractor, the Contractor may not recover any of the above costs or items or any other costs, profits, expenses, or damages of any type.

SECTION 26. TERMINATION OF CONTRACT FOR CAUSE

26.1 Termination for Cause: If the Contractor should be adjudged a bankrupt, or if it should make a general assignment for the benefit of its creditors, or if a receiver should be appointed on account of its insolvency, the City may terminate the Contract. If the Contractor should refuse or should fail, except in cases for which extension of time is provided, to supply enough properly skilled workmen or proper material, or if it should fail to make prompt payment to subcontractors or suppliers of material or labor, or disregard laws, ordinances, or the written instructions of Director of Parks and Recreation, or otherwise fails to comply with any of the terms or provisions of this Contract including, but not limited to, poor services, work or material, then the City may terminate this Contract. In no event shall termination for cause terminate the obligations of the Contractor's surety on its payment and performance bonds.

26.2 Possession of Work: Upon termination of the Contract, the City may take possession of the premises and of all material, tools, and appliances thereon and finish the Work by whatever method the City may deem expedient. In such case the Contractor shall not be entitled to receive any further payment of any type. If the expense of finishing the Work, including compensation for additional managerial and administrative services, shall exceed the unpaid balance of the Contract price, the Contractor shall pay the difference to the City, together with any other cost or expenses of terminating the Contract and having it completed by others, together with any and all other damages City may be entitled to from the Contractor.

26.3 Alternative Termination: If it should be judicially determined that the City improperly terminated this Contract for cause, then the termination shall be deemed to be a termination for the convenience of the City.

26.4 Termination Rights: Termination of this Contract under Section 26 or Section 27 is without prejudice and in addition to any other rights or remedies of the City against the Contractor.

SECTION 27. TERMINATION FOR CONVENIENCE OF CITY

27.1 Termination for Convenience: The City, at its discretion, may terminate this Contract at any time without cause, in whole or in part, upon giving the Contractor written notice of such termination. Upon such termination, the Contractor shall immediately cease work and remove from the jobsite all of its labor forces, equipment, and material as City elect not to purchase or to assume

in the manner hereinafter provided. Upon such termination, the Contractor shall take such steps as City may require assigning to the City the Contractor's interest in all subcontracts and purchase orders designated by City. After all such steps have been taken to City's satisfaction; the Contractor shall receive as full compensation for termination and assignment only the following:

a. All amounts then otherwise due under the terms of this Contract for actual work performed and approved by City; and

b. Reasonable compensation for the actual cost of demobilization incurred by the Contractor as a direct result of such termination. The Contractor shall not be entitled to any compensation for lost profits or for any other type of contractual compensation or damage, other than those provided by the preceding sentence, including any on site or home office overhead. Upon payment of the foregoing, City shall have no further liabilities or obligations to Contractor of any nature.

27.2 Termination Effect on Surety: In no event shall termination for the convenience of the City terminate the obligation of the Contractor's surety on its payment and performance bonds.

SECTION 28. PRECONSTRUCTION CONFERENCE

Director of Parks and Recreation shall notify the Contractor as to the location, date, and time of a preconstruction conference to confirm procedures for processing construction estimates for payment and related submissions and to discuss other matters pertaining to scheduling and execution of the Work.

SECTION 29. PROJECT SIGN(S)

The Contractor shall supply, erect, and maintain Project Sign(s) in accordance with the City of Roanoke Standard Detail. The sign(s) shall be located as directed by Director of Parks and Recreation. The Contractor shall not display any other signs or advertisements.

SECTION 30. ASSIGNMENTS

The Contractor shall not assign, in whole or in part, any of its rights, duties, or obligations under this Contract with the City without the prior written consent of the City.

SECTION 31. CONTRACTUAL DISPUTES

Contractual claims, whether for money or for other relief, including any disputes as to change orders or extra work, shall be submitted, in writing, no later than sixty (60) calendar days after final payment or payment designated as a final payment; however, written notice of the Contractor's intention to file such claim must be given at the time of the occurrence or beginning of the work upon which the claim is based. Such notice is a condition precedent to the assertion of any such claim by the Contractor. A written

decision upon any such claims will be made by the City Manager or his/her designee (hereafter City Manager) within thirty (30) calendar days after submittal of the claim and any practically available additional supporting evidence required by the City Manager. The Contractor may not institute legal action prior to receipt of the City's decision on the claim unless the City Manager fails to render such decision within one hundred twenty (120) calendar days from submittal of its claim. The decision of the City Manager shall be final and conclusive unless the Contractor within six (6) months of the date of the final decision on a claim or from expiration of the 120 day time limit, whichever occurs first, initiates legal action as provided in Section 2.2 - 4364, of the Code of Virginia. Failure of the City to render a decision within said one hundred twenty (120) calendar days shall not result in the Contractor being awarded the relief claimed nor shall it result in any other relief or penalty. The sole result of the City's failure to render a decision within said one hundred twenty (120) calendar days shall be Contractor's right to immediately institute legal action. No administrative appeals procedure pursuant to Section 2.2 - 4365, of the Code of Virginia, has been established for contractual claims under this Contract.

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TECHNICAL SPECIFICATIONS

SECTION 01 10 00
SUMMARY OF PROJECT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Contract Description

B. Work By Others

C. Contractor's Use of Premises

D. Codes & Regulations

E. Specification Conventions

1.2 RELATED SECTIONS

A. Division 00 – Contract – City of Roanoke, Virginia

B. Division 00 – General Conditions – City of Roanoke, Virginia

C. Division 00 – Supplemental General Conditions – City of Roanoke, Virginia

D. Division 01 - Alternates: Owner accepted items expanding/modifying the scope of work of the project.

E. Division 01 - Project Identification and Signs

1.3 CONTRACT DESCRIPTION

A. The Work shall be as indicated in the Contract Documents, prepared for this project, and as described in the Invitation For Bid, which includes:
   1. The construction of a toilet facility and pavilion at Huff Lane Park,
   2. The construction of a toilet facility and pavilion at Fishburn Park,
   3. Alternate: The demolition of a toilet facility at Fishburn Park

B. All work shown on Drawings and/or called for in these Specifications shall be performed under the General Contractor, unless specifically noted to the contrary in the Contract Documents.

C. Coordinate the work of all trades. Coordinate all submittals and deliveries for GC's own work as well as for all subcontractors so as to avoid delays in the progress of the Work.

D. Coordinate construction operations included under various sections that depend on each other for proper installation, connections and operation. Schedule construction operations in sequence required to obtain best results where installation of one part of work depends on installation of other components before or after its own installation. Coordinate installation of different components to assure maximum accessibility for required maintenance, service and repair. Make proper provisions to accommodate item schedules for later installation.

E. Require the installer of each major component to inspect both the substrate and conditions under which work will be performed. Do not permit work to proceed until unsatisfactory conditions have been corrected in an acceptable manner. <u>It is the responsibility of the Contractor to schedule the Work in order to provide an acceptable substrate condition.</u>

F. Work NOT included in this Contract:
   1. Items noted as "N.I.C." (Not in Contract) in the documents
   2. Movable furniture and room furnishings, except as specifically indicated in the documents.

1.4 WORK BY OWNER (Separate Contracts)

A. Cooperate with other contractors and allow access to the site for field measurements and storage of materials. Matters of coordination shall be processed through the Architect.

1.5 CONTRACTOR'S USE OF SITE AND PREMISES

A. No signage displaying the names of firms or products other than that specified in Section 01 58 00 – Project Identification and Signs, will be allowed on the project site unless specifically permitted by the Owner in writing.

B. Assume full responsibility for the protection and safekeeping of products under this Contract stored at the site.

C. Coordinate the use of premises with the Owner.

1.6 CODES AND REGULATIONS

A. Nothing contained within the Contract Documents shall be construed as permitting work that is contrary to applicable rules, regulations and codes. In addition to all federal codes and regulations, comply with the requirements of:

1. Virginia Department of Health, Sewage Collection and Treatment (SCAT) Regulations (latest edition).
2. Virginia Department of Health, Waterworks Regulations (latest edition).
3. The Uniform Statewide Building Code adopted by the Commonwealth of Virginia (VUSBC), and all ordinances of the Commonwealth of Virginia and those of the local authorities having jurisdiction.
4. The National Fire Protection Association Codes and Standards, as they apply to this project.
5. Uniform Federal Accessibility Standards; Americans with Disabilities Act.
6. Section 504, Rehabilitations Act 1973, Handicapped Standards.
7. Other applicable codes and standards.

B. Where a conflict exists between the Contract Documents and the codes and regulations, or among the codes and regulations, contact the Architect immediately for a decision.

1.7 SPECIFICATION CONVENTIONS

These specifications are written in imperative mood and streamlined form. This imperative language is directed to the Contractor, unless specifically noted otherwise. The words “shall be” are included by inference where a colon (:) is used within sentences or phrases.

Specifications are intended to be more precise than Drawings, often clarifying or adding definition to what is shown generally on Drawings. Should the contractor have confusion over what is intended in the Drawings and Specifications, seek interpretation from the Architect, but as a convention what is stated in the Specification shall supersede what is indicated on the Drawings (even specifications or notes on drawings).

PART 2 PRODUCTS: Not Used

PART 3 EXECUTION: Not Used

END OF SUMMARY

SECTION 01 23 00
ALTERNATES

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 alternates.

1.3 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to the Base Bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
   1. The cost for each alternate is the net addition to the Contract Sum to incorporate the alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
   1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.

C. Execute accepted alternates under the same conditions as other work of the Contract.

D. Schedule: A Schedule of Alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS: Not Used

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate - Demolition of the existing Toilet Facility at Fishburn Park

END OF SECTION 01 23 00

SECTION 01 31 00
PROJECT MANAGEMENT AND COORDINATION

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 provisions for coordinating construction operations on Project including, but not limited to, the following:
   1. Project meetings.
   2. Requests for Interpretation (RFIs).

B. Related Sections include the following:
   1. Division 1 Section "Construction Progress Documentation" for preparing and submitting Contractor's Construction Schedule.
   2. Division 1 Section "Execution Requirements" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
   3. Division 1 Section "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

A. RFI: Request For Information – Document from Contractor seeking interpretation or clarification of the Contract Documents.

1.4 COORDINATION

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.
4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
   1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
   1. Preparation of Contractor's Construction Schedule.
   2. Preparation of the Schedule of Values.
   3. Installation and removal of temporary facilities and controls.
   4. Delivery and processing of submittals.
   5. Progress meetings.
   6. Pre-installation conferences.
   7. Project closeout activities.
   8. Startup and adjustment of systems.
   9. Project closeout activities.

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
   1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

1.5 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.

B. Preconstruction Conference: The Architect shall notify the Contractor as to the locations, date and time of a preconstruction conference. Contractor shall conduct the meeting to review responsibilities and personnel assignments.
1. Attendees: Authorized representatives of Owner, Architect and their consultants; Contractor and its superintendent; major subcontractors; suppliers; Building Official, Fire Marshal, and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect progress, including the following:
   a. Tentative construction schedule.
   b. Critical work sequencing and long-lead items.
   c. Procedures for processing field decisions and Change Orders.
   d. Procedures for RFI's.
   e. Procedures for testing and inspecting.
   f. Procedures for processing Applications for Payment.
   g. Submittal procedures.
   h. Use of the premises.
   i. Work restrictions.
   j. Owner's occupancy requirements.
   k. Responsibility for temporary facilities and controls.
   l. Parking availability.
   m. Office, work, and storage areas.
   n. Equipment deliveries and priorities.
   o. Security.
   p. Progress cleaning.
   q. Working hours.
3. Minutes: Record and distribute meeting minutes.

C. Pre-installation Conferences: Conduct a pre-installation conference at Project site before each construction activity that requires coordination with other construction.
1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect and Owner of scheduled meeting dates.

2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
    a. Options.
    b. Related RFI's.
    c. Deliveries.
    d. Submittals.
    e. Review of mockups.
    f. Compatibility problems.
    g. Time schedules.
    h. Weather limitations.
    i. Warranty requirements.
    j. Compatibility of materials.
    k. Acceptability of substrates.
    l. Temporary facilities and controls.
    m. Space and access limitations.
    n. Testing and inspecting requirements.
    o. Installation procedures.
    p. Coordination with other work.
    q. Protection of adjacent work.
3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Progress Meetings: Conduct progress meetings at biweekly intervals, or as acceptable to Owner and Architect. Coordinate dates of meetings with preparation of payment requests.
1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be

expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

1) Review schedule for next period.

b. Review present and future needs of each entity present, including the following:

1) Status of submittals.
2) Deliveries.
3) Access.
4) Work hours.
5) Progress cleaning.
6) Quality and work standards.
7) Field observations.
8) RFI's.
9) Status of proposal requests.
10) Status of change orders.

3. Minutes: Record the meeting minutes.
4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.

a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

1.6 REQUESTS FOR INFORMATION (RFI's)

A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in the form specified.

1. RFI's shall originate with Contractor. RFI's submitted by entities other than Contractor will be returned with no response.
2. Coordinate and submit RFI's in a prompt manner to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:

1. Project name.
2. Date.
3. Name of Contractor.
4. Name of Architect.
5. RFI number, numbered sequentially.
6. Specification Section number and title and related paragraphs, as appropriate.
7. Drawing number and detail references, as appropriate.

8. Field dimensions and conditions, as appropriate.
9. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
10. Contractor's signature.
11. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.
    a. Supplementary drawings prepared by Contractor shall include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments.

C. Hard-Copy RFI's: Form acceptable to Owner and Architect.
   1. Identify each page of attachments with the RFI number and sequential page number.

D. Software-Generated RFI's: Software-generated form with substantially the same content as indicated above.
   1. Attachments shall be electronic files in Adobe Acrobat PDF format.

E. Architect's Action: Architect will review each RFI, determine action required, and return it. Allow seven working days from date of receipt by Architect for Architect's response for each RFI. RFI's received after 1:00 p.m. will be considered as received the following working day.
   1. The following RFI's will be returned without action:
      a. Requests for approval of submittals.
      b. Requests for approval of substitutions.
      c. Requests for coordination information already indicated in the Contract Documents.
      d. Requests for adjustments in the Contract Time or the Contract Sum.
      e. Requests for interpretation of Architect's actions on submittals.
      f. Incomplete RFI's or RFI's with numerous errors.
   2. Architect's action may include a request for additional information, in which case Architect's time for response will start again.
   3. Architect's action on RFI's that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 1 Section "Contract Modification Procedures."
      a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.

F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.

G. RFI Log: Prepare, maintain, and submit a tabular log of RFI's organized by the RFI number. Submit log monthly. Include the following:
   1. Project name.
   2. Name and address of Contractor.
   3. Name and address of Architect.
   4. RFI number including RFI's that were dropped and not submitted.
   5. RFI description.
   6. Date the RFI was submitted.
   7. Date Architect's response was received.
   8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
   9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

PART 2 - PRODUCTS: Not Used

PART 3 - EXECUTION: Not Used

END OF SECTION 01 31 00

SECTION 01 32 00
CONSTRUCTION PROGRESS DOCUMENTATION

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.

B. The principles and definitions of the terms used herein shall be as set forth in the 2nd edition of Construction Planning and Scheduling Manual, published by The Associated General Contractors of America

1.2 SUMMARY

A. This Section includes but is not limited to:
   1. Administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
      a. Contractor's CPM Construction Schedule, herein referred to as the Construction Schedule.
      b. Three-Week Look Ahead Schedules.
      c. Change Impact Schedules
      d. Schedule Recovery Plans

B. Related Sections include the following:
   1. General Conditions Section 19 “Changes in the Work” for submitting Contract modifications.
   2. General Conditions Section 20 "Payment for Work" for submitting the Schedule of Values.
   3. Division 1 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes.
   4. Division 1 Section "Submittal Procedures" for submitting schedules and reports.
   5. Division 1 Section "Quality Requirements" for submitting a schedule of tests and inspections.

C. The purpose of the Construction Schedule shall be to:
   1. Assure adequate planning, scheduling, and reporting during execution of the construction and related activities so they may be prosecuted in an

orderly and expeditious manner, within the Contract Time and any milestones that may be stipulated by the Contract.

2. Assure coordination of the work with the Contractor and the various subcontractors and suppliers at all tiers.
3. Assist in the evaluation of the Contractor's monthly progress payments.
4. Assist in monitoring the progress of the work and evaluating proposed changes to the Contract and the Construction Schedule.
5. Assist in detecting problems for the purpose of taking corrective action and to provide a mechanism or tool for determining and monitoring such corrective actions.

1.3 SUBMITTALS

A. Submittals Log and Schedule: Arrange the following information in a tabular format, in printed and electronic format:
   1. Scheduled date for first submittal.
   2. Specification Section number and title.
   3. Submittal category (action or informational).
   4. Name of subcontractor.
   5. Description of the Work covered.
   6. Scheduled date for Contractor's submittal and Architect's final release or approval.

B. Contractor's Construction Schedule:
   1. General requirements:
      a. Contractor shall prepare, submit to the Owner for acceptance, and maintain a Critical Path Method (CPM) Construction Schedule (Construction Schedule) for the Work. The Construction Schedule shall consist of a computerized network diagram together with a mathematical analysis of that network. Display accepted schedule in time-scaled logic diagram format at site construction office at all times and review with subcontractors each week.
      b. Contractor shall utilize the Construction Schedule for planning, organizing and directing the Work, for reporting progress, and for requesting payment for work completed. The Construction Schedule shall be reviewed at each progress meeting.
      c. The Construction Schedule shall clearly show sequential interdependencies, with activity duration and float clearly represented. Sequence(s) of activities with on the longest path shall be clearly identified as Critical Path(s).
      d. The approved scheduling software system shall be capable of baseline comparison analysis. Store (save) an original version of the approved Construction Schedule as the baseline schedule for comparative analysis. As work progresses, provide graphics displaying actual progress bars versus baseline or target bars.

2. Submittal Requirements:
   a. Provide the number of submittals of each version of the Construction Schedule as indicated in Division 1 “Supplementary General Conditions.”
   b. Submit the Construction Schedule in electronic format on a compact disc. Acceptable electronic format of the Construction Schedule required will be in the software format used to develop the Construction Schedule for each schedule submission.
   c. Submit hard copies of each schedule submission.
   d. Each submission of the Construction Schedule shall include three (3) sets of the Schedule Narrative (see below).
   e. Contractor’s Superintendent and major subcontractors shall review the Construction Schedule prior to submittal. Provide written certification of acceptance of the Baseline Construction Schedule by the major subcontractors concurrently with submittal. Unless otherwise defined in the Contract, major subcontractors will be defined as having work in excess of $500,000 and those subcontractors with operations on the Critical Path.
   f. Preliminary Construction Schedule: Contractor shall submit to the Owner for review and acceptance, a Preliminary Contractor’s Construction Schedule before the submission of the first application for payment. The Preliminary Contractor’s Construction Schedule will detail all work planned for the first ninety (90) calendar days of the project and include summary level activities to the completion of the project. The Preliminary Construction Schedule shall be updated monthly until the acceptance of the Baseline Schedule and shall detail all work planned for the next ninety (90) calendar days.
   g. Baseline Construction Schedule: the Baseline Construction Schedule will be the Contractor’s original plan for completing the Work and will not include progress or actual dates to the submission date.
      1) The Baseline Construction Schedule shall be submitted within the first sixty (60) calendar days after Notice to Proceed for review and acceptance by the Owner. The Baseline Construction Schedule shall incorporate the work plan for the first ninety (90) calendar days detailed in the Preliminary Construction Schedule and detail the activities for the remainder of the Work.
      2) The Contractor may submit the Baseline Construction Schedule to the Owner for review and acceptance in lieu of the Preliminary Construction Schedule prior to the submission of the first application for payment.
   h. Construction Schedule Updates (Schedule Updates):

1) Schedule Updates shall be submitted on a monthly basis with or prior to the Application for Payment for review and acceptance by the Owner.
2) The Contractor shall assess the status of the project and update the status of all started, progressed and completed activities.
3) The schedule update does not include changes to the logical plan of operations or the schedule logic.

i. Schedule Revisions: Include changes to: the work plan, the sequence of the work, changes in the anticipated duration of activities, changes in the logic and relationships between activities, constraints, and other similar revisions. Updating the Construction Schedule to reflect actual progress shall not be considered a schedule modification to the Construction Schedule. Schedule Revisions will be provided to the Owner for review and acceptance when:
1) The Contractor will make revisions to the Construction Schedule in the event the Contractor's planning of the work is revised or if the Construction Schedule no longer represents the actual prosecution and progress of the Work. The Contractor shall submit the proposed changes along with a written narrative of the proposed changes. Such revisions to the Construction Schedule shall not alter any of the Substantial Completion dates and shall be made at no additional cost to the Owner.
2) Activity ID's and original durations shall not be changed for any activity once accepted by the Owner. Contractor may propose new activities and/or substitute activities for proposed schedule modifications. Contractor may also propose changes of schedule logic for activities previously accepted by the Owner.

j. Recovery Schedule:
1) If a Schedule Update indicates that the scheduled Substantial Completion date will be more than fourteen (14) calendar days after the contractual Substantial Completion date, a Recovery Schedule for regaining the time that the Project is behind schedule shall be submitted to the Owner for review and acceptance within five (5) working days of the update submission.
2) The Recovery Schedule Narrative shall indicate the:
a) Amount of time the activity is late,
b) Reason for the lateness, and
c) The proposed method for recovering the time and achieving all required project Substantial Completion deadlines.

d) The recovery plan should clearly indicate the present and additional manpower loading, if applicable.

3) The Recovery Schedule shall be submitted and accepted prior to processing and making payment on the pay application for the immediately following month.

k. Three-Week Look Ahead Schedule

1) The Contractor shall prepare a Three-Week Look Ahead Schedule for each progress meeting showing the items work the previous week and those scheduled to be in progress during the next three weeks. The activities shall be taken from the most recent, accepted Construction Schedule.

1.4 COORDINATION

A. Contractor shall coordinate and cooperate with the Owner in scheduling and performing the Contractor's work to avoid conflict, delay in or interference with the work of other contractors or the construction or operations of the Owner's own forces, testing and inspection agencies, and the Commissioning Agent.

B. The Contractor shall be responsible for assuring that the subcontractor's work at all tiers, as well as the Contractor's own work, and Owner furnished materials, deliveries, and work are included in the schedule.

1.5 REVIEW AND ACCEPTANCE

A. The Construction Schedule shall be acceptable to the Owner but such acceptance shall neither impose on the Owner responsibility for the progress or scheduling of the Work nor relieve the Contractor from full responsibility therefore.

B. The Owner shall provide the Contractor with the results of the schedule review based on the following schedule:

1. Review of the Baseline Construction Schedule within fourteen (14) calendar days after receipt by the Owner.
2. Review of the Schedule Update(s) within seven (7) calendar days after receipt by the Owner.
3. Review of Schedule Revision(s) and Recovery Schedule(s) within fourteen (14) calendar days after receipt by the Owner.

C. The Contractor shall revise as necessary and resubmit to the Owner, the Construction Schedule within seven (7) calendar days after receipt of the Owner's review. If the Owner questions the Contractor's proposed activities, logic, durations, or other schedule components, the Contractor shall provide a

satisfactory revision of, or adequate justification for, these activities, logic, durations, or other schedule components to the satisfaction of the Owner.

D. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Owner's acceptance of the schedule. In the event the Contractor fails to define any element of work, activity or logic and the Owner's review does not detect this omission or error, such omission or error, when discovered by the Contractor or Owner, shall be corrected by the Contractor at the next monthly Schedule Update.

E. Progress Payments will be held based on the following:
   1. No progress payments shall be processed or paid until the Contractor's Preliminary Construction Schedule has been properly prepared and submitted by the Contractor and accepted by the Owner.
   2. No progress payments after the first sixty (60) calendar days will be processed or paid until the Baseline Construction Schedule has been properly prepared and submitted by the Contractor and accepted by the Owner.
   3. No progress payments after acceptance of the Baseline Construction Schedule will be processed or paid until the Schedule Update, Schedule Revision or Recovery Schedule for the month has been submitted by the Contractor and accepted by the Owner.

PART 2 - PRODUCTS

2.1 SUBMITTALS LOG AND SCHEDULE

A. Preparation: Submit a log and schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.
   1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and the Construction Schedule.
   2. Final Submittal: Submit concurrently with the first submittal of the Construction Schedule.

2.2 CONSTRUCTION SCHEDULE, TECHNICAL REQUIREMENTS

A. The Construction Schedule shall be prepared using one of the following approved scheduling software projects:
   1. From Primavera Systems, Inc. – P3, Primavera Contractor or P6, or
   2. From Microsoft Corporation – Microsoft Project 2010.

B. Time Frame: Extend schedule from date established for commencement of the Work to date of Final Completion.
   1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
   2. If the schedule indicates earlier completion time(s) than that set forth in the Contract Documents, the difference between the Schedule and the Contract Document dates shall be considered to be part of the total float available.

C. Activities: A sufficient number of activities shall be utilized to accurately depict reviews and approvals, fabrication and delivery, construction sequence, dependencies and progress. Unless approved by the Owner, comply with the following:
   1. Activity Description: Activity descriptions shall be clear, concise and describe the scope of work. Activities having similar description or that describe the same scope of work over multiple areas shall include additional information in the description to indicate the specific phases or areas covered by that activity.
   2. Activity ID: Each activity shall be assigned a unique Activity ID number that shall not be changed once assigned.
   3. Activity Duration: Define activities so no activity is longer than 20 work days, unless specifically allowed by Owner. Assigned durations shall be the Contractor's best estimate of time required to complete the activity considering the scope and resources planned for the activity. If the scope of work would normally be greater than 20 work days, divide the operation into manageable parts so that the duration is less than 20 work days.
   4. With the exception of Notice to Proceed and Final Completion, each activity shall have a predecessor relationship controlling the start of the activity and a successor relationship based on the finish of the activity.
   5. Responsibility for each activity shall be identified with a single performing organization, typically the Subcontractor name. Activities shall have only one responsible party.
   6. Activity Coding Structure: Each activity shall be associated with a set of codes to be used for sorting, selecting, organizing, and providing additional information about the activity. Each activity shall have activity codes identifying the following:
      a. Phase or Work Stage (Recommended phases: Milestones; Administrative; Submittal Development, Review and Approval; Procurement; Site Preparation; Foundations and Structure; Roof and Skin; Building Systems Installation; Finish Items; Tests, Inspections, and Startup; Site Finishes; and Project Closeout)
      b. Area (e.g. Site, Building Area)
      c. Responsibility (Owner, Architect, Contractor, or each of the subcontractors)

d. Division (01 through 16)
e. Schedule of Values Reference Number

7. In addition to the activities defined by the Contractor to accomplish the scope of work, the Contractor shall include estimated time frames for the following:
   a. Mobilization and demobilization.
   b. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days or that may be anticipated to impact the schedule, as separate activities in schedule. Procurement cycle activities include, but are not limited to, development of submittals, approvals, purchasing, fabrication, and delivery.
   c. Submittal Review Time: Include review times indicated in Division 1 Section "Submittal Procedures" in schedule. No extension of Contract Time will be authorized because of failure to transmit submittals to Architect sufficiently before work is to be performed to allow processing and resubmittal(s) as may be necessary.
   d. Owner purchase/installed items and/or Owners separate contract work.
   e. Check-out, startup, and test and balance of major equipment.
   f. Commissioning: Coordinate with the Commissioning Agent, subcontractors for mechanical, electrical and plumbing, and the General Commissioning and technical commissioning specifications for anticipated activities and durations for the commissioning process.
   g. Include submittals of record drawings and maintenance manuals.
   h. Substantial Completion: Indicate Substantial Completion on the Contract date or in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion. Include specific activities to clean up, prepare the contractor’s punch list, punch list correction, obtain occupancy permit, and administrative time to notify the Architect and Owner that the project has been prepared for inspections as described in the Contract.

D. Constraints and Schedule Logic: Include constraints and work restrictions indicated in the Contract Documents and as follows, in the Construction Schedule, and show how the sequence of the Work is affected.
   1. Except for Contract Award, Notice-to-Proceed, required Substantial Completion, and Final Completion dates activities shall not be constrained by any means other than logic ties to predecessor and successor activities. Relationships with start or finish lags may be used provided the lags are less than 7 working days, reasonable and can be logically explained.

2. Contractor shall develop logic that accounts for the resources planned to perform the Work, the fundamental building blocks of the project, safety, quality, and the flow of operations from project start to completion.

E. Critical Path: The critical path is the longest connected route through the CPM network. Critical activities are activities on the critical path that will delay completion of the project if the activity is delayed.

F. Milestones:
1. Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion**.**
2. Include milestones for critical measures, with examples as follows: foundation completion, structural masonry completion, structural steel completion, building temporarily enclosed, building weather-tight, begin ceiling grid, begin floor finishes, etc. as needed to summarize the critical elements of the project and the critical path.

G. Calendars:
1. Custom calendars will be developed by the Contractor to identify the differing calendars on which specific activities will be performed. Corresponding calendars should be associated with each activity during schedule preparation.
2. Holidays, seasonal considerations for planting, paving or as may be technically required should be clearly identified in the unique calendars.
3. The Contractor shall anticipate potential loss of workdays for each calendar month due to adverse weather, shall incorporate this lost time into the appropriate schedule's calendars, and shall schedule the work accordingly. Refer to Division 1, Supplementary General Conditions, for anticipated adverse weather.

H. Float:
1. Float is not for the exclusive use or benefit of either the Contractor or the Owner. Float time will be apportioned according to the needs of the project.
2. Float may not be used as a basis of claim by the Contractor for additional compensation for actual project completion if the Contractor submits a schedule indicating an earlier completion dates than the Substantial Completion or Final Completion dates.
3. Pursuant to the float sharing requirements set forth herein, the use of float suppression techniques such as unsupported activity durations, constrained dates, unsupported logic restraints, or the use of float constraints shall be cause for rejection of the Construction Schedule and any revisions or updates.

I. Data Date: The data date is the starting calendar date for the CPM calculation, where all dates prior to the data date are actual dates, and any date including the data date through completion are planned dates and shall not have any actual dates indicated.
   1. The Data Date for the Preliminary and Baseline Construction Schedules shall be the Notice to Proceed date and shall be clearly identified on the printed submission and in the Schedule Narrative.
   2. The Data Date for each Schedule Update shall be clearly identified on the printed submission and in the Schedule Narrative. The Data Date shall be coordinated with the status date of the Payment Application.

J. Schedule Format: Prepare initial network diagram from a list of straight "early start-total float" sort and organize the schedule by phase and then area if developed in a Primavera Systems, Inc. product or as mutually agreed to by the Owner and Contractor if developed in a Microsoft Corporation product. Identify critical path activities and the data date. The printed Construction Schedule should be formatted with the following items listed in tabular format on the left of the page with the time-scaled logic diagram shown on the right.
   1. Activity ID.
   2. Activity description.
   3. Original activity duration in workdays.
   4. Percent complete.
   5. Remaining activity duration in workdays.
   6. Early start and finish dates.
   7. Late start and finish dates.
   8. Total float.
   9. Free float.
   10. Responsible party (Contractor, individual subcontractors, Owner, Architect, Commissioning Agent, or other testing and inspection entities)

2.3 SCHEDULE NARRATIVE

A. The purpose of the Schedule Narrative is to support the understanding of the Construction Schedule and for the Contractor to communicate to the Owner its plan. The Schedule Narrative shall not be considered as providing written notice as may be required in this contract.

B. For the Preliminary Construction Schedule and the Baseline Construction Schedule, the Schedule Narrative shall include:
   1. Generally, describe the sequence of construction, proposed means and methods and crew utilization. Provide details for the critical path and near critical operations including crew utilization and production rates.
   2. Identify activities which are planned to be expedited by use of overtime or double shifts, including work on Saturdays, Sundays and holidays.
   3. List the project milestones and other key dates.

4. Describe the critical path and any near critical paths having less than fifteen (15) days of float.
5. Describe the calendars used, provide a listing of holidays, weather days and other non-work periods.
6. Discuss procurement of long lead items.
7. List the known conditions with potential schedule impact.
8. Explain the activity codes utilized.
9. Explain any abbreviations used in the CPM schedules.

C. For each of the Schedule Updates, the Schedule Narrative shall include:
1. Include the data date.
2. Discuss the updated critical path and any near critical paths having less than 15 days of float.
3. Describe problem areas, current and anticipated, delaying factors and their impact, and an explanation of corrective actions taken or proposed.
4. List the progress of the project. List the activities planned for and progressed since the prior update and the activities scheduled for the succeeding month.
5. List the Architect, Owner, and other consultants or third party responsibilities and key dates over the period to the next schedule submission.
6. Discuss any changes to the logic, duration or added and deleted activities.

PART 3 - EXECUTION

3.1 CHANGE IMPACT SCHEDULE

A. Each Contract Modification where modification to the Contract Time is needed shall include a separate Change Impact Schedule indicating the effect of this change on the most recent and accepted version of the Construction Schedule.
1. If the Contract Modification will have no impact on the duration, start or finish dates of any schedule activity, the Contractor may submit a written certification of this fact in lieu of a Change Impact Schedule.

B. Requests for extensions of time will receive consideration only for delays to the critical path. Requests for extensions of time shall include detailed written documentation that is sufficient to show that:
1. The delay has negatively impacted the work on the critical path and the projected date of Substantial Completion for the Project has been impacted by the delay, or
2. The delay has negatively impacted non-critical path work beyond the total float available to that path causing the previously non-critical path to overtake the critical path and the projected date of Substantial Completion for the Project has been impacted by the delay.

C. The Contractor shall submit a narrative description of the schedule change and a supporting computer generated comparison of the current and revised schedule.

D. Provide a detailed and quantified analysis of crews, production rates, materials and equipment to support the Change Impact Schedule.

E. Modification of the Contract Time or other modifications may be considered based on the accepted impact of Change Modifications on the project Critical Path with due consideration for concurrent critical delay due to unusually severe weather, Contractor delays, or other delays beyond the Owner's direct control.

F. The Change Impact Schedule shall be acceptable to the Owner. The Contractor shall revise as necessary and resubmit to the Owner if:
   1. The Owner questions the methodology,
   2. The methodology and process utilized is unclear,
   3. Changes to the schedule has been made and not satisfactorily justified,
   4. The Contractor fails to recognize all impacts to the project during the period of analysis, or
   5. As warranted and supported by the Owner's analysis.

END OF SECTION 01 32 00

SECTION 01 50 00

CONSTRUCTION FACILITIES

2 PART 1 GENERAL

1.1 SECTION INCLUDES

A. Security.

A.

B. Access.

B.

C. Parking.

C.

D. Field Offices and Sheds.

D.

E. Dumpsters and Refuse Removal.

F. Maintenance.

E.

G. Removal of Facilities.

1.2 RELATED SECTIONS

A. Division 1 – Temporary Utilities.

F.

B. Division 1 - Temporary Controls: Barriers / fences.

C. Division 1 - Traffic Regulation.

D. Division 31 – Erosion and Sediment Control: Construction Access.

1.3 SECURITY

A. Provide security and facilities to protect Work from unauthorized entry, vandalism, or theft.

B. Coordinate with Owner's security program.

1.4 ACCESS

A. Maintain public thoroughfares to serve construction area.

B. Provide detours necessary for unimpeded traffic flow, or as directed by Owner.

C. Provide and maintain access to all in-service fire hydrants, free of obstructions.

1.5 PARKING

G.

A. Provide temporary gravel surface parking areas to accommodate construction personnel.

B. When site space is not adequate, provide additional off-site parking.

C. Do not allow vehicle parking on new or existing pavement, unless specifically approved by the Owner.

1.6 FIELD OFFICES AND SHEDS

A. The provision and maintenance of temporary field offices and storage sheds during the construction period for the use of Contractor’s personnel, the Owner’s and Architect’s (and his consultant’s) field personnel, building official’s personnel and others is OPTIONAL. If installed, consult with City Engineer on location, access, and related facilities, prior to installation

1. All facilities shall be structurally sound and weather tight with temperature transmission resistance compatible with occupancy and storage requirements. Provide adequate heat and air

conditioning, electrical power, lighting, ventilation and self-contained bathroom facilities suitable for use. Structures for General Contractor and for Mechanical and Electrical Subcontractors shall have floors raised clear of the ground.

H.

2. Size office as required for Contractor's general use and space for project meetings with table and chairs to accommodate eight persons. Equip with sturdy furniture, drawing rack, sufficient file storage for all project documentation, and drawing display table. Racks and files for Project Documents shall be in, or adjacent to, the meeting area.

I.

3. Provide one minimum ten-inch outdoor-type thermometer, mounted in a shaded location, and a properly mounted rain gauge (minimum 0.1" graduations).

J.

4. Temporary structures of other subcontractors may not be placed on the site without prior written approval of the Owner and Architect.

5. Locate offices and sheds a minimum distance of 30 feet (10 m) from any existing or new structures. Provide and maintain gravel walkway from nearest pavement or hard surface to entrance of office/shed. Provide sufficient raised walk-off area near office/shed entrance to reduce tracking of mud and debris.

1.7 DUMPSTERS AND REFUSE REMOVAL: Provide necessary dumpsters or trash facilities within Contractor's staging area for periodic removal (at least weekly) of construction debris and refuse. Contractor shall comply with all requirements of local authority regarding dumpster type, covering, and protection from vandalism and vermin. Periodic removal of construction debris from site shall be scheduled with ongoing work so as to not create an unsightly or nuisance condition.

1.8 MAINTENANCE: Provide periodic maintenance and cleaning for temporary structures, furnishings, equipment and services.

1.9 REMOVAL OF FACILITIES

A. Remove temporary structures, contents and services at a time they are no longer needed and as approved by the Architect. Remove debris and return the site to final design conditions. All temporary field offices and structures shall be removed from the site, and areas repaired to match surrounding site, or as indicated on the Drawings, prior to final payment by the Owner.

K.

B. Clean and repair damage caused by installation or use of temporary work.

C. Restore existing facilities used during construction to condition prior to start of work. Restore permanent facilities used during construction to specified condition.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

END OF SECTION 01 50 00

SECTION 01 51 00

TEMPORARY UTILITIES

7 PART 1 GENERAL

1.1 SECTION INCLUDES

A. Description.

B. Conditions of Use.

C. General.

D. Temporary Illumination and Power Distribution.

E. Temporary Heat, Ventilation and Cooling.

F. Temporary Telephone / Internet Service.

G. Temporary Water.

H. Temporary Sanitary Facilities.

I. Temporary Fire Protection.

J. Removal.

1.2 RELATED SECTIONS:

A. Division 1 - Temporary Controls: Barriers.

A.

B. Division 33: Utility Services.

C. Division 21: Fire Protection Systems.

1.3 DESCRIPTION

A. Furnish and install temporary utilities at locations required to avoid delay in performance of work. Maintain, modify, and expand as required temporary utilities as needed throughout the progress of the Work. Do not remove until services are no longer needed, or are replaced by the authorized use of completed permanent facilities (at Contractor expense until final acceptance of entire project by Owner).

1.4 REQUIREMENTS OF REGULATORY AGENCIES

A. Comply with Federal, State and local codes and regulations and with utility company requirements.

1.5 CONDITIONS OF USE

A. Operate temporary utilities in a safe, efficient manner. Do not overload temporary utilities. Do not allow unsanitary conditions, public nuisances or hazardous conditions to develop or persist on the site.

1.6 GENERAL

A. Materials may be new or used, shall be adequate in capacity for the required usage, shall not create unsafe conditions, and shall not violate requirements of applicable codes and standards.

B. Include all utility connections to field offices and storage structures as required, as well as for construction use.

1.7 TEMPORARY ILLUMINATION AND POWER DISTRIBUTION

A. Provide and pay for all temporary poles, service drops, meters, fuses, panels, circuit breakers, wiring, switches, lights, power outlets, and other electrical materials necessary for proper execution of the work. Arrange distribution boxes so that individual trades will not need extension cords longer than 100 feet. Arrange with utility company to provide temporary services required for power and lighting, and to pay all costs for services and for power used.

B. Install weatherproof, grounded circuit and branch wiring, with area distribution boxes located so that power and lighting is available throughout the construction by the use of construction-type power cords. Provide ground-fault protection for all receptacle outlets.

C. Provide artificial lighting for all areas of Work and for areas required to be accessible to the public when natural light is not adequate. Lighting shall be of an adequate level for safety, to perform all construction operations and for the City Engineer to perform inspections.

D. As soon as the permanent system may be used, Contractor shall dismantle the temporary system and shall, at his own expense (including the cost of power), operate the permanent system, assuming all responsibility and risk thereof.

1.8 TEMPORARY HEAT, VENTILATION AND COOLING

A. Provide temporary heat, ventilation and cooling as required to maintain adequate ambient conditions to facilitate progress of the Work, to meet specified minimum conditions for the installations of materials, to protect materials and finishes from damage due to improper temperature or humidity, and to allow Owner's occupancy of designated portions of the facility.

B. Provide adequate forced ventilation and cooling of enclosed areas for curing and drying of installed materials, to disperse humidity, and to prevent hazardous accumulations of dust, fumes, vapors, or bases.

C. Portable heaters and air conditioners shall be standard approved units complete with controls. Units shall be UL and FM approved and labeled. Salamanders or other oil-fired individual units are not to be used, except as approved by Architect.

D. Pay all costs of installation, maintenance, operation and removal, and for fuel consumed.

E. When temporary heating and cooling is no longer required, or as soon as the permanent heating/cooling systems may be used, Contractor shall dismantle the temporary systems and shall, at his own expense (including the cost of fuel), operate the permanent systems, assuming all

responsibility and risk thereof, until entire project is accepted by the Owner.

F. Contractor shall be responsible for maintaining adequate building temperatures and humidities throughout the duration of the project. Damage to the building because of failure to maintain sufficient temperature and humidity shall be repaired at no cost to the Owner.

G. The use of propane bullet heaters or other heating devices which produce carbon-dioxide as an emission are prohibited in areas where masonry is being laid, or within 48 hours of masonry having been laid.

1.9 TEMPORARY TELEPHONE SERVICE

A. The Project Superintendent shall employ the use of cellular phone service at all times during the construction period to facilitate communications.

1.10 TEMPORARY WATER

A. The Contractor shall provide adequate temporary potable water for the project, if required. No washing of construction vehicles on site is permitted.

1.11 TEMPORARY SANITARY FACILITIES

A. Sanitary Facilities: Provide toilet facilities for workers at locations approved by the City Engineer; comply with all sanitary regulations for installation, use and removal. Service, clean, and maintain facilities and enclosures.

1.12 TEMPORARY FIRE PROTECTION

A. Install and maintain temporary fire protection facilities of the types needed to adequately protect against predictable and controllable fire losses. Comply with the applicable recommendations of NFPA Standard 10 “Standard for Portable Fire Extinguishers”. Locate fire extinguishers where they are most convenient and effective for their intended purpose.

B. Store combustible materials in containers in recognized fire-safe locations.

1.13 REMOVAL

A. Completely remove temporary materials and equipment when their use is no longer required.

B. Clean and repair damage caused by temporary installations or use of temporary facilities.

C. Restore permanent facilities used for temporary services to specified condition.

D. Prior to final inspections, remove temporary lamps from fixtures to remain, clean fixtures and install new lamps.

PART 2 PRODUCTS: Not Used

PART 3 EXECUTION: Not Used

END OF SECTION 01 51 00

SECTION 01 56 00

TEMPORARY CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. General.

B. Requirements and Regulatory Agencies.

C. Barriers (including Fencing).

D. Water Control / Dewatering.

E. Exterior Enclosures.

F. Protection of Installed Work.

G. Dust Control.

H. Erosion and Sediment Control.

I. Noise Control.

J. Pollution Control.

K. Special Protection.

1.2 RELATED SECTIONS

A. DIVISION 1 - Summary of Project: Contractor use of premises.

A.

B. DIVISION 1 – Coordination and Project Conditions.

B.

C. DIVISION 31-33 – Earthwork and utility related work.

C.

1.3 DESCRIPTION

A. Temporary Controls: Barriers, enclosures, protection of the Work, water control, dust control, erosion and sediment control, noise control, pest control, pollution control, and rodent control.

1.4 REQUIREMENTS AND REGULATORY AGENCIES: Comply with federal, state and local codes and regulations.

1.5 BARRIERS (Including Fencing)

A. GENERAL: Provide and maintain suitable fences, barricades, screens, and partitions as required to prevent public entry to hazardous areas, to provide for public safety, to protect the Work, and to protect existing facilities, trees, plants, and adjacent properties, rights-of-way, and uses from construction operations. Provide barriers of a neat and reasonably uniform appearance, structurally adequate for the required purposes. Erect temporary barriers of type and in location indicated on the Contract Documents and as required by federal, state and local regulations. Provide warning signs to inform personnel at the site and the public of the hazard.

B. As early in the project as possible, permanent perimeter fencing shall be installed. The Contractor shall coordinate all earthwork, seeding, and permanent fencing with the Work such that the permanent fencing is installed shortly following earthwork along the perimeter of the site. This may require portions of top soiling, seeding, and permanent fencing to be phased where other portions must remain open to facilitate construction. Protect installed work. Re-work and repair/replace portions of fencing and seeded areas disturbed after installation.

C. MATERIALS:

1. Material may be new or used, suitable for the intended purpose, at Contractor's option, as appropriate to serve the required purpose, but must not violate requirements of applicable codes and standards. Barriers shall have a neat and reasonably uniform appearance, and be structurally adequate for the required purposes.
2. Unless permanent site fencing specifications state otherwise, provide commercial grade, 6 foot (1.8 m) high, chain link fence around construction site; equip with vehicular gates with locks.

D. MAINTENANCE: Maintain barriers during entire construction period. Relocate barriers as required by progress of construction.

E. REMOVAL: Completely remove barriers, including foundations, when construction has progressed to the point that they are no longer needed, and when approved by City Engineer. Clean and repair damage caused by installation, fill and grade the areas of the site to required elevations and slopes, and clean the area.

1.6 WATER CONTROL / DEWATERING

A. Grade site to drain. Maintain positive drainage away from buildings. Protect site from puddling and running water. Dewatering shall be performed on a daily and rainfall event basis.

D.

B. Perform grading and excavation in a manner to prevent surface water and subsurface or ground water from flowing into excavations, and to prevent water from flooding the project site and surrounding areas.

C. <u>Do not allow water to accumulate in excavations.</u> (This includes unfinished elevator pits and other depressed areas inside building.) Remove water using dewatering methods which will prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations. Provide and maintain sump pumps, and suction and discharge lines, and other dewatering system components necessary to convey water away from excavations to acceptable sediment control structure.

E.

D. Provide means of conveyance for runoff and water removed from excavations to collecting areas. Comply with Division 2 - Erosion &

Sediment Control pertaining to sediment-laden discharges. Provide and maintain temporary drainage ditches and other diversions outside excavation limits of structures. Do not use trench excavations as temporary drainage ditches.

F.

E. Additional work required due to improper drainage or lack of control of drainage will be at the Contractor's expense.

3.4

1.7 EXTERIOR ENCLOSURES

A. Provide temporary weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating/cooling and maintenance of required ambient temperatures and humidities identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.8 PROTECTION OF INSTALLED WORK

A. General:
   1. Protect installed Work and provide special protection where specified in individual specification sections.
   2. Provide temporary and removable protection for installed Products. Control activity in immediate work area to prevent damage.
   3. Special Note: Soil in this area may possess strong staining characteristics. Items (including brick and windows) stained by soiling, mud splatter, or direct contact with the soil will be replaced at no additional cost to the Owner.

A.

B. Site Related:
   1. Preserve survey control points & benchmarks. Pay for replacement if disturbed.
   2. Prohibit traffic from landscaped areas.
   3. Protect approved subgrade from damage by standing water, runoff and traffic.

C. Building Related:
   1. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

2. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
3. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
4. Provide substantial coverings as necessary to protect installed products/equipment from damage.
5. Remove protection when no longer needed.

1.9 DUST CONTROL

A. Execute Work by methods to minimize raising dust from construction operations.

B.

B. Provide positive means to prevent air-borne dust from dispersing into atmosphere.

C.

C. The Contractor shall make every effort possible to prevent dust from becoming airborne and settling on adjacent buildings, autos, and mechanical equipment. Should dust or debris from this project cause harm to individuals or property on this site or in the surrounding community, the Contractor will bear the cost of clean-up and/or remediation.

1.10 EROSION AND SEDIMENT CONTROL

A. See DIVISION 2 – Erosion & Sediment Control.

1.11 NOISE CONTROL

A. Provide methods, means, and facilities to minimize noise from construction equipment and noise produced by construction operations.

1.12 POLLUTION CONTROL

A. Provide methods, means, and facilities to prevent contamination of soil,

water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations.

1.13 SPECIAL PROTECTION

A. Demolition, general construction, and exterior cleaning operations may generate airborne dust or otherwise noxious matter that is, or could be considered to be, dangerous to persons or property. It is essential that dust be controlled and that no debris of any kind be permitted to leave the site or staging area uncontrolled.

PART 2 PRODUCTS: Not Used

PART 3 EXECUTION: Not Used

END OF SECTION 01 56 00

SECTION 01 57 00

TRAFFIC REGULATION

8 PART 1 GENERAL

1.1 SECTION INCLUDES

A. General.

B. Reference Standards.

C. Barricade and Warning Signs.

1.2 GENERAL

A. General Conditions, Supplementary General Conditions and other sections in Division 1 govern work hereunder.

B. Furnish labor, materials and equipment necessary to maintaining a safe flow of traffic at all times during construction on or adjacent to public right-of-way.

1.3 REFERENCE STANDARDS

A. Traffic control procedures and equipment shall conform to
   a. VDOT Work Zone Safety “Guidelines for Temporary Traffic Control” Handbook, January 2012.
   b. VDOT Virginia Work Area Protection Manual.

1.4 SUBMITTALS

3.1

A. Contractor shall submit traffic control plan(s) to the City Traffic Engineering department for review and approval prior to construction.

PART 2 PRODUCTS

2.1 BARRICADE AND WARNING SIGNS

A. All warning signs, cones, barricades, flags, lights or other traffic control devices shall conform to the requirements of the “Manual of Uniform Traffic Control Devices for Streets and Highways.”

B. All orange construction signs shall be fabricated using encapsulated lens type reflective sheeting in accordance with VDOT Standards.

C. Comply with VDOT standards for all channelizing devices (traffic control).

PART 3 EXECUTION: Not Used

END OF SECTION 01 57 00

SECTION 01 58 00

PROJECT IDENTIFICATION AND SIGNS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Description.

B. Installation.

C. Other Signs (none).

D. Painting.

E. Maintenance.

F. Removal.

1.2 RELATED SECTIONS

A. DIVISION 1 – Summary of Project.

1.3 DESCRIPTION

A. Provide two (1) Double – Sided Construction Signs at each project location:
Construct the construction sign per detail on Drawing XC501A in the appendix.

1.4 OTHER SIGNS

A. No other signs are allowed without Owner permission except those required by law.

PART 2 PRODUCTS

2.1 GENERAL

A. Materials indicated which are structurally adequate to support the Work and suitable for specified finish.

2.2 SIGN SURFACES

A. Exterior grade plywood, sizes as indicated.

2.3 FRAMING LUMBER

A. Southern yellow pine, utility grade, salt (SSCA) pressure treated.

2.4 PAINT

A. Exterior semi-gloss enamel of colors indicated.

PART 3 EXECUTION

3.1 INSTALLATION

A. Erect each sign on site where directed by City Engineer. Signs shall be in place within 30 days following date of Notice to Proceed. Signs shall be relocated as directed by the City Engineer if changing site conditions warrant.

B. Brace as necessary for local soil conditions and wind loads.

3.2 PAINTING

A. Paint all exposed surfaces of supports, framing, and surface material with one coat of primer and two coats of exterior semi-gloss enamel. Paint graphics in the styles, sizes and colors as indicated.

3.3 MAINTENANCE

A. Maintain sign and supports in a neat, clean condition: repair damages to structure, framing or sign.

3.4 REMOVAL

A. Remove each sign, including framing, supports and foundations at completion of project. Fill holes and provide ground cover to match adjacent areas so as to remove all indications that the sign had been installed at that location.

END OF SECTION

SECTION 01 60 00

PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Products.

B. Manufacturer's Instructions.

C. Transportation and Handling.

D. Storage and Protection.

E. Product Options and Substitutions.

1.2 RELATED SECTIONS

A. Instructions to Bidders.

B. Division 1 – Submittal Procedures.

C. Division 1 – Quality Requirements: Product Quality Monitoring.

1.3 PRODUCTS

A. Conformity: Materials, products and equipment incorporated into the Work shall conform to applicable specifications and standards and shall comply with size, make, type and quality specified, unless specifically approved in writing by the Architect/Engineer.

B. Equipment Uniformity: Equipment of the same general type shall be of the same make and style throughout the Work to provide uniform appearance, operation and maintenance.

C. Product Uniformity (For Manufactured and Fabricated Products):
   1. Design, fabricate and assemble in accordance with industry standards.
   2. Manufacture like parts of duplicate units to standard sizes and gauges, to be interchangeable.
   3. Similar types of equipment shall be products of the same manufacturer.
   4. Products shall be suitable for service conditions.
   5. Equipment capacities, sizes and dimensions indicated or specified shall be adhered to unless the variations are specifically approved in writing.

D. Do not use material or equipment for any purpose other than that for which it is intended.

E. When replacing a component, provide interchangeable components of the same manufacture as that being replaced.

1.4 MANUFACTURER'S INSTRUCTIONS

A. When Contract Documents require that installation of products shall comply with manufacturer's printed instructions, obtain and distribute copies of such instructions to parties involved in the installation. Maintain one set of complete instructions at the job site.

B. Perform Work in strict accordance with manufacturer's instructions. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by Contract Documents.

C. Handle, install, connect, clean, condition, and adjust products in strict accordance with manufacturer's instructions and in conformance with specified requirements. Should job conditions or specified requirements conflict with manufacturer's instructions, consult with Architect/Engineer for clarification. Do not proceed with Work without clear instructions.

D. Should the Contractor perform work that does not comply with the manufacturer's directions or the Architect's written instructions, he shall bear all costs arising from correcting the deficiencies.

1.5 PRODUCT OPTIONS AND SUBSTITUTIONS

A. The Contract is based on the products, materials, and equipment, or on performance criteria indicated in the Contract Documents. While not considered “substitutions,” the use of materials or manufacturers other than those used as the “basis of design” – even those manufacturers listed as acceptable in the specifications – shall require the Contractor to verify that all costs associated with using the other manufacturer are included in the bid price for the Work.

B. The Contractor’s requests for changes in the products, materials, equipment and methods of construction required by the Contract Documents are considered requests for “substitutions,” and are subject to the requirements specified herein.

C. Contractor’s Option during Bidding: Refer to INSTRUCTION TO BIDDERS.

D. Contractor’s Options after Award:

1. For products specified only by performance criteria, select any product meeting that standard.

2. For products specified by naming several products or manufacturers, select any one of the products or manufacturers named, which complies with the Specifications, intent of the design and layout characteristics indicated on the documents.

3. Where one manufacturer is listed and the phrase “or approved substitution” occurs in the Contract Documents, the Contractor may provide the manufacturer specified or an equivalent manufacturer. <u>Do not assume that a product, material, or equipment not specifically mentioned will be reviewed as equal by the Architect unless the item has been specifically included in writing for this project by the Architect in the form of an Addendum.</u>

E. Substitutions After Award of Contract: The Architect will consider written requests submitted by or through the Contractor for substitution of products, particularly when one or more of the following conditions exists:

1. Required for compliance with final interpretation of code requirements or insurance regulations;

2. Unavailability of specified products, through no fault of the Contractor;

3. Subsequent information discloses inability of specified products to perform properly or to fit in designated space;

4. A substantial advantage is offered to the Owner, in terms of cost, time, energy conservation or other considerations of merit, after deducting offsetting responsibilities the Owner may be required to bear. These additional responsibilities may include additional compensation to the Architect for redesign and evaluation services, the increased cost of other work by the Owner or separate contractors, and similar considerations.

F. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

G. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified material or product cannot be provided.
b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
f. Cost information, including a proposal of change, if any, in the Contract Sum.
g. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.

h. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

8. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within 7 days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.
   a. Form of Acceptance: Change Order.
   b. Use product specified if Architect cannot make a decision on use of a proposed substitution within time allocated.

9. Submit a separate request for each product substitution, supported with complete data, drawings and samples as appropriate, including:
   1. comparison of the qualities of the proposed substitution with specified;
   2. changes required in other elements of the Work because of the proposed substitution;
   3. effect on the construction schedule;
   4. cost data comparing the proposed substitution with the product specified;
   5. any required license fees for royalties;
   6. availability of maintenance service, and source of replacement materials.

J. City Engineer shall be the judge of the acceptability of the proposed substitution.

K. The burden of proof of the merit of the proposed substitute is upon the Contractor.

L. A request for substitution constitutes a representation that the Contractor:
   1. has investigated the proposed product (whether proposed by him or through him by a subcontractor or material supplier) and determined that it is equal to, or superior in all respects to, that specified.
   2. will provide the same warranties or bonds for the substitution as for the product specified.

3. will coordinate the installation of the substitution into the Work, and make such other changes as may be required to make the Work complete in all respects.
4. waives all claims for an increase in the Project cost which may subsequently become apparent due to inclusion of the substitution.
5. certifies cost data to be complete, and that it includes all related costs under his contract, but excludes costs under separate contracts and Architect's redesign fees.

13. Upon approval by the Owner, the Architect will notify the Contractor in writing, of acceptance or rejection of the proposed substitution. If adequate data regarding any proposed substitution is not provided, the Architect may state that action will be deferred until the Contractor provides such data. Failure to object to a proposed substitution shall not constitute a waiver of any of the requirements of the Contract Documents. Acceptance of any substitution does not waive the responsibility of the Contractor to conform to the Contract Documents.

14. Two submittals will be considered for each substituted product, material, or equipment. The cost of reviews of proposed substitutions in addition to the two non-conforming submittals mentioned above will be paid by the Contractor at the Architect's contractual hourly rates as noted in Section 01770 "Re-Inspection Fees."

9 PART 2 PRODUCTS: Not Used

10 PART 3 EXECUTION

3.1 TRANSPORTATION AND HANDLING

A. Arrange deliveries of products in accordance with construction schedules. Coordinate to avoid conflict with Work and conditions at the site. Minimize length of storage time on-site.

B. Provide Owner and Architect with a list of hazardous materials at least seven (7) days before bringing those materials on site.

C. Deliver products to the site in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible.

Label packaging with names, model numbers types, grades, compliance with standards and similar information needed for distinct identification.

D. Immediately, upon delivery, inspect shipments to assure compliance with requirements of Contract Documents and approved submittals, and that Products are properly protected and undamaged.

E. Provide equipment and personnel to handle Products by methods to prevent soiling, disfigurement, or damage.

F. Handle products carefully to avoid damage, breakage and marring of finishes. Damaged materials will not be accepted. Immediately arrange for replacement of damaged material to minimize effect on progress of Work.

3.2 STORAGE AND PROTECTION

A. Storage: After acceptance of delivery, equipment and materials shall be stored at the site unless off-site storage is authorized by the Architect in writing.

B. Coordinate deliveries of materials to minimize length of storage time at the site.

C. Arrange storage in a manner to provide easy access for inspection by the Architect until installation.

D. Store and protect products in accordance with manufacturer's instructions, in original containers, suitably sheltered from the elements. See specification Sections for special requirements.

E. All items subject to moisture or temperature damage shall be stored in dry spaces heated as necessary to maintain safe minimum temperature.

F. Exterior Storage:
   1. Store products above the ground on blocking or skids to prevent soiling or staining. Provide ground cover, such as straw or gravel

to eliminate the potential for mud spatter on stored materials. Cover products which are subject to deterioration with impervious sheet coverings, and provide adequate ventilation to avoid condensation.

2. Store loose granular materials in a well-drained area on solid surfaces to prevent mixing with foreign matter.
3. Except for limited quantities of materials as required for each day's work, roofing materials shall not be stored on the roof.

G. Make periodic inspections of stored Products to assure that they are maintained under specified conditions, and free from damage or deterioration.

H. Equipment shall be tightly covered and protected against direct water, chemical and mechanical injury, theft and vandalism.

END OF SECTION 01 60 00

SECTION 01 70 00
EXECUTION REQUIREMENTS

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 general procedural requirements governing execution of the Work including, but not limited to, the following:

1. General installation of products.
2. Progress cleaning.
3. Starting and adjusting.
4. Protection of installed construction.
5. Correction of the Work.

B. Related Sections include the following:

1. Division 1 Section "Cutting and Patching" for procedural requirements for cutting and patching necessary for the installation or performance of other components of the Work.
2. Division 1 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

PART 2 - PRODUCTS: Not Used

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before

beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.

1. Before construction, verify the location and points of connection of utility services.

B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning site work, investigate and verify the existence and location of underground utilities and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

C. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
2. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
3. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
4. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to City Engineer. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.3 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
4. Maintain minimum headroom clearance of 8 feet in spaces without a suspended ceiling.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

G. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by City Engineer.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. 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.

H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.4 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F.
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to be free of trash and debris, and as necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
3. Provide appropriate number and type of trash receptacles in all work areas.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.5 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 1 Section "Quality Requirements."

E. Refer to Commissioning specifications for additional requirements.

3.6 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.7 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 1 Section "Cutting and Patching."

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 01 70 00

SECTION 01 73 10
CUTTING AND PATCHING

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 procedural requirements for cutting and patching.

B. Related Sections include the following, if applicable to this project:
   1. Divisions 2 through 33 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.

B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.4 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.

B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that result in increased maintenance or decreased operational life or safety. Operating elements include the following:

1. Primary operational systems and equipment.
2. Air or smoke barriers.
3. Mechanical systems piping and ducts.
4. Electrical wiring systems.

C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that result in increased maintenance or decreased operational life or safety. Miscellaneous elements include the following:

1. Water, moisture, or vapor barriers.
2. Membranes and flashings.
3. Equipment supports.
4. Piping, ductwork, vessels, and equipment.

D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.

1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

3.3 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
4. Proceed with patching after construction operations requiring cutting are complete.

C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

    a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    b. Restore damaged pipe covering to its original condition.

3. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
4. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION 01 73 10

SECTION 01 77 00
CLOSE-OUT PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Instructions to Owner.

B. Substantial Completion.

C. Final Inspection and Re-inspection Fees.

D. Contractor's Closeout Submittals to the Architect.

E. Final Adjustment of Accounts.

F. Final Application for Payment.

G. Final Cleaning.

1.2 RELATED REQUIREMENTS

A. Fiscal provisions, legal submittals, and additional administrative requirements: Conditions of the Contract.

B. Comply with requirements stated in Conditions of the Contract and in Specifications for administrative procedures in closing out the Work.

1.3 INSTRUCTIONS TO OWNER

A. Contractor shall instruct the Owner or his authorized representative in the proper operation and maintenance of all elements of the project systems as listed on the enclosed form or as specified.

B. Competent representatives of the Contractor shall spend as much time as reasonably necessary or as directed by the Architect to prepare the Owner to operate and maintain the building systems and equipment.

C. Obtain signature of Owner or his authorized representative on an exact duplicate of "Owner's Statement of Receipt of Adequate Instruction of System and Equipment Operation" bound at the end of this specification section and submit two copies of this form to the Architect prior to substantial completion of the project.

1.4 SUBSTANTIAL COMPLETION

E. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.

1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
2. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
3. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
4. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
5. Complete startup, testing of systems and commissioning.
6. Submit test/adjust/balance records.
7. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
8. Advise Owner of changeover in heating/cooling and other utilities.
9. Complete final cleaning requirements, including touchup painting.
10. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

F. When Contractor considers the Work, or a designated portion thereof, substantially complete in accordance with the General Conditions:

1. Make contract closeout submittals as identified herein, including a detailed punch list of all items yet to be completed.

2. Make adjustments to operating products and equipment as necessary to ensure smooth and unhindered operation.
3. Complete final cleaning per Division 1 requirements and other requirements of the Project Manual.
4. Request Substantial Completion Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements.

C. Should Architect determine that the Work is not substantially complete:

1. Architect will not inspect the Work for substantial completion and will promptly notify the Contractor in writing, giving the reasons therefore. Architect will not complete the substantial completion punch list for the Contractor.

2. Contractor shall remedy the deficiencies in the Work, and again send a written notice of substantial completion to the Architect, complete with a list of deficiencies.
3. Architect will then inspect the Work. Refer to Article 1.6 of this section for related fees.

D. When Architect concurs that the Work is substantially complete, he will:

1. Prepare a Certificate of Substantial Completion , accompanied by Contractor's list of items to be completed or corrected, as verified and amended by the Architect.

2. Submit the Certificate to Owner and Contractor for their written acceptance of the responsibilities assigned to them in the Certificate.

3.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor, as applicable to project.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.

3. Include the following information at the top of each page:
   a. Project name.
   b. Date.
   c. Name of Architect.
   d. Name of Contractor.
   e. Page number.

1.6 FINAL INSPECTION

A. When Contractor considers the Work complete, he shall submit written certification that:

1. Contract Documents have been reviewed.

2. Work has been inspected for compliance with Contract Documents.

3. Work has been completed in accordance with Contract Documents and is ready for final inspection.

4. Equipment and systems have been tested in the presence of the Owner's representative and are operational.

5. All items on the "Substantial Completion Inspection List" have been corrected.

6. All specified close-out submittals have been made.

B. Architect will make an inspection to verify the status of completion with reasonable promptness after receipt of such certification.

C. Should Architect consider that the Work is incomplete or defective:

1. Architect will promptly notify the Contractor in writing, listing the incomplete or defective work.

2. Contractor shall take immediate steps to remedy the stated deficiencies, and send a second written certification to Architect that the Work is complete.

3. Architect will then re-inspect the Work. Refer to Article 1.6 of this section for related fees.

D. When the Architect finds that the Work is acceptable under the Contract Documents, he shall request the Contractor to make closeout submittals.

E. At final acceptance of entire Project by Owner, Contractor shall replace all air filters in HVAC systems with new filters.

1.7 CONTRACTOR'S CLOSEOUT SUBMITTALS TO ARCHITECT

A. Evidence of compliance with requirements of governing authorities, including Certificate of Occupancy, Certificates of Inspection, elevator inspection certificates, domestic water system inspection certificates and AHERA certifications (stating that no ACM's are in the Project).

B. Project Record Documents: Refer to requirements of Division 1 – Project Record Documents.

C. Operation and Maintenance Data (3 copies): Refer to requirements of Division 1 – Operating and Maintenance Data.

D. Warranties and Bonds: Refer to requirements of Division 1 – Warranties and Bonds.

E. Evidence of Payment and Release of Liens: Refer to requirements of Conditions of the Contract.

F. Certificate of Insurance for Products and Complete Operations.

G. Spare Parts: Refer to technical sections of the specifications. Coordinate location of delivery with the Owner. Obtain signature of Owner or his authorized representative on an exact duplicate of "Owner's Receipt of Equipment and Materials Specified to be Furnished Directly to Owner" bound at the end of this specification section and submit two copies of this form to the Architect prior to final payment.

H. Project closeout forms are attached behind this section.

1.8 FINAL ADJUSTMENTS OF ACCOUNTS

A. Submit a final statement of accounting to Architect.

B. Statement shall reflect all adjustment to the Contract Sum:

1. The original Contact Sum.
2. Additions and deductions resulting from previous Change Orders, Deductions for uncorrected Work, Deductions for re-inspection payments, Other adjustments.
3. Final statement of accounting of all allowances.
4. Total Contract Sum, as adjusted.
5. Sum remaining due.

C. Architect will prepare a final Change Order, reflecting approved adjustments, which were not previously made by Change Orders.

1.9 FINAL APPLICATION FOR PAYMENT

A. Contractor shall submit the final Application for Payment in accordance with procedures and requirements stated in the Conditions of the Contract.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:

   a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
   b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
   c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
   d. Remove tools, construction equipment, machinery, and surplus material from Project site.
   e. Remove snow and ice to provide safe access to building.
   f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
   g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
   h. Sweep concrete floors broom clean in unoccupied spaces.
   i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
   j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
   k. Remove labels that are not permanent.
   l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration. Do not paint over

"UL" and similar labels, including mechanical and electrical nameplates.

m. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.

n. Replace parts subject to unusual operating conditions.

o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.

p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.

q. Clean ducts, blowers, and coils if units were operated without filters during construction.

r. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

s. Leave Project clean and ready for occupancy.

C. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION
(Note two forms following)

Spectrum Design, P.C.
Plaza Suite One, 10 Church Avenue, SE
Roanoke, VA 24011-2104
(540) 342-6001

PROJECT: COMM. NO.

CONTRACTOR: DATE:

OWNER'S RECEIPT OF EQUIPMENT AND MATERIALS

SPECIFIED TO BE FURNISHED DIRECTLY TO THE OWNER

I hereby acknowledge that I have received the following items of equipment and materials:

ITEM	NUMBER	DATE RECEIVED	RECEIVED BY
1. Hose Bib Keys			
2. Spare Rubber Base			
3. Spare Cans of Paint			
4. Plumbing Fixture Loose Keys			
5. Flush Valve Rebuild Kits – 1 per type			
6. Ext. Fixture Lamps-2 per type			
7. Panelboard Keys-2 per panel			
8. Mech. Room Door Keys			
9.			
10.			

SIGNATURE:

_____

(OWNER'S REPRESENTATIVE)

_____

(TITLE)

Spectrum Design, P.C.
Plaza Suite One, 10 Church Avenue, SE
Roanoke, VA 24011-2104
(540) 342-6001

PROJECT: COMM. NO.

CONTRACTOR: DATE:

OWNER'S STATEMENT OF RECEIPT OF ADEQUATE

INSTRUCTION OF SYSTEM AND EQUIPMENT OPERATION

I hereby acknowledge that adequate instruction has been received for the operation and maintenance for each of the following:

1. Hardware Maintenance	Owner's Rep Instructed:	Instructor:
		Company:
		Date:
2. Floor Maintenance	Owner's Rep Instructed:	Instructor:
		Company:
		Date:
3. Mechanical Equipment Maintenance	Owner's Rep Instructed:	Instructor:
		Company:
		Date:
4. Plumbing Equipment Maintenance	Owner's Rep Instructed:	Instructor:
		Company:
		Date:
5.	Owner's Rep Instructed:	Instructor:
		Company:
		Date:

6.	Owner's Rep Instructed:	Instructor:
		Company:
		Date:
7.	Owner's Rep Instructed:	Instructor:
		Company:
		Date:
8.	Owner's Rep Instructed:	Instructor:
		Company:
		Date:
9.	Owner's Rep Instructed:	Instructor:
		Company:
		Date:
10.	Owner's Rep Instructed:	Instructor:
		Company:
		Date:

SIGNATURE:

_____

(OWNER'S REPRESENTATIVE)

_____

(TITLE)

SECTION 01 78 10
PROJECT RECORD DOCUMENTS

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 Project Record Documents, including the following:

1. Record Drawings.
2. Record Product Data.

B. Related Sections include the following:
1. Division 1 Section "Closeout Procedures" for general closeout procedures.
2. Division 1 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
3. Divisions 2 through 33 Sections for specific requirements for Project Record Documents of the Work in those Sections.

1.3 SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit one set of marked-up Record Prints.
2. Number of Copies: Submit copies of Record Drawings as follows:

a. Initial Submittal: Submit two sets of marked-up Record Prints. Architect will initial and date each plot and mark whether general scope of changes, additional information recorded, and quality of drafting are acceptable. Architect will return prints for organizing into sets, printing, binding, and final submittal.
b. Final Submittal: Submit two sets of marked-up Record Prints, and a CD including scans of all Record Drawings. Print and record each Drawing, whether or not changes and additional information were recorded.

B. Record Product Data: Submit two copies of each Product Data submittal.

1. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in manual instead of submittal as Record Product Data.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of blue- or black-line white prints of the Contract Drawings and Shop Drawings.

1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.

   a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
   b. Accurately record information in an understandable drawing technique.
   c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.

2. Content: Types of items requiring marking include, but are not limited to, the following:

   a. Dimensional changes to Drawings.
   b. Revisions to details shown on Drawings.
   c. Revisions to routing of piping and conduits.
   d. Actual equipment locations.
   e. Duct size and routing.
   f. Changes made by Change Order or Construction Change Directive.
   g. Changes made following Architect's written orders.
   h. Details not on the original Contract Drawings.

3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.

6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Storm Drainage and Stormwater Management Field Survey: Licensed Land Surveyor in the Commonwealth of Virginia shall field survey and prepare an As-Built plan of the newly constructed storm drain and/or stormwater management measures at Huff Lane Park for submission to the City Engineer after review by Architect.
   1. As-built shall be completed prior to final acceptance and issuance of a certificate of occupancy by the City.
   2. As-built plans shall be provided in the State Plane Virginia South Coordinate System, NAD 1983, FIPS 4502 Feet, US Survey Feet, Datum NA 83
   3. In the form of 1 paper copy and 1 digital AUTOCAD file.

C. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing Record Drawings where Architect determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.

   1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
   2. Consult Architect for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared Record Drawings into Record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.

D. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

   1. Record Prints: Organize Record Prints and newly prepared Record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
   2. Record Transparencies: Organize into unbound sets matching Record Prints. Place transparencies in durable tube-type drawing containers with end caps. Mark end cap of each container with identification. If container does not include a complete set, identify Drawings included.
   3. Identification: As follows:

      a. Project name.
      b. Date.
      c. Designation "PROJECT RECORD DRAWINGS."
      d. Name of Architect.
      e. Name of Contractor.

2.2 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders and Record Drawings where applicable.

2.3 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.

B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect’s and City Engineer's reference during normal working hours.

END OF SECTION 01 78 10

SECTION 01 78 20
OPERATION AND MAINTENANCE DATA

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 preparing operation and maintenance manuals, including the following:

1. Operation manuals for systems, subsystems, and equipment.
2. Maintenance manuals for the care and maintenance of products, materials, finishes, systems and equipment.

B. Related Sections include the following:
1. Division 1 Section "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
2. Division 1 Section "Closeout Procedures" for submitting operation and maintenance manuals.
3. Division 1 Section "Project Record Documents" for preparing Record Drawings for operation and maintenance manuals.
4. Divisions 2 through 33 Sections for specific operation and maintenance manual requirements for the Work in those Sections or as written on the Drawings.

1.3 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 SUBMITTALS

A. Final Submittal: Submit two copies of each manual in final form at least 15 days before final inspection. Architect will return copy with comments within 15 days after final inspection.

1. Correct or modify each manual to comply with Architect's comments. Submit 3 copies of each corrected manual within 15 days of receipt of Architect's comments.

1.5 COORDINATION

A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

PART 2 - PRODUCTS

2.1 MANUALS, GENERAL

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents.

B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name, address, and telephone number of Contractor.
6. Name and address of Architect.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

    a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
    b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

    a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
    b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.2 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions.
2. Operating standards.
3. Operating procedures.
4. Wiring diagrams.
5. Control diagrams.

B. Descriptions: Include the following:

1. Product name and model number.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.3 PRODUCT MAINTENANCE MANUAL

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Material and chemical composition.
4. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

2.4 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

1. Standard printed maintenance instructions and bulletins.
2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Troubleshooting guide.
2. Precautions against improper maintenance.
3. Disassembly; component removal, repair, and replacement; and reassembly instructions.
4. Aligning, adjusting, and checking instructions.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

B. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

C. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

D. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.

1. Do not use original Project Record Documents as part of operation and maintenance manuals.
2. Comply with requirements of newly prepared Record Drawings in Division 1 Section "Project Record Documents."

E. Comply with Division 1 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 01 78 20

SECTION 01 78 30

WARRANTIES AND BONDS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Submittal Requirements: Preparation and submittal of warranties and bonds.

B. Time of Submittals: Time and schedule of submittals.

1.2 RELATED SECTIONS

A.

A. Invitation to Bid: Bid Bonds

B. Contractor's Performance Bond

C. Contractor's Labor and Material Payment Bond

D. General Conditions: Warranties and correction of work.

E. Division 1 – Execution Requirements: Contract closeout procedures.

F. Division 1 – Operating and Maintenance Data.

G. Individual Specification Sections: Warranties and bonds required for specific Products or Work.

1.3 SUMMARY

A. This Section specifies general administrative and procedural requirements for warranties and bonds required by the Contract Documents, including manufacturer's standard warranties on products and special warranties.

6. Refer to the General Conditions of terms of the Contractor's special warranty of workmanship and material.
7. General closeout requirements are included in Division 1.
8. Specific requirements for warranties for the Work and products and installations that are specified to be warranted, are included in the individual Sections of Divisions-2 through –33.
9. Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.

B. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

1.4 WARRANTY REQUIREMENTS

A. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed or replaced to provide access for correction of warranted Work.

B. Reinstatement of Warranty: When Work covered by the warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

B.

C. Replacement Cost: Upon determination that Work covered by the warranty that has been filed is damaged, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing and rebuilding defective Work regardless of whether other Owner has benefited from use of the Work through a portion of its anticipated useful service life.

C.

D. Owner Recourse: Written warranties made to the Owner are in addition to implied warranties and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.

1. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selection to products which have warranties not in conflict with requirements of the Contract Documents.

1.

E. The Owner reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.

1.5 SUBMITTAL REQUIREMENTS

A. Compile specified warranties and bonds. Review to verify compliance with Contract Documents. Submit to Architect for review and transmittal to Owner fifteen (15) days prior to completion of applicable portion of work.

B. When a special warranty is required to be executed by the Contractor, or the Contractor and a subcontractor, supplier or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner through the Architect/Engineer for approval prior to final execution.

1. Refer to individual Sections of Division –2 through –32 for specific content requirements, and particular requirements for submittal of special warranties.

C. Assemble two original copies of each warranty and bond executed by each of the respective manufacturers, suppliers, and subcontractors into duplicate complete sets, punch and bind in heavy-duty commercial quality, 8 –1/2" x 11" three-ring binders with durable and cleanable plastic covers thickness as necessary to accommodate contents. Identify each packet with types or printed title "WARRANTIES AND BONDS".

D. Submit all warranties and bonds specified in the respective Sections of specifications. Submit additional copies if specified elsewhere in these Specifications.

E. Table of Contents: Neatly typed, in orderly sequence based on Table of Contents of Project Manual. Provide complete information for each item:

1. product of work items;
2. firm, with name of principal, address and telephone number;
3. scope;
4. date of beginning of warranty or bond;
5. duration of warranty or bond;
6. information for Owner's personnel on proper procedure in case of failure and on instances which might in affect the validity of warranty or bond;
7. contractor, name of responsible principal, address and telephone number
8. provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark each tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address and telephone number of the installer.
9. identify each binder on the front and spine, with the typed or printed title "WARRANTIES AND BONDS", the Project title or name, and the name of the Contractor.
10. when operating and maintenance manuals are required for warranted construction, provide additional copies and each required warranty, as necessary, for inclusion in each required manual.

1.6 TIME OF SUBMITTALS

A. For equipment or component parts of equipment placed into service during progress of construction, submit documents within 10 days after

inspection and acceptance. Otherwise make submittals as specified in Section 01700 – Execution Requirements.

B. For items of Work where acceptance is delayed materially beyond the Date of Substantial Completion, provide updated submittal within 10 days after acceptance, listing the date of acceptance as the start of the warranty period.

PART 2 PRODUCTS: Not Used

PART 3 EXECUTION: Not Used

END OF SECTION

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

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 cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following :

1. Footings.
2. Slabs-on-grade.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1. Indicate amounts of mixing water to be withheld for later addition at Project site.

1.5 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Steel reinforcement and accessories.
4. Curing compounds.
5. Vapor retarders.
6. Semirigid joint filler.
7. Joint-filler strips.
8. Repair materials.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. 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."

C. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

D. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specifications for Structural Concrete," Sections 1 through 5.
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

PART 2 - PRODUCTS

2.1 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.

2.2 REINFORCEMENT ACCESSORIES

A. 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," of greater compressive strength than concrete and as follows:

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 I, Type II or Type I/II , . Supplement with the following:

   a. Fly Ash: ASTM C 618, Class F .
   b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

B. Normal-Weight Aggregates: ASTM C 33, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source.

1. Maximum Coarse-Aggregate Size: 1-1/2 inches nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: ASTM C 94/C 94M.

2.4 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

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 VAPOR RETARDERS

A. Sheet Vapor Retarder: ASTM E 1745, Class A

1. Permeance Rating: Per ASTM E 96 or ASTM F 1249

   a. Must meet permeance requirements for both new material and after ASTM E-1745 mandatory conditioning tests
   b. New Material: Less than 0.01 perms (gr/ft^2/hr/in-Hg)
   c. After Conditioning: Less than 0.01 perms (gr/ft^2/hr/in-Hg)

2. Water Vapor Barrier: ASTM E 1745, meets or exceeds Class A.
3. Minimum Thickness: 10 mils
4. Product must be manufactured from prime virgin resins. Woven materials are not acceptable.

B. Accessories:

1. Seam Tape:

   a. Water Vapor Transmission Rate of 0.3 perms or lower per ASTM E 96.

2. Vapor Proofing Mastic:

   a. Water Vapor Transmission Rate of 0.3 perms or lower per ASTM E96.

3. Pipe Boots: Construct pipe boots from vapor barrier material, pressure sensitive tape and /or mastic per manufacturer's instructions.

2.6 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, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.

F. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

2.7 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber .

B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 per ASTM D 2240.

2.8 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.

2.9 CONCRETE MIXTURES, GENERAL

A. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash: 25 percent.
2. Ground Granulated Blast-Furnace Slag: 50 percent.
3. Combined Fly Ash and Ground Granulated Blast-Furnace Slag: 50 percent portland cement minimum, with fly ash not exceeding 25 percent.

B. Limit water-soluble, chloride-ion content in hardened concrete to 1.00 percent by weight of cement.

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 for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

2.10 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Footings: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 3000 PSI at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.50 .
3. Slump Limit: 4 inches, plus or minus 1 inch.

B. Slabs-on-Grade: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Minimum Cementitious Materials Content: 470 lb/cu. yd. .
3. Slump Limit: 4 inches , plus or minus 1 inch .
4. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.
5. Synthetic Macro-Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than 3.0 lb/cu. yd.

2.11 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.12 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M, 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 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.

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."

3.2 VAPOR RETARDERS

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.

1. Unroll vapor retarder with the longest dimension parallel with the direction of the pour.
2. Lap vapor retarder over footings or seal to foundation walls.
3. Overlap joints 6 inches and seal with manufacturer’s recommended tape.
4. Seal all penetrations (including pipes) per manufacturer’s instructions.
5. No penetration of the vapor retarder is allowed except for reinforcing steel and permanent utilities.
6. Repair damaged areas by cutting patches of vapor retarder, overlapping damaged area 6 inches and taping all four sides with tape.

B. Bituminous Vapor Retarders: Place, protect, and repair bituminous vapor retarder according to manufacturer's written instructions.

3.3 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.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.4 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 Architect.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.

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. 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 column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.

3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

3.5 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. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. 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. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.

4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

G. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.6 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. 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 to be covered with resilient flooring.
2. Finish surfaces to the following tolerances, according to ASTM E 1155 , for a randomly trafficked floor surface:

a. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.

C. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.7 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. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

D. 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 with the following materials:

a. Water.
b. Continuous water-fog spray.
c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches , and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.

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 unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.

4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a 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. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.8 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

   1. Defer joint filling until concrete has aged at least one month(s). Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.9 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match

adjacent concrete. Keep patched area continuously moist for at least 72 hours.

D. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

E. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.10 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Inspections:

1. Steel reinforcement placement.
2. Headed bolts and studs.
3. Verification of use of required design mixture.
4. Concrete placement, including conveying and depositing.
5. Curing procedures and maintenance of curing temperature.

C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.

    a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173/C 173M, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31/C 31M.

a. Cast and laboratory cure two sets of two standard cylinder specimens plus one additional cylinder for each composite sample.

6. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.

   a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
   b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
   c. Reserve the additional cylinder for testing at 56 days if compressive-strength tests at 28-days do not reach required compressive strength.

7. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
8. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi .
9. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
10. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
11. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
13. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

D. Measure floor and slab flatness and levelness according to ASTM E 1155 within 72 hours of finishing.

END OF SECTION 03 30 00

SECTION 04 81 00

UNIT MASONRY ASSEMBLIES

11 PART 1 GENERAL

1.1 SUMMARY

A. Section includes concrete masonry units; reinforcement, anchorage, and accessories.

a.

B. Related Sections:

1) 1 Division 07 - Joint Sealers: Rod and sealant at control and expansion joints.

1.2 REFERENCES

A. ASTM A153/A153M - Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

B. ASTM A615/A615M - Deformed and Plain Billet Steel Bars for Concrete Reinforcement.

C. ASTM A641 - Zinc-Coated (Galvanized) Carbon Steel Wire.

D. ASTM A653/A653M - Steel Sheet, Zinc Coated, (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

E. ASTM A951 - Masonry Joint Reinforcement.

F. ASTM B370 - Copper Sheet and Strip for Building Construction.

G. ASTM C55 - Concrete Building Brick.

I. ASTM C67 - Sampling and Testing Brick and Structural Clay Tile.

J. ASTM C90 - Load-Bearing Concrete Masonry Units.

K. ASTM C129 - Non-Load Bearing Concrete Masonry Units.

L. ASTM C140 – Sampling and Testing Concrete Masonry Units.

b.

M. ASTM C652 - Hollow Brick (Hollow Masonry Units Made From Clay or Shale).

N. MSJC (Masonry Standards Joint Committee) Code - ACI (American Concrete Institute) 530/ASCE (American Society of Civil Engineers) 5/TMS (The Masonry Society) 402 - Building Code Requirements for Masonry Structures.

O. MSJC (Masonry Standards Joint Committee) Specification - ACI (American Concrete Institute) 530.1/ASCE (American Society of Civil Engineers) 6/TMS (The Masonry Society) 602 - Specifications For Masonry Structures.

1.3 SUBMITTALS

A. Division 01 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit data for masonry units and fabricated wire reinforcement, wall ties, anchors and other accessories.

c.

C. Samples: Submit four samples of masonry units to illustrate color, texture.

D. Reinforcing Steel Submittal: Submit shop drawings showing size, location. Spacing, details, splices and wall elevations necessary to describe the vertical wall reinforcement.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with MSJC Code and MSJC Specification.

B. Maintain one copy of each document on site.

1.5 QUALIFICATIONS

A. Installer: Company specializing in performing Work of this section with minimum five years documented experience.

1.6 MOCK-UP

d. A. Construct a veneer and cavity masonry wall into panels sized 4 feet long by 4 feet high, which includes masonry, mortar and accessories, structural backup, recessed courses, wall openings, flashings, wall insulation.

e. B. Locate in close proximity to the new building.
f.
g. C. Mock-up may not remain as part of the Work.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Accept masonry units on site. Inspect for damage.

B. Limit moisture absorption of concrete masonry units during delivery until time of installation to the maximum percentage permitted for Type I units.

3.2

1.8 ENVIRONMENTAL REQUIREMENTS

A. Division 01 - Product Requirements.

B. Hot and Cold Weather Requirements: MSJC Specification.

3.3 1.9 COORDINATION

A. Division 01 - Administrative Requirements: Coordination and project conditions.

B. Coordinate the masonry work with veneer, and installation of window and door anchors.

12 PART 2 PRODUCTS

2.1 COMPONENTS

a. A. Hollow Load Bearing Concrete Masonry Units (CMU): ASTM C90, Type I – Moisture Controlled; normal weight.

b. B. Decorative Block Units: ASTM C90, Type 1-Moisture controlled, normal weight, 16”x8” face; thickness as indicated on drawings.
1. Style: Single split face.
2. Manufacturers: E. Dillon, Clayton, Metromont.

2.2 ACCESSORIES

A. Single Wythe Joint Reinforcement: Ladder type; steel wire, hot dip galvanized to ASTM A641 Class 1 after fabrication, as manufactured by Dur-O-Wal or equal. 3/16” side rods & 9 Ga Cross Rods.

B. Multiple Wythe Joint Reinforcement: Ladder type; adjustable eye-wire and pintle type, steel wire, hot dip galvanized to ASTM A641 Class 1 after fabrication, 3/16 inch (4.8 mm) side rods with 9 Ga cross ties. Eyes and pintle are 3/16”.

C. Reinforcing Steel: ASTM A615/A615M, 60 ksi yield grade, deformed billet bars, uncoated finish.

D. Strap Anchors: bent steel shape, 2 x 24 inch x ¼ inch thick, hot dip galvanized to ASTM A153/A153M B2 finish.

c. E. Anchor Bolts: Headed, J-shaped or L-shaped.

d. F. Mortar and Grout: As specified in Section 04065.

G. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, heat fused joints.

e. H. Joint Filler: Closed cell polyvinyl chloride; oversized 50 percent to joint width; self expanding; in maximum lengths.

f. I. Nailing Strips: Softwood, preservative treated for moisture resistance, dovetail shape, sized to masonry joints.

g. J. Wall Flashing with integral Weeps: Blockflash by MortarNet..

M. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

B. Verify items provided by other sections of work are properly sized and located.

C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.2 PREPARATION

A. Direct and coordinate placement of metal anchors supplied to other sections.

B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent support.

3.3 INSTALLATION

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form bed and head joints of uniform thickness.

C. Coursing of Concrete Masonry Units:

1) 1. Bond: Running.
2) 2. Coursing: One unit and one mortar joint to equal 8 inches.
3) 3. Mortar Joints: Concave, except walls indicated to receive dry erase wall coverings, which shall be flush joints.

D. Placing And Bonding:

4) 1. Lay solid masonry units in full bed of mortar, with full head joints.
5) 2. Lay hollow masonry units with face shell bedding on head and bed joints.
6) 3. Buttering corners of joints or excessive furrowing of mortar joints are not permitted.
7) 4. Remove excess mortar as work progresses.
8) 5. Interlock intersections and external corners.
9) 6. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
10) 7. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
11) 8. Cut mortar joints flush where wall tile is scheduled, resilient base is scheduled, cavity insulation vapor barrier adhesive is applied, or bitumen dampproofing is applied.
12) 9. Isolate top of masonry from horizontal structural framing members and slabs or decks with compressible joint filler.
10. Racking of masonry will not be permitted.

11. Install rigid insulation in cavity walls tightly against block back-up with adhesive. No gaps between sections of insulation will be permitted. Portion of cavity between insulation and exterior with below grade shall be filled solidly with grout as detailed.

h.

i. I. Lintels:

1) 1. Install loose steel lintels over openings.

2) 2. Install reinforced unit masonry lintels over openings where steel or precast concrete lintels are not scheduled or indicated.

3) 3. Openings up to 42 inches Wide: Place two No. 4 reinforcing bars 1 inch from bottom web.

4) 4. Openings from 42 inches up to 78 inches (1,980 mm) Wide: Place two No. 5 reinforcing bars 1 inch from bottom web.

5) 5. Openings over 78 inches: Reinforce openings as indicated.

6) 6. Do not splice reinforcing bars.

7) 7. Support and secure reinforcing bars from displacement.

8) 8. Place and consolidate grout fill without displacing reinforcing.

9) 9. Allow masonry lintels to attain specified strength before removing temporary supports.

10) 10. Maintain minimum 8 inch bearing on each side of opening.

j. K. Grouted Components:

1) 1. Reinforce bond beam as indicated on drawings.

2) 2. Lap splices bar diameters required by ACI 530 and 530.1.

3) 4. Support and secure reinforcing bars from displacement.

4) 5. Place and consolidate grout fill without displacing reinforcing.

5) 6. At bearing locations, fill masonry cores with grout for a minimum 12 inches both sides of opening.

k. L. Reinforced Masonry:

1) 1. Lay masonry units with cells vertically aligned and cavities between wythes clear of mortar and unobstructed.

2) 2. Place reinforcement bars as indicated.

3) 3. Splice reinforcement in accordance with ACI 530 and 530.1.

4) 4. Support and secure reinforcement from displacement.

5) 5. Place and consolidate grout fill without displacing reinforcing.

6) 6. Place grout in accordance with ACI 530 and 530.1.

l. M. Control And Expansion Joints:

1) 1. Do not continue horizontal joint reinforcement through control and expansion joints.

2) 2. Form control joint with a sheet building paper bond breaker fitted to one side of the hollow contour end of the block unit. Fill the

resultant core with grout fill. Rake joint at exposed unit faces for placement of backer rod and sealant.

a. Block control joints (EJ) shall be 3/8” vertical joints in exterior block backup walls. Joints shall be full thickness of wall, joint reinforcing shall be interrupted, and joints shall have continuous PVC spacers in center of wall. Remainder of joint shall be kept free of mortar for later priming and sealing. Maximum spacing of block control joints shall be as recommended in the NCMA Technical Manual, or as shown on drawings, but in no case more than 20’-0” o.c. in any unbroken wall length. Exact locations of joints, if not shown on drawings, shall be coordinated with Architect prior to laying of masonry. Control joints shall also be installed where thickness of walls changes at column locations.

3) 3. Form expansion joint by omitting mortar and cutting unit to form an open space.

m. N. Built-In Work:

1) 1. As work progresses, install built-in metal door and glazed frames, fabricated metal frames, window frames, wood nailing strips, anchor bolts, plates, and other items to be built-in the work and furnished by other sections.

2) 2. Install built-in items plumb and level.

3) 3. Bed anchors of metal door frames in adjacent mortar joints. Fill frame voids solid with grout or mortar. Fill adjacent masonry cores with grout minimum 12 inches (300 mm) from framed openings.

4) 4. Do not build in materials subject to deterioration.

n. O. Cutting and Fitting:

1) 1. Cut and fit for chases, pipes, conduit, sleeves, and grounds. Coordinate with other sections of work to provide correct size, shape, and location.

2. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.4 ANCHORING MASONRY WORK

A. Provide an open space not less than 1” in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar or other rigid materials.

Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:

Flexible anchors embedded in masonry joints and attached to structure, spaced as indicated, but not more than 24” o.c. vertically and 36” o.c. horizontally.

B. Anchor masonry veneer to metal studs with masonry veneer anchors to comply with the following requirements:

1. Fasten each anchor section through sheathing to metal studs with 2 metal fasteners. Locate anchor section relative to course in which tie section is embedded to allow minimum 1” vertical differential movement of tie up and down.

2. Space anchors not more than 24” o.c. vertically and 16” o.c. horizontally. Install additional anchors to maintain 16” spacing around edges of openings.

3.5 ERECTION TOLERANCES

A. Maximum Variation From Alignment of Columns: Pilasters: 1/8” (6 mm).

B. Maximum Variation From Unit to Adjacent Unit: 1/16 inch (1.6 mm).

C. Maximum Variation from Plane of Wall: ¼ inch in 10 ft (6 mm/3 m).

D. Maximum Variation from Plumb: ¼ inch (6 mm) per story non-cumulative.

E. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and ¼ inch in 10 ft; non- cumulative.

F. Maximum Variation of Joint Thickness: 1/8 inch in 3 ft.

G. Maximum Variation from Cross Sectional Thickness of Walls: 1/8 inch.

o.

p. H. Maximum Variation for Steel Reinforcement:

1) 1. Plus or minus ½ inch when distance from centerline of steel to opposite face of masonry is 8 inches or less.

2) 2. Plus or minus 1 inch when the distance is between 8 and 24 inches.

2. 3.6 CLEANING

a. A. Remove excess mortar and mortar smears as work progresses.

b. B. Replace defective mortar. Match adjacent work.

C. Clean soiled surfaces with cleaning solution.

D. Use non-metallic tools in cleaning operations.

END OF SECTION

SECTION 06 10 00
ROUGH CARPENTRY

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. Framing with dimension lumber.
2. Wood blocking and nailers.

B. Related Requirements:
1. Section 06 16 00 "Sheathing."
2. Section 06 17 53 "Shop-Fabricated Wood Trusses" for wood trusses made from dimension lumber.

1.3 DEFINITIONS

A. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.

B. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NeLMA: Northeastern Lumber Manufacturers' Association.
2. SPIB: The Southern Pine Inspection Bureau.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. 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. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
3. Provide dressed lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

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. Do not use inorganic boron (SBX) for sill plates.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that 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 items indicated on Drawings, and the following:
1. Wood sills, sleepers, blocking and similar concealed members in contact with masonry or concrete.

2.3 DIMENSION LUMBER FRAMING

A. Joists, Rafters, and Other Framing Not Listed Above: No. 2 grade.

1. Species:
   a. Southern pine; SPIB.

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 Standard, Stud, or No. 3 grade lumber and any of the following species:
   1. Mixed southern pine; SPIB.
   2. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

C. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

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. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.

2.6 METAL FRAMING ANCHORS

A. Manufacturers: Subject to compliance with requirements, provide products by the following :
   1. Simpson Strong-Tie Co., Inc.

B. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.

   1. Use for interior locations unless otherwise indicated.

C. Rafter Tie-Downs (Hurricane or Seismic Ties): Bent strap tie for fastening rafters or roof trusses to wall below as indicated on drawings.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

B. Metal Framing Anchors: Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

C. Do not splice structural members between supports unless otherwise indicated.

D. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.

E. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

F. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

1. Use inorganic boron for items that are continuously protected from liquid water.
2. Use copper naphthenate for items not continuously protected from liquid water.

G. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
2. 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.

H. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 CEILING JOIST AND RAFTER FRAMING INSTALLATION

A. Rafters: Notch to fit exterior wall plates and use metal framing anchors. Double rafters to form headers and trimmers at openings in roof framing, if any, and support with metal hangers. Where rafters abut at ridge, place directly opposite each other and nail to ridge member or use metal ridge hangers.

B. Provide special framing as indicated for eaves, overhangs, dormers, and similar conditions if any.

END OF SECTION

SECTION 06 16 00
SHEATHING

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. Roof sheathing.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 ROOF SHEATHING

A. Plywood Roof Sheathing: Exterior, Structural I sheathing.

1. Span Rating: Not less than 24/0.

2. Nominal Thickness: As indicated on drawings.

B. Oriented-Strand-Board Roof Sheathing: Exposure 1, Structural I sheathing.

1. Span Rating: Not less than 24/0.

2. Nominal Thickness: As indicated on drawings.

2.2 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. For roofsheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

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."

D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.

E. Coordinate 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.

F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.

B. Fastening Methods: Fasten panels as indicated below:

1. Subflooring:

   a. Nail to wood framing.
   b. Space panels 1/8 inch apart at edges and ends.

2. Wall and Roof Sheathing:

   a. Nail to wood framing.
   b. Space panels 1/8 inch apart at edges and ends.

END OF SECTION

SECTION 06 17 53
SHOP-FABRICATED WOOD TRUSSES

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. Wood roof trusses.

B. Related Requirements:

1. Section 06 16 00 "Sheathing" for roof sheathing and subflooring.
2. Section 31 31 16 "Termite Control" for site application of borate treatment to wood trusses.

1.3 DEFINITIONS

A. Metal-Plate-Connected Wood Trusses: Planar structural units consisting of metal-plate-connected members fabricated from dimension lumber and cut and assembled before delivery to Project site.

1.4 ACTION SUBMITTALS

A. 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.

B. 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.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For metal connector-plate manufacturer professional engineer and fabricator.

B. Material Certificates: For dimension lumber specified to comply with minimum specific gravity. Indicate species and grade selected for each use and specific gravity.

C. Product Certificates: For metal-plate-connected wood trusses, signed by officer of truss fabricating firm.

D. Evaluation Reports: For the following, from ICC-ES:

1. Metal-plate connectors.

1.6 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 Architect and authorities having jurisdiction.

C. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that

the material bearing the classification marking is representative of the material tested.

1.7 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."

1. Store trusses flat, off of ground, and adequately supported to prevent lateral bending.
2. Protect trusses from weather by covering with waterproof sheeting, securely anchored.
3. Provide for air circulation around stacks and under coverings.

B. Inspect trusses showing discoloration, corrosion, or other evidence of deterioration. Discard and replace trusses that are damaged or defective.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," 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.

1. Design Loads: As indicated.
2. Maximum Deflection Under Design Loads:

   a. Roof Trusses: Vertical deflection of 1/240 of span.

C. Comply with applicable requirements and recommendations of the following publications:

1. TPI 1, "National Design Standard for Metal Plate Connected Wood Truss Construction."
2. TPI DSB, "Recommended Design Specification for Temporary Bracing of Metal Plate Connected Wood Trusses."

3. TPI BCSI, "Building Component Safety Information: Guide to Good Practice for Handling, Installing, Restraining, & Bracing Metal Plate Connected Wood Trusses."

D. Wood Structural Design Standard: Comply with applicable requirements in AF&PA's "National Design Specifications for Wood Construction" and its "Supplement."

2.2 DIMENSION LUMBER

A. 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, omit grade stamp and provide certificates of grade compliance issued by grading agency.
3. Provide dressed lumber, S4S.
4. Provide dry lumber with 19 percent maximum moisture content at time of dressing.

B. Minimum Chord Size for Roof Trusses: 2 by 4 inches nominal for both top and bottom chords, unless noted otherwise.

2.3 METAL CONNECTOR PLATES

A. Source Limitations: Obtain metal connector plates from single manufacturer.

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); G60 coating designation; and not less than 0.036 inch thick.

1. Use for interior locations unless otherwise indicated.

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 with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.

2.5 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20, with dry film containing a minimum of 94 percent zinc dust by weight.

2.6 FABRICATION

A. Cut truss members to accurate lengths, angles, and sizes to produce close-fitting joints.

B. Fabricate metal connector plates to sizes, configurations, thicknesses, and anchorage details required to withstand design loads for types of joint designs indicated.

C. 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.

D. 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. Install trusses plumb, square, and true to line and securely fasten to supporting construction.

F. Space trusses 24 inches o.c.; adjust and align trusses in location before permanently fastening.

G. Securely connect each truss ply required for forming built-up girder trusses.

1. Anchor trusses to girder trusses as indicated.

H. 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.

I. Install wood trusses within installation tolerances in TPI 1.

J. Do not alter trusses in field. Do not cut, drill, notch, or remove truss members.

K. Replace wood trusses that are damaged or do not meet requirements.

1. Damaged trusses may be repaired according to truss repair details signed and sealed by the qualified professional engineer responsible for truss design, when approved by Architect.

3.2 REPAIRS AND 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.

B. Protect wood trusses from weather. If, despite protection, wood trusses become wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

C. Repair damaged galvanized coatings on exposed surfaces with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

END OF SECTION

SECTION 07 21 00
THERMAL INSULATION

PART 1 - GENERAL

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. This Section includes the following:
   1. Concealed building insulation.
   2. Vapor retarders.

B. Related Sections include the following:
   1. Division 4 Section "Unit Masonry Assemblies" for insulation installed in cavity walls and masonry cells.
   2. Division 6 Sections "Sheathing "for insulation specified as part of roofing construction.
   3. Division 15 Section "Mechanical Insulation."

1.3 DEFINITIONS

A. Mineral-Fiber Insulation: Insulation composed of rock-wool fibers, slag-wool fibers, or glass fibers; produced in boards and blanket with latter formed into batts (flat-cut lengths) or rolls.

1.4 PERFORMANCE REQUIREMENTS

A. Plenum Rating: Provide glass-fiber insulation where indicated in ceiling plenums whose test performance is rated as follows for use in plenums as determined by testing identical products per "Erosion Test" and "Mold Growth and Humidity Test" described in UL 181, or on comparable tests from another standard acceptable to authorities having jurisdiction.

1. Erosion Test Results: Insulation shows no visible evidence of cracking, flaking, peeling, or delamination of interior surface of duct assembly, after testing for 4 hours at 2500-fpm air velocity.
2. Mold Growth and Humidity Test Results: Insulation shows no evidence of mold growth, delamination, or other deterioration due to the effects of high humidity, after inoculation with Chaetomium globosium on all surfaces and storing for 60 days at 100 percent relative humidity in the dark.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Verification: Full-size units for each type of exposed insulation indicated.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for insulation products.

D. Research/Evaluation Reports: For insulation.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of building insulation through one source from a single manufacturer.

B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

1. Surface-Burning Characteristics: ASTM E 84.
2. Fire-Resistance Ratings: ASTM E 119.
3. Combustion Characteristics: ASTM E 136.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect insulation as follows:

1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.

2. Protect against ignition at all times. Do not deliver insulating materials to Project site before installation time.
3. Complete installation and concealment of materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
   1. Products: Subject to compliance with requirements, provide one of the products specified.
   2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 GLASS-FIBER BLANKET INSULATION

A. Manufacturers:

   1. CertainTeed Corporation.
   2. Guardian Fiberglass, Inc.
   3. Johns Manville.
   4. Knauf Fiber Glass.
   5. Owens Corning.

B. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

C. Faced, Glass-Fiber Blanket Insulation: ASTM C 665, Type III (blankets with reflective membrane facing), Class A (membrane-faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier), faced with foil-scrim-kraft, foil-scrim, or foil-scrim-polyethylene vapor-retarder membrane on 1 face.

D. Where glass-fiber blanket insulation is indicated by the following thicknesses, provide blankets in batt or roll form with thermal resistances indicated:
   1. R=38 .

2.3 VAPOR RETARDERS

A. Fire-Retardant, Reinforced-Polyethylene Vapor Retarders: 2 outer layers of polyethylene film laminated to an inner reinforcing layer consisting of either nonwoven grid of nylon cord or polyester scrim and weighing not less than 22

lb/1000 sq. ft. , with maximum permeance rating of 0.1317 perm and with flame-spread and smoke-developed indexes of not more than 5 and 60, respectively.

1. Products:

   a. Raven Industries Inc.; DURA-SKRIM 2FR.
   b. Reef Industries, Inc.; Griffolyn T-55 FR.

B. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

C. Vapor-Retarder Fasteners: Pancake-head, self-tapping steel drill screws; with fender washers.

2.4 AUXILIARY INSULATING MATERIALS

A. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by insulation manufacturers for sealing joints and penetrations in vapor-retarder facings.

B. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.

C. Eave Ventilation Troughs: Preformed, rigid fiberboard or plastic sheets designed and sized to fit between roof framing members and to provide cross ventilation between insulated attic spaces and vented eaves.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and for other conditions affecting performance.

   1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of substances harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

3.3 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice, rain, and snow.

C. Extend insulation in thickness indicated 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. Water-Piping Coordination: If water piping is located within insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.

E. For preformed insulating units, 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.

3.4 INSTALLATION OF GENERAL BUILDING INSULATION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Set vapor-retarder-faced units with vapor retarder to warm side of construction, unless otherwise indicated.

   1. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to surrounding construction to ensure airtight installation.

C. Install mineral-fiber insulation 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 cavity, 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.
   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 stapling flanges to flanges of metal studs.
6. For wood-framed construction, install mineral-fiber 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 retarder once finish material is installed over it.

3.5 INSTALLATION OF VAPOR RETARDERS

A. General: Extend vapor retarder to extremities of areas to be protected from vapor transmission. Secure in place with adhesives or other anchorage system as indicated. Extend vapor retarder to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.

B. Firmly attach vapor retarders to metal framing and solid substrates with vapor-retarder fasteners as recommended by vapor-retarder manufacturer.

C. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarder.

D. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarder.

3.6 PROTECTION

A. Protect installed insulation and vapor retarders 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.

END OF SECTION

SECTION 07 31 10
ASPHALT SHINGLES

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. Asphalt shingles.
2. Underlayment.
3. Sheet metal

1.3 DEFINITION

A. Roofing Terminology: See ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definitions of terms related to roofing work in this Section.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for asphalt shingles.

C. Warranties: Sample of special warranties.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Source Limitations: Obtain ridge and hip cap shingles ridge vents felt underlayment and self-adhering sheet underlayment from single source from single manufacturer.

C. Fire-Resistance Characteristics: Where indicated, provide asphalt shingles and related roofing materials identical to those of assemblies tested for fire resistance per test method below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.

1. Exterior Fire-Test Exposure: Class A; ASTM E 108 or UL 790, for application and roof slopes indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store roofing materials in a dry, well-ventilated, weathertight location according to asphalt shingle manufacturer's written instructions. Store underlayment rolls on end on pallets or other raised surfaces. Do not double stack rolls.

1. Handle, store, and place roofing materials in a manner to avoid significant or permanent damage to roof deck or structural supporting members.

B. Protect unused underlayment from weather, sunlight, and moisture when left overnight or when roofing work is not in progress.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install asphalt shingles until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1. Install self-adhering sheet underlayment within the range of ambient and substrate temperatures recommended by manufacturer.

1.8 WARRANTY

A. Special Warranty: Standard form in which manufacturer agrees to repair or replace asphalt shingles that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Manufacturing defects.
b. Structural failures including failure of asphalt shingles to self-seal after a reasonable time.

2. Material Warranty Period: 50 years from date of Substantial Completion, prorated, with first three years nonprorated.
3. Wind-Speed Warranty Period: Asphalt shingles will resist blow-off or damage caused by wind speeds up to 100 mph for 10 years from date of Substantial Completion.
4. Algae-Discoloration Warranty Period: Asphalt shingles will not discolor five years from date of Substantial Completion.
5. Workmanship Warranty Period: 10 years from date of Substantial Completion.

B. Special Project Warranty: Roofing Installer's Warranty, or warranty form at end of this Section, signed by roofing Installer, covering the Work of this Section, in which roofing Installer agrees to repair or replace components of asphalt shingle roofing that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

1.9 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Asphalt Shingles: 100 sq. ft of each type, in unbroken bundles.

PART 2 - PRODUCTS

2.1 GLASS-FIBER-REINFORCED ASPHALT SHINGLES

A. Laminated-Strip Asphalt Shingles: ASTM D 3462, laminated, multi-ply overlay construction, glass-fiber reinforced, mineral-granule surfaced, and self-sealing.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Elk Prestique Plus or comparable product by one of the following:

a. Elk Premium Building Products, Inc.; an ElkCorp company.

2. Butt Edge: Notched cut.
3. Strip Size: Manufacturer's standard.

4. Algae Resistance: Granules treated to resist algae discoloration.
5. Color and Blends: As selected by Architect from manufacturer's full range.

B. Hip and Ridge Shingles: Manufacturer's standard units to match asphalt shingles.

2.2 UNDERLAYMENT MATERIALS

A. Felt: ASTM D 226, Type II, asphalt-saturated organic felts, nonperforated.

B. Self-Adhering Sheet Underlayment, Grace Ultra, Polyethylene Faced: ASTM D 1970, minimum of 30-mil- thick, slip-resisting, polyethylene-film-reinforced top surface laminated to butyl rubber, with release paper backing; cold applied. Provide primer for adjoining concrete or masonry surfaces to receive underlayment.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Insert manufacturer's name; product name or designation or comparable product by one of the following:

a. Carlisle Coatings & Waterproofing, Inc.
b. Grace, W. R. & Co. - Conn.
c. Henry Company.
d. Johns Manville.
e. Owens Corning.
f. Polyguard Products, Inc.
g. Protecto Wrap Company.
h. Elk Corporation.

2.3 RIDGE VENTS

A. Flexible Ridge Vent: Manufacturer's standard, compression-resisting, three-dimensional, open-nylon or polyester-mat filter bonded to a nonwoven, nonwicking, geotextile fabric cover.

2.4 ACCESSORIES

A. Asphalt Roofing Cement: ASTM D 4586, Type II, asbestos free.

B. Roofing Nails: ASTM F 1667; aluminum, stainless-steel, copper, or hot-dip galvanized-steel wire shingle nails, minimum 0.120-inch- diameter, barbed shank, sharp-pointed, with a minimum 3/8-inch- diameter flat head and of sufficient length to penetrate 3/4 inch into solid wood decking or extend at least 1/8 inch through OSB or plywood sheathing.

1. Where nails are in contact with metal flashing, use nails made from same metal as flashing.

C. Felt Underlayment Nails: Aluminum, stainless-steel, or hot-dip galvanized-steel wire with low-profile capped heads or disc caps, 1-inch minimum diameter.

2.5 METAL FLASHING AND TRIM

A. General: Comply with requirements in SMACNA's "Architectural Sheet Metal Manual."

1. Sheet Metal: Zinc-tin alloy-coated steel, 22 gage, at crickets, drips and valleys.

2. Kynar-finish 24 gage steel at step flashings.

3. Concealed Gutters and Ledge flashings: 24 gage stainless steel.

B. Fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of the item.

1. Apron Flashings: Fabricate with lower flange a minimum of 4 inches over and 4 inches beyond each side of downslope asphalt shingles and 6 inches up the vertical surface.
2. Step Flashings: Fabricate with a headlap of 2 inches and a minimum extension of 4 inches over the underlying asphalt shingle and up the vertical surface.
3. Cricket Flashings: Fabricate with concealed flange extending a minimum of 18 inches beneath upslope asphalt shingles and 6 inches beyond each side of chimney and 6 inches above the roof plane.
4. Open-Valley Flashings: Fabricate in lengths not exceeding 10 feet with 1-inch- high, inverted-V profile at center of valley and equal flange widths of 10 inches.
5. Drip Edges: Fabricate in lengths not exceeding 10 feet with 2-inch roof-deck flange and 1-1/2-inch fascia flange with 3/8-inch drip at lower edge.

C. Vent Pipe Flashings: ASTM B 749, Type L51121, at least 1/16 inch thick. Provide lead sleeve sized to slip over and turn down into pipe, soldered to skirt at slope of roof, and extending at least 4 inches from pipe onto roof.

D. Downspouts: Fabricate round downspouts complete with metered elbows. Furnish with metal hangers same material as downspouts, and anchors.
1. Manufactured hanger style: SMACNA figure 1-34A.
2. Fabricate from following material:
   a. .040 Kynar finished aluminum.

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.

1. Examine roof sheathing to verify that sheathing joints are supported by framing and blocking or metal clips and that installation is within flatness tolerances.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and completely anchored; and that provision has been made for flashings and penetrations through asphalt shingles.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

A. General: Comply with underlayment manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.

B. Single-Layer Felt Underlayment: Install on roof deck parallel with and starting at the eaves. Lap sides a minimum of 2 inches over underlying course. Lap ends a minimum of 4 inches. Stagger end laps between succeeding courses at least 72 inches. Fasten with felt underlayment nails.

1. Install felt underlayment on roof deck not covered by self-adhering sheet underlayment. Lap sides of felt over self-adhering sheet underlayment not less than 3 inches in direction to shed water. Lap ends of felt not less than 6 inches over self-adhering sheet underlayment.
2. Install fasteners at no more than 36 inch o.c.

C. Self-Adhering Sheet Underlayment: Install, wrinkle free, on roof deck. Comply with low-temperature installation restrictions of underlayment manufacturer if applicable. Install at locations indicated on Drawings, lapped in direction to shed water. Lap sides not less than 3-1/2 inches. Lap ends not less than 6 inches staggered 24 inches between courses. Roll laps with roller. Cover underlayment within seven days.

1. Prime concrete and masonry surfaces to receive self-adhering sheet underlayment.
2. Eaves: Extend from edges of eaves 24 inches beyond interior face of exterior wall.
3. Rakes: Extend from edges of rake 24 inches beyond interior face of exterior wall.
4. Valleys: Extend from lowest to highest point 18 inches on each side.
5. Hips: Extend 18 inches on each side.
6. Ridges: Extend 36 inches on each side without obstructing continuous ridge vent slot.
7. Sidewalls: Extend beyond sidewall 18 inches, and return vertically against sidewall not less than 4 inches.
8. Dormers, Chimneys, Skylights, and Other Roof-Penetrating Elements: Extend beyond penetrating element 18 inches, and return vertically against penetrating element not less than 4 inches.
9. Roof Slope Transitions: Extend 18 inches on each roof slope.

D. Metal-Flashed, Open-Valley Underlayment: Install two layers of 36-inch- wide felt underlayment centered in valley. Stagger end laps between layers at least 72 inches. Lap ends of each layer at least 12 inches in direction to shed water, and seal with asphalt roofing cement. Fasten each layer to roof deck with felt underlayment nails.

1. Lap roof-deck felt underlayment over first layer of valley felt underlayment at least 6 inches.

3.3 METAL FLASHING INSTALLATION

A. General: Install metal flashings and other sheet metal to comply with requirements in Division 07 Section "Sheet Metal Flashing and Trim."

1. Install metal flashings according to recommendations in ARMA's "Residential Asphalt Roofing Manual" and asphalt shingle recommendations in NRCA's "The NRCA Roofing and Waterproofing Manual."

B. Apron Flashings: Extend lower flange over and beyond each side of downslope asphalt shingles and up the vertical surface.

C. Step Flashings: Install with a headlap of 2 inches and extend over the underlying asphalt shingle and up the vertical surface. Fasten to roof deck only.

D. Cricket Flashings: Install against the roof-penetrating element extending concealed flange beneath upslope asphalt shingles and beyond each side.

E. Open-Valley Flashings: Install centered in valleys, lapping ends at least 8 inches in direction to shed water. Fasten upper end of each length to roof deck beneath overlap.

1. Secure hemmed flange edges into metal cleats spaced 12 inches apart and fastened to roof deck.
2. Adhere 9-inch- wide strip of self-adhering sheet to metal flanges and to self-adhering sheet underlayment.

F. Rake Drip Edges: Install rake drip edge flashings over underlayment and fasten to roof deck.

G. Eave Drip Edges: Install eave drip edge flashings below underlayment and fasten to roof sheathing.

H. Pipe Flashings: Form flashing around pipe penetrations and asphalt shingles. Fasten and seal to asphalt shingles as recommended by manufacturer.

3.4 ASPHALT SHINGLE INSTALLATION

A. General: Install asphalt shingles according to manufacturer's written instructions, recommendations in ARMA's "Residential Asphalt Roofing Manual," and asphalt shingle recommendations in NRCA's "The NRCA Roofing and Waterproofing Manual."

B. Install starter strip along lowest roof edge, consisting of an asphalt shingle strip with tabs removed at least 7 inches wide with self-sealing strip face up at roof edge.

1. Extend asphalt shingles 3/4 inch over fasciae at eaves and rakes.
2. Install starter strip along rake edge.

C. Install first and remaining courses of asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.

D. Install asphalt shingles by single-strip column or racking method, maintaining uniform exposure. Install full-length first course followed by cut second course, repeating alternating pattern in succeeding courses.

E. Fasten asphalt shingle strips with a minimum of four roofing nails located according to manufacturer's written instructions.

1. Where roof slope exceeds 20:12, seal asphalt shingles with asphalt roofing cement spots after fastening with additional roofing nails.

2. Where roof slope is less than 4:12, seal asphalt shingles with asphalt roofing cement spots.
3. When ambient temperature during installation is below 50 deg F, seal asphalt shingles with asphalt roofing cement spots.

F. Ridge Vents: Install continuous ridge vents over asphalt shingles according to manufacturer's written instructions. Fasten with roofing nails of sufficient length to penetrate sheathing.

G. Ridge and Hip Cap Shingles: Maintain same exposure of cap shingles as roofing shingle exposure. Lap cap shingles at ridges to shed water away from direction of prevailing winds. Fasten with roofing nails of sufficient length to penetrate sheathing.

1. Fasten ridge cap asphalt shingles to cover ridge vent without obstructing airflow.

3.5 ROOFING INSTALLER'S WARRANTY

A. WHEREAS _____, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:

1. Owner: Roanoke City Parks and Recreation
2. Address: Roanoke, VA
3. Building Name/Type: Restrooms.
4. Acceptance Date: Substantial Completion.
5. Warranty Period: 30 years.

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 100 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 <**Insert day**> day of <**Insert month**>, <**Insert year**>.

1. Authorized Signature: <**Insert signature**>.
2. Name: <**Insert name**>.
3. Title: <**Insert title**>.

END OF SECTION

SECTION 07 46 00
SIDING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fiber cement siding panels, fascia, moulding and accessories.

1.2 RELATED SECTIONS

A. Division 06 – Rough Carpentry.

B. Division 06 – Sheathing.

1.3 SUBMITTALS

A. Submit under provisions of Division 01.

B. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.

2. Storage and handling requirements and recommendations.

3. Installation methods.

C. Shop Drawings: Provide detailed drawings of atypical non-standard applications of cementitious siding materials which are outside the scope of the standard details and specifications provided by the manufacturer.

D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

E. Verification Samples: For each finish product specified, two samples, minimum size 4 by 6 inches (100 by 150 mm), representing actual product, color, and patterns.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Minimum of 2 years experience with installation of similar products.

B. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.

1. Finish areas designated by Architect.

2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.

3. Refinish mock-up area as required to produce acceptable work.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store siding on edge or lay flat on a smooth level surface. Protect edges and corners from chipping. Store sheets under cover and keep dry prior to installing.

C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.6 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.7 WARRANTY

A. Product Warranty: Limited product warranty against manufacturing defects.

1. Lap siding: 50 years.

2. Finish Warranty: Limited product warranty against manufacturing finish defects. 1. 15 years from the date of purchase: will not peel; will not crack; and will not chip.

3. Workmanship Warranty: Application limited warranty for 2 years.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer:

James Hardie Building Products, Inc;
26300 La Alameda, Suite
250, Mission Viejo, CA 92691.
Tel: (949) 348-1800. Fax: (949) 367-0185.
Email: info@JamesHardie.com.

B. Requests for approval of equal substitutions will be considered in accordance with provisions of Division 01.

2.2 SIDING

A. Code Compliance Requirement for Materials:

1. National Evaluation Report No. NER 405 (BOCA, ICBO, SBCCI)

2. City of Los Angeles, Research Report No. 24862

3. Metro Dade County, Florida Acceptance No. 07-0148, 04

4. US Department of Housing and Urban Development Materials Release 1263d

5. California DSA PA-019.

6. City of New York M EA 223-93-M.

7. Non-asbestos fiber-cement siding where required to be non-combustible shall be tested in accordance with ASTM E136.

B. Lap Siding: “Artisan Lap” as manufactured by James Hardie Building Products, Inc.

1. Type: Smooth 8-1/4 inches (210 mm) with 7 inches (178 mm) exposure.

C. Trim:

1. Hardietrim Fascia and Moulding as manufactured by James Hardie Building Products, Inc.

2. HardieSoffit Panels “Vented Cedarmill by James Hardie Building Products, Inc.

2.3 FASTENERS

A. Metal Framing:

1. Per Manufacturer’s recommendations.

2.4 FINISHES

A. Factory Primer: Provide factory applied universal primer.

1. Primer: PrimePlus by James Hardie.

2. Topcoat: Refer to Section 09900 and Exterior Finish Schedule.

B. Factory Finish: Refer to Exterior Finish Schedule.

1. Product: ColorPlus by James Hardie.

C. Factory Finish Color for Trim, Soffit and Siding Colors:

1. As selected by Architect from Manufacturer's full range of colors.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If framing preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Nominal 2 inch by 4 inch (51 m by 102 mm) wood framing selected for minimal shrinkage and complying with local building codes, including the use of water-resistive barriers or vapor barriers where required. Minimum 1-1/2 inches (38 mm) face and straight, true, of uniform dimensions and properly aligned.

1. Install water-resistive barriers and claddings to dry surfaces.

2. Repair any punctures or tears in the water-resistive barrier prior to the installation of the siding.

3. Protect siding from other trades.

D. Minimum 20 gauge 3-5/8 inch (92 mm) C-Stud 16 inches maximum on center or 16 gauge 3-5/8 inches (92 mm) C-Stud 24 inches (610 mm) maximum on center metal framing complying with local building codes, including the use of water-resistive barriers and/or vapor barriers where required. Minimum 1-1/2 inches (38 mm) face and straight, true, of uniform dimensions and properly aligned.

1. Install water-resistive barriers and claddings to dry surfaces.

2. Repair any punctures or tears in the water-resistive barrier prior to the installation of the siding.

3. Protect siding from other trades.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION - LAP SIDING

A. Install materials in strict accordance with manufacturer's installation instructions.

B. Starting: Install a minimum 1/4 inch (6 mm) thick lath starter strip at the bottom course of the wall. Apply planks horizontally with minimum 1-1/4 inches (32 mm) wide laps at the top. The bottom edge of the first plank overlaps the starter strip.

C. Allow minimum vertical clearance between the edge of siding and any other material in strict accordance with the manufacturer’s installation instructions.

D. Align vertical joints of the planks over framing members.

E. Maintain clearance between siding and adjacent finished grade.

F. Locate splices at least one stud cavity away from window and door openings.

G. Use off-stud metal joiner in strict accordance with manufacturer’s installation instructions.

H. Wind Resistance: Where a specified level of wind resistance is required lap siding is installed to framing members and secured with fasteners described in Table No. 2 in National Evaluation Service Report No. NER-405.

I. Face nail to sheathing.

J. Locate splices at least 12 inches (305 mm) away from window and door openings.

K. Wind Resistance: Where a specified level of wind resistance Is required lap siding is installed to framing members and secured with fasteners described in Table No. 2 in National Evaluation Service Report No. NER-405.

3.4 INSTALLATION - FASCIA AND MOULDING

A. Install materials in strict accordance with manufacturer's installation instructions. Install flashing around all wall openings.

B. Fasten through trim into structural framing or code complying sheathing. Fasteners must penetrate minimum 3/4 inch (19 mm) or full thickness of sheathing. Additional fasteners may be required to ensure adequate security.

C. Place fasteners no closer than 3/4 inch (19 mm) and no further than 2 inches (51 mm) from side edge of trim board and no closer than 1 inch (25 mm) from end. Fasten maximum 16 inches (406 mm) on center.

D. Maintain clearance between trim and adjacent finished grade.

E. Trim inside corner with single board.

F. Outside Corner Board: For 3/4 inch (19 mm) trim only. Install single board of outside corner board then align second corner board to outside edge of first corner board. Do not fasten board to board.

G. Outside Corner Board: For 1 inch (25 mm) and 1-1/2 inches (38 mm) trim only. Pre Build corners by fastening trim together with 16 ga. corrosion resistant finish nail 1/2 inch (13 mm) from edge spaced 16 inches (406 mm) apart, weather cut each end spaced minimum 12 inches (305 mm) apart.

H. Allow 1/8 inch gap between trim and siding.

I. Seal gap with high quality, paint-able caulk.

J. Shim frieze board as required to align with corner trim.

K. Install fascia over structural subfascia.

L. Overlay siding with moulding at windows, doors and inside corners.

M. Fasten through overlapping boards. Do not nail between lap joints.

N. Overlay siding with single board of outside corner board then align second corner board to outside edge of first corner board. Do not fasten boards to boards.

O. Shim frieze board as required to align with corner trim.

P. Install fascia over structural subfascia.

3.7 FINISHING

A. Finish unprimed siding with a minimum one coat high quality, alkali resistant primer and one coat of either, 100 percent acrylic or latex or oil based, exterior grade topcoats or two coats high quality alkali resistant 100 percent acrylic or latex, exterior grade topcoat within 90 days of installation. Follow paint manufacturer's written product recommendation and written application instructions.

B. Finish factory primed siding with a minimum of one coat of high quality 100 percent acrylic or latex or oil based exterior grade paint within 180 days of installation. Follow paint manufacturer's written product recommendation and written application instructions.

3.8 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 07 71 40

GUTTERS AND DOWNSPOUTS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes pre-finished aluminum gutters and downspouts.

B. Related Sections:

1. Division 07 - Flashing and Sheet Metal.
2. Division 07 - Joint Sealers.

1.2 REFERENCES

A. AAMA 603.8 (American Architectural Manufacturers Association) - Performance Requirements and Test Procedures for Pigmented Organic Coatings on Extruded Aluminum.

B. AAMA 605.2 (American Architectural Manufacturers Association) - Specification for High Performance Organic Coatings on Architectural Extrusions and Panels.

C. ASTM B32 - Specification for Solder Metal.

D. ASTM B209/B209M - Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

E. FS TT-C-494 - Coating Compound, Bituminous, Solvent Type, Acid Resistant.

F. SMACNA (Sheet Metal and Air Conditioning Contractors National Association) - Architectural Sheet Metal Manual.

1.3 DESIGN REQUIREMENTS

A. When size is not indicated, conform to SMACNA Manual for sizing components for rainfall intensity determined by a storm occurrence of 1 in 10 years.

1.4 SUBMITTALS

A. Shop Drawings: Indicate locations, configurations, jointing methods, fastening methods, locations, and installation details.

B. Product Data: Submit data on manufactured components, materials, and finishes.

C. Samples: Submit two samples, 4 inch x 4 inch, for each type of metal illustrating finish, color, and configuration.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with SMACNA Manual.

B. Maintain one copy of each document on site.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Division 01 - Products and Substitutions: Product storage and handling requirements.

B. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope to drain.

C. Prevent contact with materials during storage which may cause discoloration, staining, or damage.

1.7 COORDINATION

A. Coordinate Work with installation of metal flashings and roofing shingles.

1.8 WARRANTY

F. Special Warranty on Metal Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal gutters and downspouts roof panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
   a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
   b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
   c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
2. Finish Warranty Period: 20 years from date of Substantial Completion.

13 PART 2 PRODUCTS

2.1 GUTTERS AND DOWNSPOUTS

A. Product Description:

1. Gutters: 6” x 6” size, .040” aluminum with Kynar finish.
2. Downspouts: 4” x 4”, .040”, kynar finish to match gutters, maximum lengths.

A.

2.2 COMPONENTS

A. Pre-Finished Aluminum Sheet: ASTM B209/B209M, manufacturer’s standard alloy and temper for specified finish; minimum 0.040 inch thick; mill finish shop Fluoropolymer coating; color as selected by Architect from full range of standard colors.

2.3 ACCESSORIES

A. Anchors and Supports: Profiled to suit gutters and downspouts.
   1. Anchoring Devices: Where not indicated provide in accordance with SMACNA requirements.
   2. Gutter Supports: Brackets.
   3. Downspout Supports: Brackets.
   1)

B. Fasteners: Same material and finish as gutters and downspouts.

C. Protective Backing Paint: FS TT-C-494, bituminous.

2.4 FABRICATION

A. Form gutters and downspouts of profiles and sizes indicated.

B. Fabricate with required connection pieces.

C. Form sections square, true, and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints.

D. Hem exposed edges of metal.

E. Fabricate gutter and downspout accessories; seal watertight.

2.5 FACTORY FINISHING

A. PVDF (polyvinylidene fluoride) coating: Multiple coat, thermally cured, fluoropolymer system conforming to AAMA 605.2.

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15 PART 3 EXECUTION

3.1 EXAMINATION

A. Verify surfaces are ready to receive gutters and downspouts.

3.2 PREPARATION

A. Paint concealed metal surfaces and surfaces in contact with dissimilar metals with protective backing paint to a minimum dry film thickness of 15 mil.

3.3 INSTALLATION

A. Sheet Metal: Join lengths with formed seams sealed watertight. Flash and seal gutters to downspouts and accessories.

B. Slope gutters 1/8 inch per foot minimum.

C. Anchor downspouts to walls per SMACNA requirements.

D. Terminate downspouts at splash blocks.

END OF SECTION

SECTION 07 92 00
JOINT SEALANTS

PART 1 - GENERAL

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. This Section includes joint sealants for the following applications:

1. Exterior joints in the following vertical surfaces and horizontal nontraffic surfaces:

    a. Construction joints in cast-in-place concrete.
    b. Control and expansion joints in unit masonry.
    c. Joints between different materials listed above.
    d. Perimeter joints between materials listed above and frames of doors windows and louvers.
    e. Control and expansion joints in ceilings and other overhead surfaces.
    f. Other joints as indicated.

2. Exterior joints in the following horizontal traffic surfaces:
    a. Isolation and contraction joints in cast-in-place concrete slabs.
    b. Joints between different materials listed above.
    c. Other joints as indicated.

3. Interior joints in the following vertical surfaces and horizontal nontraffic surfaces:

    a. Control and expansion joints on exposed interior surfaces of exterior walls.
    b. Perimeter joints of exterior openings where indicated.
    c. Vertical joints on exposed surfaces of interior unit masonry concrete walls and partitions.
    d. Other joints as indicated.

4. Interior joints in the following horizontal traffic surfaces:

    a. Isolation joints in cast-in-place concrete slabs.

b. Other joints as indicated.

B. Related Sections include the following:
1. Division 4 Section "Unit Masonry Assemblies" for masonry control and expansion joint fillers and gaskets.
2. Division 7 Section "Fire-Resistive Joint Systems" for sealing joints in fire-resistance-rated construction.
3. Division 8 Section "Glazing" for glazing sealants.
4. Division 9 Section "Gypsum Board Assemblies" for sealing perimeter joints of gypsum board partitions to reduce sound transmission.

1.3 PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

1.4 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Verification: For each type and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

C. Product Certificates: For each type of joint sealant and accessory, signed by product manufacturer.

D. SWRI Validation Certificate: For each elastomeric sealant specified to be validated by SWRI's Sealant Validation Program.

E. Qualification Data: For Installer.

F. Field Test Report Log: For each elastomeric sealant application.

G. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized Installer who is approved or licensed for installation of elastomeric sealants required for this Project.

B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

1.6 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.7 WARRANTY

A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer's standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: 5 years from date of Substantial Completion.

C. Special warranties specified in this Article exclude deterioration or failure of elastomeric joint sealants from the following:

1. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.
2. Disintegration of joint substrates from natural causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in other Part 2 articles.

2.2 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.3 ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

B. Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

C. Suitability for Contact with Food: Where elastomeric sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

D. Single-Component Neutral- and Basic-Curing Silicone Sealant :

1. Available Products:
   a. Tremco; Spectrem 1 (Basic).
2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 100/50.
4. Use Related to Exposure: NT (nontraffic).
5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
6. Stain-Test-Response Characteristics: Nonstaining to porous substrates per ASTM C 1248.

E. Single-Component Mildew-Resistant Neutral-Curing Silicone Sealant:

1. Available Products:

    a. Pecora Corporation; 898.
    b. Tremco; Tremsil 600 White.

2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 25.
4. Use Related to Exposure: NT (nontraffic).
5. Uses Related to Joint Substrates: G, A, and, as applicable to joint substrates indicated, O.

    a. Use O Joint Substrates: ceramic tile .

F. Multicomponent Nonsag Urethane Sealant :

1. Available Products:

    a. Pecora Corporation; Dynatrol II.
    b. Tremco; Dymeric 511.
    c. Tremco; Vulkem 922.

2. Type and Grade: M (multicomponent) and NS (nonsag).
3. Class: 50.
4. Use Related to Exposure: NT (nontraffic).
5. Uses Related to Joint Substrates: M, A, and, as applicable to joint substrates indicated, O.

G. Multicomponent Nonsag Urethane Sealant :

1. Available Products:

    a. Schnee-Morehead, Inc.; Permathane SM 7200.
    b. Sika Corporation, Inc.; Sikaflex - 2c NS TG.
    c. Sonneborn, Division of ChemRex Inc.; NP 2.
    d. Tremco; Vulkem 227.
    e. Tremco; Vulkem 322 DS.

2. Type and Grade: M (multicomponent) and NS (nonsag).
3. Class: 25.
4. Uses Related to Exposure: T (traffic) and NT (nontraffic).
5. Uses Related to Joint Substrates: M, A, and, as applicable to joint substrates indicated, O.

    a. Use O Joint Substrates: aluminum coated with a high-performance coating brick.

H. Single-Component Nonsag Urethane Sealant :

1. Available Products:

a. Sika Corporation, Inc.; Sikaflex - 1a.
b. Sonneborn, Division of ChemRex Inc.; Ultra.
c. Sonneborn, Division of ChemRex Inc.; NP 1.
d. Tremco; Vulkem 116.

2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 25.
4. Uses Related to Exposure: T (traffic) and NT (nontraffic).
5. Uses Related to Joint Substrates: M, A, and, as applicable to joint substrates indicated, O.

2.4 LATEX JOINT SEALANTS

A. Latex Sealant: Comply with ASTM C 834, Type P, Grade NF.

B. Available Products:

1. Bostik Findley; Chem-Calk 600.
2. Pecora Corporation; AC-20+.
3. Schnee-Morehead, Inc.; SM 8200.
4. Sonneborn, Division of ChemRex Inc.; Sonolac.
5. Tremco; Tremflex 834.

2.5 JOINT-SEALANT BACKING

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin) , and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:

C. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 deg F . Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and to otherwise contribute to optimum sealant performance.

D. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.6 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 joint-sealant performance.

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, blast cleaning, 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.

c. Unglazed surfaces of ceramic tile.

3. Remove laitance and form-release agents from concrete.
4. Clean nonporous 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.
   d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on 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 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 type 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 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 configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

3.4 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed elastomeric sealant joints as follows:

   a. Perform 10 tests for the first 1000 feet of joint length for each type of elastomeric sealant and joint substrate.
   b. Perform 1 test for each of joint length thereafter or 1 test per each floor per elevation.

2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab in Appendix X1 in ASTM C 1193.

   a. For joints with dissimilar substrates, verify adhesion to each substrate separately; do this by extending cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

3. Inspect joints for complete fill, for absence of voids, and for joint configuration complying with specified requirements. Record results in a field-adhesion-test log.
4. Inspect tested joints and report on the following:

   a. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate.

Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.

b. Whether sealants filled joint cavities and are free of voids.

c. Whether sealant dimensions and configurations comply with specified requirements.

5. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.

6. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

B. Evaluation of Field Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 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.

3.6 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION

SECTION 087100
DOOR HARDWARE

1. General

1.1. Summary

1.1.1. Section Included: Finish Hardware for swinging doors.

1.1.1.1. Provide all components including fasteners, brackets and accessories required for complete and operable openings.

1.1.2. Intent of Hardware Groups

1.1.2.1. Should items of hardware not definitely specified by required for completion of the Work, furnish such items of type and quality comparable to adjacent hardware and appropriate for service required.

1.1.3. References

National Fire Protection Association

NFPA 80 Standard for Fire Doors and Other Opening Protectives

Builders Hardware Manufacturers Association

ANSI/BHMA A156.1 Butts & Hinges

ANSI/BHMA A156.3 Exit Devices

ANSI/BHMA A156.4 Door Controls – Closers

ANSI/BHMA A156.13 Mortise Locks and Latches

ANSI/BHMA A156.18 Materials and Finishes

Door and Hardware Institute

Keying Systems and Nomenclature

Sequence and Format

Recommended Locations for Standard Steel Doors and Frames.

Standards for Accessible Design 2010

1.2. Substitutions

1.2.1. Comply with Division 1

1.3. Submittals

1.3.1. Comply with Division 1

1.3.2. Special Submittal Requirements: Combine submittals of this Section with Sections listed below to ensure the “design intent” of the system/assembly is understood and can be reviewed together.

1.3.3. Product Data: Manufacturer’s specifications and technical data including the following:
1.3.3.1. Detailed specification of construction and fabrication.
1.3.3.2. Manufacturer’s installation instructions.
1.3.3.3. Submit 6 copies of catalog cuts with hardware schedule.

1.3.4. Shop Drawings – Hardware Schedule: Submit 6 complete reproducible copies of detailed hardware schedule in a vertical format.

1.3.4.1. List groups and suffixes in proper sequence.
1.3.4.2. Completely describe door and list architectural door number.
1.3.4.3. Manufacturer, product name, and catalog number.
1.3.4.4. Function, type, and style
1.3.4.5. Size and finish of each item
1.3.4.6. Mounting heights.
1.3.4.7. Explanation of abbreviations and symbols used within schedule.

1.3.5. Templates: Submit templates and “reviewed Hardware Schedule” to door and frame supplier and others as applicable to enable proper and accurate sizing and locations of cutouts and reinforcing.

1.3.6. Samples: Provide as requested by Architect.

1.3.7. Contract Closeout Submittals: Comply with Division 1 including specific requirements indicated.

1.3.7.1. Operating and maintenance manual: Submit 1 set in a three ring binder containing the following:

1.3.7.1.1. "As Built" Hardware schedule.
1.3.7.1.2. Catalog pages for each product.
1.3.7.1.3. Keying Schedule.

1.4. Quality Assurance

1.4.1. Comply with Division 1.

1.4.1.1. Statement of qualification for distributor and installers.
1.4.1.2. Statement of compliance with regulatory requirements and single source responsibility.
1.4.1.3. Distributor's Qualifications: Firm with 3 years experience in the distribution of commercial hardware.

1.4.1.3.1. Distributor to employ full time Architectural Hardware Consultants (AHC) for the purpose of scheduling and coordinating hardware and establishing keying schedule.
1.4.1.3.2. Hardware Schedule shall be prepared and signed by an AHC.

1.4.1.4. Installer's Qualifications: Firm with 3 years experienced in installation of similar hardware to that required for this Project, including specific requirements indicated.
1.4.1.5. Regulatory Label Requirements: Provide testing agency label or stamp on hardware for labeled openings.

1.4.1.5.1. Provide UL listed hardware for labeled and 20 minute openings in conformance with requirements for class of opening scheduled.

1.4.1.5.2. Underwriters Laboratories requirements have precedence over this specification where conflict exists.

1.4.1.5.3. Provide and install hardware for fire rated openings in conformance with NFPA 80/

1.4.1.6. Single Source Responsibility: Except where specified in hardware schedule, furnish products of only one manufacturer for each type of hardware.

1.4.2. Review Project for extent of finish hardware required to complete the Work. Where there is a conflict between these Specifications and the existing hardware, notify the Architect in writing and furnish hardware in compliance with the specification unless otherwise directed in writing by the Architect.

1.5. Delivery, Storage, and Handling

1.5.1. Packing and shipping: Comply with Division 1.

1.5.1.1. Deliver products in original unopened packaging with legible manufacture's identification.

1.5.1.2. Package hardware to prevent damage during transit and storage.

1.5.1.3. Mark hardware to correspond with "reviewed hardware schedule".

1.5.1.4. Deliver hardware to door and frame manufacturer upon request.

1.5.2. Storage and Protection: Comply with manufacturer's recommendations.

1.6. Project Conditions

1.6.1. Coordinate hardware with other work. Furnish hardware items of proper design for use on doors and frames of the thickness, profile, swing, security and similar requirements indicated, as necessary for the proper installation and function, regardless of omissions or conflicts in the information on the Contract Documents.

1.6.2. Review Shop Drawings for doors and entrances to confirm that adequate provisions will be made for the proper installation of hardware.

1.7. Warranty.

1.7.1. Refer to Conditions of the Contract
1.7.2. Manufacturer's Warranty:
1.7.2.1. Closers: Ten years
1.7.2.2. Exit Devices: Three years
1.7.2.3. Locksets: Three years
1.7.2.4. All other Hardware: Two years.

1.8. Owner's Instruction

1.8.1. Instruct Owner's personnel in operation and maintenance of hardware units.

1.9. Maintenance:

1.9.1. Extra Materials: provide owner with any manufacturer's product installation tools and remaining fasteners at project completion.

2. Products

2.1. Manufacturers

2.1.1. The following manufacturers are approved subject to compliance with requirements of the Contract Documents. Approval of manufacturers other than those listed shall be in accordance with Division 1 and provided they meet all of the requirements as indicated in Section 2.2 Materials.

Item:	Manufacturer:	Approved:
Hinges	*Stanley	Bommer, McKinney
Locksets & Cylinders	*Best	Schlage, Sargent

Exit Devices	*Precision	Von Duprin, Sargent
Closers	*Stanley	LCN, Norton
Push / Pulls	*Rockwood	Trimco, Burns
Protective Plates	*Rockwood	Trimco, Burns
Stops	*Rockwood	Trimco, Burns
OH Stops	*ABH	Rockwood, Rixson
Thresholds	*National Guard	Reese, Zero
Gasketing	*National Guard	Reese, Zero

2.2. Materials:

2.2.1. Hinges:

2.2.1.1. Furnish with template screw hole locations.
2.2.1.2. Minimum of 2 permanently lubricated non-detachable bearings.
2.2.1.3. Equip with easily seated, non-rising pins.
2.2.1.4. Sufficient size to allow 180-degree swing of door.
2.2.1.5. Furnish hinges with five knuckles and flush bearings.
2.2.1.6. Provide heavy duty stainless steel.
2.2.1.7. Furnish 3 hinges per leaf to 7 foot 6 inch height. Add one for each additional 30 inches in height or fraction thereof.
2.2.1.8. Furnish NRP (Non Removable Pin) on hinges at all reverse bevel locked doors.
2.2.1.9. Certified to ANSI/BHMA A156.1 for type, size, function and finish.
2.2.1.10. Provide and install hinges conforming to NFPA 80 at fire rated openings.

2.2.2. Mortise Locksets and Latchsets:

2.2.2.1. Best 45H series 14N VT trim. Provide heavy duty mortise locksets and latchsets certified to ANSI A156.13, Series 1000, Grade 1 Operational. Functions as listed in Hardware Sets.
2.2.2.2. Locksets shall be manufactured from heavy gauge steel, 1/8” minimum lock case thickness, containing components of steel with a zinc dichromate plating for corrosion resistance.

2.2.2.3. Cylinder face to be flush with escutcheon.
2.2.2.4. Locksets are to have a standard 2-3/4" backset with a full ¾" throw. Deadbolt shall be a full 1" throw, constructed of stainless steel.
2.2.2.5. Lock shall be easily handed without opening the lock case.
2.2.2.6. Lock trim shall be through-bolted to door to assure correct alignment and proper operation.
2.2.2.7. Furnish vandal resistant trim.
2.2.2.8. Locksets and cylinders to be from the same manufacturer.

2.2.3. Exit Devices:

2.2.3.1. Precision Apex 2000 series.
2.2.3.2. Certified to ANSI/BHMA A156.3 Grade 1.
2.2.3.3. Non-fire rated exit devices shall have cylinder dogging.
2.2.3.4. Touchpad shall be "T" style.
2.2.3.5. Exposed components shall be of architectural metals and finishes.
2.2.3.6. Lever design shall match lockset lever design. Furnish vandal resistant trim.
2.2.3.7. Provide strikes as required by application.
2.2.3.8. Fire exit devices to be listed for UL10C.
2.2.3.9. UL listed for Accident Hazard.
2.2.3.10. Provide vandal resistant or breakaway trim.
2.2.3.11. Provide and install exit devices conforming to NFPA 80 at fire rated openings.

2.2.4. Cylinders:

2.2.4.1. Provide necessary cylinder housings, collars, rings & springs as recommended by the manufacturer for proper installation.
2.2.4.2. Provide the proper cylinder cams or tail pieces as require to operate all locksets and other keyed hardware items listed in the hardware sets.
2.2.4.3. Coordinate and provide as required for related sections.

2.2.5. Door Closers:
2.2.5.1. Stanley D-4550/4551 series.
2.2.5.2. Conform to ANSI/BHMA A156.4 Grade 1.
2.2.5.3. Closer shall have extra-duty arms and knuckles.
2.2.5.4. Maximum 2-7/16 inch case projection with non-ferrous cover.
2.2.5.5. Separate adjusting valves for closing and latching speed, and backcheck.

2.2.5.6. Provide adapter plates, shim spacers and blade stop spacers as required by frame and door conditions.
2.2.5.7. Full rack and pinion type closer with 1 ½" minimum bore
2.2.5.8. Mount closers on non-public side of door, unless otherwise noted in specification.
2.2.5.9. Closers shall be non-handed, non-sized and multi-sized 1 through 6.
2.2.5.10. Provide and install conforming to NFPA 80 at fire rated openings.

2.2.6. Kickplates: Provide with four beveled edges, 8 inches high by width less 2 inches on single doors and less 1 inch on pairs of doors. Furnish oval-head, countersunk screws to match finish.

2.2.7. Seals: Seals shall be furnished as listed in schedule. Material shall be UL listed for labeled openings. National Guard 107SA.

2.2.8. Silencers: Furnish silencers on all interior frames, 3 for single doors and 2 for pairs.

2.3. Finish

2.3.1. Provide finishes as scheduled. Use manufacturer's standard finishes conforming to ANSI/BHMA A156.18 including coordination with traditional U.S. finishes shown by certain manufacturers for their products. Match finishes as closely as possible between products. General finish is 626, Satin Chromium and 630 Satin Stainless Steel, Clear Anodized Aluminum.

2.4. Keys and Keying

2.4.1. Provide keyed brass construction cores and keys during the construction period. Construction control and operating keys and core shall not be part of the Owner's permanent keying system or furnished in the same keyways (or Key section) as the Owner's permanent keying system. Permanent cores and keys (prepared according to the accepted keying schedule) will be furnished to the Owner.
2.4.2. Cylinders, removable and interchangeable core system: Best: Peaks 7-pin.
2.4.3. Permanent keys and cores: Stamped with the applicable key mark for identification. These visual key control marks or codes will not include the actual key cuts. Permanent keys will also be stamped "Do Not Duplicate".

2.4.4. Transmit Grand Masterkeys, Masterkeys and other security keys to Owner by Registered Mail, return receipt requested.

2.4.5. Furnish keys in the following quantities:

- 2.4.5.1. 4 each Masterkeys
- 2.4.5.2. 3 each Change keys each keyed core
- 2.4.5.3. 5 each Construction masterkeys
- 2.4.5.4. 2 each Control keys

2.4.6. The Owner, or the Owner's agent, will install permanent cores and return the construction cores to the Hardware supplier. Construction cores and keys remain the property of the Hardware Supplier.

2.4.7. Keying Schedule: Arrange for a keying meeting, and programming meeting the Architect, Owner, hardware supplier, and other involved parties to ensure locksets and locking hardware are functionally correct and keying and programming complies with project requirements. Furnish 3 typed copies of the keying and programming schedule to the Architect.

3. Execution

3.1. Examination

3.1.1. Verification of conditions: Examine doors, frames, related items and conditions under which Work is to be performed and identify conditions detrimental to proper and or timely completion.

- 3.1.1.1. Do not proceed until unsatisfactory conditions have been corrected.

3.2. Hardware Locations

3.2.1. Mount hardware units at heights indicated in the following publications except as specifically indicated or required to comply with the governing regulations.

- 3.2.1.1. Recommend Locations for Builder's Hardware for Standard Steel Doors and Frames.
- 3.2.1.2. Recommended Locations for Architectural Flush Wood Doors.
- 3.2.1.3. ADA Standards for Accessible Design 2010.

3.3. Installation

3.3.1. Install each hardware item per manufacturer's instructions and recommendations. Do not install surface mounted items until finishes have been completed on the substrate. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

3.3.2. Install hardware using the manufacturers fasteners provided. Drill and tap all screw holes locate in metallic materials. Do not use "Riv-Nuts" or similar products.

3.4. Field Quality Control and Final Adjustment

3.4.1. Contractor/Installers, Field Services: After installation is complete, contractor shall inspect completed door openings on site to verify installation of hardware is complete and properly adjusted, in accordance with both the Contract Documents and with final shop drawings.

3.4.1.1. Check and adjust closers to ensure proper operation.

3.4.1.2. Ensure latchset, lockset, and exit devices are properly installed and adjusted for proper operation.

3.4.1.2.1. Verify levers are free from binding.

3.4.1.2.2. Ensure latchbolts and dead bolts are engaged into strike and hardware is functioning.

3.4.1.3. Report findings, in writing, to architect and hardware supplier outlining corrective actions and recommendations.

3.5. Schedule of Finish Hardware

HW Set 1 Men's Toilet, Women's Toilet & Uni-Sex / Family Toilet

3 Ea	Hinges	FBB199 4.5 X 4.5	630	STA
1 Ea	Lockset	45H7 T 14N VT	630	BES
1 Ea	Closer	D-4551	689	STA
1 Ea	Kickplate	K1050 10" x 2" LDW B4E CSK	630	ROC
1 Ea	Wallstop	409	630	ROC
1 Ea	Threshold	424	AL	NAT
1 Ea	Weatherstrip	107SA	AL	NAT

1 Ea	Sweep	C627A	AL	NA

HW Set 2 Utility Room

3 Ea	Hinges	FBB199 4.5 x 4.5	630	STA
1 Ea	Lockset	45H7 TD 14N VT	630	BES
1 Ea	Closer	D-4550 HCS	689	STA
1 Ea	Kickplate	K1050 10” x 2” LDW B4E CSK	630	ROC
1 Ea	Latch Protector	320	630	ROC
1 Ea	Threshold	424	AL	NAT
1 Ea	Weatherstrip	107SA	AL	NAT
1 Ea	Sweep	C627A	AL	NAT

End of Section

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SECTION 08 90 00
LOUVERS AND VENTS

PART 1 - GENERAL

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. Fixed extruded-aluminum louvers.

B. Related Sections:

1. Division 7 – Section “Joint Sealants”.

1.3 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.

1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance: Louvers 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 a uniform pressure of 30 lbf/sq. ft. (1436 Pa), acting inward or outward.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes, without buckling, opening of joints, overstressing of components, failure of connections, or other detrimental effects.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

C. 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.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

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.
2. Show mullion profiles and locations.

C. Samples for Initial Selection: For units with factory-applied color finishes.

1.6 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.

1.7 QUALITY ASSURANCE

A. Source Limitations: Obtain louvers and vents from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

B. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

C. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

1.8 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum Extrusions: ASTM B 221 Alloy 6063-T5, T-52, or T6.

B. Aluminum Sheet: ASTM B 209 Alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.

C. Fasteners: Use types and sizes to suit unit installation conditions.

1. Use Phillips flat-head 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.

D. 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 per ASTM E 488, conducted by a qualified independent testing agency.

E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.2 FABRICATION, GENERAL

A. Assemble louvers in factory to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

B. Include supports, anchorages, and accessories required for complete assembly.

C. Provide subsills made of same material as louvers or extended sills for recessed louvers.

2.3 FIXED, EXTRUDED-ALUMINUM LOUVERS

A. Horizontal, Drainable-Blade Louver:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Airolite Company, LLC (The).
    b. Construction Specialties, Inc.
    c. Greenheck Fan Corporation.
    d. Industrial Louvers, Inc.
    e. Nystrom Building Products.
    f. Ruskin Company; Model ELFR 15J (Basis of Design).

2. Louver Depth: 1 1/2 inches.
3. Frame and Blade Nominal Thickness: Not less than 0.060 inch (1.52 mm) for blades and 0.080 inch (2.03 mm) for frames.
4. Mullion Type: Exposed.
5. Louver Performance Ratings:

    a. Free Area: 50%.

6. 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: Bird 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: Aluminum.

D. Louver Screening for Aluminum Louvers: Aluminum

2.5 BLANK-OFF PANELS

A. Insulated, Blank-Off Panels: Laminated panels consisting of insulating core surfaced on back and front with metal sheets and attached to back of louver.

1. Thickness: 1 inch (25 mm).
2. Metal Facing Sheets: Aluminum sheet, not less than 0.032-inch nominal thickness.
3. Insulating Core: Rigid, glass-fiber-board insulation or extruded-polystyrene foam.
4. Edge Treatment: Trim perimeter edges of blank-off panels with louver manufacturer's standard frames, with corners mitered and with same finish as panels.
5. Seal perimeter joints between panel faces and louver frames with gaskets or sealant.
6. Panel Finish: Same finish applied to louvers.

B. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

2.6 ALUMINUM FINISHES

A. Finish louvers after assembly.

B. High-Performance Organic Finish: 3-coat fluoropolymer finish complying with AAMA. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Color and Gloss: As selected by Architect from manufacturer's full range.

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.

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 vents level, plumb, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Form closely fitted joints with exposed connections accurately located and secured.

D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

E. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.

F. Protect unpainted galvanized and nonferrous-metal surfaces that will be 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.

G. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Division 7 "Joint Sealants" for sealants applied during louver installation.

3.4 ADJUSTING AND CLEANING

A. Test operation of adjustable louvers and adjust as needed to produce fully functioning units that comply with requirements.

B. Clean exposed surfaces of louvers and vents that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.

C. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

D. Restore louvers and vents 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.

SECTION 09 77 20
FIBERGLASS REINFORCED WALL PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Prefinished polyester glass reinforced plastic sheets and adhered to gypsum wallboard.
   1. PVC trim.

1.2 REFERENCES

A. American Society for Testing and Materials: Standard Specifications (ASTM)
   1. ASTM D 256 - Izod Impact Strengths (ft #/in)
   2. ASTM D 570 - Water Absorption (%)
   3. ASTM D 638 -Tensile Strengths (psi) & Tensile Modulus (psi)
   4. ASTM D 790 -Flexural Strengths (psi) & Flexural Modulus (psi)
   5. ASTM D 2583- Barcol Hardness
   6. ASTM D 5319 - Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels.
   7. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

1.3 SUBMITTALS

A. Product Data: Submit sufficient manufacturer's data to indicate compliance with these specifications, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

B. Shop Drawings: Submit elevations of each wall showing location of paneling and trim members with respect to all discontinuities in the wall elevation.

C. Selection Samples: Submit manufacturer’s standard color pattern selection samples representing manufacturer's full range of available colors and patterns.

D. Samples for Verification: Submit appropriate section of panel for each finish selected indicating the color, texture, and pattern required.
   1. Submit complete with specified applied finish.

2. For selected patterns show complete pattern repeat.
3. Exposed Molding and Trim: Provide samples of each type, finish, and color.

E. Manufacturers Material Safety Data Sheets (MSDS) for adhesives and sealants prior to their delivery to the site.

1.4 QUALITY ASSURANCE

A. Conform to building code requirements for interior finish for smoke and flame spread requirements as tested in accordance with:
   1. ASTM E 84 (Method of test for surface burning characteristics of building Materials)

B. Sanitary Standards: System components and finishes to comply with:
   1. United States Department of Agriculture (USDA) requirements for food preparation facilities, incidental contact.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver materials factory packaged on strong pallets.

B. Store panels and trim lying flat, under cover and protected from the elements. Allow panels to acclimate to room temperature (70°) for 48 hours prior to installation.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Building are to be fully enclosed prior to installation with sufficient heat (70°) and ventilation consistent with good working conditions for finish work

B. During installation and for not less than 48 hours before, maintain an ambient temperature and relative humidity within limits required by type of adhesive used and recommendation of adhesive manufacturer.
   1. Provide ventilation to disperse fumes during application of adhesive as recommended by the adhesive manufacturer.

1.7 WARRANTY

A. Furnish one year guarantee against defects in material and workmanship.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURER

A. Marlite; 202 Harger Street, Dover, OH 44622. 800-377-1221 FAX (330) 343-4668 Email: info@marlite.com www.marlite.com.
   1. Product: Standard FRP Bonded to 5/8" Gypsum Wall Board.

B. Requests for approval of equal substitutions will be considered in accordance with provisions of Division 01.

2.2 PANELS

A. Fiberglass reinforced thermosetting polyester resin panel sheets complying with ASTM D 5319.
   1. Coating: Multi-layer print, primer and finish coats or applied over-layer.
   2. Dimensions:
      a. FRP Thickness – 0.090 inch (2.29mm) nominal
      b. Gypsum Board Substrate Thickness – 5/8 inch
      c. Width - 4'-0" (1.22m) nominal
      d. Length – 10'-0" (3.0m) nominal
   3. Tolerance:
      a. Length and Width: +/-1/8 inch (3.175mm)
      b. Square - Not to exceed 1/8 inch for 8 foot (2.4m) panels or 5/32 inch (3.96mm) for 10 foot (2.4m) panels

B. Properties: Resistant to rot, corrosion, staining, denting, peeling, and splintering.
   1. Flexural Strength - 1.0 x 10^4 psi per ASTM D 790. (7.0 kilogram-force/square millimeter)
   2. Flexural Modulus - 3.1 x 10^5 psi per ASTM D 790. (217.9 kilogram-force/square millimeter)
   3. Tensile Strength - 7.0 x 10^3 psi per ASTM D 638. (4.9 kilogram-force/square millimeter)
   4. Tensile Modulus - 1.6 x 10^5 psi per ASTM D 638. (112.5 kilogram-force/square millimeter)
   5. Water Absorption - 0.72% per ASTM D 570.
   6. Barcol Hardness (scratch resistance) of 35 55 as per ASTM D 2583.
   7. Izod Impact Strength of 72 ft. lbs./in ASTM D 256

C. Back Surface: Smooth. Imperfections which do not affect functional properties are not cause for rejection.

E. Front Finish: Standard FRP.

1. Color: to be selected by Architect.
2. Fire Rating Class A (I) Fire Rating.
3. Backing: 5/8” Drywall.

2.3 MOLDINGS

A. PVC: Extruded PVC Trim Profiles for .090 inch thick panels.
   1. Division
   2. Edge
   3. Color: to match panel.

2.4 ACCESSORIES

B. Fasteners: Non-staining nylon drive rivets.
   1. Match panel colors.
   2. Length to suit project conditions.

C. Adhesive: Either of the following construction adhesives complying with ASTM C 557.
   1. Marlite C-551 FRP Adhesive - Water- resistant, non-flammable adhesive
   2. Marlite C-375 Construction adhesive flexible, water-resistant, solvent based adhesive formulated for fast, easy application.

D. Sealant:
   1. Manufacturer’s Color Match Sealant

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine backup surfaces to determine that corners are plumb and straight, surfaces are smooth, uniform, clean and free from foreign matter, nails countersunk, joints and cracks filled flush and smooth with the adjoining surface.
   1. Verify that stud spacing does not exceed 24 inch (61cm) on-center.

B. Repair defects prior to installation.
   1. Level wall surfaces to panel manufacturer’s requirements. Remove protrusions and fill indentations.

3.2 INSTALLATION

A. Comply with manufacturer's recommended procedures and installation sequence.

B. Cut sheets to meet supports allowing 1/8” inch (3 mm) clearance for every 8 foot (2.43m) of panel.
   1. Cut and drill with carbide tipped saw blades or drill bits, or cut with shears.
   2. Pre-drill fastener holes 1/8 inch (3.175mm) oversize with high speed drill bit.
      a. Space at 8 inches (20.32cm) maximum on center at perimeter, approximately 1 inch from panel edge.
      b. Space at in field in rows 16 inches (40.64cm) on center, with fasteners spaced at 12 inches (30.48 cm) maximum on center.

C. Apply panel moldings to all panel edges using silicone sealant providing for required clearances.
   1. All moldings must provide for a minimum 1/8 inch (3.18mm) of panel expansion at joints and edges, to insure proper installation.
   2. Apply sealant to all moldings, channels and joints between the system and different materials to assure watertight installation.

3.3 CLEANING

A. Remove excess sealant from panels and moldings. Wipe panel down using a damp cloth and mild soap solution or cleaner.

B. Refer to manufacturer's specific cleaning recommendations Do not use abrasive cleaners.

END OF SECTION

SECTION 09 90 00

PAINTING

16 PART 1 GENERAL

3.1 1.1 SUMMARY

a. A. Section includes surface preparation and field application of paints, stains, varnishes, and other coatings.

B. Related Sections:
1) 1. Division 5 - Metal Fabrications: Shop primed items.
2) 2. Division 15 - Mechanical Identification.
3. Division 26 - Basic Electrical Requirements.

C. Work includes, but is not limited to:
1. Painting and finishing of interior and exterior exposed items and surfaces including surface preparation and priming. Surface preparation, priming, and finish coats specified in this section are in addition to shop priming and surface treatment specified under other sections.
2. “Paint” as used herein means all coating systems materials, including primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats.
3. Where items or surfaces are not specifically mentioned, paint the same as similar adjacent materials or areas. If color or finish is not designated, Architect will select these from standard colors or finishes available.
4. Paint exposed surfaces whether or not colors are designated in schedules, except where a surface or material is specifically indicated not to be painted or to remain natural. Where an item or surface is not specifically mentioned, paint the same as similar adjacent materials or surfaces. If color or finish is not designated, the Architect will select from standard colors or finishes available.
5. Painting includes field painting exposed-to-view bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron work, and primed metal surfaces of mechanical and electrical equipment except as specified in Divisions 15 and/or 26.

3.2 1.2 REFERENCES

a. A. ASTM D16 - Terminology Relating to Paint, Varnish, Lacquer, and Related Products.

B. ASTM D823-95 Standard Practices for Producing Films of Uniform Thickness of Paint, Varnish, and Related Products.

C. ASTM D5150-92 (1997) e1 Standard Test Method for Hiding Power of Architectural Paints Applied by Roller.

D. ASTM D3276-96 Standard Guide for Painting Inspectors- (metal substrates).

3.3 1.3 DEFINITIONS

A. Conform to ASTM D16 for interpretation of terms used in this section.

a.

1.4 SUBMITTALS

A. Product Data: Submit data on all finishing products. Submit manufacturer's technical information including paint label analysis and application instructions for each material proposed for use.

B. Samples: Provide a listing of material and application for each coat of each finish sample. Submit samples for Architect's review of color and texture only. Submit two paper chip samples, illustrating range of colors and textures available for each surface finishing product scheduled..

3.4 1.5 CLOSEOUT SUBMITTALS

a. A. Operation and Maintenance Data: Submit data on cleaning, touch-up, and repair of painted and coated surfaces.

b.

c. 1.6 QUALIFICATIONS

d. A. Applicator: Company specializing in performing the work of this section with minimum five years documented experience.

3.5 1.7 DELIVERY, STORAGE, AND HANDLING

a. A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

b. B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

c. C. Paint Materials: Store at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

3.6 1.8 ENVIRONMENTAL REQUIREMENTS

a. A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

b. B. Do not apply exterior coatings during rain or snow when relative humidity is outside the humidity ranges, or moisture content of surfaces exceed those required by the paint product manufacturer.

c. C. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.

d. D. Minimum Application Temperature for Varnish: 65 degrees F for interior or exterior, unless required otherwise by manufacturer's instructions.

17 PART 2 PRODUCTS

A. 2.1 PAINTS AND COATINGS

A. Provide materials as manufactured by Sherwin-Williams, Devoe, PPG, Duron, Tnemec, or Benjamin Moore.

B. The quality of paint shall be equal to Sherwin Williams or Tnemec product numbers as specified in the schedule below.

2.2 SCHEDULE

A. Ferrous Metal:
1. First Coat: SW-KEM Kromik Universal Metal Primer, B5ONZ6
2. Second Coat: SW-Silicone Alkyd enamel, B-56 Series
3. Third Coat: SW-Silicone Alkyd enamel, B-56 Series

B. Exterior Cement Board:
4. First Coat: SW-Loxon Primer
5. Second Coat: SW-Duration Exterior Acrylic Coating
6. Third Coat: SW-Duration Exterior Acrylic Coating

C. Interior Concrete Masonry:
1. System Type: Modified cement/ epoxy
2. Surface Preparation: Tnemec SSPC-SP 13/NACE 6. Clean and dry.
3. First Coat: Tnemec Series 130 Envirofill high performance block filler @ 60-80 sq.ft./gal.
4. Second Coat: Primer Series 84 Ceramalon ENV@ 160-200 sq.ft./gal. DFT 5.0- 8.0 mils.
5. Finish Coat: Tnemec Series 84 Ceramlon ENV. DFT 5.0 to 8.0 mils
6. Total DFT: 10.0 to 16.0 mils plus surfacer.

D. Interior Concrete Floor:
1. Product: PPG Aquapon WB Interior Floor Coating
2. Installation: per manufacturer's recommendations.

18 PART 3 EXECUTION

1. 3.1 EXAMINATION

a. A. Applicator must examine areas and conditions under which painting work is to be applied and notify Contractor 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 Applicator. Starting of painting work will be construed as Applicator's acceptance of surfaces and conditions within any particular area.

b. B. Test shop applied primer for compatibility with subsequent cover materials.

c. C. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below 8%.

2. 3.2 PREPARATION

a. A. Surface Appurtenances: Remove or mask electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.

b. B. Surfaces: Correct defects and clean surfaces that affect work of this section. Remove or repair existing coatings that exhibit surface defects.

C. Asphalt, Creosote, or Bituminous Surfaces Scheduled for Paint Finish: Remove foreign particles to permit adhesion of finishing materials.

c. D. Gypsum Board Surfaces: Fill minor defects with filler compound. Spot prime defects after repair.

d. E. Galvanized Surfaces: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.

e. F. Concrete and Unit Masonry Surfaces Scheduled to Receive Paint Finish: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium

phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.

f. G. Plaster Surfaces: Fill hairline cracks, small holes, and imperfections with latex patching plaster.

g. H. Uncoated Steel and Iron Surfaces: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Spot prime paint after repairs.

I. Interior Wood Items Scheduled to Receive Transparent Finish: Wipe off dust and grit prior to sealing. Sand lightly between coats and protect from dust while drying.

J. Metal Doors Scheduled for Painting: All hollow metal frames shall receive one field prime coat, front and back, before erection (color to be medium gray); after erection, touch-up all abrasive marks; this prime coat is in addition to factory prime coat and to the two coats of finish painting specified under Paragraph 2.2. Protect from dust while drying.

K. Apply a bead of sealant where hollow metal door frames abut adjacent wall surfaces.

3.3 APPLICATION

A. Spray painting will be permitted wherever practical; however, excess thinning will not be permitted and complete surface coverage shall be equal to that of first class brush work. Do not spray paint concrete block unless it is immediately back-rolled.

B. Do all touch-up and clean-up at the completion of this work to leave all surfaces in a finished condition.

C. Where exposed, painting contractor shall paint all ducts, piping, conduit and mechanical and electrical equipment without factory finish, including those in mechanical and electrical rooms.

D. Visible surfaces on interior of ducts behind louvers, diffusers, registers and grilles shall be primed and then painted with one coat of flat black metal enamel.

E. Belt guards and other protective guards on equipment shall be painted with two coats of safety yellow metal enamel.

F. Insulated pipes and ducts with paper or canvas jacket shall be painted with one coat of paint equal to Sherwin Williams SW-Preprite 200 Latex Wall Primary, and insulated surfaces with aluminum foil jacket shall be painted with one coat of Zinc Chromate Primer prior to two coats of finish paint. Armaflex type insulation on exposed pipes shall be painted with two coats of latex base paint equal to SW-PROMAR 200 Latex flat wall paint tinted to match background color.

G. Mechanical equipment surfaces with asphalt or bitumen coating shall be sealed with an approved asphalt sealer and painted with two coats of SW-KemKromik universal/metal primer, B5ONZ6**.**

H. The Architect shall have the right to select in addition to scheduled colors, deep, accent colors for one or more walls, bulkheads, columns, or other features in any of the spaces on the project, up to 2500 sq ft of area.

I. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

J. Apply each coat to uniform appearance. Apply each coat of paint slightly darker than preceding coat unless specified otherwise.

K. Sand wood and metal surfaces lightly between coats to achieve required finish.

L. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior applying next coat.

M. Paint front and back sides of access panels, and removable or hinged covers.

N. Protect work of other trades, whether being coated or not, against damage from coating.

3. 3.4 CLEANING

A. Collect waste material that may constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.5 SCHEDULE - COLORS

A. Color schemes will be prepared by the Architect after receipt of approved manufacturer's color samples.

B. Samples of work receiving natural or stained finish shall be submitted for Architect's review and selection.

END OF SECTION

SECTION 10 28 00
TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

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. This Section includes the following:
   1. Public-use washroom accessories.

B. Related Sections include the following:
   1. Division 9 Section "Ceramic Tile" for ceramic toilet and bath accessories.

1.3 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.

B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
   1. Identify locations using room designations indicated on Drawings.
   2. Identify products using designations indicated on Drawings.

C. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

1.4 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, 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 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, 0.0312-inch minimum nominal thickness, unless otherwise indicated.

B. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.0359-inch minimum nominal thickness.

C. Galvanized Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.

D. Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

E. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

F. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).

G. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

H. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. A & J Washroom Accessories, Inc.
   2. American Specialties, Inc.
   3. Bobrick Washroom Equipment, Inc.
   4. Bradley Corporation.

B. Grab Bars: Bobrick B 5806

1. Mounting: Flanges with concealed fasteners.
2. Material: Stainless steel, 0.05 inch thick.
3. Finish: Smooth, No. 4, satin finish.
4. Outside Diameter: 1-1/4 inches.
5. Configuration and Length:
   a. Straight 36” long
   b. Straight 42” long
   c. Straight 18” long

C. Mirror Unit: Bobrick B-1556 1830
1. Frameless stainless steel mirror. 18-8, type-304, 20 gauge stainless steel polished to a No. 8 mirror finish. Mirror has ¼” return.
2. Backing: ¼” thick tempered Masonite.
3. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.
   a. Provide fiber plugs or expansion shields for use with sheet-metal screws furnished, or provide 1/8” toggle bolts or expansion bolts.
4. Size: 17-1/2” x 39-1/2”.

D. Hand Dryer: Excelerator XL-SB
1. Mounting:
2. Finish: Brushed Stainless Steel.
3. Power: 110/120v / 12.5 Amp / 60 Hz.
4. Material and Finish: Stainless steel, No. 4 finish (satin).

E. Soap Dispenser: Bobrick B-2111
1. Surface-mounted

F. Surface Mounted Multi-Roll Toilet Tissue Dispenser: Bobrick B-4288
1. Capacity: Two rolls
2. Operation: Extra roll automatically drops in place when bottom roll is depleted. Theft resistant, heavy-duty spindles
3. Size: 6 1⁄16" W, 11" H, 5 15⁄16" D (155 x 280 x 150mm)
4. Material and Finish: Stainless steel, No. 4 finish (satin).

2.3 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.

B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to method in ASTM F 446.

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

SECTION 220000
BASIC PLUMBING REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes Basic Plumbing Requirements applicable to all Division 22 Sections.

1.2 PRODUCTS

A. Furnish products of qualified manufacturers suitable for intended use. Furnish products of each type by single manufacturer unless specified otherwise.

B. Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.

C. Provide interchangeable components of the same manufacture for components being replaced.

1.3 MANUFACTURER INSTALLATION INSTRUCTIONS

A. When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting and finishing to Architect/Engineer in quantities specified for product data.

B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.4 MANUFACTURER CERTIFICATES

A. When specified in individual specification sections, submit certification by manufacturer to Architect/Engineer in quantities specified for product data.

B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

C. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect/Engineer.

1.5 REGULATORY REQUIREMENTS

A. Conform to:
   1. The Virginia Uniform Statewide Building Code including referenced codes and standards.
   2. Industry Standards, Codes and Specifications:
      a. ANSI: American National Standards Institute.
      b. ARI: Air-Conditioning and Refrigeration Institute.
      c. ASHRAE: American Society of Heating, Refrigeration and Air Conditioning Engineers.
      d. ASME: American Society of Mechanical Engineers.
      e. ASTM: American Society for Testing and Materials.
      f. AWS: American Welding Society.
      g. AWWA: American Water Works Association.
      h. CISPI: Cast Iron Soil Pipe Institute.
      i. ICC: International Code Council, Inc.
      j. MSS: Manufacturers Standardization Society of the Valve & Fittings Industry, Inc.
      k. NAIMA: North American Insulation Manufacturers Association.
      l. NBS: National Bureau of Standards.
      m. NFPA: National Fire Protection Association.
      n. SMACNA: Sheet Metal and Air Conditioning Contractors.
      o. UL: Underwriters Laboratories, Inc.
      p. USASI: United States of America Standards Institute.
      q. VDOT: Virginia Department of Transportation.

B. Obtain permits and request inspections from authority having jurisdiction.

1.6 PROJECT/SITE CONDITIONS

A. Install work in locations shown on drawings, unless prevented by project conditions. The drawings show the general arrangement of all piping, ductwork, equipment and appurtenances and shall be followed as closely as actual building construction and the work of other trades will permit. The work shall conform to the requirements shown on all of the drawings. Because of the small scale of the drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall investigate the structural and finish conditions affecting the work and shall arrange his work accordingly, providing such fittings, valves, offsets, transitions and other accessories as may be required to meet such conditions.

B. Prepare drawings showing proposed re-arrangement of work to meet project conditions, including changes to work specified in other Sections. Obtain permission of Architect/Engineer before proceeding.

1.7 EXCAVATION AND BACKFILLING FOR PLUMBING WORK

A. Provide excavation and backfilling required for plumbing work in accordance with the requirements of Division 31 Sections.

1.8 PAINTING

A. Refer to Division 9 - Paints and Coatings: Product and execution requirements for painting specified by this section.

B. Plumbing equipment, related piping, and materials do not require painting except as indicated below:
   1. Painting is not required for equipment having a factory applied finish except touch-up with matching finish where factory finish is damaged.
   2. Piping (except insulated and jacketed piping), fabricated supports, and any unfinished or unprotected materials located outdoors shall be painted with a suitable primer and compatible finish paint. Color shall be as directed by Architect/Engineer.

C. Protection of work: Painting shall be done with care to protect work and work of other trades. All damage caused by the painting operations shall be corrected, repaired and cleaned as required. Hardware, special control items, gages, thermometers, nameplates, instrument glass and other similar items shall be removed or properly protected during the painting operation to ensure that these items are not covered or splattered with paint.

1.9 ELECTRICAL PROVISIONS

A. Low voltage (less than 100 volts) control wiring and connections for equipment specified in Division 22 shall be provided under Division 22. All line voltage (100 volts and greater) field control wiring and connections for equipment furnished under Division 22, all power wiring, and all related electric supply and disconnecting equipment and wiring shall be provided under Division 26. Line voltage field wiring for equipment furnished under Division 22 shall be accomplished under the supervision of the Division 22 subcontractor.

1.10 WARRANTY

A. All materials and workmanship shall be warranted to be free from defects for a period of one (1) year from date of acceptance and Contractor shall make good, without additional cost to the Owner, any defects which may

appear within that period. Manufacturer's warranties extending beyond one year shall be processed and turned over to the Owner.

1.11 CLOSEOUT PROCEDURES: OPERATION AND MAINTENANCE MANUALS

A. Comply with requirements of Division 1 Sections and the following requirements.

B. Submit data on 8-1/2 x 11 inch text pages, bound in three ring binders with durable plastic or cloth covers.

C. Prepare binder cover with printed title "Operation and Maintenance Instructions", title or project, and subject matter of binder when multiple binders are required.

D. Internally subdivide the binder contents with permanent page dividers, logically organized, with minimum content as described below.

E. Contents:
1. Name of manufacturer.
2. Name, address and telephone number of nearest manufacturer's representative.
3. Copy of latest approved submittal including all review comments.
4. Manufacturer's installation, operation and maintenance instructions including lubrication data.
5. Parts numbers for all replaceable items.
6. Serial numbers of all principal items of equipment.
7. Manufacturer's written warranties that extend beyond the Contractor's one year warranty.

F. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect/Engineer [and Commissioning Authority] will comment on whether general scope and content of manual are acceptable. Revise content of all document sets as required prior to final submittal.

G. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect/Engineer [and Commissioning Authority] will return copy with comments.

PART 2 PRODUCTS

2.1 EQUIPMENT AND MATERIALS

A. Dimensions: The Contractor shall verify that items to be furnished fit the space available. He shall make field measurements to ascertain space requirements, including those for connections and maintenance, and shall furnish and install such sizes and shapes of equipment that the final installation shall suit the true intent and meaning of the drawings and specifications. Should he conclude that there is insufficient space for installation of specified materials, he shall immediately notify the Architect/Engineer of the conflict and shall stop affected work until he receives instructions as to how to proceed from the Architect/Engineer.

B. When substitution of equipment or materials requires changes or revisions to the arrangement, layout or design of any system, drawings showing these changes or revisions shall be submitted for review, along with other required submittal data. The costs of all such changes and revisions shall be borne by the Contractor.

C. Similar items shall be provided by a single manufacturer.

2.2 EQUIPMENT ACCESSORIES

A. The Contractor shall furnish and install all equipment, accessories, connections and incidental items necessary to fully complete the work ready for use, occupancy and operation by the Owner.

B. Equipment or Connections Different from those Shown: Where equipment requiring different arrangement of connections from those shown is proposed by the Contractor, and is acceptable to the Architect/Engineer, it shall be the responsibility of the Contractor to install the equipment to operate properly and in harmony with the intent of the drawings and specifications. The Contractor shall make all incidental changes in piping, ductwork, supports, insulation, heaters, controls and other associated facilities. He shall provide all additional equipment required for proper operation of the system, including all required changes in affected trades. The Contractor shall be responsible for the proper location of rough-in and connections. All such changes shall be made at no increase in cost to the Owner.

C. Supports: The Contractor shall support plumb, rigid and true to line all work and equipment furnished. The Contractor shall study thoroughly all general, structural and plumbing drawings, shop drawings and catalog data to determine how equipment, fixtures, piping, etc., are to be supported, mounted or suspended and shall provide extra steel bolts,

inserts, pipe stands, brackets and accessories for proper support whether or not shown on the drawings. When directed, the Contractor shall submit drawings showing supports for review by the Architect/Engineer.

2.3 ACCESS DOORS

A. General: Access doors shall be provided for all concealed valves, controls, and any other equipment or material requiring inspection or maintenance. Access doors shall be furnished for walls, and ceilings, or adequate size so that the concealed items will be readily accessible for servicing or for removal and replacement if necessary.

B. Access Doors: Provide access doors in accordance with requirements of Division 8 Sections.

C. Construction: Furnish manufacturer's complete units, of type recommended for application in indicated substrate construction, in each case, complete with anchorages and hardware. Except as otherwise indicated, fabricate wall/ceiling door units of welded steel construction with welds ground smooth; 16 gage frames and 14 gage flush panel doors, 175 degree swing with concealed spring hinges; flush screwdriver-operated cam locks; factory applied rust inhibitive prime coat paint finish.

PART 3 EXECUTION

3.1 INSTALLATION OF EQUIPMENT

A. All equipment and materials specified in this Division shall be installed in accordance with the manufacturer's instructions including, but not limited to, the following:
   1. Storage, handling, rigging, and installation shall be accomplished using means and methods recommended by the manufacturer.
   2. Location and orientation of equipment shall provide the indicated operation and performance and shall also provide the recommended unobstructed clearances around equipment for maintenance and repair.
   3. Provide accessories and incidental materials recommended by the manufacturer.

3.2 COORDINATION

A. Offsets, transitions and changes in direction in pipes and ducts shall be made as required to maintain proper head room, clearances and pitch of sloping lines whether or not indicated on the drawings. The Contractor shall furnish and install all fittings, traps, drains, air vents, sanitary vents,

etc., as required to effect these offsets, transitions and changes in direction.

B. Drawings by the Contractor: When directed by the Architect/Engineer, the Contractor shall submit for review drawings clearly showing certain portions of the plumbing work and it's relation to the work of other trades before commencing shop fabrication or erection at the project site.

3.3 DELIVERY, STORAGE AND HANDLING

A. Deliver products to project site identified with names, model numbers, types, grades, compliance labels, and other information needed for distinct identification; adequately packaged and protected to prevent damage during shipment, storage and handling. Protect stored equipment and materials from damage. Comply with manufacturer's rigging and moving instructions for unloading equipment and moving into final location.

3.4 INSTALLATION OF ACCESS DOORS

A. Install access doors at all concealed valves, controls, other equipment or materials requiring inspection or maintenance, where indicated and where required by Code, in accordance with manufacturer's written instructions and in compliance with industry practices.

B. Coordinate with other work, including substrate construction work, as necessary to interface installation of access doors with other work.

C. Locate each access door accurately in relation to the item requiring access.

D. Install in accordance with requirements of Division 8 Sections.

E. Provide adequate temporary support or attachment to framing or formwork such that units will not be dislocated during construction of substrates.

F. Set frames accurately in position and securely attach to supports with face panels plumb and level in relation to adjacent finish surfaces.

G. Adjust hardware and panels after installation for proper operation.

H. Replace panels and frames which are warped or damaged.

END OF SECTION

SECTION 220518
ESCUTCHEONS FOR PLUMBING PIPING

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. Escutcheons.
2. Floor plates.

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.

C. One-Piece, Stamped Type: Steel with chrome-plated finish or stainless steel with polished finish; spring-clip fasteners.

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. Provide brass or stainless steel escutcheons in wet locations and exterior locations.

C. 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 type.
d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass with polished, chrome-plated finish.
e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass with polished, chrome-plated finish.
f. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with rough-brass finish.
g. Bare Piping in Equipment Rooms: One-piece, cast-brass with rough-brass finish.

D. Install floor plates for piping penetrations of equipment-room floors.

E. 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

SECTION 220519
METERS AND GAGES FOR PLUMBING PIPING

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. Dial-type pressure gages.
2. Gage attachments.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of meter and gage, from manufacturer.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For meters and gages to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 PRESSURE GAGES

A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Ashcroft Inc.
b. Trerice, H. O. Co.
c. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
d. Weiss Instruments, Inc.
e. Weksler Instruments.
f. Winters Instruments - U.S.

2. Standard: ASME B40.100.
3. Case: Cast aluminum or drawn steel; 4-1/2-inch nominal diameter.
4. Pressure-Element Assembly: Bourdon tube.
5. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and bottom-outlet type.
6. Movement: Mechanical, with link to pressure element and connection to pointer.
7. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.
8. Pointer: Dark-colored metal.
9. Window: Glass or plastic.
10. Ring: Brass or stainless steel.
11. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

B. Scale Ranges:
1. Water Service Piping: 0 to 160 psi.
2. Domestic Water Piping: 0 to 100 psi.

2.2 GAGE ATTACHMENTS

A. Valves: Brass ball valve or brass or stainless-steel needle valve, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.

B. Install valve in piping for each pressure gage.

C. Install test plugs in piping tees.

D. Install pressure gages in the following locations:
1. Inlet and outlet of each pressure-reducing valve.

3.2 CONNECTIONS

A. Install meters and gages adjacent to equipment to allow service and maintenance of gages and equipment.

3.3 ADJUSTING

A. After installation, calibrate meters according to manufacturer's written instructions.

B. Adjust faces of meters and gages to proper angle for best visibility.

END OF SECTION

SECTION 22 05 23.12
BALL VALVES FOR PLUMBING PIPING

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. Brass ball valves.
2. Bronze ball valves.

1.3 DEFINITIONS

A. CWP: Cold working pressure.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of valve.

1. Certification that products comply with NSF 61 Annex G.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, and soldered ends.
3. Set ball valves open to minimize exposure of functional surfaces.

B. Use the following precautions during storage:

1. Maintain valve end protection.

2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

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 B16.5 for flanges on steel valves.
3. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
4. ASME B16.18 for solder-joint connections.
5. ASME B31.9 for building services piping valves.

C. NSF Compliance: NSF 61 Annex G 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. 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.

2.2 BRASS BALL VALVES

A. Two-Piece, Brass Ball Valves with Full Port and Brass Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Conbraco Industries, Inc.
    b. NIBCO INC.
    c. Watts; a Watts Water Technologies company.

2. Description:

    a. Standard: MSS SP-110.
    b. CWP Rating: 600 psig.
    c. Body Design: Two piece.
    d. Body Material: Forged brass.
    e. Ends: Threaded and soldered.
    f. Seats: PTFE.
    g. Stem: Brass.
    h. Ball: Chrome-plated brass.
    i. Port: Full.

B. Three-Piece, Brass Ball Valves with Full Port and Brass Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Jomar Valve.
    b. KITZ Corporation.
    c. Watts; a Watts Water Technologies company.

2. Description:

    a. Standard: MSS SP-110.
    b. CWP Rating: 600 psig.
    c. Body Design: Three piece.
    d. Body Material: Forged brass.
    e. Ends: Threaded and soldered.
    f. Seats: PTFE.
    g. Stem: Brass.
    h. Ball: Chrome-plated brass.
    i. Port: Full.

2.3 BRONZE BALL VALVES

A. Two-Piece, Bronze Ball Valves with Full Port, and Bronze or Brass Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Conbraco Industries, Inc.
b. NIBCO INC.
c. Watts; a Watts Water Technologies company.

2. Description:

a. Standard: MSS SP-110.
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.

B. Three-Piece, Bronze Ball Valves with Full Port and Bronze or Brass Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Conbraco Industries, Inc.
b. NIBCO INC.
c. Watts; a Watts Water Technologies company.

2. Description:

a. Standard: MSS SP-110.
b. CWP Rating: 600 psig.
c. Body Design: Three piece.
d. Body Material: Bronze.
e. Ends: Threaded.
f. Seats: PTFE.
g. Stem: Bronze or brass.
h. Ball: Chrome-plated brass.
i. Port: Full.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 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.

3.3 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.

3.4 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:

1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
2. Two-piece, brass ball valves with full port and brass trim.
3. Two-piece, bronze ball valves with full port and bronze or brass trim.
4. Three-piece, brass ball valves with full port and brass trim.
5. Three-piece, bronze ball valves with full port and bronze or brass trim.

SECTION 22 05 23.15
GATE VALVES FOR PLUMBING PIPING

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. Bronze gate valves.

1.3 DEFINITIONS

A. CWP: Cold working pressure.

B. NRS: Nonrising stem.

C. RS: Rising stem.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of valve.

1. Certification that products comply with NSF 61 Annex G.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces and grooves.
3. Set gate valves closed to prevent rattling.

B. Use the following precautions during storage:

1. Maintain valve end protection.

2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

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 B16.1 for flanges on iron valves.
3. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
4. ASME B16.18 for solder joint.
5. ASME B31.9 for building services piping valves.

C. NSF Compliance: NSF 61 Annex G 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. RS Valves in Insulated Piping: With 2-inch (50-mm) stem extensions.

2.2 BRONZE GATE VALVES

A. Class 125, NRS, Bronze Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Milwaukee Valve Company.
b. NIBCO INC.
c. Watts; a Watts Water Technologies company.

2. Description:

a. Standard: MSS SP-80, Type 1.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Material: Bronze with integral seat and screw-in bonnet.
d. Ends: Threaded or solder joint.
e. Stem: Bronze.
f. Disc: Solid wedge; bronze.
g. Packing: Asbestos free.
h. Handwheel: Malleable iron, bronze, or aluminum.

B. Class 125, RS, Bronze Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Milwaukee Valve Company.
b. NIBCO INC.
c. Watts; a Watts Water Technologies company.

2. Description:

a. Standard: MSS SP-80, Type 2.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Material: Bronze with integral seat and screw-in bonnet.
d. Ends: Threaded or solder joint.
e. Stem: Bronze.
f. Disc: Solid wedge; bronze.
g. Packing: Asbestos free.
h. Handwheel: Malleable iron, bronze, or aluminum.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 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.

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. Use gate valves for shutoff service only.

B. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.

3.5 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 2 (DN 50) and Smaller: Bronze gate valves, Class 125, NRS, RS with soldered, threaded ends.

END OF SECTION

SECTION 22 05 29
HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

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. Metal pipe hangers and supports.
2. Metal framing systems.
3. Thermal-hanger shield inserts.
4. Fastener systems.
5. Pipe positioning systems.
6. Equipment supports.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.4 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, 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.

C. Shop Drawings: Show fabrication and installation details and include calculations for the following; include Product Data for components:

1. Trapeze pipe hangers.
2. Metal framing systems.
3. Equipment supports.

1.5 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.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel or stainless steel.

2.2 METAL FRAMING SYSTEMS

A. MFMA Manufacturer Metal Framing Systems:

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. 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.
3. Standard: MFMA-4.
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.
6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
7. Metallic Coating: Electroplated zinc.

B. Non-MFMA Manufacturer Metal Framing Systems:

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. 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.
3. Standard: Comply with MFMA-4.
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.
6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

2.3 THERMAL-HANGER SHIELD INSERTS

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. Carpenter & Paterson, Inc.
2. Clement Support Services.
3. ERICO International Corporation.
4. National Pipe Hanger Corporation.
5. PHS Industries, Inc.
6. Pipe Shields, Inc.; a subsidiary of Piping Technology & Products, Inc.
7. Piping Technology & Products, Inc.
8. Rilco Manufacturing Co., Inc.
9. Value Engineered Products, Inc.

B. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength and vapor barrier.

C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

E. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.4 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 stainless-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.

2.5 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.

2.6 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.7 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.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
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. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.

C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

D. 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.

E. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.

F. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

H. Install hangers and supports to allow controlled thermal of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

I. Install lateral bracing with pipe hangers and supports to prevent swaying.

J. Install building attachments within concrete slabs or attach to structural steel. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

K. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

L. 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.

M. 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 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Shield Dimensions for Pipe: Not less than the following:

    a. NPS 1/4 to NPS 1-1/2: 12 inches long and 0.048 inch thick.

4. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

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. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

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. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint.

C. 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 metal framing systems and attachments for general service applications.

F. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.

G. Use padded hangers for piping that is subject to scratching.

H. Use thermal-hanger shield inserts for insulated piping and tubing.

I. 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-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. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
5. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8.
6. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.

7. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
8. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
9. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.
10. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3.
11. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
12. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.

J. 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-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.

K. 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. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

L. 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. C-Clamps (MSS Type 23): For structural shapes.
3. 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.
4. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

M. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

N. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

O. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION

SECTION 22 05 53
IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

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. Equipment labels.
2. Pipe labels.
3. Stencils.
4. Valve tags.

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 Stainless steel, 0.025-inch Aluminum, 0.032-inch or anodized aluminum, 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.
4. Fasteners: Stainless-steel rivets or self-tapping screws.
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, 1/16 inch thick, and having predrilled holes for attachment hardware.
2. Letter Color: White.
3. Background Color: Black blue or green.
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.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

C. Label Content: Include equipment's Drawing designation or unique equipment number.

D. 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 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 incheshigh.

2.3 STENCILS

A. Stencils: Prepared with letter sizes according to ASME A13.1 for piping; and minimum letter height of 3/4 inch for access panel and door labels, equipment labels, and similar operational instructions.

1. Stencil Material: Fiberboard or metal.
2. Stencil Paint: Exterior, gloss, alkyd enamel black unless otherwise indicated. Paint may be in pressurized spray-can form.
3. Identification Paint: Exterior, alkyd enamel in colors according to ASME A13.1 unless otherwise indicated.

2.4 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 Stainless steel, 0.025-inch Aluminum, 0.032-inch or anodized aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Fasteners: Brass wire-link or beaded chain; or S-hook wire-link chain or 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 major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Stenciled Pipe Label Option: Stenciled labels may be provided instead of manufactured pipe labels, at Installer's option. Install stenciled pipe labels, complying with ASME A13.1, on each piping system.

1. Identification Paint: Use for contrasting background.
2. Stencil Paint: Use for pipe marking.

B. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces; 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, 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.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

C. Pipe Label Color Schedule:

1. Domestic Water Piping:

    a. Background Color: Black.
    b. Letter Color: White.

2. Sanitary Waste Piping:

    a. Background Color: Black.
    b. Letter Color: White.

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 color scheme and with captions similar to those indicated in the following subparagraphs:

1. Valve-Tag Size and Shape:

    a. Cold Water: 1-1/2 inches, round.
    b. Hot Water: 1-1/2 inches, round.

2. Valve-Tag Color:

    a. Cold Water: Green.
    b. Hot Water: Green.

3. Letter Color:

    a. Cold Water: White.
    b. Hot Water: White.

END OF SECTION

SECTION 22 07 19
PLUMBING PIPING INSULATION

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 insulating the following plumbing piping services:

1. Domestic cold-water piping.
2. Domestic hot-water piping.
3. Supplies and drains for handicap-accessible lavatories.

1.3 ACTION SUBMITTALS

A. Shop Drawings: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied, if any).

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 Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment."

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 field-applied jackets and finishes and for space required for maintenance.

1.6 SCHEDULING

A. Schedule insulation application after pressure testing systems. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Products shall not contain asbestos, lead, mercury, or mercury compounds.

B. 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.

C. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

D. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

E. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Block Insulation: ASTM C 552, Type I.
2. Special-Shaped Insulation: ASTM C 552, Type III.
3. Preformed Pipe Insulation without Jacket: Comply with ASTM C 552, Type II, Class 1.
4. Preformed Pipe Insulation with Factory-Applied [**ASJ**] [**ASJ-SSL**]: Comply with ASTM C 552, Type II, Class 2.
5. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.

F. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type I. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

G. Mineral-Fiber, Preformed Pipe Insulation:

1. Type I, 850 Deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ or factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 INSULATING CEMENTS

A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.

B. Expanded or Exfoliated Vermiculite Insulating Cement: Comply with ASTM C 196.

C. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.

2.3 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. Cellular-Glass Adhesive: Two-component, thermosetting urethane adhesive containing no flammable solvents, with a service temperature range of minus 100 to plus 200 deg F.

1. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Adhesive 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."

C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Adhesive 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."

D. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Adhesive 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."

E. PVC Jacket Adhesive: Compatible with PVC jacket.

1. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Adhesive 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."

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.

1. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
2. Service Temperature Range: Minus 20 to plus 180 deg F.
3. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
4. Color: White.

C. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below-ambient services.

1. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 35-mil dry film thickness.
2. Service Temperature Range: 0 to 180 deg F.
3. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
4. Color: White.

D. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below-ambient services.

1. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 30-mil dry film thickness.
2. Service Temperature Range: Minus 50 to plus 220 deg F.
3. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
4. Color: White.

E. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.

1. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
2. Service Temperature Range: Minus 20 to plus 180 deg F.
3. Solids Content: 60 percent by volume and 66 percent by weight.
4. Color: White.

2.5 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C, Class I, Grade A, and shall be compatible with insulation materials, jackets, and substrates.

1. For indoor applications, use lagging adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers and products. See Section 01 60 00 "Product Requirements."

3. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over pipe insulation.
4. Service Temperature Range: 0 to plus 180 deg F.
5. Color: White.

2.6 SEALANTS

A. Joint Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Permanently flexible, elastomeric sealant.
3. Service Temperature Range: Minus 100 to plus 300 deg F.

4. Color: White or gray.
5. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
6. 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."

B. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F.
4. Color: White.
5. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
6. 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."

2.7 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.8 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Width: 3 inches.
2. Thickness: 11.5 mils.

3. Adhesion: 90 ounces force/inch in width.
4. Elongation: 2 percent.
5. Tensile Strength: 40 lbf/inch in width.
6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Width: 3 inches.
2. Thickness: 6.5 mils.
3. Adhesion: 90 ounces force/inch in width.
4. Elongation: 2 percent.
5. Tensile Strength: 40 lbf/inch in width.
6. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.

1. Width: 2 inches.
2. Thickness: 6 mils.
3. Adhesion: 64 ounces force/inch in width.
4. Elongation: 500 percent.
5. Tensile Strength: 18 lbf/inch in width.

D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Width: 2 inches.
2. Thickness: 3.7 mils.
3. Adhesion: 100 ounces force/inch in width.
4. Elongation: 5 percent.
5. Tensile Strength: 34 lbf/inch in width.

2.9 SECUREMENTS

A. Bands:

1. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316; 0.015 inch thick, 3/4 inch wide with wing seal or closed seal.
2. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 3/4 inch wide with wing seal or closed seal.

B. Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or monel.

C. Wire: 0.080-inch nickel-copper alloy or 0.062-inch soft-annealed, stainless steel.

2.10 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers:

1. 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. 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.

B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:

1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating

manufacturer for appropriate coating materials and application methods for operating temperature range.

C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

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, jackets, 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 or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. 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.

4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.

   a. For below-ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. 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.

P. 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.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall 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.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Section 07 84 13 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies.

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. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

C. Insulate instrument connections for, pressure gages and test connections on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 INSTALLATION OF CELLULAR-GLASS INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of same thickness as pipe insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of cellular-glass insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

3.7 INSTALLATION OF MINERAL-FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.

2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.8 FIELD-APPLIED JACKET INSTALLATION

A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.

1. Draw jacket smooth and tight to surface with 2-inch overlap at seams and joints.
2. Embed glass cloth between two 0.062-inch-thick coats of lagging adhesive.
3. Completely encapsulate insulation with coating, leaving no exposed insulation.

B. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch-wide joint strips at end joints.

5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

C. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints. Seal with manufacturers recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

D. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.9 FINISHES

A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 09 91 13 "Exterior Painting" and Section 09 91 23 "Interior Painting."

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

C. Do not field paint aluminum or stainless-steel jackets.

3.10 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.

3.11 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Cold Water:

1. NPS 1 and Smaller: Insulation shall be the following:

   a. Cellular Glass: 1-1/2 inches thick.
   b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

2. NPS 1-1/4 and Larger: Insulation shall be the following:

   a. Cellular Glass: 1-1/2 inches thick.
   b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1-1/2 inch thick.

B. Exposed Sanitary Drains, Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures for People with Disabilities:

1. All Pipe Sizes: Insulation shall be the following:

   a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

3.12 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Piping, Concealed:

1. PVC: 20 mils thick.

D. Piping, Exposed:

1. PVC: 20 mils thick.

3.13 UNDERGROUND, FIELD-INSTALLED INSULATION JACKET

A. For underground direct-buried piping applications, install underground direct-buried jacket over insulation material.

END OF SECTION

SECTION 22 11 16
DOMESTIC WATER PIPING

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. Under-building-slab and aboveground domestic water pipes, tubes, and fittings inside buildings.
2. Encasement for piping.

1.3 ACTION SUBMITTALS

A. Product Data: For transition fittings and dielectric fittings.

1.4 INFORMATIONAL SUBMITTALS

A. System purging and disinfecting activities report.

B. Field quality-control reports.

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 Annex G.

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.

C. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings.

D. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.

E. Copper Unions:

1. MSS SP-123.
2. Cast-copper-alloy, hexagonal-stock body.
3. Ball-and-socket, metal-to-metal seating surfaces.
4. Solder-joint or threaded ends.

F. Copper Pressure-Seal-Joint Fittings:

1. Fittings for NPS 2 and Smaller: Wrought-copper fitting with EPDM-rubber, O-ring seal in each end.
2. Fittings for NPS 2-1/2 to NPS 4: Cast-bronze or wrought-copper fitting with EPDM-rubber, O-ring seal in each end.

G. Copper-Tube, Extruded-Tee Connections:

1. Description: Tee formed in copper tube according to ASTM F 2014.

2.3 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials:

1. AWWA C110/A21.10, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
2. Full-face or ring type unless otherwise indicated.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free alloys.

D. Flux: ASTM B 813, water flushable.

E. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.4 ENCASEMENT FOR PIPING

A. Standard: ASTM A 674 or AWWA C105/A21.5.

B. Form: Sheet or tube.

C. Color: Black.

2.5 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.

C. Sleeve-Type Transition Coupling: AWWA C219.

2.6 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. Standard: ASSE 1079.
2. Pressure Rating: 125 psig minimum at 180 deg F.
3. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:

1. Standard: ASSE 1079.
2. Factory-fabricated, bolted, companion-flange assembly.
3. Pressure Rating: 125 psig minimum at 180 deg F.
4. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Insulating Kits:

1. Nonconducting materials for field assembly of companion flanges.
2. Pressure Rating: 150 psig.
3. Gasket: Neoprene or phenolic.

4. Bolt Sleeves: Phenolic or polyethylene.
5. Washers: Phenolic with steel backing washers.

E. Dielectric Nipples:

1. Standard: IAPMO PS 66.
2. Electroplated steel nipple complying with ASTM F 1545.
3. Pressure Rating and Temperature: 300 psig at 225 deg F.
4. End Connections: Male threaded or grooved.
5. Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.1 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 underground copper tube in PE encasement according to ASTM A 674 or AWWA C105/A21.5.

D. 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 Section 22 05 19 "Meters and Gages for Plumbing Piping" and with requirements for drain valves and strainers in Section 22 11 19 "Domestic Water Piping Specialties."

E. Install shutoff valve immediately upstream of each dielectric fitting.

F. Install water-pressure-reducing valves downstream from shutoff valves. Comply with requirements for pressure-reducing valves in Section 22 11 19 "Domestic Water Piping Specialties."

G. Install domestic water piping level with 0.25 percent slope downward toward drain and plumb.

H. Rough-in domestic water piping for water-meter installation according to utility company's requirements.

I. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

J. 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.

K. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

L. Install piping to permit valve servicing.

M. 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.

N. Install piping free of sags and bends.

O. Install fittings for changes in direction and branch connections.

P. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

Q. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 22 05 18 "Escutcheons for Plumbing Piping."

3.2 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. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

D. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Brazed Joints" chapter.

E. 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."

F. Pressure-Sealed Joints for Copper Tubing: Join copper tube and pressure-seal fittings with tools recommended by fitting manufacturer.

G. Extruded-Tee Connections: Form tee in copper tube according to ASTM F 2014. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.

H. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.3 TRANSITION FITTING INSTALLATION

A. Install transition couplings at joints of dissimilar piping.

B. Transition Fittings in Aboveground Domestic Water Piping NPS 2 and Smaller: Plastic-to-metal transition fittings or unions.

3.4 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.

3.5 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for seismic-restraint devices in Section 22 05 48 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

B. Comply with requirements for pipe hanger, support products, and installation in Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment."

1. Vertical Piping: MSS Type 8 or 42, clamps.
2. Individual, Straight, Horizontal Piping Runs:

    a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.

c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.

E. 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.
3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.

F. Install supports for vertical copper tubing every 10 feet.

G. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4 and Smaller: 84 inches with 3/8-inch rod.
2. NPS 1-1/2: 108 inches with 3/8-inch rod.

H. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

3.6 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.

IDENTIFICATION

E. Identify system components. Comply with requirements for identification materials and installation in Section 22 05 53 "Identification for Plumbing Piping and Equipment."

F. Label pressure piping with system operating pressure.

3.7 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.

3.8 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
4. Remove and clean strainer screens. Close drain valves and replace drain plugs.
5. Check plumbing specialties and verify proper settings, adjustments, and operation.
6. Clean all aerators.

3.9 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. Clean non-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 procedures prescribed by authorities having jurisdiction or; if methods are not prescribed, follow procedures described below:

a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
b. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

C. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.

D. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.10 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.

B. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.

C. Under-building-slab, domestic water, building-service piping, NPS 3 and smaller, shall be the following:

1. Soft copper tube, ASTM B 88, Type K; no joints.

D. Aboveground domestic water piping, NPS 2 and smaller, shall be one of the following:

1. Hard copper tube, ASTM B 88, Type L; wrought-copper, solder-joint fittings; and soldered joints.
2. Hard copper tube, ASTM B 88, Type L; copper pressure-seal-joint fittings; and pressure-sealed joints.

3.11 VALVE SCHEDULE

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Shutoff Duty: Use ball or gate valves for piping NPS 2 and smaller.
2. Drain Duty: Hose-end drain valves.

B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

C. Iron grooved-end valves may be used with grooved-end piping.

END OF SECTION

SECTION 22 11 19
DOMESTIC WATER PIPING SPECIALTIES

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. Backflow preventers.
2. Water pressure-reducing valves.
3. Temperature-actuated, water mixing valves.
4. Strainers.
5. Hose bibbs.
6. Drain valves.
7. Water-hammer arresters.
8. Trap-seal insert systems.
9. Specialty valves.
10. Flexible connectors.

B. Related Requirements:
1. Section 22 05 19 "Meters and Gages for Plumbing Piping" for thermometers, pressure gages, and flow meters in domestic water piping.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For domestic water piping specialties.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

A. Potable-water piping and components shall comply with NSF 61 Annex G and NSF 14.

2.2 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

2.3 VACUUM BREAKERS

A. Hose-Connection Vacuum Breakers:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Watts; a Watts Water Technologies company.
      b. Woodford Manufacturing Company.
      c. Zurn Industries, LLC.
   2. Standard: ASSE 1011.
   3. Body: Bronze, nonremovable, with manual drain.
   4. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
   5. Finish: Chrome plated.

2.4 BACKFLOW PREVENTERS

A. Reduced-Pressure-Principle Backflow Preventers:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. FEBCO.
      b. Watts; a Watts Water Technologies company.
      c. Zurn Industries, LLC.
   2. Standard: ASSE 1013.
   3. Operation: Continuous-pressure applications.
   4. Pressure Loss: 12 psig maximum, through middle third of flow range.
   5. Body: Bronze for NPS 2 and smaller.

6. Configuration: Designed for vertical flow.
7. Accessories:
   a. Valves NPS 2 and Smaller: Ball type with threaded ends on inlet and outlet.
   b. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

B. Backflow-Preventer Test Kits:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. FEBCO.
   b. Watts; a Watts Water Technologies company.
   c. Zurn Industries, LLC.
2. Description: Factory calibrated, with gages, fittings, hoses, and carrying case with test-procedure instructions.

2.5 WATER PRESSURE-REDUCING VALVES

A. Water-Control Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. CLA-VAL Automatic Control Valves.
   b. Watts; a Watts Water Technologies company.
   c. Zurn Industries, LLC.
2. Description: Pilot-operated, diaphragm-type, single-seated, main water-control valve.
3. Pressure Rating: Initial working pressure of 150 psig minimum with AWWA C550 or FDA-approved, interior epoxy coating. Include small pilot-control valve, restrictor device, specialty fittings, and sensor piping.
4. Main Valve Body: Cast- or ductile-iron body with AWWA C550 or FDA-approved, interior epoxy coating; or stainless-steel body.
5. Design Inlet Pressure: Varies.
6. Design Outlet Pressure Setting: 55 psig.
7. End Connections: Threaded for NPS 2 and smaller.

2.6 TEMPERATURE-ACTUATED, WATER MIXING VALVES

A. Individual-Fixture, Water Tempering Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Eemax, Inc.
   b. Lawler Manufacturing Company, Inc.
   c. Leonard Valve Company.
   d. Watts; a Watts Water Technologies company.

2. Standard: ASSE 1070, thermostatically controlled, water tempering valve.
3. Pressure Rating: 125 psig minimum unless otherwise indicated.
4. Body: Bronze body with corrosion-resistant interior components.
5. Temperature Control: Adjustable.
6. Inlets and Outlet: Threaded.
7. Finish: Rough or chrome-plated bronze.
8. Tempered-Water Setting: 110°F.

2.7 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.

2.8 HOSE BIBBS

A. Hose Bibbs:
1. Standard: ASME A112.18.1 for sediment faucets.
2. Body Material: Bronze.
3. Seat: Bronze, replaceable.
4. Supply Connections: NPS 3/4 threaded or solder-joint inlet.
5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
6. Pressure Rating: 125 psig.
7. Vacuum Breaker: Integral or field-installation, nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
8. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
9. Finish for Finished Rooms: Chrome or nickel plated.
10. Operation for Equipment Rooms: Wheel handle.
11. Operation for Finished Rooms: Operating key.
12. Include operating key with each operating-key hose bibb.
13. Include integral wall flange with each chrome-plated hose bibb.

2.9 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves:
1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 400-psig minimum CWP.
3. Size: NPS 3/4.
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.

9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

B. Gate-Valve-Type, Hose-End Drain Valves:
1. Standard: MSS SP-80 for gate valves.
2. Pressure Rating: Class 125.
3. Size: NPS 3/4.
4. Body: ASTM B 62 bronze.
5. Inlet: NPS 3/4 threaded or solder joint.
6. Outlet: Garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

2.10 WATER-HAMMER ARRESTERS

A. Water-Hammer Arresters:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. AMTROL, Inc.
   b. Josam Company.
   c. Watts; a Watts Water Technologies company.
2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: Metal bellows.
4. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

2.11 TRAP-SEAL INSERT DEVICE

A. Trap-Seal Device:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. MIFAB, Inc.
   b. Sure Seal Mfg.
   c. Proset Systems, Inc.
2. Size: Same as waste piping served.

2.12 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Flex-Hose Co., Inc.
2. Unaflex.
3. Vibration Mountings and Controls, Inc.

B. Stainless-Steel-Hose Flexible Connectors: Corrugated-stainless-steel tubing with stainless-steel wire-braid covering and ends welded to inner tubing.
   1. Working-Pressure Rating: Minimum 200 psig.
   2. End Connections NPS 2 and Smaller: Threaded steel-pipe nipple.
   3. End Connections NPS 2-1/2 and Larger: Flanged steel nipple.

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 backflow preventer. Simple air breaks are unacceptable for this application.
   3. Do not install bypass piping around backflow preventers.

B. Install water-control valves with inlet and outlet shutoff valves and bypass valve. Install pressure gages on inlet and outlet.

C. Install Y-pattern strainers for water on supply side of each backflow preventer.

D. Install water-hammer arresters in water piping according to PDI-WH 201.

E. Install vacuum relief vents at high points of water piping.

3.2 CONNECTIONS

A. Comply with requirements for ground equipment in Section 26 05 26 "Grounding and Bonding for Electrical Systems."

3.3 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:
   1. Reduced-pressure-principle backflow preventers.
   2. Water pressure-reducing valves.

B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Section 22 05 53 "Identification for Plumbing Piping and Equipment."

3.4 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.

3.5 ADJUSTING

A. Set field-adjustable pressure set points of water pressure-reducing valves.

B. Set field-adjustable temperature set points of temperature-actuated, water mixing valves.

END OF SECTION

SECTION 22 13 16
SANITARY WASTE AND VENT PIPING

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. Pipe, tube, and fittings.
2. Specialty pipe fittings.
3. Encasement for underground metal piping.

1.3 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:

1. Soil, Waste, and Vent Piping: 10-foot head of water.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.5 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

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 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 74, Extra Heavy class(es).

B. Gaskets: ASTM C 564, rubber.

C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

2.3 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. Heavy-Duty, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

   a. ANACO-Husky.
   b. Charlotte Pipe and Foundry.
   c. Fernco Inc.

2. Standards: ASTM C 1277 and ASTM C 1540.

3. Description: Stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.4 DUCTILE-IRON PIPE AND FITTINGS

A. Ductile-Iron, Mechanical-Joint Piping:

1. Ductile-Iron Pipe: AWWA C151/A21.51, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.

2. Ductile-Iron Fittings: AWWA C110/A21.10, mechanical-joint, ductile- or gray-iron standard pattern or AWWA C153/A21.53, ductile-iron compact pattern.
3. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

B. Ductile-Iron, Push-on-Joint Piping:

1. Ductile-Iron Pipe: AWWA C151/A21.51, with push-on-joint bell and plain spigot end unless grooved or flanged ends are indicated.
2. Ductile-Iron Fittings: AWWA C110/A21.10, push-on-joint ductile- or gray-iron standard pattern or AWWA C153/A21.53, ductile-iron compact pattern.
3. Gaskets: AWWA C111/A21.11, rubber.

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. Shielded, Nonpressure Transition Couplings:

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) Cascade Waterworks Mfg. Co.
2) Mission Rubber Company, LLC; a division of MCP Industries.

b. Standard: ASTM C 1460.

c. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

2.6 ENCASEMENT FOR UNDERGROUND METAL PIPING

A. Standard: ASTM A 674 or AWWA C105/A 21.5.

B. Material: high-density, cross-laminated polyethylene film of 0.004-inch minimum thickness.

C. Form: Sheet or tube.

D. Color: Black or natural.

PART 3 - EXECUTION

3.1 EARTH MOVING

A. Comply with requirements for excavating, trenching, and backfilling specified in Section 31 20 00 "Earth Moving."

3.2 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 at indicated slopes.

F. Install piping free of sags and bends.

G. Install fittings for changes in direction and branch connections.

H. Install piping to allow application of insulation.

I. 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.

J. 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.

K. 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. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

L. 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.

M. Install steel piping according to applicable plumbing code.

N. Install stainless-steel piping according to ASME A112.3.1 and applicable plumbing code.

O. Install aboveground copper tubing according to CDA's "Copper Tube Handbook."

P. Install aboveground ABS piping according to ASTM D 2661.

Q. Install aboveground PVC piping according to ASTM D 2665.

R. Install engineered soil and waste drainage and vent piping systems as follows:

1. Combination Waste and Vent: Comply with standards of authorities having jurisdiction.
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. Plumbing Specialties:

1. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary drainage gravity-flow piping. Install cleanout fitting with closure plug inside the building in sanitary drainage force-main piping. Comply with requirements for cleanouts specified in Section 22 13 19 "Sanitary Waste Piping Specialties."

T. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

U. Install sleeves for piping penetrations of floors.

V. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 22 05 18 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

A. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

B. Join hub-and-spigot, cast-iron soil piping with calked joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead-and-oakum calked joints.

C. 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.

3.4 SPECIALTY PIPE FITTING INSTALLATION

A. Transition Couplings:

1. Install transition couplings at joints of piping with small differences in OD's.
2. In Drainage Piping: Shielded, nonpressure transition couplings.

3.5 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hanger and support devices and installation specified in Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment."

1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
2. Install carbon-steel pipe support clamps for vertical piping in noncorrosive 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.

5. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Support horizontal piping and tubing within 12 inches of each fitting, and coupling.

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.

E. 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.

F. Install supports for vertical cast-iron soil piping every 15 feet.

3.6 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. 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.

D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

3.7 IDENTIFICATION

A. Identify exposed sanitary waste and vent piping. Comply with requirements for identification specified in Section 22 05 53 "Identification for Plumbing Piping and Equipment."

3.8 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.

3.9 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.

3.10 PIPING SCHEDULE

A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.

B. Aboveground, soil and waste piping NPS 4 and smaller shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; heavy-duty hubless-piping couplings; and coupled joints.

C. Aboveground, vent piping NPS 4 and smaller shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; heavy-duty hubless-piping couplings; and coupled joints.

D. Underground, soil, waste, and vent piping NPS 4 and smaller shall be any of the following:

1. Extra Heavy class, cast-iron soil piping; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; heavy-duty hubless-piping couplings; and coupled joints.

END OF SECTION

SECTION 22 13 19
SANITARY WASTE PIPING SPECIALTIES

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. Cleanouts.
2. Floor drains.
3. Miscellaneous sanitary drainage piping specialties.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For drainage piping specialties to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 CLEANOUTS

A. Exposed Metal Cleanouts:

1. ASME A112.36.2M, Cast-Iron Cleanouts:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Josam Company.
2) Smith, Jay R. Mfg. Co.
3) Watts; a Watts Water Technologies company.

2. Standard: ASME A112.36.2M for cast iron for cleanout test tee.

3. Size: Same as connected drainage piping
4. Body Material: Hub-and-spigot, cast-iron soil pipe T-branch, Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: Plastic plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

B. Metal Floor Cleanouts:

1. ASME A112.36.2M, Cast-Iron Cleanouts:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Josam Company.
2) Smith, Jay R. Mfg. Co.
3) Watts; a Watts Water Technologies company.

2.2 FLOOR DRAINS

A. Cast-Iron Floor Drains:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Josam Company.
b. Smith, Jay R. Mfg. Co.
c. Watts; a Watts Water Technologies company.

2. Standard: ASME A112.6.3.

3. Pattern: Floor drain.
4. Body Material: Gray iron.
5. Seepage Flange: Required.
6. Outlet: Bottom.
7. Top or Strainer Material: Bronze.
8. Top of Body and Strainer Finish: Polished bronze.
9. Top Shape: Round.
10. Top Loading Classification: Medium Duty.
11. Trap Material: Cast iron.
12. Trap Pattern: Deep-seal P-trap.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller.

B. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

C. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

D. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Position floor drains for easy access and maintenance.
2. Set floor drains below elevation of surrounding finished floor to allow floor drainage.
3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring.
4. Install individual traps for floor drains connected to sanitary building drain.

E. Install deep-seal traps on floor drains.

F. Install floor-drain, trap-seal device on inlet to floor drains.

G. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

3.2 CONNECTIONS

A. Comply with requirements in Section 22 13 16 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

3.3 FLASHING INSTALLATION

A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:

B. Secure flashing into sleeve and specialty clamping ring or device.

C. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings.

D. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

3.4 LABELING AND IDENTIFYING

A. Nameplates and signs are specified in Section 22 05 53 "Identification for Plumbing Piping and Equipment."

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.6 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION

SECTION 22 33 00
ELECTRIC, DOMESTIC-WATER HEATERS

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. Thermostat-control, electric, tankless, domestic-water heaters.

1.3 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.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of commercial 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.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For electric, domestic-water heaters to include in operation, and maintenance manuals.

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. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1.

C. NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61 Annex G, "Drinking Water System Components - Health Effects."

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 COMMERCIAL, ELECTRIC, DOMESTIC-WATER HEATERS

2.2 ELECTRIC, TANKLESS, DOMESTIC-WATER HEATERS

A. Thermostat-Control, Electric, Tankless, Domestic-Water Heaters:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

   a. Eemax Inc.
   b. Stiebel Eltron Inc.
   c. Rheem Manufacturing Company

2. Standard: UL 499 for electric, tankless, (domestic-water heater) heating appliance.

3. Construction: Copper piping or tubing complying with NSF 61 Annex G barrier materials for potable water, without storage capacity.

   a. Connections: ASME B1.20.1 pipe thread.
   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.

4. Support: Bracket for wall mounting.
5. Capacity and Characteristics:

   a. Temperature Setting: 110 deg F.
   b. Electrical Characteristics:

      1) Volts: 240.
      2) Phases: Single.
      3) Hertz: 60.
      4) Full-Load Amperes: 40.

2.3 DOMESTIC-WATER HEATER ACCESSORIES

A. Domestic-Water Compression Tanks:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. AMTROL, Inc.
b. Taco, Inc.
c. Watts Water Technologies.

2. Description: Steel pressure-rated tank constructed with welded joints and factory-installed butyl-rubber diaphragm. Include air precharge to minimum system-operating pressure at tank.

3. Construction:

a. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1 pipe thread.
b. Interior Finish: Comply with NSF 61 Annex G barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
c. Air-Charging Valve: Factory installed.

4. Capacity and Characteristics:

a. Working-Pressure Rating: 150 psig.
b. Capacity Acceptable: 2 gal. minimum.

B. Vacuum Relief Valves: ANSI Z21.22/CSA 4.4.

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 specified in Section 22 05 23.12 "Ball Valves for Plumbing Piping," Section 22 05 23.13 "Butterfly Valves for Plumbing Piping," and Section 22 05 23.15 "Gate Valves for Plumbing Piping."

C. Charge domestic-water compression tanks with air.

3.2 CONNECTIONS

A. Comply with requirements for piping specified in Section 22 11 16 "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 22 05 53 "Identification for Plumbing Piping and Equipment."

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.
3. 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.

END OF SECTION

SECTION 22 46 00
SECURITY PLUMBING FIXTURES

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. Water closets.
2. Lavatories.

1.3 DEFINITIONS

A. Accessible Service Space: Service area in secure space behind wall-mounted fixtures.

B. Back-Access Fixture: Security plumbing fixture designed to mount on wall sleeve built into wall or on wall, so installation and removal of fixture, piping, and other components are accessible only from service space behind wall.

C. Front-Access Fixture: Security plumbing fixture designed to mount on wall with installation and removal from fixture side of wall, and with piping and other components accessible only from access panel in fixture.

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 security plumbing fixtures.
2. Include rated capacities, operating characteristics, and furnished specialties and accessories.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For security plumbing fixtures and components to include in maintenance manuals.

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. Flushometer-Valve Repair Kits: Equal to 10 percent of quantity of each type installed, but no fewer than six of each type.

PART 2 - PRODUCTS

2.1 STAINLESS-STEEL WATER CLOSETS

A. Water Closets: Front access, off floor, back outlet, extended bowl.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Acorn Manufacturing Company, Inc.
   b. Metcraft Industries, Inc.
   c. Willoughby Industries.

2. Standard: IAPMO PS 61.

3. Material: 0.078-inch-minimum-thick stainless steel; corrosion-resistant metal for internal piping and bracing.
4. Finish: ASTM A 480/A 480M, No. 4 polished finish on exposed surfaces.
5. Bowl:

a. Type: Elongated, with back inlet, integral trap, and blowout jet design with back outlet, contoured seat, and access panel.
b. Length to Wall: Minimum of 24-1/4 inches.
c. Back-Outlet Connection: NPS 4, horizontal with cleanout and slip joint.
d. Seat Surface: ASTM A 480/A 480M, No. 7 polished finish.

6. Mounting: Bolts from fixture-mounted flanges into wall.

2.2 FLUSHOMETER VALVES

A. Flushometer Valves: Push button, diaphragm.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Delany Products.
b. Sloan Valve Company.
c. Zurn Industries, LLC.

2. Standard: ASSE 1037.

3. Minimum Pressure Rating: 125 psig.
4. Features: Integral check stops and backflow-prevention device.
5. Material: Brass body with corrosion-resistant components.
6. Exposed Flushometer-Valve Finish: Chrome plated.
7. Panel Finish: Chrome plated or stainless steel.
8. Style: Concealed.
9. Consumption: 1.6 gal. per flush.
10. Minimum Inlet: NPS 1.
11. Minimum Outlet: NPS 1-1/4.

2.3 STAINLESS-STEEL LAVATORIES

A. Lavatories: Front access.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Acorn Engineering Company.
b. Metcraft Industries, Inc.
c. Willoughby Industries.

2. Fixture:

a. Standard: IAPMO PS 61.
b. Material: 0.078-inch- minimum-thick stainless steel; corrosion-resistant metal for internal piping and bracing.
c. Finish: ASTM A 480/A 480M, No. 4 polished finish on exposed surfaces.
d. Receptor: rectangular bowl with integral soap depression, backsplash, and access panel.
e. Single Hot/Cold Water Supply Valve: Mechanical-metering type with push-button actuation, individual check stops, and deck-mounted filler spouts complying with ASME A112.18.1/CSA B125.1. 1.0 GPM minimum maximum flow.
f. Drain: Integral punched grid with NPS 1-1/4 minimum horizontal waste and trap complying with ASME A112.18.2/CSA B125.2.

3. Mounting: Bolts from fixture-mounted flanges into wall.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before fixture installation.

B. Examine walls and 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 security plumbing fixtures level and plumb according to roughing-in drawings.

B. Install back-access, stainless-steel fixtures as follows:

1. Install wall sleeve in wall if indicated.
2. Install fixture on wall sleeve or wall, as indicated, with access from accessible service space.
3. Extend supply piping from service space to fixture.
4. Install soil and waste piping from fixture and extend into service space.
5. Install fixture trap in service space instead of below fixture drain.

C. Install front-access, stainless-steel fixtures as follows:

1. Install fixture support or mounting bracket.
2. Install fixture on support; mount components inside of or attached to fixture.
3. Extend supply piping from pipe space to fixture.
4. Install trap below fixture and extend soil and waste piping into pipe space.

D. Install fixture outlets with gasket seals.

E. Install fixtures designated "accessible" according to ICC A117.1 for heights, dimensions, and clearances.

F. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible fixtures. Comply with requirements in Section 22 07 19 "Plumbing Piping Insulation."

G. Seal joints between fixtures, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color.

H. 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 22 05 18 "Escutcheons for Plumbing Piping."

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 requirements for water piping specified in Section 22 11 16 "Domestic Water Piping."

C. Comply with requirements for soil and waste drainage piping specified in Section 22 13 16 "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

A. Operate and adjust flushometer valves and flow-control valves on fixtures.

3.5 CLEANING AND PROTECTION

A. After installing fixtures, inspect and repair damaged finishes.

B. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.

C. Provide protective covering for installed fixtures and fittings.

D. Do not allow use of fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION

SECTION 22 47 13
DRINKING FOUNTAINS

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 drinking fountains and related components.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of drinking fountain.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include operating characteristics, and furnished specialties and accessories.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For drinking fountains to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 DRINKING FOUNTAINS

A. Drinking Fountains: Stainless steel, wall mounted.

1. Stainless-Steel Drinking Fountains:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Elkay Manufacturing Co.
2) Halsey Taylor.
3) Oasis International; a Lynn Tilton company.

2. Standards:

   a. Comply with ASME A112.19.3/CSA B45.4.
   b. Comply with NSF 61 Annex G.
3. Receptor Shape: Rectangular.
4. Back Panel: wall plate behind drinking fountain.
5. Bubblers: Two, with adjustable stream regulator, located on deck.
6. Control: Push button.
7. Drain: Grid type with NPS 1-1/4 tailpiece.
8. Supply: NPS 1/2 with shutoff valve.
9. Waste Fitting: ASME A112.18.2/CSA B125.2, NPS 1-1/4 waste.
10. Support: Supplied with product.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for water-supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before fixture installation.

B. Examine walls and 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 fixtures level and plumb according to roughing-in drawings. ADA, install at height required by authorities having jurisdiction.

B. Install off-the-floor carrier supports, affixed to building substrate, for wall-mounted fixtures.

C. Install water-supply piping with shutoff valve on supply to each fixture to be connected to domestic-water distribution piping. Use ball or gate valve. Install valves in locations where they can be easily reached for operation. Valves are specified in Section 22 05 23.12 "Ball Valves for Plumbing Piping" and Section 22 05 23.15 "Gate Valves for Plumbing Piping."

D. Install trap and waste piping on drain outlet of each fixture to be connected to sanitary drainage system.

E. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons where required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 22 05 18 "Escutcheons for Plumbing Piping."

F. Seal joints between fixtures and walls using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color.

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 22 11 16 "Domestic Water Piping."

C. Install ball or gate shutoff valve on water supply to each fixture. Comply with valve requirements specified in Section 22 05 23.12 "Ball Valves for Plumbing Piping" and Section 22 05 23.15 "Gate Valves for Plumbing Piping."

D. Comply with soil and waste piping requirements specified in Section 22 13 16 "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

A. Adjust fixture flow regulators for proper flow and stream height.

3.5 CLEANING

A. After installing fixtures, inspect unit. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.

B. Clean fixtures, on completion of installation, according to manufacturer's written instructions.

C. Provide protective covering for installed fixtures.

D. Do not allow use of fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION

SECTION 230000
BASIC HVAC REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes Basic HVAC (Mechanical) Requirements applicable to all Division 23 Sections.

1.2 PRODUCTS

A. Furnish products of qualified manufacturers suitable for intended use. Furnish products of each type by single manufacturer unless specified otherwise.

1.3 MANUFACTURER INSTALLATION INSTRUCTIONS

A. When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting and finishing to Architect/Engineer in quantities specified for product data.

B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.4 MANUFACTURER CERTIFICATES

A. When specified in individual specification sections, submit certification by manufacturer to Architect/Engineer in quantities specified for product data.

B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

C. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect/Engineer.

1.5 REGULATORY REQUIREMENTS

A. Conform to:
1. The Virginia Uniform Statewide Building Code including referenced codes and standards.

2. Industry Standards, Codes and Specifications:
   a. ANSI: American National Standards Institute.
   b. ARI: Air-Conditioning and Refrigeration Institute.
   c. ASHRAE: American Society of Heating, Refrigeration and Air Conditioning Engineers.
   d. ASME: American Society of Mechanical Engineers.
   e. ASTM: American Society for Testing and Materials.
   f. AWS: American Welding Society.
   g. AWWA: American Water Works Association.
   h. CISPI: Cast Iron Soil Pipe Institute.
   i. ICC: International Code Council, Inc.
   j. MSS: Manufacturers Standardization Society of the Valve & Fittings Industry, Inc.
   k. NAIMA: North American Insulation Manufacturers Association.
   l. NBS: National Bureau of Standards.
   m. NFPA: National Fire Protection Association.
   n. SMACNA: Sheet Metal and Air Conditioning Contractors.
   o. UL: Underwriters Laboratories, Inc.
   p. USASI: United States of America Standards Institute.
   q. VDOT: Virginia Department of Transportation.

B. Obtain permits and request inspections from authority having jurisdiction.

1.6 PROJECT/SITE CONDITIONS

A. Install work in locations shown on drawings, unless prevented by project conditions. The drawings show the general arrangement of all piping, ductwork, equipment and appurtenances and shall be followed as closely as actual building construction and the work of other trades will permit. The work shall conform to the requirements shown on all of the drawings. Because of the small scale of the drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall investigate the structural and finish conditions affecting the work and shall arrange his work accordingly, providing such fittings, valves, offsets, transitions and other accessories as may be required to meet such conditions.

B. Prepare drawings showing proposed re-arrangement of work to meet project conditions, including changes to work specified in other Sections. Obtain permission of Architect/Engineer before proceeding.

1.7 EXCAVATION AND BACKFILLING FOR HVAC WORK

A. Provide excavation and backfilling required for HVAC work in accordance with the requirements of Division 31 Sections.

1.8 PAINTING

A. Refer to Division 9 - Paints and Coatings: Product and execution requirements for painting specified by this section.

B. HVAC equipment, related piping, ductwork and materials do not require painting except as indicated below:
   1. Painting is not required for equipment having a factory applied finish except touch-up with matching finish where factory finish is damaged.
   2. Piping (except insulated and jacketed piping), fabricated supports, and any unfinished or unprotected materials located outdoors shall be painted with a suitable primer and compatible finish paint. Color shall be as directed by Architect/Engineer.
   3. Paint inside of ductwork with matte black paint where visible behind air inlets and outlets.

C. Protection of work: Painting shall be done with care to protect work and work of other trades. All damage caused by the painting operations shall be corrected, repaired and cleaned as required. Hardware, special control items, gages, thermometers, nameplates, instrument glass and other similar items shall be removed or properly protected during the painting operation to ensure that these items are not covered or splattered with paint.

1.9 ELECTRICAL PROVISIONS

A. Low voltage (less than 100 volts) control wiring and connections for equipment specified in Division 23 shall be provided under Division 23. All line voltage (100 volts and greater) field control wiring and connections for equipment furnished under Division 23, all power wiring, and all related electric supply and disconnecting equipment and wiring shall be provided under Division 26. Line voltage field wiring for equipment furnished under Division 23 shall be accomplished under the supervision of the Division 23 subcontractor.

1.10 WARRANTY

A. All materials and workmanship shall be warranted to be free from defects for a period of one (1) year from date of acceptance and Contractor shall make good, without additional cost to the Owner, any defects which may appear within that period. Manufacturer’s warranties extending beyond one year shall be processed and turned over to the Owner.

1.11 CLOSEOUT PROCEDURES: OPERATION AND MAINTENANCE MANUALS

A. Comply with requirements of Division 1 Sections and the following requirements.

B. Submit data on 8-1/2 x 11 inch text pages, bound in three ring binders with durable plastic or cloth covers.

C. Prepare binder cover with printed title “Operation and Maintenance Instructions”, title or project, and subject matter of binder when multiple binders are required.

D. Internally subdivide the binder contents with permanent page dividers, logically organized, with minimum content as described below.

E. Contents:
   1. Name of manufacturer.
   2. Name, address and telephone number of nearest manufacturer’s representative.
   3. Copy of latest approved submittal including all review comments.
   4. Manufacturer’s installation, operation and maintenance instructions including lubrication data.
   5. Parts numbers for all replaceable items.
   6. Serial numbers of all principal items of equipment.
   7. Control diagrams and sequence of operation.
   8. Manufacturer’s written warranties that extend beyond the Contractor’s one year warranty.

F. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect/Engineer [and Commissioning Authority] will comment on whether general scope and content of manual are acceptable. Revise content of all document sets as required prior to final submittal.

G. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect/Engineer [and Commissioning Authority] will return copy with comments.

PART 2 PRODUCTS

2.1 EQUIPMENT AND MATERIALS

A. Dimensions: The Contractor shall verify that items to be furnished fit the space available. He shall make field measurements to ascertain space requirements, including those for connections and maintenance, and shall

furnish and install such sizes and shapes of equipment that the final installation shall suit the true intent and meaning of the drawings and specifications. Should he conclude that there is insufficient space for installation of specified materials, he shall immediately notify the Architect/Engineer of the conflict and shall stop affected work until he receives instructions as to how to proceed from the Architect/Engineer.

B. When substitution of equipment or materials requires changes or revisions to the arrangement, layout or design of any system, drawings showing these changes or revisions shall be submitted for review, along with other required submittal data. The costs of all such changes and revisions shall be borne by the Contractor.

C. Similar items shall be provided by a single manufacturer.

2.2 EQUIPMENT ACCESSORIES

A. The Contractor shall furnish and install all equipment, accessories, connections and incidental items necessary to fully complete the work ready for use, occupancy and operation by the Owner.

B. Equipment or Connections Different from those Shown: Where equipment requiring different arrangement of connections from those shown is proposed by the Contractor, and is acceptable to the Architect/Engineer, it shall be the responsibility of the Contractor to install the equipment to operate properly and in harmony with the intent of the drawings and specifications. The Contractor shall make all incidental changes in piping, ductwork, supports, insulation, heaters, controls and other associated facilities. He shall provide all additional equipment required for proper operation of the system, including all required changes in affected trades. The Contractor shall be responsible for the proper location of rough-in and connections. All such changes shall be made at no increase in cost to the Owner.

C. Drives and Belt Guards: The Contractor shall provide for each chain or belt drive, rotating shaft, coupling or other moving parts, a protective guard which shall be securely bolted to the equipment base or apparatus. The guard shall completely enclose all moving parts and be constructed to comply with all safety requirements. For double inlet fans, the belt guard shall be arranged so as not to restrict the air flow into the fan inlet. Guards shall not interfere with lubrication of equipment.

D. Supports: The Contractor shall support plumb, rigid and true to line all work and equipment furnished. The Contractor shall study thoroughly all general, structural and HVAC (mechanical) drawings, shop drawings and catalog data to determine how equipment, fixtures, piping, ductwork, etc.,

are to be supported, mounted or suspended and shall provide extra steel bolts, inserts, pipe stands, brackets and accessories for proper support whether or not shown on the drawings. When directed, the Contractor shall submit drawings showing supports for review by the Architect/Engineer.

2.3 ACCESS DOORS

A. General: Access doors shall be provided for all concealed valves, controls, dampers, damper operators and any other equipment or material requiring inspection or maintenance. Access doors shall be furnished for floors, walls, and ceilings, or adequate size so that the concealed items will be readily accessible for servicing or for removal and replacement if necessary.

B. Access Doors: Provide access doors in accordance with requirements of Division 8 Sections.

PART 3 EXECUTION

3.1 INSTALLATION OF EQUIPMENT

A. All equipment and materials specified in this Division shall be installed in accordance with the manufacturer's instructions including, but not limited to, the following:
   1. Storage, handling, rigging, and installation shall be accomplished using means and methods recommended by the manufacturer.
   2. Location and orientation of equipment shall provide the indicated operation and performance and shall also provide the recommended unobstructed clearances around equipment for maintenance and repair.
   3. Provide accessories and incidental materials recommended by the manufacturer.

3.2 COORDINATION

A. Offsets, transitions and changes in direction in pipes and ducts shall be made as required to maintain proper head room, clearances and pitch of sloping lines whether or not indicated on the drawings. The Contractor shall furnish and install all fittings, traps, drains, air vents, etc., as required to effect these offsets, transitions and changes in direction.

B. Ductwork: Exact arrangement and routing of ductwork shall be determined at the job site prior to beginning fabrication of any ductwork. The Contractor shall provide offsets and transitions, and change the cross-sectional dimensions of ductwork when required to meet job conditions but

shall maintain at lease the same equivalent cross-sectional area. The Contractor shall secure the approval of the Architect/Engineer prior to fabrication of ductwork requiring such changes.

C. Drawings by the Contractor: When directed by the Architect/Engineer, the Contractor shall submit for review drawings clearly showing certain portions of the HVAC work and it's relation to the work of other trades before commencing shop fabrication or erection at the project site.

3.3 DELIVERY, STORAGE AND HANDLING

A. Deliver products to project site identified with names, model numbers, types, grades, compliance labels, and other information needed for distinct identification; adequately packaged and protected to prevent damage during shipment, storage and handling. Protect stored equipment and materials from damage. Comply with manufacturer's rigging and moving instructions for unloading equipment and moving into final location.

3.4 INSTALLATION OF ACCESS DOORS

A. Install access doors at all concealed valves, controls, dampers, damper operators, other equipment or materials requiring inspection or maintenance, where indicated and where required by Code, in accordance with manufacturer's written instructions and in compliance with industry practices.

B. Coordinate with other work, including substrate construction work, as necessary to interface installation of access doors with other work.

C. Locate each access door accurately in relation to the item requiring access.

D. Install in accordance with requirements of Division 8 Sections.

END OF SECTION

SECTION 230513
COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

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 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.

1.3 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. 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.

C. 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

SECTION 230593

TESTING, ADJUSTING, AND BALANCING FOR HVAC

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. Balancing Air Systems:

a. Constant-volume air systems.

1.3 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. NEBB: National Environmental Balancing Bureau.

C. TAB: Testing, adjusting, and balancing.

D. TAB Specialist: An entity engaged to perform TAB Work.

1.4 ACTION SUBMITTALS

A. Qualification Data: Within 30 days of Contractor's Notice to Proceed, submit documentation that the TAB contractor and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article. Provide the name and qualifications of the TAB Field Supervisor assigned to this project.

B. Certified TAB reports: Furnish reports in letter size binder manuals, complete with table of contents page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.

1. Include instrument calibration reports. Provide the following:

a. Instrument type and make.
b. Serial number.
c. Application.
d. Dates of use.
e. Dates of calibration.

1.5 INFORMATIONAL SUBMITTALS

A. Contract Documents Examination Report: Within 30 days of Contractor's Notice to Proceed, submit the Contract Documents review report as specified in Part 3.

B. Strategies and Procedures Plan: Within 60 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.

1.6 QUALITY ASSURANCE

A. TAB Contractor Qualifications:
1. Engage a TAB contractor certified by AABC or NEBB, specializing in testing, adjusting, and balancing of systems specified in this section. The company shall not be affiliated in any way with the contractor, equipment suppliers or installers.
2. Perform Work under on-site supervision of AABC Certified Test and Balance Engineer or NEBB Certified Testing, Adjusting and Balancing Supervisor.
   a. TAB Field Supervisor: Employee of the TAB contractor and certified by AABC or NEBB.
   b. TAB Technician: Employee of the TAB contractor and who is certified by AABC or NEBB as a TAB technician.

B. TAB Conference: Meet with Owner on approval of the TAB strategies and procedures plan to develop a mutual understanding of the details. Require the participation of the TAB field supervisor and technicians. Provide seven days' advance notice of scheduled meeting time and location.

1. Agenda Items:

   a. The Contract Documents examination report.
   b. The TAB plan.
   c. Coordination and cooperation of trades and subcontractors.
   d. Coordination of documentation and communication flow.

C. Certify TAB field data reports and perform the following:

1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.

D. TAB Report Forms: Use standard TAB contractor's forms approved by Engineer.

E. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."

F. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."

G. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 TAB SPECIALISTS

A. Subject to compliance with requirements engage one of the following:
1. Mechanical Balancing, Inc.
2. Mid-Atlantic Test and Balance.
3. Palmetto Air and Water Balance.

3.2 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.

B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and

statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine equipment performance data including fan and pump curves.

1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.

F. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

G. Examine fans and electric heaters to verify that they are accessible and their controls are connected and functioning.

H. Examine operating safety interlocks and controls on HVAC equipment.

I. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.3 PREPARATION

A. Prepare a TAB plan that includes strategies and step-by-step procedures.

B. Complete system-readiness checks and prepare reports. Verify the following:

1. Permanent electrical-power wiring is complete.
2. Automatic temperature-controls are operational.
3. Equipment and duct access doors are securely closed.
4. Ceilings are installed in areas where air-pattern adjustments are required and access to balancing devices is provided.
5. Windows and doors can be closed so indicated conditions for system operations can be met.

3.4 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance" or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and in this Section.

   1. Comply with requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.

   1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
   2. After testing and balancing, install test ports and duct access doors that comply with requirements in Section 233300 "Air Duct Accessories."
   3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 230713 "Duct Insulation," Section 230716 "HVAC Equipment Insulation," and Section 230719 "HVAC Piping Insulation."

C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.5 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

D. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

F. Verify that motor starters are equipped with properly sized thermal protection.

G. Check dampers for proper position to achieve desired airflow path.

H. Check for airflow blockages.

I. Check for proper sealing of air-handling-unit components.

J. Verify that air duct system is sealed as specified in Section 233113 "Metal Ducts."

3.6 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure total airflow.

   a. Where sufficient space in ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow.

2. Measure fan static pressures as follows to determine actual static pressure:

   a. Measure outlet static pressure as far downstream from the fan as practical and upstream from restrictions in ducts such as elbows and transitions.
   b. Measure static pressure directly at the fan outlet or through the flexible connection.
   c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from the flexible connection, and downstream from duct restrictions.
   d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.

3. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.

   a. Report the cleanliness status of filters and the time static pressures are measured.

4. Measure static pressures entering and leaving other devices, such as sound traps, heat-recovery equipment, and air washers, under final balanced conditions.

5. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
6. Obtain approval from Engineer for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
7. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.

1. Measure airflow of submain and branch ducts.

   a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.

2. Measure static pressure at a point downstream from the balancing damper, and adjust volume dampers until the proper static pressure is achieved.
3. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.

C. Measure air outlets and inlets without making adjustments.

1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.

D. Adjust air outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using branch volume dampers rather than extractors and the dampers at air terminals.

1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.7 TOLERANCES

A. Set HVAC system's air flow rates and water flow rates within the following tolerances:

1. Exhaust Fans: Plus or minus 10 percent.
2. Air Outlets and Inlets: Plus or minus 10 percent.
3. Pressure Relationships: Maintain pressure relationships indicated plus or minus 10 percent.

3.8 REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

3.9 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
2. Include a list of instruments used for procedures, along with proof of calibration.

B. Final Report Contents: In addition to certified field-report data, include the following:
1. Fan curves.
2. Manufacturers' test data.
3. Field test reports prepared by system and equipment installers.
4. Other information relative to equipment performance; do not include Shop Drawings and product data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.
2. Name and address of the TAB contractor.
3. Project name.
4. Project location.

5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB supervisor who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:

    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.

12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer's name, type, size, and fittings.
14. Notes to explain why certain final data in the body of reports vary from indicated values.
15. Test conditions for fans and pump performance forms including the following:

    a. Settings for outdoor-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Face and bypass damper settings at coils.
    e. Fan drive settings including settings and percentage of maximum pitch diameter.
    f. Inlet vane settings for variable-air-volume systems.
    g. Settings for supply-air, static-pressure controller.
    h. Other system operating conditions that affect performance.

D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outdoor, supply, return, and exhaust airflows.
2. Water and steam flow rates.
3. Duct, outlet, and inlet sizes.
4. Pipe and valve sizes and locations.
5. Terminal units.
6. Balancing stations.
7. Position of balancing devices.

E. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:

    a. System identification.
    b. Location.
    c. Make and type.
    d. Model number and size.
    e. Manufacturer's serial number.
    f. Arrangement and class.
    g. Sheave make, size in inches, and bore.
    h. Center-to-center dimensions of sheave, and amount of adjustments in inches.

2. Motor Data:

    a. Motor make, and frame type and size.
    b. Horsepower and rpm.
    c. Volts, phase, and hertz.
    d. Full-load amperage and service factor.
    e. Sheave make, size in inches, and bore.
    f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
    g. Number, make, and size of belts.

3. Test Data (Indicated and Actual Values):

    a. Total airflow rate in cfm.
    b. Total system static pressure in inches wg.
    c. Fan rpm.
    d. Discharge static pressure in inches wg.
    e. Suction static pressure in inches wg.

F. Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

1. Report Data:

    a. System and air-handling-unit number.
    b. Location and zone.
    c. Traverse air temperature in deg F.
    d. Duct static pressure in inches wg.
    e. Duct size in inches.
    f. Duct area in sq. ft..
    g. Indicated air flow rate in cfm.
    h. Indicated velocity in fpm.
    i. Actual air flow rate in cfm.
    j. Actual average velocity in fpm.

k. Barometric pressure in psig.

G. Instrument Calibration Reports:

1. Report Data:

a. Instrument type and make.
b. Serial number.
c. Application.
d. Dates of use.
e. Dates of calibration.

3.10 INSPECTIONS

A. Initial Inspection:

1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the final report.
2. Check the following for each system:
   a. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.
   b. Verify that balancing devices are marked with final balance position.
   c. Note deviations from the Contract Documents in the final report.

B. Final Inspection:

1. After initial inspection is complete and documentation by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Owner.
2. The TAB contractor's test and balance engineer shall conduct the inspection in the presence of Owner.
3. Owner shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.
4. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
5. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.

C. TAB Work will be considered defective if it does not pass final inspections. If TAB Work fails, proceed as follows:

1. Recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
2. If the second final inspection also fails, Owner may contract the services of another TAB contractor to complete TAB Work according to the Contract Documents and deduct the cost of the services from the original TAB contractor's final payment.

D. Prepare test and inspection reports.

END OF SECTION

SECTION 233113
METAL DUCTS

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. Single-wall rectangular ducts and fittings.
2. Single-wall round ducts and fittings.
3. Sheet metal materials.
4. Sealants and gaskets.
5. Hangers and supports.

B. Related Sections:

1. Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Section 233300 "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.

B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible".

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 SINGLE-WALL ROUND DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing

requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G60.

C. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

D. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.4 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

C. Solvent-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Base: Synthetic rubber resin.
3. Solvent: Toluene and heptane.
4. Solids Content: Minimum 60 percent.
5. Shore A Hardness: Minimum 60.
6. Water resistant.

7. Mold and mildew resistant.

D. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.

E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

F. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.5 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

E. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

F. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

G. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install ducts with fewest possible joints.

D. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

E. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

F. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

G. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

H. 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 or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.

I. During construction, install temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

J. Protect duct interiors from moisture, construction debris and dust, and other foreign materials.

3.2 DUCT SEALING

A. Seal ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":
   1. Seal Class A.

3.3 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

B. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

C. Hangers Exposed to View: Threaded rod and angle or channel supports.

D. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.

E. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.4 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.5 PAINTING

A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Section 099123 "Interior Painting."

3.6 DUCT CLEANING

A. Clean duct systems before testing, adjusting, and balancing.

B. Use service openings for entry and inspection.

1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Section 233300 "Air Duct Accessories" for access panels and doors.
2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.

C. Clean the following components by removing surface contaminants and deposits:

1. Air outlets and inlets (registers, grilles, and diffusers).

2. Exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
3. Ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.

3.7 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel.

B. Exhaust Ducts:

1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:

a. Pressure Class: Negative 1-inch wg.

C. Intermediate Reinforcement:

1. Galvanized-Steel Ducts: Galvanized steel or carbon steel coated with zinc-chromate primer.

D. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."

a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
1) Radius-to Diameter Ratio: 1.5.

b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
c. Round Elbows, 14 Inches and Larger in Diameter: Welded.

E. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."

a. Rectangular Main to Rectangular Branch: 45-degree entry.
b. Rectangular Main to Round Branch: Spin in.

2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.

   a. Velocity 1000 fpm or Lower: 90-degree tap.
   b. Velocity 1000 to 1500 fpm: Conical tap.
   c. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION 233113

SECTION 233300
AIR DUCT ACCESSORIES

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. Turning vanes and air extractors.
   2. Flexible connectors.
   3. Duct-mounted access doors.
   4. Manual volume dampers.
   5. Duct accessory hardware.

1.3 ACTION SUBMITTALS

A. Product Data:
   1. Manual volume dampers.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

2.2 MATERIALS

A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G60.

B. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

C. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.3 TURNING VANES

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. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. METALAIRE, Inc.
4. SEMCO Incorporated.

B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

C. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vanes and Vane Runners," and 4-4, "Vane Support in Elbows."

D. Vane Construction: Single wall for ducts up to 48 inches wide and double wall for larger dimensions.

2.4 FLEXIBLE CONNECTORS

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. Cain Manufacturing Co., Inc.
2. Ductmate Industries, Inc.
3. Duro Dyne Inc.
4. Elgen Manufacturing.
5. Ventfabrics, Inc.
6. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Materials: Flame-retardant or noncombustible fabrics.

C. Coatings and Adhesives: Comply with UL 181, Class 1.

D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to two strips of 2-3/4-inch- wide, 0.028-inch- thick, galvanized sheet steel or 0.032-inch- thick aluminum sheets. Provide metal compatible with connected ducts.

E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

1. Minimum Weight: 26 oz./sq. yd..
2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
3. Service Temperature: Minus 40 to plus 200 deg F.

2.5 MANUAL VOLUME DAMPERS

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. Ruskin Company.
2. Cesco Products; a division of Mestek, Inc.
3. Air Balance, Inc.

B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.

C. Rectangular Dampers: Ruskin model MD-35.
1. Frame: 16 gage galvanized steel.
2. Blades: 16 gage galvanized steel.
3. Axles: ½ inch plated steel hex.
4. Linkage: Concealed in frame.
5. Single Blade Damper: Fabricate for duct sizes up to 10 x 48 inches.
6. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 x 72 inch. Assemble center and edge crimped blades in galvanized frame channel with suitable hardware.
7. End Bearings: Nylon or oil-impregnated sintered bronze bearings. Furnish closed end bearings on ducts having pressure classification over 2 inches wg.

D. Round Dampers 20 inch diameter and smaller: Ruskin model MDRS25.
1. Frame and blade: 20 gage galvanized steel.
2. Axle: 3/8 inch steel.
3. End Bearings: Molded synthetic.

E. Quadrants: Young Regulator Co. model 404 or model 404B.
1. Furnish locking, indicating quadrant operators on single and multi-blade dampers.
2. On insulated ducts mount quadrant operators on standoff mounting brackets, bases, or adapters.
3. Where rod lengths exceed 30 inches furnish regulator at both ends.

2.6 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

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 NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

B. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.

C. Set dampers to fully open position before testing, adjusting, and balancing.

D. Install test holes at fan inlets and outlets and elsewhere as indicated.

E. Install flexible connectors to connect ducts to equipment.

F. Install duct test holes where required for testing and balancing purposes.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.
2. Inspect turning vanes for proper and secure installation.

END OF SECTION

SECTION 233423
HVAC POWER VENTILATORS

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. Inline ceiling fans.

1.3 PERFORMANCE REQUIREMENTS

A. Project Altitude: Base fan-performance ratings on actual Project site elevations.

1.4 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.
5. Fan speed controllers.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For power ventilators to include in emergency, operation, and maintenance manuals.

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. AMCA Compliance: Fans shall have AMCA-Certified performance ratings and shall bear the AMCA-Certified Ratings Seal.
   1. Performance Ratings: Conform to AMCA 210 and bear AMCA Certified Rating Seal.
   2. Sound Ratings: AMCA 301, tested to AMCA 300, and bear AMCA Certified Sound Rating Seal.
   3. Balance Quality: Conform to AMCA 204.

C. UL Standards: Power ventilators shall comply with UL 705.

PART 2 - PRODUCTS

2.1 INLINE CEILING 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. Greenheck Fan Corporation.
   2. Loren Cook Company.
   3. Acme Engineering & Manufacturing Corp.
   4. PennBarry.
   5. Trane.

B. Centrifugal Fan Unit: V-belt or direct driven with galvanized steel housing lined with 1/2 inch acoustic insulation, resilient mounted motor, gravity back-draft damper in discharge opening, integral inlet and outlet duct collars.

C. Disconnect Switch: Cord and plug in housing for thermal overload protected motor.

D. Wheel: Centrifugal forward curved type constructed of injection molded or polypropylene resin.

E. Motor: Open drip proof type with permanently lubricated sealed bearings and thermal overload protection.

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."

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 in accordance with manufacturer’s instructions.

B. Support suspended units from structure using threaded steel rods. Provide vibration isolators as specified or as indicated on the drawings.

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. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Section 233300 "Air Duct Accessories."

B. Install ducts adjacent to power ventilators to allow service and maintenance.

C. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.3 ADJUSTING

A. Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.

END OF SECTION

SECTION 233713
DIFFUSERS, REGISTERS, AND GRILLES

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. Diffusers, registers, grilles and accessories.

B. Related Sections:
1. Section 233300 "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.

1.3 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated, include the following:

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

PART 2 - PRODUCTS

2.1 DIFFUSERS, REGISTERS AND GRILLES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Price Industries.
   2. Metal Industries, Inc.
   3. Tuttle & Bailey.
   4. Krueger.

B. Diffusers, registers and grilles shall be the type, material, air pattern, and finish indicated on the drawings. Performance including throw and noise generated shall be equivalent to the indicated devices or as approved.

C. Provide accessories indicated on drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install diffusers, registers and grilles in accordance with manufacturer's instructions.

B. Install diffusers, registers, and grilles level and plumb.

C. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

D. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

E. Paint visible portion of ductwork behind air outlets and inlets matte black. Refer to Division 9.

3.3 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

B. Check location of outlets and inlets and make necessary adjustments in position to conform to architectural features, symmetry, and lighting arrangement.

END OF SECTION

SECTION 238239.19
ELECTRIC HEATERS

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 electric heaters with propeller fans and electric-resistance heating coils.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings:

1. Include plans, elevations, sections, and 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 details of anchorages and attachments to structure and to supported equipment.
4. Include equipment schedules to indicate rated capacities, operating characteristics, furnished specialties, and accessories.
5. Wiring Diagrams: Power, signal, and control wiring.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For electric heaters 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. Reznor
   2. Markel Products Company; TPI Corporation.
   3. QMark; Marley Engineered Products.

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.

C. Refer to equipment schedule for types, capacities, controls and options.

2.3 CABINET

A. Front Panel: Stamped-steel louver (ceiling heaters) or extruded-aluminum bar grille (wall heaters), with removable panels fastened with tamperproof fasteners.

B. Finish: Baked enamel over baked-on primer with manufacturer's standard color, applied to factory-assembled and -tested Electric 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

A. Electric-Resistance Heating Coil: Nickel-chromium heating wire, free from expansion noise and 60-Hz hum, embedded in magnesium oxide refractory and sealed in corrosion-resistant metallic sheath. Terminate elements in stainless-steel, machine-staked terminals secured with stainless-steel hardware, and limit controls for high-temperature protection.

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: Unit-mounted thermostat unless indicated otherwise.

B. Electrical Connection: Factory wire motors and controls for a single field connection with disconnect switch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive electric 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 electric heaters to comply with manufacturer’s instructions and NFPA 90A.

B. Install electric heaters level and plumb.

C. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

END OF SECTION

SECTION 260050

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Basic Electrical Requirements specifically applicable to Division 16 Sections, in addition to Division 1 - General Requirements.

1.2 ALTERNATES

A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at the Owner's option. Accepted Alternates will be identified in Owner-Contractor Agreement.

B. Coordinate related work and modify surrounding work as required.

C. Schedule of Alternates: See Bid Form and General Conditions of the Contract Documents.

1.3 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code, 2008.

1.4 SUBMITTALS

A. Submit under provisions of General Conditions of the Contract Documents.

B. Submit shop drawings and product data grouped to include complete submittals of related systems, products, and accessories in single submittals.

C. Mark dimensions and values in units to match those specified.

D. Apply Contractor's stamp, signed or initialed, certifying that review, verification of Products, field dimensions, adjacent construction work, and coordination of work is in accordance with the requirements of the Work and Contract Documents.

1.5 REGULATORY REQUIREMENTS

A. Electrical: Conform to NFPA 70.

B. Obtain permits, and request inspections from authority having jurisdiction.

C. Conform to Virginia Uniform Statewide Building Code (IBC) – 2009.

1.6 PROJECT/SITE CONDITIONS

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

conditions. The drawings show the general arrangement of equipment and devices and shall be followed as closely as actual building construction will permit.

B. Prepare drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other Sections. Obtain permission of Owner before proceeding.

C. Where conflicts occur between field conditions and Project Drawings, obtain Engineer and Owner direction and approval in writing prior to proceeding with work.

1.7 SHOP DRAWINGS

A. Submit Shop Drawings for the following items: Load Centers, Enclosed Switches, Wiring Devices, weatherproof plates, Lighting Fixtures and the like.

B. Submit the number of copies that the Contractor requires, plus one copy for Architect and one copy for the Engineer.

C. Mark each copy to identify applicable products, models, options, and other data – submittals without such identification shall be returned without review. Supplement manufacturers' standard data to provide information unique to this Project.

D. Submit supplemental sketches, to scale, showing Contractor’s proposed arrangement of equipment if arrangement differs from contract documents and/or if proposed equipment footprint differs from that specified.

1.8 GUARANTEE

A. All materials and workmanship shall be guaranteed to be free from defects for a period of one (1) year from date of acceptance and Contractor shall make good, without additional cost to the Owner, any defects which may appear within that period. Manufacturer's warranties extending beyond one year shall be processed and turned over to the Owner.

1.9 INSPECTIONS

A. The contractor shall be responsible for testing and proper operation of all systems specified in Division 16. The contractor shall perform interim quality control inspections to ensure the work is installed per the contract documents and that the work of other trades does not conflict with the work still to be installed. The contractor shall inspect all work prior to substantial completion and final completion inspections and shall generate punch lists from those inspections.

1.10 FINAL CLEANING

A. Execute final cleaning prior to final project assessment.

B. Clean equipment and fixtures to a sanitary condition with cleaning materials

appropriate to the surface and material being cleaned.

C. Remove waste and surplus materials, rubbish, and construction facilities from the site.

1.11 OPERATION AND MAINTENANCE DATA

A. Submit data bound in 8-1/2 x 11 inch (216 x 279 mm) text pages, three ring binders with durable plastic or cloth covers.

B. Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", title of project, and subject matter of binder when multiple binders are required.

C. Internally subdivide the binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.

D. Contents: Prepare a Table of Contents for each volume, with each Product or system description identified, typed on white paper, in three parts as follows: Part 1: Directory, listing names, addresses, and telephone numbers of Engineer, Contractor, Subcontractors, and major equipment suppliers. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following: Significant design criteria, Parts list for each component, Operating instructions, and Maintenance instructions for equipment and systems. Part 3: Project documents and certificates, including the following:
   1. Shop drawings and product data (latest approved copy with contractor's and engineer's approval stamp signed and dated).
   2. Certificates.
   3. Photocopies of warranties.

E. Submit 1 draft copy of completed volumes 15 days prior to final inspection. This copy will be reviewed and returned with Engineer comments. Revise content of all document sets as required prior to final submission.

F. Submit three (3) sets of revised final volumes, within 10 days after final inspection.

1.12 WARRANTIES

A. Execute and assemble transferable warranty documents from Subcontractors, suppliers, and manufacturers.

B. Provide Table of Contents and assemble in binder with durable plastic or cloth cover.

C. Submit prior to final Application for Payment.

D. For items of Work delayed beyond date of Substantial Completion, provide updated submittal within 10 days after acceptance, listing date of acceptance as start of warranty period.

1.13 SPARE PARTS AND MAINTENANCE MATERIALS

A. Provide products, spare parts, maintenance and extra materials in quantities specified in individual specification sections.

B. Deliver to Project site and place in location as directed; obtain receipt prior to final payment.

PART 2 PRODUCTS

2.1 EQUIPMENT AND MATERIALS

A. Dimensions: The Contractor shall ensure that items to be furnished will fit in the space available. He shall make necessary field measurements to ascertain space requirements, including those for connections and shall furnish and install such sizes and shapes of equipment so that the final installation shall suit the true intent and meaning of the drawings and specifications. Should he conclude that there is insufficient space for installation of specified materials, he shall immediately notify the Engineer of the conflict and shall stop affected work until he receives instructions from the Engineer as to proceed.

B. Trade names and catalog numbers shall be interpreted as establishing a general design and standard of quality and shall not be construed as limiting competition. Unless stated otherwise, the contractor may use any article which, in his judgment, and with written comment from the engineer indicating no objection, is equal or superior to that specified. Drawings showing changes or revisions required by the substitution for specified items shall be submitted with the shop drawing data, and the costs of all such changes shall be borne by the Contractor.

C. Equipment or Connections Different from Those Shown: Where equipment requiring different arrangement of connections from those shown is proposed by the Contractor and is not objected to by the Engineer, it shall be the responsibility of the Contractor to install the equipment to operate properly and in harmony with the intent of the drawings and specifications. The Contractor shall make all incidental changes in conduit, wiring, supports, device ratings, and other associated facilities to maintain compliance with NEC and the intended operation of involved systems. He shall provide all additional equipment required for proper operation of the system, including all required changes in affected trades. The Contractor shall be responsible for the proper location of roughing-in and connections. All such changes shall be made at no increase in the contract price to the Owner.

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 260519
LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes building wire and cable and wiring connectors and connections.

1.2 SECTION INCLUDES

A. Building wire and cable.

B. Underground feeder and branch circuit cable.

C. Wiring connectors and connections.

1.3 SYSTEM DESCRIPTION

A. Product Requirements: Provide products as follows:
1. Solid conductor for feeders and branch circuits 10 AWG and smaller.
2. Conductor not smaller than 12 AWG for power and lighting circuits.
3. For 20 ampere, 120 volt branch circuits, use 12 AWG minimum size up to 60 feet. Use 10 AWG conductors for branch circuits 61 to 95 feet in length; 8 AWG conductors for branch circuits 96 to 155 feet in length and 6 AWG for branch circuits longer than 155 feet. Conductors shall be same size for entire length of run.

B. Wiring Methods: Provide the following wiring methods:
1. Exposed Dry Interior Locations: Use only building wire in raceway.
2. Wet or Damp Interior Locations: Use only building wire in raceway.
3. Exterior Locations: Use only building wire in raceway.
4. Underground Locations: Use only building wire in raceway.

1.4 RELATED SECTIONS

A. Section 16075 - Electrical Identification.

B. Section 16130 - Raceway and Boxes.

1.5 REFERENCES

A. NFPA 70 - National Electrical Code.

B. NECA Standard of Installation (National Electrical Cotractors Assosiation).

C. NETA ATS – Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems (International Electrical Testing Assosiation).

1.6 SUBMITTALS

A. Division 1 – Submittal Procedures: Requirements for submittals.

B. Test Reports: Indicate procedures and values obtained.

C. Submit copies of all warranties to Owner and Engineer as specified in Section 16050.

D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements.

E. Project Record Documents: Record actual locations of components and circuits. Design Data: Indicate voltage drop and ampacity calculations for aluminum conductors substituted for copper conductors.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years experience.

1.8 REGULATORY REQUIREMENTS

A. Conform to NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.9 PROJECT CONDITIONS

A. Verify that field measurements are as shown on Drawings.

B. Conductor and conduit sizes are based on copper. Aluminum conductors will be accepted only where indicated on the drawings.

C. Where wire and cable routing is not shown, and destination only is indicated, determine exact outing and lengths required.

1.10 COORDINATION

A. Determine required separation between cable and other work.

B. Determine cable routing to avoid interference with other work.

PART 2 PRODUCTS

2.1 BUILDING WIRE

A. Manufacturers:
1. Allied Wire & Cable Co.
2. Essex Group Inc.
3. General Cable Co.
4. Substitutions: Division 1 - Product Requirements.

B. Description: Single Conductor, stranded insulation wire.
1. Conductor: Copper for sizes smaller than 4 AWG; copper or aluminum for sizes 4 AWG through 4/0 AWG and larger.
2. Insulation Voltage Rating: 600 volts.
3. Insulation: NFPA 70, Type THHN/THWN, THW, or XHHW.

2.2 WIRING CONNECTORS

A. Solderless Pressure Connectors: Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.

B. Spring Wire Connectors: Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.

C. Compression Connectors: Use compression connectors for copper conductor splices and taps, 6 AWG and larger. Tape uninsulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that mechanical work likely to damage wire and cable has been completed.

C. Verify that raceway installation is complete and supported.

3.2 PREPARATION

A. Completely and thoroughly swab raceway before installing wire.

3.3 INSTALLATION

A. Install cable in accordance with the NECA "Standard of Installation."

B. Route wire and cable as required to meet Project Conditions.

C. Wire ampacity shall be sized based upon 75 degree rating for the wire.

D. Pull all conductors into raceway at same time.

E. Do not install more than six phase conductors in a conduit.

F. Do not install more than nine current carrying conductors (including neutrals) in a conduit.

G. Derate conductors per National Electric code as appropriate for the number of conductors in raceway, and for ambient tamperature at the application, providing derated ampacity equal to the wire or breaker size scheduled for the circuit.

H. Use suitable wire pulling lubricant and pulling equipment for building wire 4 AWG and larger.

I. Identify and color code wire and cable under provisions of Section 16075. Identify each conductor with its circuit number or other designation indicated.

J. Tape uninsulated conductors and connectors with electrical tape to 150 percent of insulation rating of conductor.

K. Terminate aluminum conductors with tin-plated, aluminum-bodied compression connectors only. Fill with anti-oxidant compound before installing conductor.

L. Install suitable reducing connectors or mechanical connector adaptors for connecting aluminum conductors to copper conductors.

M. Clean conductor surfaces before installing lugs and connectors.

N. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible tem perature rise.

O. Protect exposed cable from damage.

P. Support cables above accessible ceiling, using spring metal clips or cable ties to support cables from structure. Do not rest cable on ceiling panels.

Q. Use suitable cable fittings and connectors.

R. Neatly train and lace wiring inside boxes, equipment, and panelboards.

3.4 WIRE COLOR

A. General
   1. For wire sizes 10 AWG and smaller, install wire colors in accordance with the following:
      a. Black and red for single phase circuits at 120/240 volts.

   2. For wire sizes 8 AWG and larger, identify wire with colored tape at terminals, splices and boxes. Colors are as follows:
      a. Black and red for single phase circuits at 120/240 volts.

B. Neutral Conductors: White. When two or more neutrals are located in one conduit, individually identify each with proper circuit number.

C. Branch Circuit Conductors: Install three or four wire home runs with each phase uniquely color coded.

D. Feeder Circuit Conductors: Uniquely color code each phase.

E. Ground Conductors:
   1. For 6 AWG and smaller: Green.
   2. For 4 AWG and larger: Identify with green tape at both ends and visible points including junction boxes.

3.5 INTERFACE WITH OTHER PRODUCTS

A. Identify wire and cable under provisions of Section 16075.

B. Identify each conductor with its circuit number or other designation indicated on Drawings.

3.6 FIELD QUALITY CONTROL

A. Inspect wire and cable for physical damage and proper connection in accordance with NETA ATS, except Section 4.

B. Verify continuity of each branch circuit conductor.

END OF SECTION

SECTION 260526
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

E. Rod electrodes.

F. Wire.

G. Mechanical connectors.

H. Exothermic connections.

1.2 REFERENCES

A. NFPA 70 - National Electrical Code, 2008.

B. IEEE 142 - Recommended Practice for Grounding of Industrial and Commercial Power Systems.

C. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

1.3 GROUNDING SYSTEM DESCRIPTION

A. Metal underground water pipe.

B. Metal frame of the building.

C. Rod electrode.

1.4 DESIGN REQUIREMENTS

A. Construct and test grounding systems for access flooring systems on conductive floors accordance with IEEE 1100. Refer to Division 10.

1.5 PERFORMANCE REQUIREMENTS

A. Grounding System Resistance: 25 ohms.

1.6 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

B. Certificate of Compliance: Indicate approval of installation by authority having jurisdiction.

C. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

1.8 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years experience, and with service facilities within 100 miles of Project.

1.9 SUBMITTALS

A. Division 1 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data on grounding electrodes and connections.

C. Test Reports: Indicate overall resistance to ground and resistance of each electrode.

D. Manufacturer's Installation Instructions: Submit for active electrodes.

1.10 CLOSEOUT SUBMITTALS

A. Division 1 - Execution Requirements: Requirements for submittals.

B. Project Record Documents: Record actual locations of components and grounding electrodes.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Division 1 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Accept materials on site in original factory packaging, labeled with manufacturer's identification.

C. Protect from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original packaging.

D. Do not deliver items to project before time of installation. Limit shipment of bulk and multiple-use materials to quantities needed for immediate installation.

1.12 COORDINATION

A. Division 1 - Administrative Requirements: Requirements for coordination.

B. Complete grounding and bonding of building reinforcing steel prior concrete placement.

PART 2 PRODUCTS

2.1 ROD ELECTRODES

A. Material: Copper-clad steel.

B. Diameter: 3/4 inch.

C. Length: 10 feet.

2.2 MECHANICAL CONNECTORS

A. Material: Bronze connectors, suitable for grounding and bonding applications, in configurations required for particular installation.

2.3 EXOTHERMIC CONNECTIONS

A. Exothermic materials, accessories, and tools for preparing and making permanent field connections between grounding system components using Cadweld process by Erico Products.

2.4 WIRE

A. Material: Stranded copper.

B. Grounding Electrode Conductor: Size to meet NFPA 70 requirements. Provide full size conductor per table 250-66 for all grounding electrodes, including supplemental made electrodes.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that final backfill and compaction has been completed before driving rod electrodes.

3.2 PREPARATION

A. Remove paint, rust, mill oils, and/or surface contaminants at connection points.

3.3 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install rod electrodes at locations indicated. Install additional rod electrodes as required to achieve specified resistance to ground.

C. Install grounding and bonding conductors concealed from view.

D. Provide grounding electrode conductor and connect to reinforcing steel in foundation footing.

E. Provide bonding to meet Regulatory Requirements.

F. Bond metal roof system to ground.

G. Bond together each metallic raceway, pipe, duct and other metal object entering building. Use 2 AWG bare copper conductor.

H. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.

I. Install continuous grounding using underground cold water system and building steel as grounding electrode. Where water piping is not available, install artificial station ground by means of driven rods or buried electrodes.

J. Permanently ground entire light and power system in accordance with NEC, including service equipment, load center, switch enclosures, motor frames, grounding type receptacles, and other exposed non-current carrying metal parts of electrical equipment.

K. Accomplish grounding of electrical system by using insulated grounding conductor installed with feeders and branch circuit conductors in conduits. Size grounding conductors in accordance with NEC. Install from grounding bus of serving panel to ground bus of served panel, grounding screw of receptacles, lighting fixture housing, light switch outlet boxes or metal enclosures of service equipment. Ground conduits by means of grounding bushings on terminations at panelboards with installed number 12 conductor to grounding bus.

L. Grounding electrical system using continuous metal raceway system enclosing circuit conductors in accordance with NEC.

M. Permanently attach equipment and grounding conductors prior to energizing equipment.

3.4 FIELD QUALITY CONTROL

A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

B. Use suitable test instrument to measure resistance to ground of system. Perform testing in accordance with test instrument manufacturer's recommendation using the fall-of-potential method.

END OF SECTION

SECTION 260529

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Conduit and equipment supports.

B. Anchors and fasteners.

1.2 REFERENCES

A. National Fire Protection Association:
1. NFPA 70 - National Electrical Code.

1.3 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years experience.

B. Installer: Company specializing in performing work of this section with minimum three years experience.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Division 1 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Accept materials on site in original factory packaging, labeled with manufacturer's identification.

C. Protect from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original packaging.

PART 2 PRODUCTS

2.1 CONDUIT SUPPORTS

A. Materials and Finishes: Corrosion resistant.

B. Select materials, sizes, and types of anchors, fasteners and supports to carry the loads of equipment and conduit, including weight of wire in conduit.

C. Hanger Rods: Threaded high tensile strength galvanized carbon steel with free running threads.

D. Beam Clamps: Malleable Iron, with tapered hole in base and back to accept either bolt or hanger rod. Set screw: hardened steel.

E. Conduit clamps - general purpose: One hole malleable iron for surface mounted conduits.

F. Cable Ties: High strength nylon temperature rated to 185 degrees F. Self locking.

G. Anchors and Fasteners:
   1. Steel Structural Elements: Use beam clamps.
   2. Concrete Surfaces: Use self-drilling anchors and expansion anchors.
   3. Sheet Metal: Use sheet metal screws.
   4. Wood Elements: Use wood screws.

PART 3 EXECUTION

3.1 INSTALLATION

A. Provide anchors, fasteners, and supports in accordance with NECA "Standard of Installation".

B. Install products in accordance with manufacturer’s instructions.

C. Obtain permission from Architect/Engineer before using powder-actuated anchors.

D. Obtain permission from Architect/Engineer before drilling or cutting structural members.

E. Fabricate supports from structural steel or formed steel channel. Install hexagon head bolts to present neat appearance with adequate strength and rigidity. Install spring lock washers under nuts.

F. Install surface-mounted load centers with minimum of four anchors.

G. Install conduit and raceway support and spacing in accordance with NEC.

H. Install multiple conduit runs on common hangers.

END OF SECTION

SECTION 260533
RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes conduit and tubing, surface raceway and outlet boxes.

B. Related Sections:
1. Division 2 - Underground Ducts and Manholes.
2. Section 16060 – Grounding and Bonding.
3. Section 16070 – Electrical Hangers and Supports.

1.2 REFERENCES

A. American National Standards Institute:
1. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.
2. ANSI C80.3 - Specification for Electrical Metallic Tubing, Zinc Coated.

B. National Electrical Manufacturers Association:
1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
2. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
3. NEMA OS 1 - Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
4. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Tubing and Conduit.
5. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

1.3 SYSTEM DESCRIPTION

A. Raceway and boxes located as indicated on Drawings, and at other locations required for splices, taps, wire pulling, equipment connections, and compliance with regulatory requirements. Raceway and boxes are shown in approximate locations unless dimensioned. Provide raceway to complete wiring system.

B. Underground Outside Foundation Wall: Use Schedule 40 nonmetallic conduit or rigid steel conduit. Minimum size 1 inch. Provide cast metal or nonmetallic boxes.

C. In or Under Slab on Grade: Provide rigid steel conduit, intermediate metal conduit, or schedule 40 nonmetallic conduit. Minimum size 1 inch. Provide cast or nonmetallic metal boxes.

D. Outdoor Locations, Above Grade: Provide rigid steel or intermediate metal conduit. Provide cast metal or nonmetallic outlet, pull, and junction boxes. Do not use pvc above grade.

E. In Slab Above Grade: Provide rigid steel conduit, intermediate metal conduit, or electrical metallic tubing. Maximum size 1 inch. Provide cast or sheet metal boxes.

F. Wet and Damp Locations: Provide rigid steel conduit. Provide cast metal outlet, junction, and pull boxes. Provide flush mounting outlet box in finished areas.

G. Exposed Dry Locations: Do not use exposed conduit in finished spaces. For unfinished spaces, provide rigid steel conduit or intermediate metal conduit below six feet; electrical metallic tubing permitted above six feet.

1.4 DESIGN REQUIREMENTS

A. Minimum Raceway Size: ½ inch unless otherwise specified for power and control circuits.

B. No PVC conduit will be allowed exposed in the Pavilion.

1.5 SUBMITTALS

A. Division 1 - Submittal Procedures: Submittal procedures.

1.6 CLOSEOUT SUBMITTALS

A. Division 1 - Execution Requirements: Closeout procedures.

B. Project Record Documents:
1. Record actual routing of conduits larger than 2 inch trade size.
2. Record actual locations and mounting heights of outlet, pull, and junction boxes.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Division 1 - Product Requirements: Product storage and handling requirements.

B. Accept conduit on site. Inspect for damage.

C. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

D. Protect PVC conduit from sunlight.

1.8 COORDINATION

A. Division 1 - Administrative Requirements: Coordination and project conditions.

B. Coordinate installation of outlet boxes for equipment connected under Section 16150.

C. Coordinate mounting heights, orientation and locations of outlets mounted above counters, benches, and backsplashes.

D. Verify that field measurements are as shown on Drawings.

E. Verify routing and termination locations of conduit prior to rough-in.

PART 2 PRODUCTS

2.1 METAL CONDUIT

A. Rigid Steel Conduit: ANSI C80.1.

B. Intermediate Metal Conduit (IMC): Rigid steel.

C. Fittings and Conduit Bodies: NEMA FB 1; material to match conduit.

2.2 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

A. Product Description: Interlocked steel construction with PVC jacket. Use only for lighting fixture connections and only in lengths not exceeding 2 feet and shall be supported per NEC.

B. Fittings: NEMA FB 1.

2.3 ELECTRICAL METALLIC TUBING (EMT)

A. Product Description: ANSI C80.3; galvanized tubing.

B. Fittings and Conduit Bodies: NEMA FB 1; steel or malleable iron, compression or set screw type.

2.4 NONMETALLIC CONDUIT

A. Product Description: NEMA TC 2; Schedule 40 or 80 PVC.

B. Fittings and Conduit Bodies: NEMA TC 3.

2.5 OUTLET BOXES

A. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.
   1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; furnish 1/2 inch male fixture studs where required.
   2. Provide one piece multiple gang boxes, not built-up boxes. Construct outlet boxes with mounting holes and with cable and conduit-size knockout openings in bottom, ends, and sides. Provide boxes with threaded screw holes, with corrosion-resistant cover and grounding screws for fastening surface and device type box covers, and for equipment type grounding.

B. Nonmetallic Outlet Boxes: Do not use.

PART 3 EXECUTION

3.1 EXAMINATION

A. Division 1 - Administrative Requirements: Coordination and project conditions.

B. Verify outlet locations and routing and termination locations of raceway prior to rough-in.

3.2 INSTALLATION

A. Ground and bond raceway and boxes in accordance with Section 16060.

B. Provide suitable pull string in each empty conduit except sleeves and nipples.

C. Use suitable caps to protect installed conduit against entrance of dirt and moisture.

D. Fasten raceway and box supports to structure and finishes in accordance with Section 16070.

E. Identify raceway and boxes in accordance with Section 16075.

F. Arrange raceway and boxes to maintain headroom and present neat appearance.

3.3 INSTALLATION - RACEWAY

A. Raceway routing is shown in approximate locations unless dimensioned. Route to complete wiring system.

B. Arrange raceway supports to prevent misalignment during wiring installation.

C. Support raceway using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.

D. Do not support raceway with wire or perforated pipe straps. Remove wire used for temporary supports

E. Route exposed raceway parallel and perpendicular to walls.

F. Route conduit in and under slab from point-to-point.

G. Do not cross conduits in slab.

H. Maintain clearance between raceway and piping for maintenance purposes.

I. Maintain 12 inch clearance between raceway and surfaces with temperatures exceeding 104 degrees F.

J. Cut conduit square using saw or pipe cutter; de-burr cut ends.

K. Bring conduit to shoulder of fittings; fasten securely.

L. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for minimum 20 minutes.

M. Install conduit hubs to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.

N. Where conduit is installed in wet locations, the entire wiring system where installed exposed, including all boxes, fittings, conduits, and cable used therewith, shall be mounted so that there is at least ¼ inch airspace between it and the wall or supporting surface.

O. Where conduit is installed in wet locations, provide corrosion-resistant supports, bolts, straps, screws, etc.

P. Install no more than equivalent of three 90 degree bends between boxes. Install conduit bodies to make sharp changes in direction, as around beams. Install factory elbows for bends in metal conduit larger than 2 inch size.

Q. Avoid moisture traps; install junction box with drain fitting at low points in conduit system.

R. Install fittings to accommodate expansion and deflection where raceway crosses control and expansion joints.

S. Install suitable pull string or cord in each empty raceway except sleeves and nipples.

T. Install suitable caps to protect installed conduit against entrance of dirt and moisture.

U. Painting of conduits as directed by the architect will be required where exposed in finished areas.

3.4 INSTALLATION - BOXES

A. Install wall mounted boxes at elevations to accommodate mounting heights as indicated on Drawings or as specified in section for outlet device.

B. Install in locations as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.

C. Adjust box location up to 10 feet prior to rough-in to accommodate intended purpose unless box location is dimensioned.

D. Orient boxes to accommodate wiring devices oriented as specified in Section 16140.

E. Maintain headroom and present neat mechanical appearance.

F. Install adjustable steel channel fasteners for hung ceiling outlet box.

G. Support boxes independently of conduit, except cast box that is connected to two rigid metal conduits, which are both, supported within 12 inches of box.

H. Install gang box where more than one device is mounted together. Do not use sectional box.

3.5 INTERFACE WITH OTHER PRODUCTS

A. Locate outlet boxes to allow luminaires positioned as indicated on Drawings.

3.6 ADJUSTING

A. Division 1 - Execution Requirements: Testing, adjusting, and balancing.

B. Adjust flush-mounting outlets to make front flush with finished wall material.

C. Install sealed knockout closures in unused openings in boxes.

3.7 CLEANING

A. Division 1 - Execution Requirements: Final cleaning.

B. Clean interior of boxes to remove dust, debris, and other material.

C. Clean exposed surfaces and restore finish.

END OF SECTION

SECTION 260553
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Nameplates and labels.

B. Wire and cable markers.

C. Underground warning tape.

1.2 RELATED SECTIONS

A. Division 9 - Paints and Coatings: Execution requirements for painting specified by this section.

1.3 ENVIRONMENTAL REQUIREMENTS

D. Division 1 - Product Requirements: Environmental conditions affecting products on site.

E. Install labels and nameplates only when ambient temperature and humidity conditions for adhesive are within range recommended by manufacturer.

PART 2 PRODUCTS

2.1 NAMEPLATES AND LABELS

A. Nameplates: Engraved three-layer laminated plastic, black letters on white background.

B. Locations:
1. Each electrical distribution and control equipment enclosure.

C. Letter Size:
1. Use 1/8 inch letters for identifying individual equipment and loads.
2. Use 1/4 inch letters for identifying grouped equipment and loads.

D. Labels: Embossed adhesive tape, with 3/16 inch (5 mm) white letters on black background. Use only for identification of individual wall switches and receptacles, and control device stations.

2.2 WIRE MARKERS

A. Description: Tape or tubing type wire markers.

B. Locations: Each conductor at panelboard gutters, pull boxes, outlet and junction boxes, and each load connection.

C. Legend:
   1. Power and Lighting Circuits: Branch circuit or feeder number indicated on drawings.

2.3 UNDERGROUND WARNING TAPE

A. Description: 4 inch wide plastic tape, detectable type, colored yellow with suitable warning legend describing buried electrical lines.

PART 3 EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive nameplates.

3.2 INSTALLATION

F. Install identifying devices after completion of painting.

G. Nameplate Installation:
   1. Install nameplate parallel to equipment lines.
   2. Install nameplate for each electrical distribution and control equipment enclosure with corrosive-resistant mechanical fasteners, or adhesive.
   3. Secure nameplate to equipment front using screws.
   4. Secure nameplate to inside surface of door on recessed panelboard in finished locations.

H. Label Installation:
   1. Install label parallel to equipment lines.
   2. Install labels for permanent adhesion and seal with clear lacquer.

I. Wire Marker Installation:
   1. Install wire marker for each conductor at panelboard gutters, pull boxes, outlet and junction boxes, and each load connection.

J. Underground Warning Tape Installation:
   1. Install underground warning tape along length of each underground conduit, raceway, or cable 3 inches below finished grade, directly above buried conduit, raceway, or cable.

END OF SECTION

SECTION 262416

PANELBOARDS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Load centers.

1.2 RELATED SECTIONS

A. Section 16060 - Grounding and Bonding.

B. Section 16070 - Supporting Devices.

C. Section 16075 - Electrical Identification.

1.3 REFERENCES

A. Institute of Electrical and Electronics Engineers:

1. IEEE C62.41 - Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.

B. National Electrical Manufacturers Association:

1. NEMA AB 1 - Molded Case Circuit Breakers and Molded Case Switches.

2. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).

3. NEMA PB 1 - Panelboards.

4. NEMA PB 1.1 - General Instructions for Proper Installation, Operation, and Maintenance of Panelboards Rated 600 Volts or Less.

C. International Electrical Testing Association:

1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

D. National Fire Protection Association:

1. NFPA 70 - National Electrical Code.

E. Underwriters Laboratories Inc.:

1. UL 67 - Safety for Panelboards.

1.4 SUBMITTALS

A. Division 1 - Submittal Procedures: Requirements for submittals.

B. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating and circuit breaker arrangement and sizes.

C. Submit manufacturer's installation instructions. Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

1.5 PROJECT RECORD DOCUMENTS

A. Record actual locations of products; indicate actual branch circuit arrangement on as-built drawings.

1.6 OPERATION AND MAINTENANCE DATA

A. Maintenance data: Include spare parts listing; source of replacement parts and supplies; and recommended maintenance procedures and intervals.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years experience.

1.8 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

1.9 MAINTENANCE MATERIALS

A. Furnish two of each load center key.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Square-D.

B. Cutler-Hammer.

C. General Electric.

D. Siemens.

E. Substitutions: under provisions of General Conditions of Contract Documents

2.2 LOAD CENTERS

A. Product Description: Circuit breaker load center, with bus ratings as indicated on Drawings. Provide copper bus. Load center shall be rated NEMA-3R.

B. Minimum Integrated Short Circuit Rating: 22,000 amperes rms symmetrical, or as noted on the drawings.

C. Molded Case Circuit Breakers: NEMA AB 1, plug-on type thermal magnetic trip circuit breakers, with common trip handle for poles, listed as Type SWD for lighting circuits, Class A ground fault interrupter circuit breakers as indicated on Drawings. Do not use tandem circuit breakers.

D. Enclosure: General Purpose or Rainproof as indicated.

E. Box: Flush or surface type with door, and lock on door. Finish in manufacturer's standard gray enamel.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install load centers in accordance with NEMA PB 1.1.

B. Install loadcenters plumb. Provide supports in accordance with Section 16070.

C. Height: 6 feet (1800 mm) to top of loadcenter.

D. Provide filler plates for unused spaces in load centers.

E. Provide typed circuit directory for each branch circuit load center. Revise directory to reflect circuiting changes required to balance phase loads.

F. Provide engraved plastic nameplates under the provisions of Section 16075.

G. Ground and bond load center enclosure according to Section 16060. Connect equipment ground bars of panels in accordance with NFPA 70.

H. Provide minimum of full sized neutral feeder to all load center.

3.2 FIELD QUALITY CONTROL

A. Measure steady state load currents at each load center feeder; rearrange circuits in the load center only if necessary to balance the phase loads to within 20 percent of each other. Maintain proper phasing for multi wire branch circuits. Submit copy of steady state load currents after rearrangement with owner’s manuals.

B. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check for proper installation and tightness of connections.

C. Maintain a record of all circuiting revisions and submit final circuiting to the architect/engineer with owner's manuals.

END OF SECTION

SECTION 262726

WIRING DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Receptacles.

B. Device plates and box covers.

C. Occupancy Sensors

1.2 RELATED SECTIONS

A. Section 16130 - Raceway and Boxes.

1.3 REFERENCES

A. NEMA WD 1 - General Requirements for Wiring Devices.

B. NEMA WD 6 - Wiring Devices - Dimensional Requirements.

1.4 SUBMITTALS

K. Division 1 - Submittal Procedures: Submittal procedures.

L. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

M. Samples: Submit two samples of each wiring device and wall plate illustrating materials, construction, color, and finish

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years experience.

3.6 EXTRA MATERIALS

A. Division 1 - Execution Requirements: Spare parts and maintenance products.

B. Furnish two of each style, size, and finish wall plate.

1.7 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

B. Provide Products listed and classified by Underwriters Laboratories, Inc., as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 OCCUPANCY SENSORS

A. Manufacturers:
1. Watt Stopper.
2. Sensor Switch
3. Hubbell
4. Substitutions: Division 1 – Product Requirements.

B. Description:
1. Ceiling mount devices indicated (OS) shall be Sensor Switch #CMR PDT 9 or equal Dual technology devices with coverage area of approximately 12' radius. Units shall be line voltage and be rated for low temperature/high humidity environments.

C. Body: Ivory plastic with wire guard.

2.2 RECEPTACLES

A. Manufacturers:
1. Leviton.
2. Bryant.
3. Eagle.
4. Substitutions: Division 1 – Product Requirements.

B. Description: NEMA WD 1, heavy duty general use receptacle, 20 ampere rating.

C. Device Body: plastic in finish as selected by architect.

D. Configuration: NEMA WD 6, type as specified and indicated.

E. Convenience Receptacle: Type 5-20.

F. GFCI Receptacle: Convenience receptacle with integral ground fault circuit interrupter to meet regulatory requirements. Requires dedicated neutral.

2.3 WALL PLATES

A. Weatherproof Cover Plate: Gasketed cast metal with hinged gasketed device cover. Must be weaterproof in use.

PART 3 EXECUTION

3.1 EXAMINATION

A. Division 1 - Administrative Requirements: Coordination and project conditions.

B. Verify existing conditions prior to beginning work according to the General Conditions of the Contract Documents.

C. Verify that outlet boxes are installed at proper height.

D. Verify that wall openings are neatly cut and will be completely covered by wall plates.

E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

3.2 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean debris from outlet boxes.

3.3 INSTALLATION

A. Install in accordance with NECA "Standard of Installation."

B. Install devices plumb and level.

C. Install switches with OFF position down.

D. Provide dedicated neutral for each receptacle circuit. Do not share neutrals.

E. Install receptacles with grounding pole on bottom.

F. Connect wiring device grounding terminal to branch circuit equipment grounding conductor.

G. Connect wiring devices by wrapping solid conductor around screw terminal. Install stranded conductor for branch circuits 10 AWG and smaller. When stranded conductors are used in lieu of solid, use crimp on fork terminals for device terminations. Do not place bare stranded conductors directly under device screws.

H. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.

I. All receptacles on building exterior, in wet or damp locations, and within six feet of a sink shall be ground fault interrupting type, whether or not shown on plans.

3.4 INTERFACE WITH OTHER PRODUCTS

A. Coordinate locations of outlet boxes provided under Section 16130 to obtain mounting heights specified and indicated on drawings.

B. Where multiple devices are shown, mount together using a multiple gang wallplates.

3.5 FIELD QUALITY CONTROL

A. Division 1 - Quality Requirements: Testing and inspection services and Execution Requirements: Testing, adjusting, and balancing.

B. Inspect each wiring device for defects.

C. Operate each wall switch with circuit energized and verify proper operation.

D. Verify that each receptacle device is energized.

E. Test each receptacle device for proper polarity.

F. Test each GFCI receptacle device for proper operation.

3.6 ADJUSTING

A. Adjust devices and wall plates to be flush and level, and to be tightly mounted to wall.

3.7 CLEANING

A. Clean exposed surfaces to remove splatters and restore finish.

END OF SECTION

SECTION 262816

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fusible switches.

B. Fuses.

1.2 REFERENCES

A. NEMA KS1 - Enclosed Switches (600 Volts Maximum).

B. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

C. NFPA 70 - National Electrical Code.

D. UL 198C - High Interrupting Capacity Fuses; Current Limiting Type.

E. UL 198E - Class R Fuses.

F. NEMA FU 1 - Low Voltage Cartridge Fuses.

1.3 SUBMITTALS

A. Division 1 - Submittal Procedures: Submittal procedures.

B. Product Data: Provide switch ratings and enclosure dimensions.

C. Project Record Documents: Record actual locations of enclosed switches and ratings of installed fuses.

D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.4 QUALITY ASSURANCE

A. Perform work in accordance with NECA Standard of Installation.

B. Maintain one copy of document on site.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years experience.

1.6 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

1.7 DESIGN REQUIREMENTS

A. Select fuses to provide appropriate levels of short circuit and overcurrent protection for the following components: wire, cable, bus structures, and other equipment. Design system to maintain component damage within acceptable levels during faults.

B. Select fuses to coordinate with time current characteristics of other overcurrent protective elements, including other fuses, circuit breakers, and protective relays. Design system to maintain operation of device closest to fault operates.

1.8 EXTRA MATERIALS

A. Provide three of each size and type fuse.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Square-D.

B. Cutler Hammer.

C. General Electric.

D. Siemens.

E. Crouse Hinds.

F. Substitutions: Under provisions of General Conditions of Contract Documents.

2.2 ENCLOSED SWITCHES

A. Fusible Switch Assemblies: NEMA KS 1, Type HD enclosed load interrupter knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse clips: Designed to accommodate NEMA FU1, Class R fuses.

B. Enclosures: NEMA KS 1.
   1. Interior Dry Locations: Type 1.
   2. Exterior Locations and Interior Wet Locations: Type 3R.

C. Service Entrance: Switches identified for use as service equipment are to be labeled for this application. Furnish solid neutral assembly and equipment ground bar.

D. Furnish switches with entirely copper current carrying parts.

2.3 FUSES

A. Manufacturers:
   1. Bussmann Low-Peak LPS-RK.
   2. Littelfuse Littelpeak LLS-RK.
   3. Substitutions: Under provisions of General Conditions of Contract Documents.

B. Description: Dual Element, current limiting, time delay, one-time fuse, 600 volt, UL 198E, Class RK 1 with interrupting rating of 200,000 rms amperes.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install disconnect switches plumb where indicated. Provide supports in accordance with Section 16070.

B. Height: 5 feet to operating handle.

C. Install engraved plastic nameplates in accordance with Section 16075.

D. Provide fusible disconnect switches unless noted otherwise.

E. Install fuses in fusible disconnect switches. Use time delay fuses for motor loads and current limiting fuses for sevice entrance applications.

F. Apply adhesive tag on inside door of each fused switch indicating NEMA fuse class and size installed.

G. Install fuses in accordance with manufacturer’s instructions.

H. Install fuses with label oriented such that manufacturer, type, and current rating are easily read.

END OF SECTION

SECTION 265116

LIGHTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Exterior luminaires and accessories.

B. LED Lighting Fixtures.

1.2 RELATED SECTIONS

A. Section 16130 - Raceway and Boxes.

1.3 REFERENCES

A. ANSI C82.1 - American National Standard for Lamp Ballast-Line Frequency Fluorescent Lamp Ballast.

B. National Electrical Manufacturers Association:
1. NEMA WD 6 - Wiring Devices-Dimensional Requirements.

C. NFPA 70 - National Electrical Code.

D. NFPA 101 - Life Safety Code.

1.4 SUBMITTALS

A. Division 1 - Submittal Procedures: Submittal procedures.

B. Shop Drawings: Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.

C. Product Data: Provide dimensions, ratings, and performance data.

D. Submit manufacturer's installation instructions. Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

1.5 OPERATION AND MAINTENANCE DATA

A. Maintenance Data: Include replacement parts list.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years experience.

PART 2 PRODUCTS

2.1 INTERIOR LUMINAIRES

A. Furnish Products as scheduled on drawings, complete with drivers, features, options, and specified accessories.

B. Substitutions: Under provisions of General Conditions of Contract Documents.

2.2 EXTERIOR LUMINAIRES

A. Furnish Products as scheduled on drawings, complete with lamps, drivers, features, options and specified accessories. Finish of exterior luminaires shall be selected by Architect.

B. All exterior luminaires shall conform to International Dark Skies requirements.

C. Substitutions: Under provisions of General Conditions of Contract Documents. Proposed substitutions shall provide documentation demonstrating equal or better performance when compared to specified fixture.

2.3 LED LIGHTING FIXTURES

A. Description: LED lighting fixtures shall have long life replaceable LEDs coupled with high-efficiency drivers, provide superior quality and quality of illumination for extended service life. Fixture shall be rated to deliver at specified performance for 50,000 hours.
   1. Fixtures shall have five year warranty.
   2. Fixtures shall provide 3500 degree K color temperature.

PART 3 EXECUTION

3.1 INSTALLATION

A. Locate recessed ceiling luminaires as indicated on plan.

B. Install surface mounted luminaires plumb and adjust to align with building lines and with each other. Secure to prevent movement.

C. Install accessories furnished with each luminaire.

D. Connect luminaires to branch circuit outlets provided under Section 16130 as indicated.

E. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.

F. Provide dedicated neutral for each lighting circuit. Do not share neutrals.

G. Ground and bond interior luminaires in accordance with Section 16060.

3.2 FIELD QUALITY CONTROL

A. Division 1 - Quality Requirements: Testing and inspection services. Starting and Adjusting: Testing, adjusting, and balancing.

B. Operate each luminaire after installation and connection. Inspect for proper connection and operation.

3.3 ADJUSTING

A. Division 1 - Execution Requirements: Testing, adjusting, and balancing.

B. Aim and adjust luminaires as directed.

C. Replace LED in luminaires that have failed at Substantial Completion.

3.4 CLEANING

A. Division 1 - Execution Requirements: Final cleaning.

B. Clean electrical parts to remove conductive and deleterious materials.

C. Remove dirt and debris from enclosures.

D. Clean photometric control surfaces as recommended by manufacturer.

E. Clean finishes and touch up damage.

END OF SECTION

SECTION 31 05 13
SOIL MATERIALS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Subsoil materials.

B. Topsoil materials.

1.2 RELATED SECTIONS (include but are not limited to)

A. Section 01 33 00 – Submittal Procedures.

B. Section 01 40 00 – Quality Requirements: Testing soil fill materials.

C. Section 31 05 16 – Aggregate Materials.

D. Section 31 22 16 – Rough Grading.

E. Section 31 25 13 – Erosion and Sediment Control: Slope protection and erosion control.

F. Section 31 23 23 – Backfill.

G. Section 31 23 17 –Trenching.

H. Section 32 91 19 – Landscape Grading.

1.3 REFERENCES

VIRGINIA DEPARTMENT OF TRANSPORTATION

A. VDOT, “Road & Bridge Standards & Specifications,” latest edition.

AMERICAN SOCIETY OF TESTING AND MATERIALS

B. ASTM D698 – Std. Test Method for Moisture Density Relations of Soils and Soil Aggregate Mixtures, Using 5.5 lb Rammer and 12 inch Drop.

C. ASTM D2487 – Classification of Soils for Engineering Purposes.

D. ASTM D2922 – Std. Test Method for Density of Soil and Soil Aggregate in Place by Nuclear Methods (Shallow Depth).

E. ASTM D3017 – Std. Test Method for Water Content of Soil and Soil Aggregate in Place by Nuclear Methods (Shallow Depth).

F. ASTM D4318 – Std. Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils (Atterberg Limits).

1.4 SUBMITTALS FOR REVIEW

A. Section 01 33 00 – Submittal Procedures.

B. Materials Source: Submit name of imported materials source, to Geotechnical Engineer.

C. Samples: Submit, in air tight containers, 10 lb sample of each type of fill to appropriate testing laboratory.

1.5 QUALITY ASSURANCE

A. Furnish each individual soil material from single source throughout the work.

PART 2 PRODUCTS

2.1 SUBSOIL MATERIALS

A. Subsoil Type S1:
1. Excavated and re used material, imported borrow, or select or local borrow.
2. Graded.
3. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris; Less than 1% (by weight) of organic matter or other deleterious material.
4. Conforming to ASTM D2487 Group Symbol CL, ML, SM, SC, SP, or better.
5. Maximum Liquid Limit of 50 and maximum Plasticity Index of 25.

2.2 TOPSOIL MATERIALS (See Section 32 91 19 – Landscape Grading for Schedule)

A. Topsoil Type T1:
1. On-site topsoil, excavated and reused material, conforming to Virginia Erosion & Sediment Control Handbook Standard & Spec. 3.30 TOPSOILING.

2. Graded.

B. Topsoil Type T2:
1. Imported borrow.

2. Natural, fertile, friable loamy soil (loam, sandy loam, silty loam, sandy clay loam, or clay loam), of 20-70% sand, 10-60% silt, and 5-30% clay.
3. Characteristic of productive soils in the vicinity which produce desirable vegetation and obtained from naturally well-drained areas.
4. Reasonably free of roots, rocks larger than 1 inch, subsoil, debris, weeds, and foreign matter.
5. Free of toxic substances or any other material or substance which might be harmful to plant growth or a hindrance to grading maintenance operations.
6. Acidity range (adjusted pH) of 6.0 to 7.0.
7. With additives as recommended in soil analysis report.

2.3 SOURCE QUALITY CONTROL

A. Section 01 40 00 – Quality Requirements: Testing and analysis of soil material.

B. Testing and Analysis of Subsoil Material: Perform in accordance with ASTM D698 (Standard Proctor) and D2487 (Classification of Soils).

C. Testing and Analysis of Topsoil Material: Furnish a soil analysis made by a qualified independent soil-testing agency stating percentages of, inorganic matter (sand, silt, & clay), deleterious material, pH, and mineral and plant nutrient content of topsoil. Report suitability of topsoil for growth of applicable planted material. State recommended quantities of nitrogen, phosphorus, and potash nutrients and any limestone, aluminum sulfate, or other soil amendments to be added to produce a satisfactory topsoil.

D. If tests indicate materials do not meet specified requirements, change material and retest.

E. Furnish materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.1 EXCAVATION

A. Excavate subsoil and topsoil from areas designated. Strip topsoil to full depth.

B. Remove lumped soil, boulders, and rock.

C. Stockpile excavated material, suitable for reuse, in a designated area onsite.

D. Remove excess material not being used from site.

E. Remove excavated materials not meeting requirements for reuse from site.

3.2 STOCKPILING

A. Stockpile in sufficient quantities to meet Project schedule and requirements.

B. Separate differing materials with dividers or stockpile apart to prevent mixing.

C. Prevent intermixing of soil types or contamination.

D. Direct surface waters away from stockpile site to prevent erosion or deterioration of materials.

E. Stockpile topsoil 8 feet high maximum.

3.3 STOCKPILE CLEANUP

A. Remove stockpile, leave area in a clean, neat, and stabilized condition. Grade site surface to prevent freestanding surface water.

B. If a borrow area is utilized, leave area in a clean, neat, and stabilized condition. Grade site surface to prevent freestanding surface water.

END OF SECTION

SECTION 31 05 16

AGGREGATE MATERIALS

19 PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes
   1. Course Aggregate Materials.
   2. Fine Aggregate Materials.
   1)

B. RELATED SECTIONS (including but not limited to:)
   1. Document 00 30 00 – Information Available to Bidders: Subsurface Investigation (Geotechnical) report; recommended needs for aggregate materials.
   2. Section 01 33 00 – Submittal Procedures.
   3. Section 01 40 00 – Quality Requirements: Testing aggregate fill materials.
   4. Section 31 22 13 – Rough Grading.
   5. Section 31 25 13 – Erosion and Sediment Control: Slope protection and erosion control.
   6. Section 31 23 23 – Backfilling.
   7. Section 31 23 17 – Trenching.
   8. Section 32 12 16 – Asphalt Paving.
   9. Section 32 13 13 – Concrete Paving.
   10. Section 33 11 16 – Water Distribution System.
   11. Section 33 46 00 – Subdrainage: Filter aggregate.
   12. Section 33 41 00 – Storm Drainage.
   13. Section 33 31 00 – Sanitary Sewer System.

1.2 REFERENCES

AMERICAN ASSOCIATION OF STATE HIGHWAY & TRANSPORTATION OFFICIALS

B. A. AASHTO - M147 - Materials for Aggregate and Soil-Aggregate.

AMERICAN SOCIETY OF TESTING AND MATERIALS

A. ASTM C136 - Method for Sieve Analysis of Fine and Coarse Aggregates.

B. ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb Rammer and 12 inch Drop.

C. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

D. ASTM D3017 - Test Method for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

VIRGINIA DEPARTMENT OF TRANSPORTATION

E. VDOT “Road & Bridge Standards & Specifications,” latest edition.

C.

F. VDOT “Special Provision for Flowable Backfill” dated March 11, 2010.

1.3 SUBMITTALS FOR INFORMATION

A. Section 01 33 00 – Submittal Procedures.

B. Manufacturer’s Certificate: Submit name of imported materials suppliers to Geotechnical Engineer.

1.4 QUALITY ASSURANCE

A. Furnish each aggregate material from a single source throughout the work.

a.

PART 2 PRODUCTS

2.1 AGGREGATE MATERIALS

A. Coarse Aggregate Type A1 (Utility Bedding, Haunching, & Initial Cover): Conforming to VDOT Std. #68, 7, or 78.

B. Coarse Aggregate Type A2 (Drainage Fill): Conforming to VDOT Std. #57.

C. Coarse Aggregate Type A3 (Base for Concrete Flatwork): Conforming to VDOT Std. #5, 56, or 57.

b.

D. Coarse Aggregate Type A4 (Aggregate Base under Bituminous Pavement): Conforming to VDOT Std. #21A or B, Type II (A or B as indicated in pavement sections on the Drawings).

c.

E. Fine Aggregate Type A5 (Sand for Bedding): Conforming to VDOT Std. Grade “C” Fine Aggregate, VDOT Std. #10 Course Aggregate, or equivalent. A minimum of 100% (by weight) must pass a 3/8” laboratory square opening sieve, 94-100% passing a No. 4 sieve, and a maximum of 25% (by weight) may pass a No. 50 sieve.

F. Fine Aggregate Type A6 (Sand for Water Quality Measures): Clean, graded sand conforming to the requirements of ASTM C33 or VDOT Standard Grade “A” Fine Aggregate.

G. Course Aggregate Type A7 (Pea Gravel for Water Quality Measures): Clean, graded stone conforming to VDOT Std. #8 or #8P.

d.

H. Course Aggregate “Rip-Rap” (as referenced on plans by d50 value): A well graded rip-rap, in accordance with DCR and VDOT standards, consisting of field stone of approximately rectangular shape. Specific gravity of individual stones shall be 2.5 minimum. Mean stone diameter shall be as denoted by the “d50” value. The diameter of the largest stone size shall not be larger than 1.5 times the d50 size. The diameter of the smallest stone size shall not be smaller than 0.3 times the d50 size. Small fines will not be permitted.

2.2 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Source testing and analysis of aggregate material.

B. Coarse Aggregate Material - Testing and Analysis: Perform in accordance with ASTM D698.

C. If tests indicate materials do not meet specified requirements, change material or material source and retest.

D. Furnish materials of each type from same source throughout the Work.

e.

PART 3 EXECUTION

3.1 STOCKPILING

A. Stockpile in sufficient quantities to meet Project schedule and requirements.

B. Separate differing materials with dividers or stockpile apart to prevent mixing.

C. Direct surface water away from stockpile site so as to prevent deterioration of materials.

3.2 STOCKPILE CLEANUP

A. Remove stockpile, leave area in a clean, neat, and stabilized condition. Grade site surface to prevent freestanding surface water.

B. If a borrow area is utilized, leave area in a clean, neat, and stabilized condition. Grade site surface to prevent freestanding surface water.

END OF SECTION

SECTION 31 09 00

GEOTECHNICAL ENGINEERING, INSPECTION AND TESTING

PART 1 GENERAL

1.1 DESCRIPTION

A. Earthwork quality assurance.

B. Underground utility quality assurance.

1.2 RELATED SECTIONS (including but not limited to:)

A. Section 31 22 13 – Rough Grading.

B. Section 31 23 16 – Excavation.

C. Section 31 23 23 – Backfill.

D. Section 31 23 17 –Trenching.

E. Section 32 13 13 – Portland Cement Concrete Pavement. Concrete Materials.

F. Division 33 Underground Utility Sections.

1.3 EXISTING SITE CONDITIONS

A. A geotechnical investigation report has not been prepared for the site of this work by an independent geotechnical engineer.

B. Bidders should visit the site and acquaint themselves with existing conditions.

C. Prior to bidding, bidders may make their own subsurface investigations to satisfy themselves as to site and subsurface conditions, but such investigations may be performed only under time schedules and arrangements approved in advance by the Architect.

1.4 EARTHWORK QUALITY ASSURANCE

A. A qualified independent Soils Testing Laboratory, which staffs a Professional Geotechnical Engineer, registered in Virginia (herein after Geotechnical Engineer), will be retained by the Owner to observe and report performance or work in connection with Rough Grading, Excavating, Backfill, & Trenching , and any other

earthwork related concern.

B. The Geotechnical Engineer shall perform the following:
   1. Make a site inspection, review governing requirements for this work and the test results and make recommendations on applicable portions of the Work (traffic bearing areas, building foundation, etc., as may be applicable to this project),
   2. All required tests to determine bearing capacity of soil (subgrade suitability) prior to placement of all footings, slabs, tanks, utilities, etc.
   3. Inspections,
   4. Testing of all proof-rolling and filling operations,
   5. Determination of materials (suitable, unsuitable, rock, etc., as may be applicable to this project),
   6. Determination of foundation undercut and/or backfill requirements based on in-field conditions, geotechnical investigation report recommendations and actual foundation loadings.
   7. Quantify materials involving unit price payments as applicable,
   8. Submit certifications of all such tests and inspections as may be herein required, with a proper description of tested or inspected locations, to the Architect/Engineer with a copy to the Contractor. Location maps shall be submitted with each report identifying areas where testing occurred.

C. All testing performed by the Geotechnical Engineer is solely in the interest of and for the protection of the Owner.

D. The density of all finally placed or excavated material shall be as specified herein and as determined suitable by the Geotechnical Engineer.

E. The Contractor shall be responsible for notifying the Geotechnical Engineer of his readiness for all tests in a timely manner and for providing access to the site so as to cause no delay to the project.

F. All instructions and directions provided by the Geotechnical Engineer to the Contractor shall be in writing and immediately communicated to the Owner and Architect.

G. When a soils test requested by the Contractor fails to meet the requirements of these specifications, the cost of all re-testing required shall be borne by the Contractor.

H. Notwithstanding any tests, instructions, or decisions made by the Geotechnical Engineer, the Contractor shall not be relieved of his obligation to perform all grading and compaction work in accordance with the Contract Documents.

I. The Contractor may, at his option, hire his own Soils Testing Service to assure himself that his work is in accordance with the Contract Documents.

1.5 UNDERGROUND UTILITY QUALITY ASSURANCE

A. Due to their involvement with related earthwork, the Geotechnical Engineer (see 1.4 A. above), retained by the Owner, will observe and report performance on work

in connection with Underground Utility installation and testing.

B. The Geotechnical Engineer shall perform the following:
   1. Review governing requirements for installation of this work,
   2. Upon accepting condition of trench for pipe installation, observe placement of bedding, haunching, pipe, any anchorage or thrust blocking required, and initial cover to assure that pipe is installed in accordance with those requirements,
   3. Verification of appropriate pipe, joint, and fitting materials,
   4. Observation of all required tests to determine suitability of said pipe installation, and
   5. Submit certifications of all such inspections and observations as may be herein required, with a proper description of tested locations, to the Architect/Engineer with a copy to the Contractor.

C. All utility related work performed by the Geotechnical Engineer is solely in the interest of and for the protection of the Owner.

D. The Contractor shall be responsible for notifying the Geotechnical Engineer of his readiness for all inspections and observations in a timely manner and for providing access to the site so as to cause no delay to the project.

E. Approvals and Disapprovals provided by the Geotechnical Engineer to the Contractor shall be in writing and immediately communicated to the Owner and Architect/Engineer.

F. When an inspection/observation requested by the Contractor fails to meet the requirements of these specifications, the cost of all re-inspection/observation required shall be borne by the Contractor.

G. Notwithstanding any tests, instructions, or decisions made by the Geotechnical Engineer, the Contractor shall not be relieved of his obligation to perform all utility work in accordance with the Contract Documents.

PART 2 PRODUCTS: NOT USED

PART 3 EXECUTION: NOT USED

END OF SECTION

SECTION 31 10 00
SITE PREPARATION AND CLEARING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Preparation.

B. Protection: Protect improvements and vegetation to remain within and beyond/outside limits of disturbance.
1. Barriers, warnings, shoring, etc.
2. Adjacent properties, waterways and the air
3. Reference points,
4. Existing improvements,
5. Existing utilities, and
6. Trees and vegetation.

C. Demolition, Clearing & Grubbing:
1. Remove surface debris.
2. Demolish and remove existing site improvements. Designated paving and curbs.
3. Clear site of plant life and grass.
4. Remove trees and shrubs, including root systems, unless designated to remain.

D. Topsoil Stripping: Excavate and stockpile topsoil.

E. Removal: Clean up, remove and dispose of undesirable material off-site.

F. Restoration: Restore existing finished surfaces disturbed to that of proposed finishes (preconstruction condition as a minimum).

G. Utility Adjustments: Adjust new and existing utility tops to meet proposed finish grades.

H. Definitions.

I. Project Record Documents.

1.2 RELATED SECTIONS (including but not necessarily limited to)

A. Division 01: Permits, Fees, & Notices: Land Disturbing Permit.

B. Division 01: Temporary Utilities: Water Service.

C. Division 01: Temporary Controls: Surface Water and Dewatering. Dust. Noise. Air pollution.

D. Section 31 09 00 – Geotechnical Engineering, Inspection, & Testing. Geotechnical

Engineer.

E. Section 31 05 13 – Soil Materials: Definitions of subsoil and topsoil materials.

F. Section 31 22 13 – Rough Grading: Site subgrade contouring. References this section for Preparation, Protection, and Clean up, Removal and Disposal.

G. Section 31 25 13 - Erosion and Sediment Control: Requirements for land disturbance, protection of stockpiles topsoil.

H. Section 32 91 19 - Landscape Grading: Coordination of soil materials stockpile removal for finish grading and preparation for landscaping/seeding.

1.3 REFERENCES

A. Virginia Erosion & Sediment Control (ESC) Manual, latest edition: Temporary seeding, construction entrances and other measures or practices which may apply.

B. Virginia Department of Health (VDH) "Waterworks Regulations", latest edition: Well or Monitoring Well abandonment.

C. Virginia Department of Transportation (VDOT) "Road & Bridge Standards & Specifications", latest edition: Safety Items.

D. Manual on Uniform Traffic Control Devices (MUTCD), latest edition (including the Virginia Supplement): Pavement Marking and Signage within right-of-way.

1.4 REGULATORY REQUIREMENTS

A. Conform to all applicable codes. These include but shall not be limited to those pertaining to erosion and sediment control and disposal of debris.

B. Obtain all required permits from authorities having jurisdiction.

C. Erosion & Sediment Control (ESC): See Section 31 25 13 - Erosion & Sediment Control for plan preparation, review, approvals, regulatory requirements, etc.

D. Utility Companies: Administrative Requirements: Coordination & Meetings: Coordinate clearing Work with utility companies. Verify locations of existing utilities. Notify them prior to starting and comply with their requirements.

E. Existing Signage within Right-of-Way: Any existing signs shall be relocated as necessary meeting all state and local ordinances including conformance in design and placement with the Virginia Supplement to the Manual on Uniform Traffic Control Devices (MUTCD), latest edition. Edge of signs shall be 12 feet off edge of pavement or 6 feet off shoulder or 2 feet behind face of curb. Clear height shall be 7 feet above grade. Reference document shall take precedence.

1.5 DEFINITIONS

A. Limit of Disturbance or Construction Limits: The extent that proposed contours, erosion and sedimentation control measures, subsurface utility work and surface

improvements are indicated on the Drawings or as delineated as limits on Drawings plus Contractor trailer, storage and parking as defined in the Contract Documents.

1.6 PROJECT RECORD DOCUMENTS

A. Accurately record on Project Record Documents the actual locations of utilities to remain, by horizontal dimensions from landmarks to remain, depth or elevations of inverts, and slope gradients while preparing for land disturbance and in providing protection of utilities.

PART 2 PRODUCTS

2.1 MATERIALS

A. Erosion and Sediment Control Materials: See Section 31 25 13 - Erosion and Sediment Control for approved materials and products.

B. See Section 31 05 13 – Soil Materials: Definitions of subsoil and topsoil materials.

PART 3 EXECUTION

3.1 PREPARATION

A. Accept premises as found. Owner assumes no responsibility for conditions of site or continuation of conditions existing at time of advertisement.

B. Assure that all pertinent required permits have been obtained.

C. Verify all site conditions pertinent to this work.

D. Locate, identify and flag/mark for protection all bench marks, property corners and reference points. Verify that survey bench mark and intended elevations for the Work are as indicated.

E. Contractor shall lay out all work and be responsible for all lines, elevations and measurements.

F. Verify that existing trees/plant life designated to remain, are conspicuously marked as such.

G. Drawings do not purport to show all objects existing on the site. Before commencing work, verify with the Architect all improvements to be protected, salvaged, relocated, removed or demolished. Existing utilities are indicated on the Drawings in accordance with available records.

H. Before any work is started, the Contractor shall contact all corporations, companies, individuals and local authorities owning, maintaining or regulating utilities, conduits, wires and pipes running to or on the property to make suitable arrangements for locating, protection, handling, relocation, adjusting, and/or removal and disposal/salvage of such lines or structures. Verify locations and

elevations.

I. Contact MISS UTILITY at least 48 hours in advance of land disturbing activities.

J. Before any work is started, the Contractor shall contact all state and local authorities owning, maintaining or regulating adjacent rights-of-way to make suitable arrangements for protection, handling, relocation, and/or removal and disposal/salvage of such improvements involved in this Work (signs, structures, etc.). Verify locations, elevations and applicable codes.

3.2 PROTECTION

A. General: Erect and maintain temporary bracing, shoring, lights, barricades, warning signs, etc., all in accordance with applicable rules and regulations.

B. Protection of adjacent properties, waterways and the air:
   1. Prior to any land disturbance activity install Erosion and Sediment Control measures conforming to Section 31 25 13 - Erosion and Sediment Control (ESC). See Site Drawings for specific practices required to prevent soil from washing from areas disturbed during clearing operations. Maintain all ESC measures required.
   2. Clearing shall be restricted to the area within the right-of-way, easements, and Construction Limits indicated on the Drawings.
   3. Any material which will result in dust shall be wet down during removal.

C. Protection of Reference Points: Protect and maintain all bench marks, property corners, monuments and other reference points from damage or displacement. Do not cover. Obtain accurate replacement of any that is disturbed, destroyed or moved due to the work and furnish a certificate by a professional civil engineer or land surveyor that all such items have been relocated accurately.

D. Protection of Existing Improvements:
   1. Conduct site clearing operations to ensure minimum interference with roads, streets, walks, utilities, and other adjacent improvements to remain. Do not close or obstruct streets, walks or other facilities without written permission from authorities having jurisdiction and prior approval by the Owner.
   2. Use all means necessary to protect existing improvements designated to remain. In the event of damage, immediately make all necessary repairs and replacements as directed by the Architect.

E. Protection of Existing Utilities:
   1. Existing utilities, encompassing all water systems, storm and sanitary sewer systems, gas lines, electric systems, telephone and communication systems, underground storage tanks, etc., and all accessories thereto, underground, on the surface or overhead, located in or affected by the construction of the work shall be relocated as required
   2. Protect existing utilities noted to remain.
   3. Coordinate the timing of utility adjustments to ensure that all new and existing utility tops are adjusted to proposed finish grades prior to stone

base applications in paved areas, and prior to topsoil applications within lawn spaces.

4. Give advance notice to the Utility Owner of work to be removed or relocated. The work shall be performed by the Contractor or Utility Owner with arrangements and payment for this work being made by the Contractor.
5. If existing concealed utilities not shown or correctly indicated by the Contract Documents are encountered, the Contractor shall stop work in that area and notify the Architect and Utility Owner. Do not proceed until written instructions are received from the Architect.
6. The Contractor shall excavate with care to determine the exact location of existing utilities, including sizes and inverts. Also, stake and flag at this time for protection. This work shall precede pipe laying, grading, excavation and other construction as far as practicable, to permit adjustments where required.

F. Protection of Existing Trees and Vegetation:

1. Contractor shall assume that all existing vegetation on the premises is intended to remain unless specifically noted otherwise.
2. Protect existing trees, plant growth, and features against compacting the root zone, unnecessary cutting, breaking, skinning of roots, or bruising of bark, or damage from dust, debris, or chemicals. Conform to details and specifications of the Virginia Erosion & Sediment Control Handbook for methods of protection.
3. Disposal of any adhesives, concrete, plaster, paints, thinners, or other volatile liquids or substances detrimental to vegetation shall be done in proper locations away from existing or new plant materials.
4. Repair or replace trees and vegetation damaged by construction operations, but not intended for demolition, in a manner acceptable to the Architect

3.3 DEMOLITION, CLEARING AND GRUBBING

A. Removal of utilities may cause excavations beneath proposed buildings and improvements. All excavations performed for demolition purposes shall be backfilled and tested in accordance with the specifications.

B. Clear areas required for access to site and execution of Work. Honor described or indicated Limits of Construction and Disturbance.

C. Remove existing walks, pavement, fencing, curbs, minor buildings and structures where required for excavation or new construction or as indicated on the Site Drawings. Existing pavement to be removed or connected to shall be neatly cut in straight lines at necessary locations required to accomplish required work. Existing pavement to be trenched through by the open cut method shall be neatly cut in straight lines at minimum width required to accomplish required work.

D. Where asphalt or concrete walks or pavement are removed in locations proposed as lawn or planting beds, all existing bedding stone shall be removed. Underlying subsoil shall be loosened and prepared to receive fill, topsoil, or mulch as applicable.

E. Upon encountering and well within limits of disturbance, verify first with A/E that well is not in use and that Owner desires it to be formally abandoned. If so desired Contract price will be adjusted by Change Order. Abandon well in accordance with Virginia Department of Health "Waterworks Regulations", Section 3.8 - Observation, Monitoring and Remediation Wells and Section 3.11 - Well Abandonment. Adjust top elevation of casing as required to maintain three (3) feet of cover from finished grade.

F. Abandon in place, in accordance with applicable codes, all utility lines not intended to remain, if it poses no conflict with the Work, will have three (3) feet of cover at finished grade and, in the opinion of the Architect, remaining in place does not have an adverse impact upon the project or intended use.

G. Remove utility lines & structures which conflict with the work or do not meet the preceding conditions. Provide for the relocation, raising or lowering of existing electric and telephone poles where required.

H. Remove grass, trees, stumps, shrubs, roots, vines, weeds, brush, surface rocks, debris and all other extraneous material or objects from areas to be built upon or graded. Remove all vegetation to a sufficient depth to prevent regrowth.

I. Conduct demolition, clearing and grubbing operations in such a manner as to minimize disturbance to subsoil and creation of dust. Remove existing foundation walls, floor slabs and footings in such a manner as to avoid disturbing underlying subgrade.

J. Where trees are indicated to be left standing, stop topsoil stripping at drip line to prevent damage to main root system. Use only hand grubbing inside the driplines of trees to remain.

K. Fill depressions caused by demolition, clearing and grubbing operations with controlled fill unless further excavation or grading is indicated and immediately follows.

L. Do not allow water to pond in any excavation or depression. See Dewatering in Division 01: Temporary Controls.

3.4 STRIPPING TOPSOIL

A. Excavate topsoil from areas to be further excavated, re-landscaped, or re-graded as indicated on the Drawings. Excavate to whatever depths encountered in a manner to prevent intermingling with underlying sub-soil or other objectionable material. Comply with the following:
   1. Do not excavate wet topsoil.
   2. Avoid including debris, stones and other extraneous matter in topsoil which will make it "unsuitable" under Section 31 05 13 – Soil Materials: Topsoil Materials.
   3. Leave subsoil surface free of trash, debris and foreign materials.

B. Stockpile on site in an area approved by the Architect/Engineer. Comply with Section 31 25 13 - Erosion & Sediment Control; Topsoil Stockpile.

3.5 CLEANUP, REMOVAL & DISPOSAL

A. Clean up debris resulting from site clearing and grading operations (earthwork related) continuously with the progress of the Work.

B. Remove debris, rock, extracted plant life, unsatisfactory, and/or surplus (not being reused) soil materials, etc. from site.

C. Any debris, rock, extracted plant life, etc. designated to be removed from the site shall become the property of the Contractor and shall be disposed at the Contractor's expense.

D. Dispose of all material in accordance with all local, state and federal regulations governing same.

END OF SECTION

SECTION 31 22 13

ROUGH GRADING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Site Subgrade Contouring. General cutting, grading, filling, and rough contouring of the site for access drives, parking, site structures, building pads, landscaping features, etc., as applicable.

B. Furnish all labor, materials, equipment, and incidentals necessary for earthmoving, grading, cutting, filling, and compaction to provide subgrade elevations as specified herein from finish grades indicated on the Drawings.

C. Unauthorized excavation defined.

1.2 RELATED SECTIONS

A. Section 31 05 13 - Soil Materials.

B. Section 31 05 16 - Aggregate Materials.

C. Section 31 10 00 - Site Preparation and Clearing.

D. Section 31 23 16 - Excavating: Building excavation.

E. Section 31 23 23 - Backfilling: General building area backfilling.

F. Section 31 23 17 - Utility Trenching & Backfilling: Trenching and backfilling for utilities.

G. Section 32 91 19 - Landscape Grading: Finish grading with topsoil to contours.

1.3 REFERENCES

AMERICAN SOCIETY OF TESTING & MATERIALS

A. ASTM C136 - Method For Sieve Analysis of Fine and Coarse Aggregates.

B. ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb Rammer and 12 inch Drop.

C. ASTM D1556 - Test Method for Density of Soil in Place by the Sand-Cone Method.

D. ASTM D2167 - Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.

E. ASTM D2419 - Test Method For Sand Equivalent Value of Soils and Fine Aggregate.

F. ASTM D2434 - Test Method For Permeability of Granular Soils (Constant Head).

G. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

H. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

1.4 DEFINITIONS

A. “Finish grade” refers to contours and spot grades indicated on the Drawings.

B. “Subgrade” or “rough grade” refers to bottom of footings at foundation walls and columns, bottom of aggregate fill within trenches or under slabs-on-grade and paving, and finish grade less specified topsoil depth elsewhere. Refer to applicable Drawings and Schedules for distances below finish grade. “Subgrade” may also refer to the subsoil base upon which fill is to be placed

C. “Unsuitable material” refers to any material beneath proposed subgrade in cut conditions and existing subgrade in fill conditions which in the opinion of the Geotechnical Engineer, after observing proof-rolling or other testing/observation, will not be a satisfactory base for supporting the proposed work above. The Contractor will not be compensated for removal and replacement of soils that have become “unsuitable” due to inadequate protection from the elements and/or construction traffic.

1.5 CLASSIFICATION OF EXCAVATION

A. All cutting, filling, excavating and backfilling to the limits of rough grade as defined herein is “unclassified” and it shall be the Contractor’s responsibility to determine the subsurface character. Bidders are expected to examine the site and then decide for themselves the character of materials to be encountered. Claims for extra compensation arising from latent subsurface conditions within the area defined will not be considered.

B. Excavation beyond the indicated subgrade elevations or excavation side dimensions shall be replaced at Contractor's expense with material per schedule this section.

1.6 SUBGRADE SUITABILITY

A. The Geotechnical Engineer shall inspect all subgrades below footings and below slabs on grade and the results of such inspections shall be reported to the Architect and Owner.

B. As determined by the Geotechnical Engineer, any unsuitable material below limits of subgrade elevations shall be removed and replaced per schedule this section.

C. Once any subgrade has been approved by the Geotechnical Engineer for pouring of footings, slabs, etc., placing of concrete should occur the same day. If the placing of concrete is delayed by the Contractor, for any reason, resulting in subsequent disapproval of said subgrade by the Geotechnical Engineer, any additional excavation required as a result of such subsequent disapproval shall be provided by the Contractor at no additional cost to the Owner. Contractor shall be responsible for protecting subgrades with flowable fill or overlaid clay soil if footing installation is delayed or rainfall is anticipated.

1.7 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Division 01.

PART 2 PRODUCTS

2.1 MATERIALS

A. Topsoil: Type T1 or T2 as specified in Section 31 05 13.

B. Subsoil Fill: Type S1 as specified in Section 31 05 13.

C. Structural Fill: Type S1 as specified in Section 31 05 13.

PART 3 EXECUTION

3.2 EXAMINATION

A. Verify site conditions under provisions of Section 01 30 00 – Administrative Requirements: Coordination.

B. Verify that survey bench mark and intended elevations for the Work are as indicated.

3.3 PREPARATION, PROTECTION, & CLEANUP

A. Control water in accordance with Division 01 – Temporary Controls. Ponding water will not be permitted.

B. Comply with Section 31 10 00 - Site Preparation & Clearing: Preparation, Protection, Field Measurements, Cleanup.

C. The Contractor shall be responsible for controlling on-site construction traffic to prevent softening or rutting of completed controlled fill work. Additional work required due to improper traffic control will be at the Contractor's expense.

D. Identify required lines, levels, contours, and datum.

E. Locate, identify, and protect above and below grade utilities that remain, from damage.

F. Notify utility company to remove and/or relocate utilities, as applicable.

G. Protect plant life, lawns, and other features remaining as a portion of final landscaping.

H. Protect bench marks, survey control points, any existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

3.4 PROOF-ROLLING

A. After all demolition, clearing, grubbing, and topsoil and organics stripping the exposed subgrade shall be proof-rolled. Proof-rolling shall be with a tandem axle dump truck or similar pneumatic tired equipment weighing at least 10 tons (20 tons max) to locate soft or other unsuitable areas. The number and direction of passes shall be as required by the Geotechnical Engineer.

B. Any soft or compressible areas or unsuitable material encountered shall be removed and replaced per schedule this section. The Geotechnical Engineer shall observe the removal, document the volume, observe and test the replacement and immediately forward copies of documentation to the Architect/Engineer.

C. Unless approved by the Geotechnical Engineer proof-rolling shall be a continuous operation until the entire site is complete.

D. When extensive excavation is required to bring the site to rough grade, proof-rolling shall occur simultaneously with the excavation work, if possible.

E. The Contractor shall provide assistance to the Geotechnical Engineer or his representative as required to accomplish this work and to accurately track the progress of proof-rolling.

F. After proof-rolling the subgrade, areas to receive fill shall be uniformly scarified to a depth of 2". Water shall be added to the loosened material or it shall be allowed to dry as required so that the moisture content is within necessary limits of the optimum as judged or tested by the Geotechnical Engineer.

3.5 SUBSOIL EXCAVATION (Cutting)

A. Excavate subsoil from areas to be further excavated, re-landscaped, or re-graded.

B. Work within 15 feet of any structure to remain shall be handled under Section 31 23 16 – Excavating & Filling. Should the Architect or Geotechnical Engineer determine the structure to be in jeopardy by grading operations this distance may be increased.

C. Do not excavate wet subsoil unless determined to be "unsuitable material" and its removal has been approved by the Geotechnical Engineer.

D. When excavating through roots of trees to remain, perform work by hand and cut roots with sharp ax.

E. If rock is encountered, it shall be excavated to 6" below rough grade and replaced per schedule this section.

F. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.

3.6 STOCKPILING

A. Stockpile suitable excavated material per Section 31 25 13 - Erosion & Sediment Control: Topsoil/Soil Materials Stockpile.

B. Stockpile in sufficient quantities to meet Project schedule and requirements. Stockpile materials on site at locations acceptable to Architect/Engineer. Avoid drainage ways and drip areas of trees. Remove excess material and material unsuitable for reuse as fill from site.

C. Separate differing materials with dividers or stockpile apart to prevent mixing.

D. Prevent intermixing of soil types or contamination.

3.7 FILLING

A. Before fill is placed, existing grade shall be prepared as specified in Section 31 10 00, shall be dry and clean of all debris, and shall be proof-rolled in accordance with this section.

B. Scarify proof-rolled, existing subgrade to a depth of 2" prior to placing fill.

C. All fill materials shall be tested and approved by the Geotechnical Engineer prior to placement and shall meet or exceed the requirements as specified in schedule this section.

D. Place fill to subgrade contours and elevations allowing for later placement of topsoil and pavements.

E. Furnish additional fill material from off site if required to complete the work. Fill material from off-site is subject to approval of the Architect and Geotechnical Engineer.

F. Filling operations for embankments having a slope greater than 1' vertically to 4' horizontally or other similar areas noted on the site plan shall be stepped or benched in 8" vertical lifts. Carry fill slope at least three feet horizontally beyond design rough grade, then cut back to well compacted material at subgrade elevations indicated on the Drawings. Divert surface runoff around fill slopes with diversions or slope drains as required until vegetation is established.

G. Do not place fill in water or mud or on frozen or frosty ground.

H. Surfaces of new grades shall be left clean and ready to receive applicable finished surface. Remove all ruts and depressions to give a smooth and uniform subgrade.

I. To avoid delay of the project, when wet weather will not permit placement of soil fill material under the building area, Contractor will be permitted the option of using structural fill type A3 or as acceptable to the Geotechnical Engineer, as the fill material at no additional cost to the Owner.

J. Fill areas to contours and elevations with unfrozen materials.

K. Place fill material on continuous layers and compact in accordance with the schedule at end of this section.

L. Maintain optimum moisture content of fill materials to attain required compaction density.

M. Slope grade away from building minimum 5 inches in 10 ft, unless noted otherwise.

N. Make grade changes gradual. Blend slope into level areas.

O. Remove surplus fill materials from site.

3.8 RESTORATION OF GRADES

A. Restore to original grades and conditions all properties damaged by any activity related to this work and take adequate precautions to avoid settlements or cave-ins of properties higher than site, and settling, eroding or other damage to properties lower than site.

B. Repair and reestablish grades in settled, eroded, and rutted areas to specified tolerances.

3.8 TOLERANCES

A. Top Surface of Subgrade: Plus or minus 0.1 foot within 100 feet of buildings, under all pavement and site improvements (such as athletic/play fields); and 0.25 foot on surrounding fields and slopes.

3.9 COMPACTION OF FILLS

A. Required compaction tests shall be carried out according to ASTM D698 Standard Proctor Test by the Geotechnical Engineer.

B. Field testing methods shall be as determined by the Geotechnical Engineer.

C. Contractor shall be responsible for notifying Geotechnical Engineer as each lift is installed. Contractor shall not place additional lifts until tests indicate the fill is compacted to specified densities. Should any lifts be placed prior to approval of lower lifts, the work shall be removed at no additional cost to the Owner.

D. Materials and densities shall be in accordance with schedule this section.

E. The moisture content of the fill material shall be within 3% of the optimum range for maximum compaction during compaction. Add water as required. If excess water exists, it shall be reduced by harrowing, dicing and natural evaporating.

3.10 FIELD QUALITY CONTROL

A. Testing: In accordance with ASTM D698.

B. Work performed which does not meet technical or design requirements as determined by the Geotechnical Engineer will be removed, replaced and retested at no additional cost to the Owner. No deviations from the Contract Documents shall be permitted without specific and written approval from the Architect/Engineer.

C. Thickness of lifts prior to compaction and distribution of tests, unless otherwise required by the Geotechnical Engineer, shall be accordance with the following table:

AREA	MAX. LIFT THICKNESS	TEST DISTRIBUTION (PER LIFT)
Lawn & unpaved areas	8"	1 per 10,000 s.f.
Backfills (Exterior)	8"	1 per 2,500 s.f.
Embankments (3H:1V & >)	8"	1 per 2,500 s.f.
Under Paving, Curbs, Walks, Footings, and Slabs on Grade	8"	1 per 1,000 s.f.

D. Lift thickness given are for heavy compaction equipment. If hand operated equipment is used then lift thickness shall be one-half of those given above.

E. Test distributions are minimum requirements with more required if deemed necessary by the Geotechnical Engineer. If fill area is linear in shape and less than 50' wide, provide one (1) test per 50 linear feet of the fill areas.

F. Density requirements under slabs, footings and pavement shall be carried ten feet (10') beyond exterior edges.

3.11 STOCKPILE CLEANUP

A. Comply with Section 32 91 19 - Landscape Grading for finish grading and preparation of stockpile areas for landscaping/seeding.

B. Comply with state and local erosion and sediment control ordinances by having stabilized all disturbed areas at completion of work.

3.12 SCHEDULES

A. Fill Under Building Interior Slab-On-Grade to 10 Feet Outside:
1. Fill Type S1, to subgrade elevation, compacted to 95 percent,
2. Inside foundation wall cover with Fill Type A3 (Base for Concrete Flatwork), 6 inches thick (unless detailed otherwise), compacted to 95 percent.

B. Fill Under Grass and Landscape Areas:

1. Fill Type S1, to specified depth of topsoil below finish grade, compacted to 90 percent. See Section 32 91 19 - Landscape Grading for topsoil depth.

C. Fill Under Non-Vehicular Concrete Paving or Pavers (Walks):
   1. Compact subsoil to 95 percent of its maximum dry density.
   2. Fill Type S1, to pavement subgrade as indicated in applicable pavement section or schedule description, compacted to 95 percent.

D. Fill to Correct Over-excavation:
   1. Lean concrete to minimum compressive strength of 1000 psi, OR
   2. Fill Type A4, flush to required elevation, compacted to 98 percent.

END OF SECTION

SECTION 31 23 16

EXCAVATING

PART 1 - GENERAL

1.10 SECTION INCLUDES

A. Excavating for building foundations.

B. Excavating for slabs-on-grade, curbing, walks, landscaping, etc.

C. Excavating for site structures.

1.11 RELATED SECTIONS

A. Appendix: Geotechnical report; bore hole locations and findings of subsurface materials.

B. Section 31 09 00 - Geotechnical Engineering, Inspection, and Testing

C. Section 31 22 13 - Rough Grading: Classification of excavation. Topsoil and subsoil removal from site surface.

D. Section 31 23 23 - Backfilling.

E. Section 31 23 17 - Utility Trenching & Backfilling: Excavating for utility trenches.

F. Section 31 25 13 - Erosion & Sediment Control: Slope protection and erosion control.

1.12 DEFINITIONS

A. Finish grade refers to contours and spot grades indicated on the Drawings.

B. Subgrade or rough grade refers to bottom of footings at foundation walls and columns, bottom of crushed stone fill within trenches or under slabs-on-grade and paving, and finish grade less specified topsoil depth elsewhere. Refer to applicable Drawings and Schedules for distances below finish grade. Subgrade may also refer to the subsoil base upon which fill is to be placed.

C. Where rock is encountered, Contractor shall over-excavate 6 inches below defined subgrade. If rock seam less than 4' in length is encountered below building foundation subgrade, Contractor shall over-excavate 12" below defined subgrade and backfill with A4 aggregate compacted to 98%.

D. Unsuitable material refers to any material beneath proposed subgrade in cut conditions and existing subgrade in fill conditions, which in the opinion of the Geotechnical Engineer, after observing proof-rolling or other testing/observation, will not be a satisfactory base for supporting the proposed work above.

PART 2 – PRODUCTS: Not Used

PART 3 - EXECUTION

3.1 PREPARATION

A. Verify that survey bench mark and intended elevations for the Work are as indicated. Identify required lines, levels, contours, and datum locations.

3.2 EXCAVATING

A. Underpin adjacent structures which may be damaged by excavating work.

B. Work within 15 feet of any structure to remain shall be handled under Excavation. Should the Architect or Geotechnical Engineer determine the structure to be in jeopardy by grading operations this distance may be increased.

C. Excavate subsoil to accommodate building foundations, slabs-on-grade, curbing, and site structures, construction operations, etc.

D. Compact disturbed load bearing soil in direct contact with foundations to original bearing capacity; perform compaction in accordance with Section 31 23 23.

E. Slope banks with machine to angle of repose or less until shored.

F. Do not interfere with 45 degree bearing splay of foundations.

G. Grade top perimeter of excavation to prevent surface water from draining into excavation. Hand trim excavation. Remove loose matter.

H. Notify Architect/Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

I. Do not excavate wet subsoil unless authorized as "unsuitable material" and its removal has been approved by the Geotechnical Engineer.

J. When excavating through roots, perform work by hand and cut roots with sharp ax.

3.3 TOLERANCES

A. Bottom of Footings: Excavate in excess of required dimension on detail from true line and grade.

B. Sides of Footings: Excavate in excess of required dimension on detail from centerline of true alignment.

C. Excavation for Misc. Structures: Plus or minus 0.04 foot (0.5 in) from true line and grade.

1.4 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Assurance: Field inspection and testing. Geotechnical Engineer.

B. Prevent soil in excavated areas previously considered suitable from becoming “unsuitable” due to rainfall or surface runoff and ponding. Measures to protect subgrade shall include, but not be limited to, delaying final excavation of bottom 8” of material to just prior to finished product placement, or installing a protective layer of lean concrete. See geotechnical investigation report for additional recommendations.

C. Provide for visual inspection of bearing surfaces. Place no footing until soil bearing capacity has been verified by the Geotechnical Engineer.

3.3 PROTECTION

A. Prevent displacement or loose soil from falling into excavation; maintain soil stability.

B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

END OF SECTION

SECTION 31 23 17
UTILITY TRENCHING AND BACKFILLING

PART 1 GENERAL

1.1 SECTION INCLUDES (But is not limited to)

A. Excavating trenches for utilities from inlets to indicated points of connection to municipal utilities, source, outfall, etc., as applicable.

B. Compacted backfill from top of utility cover bedding/initial backfill to subgrade elevations.

C. Replacing private entrance pavement and pavement patching where disturbed by utility trenching.

1.2 RELATED SECTIONS

A. Section 31 09 00 - Geotechnical Engineering, Inspections, and Testing.

B. Section 31 05 13 - Soil Materials.

C. Section 31 05 16 - Aggregate Materials.

D. Section 31 10 00 - Site Preparation and Clearing: Preparation for land disturbance. Protection of the work. Demolishing structures. Clearing and grubbing. Stripping and stockpiling topsoil.

E. Section 31 22 13 - Rough Grading: Subgrade Suitability, Correction of Over-excavation.

F. Section 32 91 19 - Landscape Grading: Depth of topsoil.

G. Division 33 - Water, Sanitary Sewer, Storm Drainage, Foundation Drainage Sections, as applicable.

H. Division 23 – Underground Natural Gas, Refrigerant, etc., as applicable.

I. Division 26 - Underground Electrical Conduits

1.3 REFERENCES

A. VDOT “Special Provision for Flowable Backfill” dated March 11, 2010.

B. Virginia Department of Transportation "Road & Bridge Standards & Specifications", latest edition. VDOT section numbers referenced herein refer to sections in these Road & Bridge Specifications. The provisions therein for method of measurement and payment do not apply.

C. ASTM C136 - Method for Sieve Analysis of Fine and Coarse Aggregates.

D. ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb (2.49 Kg) Rammer and 12 inch (304.8 mm) Drop.

E. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

1.4 DEFINITIONS

A. Utility: Any buried pipe, duct, conduit, or cable.

B. Bedding: Fill placed under pipe to provide support.

C. Haunching: Fill placed from bedding to spring line of the pipe, also considered bedding, which further supports pipe in both the horizontal and vertical.

D. Cover Bedding/Initial Backfill: Fill placed above haunching to protect pipe prior to further backfill.

1.5 FIELD MEASUREMENTS

A. Verify that survey bench mark, control point, and intended elevations for the Work are as shown on the Drawings.

1.6 COORDINATION

A. Verify work associated with lower elevation utilities is complete before placing higher elevation utilities.

1.7 PROJECT RECORD DOCUMENTS

A. Accurately record on Project Record Documents the actual locations of existing utilities encountered, by horizontal dimensions, elevations or inverts, and general direction.

PART 2 PRODUCTS

2.1 FILL MATERIALS

A. Backfill: Type S1 as specified in Section 31 05 13 – Soil Materials.

B. Coarse Aggregate (Utility Bedding): Type A1 as specified in Section 31 05 16 - Aggregate Materials.

C. Flowable Backfill: As specified in VDOT "Special Provision for Flowable Backfill" dated March 11, 2010.

D. Concrete: Lean concrete with a compressive strength of 1,000 psi.

2.2 ACCESSORIES

A. Buried Utility Warning and Identification Tape: Provide detectable aluminum foil

plastic-backed tape or detectable magnetic plastic tape or manufactured specifically for warning and identification of buried piping. Tape shall be detectable by an electronic detection instrument. Provide tape in rolls, 3 inches minimum width, color coded for the utility involved, with warning and identification imprinted in bold black letters continuously over entire tape length. Warning and identification shall be "CAUTION BURIED WATER LINE/SANITARY SEWER/STORM SEWER BELOW" or similar, as applicable. Use permanent code and letter coloring unaffected by moisture and other substances contained in trench backfill material.

B. Should Local Governing Authority require separate Detection Wire and Warning/ Identification Tape, meet the local requirements regarding materials, function, and placement.

2.3 ASPHALT PAVEMENT REPLACEMENT

A. Where not covered under general specifications for asphaltic pavement, these guidelines shall be followed. Reference Pavement Sections and Details on the Drawings.

B. Aggregate for Base Course: Type A4 as specified in Section 31 05 16 – Aggregate Materials for Base under Bituminous Pavement.

C. Primer/Tack Coat: In accordance with VDOT Section 211, RC-250 liquid bituminous material.

D. Asphalt: In accordance with VDOT Section 212.17, Type SM-9.5AL and BM-25.0 bituminous concrete.

E. Where concrete curb or curb and gutter is encountered, asphalt shall be removed and replaced, but concrete shall be left intact and tunneled under for utility installation and backfilled according to this section, if possible without causing damage to or movement of existing work. If damage is determined, curb or curb and gutter shall be replaced at no additional cost to the Owner.

PART 3 EXECUTION

3.1 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. Verify that all prerequisite work has been completed. Verify location and elevation of points of connection. Notify Miss Utility.

C. Protect plant life, lawns and other features remaining as a portion of final landscaping.

D. Protect bench marks, and any existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

E. Maintain and protect above and below grade utilities which are to remain.

3.2 EXCAVATING

A. Excavate subsoil required for utilities from origin to destination as indicated.

B. Cut trenches sufficiently wide to enable safe installation and allow inspection. Remove water or materials that interfere with Work.

C. Install trench forms of sufficient height and minimum width to reduce the amount of lateral excavation. Portions of excavations may approach adjacent property lines, pins, landscaping and tree root systems which shall be protected.

D. Do not interfere with 45 degree bearing splay of foundations or as otherwise indicated by Geotechnical Engineer in Soils Report or from their field inspection.

E. Hand trim excavation, including joints, as necessary. Remove loose matter.

F. Remove any lumped subsoil, large stones, or other hard matter which could damage pipe or impede consistent backfilling or compaction.

G. Cut out soft areas of subgrade not capable of compaction in place. See Section 31 22 13 – Rough Grading for Subgrade Suitability. Backfill per schedule this section.

H. Correct areas over-excavated in accordance with Section 31 22 13 – Rough Grading.

I. Stockpile excavated material, if suitable for use and required for rough grading, in area designated on site, and remove excess material from site.

3.3 BEDDING & HAUNCHING

A. Place Geotextile fabric, if applicable, as indicated in details in coordination with appropriate lifts of fill.

B. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.

C. Place bedding and haunching to spring line of pipe and compact material in equal continuous layers not exceeding 8 inches (200 mm) compacted depth.

3.4 BACKFILLING

A. Backfill trenches with unfrozen fill materials per applicable utility trench section to proposed subgrade per finished contours and elevations allowing for topsoil or pavement as applicable.

B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.

C. Backfill: Place and compact material in equal continuous layers not exceeding 8 inches compacted depth.

D. Employ a placement method that does not disturb or damage utilities in trench or

any adjacent work.

E. Maintain optimum moisture content of fill materials to attain required compaction density.

F. Place Buried Utility Warning and Identification Tape continuous over each separate run of piping. Bury tape with printed side up and at the location indicated in the trench sections on the Drawings.

G. Remove surplus fill materials from site.

H. Leave fill material stockpile areas completely free of excess fill materials and restore to applicable proposed finished surface condition.

3.5 COMPACTING

A. Percentage of maximum density requirements:
   1. Compact virgin subsoil (bottom of excavated trench) and each layer of backfill due to over-excavation to 95 percent of maximum dry density at +/-3% optimum moisture content as determined by ASTM D698 (Standard Proctor).
   2. Compact each layer of backfill to not less than the scheduled percentages of maximum dry density at +/-3% optimum moisture content as determined by ASTM D698 (Standard Proctor).

B. Equipment: Use power-driven hand tampers for compacting materials adjacent to structures and in trenches. Provide equipment capable of adding moisture to the soil material or for aerating the soil as determined necessary by moisture-density tests.

C. Moisture Conditioning: Uniformly apply water in such a manner as to prevent free water appearing on the surface, either during or subsequent to compaction operations. Compaction by flooding is prohibited.

D. Re-fill, re-grade and re-finish any area that becomes unsatisfactory due to freeze-thaw, erosion or settling. All areas or portions thereof that do not meet minimum density requirements shall be reworked and compacted until they meet the project density requirements.

3.6 TOLERANCES

A. Top Surface of General Backfilling: Plus or minus 1-1/2 inches (0.12 ft) (37 mm) from required elevations.

B. This tolerance shall not relieve the Contractor from providing minimum sections of finish surfaces or meeting critical spot grades shown on drawings.

3.7 FIELD QUALITY CONTROL

A. Compaction testing will be performed in accordance with ASTM D698 (Standard Proctor) and ASTM D3017 (Moisture Content).

B. Field testing methods shall be as deemed appropriate by the Project Geotechnical Engineer.

C. Request inspection prior to and immediately after placing bedding.

D. Frequency of Compaction Tests: One per lift per 200 LF of trench or fraction thereof.

E. If tests indicate Work does not meet specified requirements, remove unacceptable Work, replace, compact, and retest.

3.8 PROTECTION OF FINISHED WORK

A. Re-fill, re-grade and re-stabilize any area that becomes unsatisfactory due to freeze-thaw, erosion or settling, or vehicular traffic during construction.

3.9 SCHEDULE: See applicable trench sections on Drawings.

A. Backfill Under Asphalt Pavement, Concrete Flatwork, and Road Shoulders:
1. To pavement subgrade, compacted to 95 percent.

B. Backfill Under Grass:
1. To specified depth of topsoil below finish grade, compacted to 90 percent. See Section 32 91 19 - Landscape Grading.

C. Backfill Under Landscaped Areas:
1. To 12 inches below finish grade, compacted to 90 percent.

D. Backfill to Correct Over-excavation:
1. To subgrade elevation, Type A4 Aggregate compacted to 98 percent. On a case by case basis, as approved by the Engineer, lean concrete to minimum compressive strength of 1000 psi may be allowed.

E. Asphalt Patch of Existing Pavement:
1. Type SM-9.5AL and BM-25.0 to full depth of existing asphalt or as otherwise required by City inspector if within public right-of-way. Compacted tolerance is 1/8th inch in 2 feet and freely draining as prior to disturbance.

END OF SECTION

SECTION 31 23 23

BACKFILLING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Building perimeter and site structure backfilling to subgrade elevations.

B. Site backfilling.

C. Fill under slabs-on-grade.

D. Fill in landscaped beds/areas.

E. Fill for over-excavation.

F. Consolidation and compaction as scheduled.

1.2 RELATED SECTIONS

A. Appendix: Geotechnical report; bore hole locations and findings of subsurface materials.

B. Section 31 09 00 - Geotechnical Engineering, Inspection, and Testing: Geotechnical Engineer.

C. Section 31 05 13 - Soil Materials.

D. Section 31 05 16 - Aggregate Materials.

E. Section 31 23 16 - Excavating.

F. Section 31 23 17 - Utility Trenching & Backfilling: Backfilling of utility trenches.

G. Section 33 46 00 - Subdrainage: Filter aggregate and filter fabric.

H. Section 32 13 13 – Portland Cement Concrete Pavement. Concrete Materials.

I. Section 32 91 19 - Landscape Grading: Filling of topsoil to finish grade elevation.

1.3 REFERENCES

A. ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb Rammer and 12 inch Drop.

B. ASTM D1556 - Test Method for Density of Soil in Place by the Sand-Cone Method.

C. ASTM D2167 - Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.

D. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

E. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

1.4 SUBMITTALS FOR REVIEW

A. Samples: Submit to testing laboratory, in air-tight containers, 10 lb sample of each type of subsoil fill from each source to be used.

B. Samples: Submit to testing laboratory, in air-tight containers, 10 lb sample of each type of aggregate fill from each source to be used.

PART 2 PRODUCTS

2.1 FILL MATERIALS

A. Fill Type S1: As specified in Section 31 05 13.

B. Structural Fill Type A4: As specified in Section 31 05 16.

C. Topsoil Fill Type T1 or T2: As specified in Section 31 05 13.

D. Concrete: Lean concrete conforming to Section 03 30 00 with a compressive strength of 1,000 psi.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify sub-drainage, damp proofing, or waterproofing installation has been inspected.

B. Verify structural ability of unsupported walls to support loads imposed by the fill. Allow necessary time for curing and provide adequate bracing prior to backfilling.

3.2 PREPARATION

A. Compact subgrade to density requirements for subsequent backfill materials.

B. Cut out soft areas of subgrade not capable of compaction in place in locations and to the extent as required by the Geotechnical Engineer. Backfill in accordance with schedule at the end of this section. Contractor shall reference geotechnical investigation report for additional information.

C. Scarify and proof roll subgrade surface to a depth of 1 inch to identify soft spots; fill and compact to density equal to or greater than requirements for subsequent fill material.

3.3 BACKFILLING

A. Backfill areas to contours and elevations with unfrozen materials.

B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.

C. Place geotextile fabric over Type A2 fill prior to placing next lift of fill.

D. Soil Fill Type S1: Place and compact material in equal continuous layers not exceeding 8 inches compacted depth.

E. Employ a placement method that does not disturb or damage other work.

F. Maintain optimum moisture content of backfill materials to attain required compaction density.

G. Backfill against supported foundation walls and retaining walls. Do not backfill against unsupported walls.

H. Backfill simultaneously on each side of unsupported foundation walls until supports are in place.

I. Maintain minimum grade away from building per Section 31 22 13 – Rough Grading.

J. Make gradual grade changes. Blend slope into level areas.

K. Stockpile in sufficient quantities to meet Project schedule and requirements where specified in Section 31 22 13 – Rough Grading. Remove excess material and material unsuitable for reuse as fill from site.

3.4 TOLERANCES

A. Top Surface of Backfill (Subgrade): Plus or minus 0.1 foot within 100 feet of buildings, under all pavement and site improvements (such as athletic/play fields); and 0.25 foot on surrounding fields and slopes.

3.5 FIELD QUALITY CONTROL

A. Section 31 09 00 - Geotechnical Engineering, Inspection, and Testing.

B. Compaction testing will be performed in accordance with ASTM D698.

C. If tests indicate Work does not meet specified requirements, remove Work, replace and retest.

D. Frequency of Tests: Meeting requirements listed in Section 31 22 13 – Rough Grading

Max. Lift Thickness	Tests (per Lift)

Backfills (Exterior)	8"	1 per 2,500 s.f.
Under Paving, Curbs, Walks, Footings, and Slabs on Grade	8"	1 per 1,000 s.f.

3.6 PROTECTION OF FINISHED WORK

A. Reshape and re-compact fills subjected to vehicular traffic.

3.7 SCHEDULE

A. Building Foundations:
   1. Lean concrete to minimum compressive strength of 1000 psi, OR
   2. Aggregate Type A4, flush to required elevation, compacted to 98 percent.

B. Interior Slab-On-Grade:
   1. Fill Type S1, per section on Drawings, compacted to 95 percent,
   2. Cover with Aggregate Type A3, per section on Drawings, compacted to 95 percent.

C. Exterior Side of Foundation Walls, Retaining Walls and Over (geotextile protected) Granular Filter Material and Foundation Perimeter Drainage Stone:
   1. Fill Type S1, per structural details to subgrade elevation, each lift, compacted to 90 percent.

D. Fill Under Grass and Landscaped Areas:
   1. Fill Type S1, to rough grade, compacted to 90 percent.

E. Fill to Correct Over-excavation:
   1. Lean concrete to minimum compressive strength of 1000 psi, OR
   2. Aggregate Type A4, flush to required elevation, compacted to 98 percent.

END OF SECTION

SECTION 31 25 13

EROSION AND SEDIMENT CONTROL

PART 1 GENERAL

1.1 WORK INCLUDED (But is not limited to)

A. Furnish all labor, equipment and materials to complete and maintain Erosion and Sediment Control (ESC) measures necessary to prepare for and control proposed land disturbance per local and state regulations.

B. Responsible Land Disturber defined.

C. Install ESC Structures and Measures.

D. Maintain Effectiveness of Structures and Measures.

E. Control Water Run-off.

F. Control Dust Accumulation.

G. Control Amount of Disturbed/Unstabilized Area.

H. Temporary and Permanent Stabilization of Disturbed Areas.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Division 00 & 01: Permits, Fees, & Notices: Land Disturbing Permit.

B. Section 31 10 00 – Site Preparation & Clearing: Topsoil Stripping and Stockpiling.

C. Section 31 22 13 – Rough Grading: Site subgrade contouring.

D. Section 31 23 16 – Excavating and Filling: Excavating for other than linear utility work.

E. Section 31 23 23 – Backfilling: Backfilling for other than linear utility work.

F. Section 31 23 17 – Utility Trenching & Backfilling.

G. Section 33 41 00 – Site Storm Drainage System.

H. Section 32 91 19 – Landscape Grading: Topsoiling.

I. Section 32 92 19 – Seeding: Temporary Seeding. Permanent Seeding.

1.3 REFERENCES

A. Virginia Erosion & Sediment Control (ESC) Handbook: Temporary seeding, construction entrances and other measures or practices which may apply.

B. Virginia Department of Transportation (VDOT) "Road & Bridge Standards & Specifications": Outlet Protection, Channel Sections, Materials, Installation of Measures, etc. (but excluding references to measurement and payment).

1.4 DEFINITIONS

A. Local Governing Authority (LGA) - The state agency, plan approving authority, municipal department or other entity which legally has jurisdiction over the referenced work or activity. This usually means the field official who makes or controls onsite inspections of the Work.

1.5 REGULATORY REQUIREMENTS

A. Contractor shall comply with all requirements of the Virginia Erosion & Sediment Control Law pertaining to this project as presented in the Virginia Erosion & Sediment Control Handbook.

B. Erosion & Sediment Control (ESC):

1. The Contractor shall employ a Responsible Land Disturber who is certified by the Department of Conservation and Recreation. The name of this person is to be designated in writing by the Contractor to the State ESC plan approving authority (LGA) and the Owner along with copies of their certification prior to any land disturbance. The Responsible Land Disturber for this project shall be in charge of and is responsible for carrying out the land-disturbing activities on this project. The certified Responsible Land Disturber may change at any time during the life of this project, as long as the State ESC plan approving authority is notified in advance and in writing.
2. Obtain and pay for such land disturbing permits as required by the plan approving authorities, including fees and bonds, per Division 0 & 1.
3. The Contractor shall not begin land disturbance until all required permits have been obtained and, if required, posted at the site. Payment of fees and acquisition of permits shall be made by the Contractor. Permits may include, but are not limited to, the following:
   a) Local (or State) Land Disturbance Permit.
   b) Virginia Stormwater Management Program (VSMP) Permit.
   c) Erosion and Sediment Control Bond.
   d) Right-of-Way Excavation Permit and Bond.
4. The plans have been drawn according to specifications of the Virginia Erosion and Sediment Control Handbook (Latest Edition) and pertinent state regulations. The ESC Narrative shall be considered part of these Contract Documents as required by the State ESC plan approving authority (LGA).

1.6 SUBMITTALS

A. Samples for Initial Selection: Manufacturer's standard color charts showing range of colors available for River Rock erosion control stone.

PART 2 PRODUCTS

2.1 MATERIALS

A. All Erosion and Sediment Control materials shall conform to the standards set forth in the ESC Handbook unless indicated as VDOT Std. in which case they shall conform to the "Road & Bridge Stds. & Specs."

B. Construction Entrance Stone: Provide in accordance with the ESC Handbook Std. & Spec. 3.02.

C. Construction Road Stabilization Stone: Provide in accordance with ESC Handbook Std. & Spec. 3.03. Within areas to be paved and once rough grade has been obtained, the Contractor may use pavement base material as specified and/or indicated in the pavement section on Drawings.

D. Outlet Protection or Storm Water Conveyance Channel Stone: Provide in accordance with VDOT Std. EC-1 Erosion Control Stone and Spec. 414.03(e) Erosion Control Stone. Rock shall be washed River Rock, uniform in size, per median stone size indicated on the Drawings. All fines shall be screened from the aggregate. Rock shall be composed of round River Rocks that may be varied in color, sound, durable, non-erodible and free from seams, cracks, and other structural defects.

E. Outlet Protection Stone Geotextile Fabric for bedding shall conform to VDOT Std. & Spec. Section 245, which includes but is not limited to meeting the following requirements: apparent size opening equal to or greater than No. 50 sieve as tested per ASTM D4751, tensile strength @ 20% maximum elongation of 30 lbs/linear inch minimum as tested per VTM-52, puncture strength of 80 lbs minimum as tested per ASTM D4833, and have seams equal in strength to the basic material. Submit written documentation of test results from an independent commercial lab verifying that material meets specified requirements.

F. Silt Fence: Woven fabric for use as silt fence around inlets or to protect slopes.
   1. Manufacturer - Product:
      a) Amoco - Propex Silt Stop
      b) Mirafi, Inc. - Mirafi 100X, Envirofence
      c) Exxon - GTF 101-S
   2. Posts for staking silt fence shall be 1" x 2" wood with a minimum length of 48".

G. Filter Fabric: Non-woven fabric for use in foundation drain systems, dry wells, lining beneath EC Stone, etc.
   1. Manufacturer - Product:
      a) TC Mirafi – Mirafi 180N
      b) Amoco Fabrics and Fibers Co. – ProPex 4547
      c) Reemay, Inc. – Typar 3401

H. Temporary & Permanent Seeding and Related Items: Provide in accordance with Section 32 92 19 – Seeding.

I. Water: Water shall be potable and provided in accordance with Section 01 51 00 – Temporary Utilities: Temporary Water.

PART 3 EXECUTION

3.1 GENERAL

A. Accept premises as found. Owner assumes no responsibility for conditions of the site or continuation of conditions existing at the time of advertisement.

B. Temporary erosion and sediment control measures are required during construction and shall be installed prior to any clearing, grading or other construction, and to the minimum standards and specifications of the ESC Handbook. Comply with all minimum standards of the Virginia Erosion and Sediment Control Regulations, 4VAC50-30-40 of the Code of Virginia.

C. Permanent storm water management measures are required for the project and shall be installed to the minimum standards and specifications of the ESC Handbook. Comply with all minimum standards of the Virginia Storm Water Management Regulations, 4VAC3-20 et seq.

D. The erosion control and storm water management plans as approved by the LGA shall be made part of these Contract Documents. This includes the ESC Narrative.

E. Prior to initial disturbance of earth, comply with all applicable standards and ordinances to prevent soil erosion and siltation. Install, construct and maintain such measures as shown on Drawings and all others as required by the inspecting authorities having jurisdiction.

F. Be responsible for satisfying any and all erosion control and storm water management requirements for any land disturbing activities, including but not limited to on-site or off-site borrow, on-site or off-site stockpiling or disposal of waste materials. Before undertaking any land disturbing activity for which the Contract Documents do not specifically address erosion control and storm water management (such as off-site borrow and waste areas), contact the Regional Office of the Division of Soil and Water Conservation (SWC) or other LGA to determine what Erosion Control and storm water management measures are necessary. Completely satisfy all requirements of the LGA, including payment of design, review, and permit expenses, before continuing with the concerned activity.

G. Dust Control: Any material which will result in dust shall be wet down during the work.

H. Use whatever means necessary to prevent mud and dirt from being carried onto public streets.

I. Should mud and dirt accumulate on streets execute immediate cleaning methods to remove accumulation.

3.2 PREPARATION

A. Assure that all pertinent required permits have been obtained.

B. Notify LGA of intent to begin work.

C. Verify that existing trees/plant life designated to remain, are conspicuously marked as such.

3.3 PROTECTION

A. Protection of adjacent properties and waterways: Prior to any land disturbance activity install Erosion and Sediment Control measures. See Site Drawings for specific practices required to prevent soil from washing from areas disturbed during clearing operations. Maintain all ESC measures required.

B. Protection of Existing Trees and Vegetation:
1. Provide protection for existing trees, plant growth, and features designated to remain against compacting the root zone, unnecessary cutting, breaking, skinning of roots, or bruising of bark. Conform to details and specifications of the ESC Handbook for methods of protection.
2. Repair or replace trees and vegetation indicated to remain which are damaged by construction operations, in a manner acceptable to the Architect.

3.4 EROSION & SEDIMENT CONTROL MEASURES

A. General:
1. The LGA reserves the right to require more ESC measures if field observation of in place measures shows they are inadequate for the task.
2. Maintain erosion control during construction until permanent pavement, plantings and restoration of natural areas is effective in controlling erosion.
3. Plan and execute construction by methods to control surface drainage from cut, fill, borrow and grading areas.
4. Minimize amount of bare soil exposed at one time.
5. Schedule operations so ground surface will be disturbed for shortest possible time before permanent construction is installed.
6. Maintain large areas as flat as practicable to minimize soil transfer through surface flow.
7. Storm Drainage System: Install as much of permanent system as soon as practicable and divert surface water into system, with remainder of system installed as soon as conditions allow. Coordinate with Section 33 41 00 - Site Storm Drainage System.
8. Repair washed and eroded areas. Re-establish required grades, densities, elevations, profiles and contours. Re-seed as required.

B. Temporary Construction Entrance:
1. A construction entrance is required at all locations where construction vehicles enter a public right-of-way. During wet weather conditions, clean the wheels of construction vehicles prior to their accessing public streets.
2. Install and maintain in accordance with VEC Std. & Spec. 3.02, to the extent shown on Drawings.
3. No point of vehicular access onto the disturbed earthen portion of the site shall be utilized other than the Construction Entrance (CE) shown on Drawings. Access is allowed from pavement directly onto Construction Road Stabilization (CRS) but not from CRS onto disturbed earth.
4. Place stone to the dimensions shown on Drawings (default: 12' width x 70'

length, minimum) and at a depth of 6 inches minimum. A wash rack and temporary water service may be required by the LGA at their discretion.

5. In addition to periodically adding clean stone to the construction entrance and maintaining the edges, the Contractor is required to clean all mud, soil and debris from public roadways which originates from the project site on a daily basis.

C. Construction Road Stabilization:

1. Install and maintain in accordance with VEC Std. & Spec. 3.03, as required for a job trailer, construction parking, building access, and/or storage.
2. Additionally 6-inch depth of roadway base stone shall be placed immediately after final subgrade elevations are established in the portions of the site receiving heavy construction vehicular traffic.

D. Silt Fence:

1. Install and maintain in accordance with VEC Std. & Spec. 3.05 to the extent shown on Drawings.
2. Drive posts a minimum of 12 inches into the ground at a maximum spacing of 10 feet. Maximum height above grade shall be 36 inches.
3. At the base of the posts on the up hill side, excavate a continuous shallow trench.
4. Staple, wire or attach filter fabric to the post according to the manufacturer's instructions, leaving 8 inches of fabric along the bottom.
5. Extend bottom surplus of fabric into the trench. Backfill and compact the soil over the trench providing a secure anchor.

E. Storm Drain Inlet Protection for Drop Inlets:

1. Install and maintain in accordance with VEC Std. & Spec. 3.07, using filter fabric as herein specified.
2. Space posts around the perimeter of the inlet at 3 feet on center and drive 12 inches into the ground. The height above-grade of the posts shall be between 15 and 18 inches.
3. Excavate a shallow trench around the perimeter of the posts.
4. Staple, wire or attach fabric to the posts according to the manufacturer's recommendations, leaving 8 inches of surplus fabric along the bottom.
5. Extend bottom of fabric into the trench, backfill and compact over the trench.

F. Storm Drain Inlet Protection for Culverts:

1. Install and maintain in accordance with ESC Std. & Spec. 3.08, using material as herein specified.
2. Space posts around the perimeter of the culvert inlet placed approximately 6 feet up stream from the culvert at a maximum of 3 feet on center and drive 12 inches into the ground. The height above-grade of the posts shall be between 16 and 36 inches.
3. Excavate a shallow trench around the perimeter of the posts.
4. Staple, wire or attach fabric to the posts according to the manufacturer's recommendations, leaving 8 inches of surplus fabric along the bottom.
5. Extend bottom of fabric into the trench, backfill and compact over the trench.
6. If the above proves of insufficient to provide protection from silt entering the

culvert, replace with the Optional Stone Combination as detailed in ESC Handbook Plate 3.08-1.

G. Outlet Protection or Storm Water Conveyance Channel:

1. After surrounding area has been brought to subgrade, excavate to subgrade elevations for OP or SCC as indicated from finish grade on plans less EC Stone depth in detail.
2. Compact subgrade to requirements for surrounding subgrade under applicable earthwork section.
3. Install bedding geotextile fabric in accordance with detail, overlapping joints 6 inches minimum and stapling per manufacturer's recommendations and entrenching entire perimeter of fabric 9 inches. Compact fabric entrenchment to requirements of surrounding subgrade.
4. Place, do not dump, Erosion Control Stone to the dimensions and configuration indicated on the applicable detail.

H. Erosion Control/Re-vegetation Mat:

1. Install Erosion Control Mat in accordance with VDOT Std. EC-2 or EC-3 in the locations shown on Drawings or as otherwise indicated.
2. Install Re-vegetation Mat in the locations shown on Drawings or otherwise indicated. Mat shall conform to Part 2 of Section 32 92 19 - Seeding.
3. Shape and grade the channel or slope; remove all rock and debris.
4. Place and compact topsoil to the depth previously specified.
5. Apply fertilizer, lime and seed at the rates specified for seeded lawn areas in Section 32 92 19 – Seeding.
6. Place and secure the mat as described in Part 3 of Section 32 92 19 – Seeding.

I. Temporary Check Dams in Swales:

1. Install and maintain in accordance with VEC Std. & Spec. 3.20.
2. Place VDOT #1 stone in locations as necessary to control erosion such that the entire width of the swale is guarded. The maximum height of the dam shall not exceed 24 inches. The center portion shall be 6 inches lower than the outer edges.
3. Upstream and downstream faces of the dam shall be sloped 2 feet horizontally for every one foot of height.

J. Temporary Seeding:

1. Temporary seeding shall be applied to denuded areas within seven (7) days after final grade has been established and to portions of the site which may not be at final grade but which will remain inactive for more than 30 days and less than one year. Lawn areas and slopes may be topsoiled and permanently seeded only if this can be accomplished during the correct time of year for the permanent seed mixture specified in Section 32 92 19 – Seeding. Permanent Seeding is required for areas which will remain dormant for more than one year.
2. Where the area is compacted, crusted or hardened, the soil surface shall be loosened by disking, raking, harrowing or other means.
3. Apply lime at a rate of 50 pounds per 1000 sq. ft. and 5-10-10 fertilizer at 10 pounds per 1000 sq. ft. Thoroughly mix into loosened soil.

4. Seed shall be evenly applied at a rate of 2 lbs. per 1000 sq. ft. to the prepared ground and mulched.
5. Slopes greater than 3:1 shall be hydroseeded. Other areas may be hydroseeded or dry seeded at the Contractor's option.
6. Hydroseeding operations shall include seed, fertilizer, mulch and binder in one operation. Areas which are hydroseeded from 6/1 to 9/1 or 12/1 to 3/1 shall be mulched with straw. Wood fiber mulch shall not be used during these times.
7. After mulching of dry seeded areas, mulch shall be stabilized using a liquid binder. Portions which continue to lose mulch due to wind or runoff shall be further stabilized with mulch stabilization netting. Install netting according to Section 32 92 19 – Seeding.
8. Areas which fail to establish initial vegetative cover adequate in checking erosion shall be re-seeded as soon as such areas are recognized. Matting and blankets shall be installed on areas which fail to establish subsequent vegetative efforts.

K. Topsoil/Soil Materials Stockpile: Do not stockpile in drainage ways or within the drip line of trees. Stockpile to a depth not exceeding 8 feet (2.5 m) and with side slopes not exceeding 2H:1V. Protect from wind and water erosion and from admixture of debris.

L. Tree Protection:
1. Install and maintain in accordance with VEC Std. & Spec. 3.38 to the extent shown on the Drawings, unless detailed otherwise. Also refer to Section 31 10 00 – Site Clearing and Preparation and Section 31 23 23 – Backfilling for filling within drip lines of vegetation to remain.
2. The limits of clearing shall be beyond the drip line of existing trees to remain.
3. Prior to clearing the site, protected trees shall be clearly identified with a bright colored surveyor’s ribbon applied in a band circling the tree at heights of 4 and 8 feet.
4. No equipment, building materials or topsoil shall be placed within the drip line of protected trees.
5. 40 inch high snow fence shall be placed at the limits of clearing (drip line). Fence shall be maintained at all times.

3.5 REMOVAL OF TEMPORARY EROSION AND SEDIMENT CONTROLS

A. Remove temporary erosion and sediment control measures within 30 days after permanent lawn areas have become substantially established as defined in Section 32 92 19 - Seeding or after the temporary measures are no longer required as determined and authorized by the local program administrator. Permanently stabilize disturbed soil areas resulting from the disposition of temporary measures to prevent further erosion.

END OF SECTION

SECTION 31 31 16
TERMITE CONTROL

PART 4 - GENERAL

4.1 RELATED DOCUMENTS

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

4.2 SUMMARY

A. Section Includes:
   1. Soil treatment with termiticide at each structure where concrete adjoins soil.

4.3 ACTION SUBMITTALS

A. Product Data: For each type of termite control product.
   1. Include the EPA-Registered Label for termiticide products.

4.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For termite control products, from manufacturer.

B. Soil Treatment Application Report: After application of termiticide is completed, submit report for Owner's records and include the following:
   1. Date and time of application.
   2. Moisture content of soil before application.
   3. Termiticide brand name and manufacturer.
   4. Quantity of undiluted termiticide used.
   5. Dilutions, methods, volumes used, and rates of application.
   6. Areas of application.
   7. Water source for application.

C. Warranties: Sample of special warranties.

4.5 QUALITY ASSURANCE

A. Regulatory Requirements: Formulate and apply termiticides and termiticide devices according to the EPA-Registered Label.

B. Source Limitations: Obtain termite control products from single manufacturer.

4.6 PROJECT CONDITIONS

A. Environmental Limitations: To ensure penetration, do not treat soil that is water saturated or frozen. Do not treat soil while precipitation is occurring. Comply with requirements of the EPA-Registered Label and requirements of authorities having jurisdiction.

B. Coordinate soil treatment application with excavating, filling, grading, and concreting operations. Treat soil under footings, grade beams, and ground-supported slabs before construction.

4.7 WARRANTY

A. Soil Treatment Special Warranty: Manufacturer's standard form, signed by Applicator and Contractor, certifying that termite control work, consisting of applied soil termiticide treatment, will prevent infestation of subterranean termites. If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.
   1. Warranty Period: Five years from date of Substantial Completion.

PART 5 - PRODUCTS

5.1 SOIL TREATMENT

A. Termiticide: Provide an EPA-Registered termiticide, complying with requirements of authorities having jurisdiction, in an aqueous solution formulated to prevent termite infestation. Provide quantity required for application at the label volume and rate for the maximum termiticide concentration allowed for each specific use, according to product's EPA-Registered Label.
   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. BASF Corporation, Agricultural Products; Termidor.
      b. Bayer Environmental Science; Premise 75.
      c. FMC Corporation, Agricultural Products Group; Dragnet FT, Talstar, Prevail.
      d. Syngenta; Demon TC, Prelude, Probuild TC.
   2. Service Life of Treatment: Soil treatment termiticide that is effective for not less than five years against infestation of subterranean termites.

PART 6 - EXECUTION

6.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for moisture content of soil per termiticide label requirements, interfaces with earthwork, slab and foundation work, landscaping, utility installation, and other conditions affecting performance of termite control.

B. Proceed with application only after unsatisfactory conditions have been corrected.

6.2 PREPARATION

A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's written instructions for preparation before beginning application of termite control treatment. Remove all extraneous sources of wood cellulose and other edible materials such as wood debris, tree stumps and roots, stakes, formwork, and construction waste wood from soil within and around foundations.

B. Soil Treatment Preparation: Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated except previously compacted areas under slabs and footings. Termiticides may be applied before placing compacted fill under slabs if recommended in writing by termiticide manufacturer.
   1. Fit filling hose connected to water source at the site with a backflow preventer, complying with requirements of authorities having jurisdiction.

6.3 APPLICATION, GENERAL

A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's EPA-Registered Label for products.

6.4 APPLYING SOIL TREATMENT

A. Application: Mix soil treatment termiticide solution to a uniform consistency. Provide quantity required for application at the label volume and rate for the maximum specified concentration of termiticide, according to manufacturer's EPA-Registered Label, to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction. Distribute treatment evenly.
   1. Slabs-on-Grade and Basement Slabs: Under ground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed.

B. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.

C. Protect termiticide solution, dispersed in treated soils and fills, from being diluted until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.

D. Post warning signs in areas of application.

E. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

END OF SECTION 31 31 16

SECTION 32 13 13

PORTLAND CEMENT CONCRETE PAVEMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Concrete sidewalks, integral curbs, curb &/or gutters, median barriers, parking areas, and roads.

B. Aggregate base course.

1.2 RELATED SECTIONS (including but not limited to)

A. Division 01 – Submittals, Quality Requirements, Inspection and Testing, Traffic Regulation, Protection of Completed Work.

B. Section 31 09 00 - Geotechnical Engineering, Inspections, and Testing.

C. Section 31 05 16 - Aggregate Materials: Aggregate base course.

D. Section 31 22 13 - Rough Grading: Preparation of site for paving and base.

E. Section 31 23 23 - Backfilling: Compacted subbase for paving.

F. Section 32 13 13 – Reactive Chemical Concrete Stain.

G. Section 32 13 16 - Stamped Concrete Paving

H. Section 32 91 19 - Landscape Grading: Preparation of subsoil at pavement perimeter.

I. Section 03 30 00 - Cast-in-place Concrete: Reinforcing, Joints, Curing.

J. Section 07 92 00 - Joint Sealers: Sealant for joints.

1.3 REFERENCES

A. ACI 301 - Specifications for Structural Concrete for Buildings.

B. ACI 304 - Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.

C. ASTM A615 - Deformed and Plain Billet-Steel for Concrete Reinforcement.

D. ASTM C33 - Concrete Aggregates.

E. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.

F. ASTM C698 - Test Methods for Moisture-Density Relations of Soil and Soil-Aggregate Mixtures, Using 5.5 lb Rammer and 12 inch Drop.

G. Virginia Department of Transportation "Road & Bridge Standards & Specifications", latest edition. VDOT section numbers referenced herein refer to sections in these Road & Bridge Specifications. The provisions therein for method of measurement and payment do not apply.

1.4 SUBMITTALS FOR INFORMATION

A. Section 01 33 00 – Submittal Procedures.

B. Product Data: Provide data on joint filler, admixtures, curing compounds and ADA tactile warning mats.

C. Submit certification from Concrete batch plant for proposed mix design of each class of mix for information prior to beginning of work.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with requirements of Reference Standards above. Refer to ACI 304 for any concrete related item not covered in Reference Standard. Maintain one copy of the reference utilized onsite with Contract Documents.

B. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with industry

standards, the specified requirements and the methods for proper performance of the work of this section.

C. Concrete Mixing Plant: VDOT Certified.

D. Obtain materials from same source throughout.

1.6 REGULATORY REQUIREMENTS

A. Conform to VDOT review, approval and inspections per VDOT Stds.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Materials, other than concrete, shall be placed or installed per manufacturer's recommendations.

PART 2 PRODUCTS

2.1 AGGREGATE BASE

A. Aggregate for Base Course: Type A3 per Section 31 05 16 - Aggregate Materials.

2.2 FORM MATERIALS

A. Steel form material, profiled to suit conditions.

B. Joint Filler: Asphalt impregnated fiberboard, 1/2 inch thick by full depth of concrete pavement less 1/2 inch allowance for joint sealant.

C. Curbing Joint Filler: Asphalt impregnated fiberboard, 1/2 inch thick by full depth of VDOT Std. CG-2 (curb only) or CG-6 (curb & gutter) as indicated less 1/2 inch allowance for joint sealant. See Drawings for delineation.

2.3 REINFORCEMENT

A. Reinforcing Steel and Welded Steel Wire Fabric: Type specified in Section 03 30 00 - Cast-in-Place Concrete.

B. Dowels: ASTM A615; 40 ksi yield grade, plain steel, galvanized finish.

2.4 CONCRETE MATERIALS

A. Concrete shall be VDOT Std. Class A3 for walks and stairs and Class A4 within traffic bearing areas. See Drawings for delineations.

B. Fine and Coarse Mix Aggregates: ASTM C33.

C. Detectable Warning Surface: Per VDOT Std. CG-12.

D. Water: Potable, not detrimental to concrete.

2.5 ACCESSORIES

A. Method of Curing: Membrane Curing Compound meeting requirements of Section 03 30 00 - Cast In Place Concrete.

B. Joint Sealers: Specified in Section 07 92 00.

2.6 FINISH

A. Finish for exterior flatwork shall be per schedule at the end of this Section.

B. Edges of exterior flatwork shall be quarter round tooled after broom finish and left with steel troweled appearance and slightest depression below the interior surface.

C. Crack control joints for exterior flatwork shall be quarter round tooled after broom finish and left with steel troweled appearance and slightest depression below the interior surface.

2.7 SOURCE QUALITY CONTROL AND TESTS

A. Section 01 40 00 - Quality Requirements: Quality assurance testing.

B. Section 31 09 00 - Geotechnical Engineering, Inspections, and Testing.

C. Submit proposed mix design of each class of concrete to appointed firm for review prior to commencement of work.

D. Tests on cement and aggregates will be performed to ensure conformance with specified requirements.

E. Test samples in accordance with ACI 301.

PART 3 EXECUTION

3.13 EXAMINATION

A. Coordinate the Work and verify base conditions under provisions of Div. 1. Verify that all pre-requisite work (subsurface utilities, etc.) has been completed and is ready to receive the work of this section. Verify that compacted subgrade is dry and ready to support paving/surfacing and imposed loads. Verify that gradients and elevations of base are correct.

3.2 PLACING AGGREGATE BASE COURSE

A. For Concrete Pavement: Place base material of sufficient width to support formed work. Compact to 100 percent ASTM D-698 maximum dry density. Maintain the base smooth, compacted, well bonded, and true to the designed cross section until concrete placement.

3.3 PREPARATION

A. For repair work, cut existing surface back to undisturbed material to provide uniform division lines between existing and new work.

B. Butt new work to existing surfaces to result in smooth transitions and uniform sections.

C. Before placing surface, inspect the subgrade and base for conformity with the specified section. If necessary, remove or add material to bring all portions of the subgrade and base to proper section and correct elevation. Thoroughly compact and inspect the adjusted section after correcting.

D. Moisten base to minimize absorption of water from fresh concrete.

E. Coat surfaces of manhole and drainage structure frames with oil to prevent bond with concrete pavement.

F. Notify Architect/Engineer minimum 24 hours prior to commencement of concreting operations.

3.4 FORMING

A. Place and secure forms to correct location, dimension, profile, and gradient.

B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

C. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.

3.5 REINFORCEMENT

A. Place reinforcement as indicated in details on Drawings.

B. Interrupt reinforcement at expansion joints.

C. Place dowels to achieve pavement and curb alignment as necessary to prevent differential settlement of adjacent work. One end of dowel shall be set in capped sleeve to allow longitudinal movement (typical of all installations).

D. Provide dowels at expansion joints. Place dowels at 12 feet OC maximum with two (2) per connection min.

E. Provide keyed and doweled, longitudinal construction joints at maximum of 12 feet OC where slabs exceed 500 SF and are not otherwise segmented by expansion joints.

3.6 PLACING CONCRETE

A. Measure, mix, transport, and place concrete in accordance with ACI 304 unless superceded by VDOT Section 217.10 and 316.04(j). Use of admixtures shall be approved in advance by the Architect.

B. Do not produce or place concrete when the weather is rainy or foggy, when the subgrade is frozen or has excess moisture, or when the ambient temperature is less than 40 degrees F in the shade away from artificial heat.

C. Place concrete using the slip form technique.

D. Ensure reinforcement, inserts, embedded parts, formed joints, etc. are not disturbed during concrete placement.

E. Place concrete continuously over the full width of the panel and between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.

F. Place concrete to pattern indicated. Default to VDOT Spec. if none indicated.

3.7 JOINTS

A. Place joint filler in pavement pattern placement sequence as indicated on the Drawings. Place joint filler between paving components and building or other appurtenances. Place joint filler where new concrete work meets existing concrete.

B. For linear work place expansion joints at 30 foot intervals unless otherwise indicated. Align curb, gutter, and sidewalk joints where adjacent.

C. Set top to required elevations. Secure to resist movement by wet concrete.

D. Recess top of filler ½ inch for joint sealant placement.

E. Use joint sealant for caulking all joints in concrete pavements and walks.

F. Provide tooled control joints per VDOT specs to pattern indicated (with 6' OC as default value). Verify pattern with Architect prior to concrete placement.

G. Provide keyed joints as indicated.

3.8 EXPOSED AGGREGATE

A. Wash exposed aggregate surface with clean water and scrub with stiff bristle brush exposing aggregate to match sample panel.

3.9 BROOM FINISH

A. General: Do not add water to concrete surfaces during finishing operations.
B. Provide broom surface finish to uniform granular texture. Finish surfaces to true planes. Cut down high spots and fill low spots. .
C. Direction of Texturing: Transverse to pavement direction, unless otherwise indicated in schedule.

3.10 FINISHING & CURING

A. Finish per schedule at the end of this section. Avoid over-finishing!

B. Tactile Warning: Provide ADA required finish where indicated on Drawings. Finished product shall match sample panel.

C. Place curing compound on exposed concrete surfaces immediately after finishing. Apply in accordance with Manufacturer's instructions.

3.11 JOINT SEALING

A. Separate pavement from vertical surfaces with ½ inch thick joint filler.

B. Place joint filler in pavement pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.

C. Extend joint filler from bottom of pavement to within ½ inch of finished surface. Conform to Section 07 92 00 for finish joint sealer requirements.

3.12 CURBS

A. Install VDOT Std. CG-2 (curb only) and/or VDOT Std. CG-6 (curb & gutter) as delineated on the Drawings. Typically upslope curbing may be curb only. Provide also for dry-pan or reverse gutters at locations required to prevent ponded water. This shall be verified and coordinated in advance with the Architect.

B. Wiped down or submerged curbs (see details) shall have machined finish matching typical CG-2 finish.

3.13 TOLERANCES

A. Section 01 40 00 - Quality Requirements: Quality Assurance. Tolerances.

B. Maximum Variation of Surface Flatness: ¼ inch in 10 ft.

C. Maximum Variation From True Position: ¼ inch.

3.14 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Field inspection and testing.

B. Section 31 09 00 – Geotechnical Engineering, Inspections, and Testing.

C. Testing firm will take cylinders and perform slump and air entrainment tests in accordance with ACI 301.

D. Three concrete test cylinders will be taken for every 75 or less cu. yds. of each class of concrete placed each day.

E. One additional test cylinder will be taken during cold weather and cured on site under same conditions as concrete it represents.

F. One slump test will be taken for each set of test cylinders taken.

G. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.15 PROTECTION

A. Section 01 70 00 – Execution Requirements: Protection of Completed Work.

B. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.

C. Do not permit pedestrian or vehicular traffic over pavement for 7 days minimum after finishing.

3.16 SCHEDULE

A. Area Paving: As detailed on Drawings with Light broom finish as default. Verify with Architect prior to placement of concrete.

B. Sidewalk Paving (Non-colored): Light broom, radius to ¼ inch radius, and trowel joint edges.

END OF SECTION

SECTION 32 91 19

LANDSCAPE GRADING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Providing, placing on previously prepared subgrade, and grading topsoil to finish grade.

1.2 RELATED SECTIONS

A. Division 01 - GENERAL CONDITIONS: Including but not limited to:
1. Coordination of the Work,
2. Submittals; Procedure for submittals, and
3. Protection of the finished Work.

B. Section 31 09 00 - Geotechnical Engineering, Inspection, and Testing: Geotechnical Engineer.

C. Section 31 05 13 - Soil Materials: Topsoil materials.

D. Section 31 10 00 - Site Preparation and Clearing: Preparation for land disturbance, protection of the Work, and stripping and stockpiling topsoil.

E. Section 31 22 13 - Rough Grading: Site subgrade contouring; general cutting, grading, filling and rough contouring the site. Dewatering excavations and water control.

F. Section 31 23 17 - Utility Trenching & Backfilling: Utility excavation, backfill and compaction. Excludes bedding and setting utilities. References this section for provision and placement of topsoil.

G. Section 31 25 13 - Erosion & Sediment Control: Topsoil stockpile protection.

H. Section 32 92 19 - Seeding: Temporary and permanent seeding. Topsoil testing.

1.3 SUBMITTALS FOR INFORMATION

A. Section 01 33 00 – Submittal Procedures.

B. Topsoil source.

PART 2 PRODUCTS

2.1 MATERIAL

A. Topsoil: Fill Type T1 or T2 as specified in Section 31 05 13 – Soil Materials.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that building, utility and miscellaneous backfilling have been inspected.

B. Verify that subgrade has been contoured and compacted and that uneven areas, low spots, and stockpiles have been eliminated.

C. Do not place topsoil within areas yet to be disturbed by other trades. This may include utility, sidewalk, paving, trellis, sprinkler system or fencing operations.

3.2 SUBGRADE PREPARATION

A. Establish limits, providing for smooth transition to undisturbed area or other finishes.

B. Remove debris, roots, branches, stones, in excess of 1/2 inch (13 mm) in size. Remove subsoil contaminated with petroleum products, cleaners, paint products, or waste concrete or asphalt.

C. Scarify subgrade to depth of 3 inches (75 mm) where topsoil is scheduled. Re-scarify in areas where equipment used for hauling and spreading topsoil has compacted subsoil.

3.3 PLACING TOPSOIL

A. Use all acceptable, on-site, stockpiled topsoil before importing topsoil. It shall be the Contractor's responsibility to determine the need to import topsoil to complete the project. Latent requests for additional costs due to importing topsoil will not be considered.

B. Do not deliver or place topsoil in frozen, wet or muddy condition.

C. Place topsoil in areas where seeding to thickness as scheduled. Manually spread topsoil close to trees, plants, site improvements, and buildings to prevent damage. Place topsoil during dry weather.

D. Fine grade topsoil eliminating rough or low areas. Maintain profiles and contour of subgrade.

E. Remove roots, weeds, rocks and foreign material while spreading.

F. Lightly compact placed topsoil.

G. Unless otherwise noted or indicated, compacted surface of placed topsoil shall be 1/2" below top of header boards, walks, pavements, and utility structures. Where upslope and against curb, flush with top of curb to allow positive drainage.

H. All required topsoil (per schedule) shall be in place prior to any landscaping activities within the area to immediately receive landscaping.

I. Leave stockpile area and site clean and raked, matching existing grade before

placement of stockpile or proposed grade, as applicable, and ready to receive landscaping. Grade site surface to prevent free-standing surface water.

3.4 TOLERANCES

A. Top of Topsoil: Plus or minus 1/2 inch (13 mm) adjacent to improvements; 1 inch (25 mm) within 100 feet of buildings or athletic or play fields; and 2 inches (50 mm) on surrounding fields and slopes.

3.5 PROTECTION

A. Section 01 70 00 – Execution Requirements: Protection of Completed Work.

B. Comply with Section 31 10 00 – Site Preparation and Clearing: Protection.

C. Protect landscaping and other features remaining as final work.

D. Protect any/all existing site improvements including structures, fences, sidewalks, utilities, paving and curbs.

3.6 SCHEDULES

A. Compacted topsoil thickness at the following areas:
   1. Seeded Grass: 4 inches.

END OF SECTION

SECTION 32 92 19

SEEDING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. All labor, materials, equipment and incidentals necessary to provide a complete installation of all tillage, pH balancing, fertilizing, seeding, and mulching of all disturbed areas within the Contract limits not occupied by structures, pavement or plantings, as indicated on the Drawings and specified herein.

B. Topsoil testing.

C. Erosion Control/Temporary Seeding.

D. Permanent Seeding/complete stabilization with natural materials.

E. Maintenance.

F. Lawn guarantee.

1.2 RELATED SECTIONS

A. Division 01 - GENERAL CONDITIONS: Including but not limited to:
   1. Coordination of the Work,
   2. Submittal Procedures,
   3. Closeout Procedures,
   4. Protection of Completed Work.

B. Section 31 05 13 - Soil Materials: Topsoil.

C. Section 31 23 17 - Utility Trenching & Backfilling: Backfilling to subgrade over utilities.

D. Section 31 25 13 - Erosion & Sediment Control: References EC / Temporary Seeding.

E. Section 32 91 19 - Landscape Grading: Preparation of subgrade and provision and placement of topsoil in preparation for the work of this section.

1.3 REFERENCE STANDARDS AND QUALITY ASSURANCE

A. All materials, preparations and workmanship shall be performed by experienced workmen regularly engaged in the work of this section. Seeding work shall be performed by a single firm specializing and experienced in landscape work.

B. All products shall be applied or installed in strict conformance with the manufacturer's written instructions and acceptable trade practices.

C. All products shall be labeled in accordance with the U.S. Department of Agriculture Rules & Regulations.

D. Provide seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging.

E. Have topsoil classified and analyzed to determine nutritional requirements of soil for establishment of lawns.

F. FS O-F-241D - Fertilizers, Mixed, Commercial.

1.4 REGULATORY REQUIREMENTS

A. Comply with regulatory agencies for fertilizer composition.

1.5 DEFINITIONS

A. Noxious Weeds: Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

B. Satisfactory stand of grass: A dense, vigorous and well established cover of living grass of the specified mixture where no individual lawn area has unacceptable portions in excess of one percent of its area or gaps larger than a circle 4 inches in diameter.

C. Establishment period: The establishment period for lawn areas shall be the time from installation until final acceptance, as determined by the Architect.

1.6 SUBMITTALS FOR INFORMATION

A. Section 01 33 00 – Submittal Procedure.

B. Soil analysis report: Testing will be at the Contractor's expense.

1. During the fine grading process contractor must complete a soil analysis through A & L Labs (or similar firm) to identify current nutrient levels and deficiencies (if any). Contractor is responsible to add amendments as recommended from this soil test prior to seeding. Soil test results shall be shared with Parks and Recreation upon receipt to verify amendment(s) being added.

C. Certification that imported topsoil is free from weeds.

D. Certificates of inspection as required by governing authorities.

E. Other data substantiating that materials comply with specified requirements.

F. Manufacturer's or vendor's certified statement for each grass seed mixture required, stating botanical and common name, percentage by weight, and percentages of purity, germination, and weed seed for each grass seed species.

1.7 SUBMITTALS AT PROJECT CLOSEOUT

A. Section 01 70 00 - Execution Requirements: Contractor’s Closeout Submittals to Architect.

B. Maintenance Data: Include maintenance instructions, cutting method and maximum grass height; types, application frequency, and recommended coverage of fertilizer.

C. Guarantee and warranties.

1.8 DELIVERY, STORAGE, AND PROTECTION

A. Section 01 60 00 – Product Requirements.

B. Fertilizer, soil amendments, and seed shall be delivered to the site in the original, unopened, undamaged containers bearing the manufacturer's guaranteed analysis, name, trade name, trademark, and statement of conformance to state and federal laws. Labels shall be intact and legible. In lieu of containers, fertilizer and soil amendments may be furnished in bulk with a certificate indicating the above information accompanying each delivery. All such certificates shall be submitted to the Architect to confirm quantities of materials used on project.

C. During delivery and storage, seed, fertilizer, soil amendments, straw and matting shall be kept in dry storage free from the effects of weather and away from contaminants. Should any material become wet or damaged, reject immediately and replace at no cost to the Owner.

D. Precautions shall be taken to protect containers from rupture prior to use.

1.9 MAINTENANCE SERVICE

A. Provide service and maintenance of seeded areas through establishment period (see definitions above).

1.10 INITIAL ACCEPTANCE

A. Establishment of new lawn: Contractor shall be responsible for providing a finished lawn of a satisfactory stand of grass (see definitions above). Any areas which fail to show a satisfactory stand of grass shall be reworked and reseeded at the Contractor’s expense with the same seed as originally used thereon until all required areas are satisfactorily covered.

1.11 GUARANTEE AND WARRANTIES

A. Contractor shall guarantee that all grasses shall germinate, survive, and produce a continuous uniform stand, free of disease for a period of one (1) year. Guarantee

period shall begin on the date of acceptance of the established lawn for the entire project, as determined by the Architect.

B. Provide written warranties within thirty (30) days of final acceptance.

PART 2 PRODUCTS

2.1 SEED MIXTURE

A. State-certified seed of the latest season's crop, labeled in conformance with U.S. Department of Agriculture rules and regulations under the Federal Seed Act and applicable State seed laws.

B. All seed shall be Blue Tag Certified Seed with varieties strictly conforming to those listed on the Virginia Turfgrass Variety Recommendations, latest edition, published by Virginia Polytechnic Institute and State University.

C. Permanent Seeding

1. Lawn areas shall be seeded with a mixture of 90 percent by weight (typ) “Southern Lawn” tall turf fescue and 10 percent “Field General” perennial ryegrass. Seed at 200 #/acre.

2. Athletic Areas shall be overseeded at 10#/acre.

3. Seeding shall be between February 15 and April 1, or September 1 and October 20.

D. All blends shall not contain any noxious weeds and have less than 0.01% weed matter.

E. Seed that has become wet, moldy, or otherwise damaged will not be acceptable.

F. Erosion Control/Temporary Seeding: Apply at 100#/acre.

2/16 to 4/30	Annual rye grass (Lolium multiflorum)	60-100 #/ac
5/1 to 8/31	German Millet (Setaria italic)	50 #/ac
9/1 to 2/15	50% Annual Ryegrass (Lolium multiflorum)	50-100 #/ac
	50% Winter rye (Secale cereale)	

2.2 SOIL MATERIALS

A. Topsoil: As specified in Section 31 05 13 – Soil Materials: Topsoil Materials.

2.3 ACCESSORIES

A. Straw Mulch Material:
1. Straw shall be stalks from oats, wheat, rye, barley or rice that are free from

noxious weeds, chemicals, mold, decay or foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are not acceptable.

2. Straw shall be in an air-dry condition suitable for placing. Straw supplied for mechanical application shall be chopped.

B. Wood Cellulose Mulch Material:

1. Mulch shall be virgin wood cellulose fiber made from whole wood chips. Within the fiber mulch material, at least 20 percent of the fibers will be 10.7 mm in length and 0.27 mm in diameter.
2. Wood cellulose fiber mulch, for use in the grass seed and fertilizer, shall be processed in such a manner that it will not contain germination or growth inhibiting factors. It shall be dyed an appropriate color to allow visual metering of its application. The wood cellulose fibers shall have the property of becoming evenly dispersed and suspended when agitated in water. When sprayed uniformly on the surface of the soil, the fibers shall form a blotter-like ground cover, which readily absorbs water and allows infiltration to the underlying soil.
3. Weight specifications from suppliers for all applications shall refer only to the underlying soil. Weight specifications from suppliers, shall refer only to the air dry weight of the fiber. The mulch material shall be supplied in packages having a gross weight not in excess of 100 pounds and must be marked by the manufacturer to show the dry weight content.
4. Suppliers shall be prepared to certify that laboratory and field testing of their product has been accomplished and that it meets all of the foregoing requirements.

C. Binder for Mulch: Emulsified asphalt, ASTM D977-86, Grade SS-1.

D. Fertilizer:

1. First Application: A 15-20-15 or approved equivalent formulation product applied at a rate of 1.5 lbs Nitrogen/1,000 SF shall be required for permanent seeding. Similar fertilization shall occur if contractor is required to provide temporary seeding. Product shall contain an approximate 32% stabilized (Water Insoluble) Nitrogen source, and such Nitrogen shall be Urea or Methylene Urea, and/or Ammonium Phosphate or Ammonium Sulfate. The P source in the product shall be Ammonium Phosphate and the source of K shall be Muriate of Potash.
2. Second Application: Between September 1st and September 15th, and between November 1st and November 15th, a 25-5-15 or approved equivalent product shall be applied at the rate of 1 LB. Nitrogen/1,000 SF. Fertilizer shall be approximately 33% Water Insoluble Nitrogen (WIN), and such Nitrogen shall be Urea or Methylene Urea, and/or Ammonium Phosphate or Ammonium Sulfate. The P source in the product shall be Ammonium Phosphate and the source of K shall be Muriate of Potash.

E. Soil Amendments:

1. Lime: To pH balance soil, ground, natural, dolomitic limestone containing not less than 85% of total carbonates with a minimum of 30% magnesium carbonates, ground so that not less than 90% passes a 10-mesh sieve and not less than 50% passes a 20-mesh sieve.

2. Aluminum Sulfate: To pH balance soil, commercial grade in dry power form.
3. Superphosphate: Soluble mixture of treated minerals; 20% available phosphoric acid.

F. Water: Potable.

G. Mulch Stabilization Netting: Plastic or natural fiber netting used to prevent displacement of straw mulch, manufactured by:
1. American Excelsior Co. - Erosion Control Netting
2. Belton Industries - Soil Anti-wash/Geojute
3. CONWED Fibers - Erosion Control Netting

H. Re-vegetation Mats/Erosion Control Mats:
1. Mats manufactured specifically to hold moisture without the additional use of mulch, and retard erosion, manufactured by:
2. Re-vegetation Mats:
   a. North American Green, Inc. - SC150 Blanket
   b. American Excelsior Co. - Curlex Blanket
   c. Gulf States Paper Corp. - Hold/Gro
   d. CONWED Fibers - Futerra Revegetation Blanket
   e. CONTECH Constr. Prod., Inc. - Excelsior Erosion Control Blankets
3. Erosion Control Mats:
   a. North American Green, Inc. - P350
   b. Landlok - TRM 450

I. Staples: Plain iron wire, No. 8 gauge or heavier, with a minimum in-ground length of 6 inches.

J. Stakes: Softwood lumber, chisel pointed.

K. String: Inorganic fiber.

L. Landscape Fabric: 3.0 oz. Or better non-woven polyester, commercial weed restrictor fabric. UV stabilized

M. Other Materials: All other materials, not specifically described but required fir a complete and proper seeding operation, shall be selected by the Contractor and subject to the approval of the Architect.

PART 3 EXECUTION

3.1 EXAMINATION / COORDINATION

A. Series 01300 – Administrative Requirements: Coordination.

B. Verify that prepared subsoil base and utility installation work is complete.

C. Verify that Landscape Grading (topsoil material and depth) is complete, correct and ready to receive the work of this section.

3.2 EROSION CONTROL/TEMPORARY SEEDING

A. Temporary seeding shall be applied to denuded areas within 7 days after final grade has been established, if season is improper for permanent seeding, and within 7 days to portions of the site which may not be at final grade but which will remain inactive for more than 30 days and less than one year. Lawn areas, athletic fields and slopes may be topsoiled and permanently seeded only if this can be accomplished during the correct time of year for the permanent seed mixture specified. Permanent Seeding is required for areas which will remain dormant for more than one year.

B. Where the area is compacted, crusted or hardened, the soil surface shall be loosened by disking, aerating, harrowing or other means.

C. Apply lime at a rate of 50 pounds per 1000 sq. ft. and commercial fertilizer at 10 pounds per 1000 sq. ft. Thoroughly mix into loosened soil.

D. Seed shall be evenly applied at a rate of 2 lbs. per 1000 sq. ft. to the prepared ground and mulched.

E. Hydroseeding operations shall include seed, fertilizer, mulch and binder in one operation. Areas which are hydroseeded from 6/1 to 9/1 or 12/1 to 3/1 shall be mulched with straw. Wood fiber mulch shall not be used during these times.

F. After mulching of dry seeded areas, mulch shall be stabilized using a liquid binder. Portions which continue to lose mulch due to wind or runoff shall be further stabilized with mulch stabilization netting. Install netting as specified herein.

G. Areas which fail to establish vegetative cover adequate in checking erosion shall be re-seeded as soon as such areas are recognized.

3.3 PERMANENT SEEDING - GENERAL

A. All seed, fertilization, hydromulch, tack agents, etc shall be approved by Architect prior to purchase and application thereof.

B. All permanent seeding shall be applied between September 1st and October 20th, or between February 15th and May 1st. All seeding done outside these periods shall be temporary, for erosion control only. If project completion necessitates seeding outside these dates, contractor is responsible to apply permanent seeding during the months outlined above. Temporary seeding measures must be approved by the Department of Parks & Recreation.

C. At the time of beginning seed bed preparation, topsoil shall be in a loose, friable condition, free from stones over 1" in any dimension, sticks, roots and other extraneous matter. If topsoil has become crusty, hardened or eroded since being spread, it shall be a part of this work to restore the soil to the loose condition described above.

D. Prior to preparation of undisturbed areas, remove vegetation and debris and dispose of such material off-site; do not turn under into soil being prepared for seed

bed. Loosen existing grade to a depth of 4", remove all debris which surfaces.

E. Hydroseeding
   1. First Shot: Grass Seed and Fertilizer mix. Seed at recommended rates listed below (Section III).
   2. Second Shot for Hydromulch Only (Section IV): Tacking agent & Hydromulch. Shoot hydromulch over planting bed @ 750 lbs/acre.

3.4 SEED BED PREPARATION

A. Upon successful demolition and complete removal of all hardscape materials, Contractor shall prepare sites for seeding such that the remaining subsoil is permeable to a depth of 12” and scarify. This step is critical to guarantee proper water-table percolation.

B. Final grading of the subsoil for slopes flatter than 3 to 1. Final grading must be inspected and approved by Parks and Recreation before any seeding procedure is initiated.

C. Thereafter, such areas must have the finish grading operations performed to obtain an acceptable seed bed with the top 8 inches of soil well pulverized and rolled to a compaction rate of 90%; meeting all adjoining paved or turfed surfaces. (Steps A and B may be combined upon the approval of the Superintendent of Parks whereas acceptable seed bed establishment has been met).

D. Prior to seeding or the application of fertilizer, lime, etc, all areas to be seeded and mulched must be cleaned of all stones and rocks over 1 inch in any dimension, sticks, roots, rubbish and extraneous matter, and such debris, etc. must be removed from the site such that this future park space will be void of hazardous and/or impalement obstacles that could either injury park users or damage mowing equipment.

3.5 HYDROSEEDING NEW AREAS

A. Rate of application shall be 2,000 pounds per acre. Soil stabilizers such as Terra Tack I (or pre-approved equal) shall be applied at a rate of 40 pounds per acre on flatter portions..

B. Operators of hydro-mulching equipment shall be thoroughly experienced in this type of application.

C. Apply the specified slurry mix in a motion to form a uniform mat at the specified rate.

D. Operators shall keep the hydro-mulch within the areas designated and keep from contact with other plant material.

E. Immediately after application, thoroughly wash off any plant material, planting areas or paved areas not intended to receive slurry mix.

F. Keep all paved and planting areas clean during maintenance operations. Contractor shall keep hydro-mulching within the areas designated and keep from contact with

other plant material.

G. If in the opinion of the Parks & Recreation Department, unplanted skips and areas are noted after hydro-mulching, the contractor shall be required to seed the unplanted areas with the grasses that were to have been planted at no additional cost to owner.

3.6 SEED PROTECTION

A. Identify seeded areas with stakes and string around area periphery. Set string height to 12 inches (300 mm). Space stakes at 10 feet max. (3 m).

B. Cover seeded slopes where grade is 3H:1V or greater with re-vegetation mats.

C. Place re-vegetation mats or erosion control mats in ditches where indicated on the Drawings.

3.7 NETTING/MAT PLACEMENT

A. Laying the Net/Mat:
1. Start laying net/mat from top of swale/slope and unroll downgrade. Mat shall be placed minimum 12" beyond edges of swale and 18" beyond top and bottom of slopes.
2. Allow to lay loosely on soil - do not stretch or pull.
3. To secure: Upslope ends of net/mat should be buried in a slot or trench no less than 6 inches deep. Tamp earth firmly over net/mat. Staple every 12 inches across the top end.
4. Edges shall be stapled every 3 feet. Where 2 strips are laid side by side, the adjacent edges shall be overlapped 3 inches and stapled together.
5. Staples shall be placed down the center of net/mat strips at 3-foot intervals. DO NOT STRETCH when applying staples.

B. Joining Strips: Insert new roll of net/mat in trench, as with upslope ends. Overlap the end of the previous roll 18 inches, turn under 6 inches, and staple across end of roll just below anchor slot and at the end of the turned-under portion every 12 inches.

C. At Bottom of Slopes: Lead net/mat out onto a level area before anchoring. Turn ends under 6 inches, and staple across end every 12 inches.

D. Provide 12 inch (300 mm) overlap of adjacent rolls. At sides of ditches, lay fabric laps in direction of water flow.

E. Check Slots: On highly erodible soils and on slopes steeper than 4:1, erosion check slots should be made every 15 feet. Insert a fold into a 6-inch trench and tamp firmly. Staple at 12-inch intervals across the downstream portion.

F. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.

G. Rolling: After installation, net/mat should be rolled to ensure firm contact with soil.

3.8 MAINTENANCE DURING ESTABLISHMENT PERIOD

A. The hydro-mulch seeding shall be adequately watered until established by Contractor. Any areas damaged by erosion or areas that do not have an acceptable turf shall be redone to the satisfaction of the Parks and Recreation as per VI, B).

B. Acceptance of grass areas shall be to a point where exceptional plant health is achieved and coverage is equivalent to vertical stem growth of at least 2.5", vibrant coloration, and no bare or dwarfed growth areas larger than 2" in diameter over no more than 5% of the total field acreage.

C. Approval from Parks and Recreation is required prior to cutting of the turf.

D. Until the turf establishment is accepted by Parks and Recreation as indicated above, Contractor shall perform the necessary maintenance (with the exception of cutting) to include watering, weeding, repair of all erosion and reseeding, feeding, as necessary to establish a uniform stand of the specified grasses. Contractor shall guarantee growth and coverage of hydro-mulch planting under this contract to the effect that a minimum of 95% of the area.

E. Additionally, the Contractor shall water the entire hydromulched areas to a saturated depth of one (1) inch at least once a week between the months of April to September and at least once a month between the months of October to March to achieve the required acceptable standard. The Contractor shall make a second application of specified hydromulch planting those bare areas not meeting specified coverage as determined by Parks and Recreation. Such replanting is to be performed within 60 days of initial application and upon notification by the Project Manager to replant.

3.9 CLEAN-UP AND PROTECTION

A. Keep pavements clean and work area in an orderly condition.

B. Remove from the site, all equipment, surplus materials, debris, etc. resulting from the seeding work as herein specified.

C. Protect seeded areas and materials from damage due to operations by other contractors, trades and trespassers. Maintain protection during installation and until final acceptance. Treat, repair or replace damaged seeded areas as herein before specified.

3.10 INSPECTION AND ACCEPTANCE

A. When establishment period is completed, Architect will, upon written request, make an inspection to determine acceptability.

B. Work may be inspected for acceptance in sections agreeable to the Architect, provided all work for that section is complete.

C. When inspected work is not acceptable, replace or remedy rejected work. Continue

all applicable requirements of Contract until re-inspection and acceptance by the Architect.

3.11 GUARANTEE

A. The Contractor shall be responsible for providing a finished lawn by Substantial Completion if possible. The Contractor shall produce dense, vigorous, well established lawns and shall maintain lawn areas until final acceptance of the work by the Owner. Any areas which fail to show a uniform stand of grass shall be reworked and reseeded at the Contractor's expense with the same seed as originally used thereon, and such reseeding shall be replaced until all required areas are covered with a satisfactory stand of grass.

B. Re-seeding of bare areas must be accomplished through mechanical means using a slit-seeder or a core aerator.

C. Contractor's responsibility to maintain shall begin when work is begun and continue until maintenance program is accepted by Owner.

D. In the event that treatment or replacement is made necessary as a result of damage caused by circumstances which are beyond the Contractor's control, and not due wholly or partially as a result of any act or omission by the Contractor, such treatment or replacement will be authorized by the Owner by Change Order in accordance with the General Conditions.

END OF SECTION

SECTION 33 11 16

WATER MAINS AND SERVICES

PART 1 GENERAL

1.1 SECTION INCLUDES (but is not limited to)

A. Pipe and fittings for exterior water system including distribution main, domestic service and fire service, as applicable.

B. Valves, fire hydrants, fire department connection, and domestic water hydrants.

C. Bedding and compaction.

D. Adjustment of existing utility structures to meet proposed work.

E. Provide an approved, operational underground exterior water service system from five (5) feet outside the building through connection to existing municipal system.

1.2 RELATED SECTIONS

A. Applicable sections of Division 1 - GENERAL CONDITIONS: Including but not limited to:
   1. Section 01 31 00 – Coordination of the Work.
   2. Section 01 33 00 – Submittal Procedures: Procedures for submittals.
   3. Section 01 40 00 – Quality Requirements: Aggregate and concrete testing.
   4. Section 01 56 00 – Temporary Facilities and Controls: Dewatering excavations and water control.
   5. Section 10 60 00 – Products Requirements: Product delivery, handling, storage, and protection.
   6. Section 01 70 00 – Execution Requirements: Contract Closeout, Project Record Documents.

B. Section 31 05 13 – Soil Materials: Soil and aggregate materials.

C. Section 31 05 16 – Aggregate Materials.

D. Section 31 10 00 - Site Preparation and Clearing: Preparation for land disturbance, protection of the Work.

E. Section 31 22 13 – Rough Grading.

F. Section 31 23 17 - Utility Trenching & Backfilling: Excavation, backfill, compaction, testing, Trace Wire & ID Tape.

G. Section 33 13 00 - Disinfection of Water Distribution System: Disinfection of site service utility water piping.

1.3 REFERENCES

A. AMERICAN SOCIETY OF TESTING & MATERIALS (ASTM)

B. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

C. AMERICAN WATER WORKS ASSOCIATION (AWWA)

D. AMERICAN WELDING SOCIETY (AWS)

E. FACTORY MUTUAL RESEARCH CORP. (FM)

F. MANUFACTURERS' STANDARDS SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

G. NATIONAL FIRE PREVENTION ASSOCIATION (NFPA)

H. UNDERWRITERS LABORATORIES (UL)

I. UNI-BELL PLASTIC PIPE ASSOCIATION (UNI)

J. VIRGINIA DEPARTMENT OF HEALTH (VDH)

1. Virginia Department of Health (VDH) "Waterworks Regulations," latest edition, hereinafter Waterworks Regulations.

K. SOILS

1. ANSI/ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb Rammer and 12 inch Drop.
2. ANSI/ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb Rammer and 18 inch Drop.
3. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
4. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

L. COPPER

1. ANSI/ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
2. ANSI/ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
3. ASTM B32 - Solder, Metal.
4. ASTM B88 - Seamless Copper Water Tube.
5. AWS A5.8 - Brazing Filler Metal.

M. PVC

1. ASTM D1785 - Polyvinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, 120.
2. ASTM D2241 - Polyvinyl Chloride (PVC) Plastic Pipe, (SDR-PR).
3. ASTM D2672 - Bell-End Polyvinyl Chloride (PVC) Plastic Pipe.
4. ASTM D2466 - Polyvinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 40.
5. ASTM D2467 - Socket-Type Polyvinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 80.
6. ASTM D2564 - Solvent Cements for Polyvinyl Chloride (PVC) Plastic Pipe

and Fittings.

7. ASTM D2774 - Underground Installation of Thermoplastic Pressure Piping.
8. ASTM D3139 - Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals.
9. ASTM D2855 - Making Solvent-Cemented Joints With Poly Vinyl Chloride (PVC) Pipe and Fittings
10. ASTM F402 - Safe Handling of Solvent Cements and Primers Used for Joining Thermoplastic Pipe and Fittings
11. ASTM F477 - Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
12. ANSI/AWWA C900 - Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4 inch through 12 inch, for Water.
13. UNI B3 - Installation of Polyvinyl Chloride (PVC) Pressure Pipe Complying With AWWA C900.

N. DUCTILE IRON

1. ANSI/AWWA C104 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
2. ANSI/AWWA C105 - Polyethylene Encasement for Ductile Iron Piping for Water and Other liquids.
3. ANSI/AWWA C110 - Gray Iron and Ductile Iron Fittings, 3 Inch Through 48 Inches, for Water and Other Liquids.
4. ANSI/AWWA C111- Rubber-Gasket Joints for Ductile Iron and Grey-Iron Pressure Pipe and Fittings.
5. ANSI/AWWA C115- Rubber-Gasket Joints for Ductile Iron and Grey-Iron Flanged Pressure Pipe and Fittings.
6. ANSI/AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids.
7. ANSI/AWWA C153 - Ductile-Iron Compact Fittings, 3 Inch Through 16 Inch, for Water and Other Liquids.
8. ANSI/AWWA C600 - Installation of Ductile-Iron Water Mains and Appurtenances.
9. ANSI/AWWA C606 - Grooved and Shouldered Type Joints.
10. ASTM A48 - Gray Iron Castings.

O. PE PIPE

1. AWWA C901 - Polyethylene (PE) Pressure Pipe, Tubing, and Fittings, 1/2 inch through 3 inch, for Water
2. ASTM D3035 - Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter.

P. VALVES, ETC

1. ANSI/AWWA C500 - Gate Valves (Double Disc), 3 through 48 in NPS, for Water and Sewage Systems.
2. ANSI/AWWA C502 - Dry Barrel Fire Hydrants.
3. ANSI/AWWA C504 - Rubber Seated Butterfly Valves.
4. ANSI/AWWA C508 - Swing-Check Valves for Waterworks Service, 2 in through 24 in NPS.
5. ANSI/AWWA C509 - Resilient Seated Gate Valves 3 in through 12 in NPS, for Water and Sewage Systems.
6. AWWA C550 - Protective Interior Coatings for Valves and Hydrants.
7. ANSI/AWWA C600 - Installation of Ductile-Iron Water Mains and

Appurtenances.

8. MSS SP80 - Bronze Gate, Globe, Angle and Check Valves.
9. MSS SP71 - Cast Iron Swing Check Valves, Flanged and Threaded Ends.
10. UL 246 - Hydrants for Fire - Protection Service.

Q. FIRE SERVICE

1. NFPA 24, "Standard for the Installation of Private Fire Service Mains and Their Appurtenances."
2. NFPA 13, "Standard for the Installation of Sprinkler Systems."

1.4 SUBMITTALS FOR REVIEW

A. Section 01 33 00 – Submittal Procedures: Submittals.

B. Product Data: Provide data on pipe materials, pipe fittings, valves and accessories.

C. Manufacturer's Certificate: Certify that above referenced products meet or exceed specified requirements.

D. Submit NFPA "Contractor's Materials and Test Certificate for Underground Piping." Use NFPA 13 Version with Owner Representative signature block.

1.5 PROJECT RECORD DOCUMENTS

A. Section 01 70 00 – Execution Requirements: Contract Closeout.

B. Accurately record actual locations of piping mains, valves, connections, and invert elevations.

C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

D. Certify in writing to the Owner and to the Architect that the "System" has been approved and is ready for use.

E. Maintenance Data: Submit maintenance data and parts list for the fire water system materials and products.

1.6 REGULATORY REQUIREMENTS

A. The Contractor shall not begin work on the public water system (existing or proposed) until all required availability, tapping and meter fees have been paid. Payment of fees for the water system shall be made by the Owner.

1.7 QUALITY ASSURANCE

A. Code Compliance: Comply with:

1. VDH Waterworks Regulations,
2. Local water system standards and specifications,
3. Local Fire Department/Marshal Regulations or Standards: Comply with governing regulations pertaining to hydrants, including hose coupling threading and matching of connections, and

4. Owner's Insurance Company requirements.

B. Install fire water systems in accordance with NFPA 24.

C. Valves: Manufacturer's name and pressure rating shall be marked on valve body.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 – Product Requirements: Deliver, store, protect and handle products to site: Material & Equipment.

B. Deliver and store valves in shipping containers with labeling in place.

PART 2 PRODUCTS

2.1 PIPE & FITTINGS (smaller than 4-inch diameter)

A. Copper Tubing (for water piping only): ASTM B88, Type K:
   1. Fittings:
      a. ANSI/ASME B16.18, cast copper and brass, solder joint fittings, or
      b. ANSI/ASME B16.22, wrought copper, solder joint fittings.
   2. Joints:
      a. ASTM B32, 95-5 tin antimony solder, or
      b. Plumbing Code approved lead free solder, or
      c. Compression connection, as applicable.

B. Polyvinyl Chloride (PVC) Pipe: ASTM D2241, SDR-21 (200 psig rated).
   1. Joints: ASTM F477 rubber gaskets for push-on pipe.
   2. Pipe and fittings shall bear the seal of approval of the National Sanitation Foundation for potable water service.
   3. Pipe and fittings shall be of the same PVC material and shall be one of the following pipe/fitting combinations, as marked on the pipe and fitting, respectively: PVC 2120/PVC II; PVC 2116/PVC II.
   4. Examples Meeting the above Criteria include, but are not necessarily limited to:
      a. Johns-Manville Ring-Tite PVC Pressure Pipe (D2241) Bell & Spigot
      b. Clow PVC Bell-Tite Pressure Rated Pipe (D2241) Bell & Spigot

C. Polyethylene Pipe: AWWA C901 ASTM D3035, with outside Dimension Ratio (DR) of 11.
   1. Joints: Butt fusion.
   2. Fittings: AWWA C901, molded.

2.2 INSULATING JOINTS

A. Provide between pipes of dissimilar metals a rubber gasket or other approved type of insulating joint or dielectric coupling which shall effectively prevent metal-to-metal contact between adjacent sections of piping.

2.3 METER BOX

A. Meter Box and meter setter to be furnished and installed per WVWA requirements.

2.5 ACCESSORIES

A. General: Provide flanges, connecting pieces, transition glands, transition sleeves, and other adapters as required for a complete and operational system.

B. Structure top adjustments: Provide grade rings, brick and mortar, or extensions as required for adjusting structure top elevations to meet proposed finish grades.

C. Thrust Block/Anchorages: Provide at all tees, wyes, crosses, plugs, caps, bends, valves and hydrants.

D. Valve Box: Each valve on buried piping shall be provided with an adjustable cast-iron valve box of a size suitable for the valve. Provide each cast-iron box with a heavy coat of bituminous paint. The head shall be round and the lid shall have the word "WATER" cast on it. The least diameter of the box shaft shall be 5.25 inches.

E. Trace Wire for Non-Metallic Piping: Comply with Section 31 23 17 - Utility Trenching & Backfilling.

F. Buried Utility Warning and Identification Tape: Comply with Section 31 23 17 - Utility Trenching & Backfilling.

G. Identification Tags and Plates: Provide valves with tags or plates numbered and stamped for their usage. Plates and tags shall be of brass or non-ferrous metal and shall be mounted or attached to the valve.

H. Rim Adjustments: Provide pre-cast grade rings or install brick and mortar as necessary to level, raise or lower existing or new manhole frames and covers to meet finish grade. Adjustments of 8 inches or less in height shall not be considered for additional compensation.

2.6 BEDDING MATERIALS

A. Bedding & Haunching: Coarse Aggregate Type A1 (Utility Bedding, Select Backfill) as specified in Section 31 05 16 - Aggregate Materials.

B. Cover Bedding/Initial Backfill: Soil Type S1 or S2 as specified in Section 31 05 13 - Soil Materials.

PART 3 EXECUTION

3.1 EXAMINATION

A. Coordinate with the WVWA for all required meetings, inspections, and approvals.

B. Verify that building service connection, point of water service connection and municipal utility water main size, location and invert are as indicated.

C. Verify that grades are within six (6) inches of finished subgrade prior to the commencement of this work. Minimum clear cover over all water pipe shall be three (3) feet.

D. Inspect all new water piping material upon receipt and immediately prior to installation to verify that it is in acceptable condition and proper working order. Mark all damaged material, remove it from the site at the first opportunity and replace it promptly so the work will not be delayed.

E. For new and existing water utilities affected by new work, verify that structure top elevations have been adjusted to meet proposed finished grades.

3.2 PREPARATION

A. Provide adequate means and methods for lowering sections of pipe and associated

items into trenches. Do not drop or dump pipe, fittings, valves, or any other water piping material.

B. Have all necessary arrangements made to complete the work and place it in operation without delays.

C. Prepare pipe connections to equipment with flanges or unions.

3.3 SEPARATION

A. Water Piping Installation Parallel to Sewer Piping
   1. Normal Conditions: Water piping shall be laid at least ten (10) feet horizontally from a sewer or sewer manhole wherever possible, measured edge to edge.
   2. Unusual Conditions: When local conditions prevent ten (10) feet horizontal separation, the water piping may be laid closer to a sewer or sewer manhole provided that:
      a. The bottom (invert) of the water piping shall be at least 18 inches above the top (crown) of the sewer piping.
      b. Where this vertical separation cannot be obtained, the sewer piping shall be constructed of AWWA-approved water pipe and pressure tested in place without leakage prior to backfilling.
      c. The sewer manhole shall be of water-tight construction and tested in place.

B. Water Piping Installation Crossing Sewer Piping
   1. Normal Conditions: Water piping crossing above sewer piping shall be laid to provide a separation of at least 18 inches above the top (crown) of the sewer piping.
   2. Unusual Conditions: When local conditions prevent the vertical separation described above, the following construction shall be used:
      a. Sewer piping passing over or under water piping shall be constructed of AWWA-approved water pipe and pressure tested in place without leakage prior to backfilling.
      b. Water piping passing under sewer piping shall, in addition, be protected by providing the 18 inch vertical separation described above, adequate structural support for the sewer piping to prevent excessive deflection of the joints and the settling on and breaking of the water piping, and that the length (min. 18 feet) of the water piping be centered at the point of crossing so that joints shall be equidistant and as far as possible from the sewer piping.

C. Sewer Manholes
   1. No water piping shall pass through or come in contact with any part of a sewer manhole.

3.4 BEDDING

A. Excavate pipe trench in accordance with Section 31 23 17 - Utility Trenching & Backfilling for work of this Section. Hand trim excavation for accurate placement of pipe to elevations indicated. See Drawings for trench detail.

B. Place bedding material at trench bottom, level fill materials in one continuous layer not exceeding 6 inches (150 mm) compacted depth, compact to 95 percent. Continue until pipe springline elevation is reached and hand excavate an accurate pipe shape to invert required. After setting pipe, where hand excavation is irregular against pipe, hand fill and tamp for an even fit tight to pipe at springline.

C. Maintain optimum moisture content of bedding material to attain required compaction density.

3.5 INSTALLATION - PIPE

A. Connection to Existing Water Systems: Connection to existing system will be made by the Contractor and coordinated with the Western Virginia Water Authority. Use tapping and drilling machine valve and mechanical joint type sleeves for connections to be made under pressure. Bolt sleeves around mains; bolt valve conforming to AWWA C500 to the sleeve. Open valve, attach drilling machine, make tap, close valve, and remove drilling machine, all without interruption of service. Notify the Owner in writing at least fifteen (15) days prior to the date the connections are required; receive approval before any service is interrupted. Furnish all materials and labor required to make connections into the existing water supply systems.

B. The Contractor shall be responsible for all public notification of service interruptions of the water main. Comply with all WVWA requirements regarding safety, temporary services and installation procedures.

C. The Contractor shall comply with the Waterworks Regulations pertaining to separation of water and sanitary sewer.

D. Establish elevations of buried piping to ensure not less than 3 ft (900 mm) of cover.

3.6 UTILITY ADJUSTMENT

A. Adjust the tops of all affected water utility structures whether new or existing to meet finished grades. Provide grade rings, brick and mortar, or extensions for existing or new structures such that tops meet proposed finish grades. Adjustments of 8 inches or less in height shall be made at no additional cost to the Owner.

B. Coordinate timing of adjustment work to be prior to stone base applications for paved areas and prior to topsoil applications in lawn spaces.

3.7 DUCTILE IRON

A. Install ductile iron piping and fittings in accordance with ANSI/AWWA C600.

3.8 POLY-VINYL CHLORIDE (PVC)

A. Install PVC piping and fittings to ASTM D2774.

B. Inspect pipe, fittings, valves, and accessories before and after installation; those found defective shall be replaced with new materials. Ream pipe and tube ends

and remove fins and burrs from pipe and fittings. Before placing in position, clean pipe, fittings, valves, and accessories, removing scale and dirt, on inside and outside, before assembly and maintain in a clean condition.

C. Route pipe in a straight line, unless otherwise indicated on the Drawings. Lay bell-and-spigot pipe with the bell end pointing in the direction of laying.

D. Cut pipe accurately to measurements established at the site and work into place without springing or forcing and making proper provision for expansion and contraction of piping without stressing pipe or joints. Replace pipe or fitting that does not allow sufficient space for proper installation of joint material with new pipe or fittings of proper dimensions. Blocking or wedging between bells and spigots will not be permitted.

E. Install pipe to indicated elevations and grade to within tolerance of 5/8 inch. Ensure firm and uniform support. Wood support blocking will not be permitted. Lay pipe so that the full length of each section of pipe and each fitting will rest solidly on the pipe bedding; excavate recesses to accommodate bells, joints, and couplings. Provide anchors and supports where indicated and where necessary for fastening work into place. Keep trenches free of water. At the end of each days work, close open ends of pipe temporarily with wood blocks or bulkheads.

F. Install access fittings to permit disinfection of water system performed under Section 33 13 00 - Disinfection of Water Distribution System. Position drains at low points.

G. Conduct testing.

H. Form and place concrete for thrust blocks at each elbow or change of direction of pipe main, vertical and horizontal, and behind fire hydrant as recommended by manufacturer. See detail on the Drawings.

I. Install trace wire continuous over top of non-metallic pipe. Coordinate with Section 31 23 17 - Utility Trenching & Backfilling.

J. Place cover bedding/initial backfill to depth indicated in trench section on the Drawings, compacted to 95%.

K. Backfill pipe trench in accordance with Section 31 23 17 - Utility Trenching & Backfilling for work of this Section.

3.9 SETTING OF VALVES AND VALVE BOXES

A. Valve, Air Release, Meter and Blow-Off Chambers (as applicable):
   1. Drain to surface where not subject to flooding by surface water or to absorption pit located above seasonal water table elevation per Waterworks Regulations Section 3.53 C, otherwise to manufacturer's recommendation.
   2. Install valves with operator stems in the vertical plane through the pipe axis and perpendicular to the pipe axis. Locate valves where shown on the Drawings. Thoroughly clean before installation. Check valves for satisfactory operation.

3. Equip all underground valves without gearing or operators with valve boxes. Set box in alignment with valve stem centered on valve nut. Set the valve box to prevent transmitting shock or stress to the valve. Set the box cover flush with the finished ground or pavement surface.
4. Valve, Air Release, Meter and Blow-Off Chambers
   a. Drain to surface where not subject to flooding by surface water or to absorption pit located above seasonal water table elevation per Waterworks Regulations Section 3.53 C, otherwise to manufacturer's recommendation.
   b. Provide chambers/boxes in accordance with manufacturer's recommendations and of adequate size to permit ease of access and maintenance.

3.10 SPECIAL REQUIREMENTS FOR INSTALLATION OF WATER SERVICE PIPING

A. Metallic Piping:
   1. Install pipe and fittings in accordance with the general requirements for installation of piping and with the applicable requirements of AWWA C600 for pipe installation, except as otherwise specified in the following paragraphs.

B. Joints for Copper Tubing:
   1. Cut copper tubing with square ends; remove fins and burrs. Replace dented, gouged, or otherwise damaged tubing with new tubing. Before making joint, clean ends of tubing and interior of fitting or coupling with wire brush or abrasive. Apply a rosin flux to the tubing end and on recess inside of fitting or coupling. Insert tubing end into fitting or coupling for the full depth of the recess and solder. For compression joints on flared tubing, insert tubing through the coupling nut and then flare tubing with flaring tool.

C. Flanged Joints:
   1. Make flanged joints up tight; avoid undue strain on flanges, valves, fittings, and accessories.

D. PVC Piping
   1. Install pipe and fittings in accordance with the general requirements for installation of piping and with the applicable requirements of ASTM D2774 and ASTM D2855, except as modified herein. ASTM F402 for safe handling of solvent cements.
   2. Jointing
      a. Make solvent-cemented joints and assemble in accordance with ASTM D2855. Make pipe joints to other pipe materials in accordance with the recommendation of the PVC pipe manufacturer, as approved.

E. Installation of Valves and Valve Boxes:
   1. Valves and valve boxes shall be set plumb, with valve boxes centered directly over the valves. Valve boxes shall be located outside the area of the roads and streets whenever possible. Earth fill shall be tamped around the valve box to a distance of 4 feet on all sides of the box, or to the undisturbed trench face if less than 4 feet. Clean foreign matter from interior

of valves before installation. Stuffing boxes shall be tightened and the valve shall be inspected in open and closed positions to ensure that all parts are in proper working order.

2. Install a full-ported shut-off valve below each Air Release or Combination Air Valve in the event servicing is required.

3.11 FIELD TESTS AND INSPECTIONS OF WATER SERVICE

A. Perform all field tests, and provide all labor, equipment, and incidentals required for testing. The Contractor shall produce evidence, when required, that any item of work has been constructed in accordance with contract requirements. Allow concrete to cure a minimum of 5 days before testing any section of piping where concrete thrust blocks have been provided.

B. Field Testing of System:

1. The Contractor may backfill over the pipe as laid, except as noted below. The bell holes shall either be left open or reopened for a visual inspection of the joints during the test period. The bell holes of all dry joints may be backfilled following this test. All leaking joints shall be reconnected (or tightened as necessary) and retested and all pipe, valves and fittings and other materials found defective under this test shall be removed and replaced at the Contractor's expense.
2. Exception: When the open trench or open bell holes necessary for a visual inspection and test of the joints present a hazard to safety and welfare, or in an emergency, and/or special case, the operation incident to trenching, pipe laying, backfilling and testing shall be so coordinated as to minimize the lineal footage of open trench and that portion of the system tested in accordance with this section.
3. This portion or portions of the system shall be tested between valves or temporary plugs in sections of not more than 2,500 lineal feet.

C. Pressure and Leakage Test:

1. Test Restrictions and Certification:
   a. Per “Contractor’s Material and Test Certificate for Underground Piping” following this section.
   b. Test pressure shall not vary by more than +/-5 psi for the duration of the test.
   c. Valves shall not be operated in either direction at differential pressure exceeding the rated valve working pressure. Use of a test pressure greater than the rated valve pressure can result in trapped test pressure between the gates of a double-disc gate valve. For tests at these pressures, the test setup should include provision, independent of the valve, to reduce the line pressure to the rated valve pressure on completion of the test. The valve can then be opened enough to equalize the trapped pressure with the line pressure, or fully opened if desired.
   d. Test pressure shall not exceed the rated pressure of the valves when the pressure boundary of the test section includes closed, resilient-seated gate valves or butterfly valves.

D. Pressurization:

1. After the pipe has been laid, all newly laid pipe or any valved section thereof shall be subjected to the required hydrostatic pressure at the point of testing to provide the minimum required pressure at the high point in the test section. Each valved section of pipe shall be slowly filled with water, and the specified test pressure, based on the evaluation of the lowest point of the line or section under test and corrected to the elevation of the test gauge, shall be applied by means of a pump connected to the pipe in a manner satisfactory to the Owner. Valves shall not be operated in either the opening or closing direction at differential pressures above the rated pressure. It is good practice to allow the system to stabilize at the test pressure before conducting the leakage test.

E. Air Removal:
1. Before applying the specified test pressure, air shall be expelled completely from the pipe, valves, and hydrants. If permanent air vents are not located at all high points, the Contractor shall install corporation cocks at such points so that the air can be expelled as the line is filled with water. After all the air has been expelled, the corporation cocks shall be closed and the test pressure applied.

F. Examination:
1. All fittings, valves, hydrants, and joints shall be examined carefully during the test. Any damaged or defective pipe, fittings, valves, hydrants, or joints that are discovered following the pressure test shall be repaired or replaced with sound material, and the test shall be repeated until it is satisfactory to the Owner.

G. Flushing: Per Test Certificate unless test section is a fire service line, then flushing shall be in accordance with NFPA 24.

H. Leakage Defined
1. See Test Certificate.

I. Allowable Leakage
1. See Test Certificate.

J. When hydrants are in the test section, the test shall be made against closed hydrant valves.

K. Acceptance of Installation:
1. Acceptance shall be determined on the basis of allowable leakage. If any test of laid pipe disclosed leakage greater than that specified in Paragraph "H" above, the contractor shall, at his own expense, locate and make approved repairs as necessary until the leakage is within the specified allowance.
a. All visible leaks are to be repaired, regardless of the amount of leakage.

3.12 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Flush and disinfect system in accordance with Section 33 13 00 -Disinfection of

Water Distribution System.

3.13 SERVICE CONNECTIONS

A. Provide all sleeves, caulk or other materials required to provide a watertight connection at buildings or though walls or foundations.

3.14 FIELD QUALITY CONTROL

A. Field trench inspection and compaction testing shall be performed under provisions of Section 31 23 17 - Utility Trenching & Backfilling.
B. Compaction testing will be performed in accordance with ANSI/ASTM D698 Standard Proctor. Field testing methods shall be as deemed appropriate by the Geotechnical Engineer.
C. Installation and testing shall be inspected in accordance with Section 31 09 00 – Geotechnical Engineering, Inspections & Testing
D. Disinfection testing shall be performed in accordance with Section 33 13 00 - Disinfection of Water Distribution System.
E. All equipment shall be tested in operation to demonstrate compliance with the contract requirements.
F. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

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Contractor's Material and Test Certificate for Underground Piping

PROCEDURE

Upon completion of work, inspection, and tests shall be made by the contractor's representative and witnessed by an owner's representative. All defects shall be corrected and system left in service before contractor's personnel finally leave the job.

A certificate shall be filled out and signed by both representatives. Copies shall be prepared for approving authorities, owners, and contractor. It is understood the owner's representative's signature in no way prejudices any claim against contractor for faulty material, poor workmanship, or failure to comply with approving authority's requirements or local ordinances.

PROPERTY NAME	DATE
PROPERTY ADDRESS	

PLANS	ACCEPTED BY APPROVING AUTHORITIES (NAMES)	
	ADDRESS	
	INSTALLATION CONFORMS TO ACCEPTED PLANS EQUIPMENT USED IS APPROVED IF NO, STATE DEVIATIONS	☐ YES ☐ NO ☐ YES ☐ NO
INSTRUCTIONS	HAS PERSON IN CHARGE OF FIRE EQUIPMENT BEEN INSTRUCTED AS TO LOCATION OF CONTROL VALVES AND CARE AND MAINTENANCE OF THIS NEW EQUIPMENT? IF NO, EXPLAIN	☐ YES ☐ NO
	HAVE COPIES OF APPROPRIATE INSTRUCTION AND CARE AND MAINTENANCE CHARTS BEEN LEFT ON PREMISES? IF NO, EXPLAIN	☐ YES ☐ NO
LOCATION	SUPPLIES BUILDINGS	
UNDERGROUND PIPES AND JOINTS	PIPE TYPES AND CLASS	TYPE JOINT
	PIPE CONFORMS TO _____ STANDARD FITTINGS CONFORM TO _____ STANDARD IF NO, EXPLAIN	☐ YES ☐ NO ☐ YES ☐ NO
	JOINTS NEEDING ANCHORAGE CLAMPED, STRAPPED, OR BLOCKED IN ACCORDANCE WITH _____ STANDARD IF NO, EXPLAIN	☐ YES ☐ NO
TEST DESCRIPTION	FLUSHING: Flow the required rate until water is clear as indicated by no collection of foreign material in burlap bags and outlets such as hydrants and blow-offs. Flush at flows not less than 390 GPM (1476 L/min) for 4-inch pipe, 880 GPM (3331 L/min) for 6-inch pipe, 1560 GPM (5905 L/min) for 8-inch pipe, 2440 GPM (9235 L/min) for 10-inch pipe, 3520 GPM (13323 L/min) for 12-inch pipe. When supply cannot produce stipulated flow rates, obtain maximum available. HYDROSTATIC: Hydrostatic tests shall be made at not less than 200 psi (13.8 bars) for two hours or 50 psi (3.4 bars) above static pressure in excess of 150 psi (10.3 bars) for two hours. LEAKAGE: New pipe laid with rubber gasketed joints shall, if the workmanship is satisfactory, have little or no leakage at the joints. The amount of leakage at the joints shall not exceed 2 qts. per hr (1.89 L/h) per 100 joints irrespective of pipe diameter. The leakage shall be distributed over all joints. If such leakage occurs at a few joints the installation shall be considered unsatisfactory and necessary repairs made. The amount of allowable leakage specified above may be increased by 1 fl oz per in. valve diameter per hr. (30 mL/25 mm/h) for each metal sealed valve isolating the test section. If dry barrel hydrants are tested with the main valve open, so the hydrants are under pressure, an additional 5 oz. per minute (150 mL/min) leakage is permitted for each hydrant.	

Figure 8-1(b) Part 1

FLUSHING TEST	NEW UNDERGROUND PIPING FLUSHED ACCORDING TO _____ STANDARDS BY (COMPANY) ☐ YES ☐ NO IF NO, EXPLAIN		
	HOW FLUSHING FLOW WAS OBTAINED ☐ PUBLIC WATER ☐ TANK OR RESERVOIR ☐ FIRE PUMP	THROUGH WHAT TYPE OPENING ☐ HYDRANT BUTT ☐ OPEN PIPE	
	LEAD-INS FLUSHED ACCORDING TO _____ STANDARD BY (COMPANY) IF NO, EXPLAIN ☐ YES ☐ NO		
	HOW FLUSHING FLOW WAS OBTAINED ☐ PUBLIC WATER ☐ TANK OR RESERVOIR ☐ FIRE PUMP	THROUGH WHAT TYPE OPENING ☐ Y.CONN TO FLANGE & SPIGOT ☐ OPEN PIPE	
HYDROSTATIC TEST	ALL NEW UNDERGROUND PIPING HYDROSTATICALLY TESTED AT _____PSI FOR _____ HOURS		JOINTS COVERED ☐ YES ☐ NO
LEAKAGE TEST	TOTAL AMOUNT OF LEAKAGE MEASURED _____ GALS _____ HOURS		
	ALLOWABLE LEAKAGE _____ GALS _____ HOURS		
HYDRANTS	NUMBER INSTALLED	TYPE AND MAKE	ALL OPERATE SATISFACTORILY ☐ YES ☐ NO
	WATER CONTROL VALVE LEFT WIDE OPEN ☐ YES ☐ NO IF NO, STATE REASON HOSE THREADS OF FIRE DEPARTMENT CONNECTIONS AND HYDRANTS ☐ YES ☐NO INTERCHANGEABLE WITH THOSE OF THE FIRE DEPARTMENT ANSWERING ALARM		
REMARKS	DATE LEFT IN SERVICE		
SIGNATURES	NAME OF INSTALLING CONTRACTOR		
	TESTS WITNESSED BY		
	FOR PROPERTY OWNER (SIGNED)	TITLE	DATE
	FOR INSTALLING CONTRACTOR (SIGNED)	TITLE	DATE
ADDITIONAL EXPLANATION AND NOTES			

Figure 8-1 (b) Part 2.

END OF SECTION

SECTION 33 13 00

DISINFECTION OF WATER DISTRIBUTION SYSTEM

PART 1 GENERAL

1.1 SECTION INCLUDES (but is not necessarily limited to)

A. Disinfection of all equipment, pipe lines, and all structures in the water project with which water comes in contact and/or which have been contaminated by the Contractor's operations shall be accomplished after completion of construction and immediately before the system or unit is placed in operation.

B. Testing and reporting results.

1.2 RELATED SECTIONS

A. Applicable sections of Division 01 – GENERAL CONDITIONS: Including but not limited to:

1. Coordination of the Work,
2. Submittals: Procedures for submittals,
3. Quality Control or Testing Laboratory Services: Testing water samples. Field inspection and testing,
4. Material & Equipment: Delivery, storage and handling, and
5. Contract Closeout: Project Record Documents, Requirements.

B. Section 33 11 16 – Water Mains and Services

1.3 REFERENCES

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

AMERICAN WATER WORKS ASSOCIATION (AWWA)

VIRGINIA DEPARTMENT OF HEALTH (VDH)

A. VDH "Waterworks Regulations," latest edition, hereinafter Waterworks Regulations.
B. ANSI/AWWA B300 – Standard for Hypochlorites.
C. ANSI/AWWA B301 – Standard for Liquid Chlorine.
D. ANSI/AWWA B302 – Standard for Ammonium Sulfate.
E. ANSI/AWWA B303 – Standard for Sodium Chlorite.
F. AWWA C651 – Standards for Disinfecting Water Mains.
G. ANSI/AWWA C652 – Standards for Disinfecting Water Storage Facilities.

1.4 PROJECT RECORD DOCUMENTS

A. Submit under provisions of applicable of Division 01: Contract Closeout: Project Record Documents, Requirements.

B. Disinfection report; record:

1. Type and form of disinfectant used.

2. Date and time of disinfectant injection start and time of completion.

3. Test locations.

4. Initial and 24 hour disinfectant residuals (quantity in treated water) in ppm for each outlet tested.

5. Date and time of flushing start and completion.

6. Disinfectant residual after flushing in ppm for each outlet tested.

C. Bacteriological report; record:

1. Date issued, project name, and testing laboratory name, address, and telephone number.

2. Time and date of water sample collection.

3. Name of person collecting samples.

4. Test locations.

5. Initial and 24 hour disinfectant residuals in ppm for each outlet tested.

6. Coliform bacteria test results for each outlet tested.

7. Certification that water conforms, or fails to conform, to bacterial standards of VDH Waterworks Regulations.

8. Bacteriologist's signature and authority.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with AWWA C651.

PART 2 PRODUCTS

2.1 DISINFECTION CHEMICALS & DILUTION MEDIUM

A. Disinfecting Agent: The disinfection agent shall be liquid chlorine ANSI/AWWA B301, or sodium hypochlorite solution ANSI/AWWA B303. Dry hypochlorite ANSI/AWWA B300, similar and equal to "HTH" may also be used as the disinfecting agent.

B. Potable water.

PART 3 EXECUTION

3.1 EXAMINATION

A. Piping shall be cleaned immediately after placing and all open ends shall be adequately sealed to prevent entry of debris.

B. Unless the Contractor adheres to AWWA C651 concerning pipe cleanliness and prevents contamination of pipe, fittings and valves during construction, disinfection will be difficult.

C. All sediment and foreign matter including debris resulting from cutting, welding or fabrication shall be removed from entire water distribution system including water lines and hydrants, followed by thorough flushing with potable water at a minimum velocity of 2.5 ft/sec to remove any sediment which may have collected during operation with raw water. In cases where this velocity is not attainable or is ineffective, cleaning devices such as foam swabs or “pigs” will be considered.

D. Perform scheduling and disinfection activity with start-up, testing, adjusting and balancing, demonstration procedures, including coordination with related systems.

3.2 INSTALLATION

A. Provide and attach required equipment to perform the work of this Section.

B. Pressure Testing: After the valves and piping have been installed, they shall be subjected for one hour to a hydrostatic pressure test of 150 pounds per square inch at the points of reading when the system is put into operation. Any defective material shall be replaced by the Contractor with sound material.

C. Disinfection: All water lines shall be disinfected prior to being placed in operation. Potable water shall be introduced into the pipe line at a constant flow rate. This water shall receive a chlorine dosage which will result in a chlorine concentration of 100 mg/L in a “slug” of the water. An approved hypochlorite solution injected by a metering pump or liquid chlorine injected by a solution-feed chlorinator and booster pump may be used. The chlorine shall be added long enough to ensure that all portions of the pipe are exposed to the 100 mg/L chlorine solution for at least 3 hours. The Chlorine residual shall be checked at regular intervals not to exceed 2000 feet to ensure that adequate residual is maintained. As the chlorinated water passes valves and other appurtenances, they shall be operated to ensure disinfection of these appurtenances.

After the required retention period, the heavily chlorinated water shall be requirements for disposal of disinfecting water with high chlorine concentrations.

After flushing the waterlines, two series of bacteriological samples shall be taken 24 hours apart. Collect one set of samples at intervals of 1,200 ft. of waterline, plus one set at each end of the new line and at the end of each branch (minimum of three sets total). Sets of two consecutive biological samples, taken at least 24 hours apart, which show no contamination, will indicate acceptable disinfection and the water lines may be placed in service.

D. Disinfect permanent system devices removed for system disinfection by exposing to a chlorine solution for a similar time period (method shall be approved in the field). Replace same devices, being sure not to contaminate in the process.

3.3 QUALITY CONTROL

A. Submit under provisions of applicable section of Division 01: Quality Control or Testing Laboratory Services: Testing water samples. Field inspection and testing.

B. Test samples in accordance with AWWA C651.

C. Approval of Disinfection: The complete disinfection program and methods followed, especially if materially different from those specified, shall be in accordance with directives of VDH and all methods employed shall have the approval of VDH. Definite instructions as to the collection and shipment of samples shall be requested from VDH and shall be followed in all respects. Final approval of the bacterial samples shall be received from VDH prior to the time that water mains are placed in service and allowed to be used for distribution of potable water. The Contractor shall deliver copies of the approved test data for the Owner and the Engineer.

D. All references made above to VDH shall also apply to the local utility purveyor, as applicable.

END OF SECTION

SECTION 33 31 00

SITE SANITARY GRAVITY SEWER SYSTEM

PART 1 GENERAL

1.1 SECTION INCLUDES (but is not limited to)

A. Sanitary gravity sewerage piping, fittings and accessories, and bedding.

B. Connection of building sanitary drainage system to municipal sewer.

C. Cleanout access and manholes.

D. Utility top elevation adjustment.

E. Provide new and modify existing exterior sanitary gravity sewer piping and appurtenances. Provide each system complete and ready for operation. The exterior sanitary gravity sewer system includes equipment, materials, installation, and workmanship as specified herein from approximately five (5) feet outside building walls.

1.2 RELATED SECTIONS

A. Applicable sections of Division 01 - GENERAL CONDITIONS: Including but not limited to:
1. Coordination of the Work,
2. Soil and aggregate testing, compaction testing, and inspection of bearing surfaces,
3. Material delivery, storage and handling,
4. Project Record Document Requirements, and
5. Procedures for Submittals.

B. Section 31 22 13 – Rough Grading: Site subgrade contouring. General cutting, grading, filling and rough contouring the site. Geotechnical Engineer. Subsoil and aggregate materials. Classifications of Excavation. Unauthorized excavation defined. Excavation. Dewatering.

C. Section 31 23 17 - Utility Trenching & Backfilling: Excavating for sewer system piping and structures. Inspection of bearing surfaces. Bedding & haunching. Trace Wire for Non-Metallic Piping. Initial backfill. Backfill over piping up to subgrade elevation. Warning & ID Tape. Protection of utility from disturbance and damage during backfill operation.

1.3 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. Latest revision shall be assumed.

AMERICAN SOCIETY OF TESTING & MATERIALS (ASTM)

B. ASTM C923 - Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals

C. ASTM D2321 - Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe

D. ASTM D3034 - Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings

E. ASTM D3212 - Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals

F. ASTM F477 - Elastomeric Seals (Gaskets) for Joining Plastic Pipe

UNI-BELL PLASTIC PIPE ASSOCIATION (UNI)

G. UNI B5 - Installation of Polyvinyl Chloride (PVC) Sewer Pipe

H. UNI B6 - Low Pressure Air Testing of Installed Sewer Pipe

VIRGINIA DEPARTMENT OF TRANSPORTATION (VDOT)

I. VDOT - Virginia Department of Transportation "Road & Bridge Standards & Specifications"

VIRGINIA DEPARTMENT OF HEALTH (VDH)

J. VDH - Virginia Department of Health "Sewage Conveyance and Treatment (SCAT) Regulations."

K. VDH - Virginia Department of Health "Sewage Handling and Disposal (SH&D) Regulations."

L. VDH – Virginia Department of Health "Waterworks Regulations."

1.4 QUALITY ASSURANCE

A. Qualifications of Installers: Use skilled and experienced workmen to ensure proper installation of the products specified herein. Workmen shall be thoroughly familiar with codes covering work of their trade and work to be performed under this contract. In the acceptance or rejection of installed Work, no allowance shall be made for the lack of experience on the part of the workmen.

B. Comply with all standards specified in this Section.

1.5 SUBMITTALS FOR INFORMATION

A. Manufacturer's Product Data:
   1. Provide manufacturer's standard drawings or catalog cuts for pipe, pipe accessories, and fittings.

2. Provide manufacturer's drawings for metal work.

B. Manufacturer's Installation Instructions: Indicate special procedures required to install products specified.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements. Certificates shall attest that tests set forth in each applicable referenced publication have been performed, whether specified in that publication to be mandatory or otherwise. Production control tests shall have been performed at the intervals or frequency specified in the referenced publication. Other tests shall have been performed within three years of the date of submittal of certificates on the same type, class, grade, and size of material as is being provided for the project. Include:
1. Pipe and fittings, including factory applied linings,
2. Pipe joint materials,
3. Cast iron frames and covers,
4. Precast concrete manhole sections.

1.6 REGULATORY REQUIREMENTS

A. The Contractor shall not begin work on the public sanitary sewer system (existing or proposed) until all required availability and tapping fees have been paid. Payment of fees for the sanitary sewer system shall be made by the Owner.

1.7 DELIVERY, STORAGE, HANDLING, AND PROTECTION

A. Delivery and Storage
1. Piping: Inspect materials delivered to the site for damage; store with minimum of handling, on site in enclosures or under protective covering and not directly on the ground. Store plastic piping, jointing materials and rubber gaskets out of direct sunlight. Keep inside of pipes and fittings free of dirt and debris.
2. Metal Items: Check upon arrival; identify and segregate as to types, functions, and sizes. Store off the ground in a manner affording easy accessibility and not causing excessive rusting or coating with grease or other objectionable materials.

B. Handling: Handle pipe, fittings, and other accessories in such a manner as to ensure delivery to the trench in sound undamaged condition. Take special care not to damage linings of pipe and fittings; if lining is damaged, make satisfactory repairs or replace. Carry, do not drag, pipe to the trench.

C. Protection: Use all means necessary to protect materials of this Section before, during, and after installation and to protect installed work and materials of other trades.

D. Damage: in the event of damage, immediately make all repairs and replacements necessary to the approval of and at no additional cost to the Owner or Engineer.

1.8 PROJECT RECORD DOCUMENTS

A. Record location of pipe runs, connections, manholes, cleanouts, structure top elevations and all pipe invert elevations.

B. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities (active or abandoned).

1.9 REGULATORY REQUIREMENTS

A. Conform to applicable code for materials and installation of the Work of this section. Conform to materials' manufacturer's installation recommendations. Code shall take precedence.

B. The Contractor shall comply with the VDH Waterworks Regulations Section pertaining to separation of water and sanitary sewer. Comply also with VDOT Std. UB-1 where separation requirements cannot be maintained.

1.10 COORDINATION

A. Verify that field measurements and elevations are as indicated.

B. Coordinate the Work with earthwork, trenching, point of connection to building sanitary plumbing, and connection to municipal sanitary sewer.

C. Assure that structure tops will be at proposed finish grade and slope and that pipe cover is as specified.

PART 2 PRODUCTS

2.1 SEWER PIPE MATERIALS

A. Plastic Gravity Sewer Pipe & Fittings (12" and less in diameter with 10' max. bury): Conform to ASTM D3034, Type PSM, Poly-Vinyl Chloride (PVC) material, SDR-35; inside nominal diameter as indicated on Drawings. Examples meeting design criteria:
1. National Pipe Company, PVC Sewer Pipe (SDR 35),
2. Robintech, King's Joint PVC Sewer Main (SDR-35),
3. Clow, Deflec-Tite PVC Sewer Pipe (SDR-35), or
4. Approved equal.

B. Joints: Bell and spigot type suitable for elastomeric gasket joints conforming to ASTM D3212.

C. Gaskets: Conform to ASTM F477.

2.2 PIPE ACCESSORIES

A. Joints of Dissimilar Pipe: Provide standard manufactured fitting specifically for the proposed connection by same manufacturer of either type pipe or provide mechanical clamp ring type, stainless steel expanding and contracting sleeve,

neoprene ribbed gasket for positive seal.

B. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required and with gaskets conforming to ASTM F477.

2.3 MANHOLES

A. Any manholes indicated on Drawings shall be precast VDOT Std. MH-2 with nominal shaft diameter of 4 feet unless otherwise indicated. Taper shape shall be as indicated on Drawings by symbol or description. No parging will be permitted on interior manhole walls.

B. Manhole frames and covers shall conform to VDOT Std. MH-1 except as herein modified. The frame shall be drilled to permit using 3/4 inch diameter bolts to secure it to the structure. Three such bolts shall be used per frame at 120 degrees. The words "SANITARY SEWER" shall be cast into the cover so as to be plainly visible. Covers shall be solid with two (2) "pick holes" at opposing edges.

C. Steps shall be per VDOT Std. ST-1 placed in line with vertical wall of eccentric tapers or as creates most desirable access in other situations. All structures in excess of 3'-6" depth shall be provided with steps.

D. Shaping shall be per VDOT Std. IS-1. All structures shall be provided with shaping.

E. Base Pad (Precast): VDOT Standard B-1.

F. Base Pad (Cast-in-place): VDOT Std. B-2 footing.

G. Resilient Pipe Sleeve: For pipes from 4" to 22" diameter, provide resilient connectors in the wall of the reinforced concrete base/riser made of rubber with stainless steel sleeves and clamps, all conforming to ASTM C-923 equal.

H. Riser Joint Sealant: Provide flexible rubber gasket conforming to ASTM C443 to create permanently flexible watertight joints.

I. Waterproofing: Provide a 2 component, low-modulus, chemically cured coal tar epoxy polymide waterproofing vapor barrier to manhole exteriors. It shall be spray applicable cure to a durable, flexible consistency.

J. Rim Adjustments: Provide pre-cast grade rings or install brick and mortar as necessary to level, raise or lower existing or new manhole frames and covers to meet finish grade. Adjustments of 8 inches or less in height shall not be considered for additional compensation.

2.4 CLEANOUTS

A. Per detail(s) on Drawings as applicable.

2.5 BEDDING & BACKFILL MATERIALS

A. See Section 31 23 17 - Utility Trenching & Backfilling for:
   1. Bedding & Haunching,
   2. Cover Bedding/Initial Backfill, and
   3. Backfill Materials.

2.6 UTILITY ADJUSTMENT

A. Provide grade rings, brick and mortar, or extensions for existing or new structures such that tops meet proposed finish grades. Adjustments of 8 inches or less in height shall be made at no additional cost to the Owner.

2.7 CONCRETE MATERIALS

A. Concrete Materials not otherwise described herein shall be as specified in Section 03 30 00 - Cast-In-Place Concrete.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that all prerequisite work has been completed. Verify location and elevation of points of connection. Notify Engineer of any discrepancies.

B. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on Drawings.

3.2 GENERAL

A. See Section 31 23 17 - Utility Trenching & Backfilling: Excavating for sewer system piping and structures. Inspection of bearing surfaces. Bedding & haunching. Trace Wire for Non-Metallic Piping. Initial backfill. Backfill over piping up to subgrade elevation. Warning & ID Tape. Protection of utility from disturbance and damage during backfill operation.

3.3 INSTALLATION - PIPE

A. These General Requirements for installation of pipelines apply except where specific exception is made in the following paragraph entitled, "Special Requirements." "Also" shall mean in addition to the general requirements.

B. Obtain required approvals before making connection to existing line. Conduct work so that there is minimum impact from any interruption of service on existing line.

C. Inspect each pipe and fitting before and after installation; replace those found defective and remove from site. Ream pipe and tube ends and remove fins and burrs from pipe and fittings. Provide adequate means and methods for lowering sections of pipe and associated items into trenches. Do not drop or dump pipe, fittings, or any other sewer piping material. Before placing in position, clean pipe,

fittings and accessories, removing scale and dirt, on inside and outside, before assembly and maintain in a clean condition.

D. Install pipe, fittings, and accessories in accordance with ASTM D2321 (PVC) and manufacturer's instructions. Seal joints watertight.

E. Route pipe in straight line. Lay non-pressure pipe with bell ends in the upgrade direction. Adjust spigots in bells to give a uniform space all around unless a curved section is indicated on Drawings.

F. Cut pipe accurately to measurements established at the site and work into place without springing or forcing and making proper provision for expansion and contraction of piping without stressing pipe or joints. Replace pipe or fitting that does not allow sufficient space for proper installation of joint material with new pipe or fittings of proper dimensions. Blocking or wedging between bells and spigots will not be permitted.

G. Tolerance: Lay pipe to slope gradients indicated on Drawings; with maximum variation from true slope of 1/8 inch in 10 feet. Provide batterboards not more than 25 feet apart in trenches for checking and ensuring that pipe invert elevations are as indicated. Laser beam method may be used in lieu of batterboards for the same purpose.

H. Ensure firm and uniform support. Wood support blocking will not be permitted. Lay pipe so that the full length of each section of pipe and each fitting will rest solidly on the pipe bedding; excavate recesses to accommodate bells, joints, and couplings. Provide anchors and supports where indicated and where necessary for fastening work into place. Keep trenches free of water. At the end of each days work, close open ends of pipe temporarily with plugs, wood blocks or bulkheads.

I. Install haunching to springline of pipe (compacted thickness) per Section 31 23 17 - Utility Trenching & Backfilling.

J. Conduct required testing of piping system.

K. Install trace wire continuous over top of non-metallic pipe and place cover bedding/initial backfill above springline of pipe per Section 31 23 17 - Utility Trenching & Backfilling.

L. Connect to building sanitary plumbing outlet and municipal sewer system, septic tank & drainfield, or on-site treatment, as applicable.

3.4 SPECIAL REQUIREMENTS

A. PVC Plastic Piping: Also conform to the requirements of UNI B5 for laying and joining pipe and fittings. Make joints with the gaskets specified for joints with this piping and assemble in accordance with the requirements of UNI B5 for joint assembly. Make joints to other pipe materials in accordance with the recommendations of the plastic pipe manufacturer.

3.5 INSTALLATION - CLEANOUTS

A. Location/spacing: As indicated on Drawings, at all angular changes of direction and at 60 feet O.C. maximum in gravity lines not between manholes.

B. Establish location, top elevation and pipe inverts and install wye as indicated in pipe installation above.

C. Set vertical piping (adjusted to make ferrule or cover at proper finish grade), backfill per Section 31 23 17 - Utility Trenching & Backfilling, then set cleanout ferrule.

D. Level top surface of backfill, form for the concrete collar pad (coordinating with adjacent work as necessary), and cast-in-place.

E. Traffic Bearing Only: Set adapter so that in the completed work the cleanout plug has 2 inches minimum to 6 inches maximum clearance beneath the cover but no deeper than flush with the concrete anchor pad. Fill from cleanout invert with VDOT Std. #26 coarse aggregate to beneath the concrete anchor pad. Wrap cleanout adapter with welder's cloth followed by aluminum flashing prior to placing concrete. See detail on Drawings for other dimensions. Mount cover frame on grout to slope and elevation of finished traffic surface. Anchor frame with 5/8" bolts to anchor pad.

3.6 MANHOLE CONSTRUCTION

A. Construct base slab of cast-in-place concrete or use precast concrete base sections as indicated. Make inverts conforming with VDOT Std. IS-1 Shaping. For changes in direction of the sewer and entering branches into the manhole, make a circular curve in the manhole invert of as large a radius as the manhole size will permit. For cast-in-place concrete construction, key and bond walls to bottom slab. No parging will be permitted on interior manhole walls. Make joints between precast manhole sections with the gaskets specified for this purpose; install in the manner specified for installing joints for precast concrete manholes. Make joints between concrete manholes and pipes entering manholes with the resilient connectors specified for this purpose; install in accordance with the recommendations of the connector manufacturer. Where a new manhole is constructed on an existing line, applicable local utilities standards shall take precedence over the above.

B. Perform metal work so that workmanship and finish will be equal to the best practice in modern structural shops and foundries. Form iron to shape and size with sharp lines and angles. Do shearing and punching so that clean true lines and surfaces are produced. Make castings sound and free from warp, cold shuts, and blow holes that may impair their strength or appearance. Give exposed surfaces a smooth finish with sharp well-defined lines and rises. Provide necessary rabbets, lugs, and brackets wherever necessary for fitting and support.

C. Apply waterproofing to exterior of structures, which have fully cured, to a minimum dry film thickness of 35 mils.

3.7 UTILITY ADJUSTMENTS

A. Adjust new and existing structure tops affected by new work to meet proposed finish grades.

B. Coordinate timing of adjustments to be prior to stone base applications for paved areas and prior to topsoil applications for lawn spaces.

3.8 FIELD QUALITY CONTROL

A. The Engineer or other assigned Owner's representative will conduct field investigations and witness field tests specified in this section. The Contractor shall provide sufficient notice of tests for Owner's representative to be present (24 hours minimum). The Contractor shall perform field tests and provide labor, equipment, and incidentals required for testing, except that water and electric power needed for field tests will be furnished as set forth in applicable section of Division 1; Temporary Utilities. Be able to produce evidence, when required, that each item of work has been constructed in accordance with the Drawings and Specifications.

B. Trench, Bedding and Compaction Tests: Per Section 31 23 17 - Utility Trenching & Backfilling.

C. Tests for Non-Pressure Lines: Check each straight run of pipeline for gross deficiencies by holding a light in a manhole; it shall show a practically full circle of light through the pipeline when viewed from the other end of the segment/run of pipe. When pressure piping is used in a non-pressure line for non-pressure use, test as specified for non-pressure line.

D. Leakage Test: Test lines for leakage by low-pressure air tests. Prior to testing for leakage, place and compact haunching. When necessary to prevent pipeline movement during testing, place cover bedding/initial backfill around pipe sufficient to prevent movement, but leaving joints uncovered to permit inspection. When leakage or pressure drop exceeds the allowable amount specified, make satisfactory correction and retest pipeline section in the same manner. Correct visible leaks regardless of leakage test results.

E. Low-Pressure Air Test for PVC Piping: Test in accordance with UNI B6, including the allowable pressure drop. Make calculations in accordance with the Appendix to UNI B6.

F. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

3.9 SCHEDULE

A. Sanitary Gravity Line: Indicated on the Drawings as "SS". Size: as indicated on Drawings.

B. Cleanout: As indicated on Drawings by "SSCO".

END OF SECTION

Environmental Hazards Services, L.L.C.
7469 Whitepine Rd
Richmond, VA 23237
Telephone: 800.347.4010

Asbestos Bulk Analysis Report

Report Number: 15-03-01399

Client: ECS-Mid-Atlantic LLC- Roanoke
7670 Enon Drive
Suite 101
Roanoke, VA 24019

Received Date: 03/12/2015
Analyzed Date: 03/12/2015
Reported Date: 03/12/2015

Project/Test Address: Fishburn Park; Roanoke, VA

Client Number:
200608

Fax Number:

Laboratory Results

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
15-03-01399-001	8093-1		Black Tar; Fibrous; Gray Aggregate; Inhomogeneous	NAD	25% Cellulose 5% Fibrous Glass 70% Non-Fibrous
15-03-01399-002	8093-2		Black Tar; Fibrous; Gray Aggregate; Inhomogeneous	NAD	25% Cellulose 5% Fibrous Glass 70% Non-Fibrous

Environmental Hazards Services, L.L.C

Client Number: 200608 Report Number: 15-03-01399

Project/Test Address: Fishburn Park; Roanoke, VA

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials

QC Sample: 78-M12012-1

QC Blank: SRM 1866 Fiberglass

Reporting Limit: 1% Asbestos

Method: EPA Method 600/R-93/116, EPA Method 600/M4-82-020

Analyst: Katherine Charles Harris

Reviewed By Authorized Signatory: Tasha Eaddy

Tasha Eaddy
QA/QC Clerk

The condition of the samples analyzed was acceptable upon receipt per laboratory protocol unless otherwise noted on this report. Each distinct component in an inhomogeneous sample was analyzed separately and reported as a composite. Results represent the analysis of samples submitted by the client. Sample location, description, area, volume, etc., was provided by the client. This report cannot be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government. This report shall not be reproduced except in full, without the written consent of the Environmental Hazards Service, L.L.C. California Certification #2319 NY ELAP #11714 NVLAP #101882-0. All information concerning sampling location, date, and time can be found on Chain-of-Custody. Environmental Hazards Services, L.L.C. does not perform any sample collection.

Environmental Hazards Services, L.L.C. recommends reanalysis by point count (for more accurate quantification) or Transmission Electron Microscopy (TEM), (for enhanced detection capabilities) for materials regulated by EPA NESHAP (National Emission Standards for Hazardous Air Pollutants) and found to contain less than ten percent (<10%) asbestos by polarized light microscopy (PLM). Both services are available for an additional fee.

400 Point Count Analysis, where noted, performed per EPA Method 600/R-93/116 with a Reporting Limit of 0.25%.

* All California samples analyzed by Polarized Light Microscopy, EPA Method 600/M4-82-020, Dec. 1982.

LEGEND: NAD = no asbestos detected

2 PLM

EHS Laboratories™

Environmental Hazards Services, LLC

www.leadlab.com
(800)347-4010
(804)275-4907 (fax)

7469 Whitepine Rd
Richmond, VA
23237

Asbestos Chain-of-Custody

POSTIVE STOP

15-03-01399

Due Date:
03/12/2015
(Thursday)
ER

SI KMK

Company Name: ECS Mid-Atlantic, LLC Address: 7670 Enon Drive, Suite 101 City/State/Zip: Roanoke, VA 24019

Phone: (540) 362-2000 Fax: (540) 362-1202 E-mail: amoon@ecslimited.com Acct. Number:

Project Name / Testing Address: Fishburn Park City/State (Required): Roanoke, VA

Collected by: Alexandra Moon Purchase Order Number: 8093

Turn Around Times : *If no TAT is specified, sample(s) will be processed and charged as 3-day TAT.*

____ 1 - Day ____ 2 - Day ____ 3 - Day ✔ Same Day (Must Call Ahead) ____ Weekend (Must Call Ahead)

No.	Client Sample ID	Date Collected	ASBESTOS							AIR					COMMENTS
			PLM	PLM Point Count 400	PLM Point Count 1000	PLM NY Protocol	PCM	TEM Chatfield (Bulk)	TEM AHERA (Air)	Time On	Time Off	Flow Rate (L/min)	Total Time (minutes)	Volume (Total Liters)	
1	8093-1	03/11/2015	✔												roof- shingle & felt } PS
2	8093-2	03/11/2015	✔												roof- shingle & felt } PS
3															
4															
5															
6															
7															
8															
9															
10															

Released by: Alexandra Moon Signature: alexandra Moon Date/Time: 03/11/2015

Received by: JStone Signature: JStone Date/Time: 3/12/15

ASBESTOS SURVEY AND LEAD-BASED PAINT SCREENING SURVEY

FISHBURN PARK - BATHROOMS
BRAMBLETON AVENUE, SW
ROANOKE, VIRGINIA

ECS PROJECT NO. 12-8093

FOR

CITY OF ROANOKE

MARCH 24, 2015

ECS MID-ATLANTIC, LLC
"Setting the Standard for Service"
Geotechnical • Construction Materials • Environmental • Facilities

March 24, 2015

Mr. Donnie Underwood
Roanoke Parks and Recreation
The City of Roanoke
215 Church Street, SW
Room 301
Roanoke, Virginia 24011

ECS Project No. 12-8093

Reference: Asbestos Survey and Lead-Based Paint Screening Survey, Fishburn Park - Bathrooms, Brambleton Avenue, SW Roanoke, Virginia

Dear Mr. Underwood:

ECS Mid-Atlantic, LLC (ECS) is pleased to provide The City of Roanoke's Parks and Recreation Department with the results of our non-invasive Asbestos Containing Material (ACM) survey and Lead-Based Paint Screening Survey which was performed at the above referenced site. This non-invasive assessment was conducted in general accordance with ECS Proposal No. 12:11744-P, dated February 20, 2015, revised March 4, 2015. This report presents a summary of ECS' assessment performed on March 11, 2015 and March 13, 2015 for the above referenced property.

Purpose and Scope of Work

The scope of services performed included the following:

- A visual non-invasive evaluation of the above referenced property.
- The collection of representative bulk samples of suspect ACM within each unique and homogeneous area (areas similar in appearance and material composition) utilizing wet sampling methods, clean extraction tools, and personal protective equipment. Materials sampled were done based upon ECS understanding of the scope of work.
- Submittal of collected bulk samples to a subcontracted analytical laboratory, for microscopic analyses utilizing Polarized Light Microscopy (PLM) with dispersion staining using US Environmental Protection Agency (USEPA) protocol in general accordance with NIOSH manual of analytical methods (USEPA 40 CFR Part 763, entitled *Methods for Determination of Asbestos in Bulk Samples*).
- A screening survey of lead-based paint (LBP) to generally determine the lead concentrations of typical painted and varnished surfaces that may be present within the above referenced areas. It should be noted that this is a screening survey only for evaluation with respect to OSHA and was not a surface to surface evaluation for purposes of compliance with EPA Renovation, Repair, and Painting Program (RRP) or Title X requirements.

7670 Enon Drive, Suite 101, Roanoke, Virginia 24019 • T: 540-362-2000 • F: 540-362-1202 • www.ecslimited.com
ECS Capitol Services, PLLC • ECS Carolinas, LLP • ECS Central, PLLC • ECS Florida, LLC • ECS Mid-Atlantic, LLC • ECS Midwest, LLC • ECS Southeast, LLC • ECS Texas, LLP

- Testing to determine the lead concentration of painted surfaces, performed using an x-ray florescence (XRF) spectrum analyzer. The XRF is a hand-held portable lead detector, designed to obtain accurate, non-destructive measurements of lead concentrations in paints and coatings.

Site Description

The property is located at Fishburn Park in Roanoke, Virginia. The property is a one story bathroom structure with men's and women's bathrooms and a storage area. The building is proposed to be demolished.

Sampling Locations and Methods

A survey of the building, to identify asbestos-containing materials (ACMs), was performed by Ms. Alexandra Moon (VA Asbestos Inspector # 3303 003364) on March 12, 2015. A total of 2 representative bulk samples were collected from the building during our survey.

Sample methodology was conducted in general accordance with US EPA and OSHA regulations. The samples were submitted to Environmental Hazards Services, LLC (EHS) in Richmond, Virginia for analysis using the EPA recommended method of Polarized Light Microscopy (PLM) (Method No. EPA 600/R-93/116 and 600/M4-82-020). EHS participates in the National Voluntary Laboratory Accreditation Program (NVLAP) and is accredited by the Commonwealth of Virginia. Their NVLAP accreditation number is #101882-0. EPA recommended chain-of-custody procedures were maintained throughout the sampling and testing operations. A list of the materials sampled and analyzed for asbestos content is located in Table 1. A separate attachment for the asbestos laboratory analysis is also found in the appendices.

Analytical Test Results

ACM is defined as any material containing more than one percent (>1%) asbestos as determined using the method specified in Appendix A, Subpart F, 40 CFR Part 763, Section 1, PLM. A friable ACM is defined as any ACM that, when dry, can be crumbled, pulverized or reduced to powder by hand pressure. A non-friable ACM is defined as any ACM that, when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure. Category I non-friable ACM are listed as follows: packings, gaskets, resilient floor coverings, and asphalt roofing products containing more than one percent (>1%) asbestos. Category II non-friable ACMs are listed as any material, excluding Category I non-friable ACM, containing more than one percent (>1%) asbestos.

Table I – Asbestos		
Sample No.	**Sample Description**	**Analytical Results**
8093-1	Roof Shingle	NAD
8093-2	Roof Shingle	NAD

Key: NAD = No Asbestos Detected

Conclusions

Friable Asbestos Containing Materials

No asbestos was detected in samples collected of suspect friable materials identified during this survey.

Non-friable Asbestos-Containing Materials

No asbestos was detected in samples collected of suspect non-friable materials identified during this survey.

Qualifications of Asbestos Survey

This report summarizes our evaluation of the type, condition and location of asbestos containing building materials observed, sampled, and analyzed at the site. The findings prepared by ECS are based upon our observations in the facility and analysis of the samples collected at the time of this survey. Additional ACM may exist (undetected or concealed) in other portions of the facility such as behind walls and permanent ceilings or in inaccessible areas, such as below grade foundation walls. Our recommendations are based on the guidelines presented by the EPA, Commonwealth of Virginia, and OSHA. Any conditions discovered which deviate from the data contained in this report should be presented to us for our evaluation.

Recommendations

If during demolition suspect materials are encountered/identified, it is recommended that they be sampled immediately by a Virginia licensed asbestos inspector before proceeding further with demolition.

Lead-Based Paint Screening Procedures and Results

A screening of the building, to identify Lead-Based Paint (LBP), was performed by Ms. Alexandra Moon of ECS on March 13, 2015. The lead screening consisted of observing major painted and varnished components, which may contain LBP that could be impacted during demolition of the structures. The screening was generally conducted using the methodology recommended by the U.S. Department of Housing and Urban Development (HUD). Modifications were made, where appropriate, for this project. It is important to note that this survey was not a comprehensive, surface-by-surface evaluation, but rather a screening survey only of a major painted and varnished components which may contain LBP and was not performed for compliance for US EPA regulations regarding LBP under RRP or under Title X.

The testing was conducted by using a Innov-X Alpha Series X-Ray Fluorometer (XRF) Lead Paint Analyzer (Model No. I 3000, Serial No. 11884). The XRF can measure surface or non-surface concentrations of lead with 95% accuracy at the HUD action level of 1.0 mg/cm^2. Levels of lead are reported in units of milligrams per square centimeter (mg/cm^2). The XRF is able to accurately detect as little as 0.1 mg/cm^2 of lead. The XRF classifies painted surfaces as "positive" or "negative" for lead content based on the HUD action level (1.0 mg/cm^2) and the performance characteristics of the XRF.

Positive: Lead is present at or above the HUD standard of 1.0 mg/cm^2 on one or more of the components.

Negative: Lead is not present at or above the HUD standard of 1.0 mg/cm^2 on the tested components.

A total of 17 individual XRF readings were collected during the survey. Lead concentrations at or above the Commonwealth of Virginia and Environmental Protection Agency (EPA) lead levels of equal to or greater than 1.0 mg/cm^2 were identified in the following:

- Window Frames

Recommendation for Lead-Based Paint Containing Materials

Positive and negative results are based on U.S. Department of Housing and Urban Development (HUD), U.S. Environmental Protection Agency (EPA), and Commonwealth of Virginia guidelines. It is important to note that even if a component is negative based on HUD, EPA, and Commonwealth of Virginia standards, it may still contain concentrations of lead in the paint, which when disturbed, may generate lead dust greater than the Permissible Exposure Limit (PEL) of 50 micrograms per cubic millimeter (ug/m^3) as an 8-hour Time Weighted Average (TWA) established by the OSHA "Lead Exposure in Construction Rule (29 CFR 1926.62)."

The OSHA standard gives no guidance on acceptable levels of lead in paint at which no exposure to airborne lead (above the action level) would be expected. Rather, OSHA defines airborne concentrations, and references specific types of work practices and operations from which a lead hazard may be generated (reference 29 CFR 1926.62, section d). Environmental and personnel monitoring should be conducted during any removal/demolition process (as appropriate) to verify that actual personal exposures are below the Permissible Exposure Limit (PEL). Under OSHA requirements, the contractor performing the work will be required to conduct this monitoring and follow all of the other requirements found under 29 CFR 1926.62.

Since LBP is present, ECS recommends that prior to disposal of the structure that one representative sample be collected of the waste stream for analysis of leachable lead in general accordance with US EPA RCRA requirements.

Limitations

The conclusions and recommendations presented within this report are based upon a reasonable level of assessment within normal bounds and standards of professional practice for a site in this particular geographic setting. ECS is not responsible or liable for the discovery and elimination of hazards that may potentially cause damage, accidents, or injuries.

The observations, conclusions, and recommendations pertaining to environmental conditions at the subject site are necessarily limited to conditions observed, and/or materials reviewed at the time this study was undertaken. No warranty, expressed or implied, is made with regard to the conclusions and recommendations presented within this report. This report is provided for the exclusive use of the client. This report is not intended to be used or relied upon in connection with other projects or by other unidentified third parties without the written consent of ECS and the client.

During this study, suspect asbestos samples were submitted for analysis at an NVLAP-accredited laboratory via polarized light microscopy. As with similar surveys of this nature, actual conditions exist only at the precise locations from which suspect asbestos samples were collected. Certain inferences are based on the results of this sampling and related testing to form a professional opinion of conditions in areas beyond those from which the samples were collected. No warranty, expressed or implied, is made.

Our recommendations are in part based on federal and local regulations and guidelines. ECS does not assume the responsibility of the person(s) in charge of the site, or otherwise undertake responsibility for reporting to any local, state, or federal public agencies any conditions at the site that may present a potential danger to public health, safety, or the environment. Under this scope of services, ECS assumes no responsibility regarding any response actions initiated as a result of these findings. General compliance with regulations and response actions are the sole

responsibility of the Client and should be conducted in accordance with local, state, and/or federal requirements.

The client agrees to notify the appropriate local, state, or federal public agencies as required by law, or otherwise to disclose, in a timely manner, information that may be necessary to prevent any danger to public health, safety, or the environment.

Feel free to contact us at 540-362-2000, if there are questions regarding this report, or if you need further information.

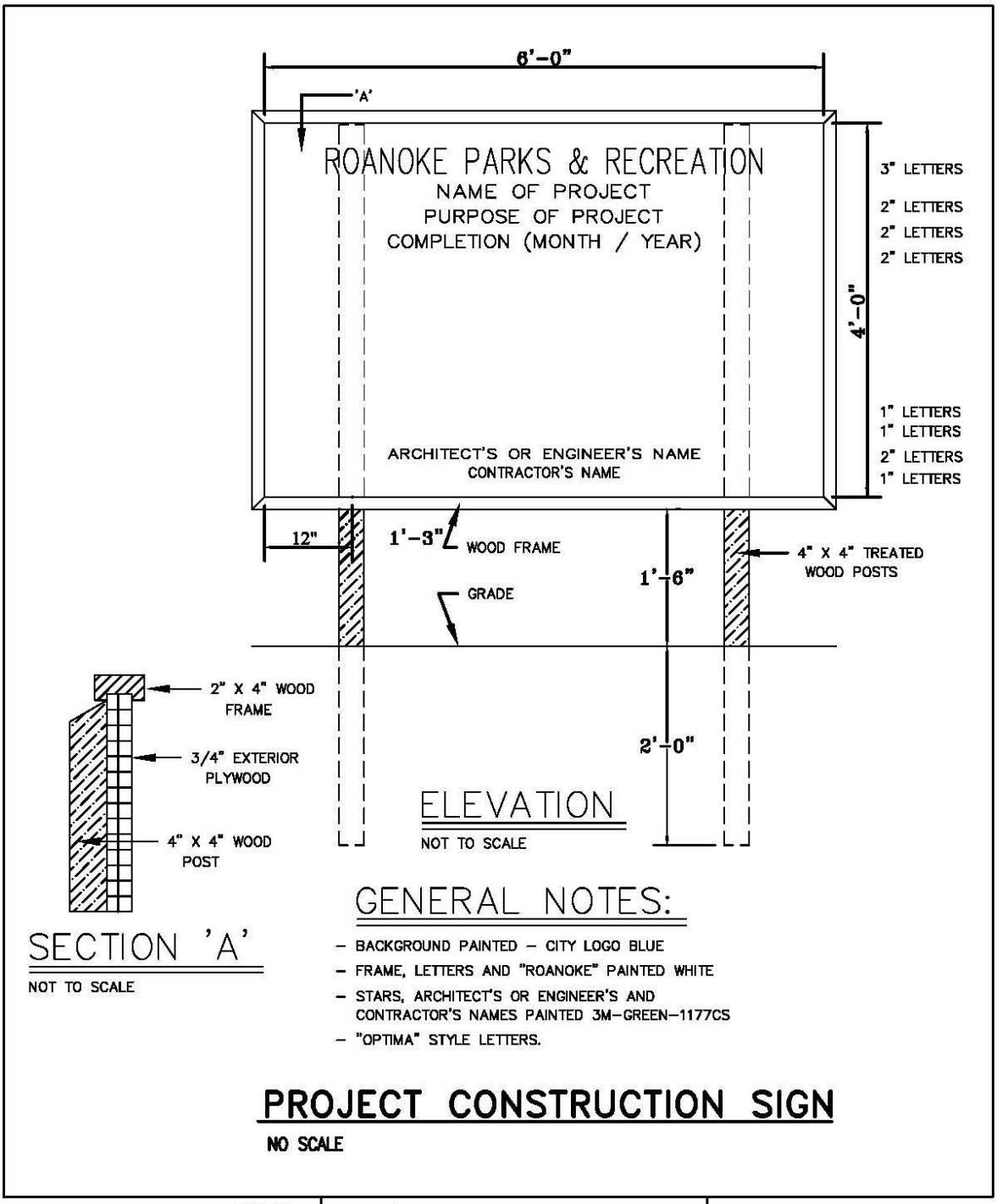
Respectfully submitted,

ECS MID-ATLANTIC, LLC

Alexandra Moon
Environmental Scientist
VA Asbestos Inspector # 3303 003364

Christopher J. Chapman, CIH
Director of Industrial Hygiene
VA Asbestos Inspector # 3303 000515

Attachments: Analytical Test Results and Chain of Custody



SPECTRUM DESIGN
architects | engineers

COMM. NO.	ROANOKE CITY PARK IMPROVEMENTS	DRAWN BY:	
14043	**PROJECT SIGN DETAIL**	MF	**XC501A** DRAWING NO.
DATE: 5/13/15	SCALE: NO SCALE / REF. NO.: C501	CHECKED BY: MAR	