PROJECT MANUAL
FOR
CITY OF LYNCHBURG

Historic Filter Building Renovations and Alterations

September 2010

PROCUREMENT DIVISION
3RD FLOOR CITY HALL
900 CHURCH STREET
LYNCHBURG, VA 24504
TELEPHONE (434) 455-3970
FAX (434) 845-0711

Table of Contents

Document **Page No.**

Part I:
Table of Contents PM-1
Advertisement For Bids PM-2
Bid-Form PM-3
Escrow Account Election PM-5
Equal Opportunity Report Statement PM-6
Statement Of Experience PM-7
Statement Of Available Resources PM-8
Corporate Status Form PM-9
Questions To Bidders/Offerors PM-10
Construction Agreement PM-11
City Of Lynchburg, Virginia Standard Performance Bond PM-13
City Of Lynchburg Standard Labor And Material Payment Bond PM-15
Escrow Agreement PM-18
Instructions To Bidders PM-22
General Conditions PM-27

Part II: Technical Specifications
Part III: Drawings

ADVERTISEMENT FOR BIDS

Sealed bids for the Historic Filter Building Renovations and Alterations will be received by the City of Lynchburg, Procurement Division, City Hall, Lynchburg, VA, until 3:00 p.m., October 15, 2010, and then publicly opened and read, in the Bidder's Room, Third Floor, City Hall.

The Project includes the renovation and alteratiosn of a one story, approximately 8600 square feet, with a 1900 square foot second floor. Interior spaces include general administration and engineering offices; conference rooms; display area, general storage, toilets and breakroom.

The Contract Documents for the above project may be obtained from CRI Mutual Press, 60 9th Street, Lynchburg, Virginia 24504 for a non-refundable fee of $125/set. No partial sets will be provided. Documents are also available on the City's website: www.lynchburgva.gov, Quick Index, Current Solicitations.

Pre-Bid Conference will be held at 2:00 p.m., September 29, 2010, in the College Hill Filter Plant Conference Room, 525 Taylor Street and will be followed by a site inspection.

All requests for clarification or questions regarding this project should be sent to Stephanie Suter, email: stephanie.suter@lynchburgva.gov, fax: 4348450711 by October 7, 2010.

BID FORM

Stephanie Suter, CPPB
Procurement Division
City of Lynchburg
Third Floor, City Hall
900 Church Street
Lynchburg, Virginia 24504

Dear Ms. Suter:

The undersigned, as bidder, hereby declares that the only persons interested in this bid as principal, or principals, is or are named herein and that no person other than herein mentioned has any interest in this bid or in the Construction Agreement to be entered into; that this bid is made without connection with any other person, company, or parties making a bid; and that it is in all respects fair and in good faith, without collusion or fraud.

The undersigned, having visited and examined the site and having carefully studied all the Contract Documents, including without limitation, all drawings and specifications pertaining to "Historic Filter Building Renovations and Alterations" for the City of Lynchburg, Virginia, hereby proposes to furnish all labor, equipment, materials, and services to perform all operations necessary to execute and complete the Work required for the project, in strict accordance with the Contract Documents, together with Addenda numbered _____ through _____ issued during bidding period and hereby acknowledged, subject to the terms and conditions of the Construction Agreement for the sum of:

_____DOLLARS

($_____), which shall be referred to hereinafter as the Base Bid.

It is understood and agreed that the Owner, in protecting its best interests, reserves the right to reject any or all bids or waive any defects. Any changes, erasures, modifications, deletions in the bid form, or alternate proposals not specified in the Advertisement for Bids may make the bid irregular and subject to rejection.

We are properly equipped to execute all work of the character and extent required by the Contract Documents, and we will enter into the Construction Agreement for the execution and completion of the Work in accordance with the Contract Documents; and we further agree that, if awarded the Construction Agreement, we will commence the Work on the date stated in the "Notice to Proceed" and will maintain a work force large enough to execute the Work and all obligations no later than the completion date stated in the Contract Documents.

Enclosed herewith is the following Security, offered as assurance that the undersigned will enter into the Construction Agreement for the execution and completion of the Work in accordance with the Contract Documents:

Bidder's Certified Check issued by_____(name of bank) in the

amount of: $_____(5% of Base Bid amount).

Bidder's Bid Bond for 5% of Base Bid Amount Issued by _____
(name of surety authorized to do business in Virginia).

The undersigned hereby agrees, if awarded the Construction Agreement, to execute and deliver to the City within ten (10) days after his receipt of the Notice of Award, a performance bond and a payment bond, in forms satisfactory to the City, from sureties authorized to do business in Virginia satisfactory to the City, in the amount of one hundred (100) percent of the Base Bid.

The undersigned further agrees that, in case of failure on his part to execute the said Construction Agreement within the ten (10) days after written notice being given on the award of the Construction Agreement or the failure to deliver the required performance and payment bonds within the ten (10) days, the monies payable by the Security accompanying this bid shall be paid to the City of Lynchburg, Virginia, as liquidated damages for such failure; otherwise the Security accompanying this Bid shall be returned to the undersigned.

Attached herewith are completed Statement of Experience and Statement of Resources forms which include the information requested.

The undersigned further certifies that this bid is not the result of, or affected by, any act of collusion with another person engaged in the same line of business, or any act punishable under the Virginia Governmental Frauds Act, or other law.

This bid remains valid and may not be withdrawn for a period of 90 days from this date.

CURRENT VIRGINIA CLASS A CONTRACTOR'S LICENSE/ REGISTRATION NO.:_____

Respectfully submitted,

_____
CONTRACTOR

_____
DATE

_____

_____
ADDRESS

_____
PHONE/FAX

BY:_____

ITS:_____
(Title)

ELECTION OF ESCROW ACCOUNT PROCEDURE FOR RETAINAGE

If determined to be the successful low bidder(s), the above signed elects to use the Escrow Account Procedure for retainage.

_____

Write “Yes” or “No” on above line

If the successful bidder elects to use the Escrow Account Procedure for Retainage, the "Escrow Agreement" form shall be executed and submitted to the City of Lynchburg Engineering Division within fifteen (15) calendar days after notification. If the "Escrow Agreement" form is not submitted within the fifteen (15) day period, the Contractor shall forfeit his rights to the use of the Escrow Account Procedure.

Company_____

Authorized Signature_____

EQUAL OPPORTUNITY REPORT STATEMENT

The Bidder shall complete the following statement by checking the appropriate blank as follows.

The Bidder has_____ has not _____ participated in a previous contract subject to the nondiscrimination clause prescribed by Executive Order 10925, dated March 6, 1961, or Executive Order 11114 dated June 22, 1963.

In conjunction with the City of Lynchburg's policy to utilize Minority and Disadvantaged Business Enterprises ("DBE") wherever possible, the Bidder has solicited quotations for labor, material and/or services from the following Minority and Disadvantaged Business Enterprises:

NAME OF FIRM	PERSON(S) CONTACTED	DATE

Of those listed above, we intend, at this time, to utilize the following in the completion of the Work required by this Construction Agreement:

_____

_____

_____

"This firm assures that it will give its best efforts to utilize Minority and Disadvantaged Business Enterprises whenever possible."

CERTIFIED BY: _____(Signature)

_____(Typed/Printed name & Title)

BIDDER'S NAME: _____

TAXPAYER IDENTIFICATION NUMBER:_____

_____This firm will perform all construction with its own employees and, therefore, is not required to solicit quotations from DBEs.

FAILURE TO DOCUMENT AND REPORT DBE CONTACTS ON THIS FORM MAY BE A BASIS FOR REJECTION OF THE BID AS NONCONFORMING.

STATEMENT OF EXPERIENCE

Proposer: _____

_____

How Long In Business: _____ At Current Address: _____

Principals: _____ Title: _____

_____ Title: _____

_____ Title: _____

Type of Work Normally Performed: _____

_____

Projects of this type previously completed:

1. _____

_____ Amount $ _____

Reference Contact: _____ Tel. No. _____

2. _____

_____ Amount $ _____

Reference Contact: _____ Tel. No. _____

3. _____

_____ Amount $ _____

Reference Contact: _____ Tel. No. _____

4. _____

_____ Amount $ _____

Reference Contact: _____ Tel. No. _____

5. _____

_____ Amount $ _____

Reference Contact: _____ Tel. No. _____

STATEMENT OF AVAILABLE RESOURCES

Equipment: _____

_____

_____

Number of Personnel Currently Employed: _____

Number of Personnel Available for Project: _____

Other Pertinent Information: _____

_____

_____

_____

_____

_____

_____

_____

CORPORATE STATUS FORM

ALL PROSPECTIVE FIRMS MUST RESPOND TO THE FOLLOWING

If a limited liability company, limited liability partnership or a limited partnership, indicate by checking one: _____Limited liability company

_____Limited liability partnership

_____Limited partnership

Have you registered with the Virginia State Corporation Commission, to conduct business in Virginia? □ Yes □ No

Name and address of organizer: _____

_____

_____

_____

List who is authorized to execute contracts:

_____

If conducting business under an assumed (fictitious) business name, fill out the following information:

Names of persons or entities owning business using assumed business name:_____

Owners' addresses: _____

Registration date: _____ Expires: _____

If conducting business as a sole proprietorship, general partnership, or joint venture, fill out the following information:

Names of all persons liable for obligations of the business: _____

Addresses of such persons:_____

Questions to Bidders/Offerors

Bidders/Offerors are to respond to the following question: Have any of the individual(s), owner(s), and/or principal officer(s) of the firm submitting the bid/proposal ever been convicted of (1) a felony, or (2) a misdemeanor involving moral turpitude?

YES _____ NO _____

If yes, list individual or officer and title and give details.

_____

_____

_____

_____

_____

_____

_____

_____

NOTE: Answering yes to this question will not necessarily exclude your company from consideration but will be used to weigh the relationship between the offense and the contract to be performed.

Is your firm currently involved in litigation or a dispute involving arbitration?

YES _____ NO _____

If yes, for litigation list the litigation by case name, name of court, case number, and jurisdiction, and for arbitration, list the organization administering, if any, its contact information, any case number assigned, the arbitrators, and the location of the arbitration. For litigation and arbitration, briefly describe the claims and status, and give contact information for the opposing party or parties.

_____

_____

_____

_____

CONSTRUCTION AGREEMENT

This Construction Agreement (the "Contract") made and entered into on the _____ day of _____, 2010, by and between _____, party of the first part, hereinafter referred to as Contractor, and the City of Lynchburg, a municipal corporation of the Commonwealth of Virginia, party of the second part, hereinafter referred to as the Owner or City.

That the Contractor, for the consideration hereinafter fully set out, hereby agrees with the Owner as follows:

1. That the Contractor shall furnish all labor, materials, tools, and equipment and perform all Work required by the Contract Documents (as defined in the General Conditions hereto) for the Historic Filter Building Renovations and Alterations.

2. That the Contractor shall commence Work within ten (10) days after Notice to Contractor to Proceed with the Work under Contract ("Notice to Proceed"), and shall complete the work within 270 days. Owner and Contractor recognize that time is of the essence of this Contract and that the Owner will suffer financial loss if the Work is not completed within the times specified in the Notice to Proceed, plus any extensions thereof. They also recognize the delays, expense and difficulties involved in providing the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for certain losses Owner is expected to suffer due to delay (but not as a penalty) Contractor shall pay $500 for each day that expires after the time specified for completion. If the Contractor is subject to liquidated damages, the City has the right, but not the obligation, to withhold the liquidated damages from the Contractor's regular payments or retainage. Rights and obligations relating to these liquidated damages are set out more fully in the General Conditions.

3. The Owner hereby agrees to pay the Contractor for the faithful performance of this Contract in accordance with the Contract Documents, subject to additions and deductions as provided in the Contract Documents, in lawful money of the United States, as follows:

_____Dollars

($_____)

4. The Owner shall make partial payment on a monthly basis to the Contractor in accordance with the Contract Documents on the basis of a duly certified and approved estimate of work performed during the preceding calendar month by the Contractor, less five percent (5%) of the amount of such estimate which may be retained by the Owner until all Work has been performed strictly in accordance with the Contract Documents and until such Work has been accepted by the Owner.

5. Within ninety (90) days after submission by the Contractor of evidence satisfactory to the Owner that all payrolls, material bills and other costs incurred by the Contractor in connection with the construction of the Work have been paid in full, satisfaction of all the requirements of the Contract Documents, and acceptance of such Work by the Owner, final payment on account of this Contract shall be made.

6. It is further mutually agreed between the parties hereto that if, at any time after the execution of this Contract, the performance bond provided for its faithful performance and the payment bond, the

Owner shall deem the surety or sureties upon such bonds or either of them to be unsatisfactory, or if for any reason, such bonds cease to be adequate to cover the performance of the Work, the Contractor shall, at his own sole expense, within five (5) days after the receipt of Notice from the Owner so to do, furnish an additional bond or bonds in such form and amount, and with such surety or sureties as shall be satisfactory to the Owner. In such event, no further payment to the Contractor shall be deemed to be due under this Contract until such new or additional security for the faithful performance of the Work shall be furnished in manner and form satisfactory to the Owner.

7. Contractor agrees to fulfill all requirements of state, Federal, and municipal laws which may be applicable to this project.

8. This Contract is subject to the General Conditions accompanying it, and all the documents defined by the General Conditions to be the Contract Documents are a part of this Contract.

This Contact is executed in two counterparts, each of which shall, without proof or accounting for the other counterparts, be deemed an original contract.

IN WITNESS WHEREOF, _____ has

caused its name to be subscribed to this Contract by _____, its

_____, and its corporate seal to be hereunto affixed and attested by

_____, its _____, said officers being duly authorized therefore; and the City of Lynchburg has caused its name to be hereunto subscribed by L. Kimball Payne, City Manager, and its corporate seal to be hereunto affixed and attested by Patricia Kost, its Clerk of Council, said officers being duly authorized therefore, all as to the day and year first above written.

CONTRACTOR

BY: _____

ITS: _____

(SEAL)

_____
ATTEST:

_____ CITY OF LYNCHBURG

(SEAL) BY: _____
City Manager

_____
ATTEST:

_____
Clerk of Council

CITY OF LYNCHBURG, VIRGINIA
STANDARD PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS: That_____
_____, the Contractor ("Principal"), whose principal place of business is located at _____
_____and_____
_____("Surety"), are held and firmly bound unto the City of Lynchburg, Virginia, the Owner ("Obligee"), in the amount of

_____ Dollars
($_____) for the payment whereof Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS,

Principal has, entered into a Construction Agreement with Obligee for certain work on a construction project known as ”Historic Filter Building Renovations and Alterations”, which contract (the "Contract") is by reference expressly made a part hereof;

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if the Principal shall promptly and faithfully perform said Contract in strict conformity with the plans, specifications and conditions of the Contract and its Contract Documents, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

Provided, that any alterations which may be made in the terms of the Contract, or in the Work to be done under it, or the giving by the Obligee of any extension of time for the performance of the Contract, or any other alterations, extensions or forbearance on the part of either or both of the Obligee or the Principal to the other shall not in any way release the Principal and the Surety, or either of them, their heirs, executors, administrators, successors or assigns, from their liability hereunder, notice to the Surety of any such alterations, extensions, or forbearance being hereby waived.

No action shall be brought on this bond unless brought within one year after: (a) completion of the Contract and all Work thereunder, including expiration of all warranties and guarantees, or (b) discovery of the defect or breach of warranty or guarantee if the action be for such.

The Surety represents to the Principal and to the Obligee that it is legally authorized to do business in the Commonwealth of Virginia.

Signed and sealed this _____ day of _____, 2010.

_____ (SEAL)
Contractor/Principal

By: _____

Witness: _____ Title: _____

_____ (SEAL)
Surety

By: _____
Attorney -in-Fact

My Power of Attorney is recorded in the Clerks Office of the Circuit Court of _____, Virginia in Deed Book _____, Page _____, and has not been revoked.

_____
Attorney-in-Fact

AFFIDAVIT AND ACKNOWLEDGEMENT OF ATTORNEY-IN-FACT

COMMONWEALTH OF VIRGINIA
(or, alternatively, Commonwealth or State of _____)

CITY/COUNTY OF _____ to wit:

I, the undersigned notary public, do certify that _____ personally appeared before me in the jurisdiction aforesaid and made oath that he is the attorney-in-fact of _____, the Surety, that he is duly authorized to execute on its behalf the aforesaid Bond(s) as its act and deed.
Given under my hand this _____ day of _____ 2009.

_____ (SEAL)
Notary Public

My Commission expires: _____

APPROVED:

_____
City Attorney/Designee Date

CITY OF LYNCHBURG
STANDARD LABOR AND MATERIAL PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS: That _____

_____, the Contractor ("Principal") whose principal

place of business is located at_____

_____and_____

_____("Surety") are held and firmly bound unto the City of Lynchburg,

Virginia, the Owner ("Obligee") in the amount of_____ Dollars

($_____) for the payment whereof Principal and Surety bind themselves, their heirs,

executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS,

Principal has by written agreement dated_____entered into a Construction Agreement with Obligee for the Historic Filter Building Renovations and Alterations, which contract (the "Contract") is by reference expressly made a part hereof;

NOW THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if the Principal shall promptly make payment to all claimants as hereinafter defined, for labor performed and material furnished in the prosecution of the Work provided for in the Contract and its Contract Documents, then this obligation shall be void~~,~~; otherwise it shall remain in full force and effect, subject, however, to the following conditions.

The Principal and Surety, jointly and severally, hereby agree with Obligee as follows:

1. A claimant is defined as one having a direct contract with the Principal or with a subcontractor of the Principal for labor, material, or both for use in the performance of the Contract. A "subcontractor" of the Principal, for the purposes of this bond only, includes not only those subcontractors having a direct contractual relationship with the Principal but also any other contractor who undertakes to participate in the Work which the Principal is to perform under the aforesaid Contract, whether there are one or more intervening subcontractors contractually positioned between it and the Principal (for example, a subcontractor). "Labor" and "material" shall include, but not be limited to, public utility services and reasonable rentals of equipment, but only for periods when the equipment rented is actually used at the Work site.

2. Subject to the provisions of paragraph 3, any claimant who has performed labor or furnished material in accordance with the Contract Documents in the prosecution of the Work provided in the Contract, 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 of such labor or furnished the last of such materials for which he claims payment, may bring an action on this bond to recover any amount due him for such labor or material, and may prosecute such action to final judgment and have

execution on the judgment. The Obligee need not be a party to such action and shall not be liable for the payment of any costs, fees or expenses of any such suit.

3. Any claimant who has a direct contractual relationship with any subcontractor of the Principal from whom the Principal has not required a subcontractor payment bond, but who has no contractual relationship, express or implied, with the Principal, may bring an action on this bond only if he has given written notice to the Principal within one hundred eighty (180) days from the day on which the claimant performed the last of the labor or furnished the last of the materials for which he claims payment, 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. Notice to the Principal shall be served by registered or certified mail, postage prepaid, in an envelope addressed to the Principal at any place where his office is regularly maintained for the transaction of business. Claims for sums withheld as retainages with respect to labor performed or materials furnished shall not be subject to the time limitations stated in this paragraph 3.

4. No suit or action shall be commenced hereunder by any claimant.

   a. Unless brought within one year after the day on which the person bringing such action last performed labor or last furnished or supplied materials, it being understood, however, that if any limitation embodied in this bond is prohibited by any law controlling the construction hereof, the limitation embodied within this bond shall be deemed to be amended so as to be equal to the minimum period of limitation permitted by such law.

   b. Other than in a Virginia court of competent jurisdiction, with venue as provided by statute, or in the United States District Court for the district in which the project, or any part thereof is situated.

5. The amount of this bond shall be reduced by and to the extent of any payment or payments made in good faith hereunder.

6. This bond is intended to comply with the requirements and to afford all the benefits of a payment bond consistent with the requirements of Virginia Code § 2-2-4337 and § 2-2-4341. To the extent that those sections as they are in effect as of the date of issuance of this bond confer any requirements on Principal or Surety, or confer any additional benefits on any claimant (as the term "claimant" is used within either the meaning of those sections or this bond), those requirements and benefits shall be deemed to be incorporated into and be part of this bond.

Signed and sealed this_____ day of_____.

_____(SEAL)
Contractor/ Principal

By:_____

Witness:_____ Title:_____

_____(SEAL)
Surety

By:_____
Attorney-in-Fact

Typed Name:_____

My Power of Attorney is recorded in the Clerks Office of the Circuit Court of_____ Virginia in Deed Book_____, Page_____, and has not been revoked.

_____
Attorney-in-Fact

AFFIDAVIT AND ACKNOWLEDGEMENT OF ATTORNEY-IN-FACT

COMMONWEALTH OF VIRGINIA

(or, alternatively, Commonwealth or State of_____)

CITY / COUNTY OF_____

I, the undersigned notary public, do certify that_____personally appeared before me in the jurisdiction aforesaid and made oath that he is the attorney-in-fact of _____, the Surety, that he is duly authorized to execute on its behalf the foregoing bond pursuant to the Power of Attorney noted above, and on behalf of said Surety, acknowledged the aforesaid bond(s) as its act and deed.

Given under my hand this_____day of _____.

_____(SEAL)

Notary Public

_____

My Commission expires:_____

APPROVED: _____
City Attorney/Designee Date

ESCROW AGREEMENT

THIS AGREEMENT ("Agreement"), made and entered into this ____ day of _____, 2010 by,

between and among the City of Lynchburg ("City"), _____ ("Contractor"), and

_____

(Name of Bank)

_____

(Address of Bank)

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

_____ ("Surety") provides:

I.

The City and the Contractor have entered into the Construction Agreement (“Contract”) with respect to City Project Name: Historic Filter Building Renovations and Alterations, ("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 by the City of performance by the Contractor or Surety.

II.

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

III.

The City may from time to time pursuant to this Agreement pay to the Bank amounts retained by the City under the Contract. Except as to amounts actually withdrawn from escrow by the City, the Contractor shall look solely to the Bank for payment of funds retained under the Contract and paid by the City to the Bank.

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

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

IV.

Upon receipt of checks or warrants drawn by the City's Director of Finance and made payable to it as escrow agent, the Bank shall promptly notify the Contractor, negotiate the same and deposit or invest and reinvest the proceeds in "Approved Securities" within the meaning of this Agreement in accordance with the written instruction of the Contractor. In no event shall the Bank invest the escrowed funds in any security that is not an "Approved Security."

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 City,

(4) Bonds of any political subdivision of the City, if such bonds carried, at the time of purchase by the Bank or deposit by the Contractor, a Standard and Poor's or Moody's Investors Service rating of at least "A", and

(5) Certificates of deposit issued by commercial Banks located within the Commonwealth, including, but not limited to, those insured by the Bank and its affiliates,

(6) Any bonds, notes, or other evidences of indebtedness listed in Section (1) through (3) may be purchased pursuant to a repurchase agreement with a Bank, within or without the City ,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 collaterized by the securities themselves, and the securities have on the date of the repurchase agreement a fair market value equal to at least 100 percent 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 an Approved Security hereunder if it matures more than five years after the date of its purchase by the Bank or deposit by the Contractor.

VI.

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

Upon receipt of a direction signed by the City's Director of Public Works or the City Engineer, the Director of Finance or the City Accountant shall authorize the Bank to pay the principal of the fund, or any specified amount thereof, to the account of the City of Lynchburg. Such payment shall be made in cash as soon as is practicable after receipt of the direction.

Upon receipt of a direction signed by the City's Director of Public Works or the City Engineer, the Director of Finance or the City Accountant shall authorize the Bank to pay and deliver the principal of the fund, or any specified amount thereof, to the Contractor, in cash or in kind, as may be specified by the Contractor. Such payment and delivery shall be made as soon as is practicable after receipt of the direction.

VII.

For its services, hereunder the Bank shall be entitled to a reasonable fee in accordance with its published schedule of fees or as may be agreed upon by the Bank and the Contractor. Such fee and any other costs of administration of 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 first be paid or applied to pay the Bank's fee and any other costs of administration and such income shall be deemed a part of the principal of the fund. After all of the Bank’s fees and other costs of administration have been paid from such income, the net income earned thereafter may then be paid over to Contractor in installments.

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.

CITY OF LYNCHBURG CONTRACTOR: _____

BY: _____ BY: _____
City Manager Officer, Partner, or Owner (Seal)

SURETY:

By: _____

Its: President (Seal)

ATTEST:

_____
Secretary

By: _____
Attorney-in-Fact

AFFIDAVIT AND ACKNOWLEDGEMENT OF ATTORNEY-IN-FACT

COMMONWEALTH OF VIRGINIA
(or, alternatively, Commonwealth or State of _____)
CITY / COUNTY OF _____

I, the undersigned notary public, do certify that _____ personally appeared before me in the jurisdiction aforesaid and made oath that he is the attorney-in-fact of _____, the Surety, that he is duly authorized to execute on its behalf the foregoing bond pursuant to the Power of Attorney noted above, and on behalf of said Surety, acknowledged the aforesaid bond(s) as its act and deed.
Given under my hand this _____ day of _____.

_____ (SEAL)
Notary Public

My Commission expires: _____

APPROVED:

_____
City Attorney/Designee Date

INSTRUCTIONS TO BIDDERS

DESCRIPTION OF WORK:

The Work included under this Contract shall consist of all labor, materials, equipment, and the performance of all work necessary to complete the project known as the Lynchburg Regional Historic Filter Building Renovations and Alterations, as described in the Contract Documents. This Work shall be performed in accordance with the Contract Documents.

1. General: Subject to Owner's right to waive informalities, to be valid for consideration, bids must be completed and submitted in accordance with these instructions to bidders. All individual bid unit price items must be filled in, regardless of the quantity shown.

2. Plans and Specifications: The Contract Documents for the above project may be obtained from CRI Mutual Press, 60 9th Street, Lynchburg, Virginia 24504, for a non-refundable fee of $125/set, which includes tax. No partial sets will be provided. Documents are also available on the City's website: www.lynchburgva.gov, Current Solicitations.

   The successful bidder shall be issued, without charge, five sets of sets of plans and specifications.

3. Qualification of Bidders: Each bidder must be prepared to submit within five calendar days of the Owner's request written evidence of his qualifications for the project, including, without limitation, financial data, previous experience, resources, personnel and evidence of authority to conduct business in the jurisdiction where the project is located.

   3.1 Projects listed by the bidder shall have been completed by the bidder under the company name in which the bidder will be bidding. If the bidder has completed projects under a different company name, the name(s) under which the projects were completed shall be noted.

   3.2 A contractor who has pending litigation against the company for work not completed or for failed work may be subject to disqualification.

   3.3 Debarment by federal, state, or local government may be cause for disqualification.

   3.4 By submitting a bid, the bidder certified that the company is not currently debarred from submitting bids in the state or local governing jurisdiction where the project is located.

4. Examination of Bid Documents and Site:

   4.1 Before submitting bids, each bidder must examine bid documents, including, without limitation, all the Contract Documents, thoroughly; familiarize himself with Federal, state and local laws, ordinances, rules, codes, and regulations affecting the Work; and correlate his observations with requirements of the bid documents.

   4.2 Bidders are requested and expected to visit the site of the project to alert themselves to local and special conditions which may be encountered during construction of the project such as: labor and transportation, handling and storage of materials, the availability of materials, and site access. Failure to make such investigations shall not relieve the successful bidder from performing and completing the Work in accordance with the Contract Documents.

      a. An optional pre-bid conference will be held at the time and place stated in the Advertisement for Bids.

5. Clarification:

5.1 No oral clarification of the bid documents will be made to any bidder. To be given consideration, requests for clarification must be received in time to allow preparation of a written response at least seven (7) days prior to date fixed for opening of bids. Clarifications will be issued in the form of written addenda to the bid documents and posted to the Procurement Website within five (5) days of the bid opening. Only clarifications by formal written addenda will be binding.

(1) All communications in regard to clarifications and any other matters related to this project shall be addressed to: Stephanie Suter, Procurement Division, 900 Church Street, Lynchburg, VA 24504, Fax: 434-845-0711, email: stephanie.suter@lynchburgva.gov.

6. Substitutions:

6.1 Substitutions of material or equipment or both may be offered by the Contractor with his bid, provided that, if approved:

a. No major changes in the construction or design intent of the project would be required. Changes required to accommodate substituted items shall be made by the Contractor at no additional cost or time delay.

b. Features of quality, capacity, construction, performance, appearance, size, arrangement, and general utility, including economy of operation of substitutes offered, either parallel or exceed those of specified products.

c. The provisions of the General Conditions are met, and the provisions of the General Conditions any other guarantees, if required by the specification sections, shall apply in full force and effect to the performance of such substitute products~~,~~ approved for incorporation into the Work.

6.2 Technical data covering the proposed substitution shall be furnished with the bid when possible, and not later than 10 days after bid submission.

7. Bid Submission:

7.1 Submit bids using forms furnished in the Project Manual and fill in all blank spaces on the form. Repeat notation "Contractor's Current Virginia License No._____" on outside of inner envelope containing bid and bid security, and place this envelope within another envelope addressed to:

City of Lynchburg
Procurement Division
900 Church Street
Third Floor, City Hall
Lynchburg, VA 24504

Bidders shall include the following with their bid submission:

- Bid Form
- Statement of Experience
- Statement of Available Resources
- Equal Opportunity Report Statement
- Corporate Status Form
- Questions to Offeror Form
- Bid Bond or Cashiers Check Equivalent

7.2 Both the inner and outer envelopes shall have noted thereon:

a. "Sealed Bid Enclosed for WWTP Maintenance Building";

b. The bidder's name and address;

c. Repeat notation "Current Registered Virginia Contractor No. ____" on the outside envelope.

7.3 Each bid must be accompanied by a cashier's check payable to the City drawn on a bank satisfactory to the City, or a Bid Bond, in the amount of five percent (5%) of the amount of the total base bid, with the City as obligee, as assurance that the successful bidder will enter into the Contract within ten (10) days after Notice of Award.

If the successful bidder defaults by failure to enter into the Contract and to provide required performance and payment bonds, the certified check or Bid Bond accompanying the successful bid shall be collected by the City, not as a penalty but as liquidated damages for delays and such additional expenses as may be incurred by the City for reasons of such default.

7.4 Any changes, erasures, modifications, or deletions in the bid form, or alternate proposals not specified in the bid proposal may make the proposal irregular and subject to rejection.

7.5 Receipt deadline for bids will be as stated in the Advertisement for Bids.

7.6 Bids will be opened publicly in accordance with the Advertisement for Bids.

7.7 Withdrawal of bid after bid opening: To withdraw a bid after bid opening, a bidder must satisfy the substantive requirements of Va. Code §2.2-4330. In addition, the following procedures shall apply:

a. The bidder shall give notice in writing of his claim of right to withdraw his bid within two business days after the conclusion of the bid opening procedure and shall submit original work papers with such notice.

b. The mistake may be proved only from the original work papers, documents and materials used in preparation of the bid and delivered as required herein.

8. Bonds and Damages:

8.1 Bonds shall be with a surety company acceptable to the Owner~~.~~ that is legally authorized to do business in Virginia and in a form acceptable to Owner.

8.2 A performance bond and a labor and material payment bond will be required in the amount of 100 percent of the bid.

8.3 Liquidated damages shall be as indicated in the Contract Documents.

9. Award of Contract:

9.1 The award of the Contract will be the responsible bidder submitting the lowest responsive base bid.

Selection of the apparently successful bidder's responsibility will include a serious evaluation of whether the bidder has conscientiously attempted to meet Minority and Disadvantaged Business Enterprise goals. A requirement of the Contract bidder will be that a genuine concerted effort will be utilized to meet the Contract goal.

9.2 Before the Contract is awarded, the bidder submitting the lowest responsive bid must satisfy the City that it has the requisite organization, capital, equipment, ability, resources, personnel, management, business integrity, and at least five years experience in the type municipal work for which it has submitted a bid. Each bidder shall, with his bid, submit a list of at least five projects of similar size and dollar value completed within the last five years, giving location, dollar value, year completed, and the name(s) of the owner(s) and architect/engineers(s). The bidder shall verify to the City that it has the sufficient and qualified personnel to provide for the Contact Work. Failure by the lowest responsive bidder to sufficiently satisfy the City of its ability to meet any of the above requirements may serve as grounds for rejection of the bid.

9.3 The Owner reserves the right to cancel the Advertisement for Bids, reject any and all bids, waive any and all informalities, and disregard all conforming, nonconforming, conditional bids or counterproposals.

9.4 Unless canceled or rejected, a responsive bid from the lowest responsible bidder shall be accepted as submitted, except that if the responsive bid from the lowest responsible bidder exceeds available funds, pursuant to Section 18.1-9 of the Lynchburg Public Procurement Code, the Owner may negotiate with the apparent low bidder to obtain a contract price within available funds.

a. Procedures for Negotiations: If the Owner wishes to negotiate with the apparent low bidder to obtain a contract price within available funds, negotiations shall be conducted in accordance with the following procedures:

1. If the using agency wishes to conduct negotiations pursuant to this section, it shall provide the procurement administrator with a written determination that the bid from lowest responsive, responsible bidder exceeds available funds. This determination shall be confirmed in writing by the director of finance or his designee. The using agency shall also provide the procurement administrator with suggested measures to bring the proposed purchase within budget through negotiations with the lowest responsive, responsible bidder, including reductions in scope, changes in quality, value engineering, changes in terms and conditions, or changes in schedule.

2. The procurement administrator shall advise the lowest responsive, responsible bidder, in writing, that the proposed purchase exceeds available funds. He shall further invite proposed measures, such as a reduction in scope, change in quality, value engineering, changes in terms or conditions, or changes in schedule for the proposed purchase, and invite the lowest responsive, responsible bidder to amend its bid based upon the proposed measures to bring the purchase within available funds.

3. Informal discussions between the City and the lowest responsive, responsible bidder, either in person, by e-mail, by telephone, or by other means, may be used to attempt to obtain a contract within available funds.

4. Following any successful negotiations, the lowest responsive, responsible bidder shall submit a proposed addendum to its bid, which addendum shall include the specific changes in the proposed purchase, the reduction in price, and the new contract value. The addendum shall be reviewed by the purchasing agency, the City Manager, and City Attorney for acceptability.

5. If an addendum is acceptable to the City, the City may award a contract within funds available to the lowest responsive, responsible bidder based upon the amended bid proposal.

6. If the City and the lowest responsive, responsible bidder cannot negotiate a contract within available funds, all bids shall be rejected.

9.5 Protests of Award or Decisions to Award of Contract

a. The following are the exclusive procedures for a bidder or offeror to protest the City's award or decision to award a contract.

1. Any protest to award a contract shall be in writing and shall be delivered so that it is received by the City Manager not later than five (5) business days after announcement of the award or decision to award, whichever comes first. Otherwise any such protest shall be deemed to be waived.

2. Except for a protest of an emergency or sole source procurement, a protest of a City award or decision to award a contract may only be made by a person who submitted a bid or proposal for the procurement at issue and who was reasonably likely to have its bid or proposal accepted but for the City's decision. In the case of an emergency or sole source procurement, a protest may only be made by a person who can show that he was reasonably likely to have submitted a successful bid or proposal if the procurement had been other than emergency or sole source.

3. Protests shall only be granted if (1) the protester has complied fully with Sec. 18.1-6 of the Lynchburg Public Procurement Code and there has been a violation of law, the Lynchburg Public Procurement Code, or mandatory terms of the solicitation that clearly prejudiced the protestor in a material way, or (2) a statute requires voiding of the decision.
4. The City Manager shall issue a written decision on a protest within ten (10) days of its receipt by the City Manager.

5. If the protest is denied, the protestor may only appeal the denial or otherwise contest or challenge the procurement by then filing suit in the Lynchburg Circuit Court, Lynchburg, Virginia, and serving the city with such suit within ten (10) days of such denial. Otherwise, the City Manager's decision shall be final and conclusive, and the protester's right to appeal the denial or to otherwise contest or challenge the procurement shall be deemed to be waived.

6. Strictly following these procedures shall be a mandatory prerequisite for protest of the City's award or decision to award a contract. Failure by a bidder to follow these procedures strictly shall preclude that bidder's protest and be deemed to constitute a waiver of any protest.

b. A protest may not be based upon the alleged non-responsibility of a person to whom the City awards or makes a decision to award a contract.

10. Bidders are referred to the General Conditions for the meanings of capitalized terms.

End of Instructions to Bidders

GENERAL CONDITIONS

ARTICLE 1	CONTRACT DOCUMENTS AND DEFINITIONS
ARTICLE 2	ARCHITECT/ENGINEER
ARTICLE 3	OWNER
ARTICLE 4	CONTRACTOR
ARTICLE 5	SUBCONTRACTORS
ARTICLE 6	WORK BY OWNER OR BY SEPARATE CONTRACTORS
ARTICLE 7	MISCELLANEOUS PROVISIONS
ARTICLE 8	CONTRACT TIME
ARTICLE 9	PAYMENTS AND COMPLETION
ARTICLE 10	PROTECTION OF PERSONS AND PROPERTY
ARTICLE 11	INSURANCE FOR CONTRACTS
ARTICLE 12	CHANGES AND MODIFICATIONS IN THE WORK
ARTICLE 13	CLAIMS AND DISPUTE PROCEDURE
ARTICLE 14	UNCOVERING AND CORRECTION OF WORK
ARTICLE 15	TERMINATION OF THE CONTRACT

GENERAL CONDITIONS

ARTICLE 1 CONTRACT DOCUMENTS AND DEFINITIONS

1.1 DEFINITIONS

1.1.1 CONTRACT AND CONTRACT DOCUMENTS:
The Contract Documents include: (1) the Construction Agreement (the "Contract"), its General Conditions, its Special Conditions (if any) and its attachments (if any); (2) the City's Invitation for Bid No. 11-655 dated September 2010, and any addenda; (3) the Contractor's bid; (4) the Contract plans, drawings, and specifications and any addenda; and (5) any Modifications and any Field Orders. Any soils, geotechnical or other reports, surveys and analyses which may be made available to the Contractor for review or information under this Contract~~,~~ are not adopted by reference into, nor are they part of the Contract Documents.

1.1.2 MODIFICATION:
A Modification is (1) a written amendment to the Contract signed by both parties (Project Manager for City of Lynchburg and authorized agent for the Contractor), (2) a written Change Order signed by the Project Manager or Owner's authorized representative and an authorized agent for the Contractor, or (3) a written Change Directive signed by the Owner's authorized representative. Modifications may be made to the Contract and Contract Documents without notice to any surety for the performance or payment bonds for the Work. Any Modification that increases the Contract Sum by more than $50,000 or that causes total expenditures for the Contract to exceed the amount budgeted for the Contract may only be made with the specific approval of the City Manager.

1.1.3 WORK:
"Work" means the construction and services required by the Contract Documents and includes all services, plant, labor, materials, supplies, equipment and other things necessary for Contractor to carry out and complete the requirements of the Contract Documents. "Work" includes material suitably stored and protected. "Work" also includes any portion of the Work, whether completed or not.

1.1.4 PROJECT:
The Project is the total construction of which the Work performed by Contractor under the Contract Documents may be the whole or a part.

1.1.5 FURNISH, INSTALL & PROVIDE:
The terms "Furnish" or "Install" or "Provide", unless specifically limited in context, mean furnishing and incorporating a specified item, product or material into the Work, including all necessary labor, materials, equipment to make the item and the Work ready for use.

1.1.6 EXTRA WORK:
The term "Extra Work" as used herein, refers to and includes work required by the Owner, which, in the judgment of the Owner involves changes in or additions to the Work required by the Contract Documents in their then-existing form.

1.1.7 NOTICE OF AWARD:
"Notice of Award" is the written notice of the Owner's acceptance of the Contractor's bid given by the Owner to Contractor as the successful bidder.

1.1.8 NOTICE:
"Notice" means written notice made in the manner specified in this paragraph.

1.1.8.1 "Notice" shall be deemed to have been given to the Owner if sent to the following persons by the means indicated in 1.1.8.3 and either such Notice actually was received by such persons or adequate proof of receipt is made:

Department of Utilities 525 Taylor Street Lynchburg, Virginia 24504	Procurement Division 3rd Floor, City Hall 900 Church Street Lynchburg, Virginia 24504	City Attorney 3rd Floor, City Hall 900 Church Street Lynchburg, Virginia 24504

1.1.8.2 "Notice" shall be deemed to have been given to the Contractor if sent to the following person by the means indicated in 1.1.8.3 and either such Notice was received by such person or the Contractor or adequate proof of receipt by such person or the Contractor is made:

(Insert Successful bidder authorized representatives name and address)

1.1.8.3 "Notice" shall be sent by special courier, recognized overnight delivery service, or United States mail. With the exception of original bid documents, facsimile copies and e-mail shall be acceptable if the original is then sent by special courier, recognized overnight delivery service, or United States mail within three business days.

1.1.9 CHANGE DIRECTIVES:

If the parties cannot agree to a written amendment to the Contract or to a Change Order, Owner may, by issuance of a written "Change Directive," direct Contractor to perform Work that Owner acknowledges, or that Contractor contends, to be a change to the Work required by the Contract Documents. A change order signed by the Owner that Contractor fails or refuses to sign shall be considered a "Change Directive."

1.1.10 MISCELLANEOUS WORDS OR TERMS:

1.1.10.1 Whenever they refer to the Work or its performance, "directed", "required", "permitted", "ordered", "designated", "prescribed", and words of like import shall imply the direction, requirements, permission, order, designation or prescription of the Owner, and "approved", "acceptable", "satisfactory", "in the judgment of" and words of like import shall mean approved by or acceptable to or satisfactory to or in the judgment of the Owner.

1.1.10.2 The Contract Documents generally refer to the Owner, Contractor, Architect/Engineers, entities, and persons as if masculine in gender and singular in number. Such references are intended to include the feminine or neutral in gender and/or the plural in number when appropriate.

1.2 EXECUTION, CORRELATION AND INTENT OF CONTRACT DOCUMENTS

1.2.1 Two originals of the Contract shall be executed.

1.2.2 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work, including without limitation, all items reasonably inferable from the Contract Documents. The Contract Documents are complementary, and what is required by any one shall be as binding as if required by all. Words and abbreviations which have well-known technical or trade meanings are used in the Contract Documents in accordance with such recognized meanings.

1.2.3 Anything shown on the drawings and not mentioned in the specifications or mentioned in the specifications and not shown on the drawings shall have the same effect as if shown or mentioned respectively in both. Technical specifications take priority over general specifications, and detail drawings take precedence over general drawings. Contractor shall promptly notify the A/E and Owner of

any conflict or inconsistency in the Contract Documents, upon its discovery, and promptly submit an explanation in writing of the conflict or inconsistency to the A/E, with a copy to the Owner. The A/E's decision thereon shall be final. In case of conflict or inconsistency between the drawings and the specifications, the specifications shall govern.

1.2.4 Should any labor, material, or equipment be required which is not denoted in the drawings and specifications, but which is, nevertheless, reasonably necessary for the proper carrying out of the intent of the Work, it is agreed that the labor, material, or equipment is implied, and the Contractor shall provide such labor and furnish such materials and equipment as fully as if they were completely delineated and prescribed, without additional cost to the Owner.

1.2.5 The Contractor may be furnished additional instructions and detail drawings to carry out the Work included in the Contract Documents. The additional drawings and instructions thus supplied to the Contractor will coordinate with the Contract Documents and will be so prepared that they can be reasonably interpreted as a part thereof. The Contractor shall carry out the Work in accordance with the additional detail drawings and instructions.

1.2.6 The drawings and specifications are divided into sections for convenience and clarity only. The Contractor shall not construe this division as a division of the Work into various subcontractor units. The Contractor may subcontract the Work in such divisions as he sees fit, but he is ultimately responsible for furnishing all Work required by the Contract Documents.

1.2.7 The provisions of this Contract cannot be amended, modified, varied or waived in any respect that causes a change to the Contract Sum or Contract Time except by a Modification. **The Contractor is hereby given notice that no person has authority to orally waive, or to release the Contractor from any of the Contractor's duties or obligations under or arising out of the Contract Documents.** Any waiver, approval or consent granted by Modification or Field Order to the Contractor shall be limited to those matters specifically and expressly stated thereby to be waived, approved or consented to and shall not relieve the Contractor of the obligation to obtain any future waiver, approval or consent.

1.3 OWNERSHIP AND USE OF DOCUMENTS

1.3.1 All plans, drawings, specifications, and documents relating to the Work are the property of the Owner and are to be used only for the Project.

ARTICLE 2 ARCHITECT/ENGINEER

2.1 DEFINITIONS

2.1.1 The term Architect/Engineer, hereinafter "A/E" or "Architect" or "Engineer", shall mean the consulting firm or City Department/Division, or their duly authorized representatives, lawfully licensed to practice in Virginia, that is responsible for the activities specified herein.

2.1.2 Although the A/E is referred to throughout the Contract Documents as if singular in number and masculine in gender, A/E includes plural in number and feminine or neuter in gender, as appropriate.

2.2. ARCHITECT/ENGINEER SERVICES

2.2.1 The A/E will provide services as described in these General Conditions.

2.2.2 The A/E will advise and consult with the Owner. The Owner's instructions to the Contractor may be forwarded through the A/E. The A/E has authority to act on behalf of the Owner only to the extent

provided in the Contract Documents, and the A/E does not have authority to approve a change to the Contract Sum or the Contract Time.

2.2.3 The A/E may visit the site at intervals appropriate to the stage of construction to familiarize himself generally with the progress and quality of the Work and to determine in general if the Work is proceeding in accordance with the Contract Documents. Any visits or inspections by the A/E, any Owner's representative, or any consultant retained by the Owner are solely for the Owner's benefit and shall not confer any rights on Contractor or excuse Contractor from any obligation under the Contract Documents.

2.2.4 The A/E will immediately inform the Owner and Contractor whenever, in the reasonable opinion of the A/E, any of the Work is proceeding contrary to the requirements of the Contract Documents and will be unacceptable. Such notification by the A/E is solely for the benefit of the Owner and will not be a cause for the Contractor to claim either delay of the Work or any increase in the Contract Sum or Contract Time.

2.2.5 The A/E, the Owner and other governmental representatives shall at all times have access to the Project site and the Work regardless of its stage of progress. The Contractor shall provide facilities for such access so that the A/E, the Owner and other governmental representatives may perform their functions under the Contract Documents.

2.2.6 Where applicable, based on the A/E's observations and an evaluation of the Contractor's Applications for Payment, the A/E will recommend the amounts owing to the Contractor and will issue Certificates for Payment in such amounts, as provided in Article ~~9~~9, Payments and Completion.

2.2.7 The A/E will be an interpreter of the requirements of the Contract Documents. The A/E will render interpretations necessary for the proper execution and progress of the Work, with reasonable promptness and in accordance with any time limit agreed upon. Either party to the Contract may make written request to the A/E for such interpretations. All interpretations of the A/E shall be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing and/or in the form of drawings.

2.2.8 The A/E will recommend to the Owner the rejection of Work that does not conform to the Contract Documents. Whenever, in his opinion, he considers it necessary or advisable for the implementation of the intent of the Contract Documents, he will have authority to require special inspection or testing of the Work in accordance with Subparagraph 7.6.2 whether or not such Work is then fabricated, installed or completed.

2.2.9 The A/E will review and approve or take other appropriate action upon Contractor's submittals such as Shop Drawings, Product Data, Samples and Manuals, but only for conformance with the design concept of the Work and with the information given in the plans, drawings, and specifications. Contractor shall ensure that all submittals are complete and have had included with them all correlated items that the A/E requires for his review. In the A/E's and Owner's sole discretion, the A/E may decline to review partial submittals or submittals for which correlated items have not been included. Contractor shall clearly note, both in a cover letter with any submittal and on the submittal itself, any deviation or inconsistency of anything submitted with the requirements of the Contract Documents. The A/E's approval of a specific item shall not indicate approval of an assembly of which the item is a component. The A/E's review and approval is for the sole benefit of the Owner and is not for the benefit of the Contractor. The A/E's review and approval shall in no way excuse Contractor from fully complying with the Contract Documents.

2.2.10 The A/E's acceptance of materials or products on behalf of the Owner shall not bar future rejection of such items (a) if they are subsequently found to be defective or inferior in quality or uniformity to the materials or products specified by the Contract Documents, (b) if such materials or products are not as

represented by the Contractor, or (c) if such materials or products do not conform to the requirements of the Contract Documents.

2.2.11 As required, the A/E will conduct inspections to assist the Owner in determining the dates of Substantial Completion and Final Completion, will receive and forward to the Owner for the Owner's review written warranties and related documents required by the Contract Documents and assembled and submitted by the Contractor, and will recommend a final Certificate for Payment upon Contractor's full compliance with the requirements of Article 9, Payment and Completion.

2.2.12 All claims, disputes, or other matters or questions between the Contractor and Owner arising out of or relating to the A/E's interpretation of the Contract Documents or arising out of any other decisions, communications, or actions of the A/E relating to the performance of the Work shall be resolved as set forth in Article 12, Changes and Modifications in the Work, and Article 13, Claims.

2.2.13 In case of the termination of the employment of the A/E, the Owner shall appoint a new A/E, who shall have the same status under the Contract Documents as the former A/E.

ARTICLE 3 OWNER

3.1 DEFINITION

3.1.1 The Owner is the City of Lynchburg, Virginia ("City"). The term Owner means the Owner or its authorized representative. The Departmental Director, or his designee, is the authorized Owner's representative for this Contract. Notwithstanding the foregoing, the authority of the Owner's representative is subject to the limitations in the Lynchburg Public Procurement Code.

3.1.2 The Departmental Director, will designate a single Owner's representative, with the title of Project Manager (PM), who will have the power to act, within the scope of his delegated authority, for and on behalf of the Owner, in accordance with the terms of the Contract Documents.

3.1.3 For purposes of any change in the Work, the term "Owner" or "Owner's representative" specifically excludes any and all inspectors having building code or City ordinance responsibilities or jurisdiction under the requirements of the building permit for the Project.

3.2 INFORMATION POSSESSED BY OWNER

3.2.1 The Owner, as a courtesy, may make available for the Contractor's reasonable review, at the Owner's offices or together with the Contract Documents, certain boring logs, geotechnical, soils and other reports, surveys and analyses pertaining to the Project site. Any such information provided to the Contractor is intended to be for the Contractor's convenience only, and its accuracy and completeness are not guaranteed or warranted by the Owner or the A/E, it being the Contractor's sole responsibility to verify the accuracy and completeness of such information. Such information is not incorporated by reference into or made a part of the Contract Documents.

3.2.1.1 Notwithstanding any information provided by Owner or anyone acting on the behalf of Owner, the Contractor assumes full responsibility for inspection of the site and for the means and methods of construction that he employs when performing the Work. The Owner shall not be liable for any additional work or costs arising as a result of any conclusions reached or assumptions derived by the Contractor from or based upon any such information that the Owner makes available for the Contractor's convenience.

3.3 OWNER-PAID PERMITS AND FEES

3.3.1 The Owner will, where applicable, pay for:

.1 Sewer availability fees;

.2 Water availability/meter connection fee;

.3 Electrical, natural gas, telephone, and cable TV permanent installation charges;

.4 Any easements required;

.5 Railroad flagging services; and

.6 Permits for work in Virginia Department of Transportation (VDOT) right-of-way. The Contractor is required to comply with the general requirement for work in the VDOT right-of-way as outlined in the The Manual of Specifications and Standard Details, 2005 for the City of Lynchburg, and the VDOT Manual for this work. Upon completion of all work in the VDOT right-of-way, the VDOT Personnel will conduct an inspection and issue a punch list. The Contractor shall be responsible for completion of those items on the punch list and for obtaining the written release of the permit.

3.3.2. The Contractor's attention is directed to Article 4.7, Contractor-Paid Taxes, Permits, Fees, and Notices, describing other permits to be obtained and fees to be paid by the Contractor.

3.4 OWNER'S RIGHT TO STOP WORK

3.4.1 If the Contractor fails to correct defective Work as required herein or persistently fails to carry out the Work in accordance with the Contract Documents, the Owner, by a written order, may order the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of the Owner to stop the Work shall not give rise to any duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity.

3.5 OWNER'S RIGHT TO CARRY OUT THE WORK

3.5.1 If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within seven (7) days after receipt of Notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to any other remedy he may have, rectify such deficiencies, including without limitation, by performing the Work or having the Work performed by other contractors, as outlined in Section 6.1, Owner’s Right to Perform Work and to Award Separate Contracts. In such case, an appropriate Change Order or Change Directive shall be issued by Owner deducting from the payments then or thereafter due the Contractor the cost of correcting such deficiencies, including compensation for the A/E's additional services made necessary by such default, neglect or failure. If the payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor shall pay the difference to the Owner.

3.5.2 Neither the Owner nor the A/E nor their officers, agents, assigns or employees are in any way liable or accountable to the Contractor or his surety for the method by which Work performed by the Owner or performed by other contractors pursuant to this Article 3.5, or any portion thereof, is accomplished or for the price paid therefore. Notwithstanding the Owner's exercise of its rights under this Article 3.5, the Contractor and its surety shall have sole responsibility to maintain and protect the Work, including without limitation, that portion of the Work performed by or on behalf of Owner pursuant to this Article 3.5.

3.6 SUSPENSION OF WORK

3.6.1 The Owner shall have the authority to suspend the Work, in whole or in part, for such periods and such reasons as the Owner may deem necessary or desirable, in its sole discretion, including without limitation:

.1 Unsuitable weather;

.2 Other conditions considered unfavorable for the suitable prosecution of the Work; and/or

.3. Other conditions considered adverse to the best interests of the Owner.

3.6.2 Any such suspension shall be made by Owner by written order to the Contractor. The Contractor shall obey immediately such order of the Owner and shall not resume the Work until so ordered in writing by the Owner. The Contractor shall be entitled to an extension of the Contract Time, subject to the provisions of Article 8, Contract Time, herein.

3.6.3 No such suspension of the Work shall be the basis of a claim by the Contractor for any increase in the Contract Sum or for any other damages, losses, costs or expenses if the suspension is for a reasonable time under the circumstances then existing and the cause thereof is beyond the control and is without the fault or negligence of the Owner or those acting on Owner's behalf.

3.6.4 In the event of suspension of Work, the Contractor will, and will cause his Subcontractors and others providing any of the Work through Contractor to, protect carefully his and their materials and Work against damage or injury from the weather and maintain completed and uncompleted portions of the Work as required by the Contract Documents. If, in the opinion of the Owner, any Work is damaged or injured by reason of failure on the part of the Contractor or any of his subcontractors to so protect same, such Work shall be removed and replaced at the expense of the Contractor.

3.7 USE AND OCCUPANCY PRIOR TO FINAL ACCEPTANCE BY OWNER

3.7.1 The Owner has the right to take possession of and use any completed or partially completed portions of the Work, notwithstanding that the time for completing the entire Work or any portions thereof may, or may not, have expired. The taking of possession and use by the Owner shall be in accordance with the provisions in Article 9.8, Substantial Completion and Guarantee Bond. If such prior use delays the Work, the Contractor may submit a request for a time extension in accordance with the requirements of Article 8, Contract Time.

3.8 RIGHT TO AUDIT AND PRESERVATION OF RECORDS

3.8.1 The Contractor shall maintain books, records and accounts that completely and accurately account for all of his costs and receipts relating to the Project in accordance with generally accepted accounting principles and practices. The Owner or its authorized representatives shall have the right to review, inspect, audit and/or copy the books, records, accounts and related documents, including without limitation, supporting documents, of the Contractor under any of the following conditions:

.1 If the Contract is terminated for any reason in accordance with the provisions of these Contract Documents, in order to arrive at equitable termination costs;

.2 If the Contractor and the Owner dispute the amount due the Contractor under the terms of this Contract;

.3 To check or substantiate any amounts invoiced or paid that are required to reflect the costs of the Contractor, or the Contractor's efficiency or effectiveness under this Contract or in connection with any extras, changes, claims, additions, backcharges, or other, as may be provided for in this Contract; and/or

.4 If it becomes necessary to determine the Owner's rights and the Contractor's obligations under the Contract or to ascertain facts relative to any Claim.

3.8.2 These provisions for review, inspection, audit and copying shall give the Owner unlimited access during normal working hours to the Contractor's books, records, accounts and supporting documents under the conditions stated above.

3.8.3 The Contractor shall make all his books, records, accounts, and all other documents relating to his costs and receipts under this Contract, including without limitation any supporting documents, available to the Owner and its representatives for review, audit, inspection and copying at any time during the period from entry into this Contract through three years after Final Payment or termination of this Contract, whichever occurs later.

3.8.4 Any payments made under this Contract shall not constitute a waiver of the Owner's rights to review, inspect, copy and audit. Payments shall not constitute a waiver or agreement by the Owner that it accepts as correct the billings, invoices or other charges upon which the payments are based. If the Owner's review and audit produces a claim against the Contractor, the Owner may pursue all its legal remedies, even though Owner has made all or part of the payments required by this Contract.

3.8.5 If any review or audit by the Owner or the Owner's representatives discloses an underpayment by the Owner, the Owner shall pay any amounts found by the audit to be owed to the Contractor. If such audit discloses an overpayment, the Contractor reimburses the Owner for the amount of the overpayment.

3.8.6 The Owner's right to review, inspect, audit and copy, and the Contractor's duty as to preservation of records shall terminate at the end of three (3) years after Final Payment or termination of this Contract, whichever occurs later. The Contractor shall include this "Right to Audit and Preservation of Records" clause in all his subcontracts, and he shall require the same to be inserted by all Subcontractors and lower-tier subcontractors in their subcontracts~~,~~ for any portion of the Work. Should Contractor fail to cause this clause to be included in any such subcontract or lower tier subcontract or otherwise fail to ensure the Owner's rights under this Article 3.8, Contractor shall be liable to Owner for all costs, expenses and attorney's fees that Owner may incur in order to obtain the information that would have otherwise been available to Owner under this Article 3.8, and the absence of such information shall create a presumption in the Owner's favor, which Contractor must overcome with clear and convincing evidence, that the missing information does not support the payment to Contractor or Contractor claim at issue.

3.8.7 Review, inspection, audit and copying pursuant to this Article 3.8 may be conducted by the Owner or its authorized representatives.

3.8.8 Documents subject to this Article 3.8 shall be made available to Owner and its representatives in whatever formats Owner requests, including without limitation, any electronic formats and/or in paper formats.

3.9 RIGHT TO REVIEW OTHER DOCUMENTS AND MATERIALS

3.9.1 In addition to the rights granted to the Owner under Article 3.8, Right to Audit and Preservation of Records or Documents, the Owner shall have the right to inspect, review and copy any and all of the Contractor's records or documents pertaining to or relating in any way to the Work, including, but not limited to, correspondence, memoranda, minutes, reports, intra- and inter-office communications, work papers, estimating sheets, progress reports, forecasts, audio or video recordings, computer disks, e-mails, films, or any other materials, regardless of physical form or characteristics, which were prepared by or in the possession of, or obtainable by, the Contractor. The Contractor shall make all such documents and records available to the Owner upon ten (10) days Notice to the Contractor of the Owner's intent to

inspect and review such documents. The Contractor shall include this "Right to Review Documents and Other Materials" clause in all its subcontracts, and Contractor shall cause the same to be inserted by all Subcontractors and lower-tier subcontractors in their subcontracts for any portion of the Work. The Contractor hereby waives any right he may have to additional compensation or time extensions in the event he fails or refuses to preserve and produce records pertaining to any such claim as requested by the Owner pursuant to this paragraph. In addition, the Owner may withhold all or any portion of any progress payments, which may be otherwise due, in the event Contractor refuses to comply with its obligations under this Article 3.9. The review, inspection and copying of documents and other records under this Article 3.9 may be conducted by the Owner or its authorized representatives.

3.9.2 Records and documents subject to this Article 3.9 shall be made available to Owner and its representatives in whatever formats Owner requests, including without limitation, any electronic formats and/or in paper formats.

ARTICLE 4 CONTRACTOR

4.1 DEFINITION

4.1.1 The Contractor is the person or entity identified in the Contract as such, and is generally referred to throughout the Contract Documents as if singular in number and masculine in gender but includes the feminine and neuter in gender, as appropriate. The term Contractor means the Contractor or his authorized representative.

4.1.2 This entire Contract is not one of agency by the Contractor for Owner but one in which the Contractor is engaged independently in the business of providing the services and performing the Work herein described as an independent contractor.

4.2 REVIEW OF CONTRACT DOCUMENTS

4.2.1 The Contractor shall not perform any portion of the Work at any time without having obtained and carefully reviewed the Contract Documents or, where required, approved Shop Drawings, Product. Data, Samples or Manuals for such portion of the Work.

4.2.2 The Contractor shall keep at the Project site at least two (2) copies of the drawings and specifications and shall at all times give the A/E, inspectors, and representatives of the Owner access thereto. Further, said drawings and specifications shall be the approved sets issued to the Contractor by the appropriate City permit agencies

4.3 CONTRACTOR'S REPRESENTATIONS

By entering into this Contract with the Owner, the Contractor represents and warrants the following, together with all other representations and warranties in the Contract Documents

4.3.1 That he is experienced in and competent to perform the type of work required and to furnish the plant, materials, supplies or equipment to be so performed or furnished by him;

4.3.2 That he is financially solvent, able to pay his debts as they mature, and possessed of sufficient working capital to initiate and complete the Work required by the Contract Documents;

4.3.3 That he is familiar with all federal, state, and local government laws, ordinances, permits, regulations and resolutions that may in any way affect the Work or those employed therein;

4.3.4 That such temporary and permanent Work required by the Contract Documents which is to be done by him will be satisfactorily constructed and fit for use for its intended purpose and that such construction will not injure any person, or damage any property;

4.3.5 That he has carefully examined the Contract Documents and the site of the Project and the Work and that from his own investigations, he has satisfied himself and made himself familiar with: (1) the nature and location of the Work, (2) the character, quality and quantity of materials likely to be encountered, including, but not limited to, all structures and obstructions on or at the project site, both natural and man-made; (3) the character of equipment and other facilities needed for the performance of the Work, (4) the general and local conditions, including without limitation its climatic conditions, the availability and cost of labor and the availability and cost of materials, tools and equipment; (5) the quality and quantity of all materials, supplies, tools, equipment, labor and professional services necessary to complete the Work in the manner required by the Contract Documents; and (6) all other matters or things which could in any manner affect the performance of the Work;

4.3.6 That he will fully comply with all requirements of the Contract Documents;

4.3.7 That he will perform the Work consistent with good workmanship, sound business practice, and in the most expeditious and economical manner consistent with the best interests of the Owner;

4.3.8 That he will furnish efficient business administration, an experienced superintendent, and an adequate supply of workmen, equipment, tools and materials at all times;

4.3.9 That he will complete the Work within the Contract Time;

4.3.10 That his Contract Sum is based upon the labor, materials, systems and equipment required by the Contract Documents, without exception; and

4.3.11 That he has satisfied himself as to the feasibility and correctness of the Contract Documents for the construction of the Work.

4.4 SUPERVISION AND CONSTRUCTION PROCEDURES

4.4.1 The Contractor shall supervise and direct the Work, using his best skill and attention. He shall be solely responsible for all construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract; subject, however, to the Owner's right to reject means and methods proposed by the Contractor which are unsafe or otherwise not in compliance with the Contract Documents.

4.4.2 The Contractor shall be responsible to the Owner for the acts and omissions of Contractor's employees, Subcontractors and sub-subcontractors, suppliers, their agents and their employees, and of any other persons providing any of the Work through Contractor, and for their compliance with each and every requirement of the Contract Documents, in the same manner as if they were directly employed by the Contractor.

4.4.3 The Contractor understands and agrees that he shall not be relieved of his obligations to perform the Work in accordance with the Contract Documents either by the activities or duties of the Owner or the A/E in their administration of the Contract or by inspections, tests, or approvals required or performed under Article 7 by persons other than the Contractor.

4.4.4 Before starting a section of the Work, the Contractor shall carefully examine all preparatory work that has been executed by others to receive his Work to see that it has been completed. He shall check carefully, by whatever means are required, to ensure that his Work and adjacent, related work will finish to proper quality, contours, planes, and levels.

4.4.5 The Contractor understands and agrees that the Owner and A/E will not have any liability for or any responsibility to exercise any control over construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with the Work, and they will not be responsible for the Contractor's failure to carry out the Work in accordance with the Contract Documents. The Owner and the A/E will not have any liability for or any responsibility to exercise any control over the acts or omissions of the Contractor, Subcontractors, sub-subcontrators or any of their agents or employees, or any other persons performing any of the Work.

4.4.6 The Contractor shall use no plant, equipment, materials, or persons for this Work to which the Owner objects.

4.4.7 The Contractor shall not remove any portion of the Work or stored materials from the site of the Project without the Owner's prior, written approval.

4.5 LABOR, MATERIALS AND EQUIPMENT

4.5.1 The Contractor shall furnish all plant, labor, materials, supplies, equipment and other facilities and things necessary or proper for, or incidental to, the Work, and will perform all other obligations imposed on him by the Contract Documents. Final payment will not be made until the Work is so completed.

4.5.2 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for all labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for the proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

4.5.3 Work, materials, and equipment which are necessary in the construction but which are not specifically referred to in the specifications or shown in the drawings but implied by the Contract Documents shall be furnished by the Contractor at his own cost and expense. Such work and materials shall correspond with the general character of the Work as may be determined by the A/E subject to review as provided in Article 2.2.11.

4.5.4 The Contractor shall perform at least that percentage of the Work specified in the Contract to be Contractor self performed with forces that are in the direct employment of the Contractor. The Contractor shall submit to the Owner within thirty (30) days after award of the Contract a designation of the Work to be performed by the Contractor with his own forces. The percentage of the Work to be performed under subcontract shall be calculated by adding the amounts of all subcontracts and dividing this sum by the total Contract Sum.

4.5.5 The Contractor shall at all times enforce strict discipline, safety and good order among all persons providing any of the Work through him and shall not cause or allow to be used for the Work any unfit person or anyone not skilled in the task assigned to him. If any person providing any of the Work through the Contractor shall appear to the Owner to be incompetent or to act in a disorderly or improper manner, such person shall be removed immediately, at the request of the Owner, and shall not provide any of the Work except on written consent of the Owner.

4.5.6 No materials or supplies for the Work shall be purchased by the Contractor or by any Subcontractor subject to any chattel mortgage, or under a conditional sale or other agreement by which an interest is

retained by the seller. The Contractor warrants that he has good title to all materials and supplies used by him in the Work.

4.5.7 The Contractor shall provide approved and adequate sanitary accommodations. All wastes shall be covered, disinfected, incinerated or otherwise disposed of legally.

4.5.8 All equipment, apparatus and/or devices of any kind to be incorporated into the Work that are shown or indicated on the drawings or called for in the specifications or required for the completion of the Work shall be entirely satisfactory to the Owner as regards operation, capacity and/or performance. No approval, either written or verbal, of any drawings, descriptive data or samples of such equipment, apparatus, and/or device shall relieve the Contractor of his responsibility to turn over the same in good working order for its intended purpose at the completion of the Work in complete accordance with the Contract Documents. Any equipment, apparatus and/or device not fulfilling these requirements shall be removed and replaced by Contractor with proper and acceptable equipment, apparatus, and/or device, or put in good working order satisfactory to the Owner by Contractor without additional cost to the Owner.

4.6 WARRANTY

4.6.1 The Contractor warrants to the Owner that all materials and equipment furnished under this Contract will be new unless otherwise specified, and that all workmanship will be of first class quality, free from faults and defects and in conformance with the Contract Documents and all other warranties and guaranties specified therein. Where no standard is specified for such workmanship or materials, they shall be the best of their respective kinds. All Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. If required by the Owner, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment. This warranty is not limited by the provisions of Article 13, Uncovering and Correction of Work.

4.6.2 The Work included in this Contract is specified in the Contract Documents. The Contractor shall be required to complete the Work specified and to provide all items needed for construction of the Work, complete and in good order.

4.7 CONTRACTOR-PAID TAXES, PERMITS, FEES AND NOTICES

4.7.1 The Contractor shall pay all sales, consumer, use and other similar taxes for the Work or portions thereof provided by the Contractor which are legally enacted at the time bids are received, whether or not yet effective. Taxes to be paid by the Contractor shall include, but shall not be limited to, the Lynchburg City Business, Professional and Occupational License Tax (a gross receipts tax).

4.7.2 Except as provided in Article 3.3, Owner-Paid Permits and Fees, the Contractor will be responsible for obtaining and paying for all other fees, permits and licenses necessary for the proper execution of the Work, including but not limited to:

.1 Building Permit and inspections (City fees waived);

.2 Plumbing, Electrical, Mechanical Permits and inspections (City fees waived);

.3 Temporary water meter, temporary electrical and telephone installations and temporary utility usage;

.4 Temporary security lighting;

.5 All other permits necessary in order to perform the Work shall also be secured by the Contractor, and fees necessary in order to perform the Work shall be paid by him as part of this Contract at no additional cost to the Owner.

4.7.3 The Contractor shall give all notices and comply with all laws, ordinances, rules, regulations, codes, permits, resolutions and lawful orders of any public authority bearing on the performance of the Work; including but not limited to OSHA, Title 40.1 Labor and Employment Chapter 3 of the Code of Virginia, and Title VII of the Civil Rights Act of 1964, as amended. All safety violations shall be corrected immediately upon receipt of notice of violation.

4.8 COMPLIANCE

4.8.1 All demolition and excavation shall comply with all laws, ordinances, rules and regulations, and lawful orders of public authority, including without limitation, those for the prevention of accidents as issued by the Department of Labor and Industry of the Commonwealth of Virginia.

4.8.2 To the extent of the Work indicated in the Contract Documents, the Contractor shall comply and the construction shall conform to all applicable and current editions or revisions of the following codes, specifications and standards. In case of conflict, the order of precedence shall be as hereinafter listed:

.1 Lynchburg Public Procurement Code;

.2 Contract Documents;

.3 The Virginia Uniform Statewide Building Code (“USBC”), as amended including, without limitation, The International Building Code ("IBC") and other codes incorporated by the USBC and IBC); and

.4 The Virginia Department of Transportation Road and Bridge Specifications and the Road Designs and Standards.

4.8.3 If the Contractor (or any person in a contract with the Contractor relating to the Work) finds an error, inconsistency, omission, ambiguity, discrepancy, conflict or variance in the Contract Documents, or between the Contract Documents and any provisions of law, ordinance, rule, or regulations or any of the codes, specifications and standards set forth in 4.8.2 herein, the Contractor has the obligation to promptly seek in writing a clarification thereof from the A/E, with a copy to the Owner, prior to the time of beginning any of the Work that is affected by such error, inconsistency, omission, ambiguity, discrepancy, conflict or variance. The Owner will welcome such a clarification request, and, if deemed necessary by the Owner, the Owner will issue a written instruction clarifying the matter in question. If the Contractor feels that the written clarification requires additional work, the Contractor shall follow the change process in Article 12, Changes and Modifications in the Work.

Should the Contractor fail to seek such a clarification thereof immediately upon the discovery of the need therefor, prior to the time the said Work is performed, the Contractor thereby assumes all risk of loss related to such error, inconsistency, ambiguity, discrepancy, conflict or variance which the Contractor (and any person in contract with Contractor relating to the Work) knew or should have known, using a normal, professional standard of care, existed prior to the time the Work was performed.

4.8.4 Any material or operation specified by reference to publications~~,~~ or published specifications of a manufacturer, a society, an association, a code, or other published standard, shall comply with the requirements of the referenced document which is current on the date of receipt of bids. If the Contractor observes that any of the Contract Documents are at variance with any such referenced publications, codes, published specifications, or published standards in any respect, he shall promptly notify the A/E in writing, with a copy to the Owner. The A/E will make such judgments as are necessary and notify the Contractor prior to the performance of the Work.

4.8.5 If the Contractor performs any Work contrary to any law, code, ordinance, regulation, publication, standard, permit, rule, regulation or resolution, he shall assume full responsibility therefore and shall bear all costs attributable thereto.

4.8.6 The Contractor is responsible for locating all underground structures such as water, oil and gas mains, water and gas services, storm and sanitary sewers and telephone and electric conduits that may be encountered during construction. The Contractor shall have Miss Utility locate all utilities on the site within the area of the Work and shall dig test holes, to determine the position of the underground structures. The Contractor shall pay the cost of digging test holes and likewise he shall pay the cost of the services of the representatives of the owners of such utilities for locating the said utilities. The cost of determining the location of any and all utilities is to be included in the bid price. The Owner shall pay the owners of such utilities for fees or charges for relocation of gas, electric, telephone, cable or other lines and/or services indicated to be relocated by others.

4.8.7 If utilities are marked which are not shown on the plans, the Contractor shall immediately give Notice to the Owner and the A/E of such finding. The Owner and A/E shall provide a direction to the Contractor within a reasonable period of time if additional work is required as a result of the finding. If the Contractor believes that it requires additional work, the Contractor shall follow the change process in Article 12, Changes and Modifications in the Work.

4.9 ALLOWANCES

4.9.1 The Special Conditions, if any, will contain provisions for allowances, if applicable to this Contract.

4.10 SUPERINTENDENT

4.10.1 The Contractor shall employ and have present at the Project site a competent Superintendent and any necessary assistants to ensure adequate supervision of the Work. The Superintendent shall have full authority to represent the Contractor, and all communications given to the Superintendent shall be as binding as if given to the Contractor.

4.10.2 Such Superintendent shall be acceptable to the Owner and shall be one who will be continued in that capacity for duration of this Project, unless he ceases to be on the Contractor's payroll. The Superintendent shall not be employed on any other project during the performance of this Contract.

4.11 CONSTRUCTION SCHEDULE

4.11.1 The Contractor shall, within twenty (20) days after issuance of the Notice of Award, prepare and submit to the A/E and Owner for review, a reasonably practicable and feasible Construction Schedule, showing the method by which the Contractor will comply with Completion Date requirements as set forth in the Contract. Unless otherwise agreed in writing by Owner or indicated in the specifications, the Construction Schedule shall use the Critical Path Method (“CPM”) and an industry-standard computer software program, such as Primvera, acceptable to Owner and A/E, and shall be provided in electronic and paper format. The Construction Schedule shall show in detail how the Contractor plans to execute and coordinate the Work. The Contractor shall use this schedule in the planning, scheduling, direction, coordination and execution of the Work. The Construction Schedule shall encompass all of the work of all trades necessary for construction of the Project and shall be sufficiently complete and comprehensive to enable progress to be monitored on a day-to-day basis. The Owner and A/E shall each be provided with a copy of all schedules, updates, reports and other documentation required herein, which shall be suitable for reproduction by the Owner, and, unless otherwise agreed by Owner, shall be in electronic and paper format. When required to assist the A/E with Project staffing requirements for the following week, the Contractor shall provide the A/E, on each Friday, with a detailed work schedule for the following week. The Contractor shall provide the A/E with at least a seventy-two (72) hour notice for the following

items: (1) All traffic lane changes, (2) Work ready for inspection or testing, (3) _____. The Contractor may be charged for additional costs of inspection when material and workmanship are found to not be ready for inspection or testing at the time the Contractor calls for inspection or testing.

4.11.2 It is the sole responsibility of the Contractor to prepare, maintain, update, revise and utilize the Construction Schedule as outlined in this Article 4.11, Construction Schedule. The Construction Schedule shall be the sole overall schedule utilized by the Contractor in managing this Project; provided, however, that Contractor may, at its option, employ and utilize other schedules based upon and consistent with the Construction Schedule. In general, it is the intent of this paragraph 4.11.2 to allow the Contractor to choose its own means, methods and construction procedures consistent with good practice and the Contract Documents.

4.11.3 If the Contractor should express an intention to complete the Work earlier than any required Milestone or Completion Date, including without limitation, in any schedule, the Owner shall not be liable to the Contractor for any delay or associated extra costs based upon the Contractor being unable to complete the Work before such earlier date. The duties, obligations and warranties of the Owner to the Contractor apply only to the completion of the Work on the Milestone and Completion Dates required by the Contract Documents and do not apply to early completion.

4.11.4 Submission to the Owner of the Construction Schedule is advisory only, does not satisfy any requirement for any notice required by the Contract Documents or the Lynchburg Public Procurement Code, and such submission shall not relieve the Contractor of the responsibility for accomplishing the Work within each and every required Milestone and Completion Date. Omissions and errors in the approved Construction Schedule shall not excuse performance that is not in compliance with the Contract Documents. Submission to the Owner and/or A/E in no way makes the Owner and/or A/E an insurer of the Construction Schedule's success or makes Owner and/or the A/E liable for time or cost overruns flowing from the Construction Schedule’s shortcomings. The Owner hereby disclaims any obligation or liability by reason of Owner and/or A/E approval or failure to object to the Construction Schedule, and any such approval or failure to object shall not be considered an admission by the Owner that the Construction Schedule was reasonably practicable or feasible.

4.11.5 Contractor shall consult with and obtain information from principal Subcontractors necessary in preparation of the Construction Schedule, and for updates and revisions required therein. Contractor shall provide each principal Subcontractor with copies of the Construction Schedule and any revisions or updates affecting that Subcontractor's work. Contractor shall hold appropriate progress meetings with Subcontractors and shall direct and coordinate the work of Subcontractors consistent with and as required herein. Owner shall have the right to attend Subcontractor progress meetings but shall not be required to participate in such meetings or provide information to Subcontractors, except through the Contractor. Contractor shall keep up-to-date minutes of subcontractor progress meetings and shall provide same to Owner. The Contractor shall ensure that each Subcontractor, sub-subcontractor or supplier acknowledges and accepts the requirements of the Construction Schedule relating to their part of the Work.

4.11.6 If Contractor's Construction Schedule indicates that Owner, the A/E, or a separate contractor is to perform an activity by a specific date, or within a certain duration, Owner, the A/E, or any separate contractor shall not be bound to said date or duration unless Owner expressly and specifically agrees in writing to the same. The Owner's and/or A/E’s overall review and acceptance or approval of the schedule does not constitute an agreement to specific dates or durations for activities of the Owner, A/E, or any separate contractor.

4.11.7 The Contractor's Superintendent shall maintain at the Project site a current, updated Construction Schedule, indicating actual monthly progress for those portions of the Project on which Work has been or is being performed.

4.11.8 If an extension or contraction of any Milestone or Completion Date is authorized by any Change Order, the Contractor shall revise his Construction Schedule, Milestone and Completion Dates accordingly.

4.11.9 If, in the opinion of the Owner, the Construction Schedule does not accurately reflect the actual progress and sequence of the Contractor's performance of the Work, the Contractor shall revise the Construction Schedule, upon the Owner's request, and submit a revised Construction Schedule that accurately represents the progress and sequence of the Contractor's performance of the Work.

4.11.10 Contractor shall submit to the Owner the name of any scheduling consultant that Contractor may select or retain, prior to using such consultant. Contractor shall not utilize any particular scheduling consultant over the reasonable objection of the Owner to that consultant.

4.11.11 Contractor covenants, warrants, and guarantees that Contractor will not:

.1 Misrepresent to Owner its planning and scheduling of the Work;

.2 Utilize schedules materially different from those made available to the Owner or any subcontractors for the direction, execution and coordination of the Work, or which are not feasible or realistic;

.3 Prepare schedules, updates, revisions or reports that do not accurately reflect Contractor's actual intent or Contractor's reasonable and actual expectations as to:

(a) The sequences of activities,

(b) The duration of activities,

(c) The responsibility for activities,

(d) Resource availability,

(e) Labor availability or efficiency,

(f) Expected weather conditions,

(g) The value associated with the activity,

(h) The percentage complete of any activity,

(i) Completion of any item of work or activity,

(j) Project completion,

(k) Delays, slippages, or problems encountered or expected,

(l) Subcontractor requests for time extension, or delay claims of subcontractors, and

(m) If applicable, the float time available.

4.11.12 Contractor's failure to substantially comply with the foregoing covenants, warranties and guarantees of paragraph 4.11.11 shall be a substantial and material breach of contract which will permit Owner to terminate Contractor for default~~,~~ or withhold payments under the Contract Documents~~,~~ and shall entitle Owner to the damages afforded by these Contract Documents or applicable law.

4.11.13 Should Contractor fail to substantially comply with the provisions of the Contract Documents relating to scheduling and execution of the Work by the overall Construction Schedule, Owner shall have the right, at its option, to retain the services of scheduling consultants or experts (including attorneys if necessary in the opinion of the Owner) to prepare schedules, reports, updates and revisions of the schedule in accordance with the Contract Documents and to review and analyze same, in order to allow Owner and the A/E to evaluate the progress of the Work by Contractor, to determine whether Contractor is substantially complying with the Contract Documents, and to direct such action by the Contractor, as permitted by the Contract Documents, as required to ensure, under the Owner's schedule prepared hereunder, that Contractor will complete the Work within the Contract Time. All costs and expenses and fees incurred by Owner in exercising its rights hereunder shall be charged to Contractor's account. If Contractor fails to substantially comply with the scheduling and execution of the Work requirements of the Contract Documents, Contractor hereby agrees, in such instance, to comply with such Owner-prepared schedules, if any, or directions, activity sequences and durations as Owner may reasonably require, without additional cost to the Owner (subject only to cost adjustments for such changes in the Work as Owner may direct), to ensure completion within the Contract Time.

4.11.14 The Construction Schedule shall be utilized by Owner, A/E and Contractor for submission, review and approval of monthly Payment Requests. The schedule must be updated by Contractor monthly with each progress payment application and submitted to the Owner and A/E for review with the progress payment application. Owner shall not be required to process and review Contractor's Application for Payment if Contractor has failed or refused to provide the scheduling update information required herein.

4.11.15 The type of schedule to be utilized on this Project, along with its particular elements, shall be as specified in the Contract Documents.

4.12 RESPONSIBILITY FOR COMPLETION

4.12.1 The Contractor shall furnish such manpower, materials, facilities and equipment and shall work such hours, including night shifts, overtime operations and Sundays and holidays, as may be necessary to ensure the performance of the Work within the Milestone and Completion dates specified in the Contract. If the Owner notifies the Contractor that it has become apparent that the Work will not be completed within required Milestone or Completion Dates and such is not due solely to circumstances for which Contractor has established entitlement to an extension to the Contract Time, the Contractor agrees that it will assume full responsibility to take some or all of the following actions, at no additional cost to the Owner (except for circumstances beyond the Contractors' control), in order to ensure, in the opinion of the Owner, that the Contractor will comply with all Milestone and Completion Date requirements:

.1 Increase manpower, materials, crafts, equipment and facilities;

.2 Increase the number of working hours per shift, shifts per working day, working days per week, or any combination of the foregoing; and

.3 Reschedule activities to achieve maximum practical concurrency of accomplishment of activities.

Failure of the Owner to notify the Contractor of the apparent delay shall not relieve Contractor of the obligation to finish the Work within the required Milestone or Completion date.

4.12.2 If the actions taken by the Contractor to remedy delays not due solely to circumstances for which Contractor has established entitlement to a time extension are not satisfactory, the Owner may direct the Contractor to take any and all actions necessary to ensure completion within the required Milestone and Completion Dates, without additional cost to the Owner. In such event, the Contractor shall continue to assume responsibility for his performance and for completion within the required dates.

4.12.3 If, in the opinion of the Owner, the actions taken by the Contractor pursuant to this Article or the progress or sequence of Work are not accurately reflected on the Construction Schedule, the Contractor shall revise such schedule to accurately reflect the actual progress and sequence of Work.

4.12.4 Failure of the Contractor to substantially comply with the requirements of this Article is grounds for a determination by the Owner, pursuant to Article 15, Termination Of The Contract, that the Contractor is failing to prosecute the Work with such diligence as will ensure its completion within the time specified.

4.12.5 The Owner may, at its sole discretion and for any reason, including when it is apparent to the A/E or Owner that the Work will not be completed within the required Milestone or Completion Dates, require the Contractor to accelerate the Construction Schedule by providing overtime, Saturday, Sunday and/or holiday work and/or by having all or any subcontractors designated by the Owner provide overtime, Saturday, Sunday, and/or holiday work. If the Owner requires overtime, Saturday, Sunday or holiday work by the Contractor's or his Subcontractor's own forces, and such requirement is not related in any way to the Contractor's apparent inability to comply with Milestone and Completion Date requirements, the Owner shall reimburse the Contractor for the direct cost to the Contractor of the premium time for all labor utilized by the Contractor in such overtime, Saturday, Sunday or holiday work (but not for the straight time costs of such labor), together with any Social Security and State or Federal unemployment insurance taxes in connection with such premium time. However, no overhead supervision costs, commissions, profit or other costs and expenses shall be payable in connection therewith.

4.12.6 This provision does not eliminate the Contractor's responsibility to comply with the City's noise ordinances, all VDOT permit requirements, and all other applicable laws, regulations, rules, ordinances, resolutions, and permit requirements.

4.13 DOCUMENTS AND SAMPLES AT THE SITE

4.13.1 The Contractor shall, at the Owner's direction, maintain at the site for the Owner one record copy of all drawings, specifications, addenda, Change Orders and other Modifications, and Field Orders in good order and marked currently to record all changes made during construction, and approved Shop Drawings, Product Data, Samples and Manuals. These shall be available to the A/E. These shall be delivered to the Owner upon completion of the Work.

4.14 SHOP DRAWINGS, PRODUCT DATA, SAMPLES AND MANUALS

4.14.1 SHOP DRAWINGS are drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or any Subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work.

4.14.2 PRODUCT DATA are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate a material, product or system for some portion of the Work.

4.14.3 SAMPLES are physical examples that illustrate materials, equipment or workmanship and establish standards by which the Work will be judged.

4.14.4 MANUALS are manufacturer's installation, start-up, operating, maintenance and repair instructions, together with parts lists, pictures, sketches and diagrams that set forth the manufacturer's requirements, for the benefit of the Contractor and the Owner.

4.14.5 The Contractor shall review, approve and submit, with reasonable promptness and in such sequence as to cause no delay in the Work or in the work of the Owner or any separate contractor, all Shop Drawings, Product Data, Samples and Manuals required by the Contract Documents.

4.14.6 By approving and submitting Shop Drawings, Product Data, Samples and Manuals, the Contractor represents that he has determined and verified all materials, field measurements, and field construction criteria related thereto, and that he has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

Parts and details not fully indicated on the contract drawings shall be detailed by the Contractor in accordance with standard engineering practice. Dimensions on the drawings, as well as detailed drawings themselves, are subject in every case to measurements of existing, adjacent, incorporated and completed Work, which shall be taken by the Contractor before undertaking any Work dependent on such data.

4.14.7 The Contractor shall not be relieved of responsibility for any deviation from the requirements of the Contract Documents by the Owner or A/E's approval of Shop Drawings, Product Data, Samples or Manuals under Article 2, Architect/Engineer unless the Contractor has specifically informed the Owner and A/E in writing of such deviation at the time of submission and the Owner has given specific written approval to the specific deviation. The Contractor shall not be relieved from responsibility for errors or omissions in the Shop Drawings, Product Data, Samples or Manuals by the A/E's approval thereof.

4.14.8 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data or Samples, to revisions other than those requested by the Owner or A/E on previous submittals.

No portion of the Work requiring submission of Shop Drawings, Product Data, or Samples shall commence until the submittal has been approved by the Owner and A/E as provided in Article 2, Architect/Engineer. All such portions of the Work shall be in accordance with approved submittals.

4.14.9 For substances that are proposed for use in the Project that may be hazardous to human health, the Contractor shall submit to the A/E, for information only, information on precautions for safely using these substances, including Material Safety Data Sheets and certification of registration by the Contractor with authorities under the respective Virginia and Federal Toxic Substances Control Acts.

4.14.10 Unless otherwise modified by the Owner in writing, the Contractor shall label or stamp and number all Shop Drawings, Product Data, Samples or Manuals as prescribed by the Project Manager.

4.14.11 The Contractor shall submit a copy of each submittal, including the transmittal sheet (for shop drawings, product data, samples or manuals) to the Owner simultaneously with the Contractor's submission of said drawings, data, samples or manual packages to the A/E.

4.15 EQUAL PRODUCTS:

4.15.1 The term "Product" as used in the Contract Documents refers to materials, equipment, supplies, articles, fixtures, devices, types of construction, or products, as appropriate.

4.15.2 All products furnished shall, whenever specified and otherwise wherever practicable, be the standard products of recognized, reputable manufacturers. If the manufacturer cannot make scheduled delivery of an approved item, the Contractor may request approval of the A/E to use another brand, make, manufacturer, article, device, product, material, fixture, form or type of construction which the Contractor judges to be equal to that specified. An item need not be considered by the A/E for approval as equal to the item so named or described unless it (1) it is at least equal in quality, durability, appearance, strength, and design; (2) it will perform at least equally the specific function imposed by the general design for the work being contracted for or the material being purchased; and (3) it conforms substantially, even with

deviations, to the detailed requirements for the item in the specifications. Approval shall be at the sole discretion of the A/E and will be based upon considerations of quality, workmanship, economy of operation, suitability for the purpose intended, and acceptability for use on the project. Any such approval must be in writing to be effective, and the decision of the A/E shall be final.

4.15.4 To obtain such approval of equal products other than those specified in Contract Documents, and not previously approved during the bidding, the Contractor's request for approval of any equal product shall include the following:

.1 Complete data substantiating compliance of the proposed equal product with the Contract Documents;

.2 Accurate cost data on proposed equal product in comparison with product or method specified;

.3 Product identification including manufacturer's name, address, and phone number;

.4 Manufacturer's literature showing complete product description, performance and test data, and all reference standards;

.5 Samples and colors in the case of articles or products;

.6 Name and address of similar projects on which the product was used and date of installation;

.7 All directions, specifications, and recommendations by manufacturers for installation, handling, storing, adjustment, and operation.

4.15.5 The Contractor shall also submit with his request for approval a statement which shall include all of the following representations by the Contractor, namely that:

.1 He has investigated the proposed equal product and determined that it is equal or better in all respects to that specified and that it fully complies with all requirements of the Contract Documents;

.2 He will meet all contract obligations with regard to this substitution;

.3 He will coordinate installation of accepted equal products into the work, making all such changes and any required schedule adjustments, at no additional cost to the Owner, as may be required for the Work to be complete in all respects;

.4 He waives all claims for additional costs and additional time related to equal products. He also agrees to hold the Owner harmless from claims for extra costs and time incurred by subcontractors and suppliers, or additional services which may have to be performed by the A/E, for changes or extra work that may, at some later date, be determined to be necessary in order for the Work to function in the manner intended in the Contract Documents;

.5 He will provide the same warranty and guarantee, and perform any work required in accordance therewith, for the equal product that is applicable to the specified item for which the equal product is requested;

.6 Material will be installed, handled, stored, adjusted, tested, and operated in accordance with the manufacturers' recommendation and as specified in the Contract Documents;

.7 In all cases, new materials will be used unless this provision is waived in writing by, the Owner or unless otherwise specified in the Contract Documents;

.8 All material and workmanship will be in every respect, in accordance with that which in the opinion of the Owner, is in conformity with approved modern practice; and

.9 He has provided accurate cost data on the proposed equal product in comparison with the product or method specified, if applicable.

4.15.6 The Owner may require tests of all products proposed as equal products so submitted to establish quality standards, at the Contractor's expense. After approval of an equal product, if it is determined that the Contractor submitted defective information or data regarding the equal product upon which Owner's approval was based, and that unexpected or uncontemplated redesign or rework of the Project will be required in order to accommodate the equal product, or that the item will not perform or function as well as the specified item for which equal product was requested, the Contractor will be required to furnish the original specified item or request approval to use another equal product. The Contractor shall pay all costs, expenses or damages associated with or related to the unacceptability of such an equal product and the resultant utilization of another item, and no time extension shall be granted for any delays associated with or related to such an equal product.

4.15.7 Equal products will not be considered for approval by the Owner if:

.1 The proposed equal product is indicated or implied on the Contractor's shop drawing or product data submittals and has not been formally submitted for approval by the Contractor in accordance with the above-stated requirements; or

.2 Acceptance of the proposed equal product will require substantial design revisions to the Contract Documents or is otherwise not acceptable to the Owner.

4.15.8 Except as otherwise provided for by the provisions of any applicable laws, the Contractor shall not have any right of appeal from the decision of the Owner disapproving any products submitted if the Contractor fails to obtain the approval for an equal product under this Article.

4.15.8 If the Contractor proposes a product which the Owner determines is not equal to the product named in Contract Documents but which the Owner nevertheless is willing to accept, Contractor shall provide, upon request by the Owner, an itemized comparison of the proposed substitution with the product specified and the cost differential which shall be credited to the Owner in a Change Order issued in accordance with Article 12, Changes and Modifications in the Work.

4.16 USE OF SITE

4.16.1 The Contractor shall confine his operations at the site to areas permitted by law, ordinances, permits, easements, right-of-way agreements and the Contract Documents. The Contractor shall not unreasonably encumber the site, in the opinion of the Owner, with any materials, equipment or trailers, nor shall Contractor block the entrances or otherwise prevent reasonable access to the site, other working and parking areas, completed portions of the Work and/or properties, storage areas, areas of other facilities that are adjacent to the worksite. If the Contractor fails or refuses to move said material, equipment or trailers within 24 hours of Notice by the Owner to so do, the Owner shall have the right, without further Notice, to remove, at the Contractor's expense, any material, equipment and/or trailers which the Owner deems are in violation of this paragraph.

4.17 CUTTING AND PATCHING OF WORK

4.17.1 The Contractor shall be responsible for all cutting, fitting or patching that may be required to complete the Work and to make its several parts fit properly and in accordance with the Contract Documents.

4.17.2 The Contractor shall not damage or endanger any portion of the Work or the work of the Owner or any separate contractors by cutting, patching or otherwise altering any work, or by excavation. The Contractor shall not cut or otherwise alter the work of the Owner or any separate contractor except with the written consent of the Owner and of such separate contractor. The Contractor shall not unreasonably withhold from the Owner or any separate contractor Contractor's consent to cutting or otherwise altering the Work. The Owner shall not be required to accept Work with a cut, splice, or patch when such cut, splice or patch is not generally accepted practice for the particular work involved or is otherwise unworkmanlike in the opinion of the Owner.

4.18 SITE CLEAN UP

4.18.1 The Contractor at all times shall keep the Project site and adjacent areas free from accumulation of waste materials or rubbish caused by his operations. Before final payment is made, the Contractor shall remove all of his waste materials, rubbish, scrap materials, debris, tools, construction equipment, machinery, surplus materials, falsework, temporary structures, including foundations thereof and plant of any description, from the Project site and put the site in a neat, orderly condition.

4.18.2 If the Contractor fails to clean up as required herein at any time during the performance of the Work or at the completion of the Work, the Owner may, upon 24 hours notification, clean up the site at the Contractor's expense.

4.19 PATENTS, ROYALTIES, ETC.

4.19.1 The Contractor guarantees to save harmless the Owner, its officers, agents, servants and employees from liability of any kind or nature, including without limitation, cost, expense and attorney's fees, on account of suits and claims of any kind for violation or infringement of any patents or patent rights by the Contractor, or by anyone directly or indirectly employed by him, or by reason of the use of any art, process, method, machine, manufacture, or composition of matter patented or unpatented in the performance of this Contract in violation or infringement of any letter or rights. The Contractor agrees to pay all royalties, fees, licenses, etc. required in respect of the Work or any part thereof as part of his obligations hereunder without any additional compensation.

4.20 INDEMNIFICATION

4.20.1 It is hereby mutually covenanted and agreed that the relation of the Contractor to the Work to be performed by him under this Contract shall be that of an independent contractor and that as such he will be responsible for all damages, loss or injury, including death, to persons or property that may arise or be incurred in or during the conduct and progress of said work as the result of any action, omission or operation under the Contract or in connection with the Work, whether such action, omission or operation is attributable to the Contractor, subcontractor, any material supplier, or anyone directly or indirectly employed by any of them. The Contractor shall make good any damages that may occur in consequence of the Work or any part of it. The Contractor shall assume all liability, loss and responsibility of whatsoever nature by reason of his neglect or violation of any federal, state, county or local laws, regulations , codes or ordinances.

4.20.2 The Contractor shall indemnify, hold harmless and defend the Owner, its employees, agents, servants and representatives from and against any and all claims, suits, demands, actions (regardless of the merits thereof) and damages of whatever nature arising out of or resulting from the performance of the Work or the failure to perform the Work, including without limitation, jurisdictional labor disputes or other labor troubles that may occur during the performance of the Work.

4.20.3 The indemnification obligations under this Article shall not be affected in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor or any Subcontractor under worker's or workman's compensation acts, disability benefit acts or other employee benefit acts.

4.20.4 The obligations of the Contractor under this Article 4.20 shall not extend to the actions or omissions of the A/E, his agents or employees, arising out of the preparation or approval of maps, drawings, opinions, reports, surveys, change orders, designs or specifications.

4.20.5 The obligations of the Contractor under this Article 4.20 shall not extend to the proportion of damages, loss or injury, including death, to persons or property that may arise or be incurred as the result of any action, omission or operation of the Owner, or Owner's separate contractor(s), and their employees, agents, servants, and/or representatives.

4.21 NON-DISCRIMINATION IN EMPLOYMENT

4.21.1 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 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, 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.

.4 The Contractor will include the provisions of the foregoing paragraphs 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.

4.21.2 DRUG-FREE WORKPLACE REQUIRED:

As required by section 2.2-4312 of the Code of Virginia during the performance of the Contract, 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 of over $10,000, so that the provisions will be binding upon each subcontractor or vendor.

For the purposes of this Article 4.21, "drug-free workplace" means a site for the performance of Work done in connection with this Contract where Contractor's employees 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.

4.22 CONTRACT SECURITY

4.22.1 The Contractor shall deliver to the Owner, within ten (10) working days from Notice of Award, two (2) originals of a Performance Bond and a separate Labor and Material Payment Bond, in a form acceptable to the Owner, and each in an amount required by the Contract Documents and the Virginia Public Procurement Act, as security for the faithful performance of the Contract, and the payment of all persons performing labor and furnishing materials in connection with this Contract. The City will not issue Notice to Proceed until the bonds are received. The amount of the Performance and Payment Bonds shall be increased to the same extent the Contract Sum is increased due to Modifications. The form of bonds shall be acceptable to the Owner, and the surety shall be such surety company or companies as are acceptable to the Owner and as are authorized to transact business in the Commonwealth of Virginia. The cost of such bonds shall be included in the Contractor's bid amount.

4.22.2 The bonds shall irrevocably obligate the Contractor and surety to the full amount of the bonds unless and until all of Contractor's obligations under the Contract Documents have fully been fulfilled.

4.22.3 If, at any time, any surety or sureties for any bond relating to the Work becomes insolvent or is determined by the Owner to be unable to adequately secure the interest of the Owner, the Contractor shall, within (30) days after Notice from the Owner to do so, substitute an acceptable bond(s) in such form and sum and with such other sureties as obligors as may be satisfactory to the Owner. The premiums on such bond(s) shall be paid by the Contractor.

ARTICLE 5 SUBCONTRACTORS

5.1 DEFINITIONS

5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform or supply any of the Work at the site. Subcontractor means a Subcontractor or his authorized representative. The term Subcontractor does not include any separate contractor performing work pursuant to Article 6 or his subcontractors.

5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform or supply any of the Work at the site. The term Sub-subcontractor includes a Sub-subcontractor or an authorized representative thereof.

5.1.3 The A/E will not deal directly with any Subcontractor or Sub-subcontractor or materials supplier. Subcontractor, Sub-subcontractors or material suppliers shall route requests for information or clarification through the Contractor to the A/E, with a copy to the Owner.

5.2 AWARD OF SUBCONTRACT AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

5.2.1 The Contractor shall submit to the Owner with a copy to the A/E prior to the award of any subcontract for Work under this Contract and thirty (30) calendar days after the award of this Contract, the names of the suppliers of principal items, systems, materials, and equipment proposed for the Work; the names and addresses, business and emergency phones of the Subcontractors which he proposes to employ under this Contract, as well as such other information as may be requested by the Owner. The Owner will review each Subcontractor and supplier based upon his apparent financial soundness and responsibility, his known or reported performance on previous similar work, and his available plant, equipment and personnel to perform the Work. The Contractor shall not employ a Subcontractor or supplier to whom the Owner reasonably objects. The Owner's objection to a proposed Subcontractor or supplier shall not affect the Contract Sum.

5.2.2 The Contractor shall make no substitutions for any Subcontractor, person or entity previously selected unless first submitted to the Owner for review and approval.

5.3 SUBCONTRACTUAL RELATIONS

5.3.1 By an appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by the terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities which the Contractor, by these Contract Documents, assumes toward the Owner and the A/E. Said agreement shall preserve and protect the rights of the Owner and the A/E under the Contract Documents with respect to the Work to be performed by the Subcontractor so that the subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the Contractor-Subcontractor agreement, the benefit of all rights, remedies and redress against the Contractor that the Contractor, by these Contracts Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with his Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract, copies of all of the Contract Documents, and identify to the Subcontractor any terms and conditions of the proposed subcontract which may be at variance with the Contract Documents. Each Subcontractor shall similarly make copies of such Contract Documents available to his Sub-subcontractor's. Each subcontract agreement shall insure that all appropriate provisions of the Contract Documents are complied with by the Subcontractor.

5.3.2 The provisions herein regarding the City’s reasonable objection to any Subcontractor shall in no way affect the liability of the Contractor to Owner regarding performance of all obligations by or payment of Subcontractors. The City’s failure to object to any given Subcontractor shall not relieve the Contractor of his obligation to perform or have performed to the full satisfaction of the Owner all of the work required by this Contract.

5.3.3 Neither this article nor any other provision of the Contract Documents shall be deemed to make the Owner a joint venture or partner with the Contractor or to place the Subcontractor and materialmen in privity of contract with the Owner.

5.4 QUALIFICATION SUBMITTALS

5.4.1 Specific qualification submittals may be required of the Contractor, Subcontractors, installers and suppliers for certain critical items of the Work. Required qualification submittals are set forth in detail in the Instruction to Bidders and shall be provided, collected and submitted by the Contractor to the A/E with copies to the Owner. All information required of a single Subcontractor, installer or supplier shall be contained in a single, complete submittal. The Contractor shall submit the required qualification information within ten (10) days after receipt of the Owner's request.

5.4.2 The Owner may reject any proposed Subcontractor, installer or supplier, or any qualification submittals related thereto, for the following reasons:

.1 The Contractor's failure to submit requested information within the specified time; or

.2 The Contractor's failure to provide all of the requested information; or

.3 The Contractor's submission of a Subcontractor, installer or supplier, or qualifications thereof, which are unacceptable in the judgment of the Owner.

5.4.3 Should the Owner have reasonable objection to any proposed Subcontractor, installer or supplier, the Contractor shall submit another firm for approval by the Owner at no additional cost to the Owner.

ARTICLE 6 WORK BY OWNER OR BY SEPARATE CONTRACTORS

6.1 OWNER'S RIGHT TO PERFORM WORK AND TO AWARD SEPARATE CONTRACTS

6.1.1 The Owner reserves the right to perform work related to the Project with his own forces, and to award separate contracts in connection with other portions of the Project or other work on the site.

6.1.2 When separate contracts are awarded for different portions of the Project or other work on the site, the term "contractor" in the contract documents in each case shall mean the contractor who executes each separate construction agreement.

6.2 MUTUAL RESPONSIBILITY

6.2.1 The Contractor shall afford other contractors and the Owner reasonable opportunity for the introduction and storage of their materials and equipment and the execution of their work and shall properly connect and coordinate the Work with such other work. The Contractor shall coordinate his Work with the Owner and other contractors and store his apparatus, materials, supplies and equipment in such orderly fashion at the site of the Work as will not unduly interfere with the progress of the Work or the work of any other contractors.

6.2.1.1 If the execution or result of any part of the Work depends upon any work of the Owner or of any separate contractor, the Contractor shall, prior to proceeding with the Work, inspect and promptly report to the Owner in writing any apparent discrepancies or defects in such work of the Owner or of any separate contractor that render it unsuitable for the proper execution or result of any part of the Work.

6.2.1.2 Failure of the Contractor to so inspect and report shall constitute an acceptance of the Owner's or separate contractor's work as fit and proper to receive the Work, except as to defects which may develop in the Owner's or separate contractor's work after completion of the Work and which the Contractor could not have discovered by its inspection prior to completion of the Work.

6.2.2 Should the Contractor cause damage to the work or property of the Owner or of any separate contractor on the Project, or to other work on the site, or delay or interfere with the Owner's work on ongoing operations or facilities or adjacent facilities or said separate contractor's work, the Contractor shall be liable for the same; and, in the case of another contractor, the Contractor shall attempt to settle said claim with such other contractor prior to such other contractor's institution of litigation or other proceedings against the Contractor.

If such separate contractor sues the Owner on account of any damage, delay or interference caused or alleged to have been so caused by the Contractor, the Owner shall notify the Contractor, who shall defend the Owner in such proceedings at the Contractor's expense. If any judgment or award is entered against the Owner, the Contractor shall satisfy the same and shall reimburse the Owner for all damages, expenses, and other costs that the Owner incurs as a result thereof.

6.2.3 Should Contractor have a dispute with a separate contractor with whom the Owner has contracted regarding damage to the Work or the property of Contractor or to the Work or property of said separate contractor or with regard to any delays or interferences which either Contractor or said separate contractor has caused to the performance of the other's Work, Contractor agrees to attempt to settle such dispute directly with said separate contractor. Contractor agrees that it will not seek to recover from the Owner any damages, costs, expenses (including, but not limited to, attorney's fees) or losses of profit incurred by the Contractor as a result of any damage to the Work or property of the Contractor or for any delay or interference caused or allegedly caused by any separate contractor.

6.3 OWNER'S RIGHT TO CLEAN UP

6.3.1 If a dispute arises between the Contractor and separate contractors as to their responsibility for cleaning up as required by Article 4, Contractor, the Owner may clean up and charge the cost thereof to the contractor responsible as the Owner shall determine to be just.

ARTICLE 7 MISCELLANEOUS PROVISIONS

7.1 GOVERNING LAW

The provisions of this Contract shall be interpreted in accordance with the laws of the Commonwealth of Virginia.

7.2 PROVISIONS REQUIRED BY LAW DEEMED INSERTED

Each and every provision of law and clause required by law to be inserted in this Contract shall be deemed to be inserted herein, and the Contract shall be read and enforced as though it were included herein and if through mistake or otherwise, any such provision is not inserted or is not correctly inserted, then upon the application of either party, the Contract shall forthwith be physically amended to make such insertion.

7.3 SUCCESSORS AND ASSIGNS

The Owner and the Contractor each binds himself, his partners, successors, assigns and legal representatives to the other party hereto and to the partners, successors, assigns and legal representatives of such other party in respect to all covenants, agreements and obligations contained in the Contract Documents. Neither party to the Contract shall assign the Contract or sublet it without the written consent of the other, nor shall the Contractor assign any monies due or to become due to him hereunder, without the previous written consent of the Owner and the Contractor's surety.

In the event the Contractor desires to make an assignment of all or part of the Contract or any monies due or to become due hereunder, the Contractor shall file a copy of consent of surety, together with a copy of the assignment to the Owner and A/E. In the event the Contractor assigns all or any part of the monies due or to become due under this Contract, the instrument of assignment shall state that the right of assignees in and to any monies due to or to become due to Contractor shall be subject to prior liens and claims of all persons, firms and corporations that provided labor services or furnished material and equipment during the performance of the Work. The rights of assignees shall further be subject to the payment of any liens, claims, or amounts due to Federal, state, or local governments.

7.4 RIGHTS AND REMEDIES

7.4.1 The duties and obligations imposed by the Contract Documents and the rights and remedies available thereunder shall be in addition to, and not a limitation of, any duties, obligations, rights and remedies otherwise imposed or available by law, not inconsistent with the Contract Documents. No time limitations described in this Contract shall be construed to alter the applicable statutory period of limitations with regard to the enforcement of the obligations of the parties.

7.4.2 No action or failure to act by the Owner, A/E or Contractor shall constitute a waiver of any right or duty afforded any of them under the Contract, nor shall any such action or failure to act constitute an approval of or acquiescence in any breach thereunder, except as may be specifically agreed in writing.

7.4.3 Contractor agrees that he can be adequately compensated by money damages for any breach of this Contract which may be committed by the Owner and hereby agrees that, no default, act, or omission of

the Owner or the A/E, except for failure to make payments as required by the Contract Documents, shall constitute a material breach of the Contract entitling Contractor to cancel or rescind the provisions of this Contract or (unless the Owner shall so consent or direct in writing) to suspend or abandon performance of all or any part of the Work. Contractor hereby waives any and all rights and remedies to which he might otherwise be or become entitled, saving only its right to money damages.

7.5 SEVERABILITY

In the event that any provision of this Contract shall be adjudged or decreed to be invalid, such ruling shall not invalidate the entire agreement but shall pertain only to the provision in question and the remaining provisions shall continue to be valid, binding, and in full force and effect.

7.6 TESTS

7.6.1 If the Contract Documents, laws, ordinances, rules, regulations, codes, permits, resolutions or orders of any public authority having jurisdiction require any portion of the Work to be inspected, tested or approved, the Contractor shall give the Owner at least 24 hours notice of its readiness so that the Owner or the A/E or other representatives of the Owner may observe such inspection, testing or approval. The Contractor shall bear all costs of such inspections, tests or approvals conducted by public authorities. Site inspections, tests conducted on site or tests of materials gathered on site, which the Contract requires to be performed by independent testing entities, shall be contracted and paid for by the Contractor. Examples include, but are not limited to, the testing of cast-in-place concrete, foundation materials, soil compaction, pile installations, caisson bearings, and steel framing connections.

7.6.2 All materials and workmanship (if not otherwise designated by the specifications) shall be subject to inspection, examination or test by the Owner, A/E, and other representatives of the Owner, at any and all times during the manufacture and/or construction and at any and all places where such manufacture and/or construction are carried on. Special, full-sized and performance tests shall be as described in the specifications. Without additional charge, the Contractor shall furnish promptly all reasonable facilities, labor and materials necessary to make tests safe and convenient.

7.6.3 The selection of bureaus, laboratories and/or agencies for the inspection and tests of supplies, materials or equipment shall be subject to the approval of the Owner. Satisfactory documentary evidence, including but not limited to certificates of inspection and certified test reports that the material has passed the required inspection and tests must be furnished to the Owner, with a copy to the A/E, by the Contractor prior to the incorporation of the supplies, materials or equipment into the Work or at such times as to allow for appropriate action by the Owner.

7.6.4 Inspection or testing performed exclusively for the Contractor's convenience shall be the sole responsibility of the Contractor. Tests required by Contractor's or Subcontractor's error, omission or non-compliance with the Contract Documents, shall be paid for by the Contractor.

7.6.5 It is specifically understood and agreed that an inspection and approval of the materials by the Owner shall not in any way subject the Owner to pay for the said materials or any portion thereof, even though incorporated in the Work, if said materials shall in fact turn out to be unfit to be used in the Work, nor shall such inspection be considered as any waiver of objection to the Work on account of the unsoundness or imperfection of the material used.

ARTICLE 8 CONTRACT TIME

8.1 DEFINITION

8.1.1 Unless otherwise provided, the Contract Time is the period of time specified in the Contract Documents for Substantial Completion of the Work as defined herein, including authorized adjustments thereto. The Contractor shall complete his Work within the Contract Time.

8.1.2 The date of commencement of the Work is the date established in the Notice to Proceed

The Contractor shall not commence Work or store materials or equipment on site until written Notice to Proceed is issued or until the Contractor otherwise receives the Owner's written consent. The Contractor shall commence work no later than ten (10) days after the date established in the Notice to Proceed.

8.1.3 The date of Substantial Completion of the Work or designated portion thereof is the date determined by Owner when: (1) construction is sufficiently complete, in accordance with the Contract Documents, so the Owner can occupy or utilize the Work or designated portion thereof for the use for which it is intended; and (2) the Contractor has satisfied all other requirements for Substantial Completion which may be set forth in the Contract Documents.

8.1.4 The date of Final Completion of the Work is the date determined by the Owner when the Work is totally complete, to include punch list work, in accordance with the Contract Documents and the Owner may fully occupy and utilize the Work for the use for which it is intended.

8.1.5 The term “day” as used in the Contract Documents shall mean calendar days unless otherwise specifically designated.

8.2 PROGRESS AND COMPLETION

8.2.1 All time limits stated in the Contract Documents, including without limitation the date of Substantial Completion of the Work, are of the essence of the Contract.

8.2.2 The Contractor shall begin the Work on the date of commencement as defined herein. He shall carry the Work forward expeditiously with adequate forces and shall achieve Substantial and Final Completion as required by the Contract Documents.

8.3 CLAIMS FOR TIME EXTENSIONS

8.3.1 The time during which the Contractor is delayed in the performance of the Work by the acts or omissions of the Owner, the A/E or their employees or agents, acts of God, unusually severe and abnormal climatic conditions, fires, floods, epidemics, quarantine restrictions, strikes, riots, civil commotion or freight embargoes, or other conditions beyond the Contractor's control and which the Contractor could not reasonably have foreseen and provided against, shall be added to the time for completion of the Work (i.e., the Contract Time) stated in the Agreement; however, no claim by the Contractor for an extension of time for delays will be considered unless made in compliance with the requirements of this Article and other provisions of the Contract Documents.

8.3.2 The Owner shall not be obligated or liable to the Contractor for, and the Contractor hereby expressly waives any claims against the Owner on account of, any indirect or direct damages, costs or expenses of any nature which the Contractor, its Subcontractors, or Sub-subcontractor's or any other person may incur as a result of (1) any delays, reasonable or unreasonable, foreseeable or unforeseeable, which are either not caused by the acts or omissions of the Owner, its agents or employees or which arise from or out of (or due to) causes not within the control of the Owner, its agents or employees, or (2) any reasonable

delay regardless of its cause, it being understood and agreed that the Contractor's sole and exclusive remedy in any such events shall be an extension of the Contract Time, but only as determined in accordance with the provisions of the Contract Documents.

8.3.3 The burden of proof to substantiate a claim for an extension of the Contract Time shall rest with the Contractor, including evidence that the cause was beyond his control. It shall be deemed that the Contractor has control over the supply of labor, materials, equipment, methods and techniques of construction and over the Subcontractors, Sub-contractors, and suppliers, unless otherwise specified in the Contract Documents.

8.3.4 In the event of changes in the Work, the Contractor must identify any additional time required in the Proposed Change Order. The Owner need not consider any time extensions for changes in the Work not included in the Proposed Change Order.

8.3.5 No time extensions will be granted as a result of the Contractor's improper or unreasonable scheduling or for the Contractor's failure to have Shop Drawings, Product Data, Samples or Manuals submitted in ample time for review under a reasonable and agreed upon schedule.

8.3.6 Delays by Subcontractors, Sub-subcontractors or suppliers will not be considered justification for a time extension, except for the same valid reasons and conditions enumerated herein.

8.3.7 The Contractor acknowledges and agrees that actual delays due to changes, suspension of work or excusable delays~~,~~ in activities which, according to the Construction Schedule, do not affect the Contract Time will not be considered to have any effect upon the Contract Time and therefore will not be the basis for a time extension.

8.3.8 The Contractor acknowledges and agrees that time extensions will be granted only to the extent that: (1) excusable delays exceed the available flexibility in the Contractor's schedule; and (2) Contractor can demonstrate that such excusable delay actually caused, or will cause, delay to the Contractor's schedule that will extend the Contract Time.

8.3.9 With respect to Suspensions of Work under Paragraph 3.6, Suspension of Work, herein, the Contractor shall be entitled to an extension of the Contract Time not to exceed the length of time that the Work was suspended (unless as determined under this Article and the other requirements of the Contract Documents that a further extension is justified and warranted) if the claim is submitted in accordance with the requirements of this Article, and if the suspension is not due to any act or omission of the Contractor, any Subcontractor or Sub-subcontractor or any other person or organization for whose acts or omission the Contractor may be liable. The Contractor's claim will be evaluated in accordance with the terms of this Article.

8.3.10 The Contractor shall not be entitled to any extension of time for delays resulting from any conditions or other causes unless it shall have given written Notice to the Owner, within seven (7) calendar days following the commencement of each such condition or cause, describing the occurrence, the activities impacted and the probable duration of the delay. The Contractor's complete claim submittal for a time extension shall be submitted no later than twenty (20) calendar days after cessation of the delay or within such other longer period as the Owner may agree in writing to allow.

8.3.11 No such extension of time shall be deemed a waiver by the Owner of his right to terminate the Contract for abandonment or delay by the Contractor as herein provided or to relieve the Contractor from full responsibility for performance of his obligations hereunder.

8.4 CHANGE ORDER WORK

8.4.1 The Contractor shall make every reasonable effort to perform Change Order work within the Contract Time and in such manner as to have minimum delaying effects on all remaining Work to be performed under the Contract. If, however, the Change Order work results in an unavoidable increase in the time required to complete the Work, an extension of the Contract Time may be granted to the Contractor for the Change Order work. The Contractor's request shall be determined in accordance with the provisions of Article 8.3, Claims for Time Extensions, herein and as follows:

.1 If the time required for performance of the Change Order work has an unavoidable, direct, delaying effect on the primary sequence of Work activities remaining after rescheduling (e.g., the critical path in CPM type scheduling), the overall Contract Time may be extended by the minimum number of days required for the Change Order work as mutually agreed upon by the Owner and the Contractor;

.2 If the time required for performance of the Change Order work does not have an unavoidable direct delaying effect on the primary sequence of Work activities but is ordered by the Owner at a time such that insufficient Contract Time remains for completion of the Change Order work (and any limited number of contingent work activities), the Contract Time may be extended by the minimum number of days required for the Change Order work as mutually agreed upon by the Owner and the Contractor but only for the Change Order work and contingent activities, All other unaffected Work shall be performed within the Contract Time;

.3 Failure of the Owner and the Contractor to agree on a Contract Time extension as specified in .1 and .2 above shall not relieve the Contractor from proceeding with and performing the Change Order work promptly, as well as in such manner as to have minimal delaying effects on all remaining Work to be performed under the Contract. Such disagreement shall be resolved as soon as practical by negotiation.

8.5 LIQUIDATED DAMAGES FOR DELAY

8.5.1 The damages incurred by the Owner due to the Contractor's failure to complete the Work within required Milestone Dates and the Contract Time, including any extensions thereof, shall be in the amount set forth in the Construction Agreement, for each consecutive day beyond the Milestone Dates or the Contract Time (Sundays and all holidays included) for which the Contractor shall fail to complete the Work.

8.5.2 The parties hereby agree that the amount of liquidated damages provided in this Contract is neither a penalty nor a forfeiture and is intended to compensate the Owner solely for the Owner's inability to use the Work for its fully intended purpose, and is not intended to, nor does said amount include: (1) any damages, additional or extended costs~~,~~ incurred by the Owner for extended administration of this Contract, or by the Owner's agents, consultants or independent contractors for extended administration of this Contract, or (2) any additional services, relating to or arising as a result of the delay in the completion of the Work. Owner shall be entitled to claim against Contractor for its actual damages ~~and~~for any damages not specifically included within the liquidated damages as set forth herein. Such damages shall be computed separately, and, together with liquidated damages, either deducted from the Contract Sum or billed to the Contractor, at the option of the Owner.

Contractor agrees that it will not challenge the per diem amounts of liquidated damages imposed pursuant to this Article 8.5 except as to whether Contractor is responsible for the delays, themselves, that have resulted in the assessment of liquidated damages. The Contractor waives any challenge as to the validity of any liquidated damages specified on the grounds that such liquidated damages allegedly are void as penalties or allegedly are not reasonably related to Owner’s actual damages.

Owner may, in its sole discretion, deduct from any payments otherwise due Contractor amounts of liquidated damages assessable under this Article 8.5. Owner's failure to deduct liquidated damages assessable under this Article 8.5 from payments to Contractor shall not be deemed a waiver by Owner of any entitlement to such liquidated damages.

8.6 TIME EXTENSIONS FOR WEATHER

8.6.1 The Contract Time will not be extended due to inclement weather conditions that are normal to the general locality of Work site. The time for performance of this Contract includes an allowance for workdays (based on a 5-day workweek) which, according to historical data, may not be suitable for construction work.

.1 The following is the schedule of monthly anticipated normal inclement weather workdays for the Project location and will constitute the base line for monthly weather time extension evaluations.

ANTICIPATED NORMAL INCLEMENT WEATHER WORK-DAYS INCLUDED IN THE CONTRACT TIME OF PERFORMANCE											
JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
7	7	7	7	9	7	7	7	6	6	6	7

8.6.2 The Contractor, in his planning and scheduling of the Work as required by the Contract Documents, shall allow for the normal inclement weather for the locality of the Work site. If the Contractor believes that the progress of the Work has been adversely affected and that it will directly result in a failure to meet Substantial Completion within the Contract Time, by weather conditions above and beyond the amount normally expected, he shall submit a written request to the Owner, with a copy to the A/E, for an extension of time, pursuant to Paragraph 8.3, Claims for Time Extensions.

8.6.3 Such request shall be evaluated by the Owner in accordance with the provisions of the Contract Documents and shall include a comparison of actual weather statistics compiled by City of Lynchburg's Department of Public Works, for the time of year, locality of the particular Work site with the days claimed by the Contractor and the anticipated normal inclement weather as stated in subparagraph 8.6.1. The normal inclement weather expected has been included in the designated Contract Time for completion. The decision of the Owner shall be final.

8.6.4 The Contractor shall not be entitled to any money damages whatsoever for any delays resulting from inclement weather, whether normal or abnormal, foreseeable or unforeseeable. The Contractor and Owner stipulate and agree that, for delays due to weather as determined in 8.6.3, the Contractor's sole relief is a time extension granted in accordance with this Article 8.6, Time Extensions for Weather.

ARTICLE 9 PAYMENTS AND COMPLETION

9.1 CONTRACT SUM

9.1.1 The Contract Sum is stated in the Construction Agreement and, including authorized adjustments thereto, is the total amount payable by the Owner to the Contractor for the performance of the Work under the Contract Documents. The Contract Sum includes, but is not limited to, the Contractor's profit and general overhead and all costs and expenses of any nature whatsoever (including without limitation taxes, labor, equipment and materials), foreseen or unforeseen, and any increases in said costs and expenses, foreseen or unforeseen, incurred by the Contractor in connection with the performance of the Work, all of which

costs and expenses shall be borne solely by the Contractor. The Contractor agrees to assume all increases in costs of any nature whatsoever that may develop during the performance of the Work.

9.2 SCHEDULE OF VALUES

9.2.1 For Lump Sum Price contracts, before the pre-construction meeting, the Contractor shall submit to the Owner and A/E a schedule of values allocated to the various portions of the Work, prepared on payment forms provided by the Owner and supported by such data to substantiate its accuracy as the Owner may require. This schedule of values, unless rejected by the Owner, shall be used as a basis for the Contractor's Applications for Payment.

9.2.2 For Unit Price contracts, the Contractor shall utilize the payment request form provided by the Owner, wherein the schedule of values shall correspond with the individual unit price bid items. When so requested by the Owner, the Contractor shall provide a more detailed cost breakdown of the unit price items.

9.2.3 Contractor may include in his schedule of values a line item for "mobilization" which shall include a reasonable amount for mobilization for the Contractor and his Subcontractors. The Contractor shall not front-end load his schedule of values.

9.3 APPLICATION FOR PAYMENT

9.3.1 The Contractor shall submit to the A/E three (3) originally executed, itemized Applications for Payment (and one (1) copy to the Owner) by the tenth of each month, along with any authorized change orders for that billing cycle. The Applications for Payment shall be notarized, indicate in complete detail all labor and material incorporated in the Work during the month prior to submission, and supported by such data substantiating the Contractor's payment request as the Owner may require. The Applications for Payment shall also contain Contractor’s certification that due and payable amounts and bills have been paid by the Contractor for Work for which previous Certificates of Payment were issued and payments received from the Owner.

9.3.2 Payment may be made for the value of materials, which are to be incorporated into the finished Work, and which are delivered to and suitably stored and protected on the Work site. The Contractor shall provide releases or paid invoices from the seller of such materials to establish, to the Owner's satisfaction, that the Owner has title to said material. Stored materials shall be in addition to the Work completed and shall be subject to the same retainage provisions as the completed Work. Material once paid for by the Owner becomes the property of the Owner and may not be removed from the Work site without the Owner's written permission.

9.3.3 The requirements for payment for materials stored off-site shall include, but are not limited to, those specified in Paragraph 9.3.2 and the additional requirements hereinafter specified. Material stored off-site under this provision shall be included in the definition of Work, Article 1, Contract Documents.

9.3.3.1 The requirements of Paragraph 10.2, Safety of Persons and Property, are fully applicable to materials stored off-site.

9.3.3.2 For purposes of administering this provision, the following definitions are provided.

a. Material stored NEAR the Work site: A storage location shall be considered near the Work site if it is not more than fifty (50) miles (approximately an one-hours drive) from the Work site.

b. Material stored DISTANT from the Work site: Locations beyond the limit of fifty (50) miles shall be considered distant.

9.3.3.3 All proposed off-site locations, regardless of whether they are near or distant, shall be approved by the Owner prior to any payment under this Article. The approval process will include an inspection of the proposed storage site, which may or may not coincide with any inspection of materials stored.

9.3.3.4 Prior to payment for any material stored off-site, said material shall be inspected to verify that it is properly stored; i.e., segregated, inventoried, identified as the property of the Owner and Contractor, and duly protected as required in Article 10.2, Safety of Persons and Property. This material shall be clearly identified and physically segregated from any other material or stock, in such a manner that it is clear, from casual observation that said material is not a part of any other stock or stored material.

9.3.3.5 For materials stored distant to the Work site, the Contractor shall reimburse the Owner for all reasonable costs incurred by the Owner, to include but not limited to salary, transportation, lodging and per diem, for the Owner's or the A/E's employees to travel to and from the storage locations for the purpose of verifying that the material is properly stored. It is anticipated that such trips would occur whenever additional material is claimed for payment and/or at least every six (6) months until the material is delivered to the Work site.

9.3.3.6 Except for unusual circumstances, the Contractor will not be required to reimburse the Owner's costs for visits to storage locations near the Work site.

9.3.3.7 The Contractor shall hold the Owner harmless from any and all losses, additional costs, direct or indirect damages and/or delays, whatsoever, which may occur as a result of a failure of the Contractor to deliver (or have delivered), in a timely manner, materials (for which payment has been made) to the Work site for installation and incorporation into the Work.

9.3.3.8 The Contractor shall provide to the Owner a release of lien or other suitable certification by the seller of the materials, in addition to paid invoices, verifying that the Contractor has valid title to all materials for which payment is requested. The seller, however, shall not be required to waive his rights for recovery against Contractor or any surety if his contract is breached.

9.3.4 The Contractor warrants that title to all Work, materials and equipment covered by an Application for Payment will pass to the Owner, either by incorporation in the construction or upon the receipt of payment by the Contractor, whichever occurs first, free and clear of all liens, claims, security interests or encumbrances, hereinafter referred to as "liens". The Contractor further warrants that no Work, materials or equipment covered by an Application for Payment will have been acquired by the Contractor or by any other person performing Work at the site or furnishing materials and equipment for the Work that is subject to an agreement under which an interest therein or an encumbrance thereon is retained by the seller or otherwise imposed by the Contractor or such other person.

9.3.5 The Contractor's Application for Payment shall provide that the payment request attests that all Work for which the request is made has been completed in full according to all the requirements of the Contract Documents. By submitting his Application for Payment, the Contractor also represents that he has no knowledge that any Subcontractors or suppliers have not been fully and timely paid and that, insofar as he knows, the only outstanding items for payment with respect to the Contract are those to be paid from the funds for which application is being made.

9.4 CERTIFICATES FOR PAYMENT

9.4.1 The A/E will, within seven (7) calendar days after the receipt of the Contractor's Application for Payment, recommend a Certificate for Payment to the Owner, for such amount as the A/E determines is properly

due, with his reasons for any withholding or adjusting a Certificate as provided in Paragraph 9.6, Payments Withheld.

9.4.2 After the Certificate for Payment is recommended by the A/E, the Owner will review it and make any changes deemed necessary by the Owner's representative. The recommendation of the Certificate for Payment by the A/E does not waive or limit the Owner's right to reduce the amount of the payment due to the Contractor as determined to be appropriate by the Owner.

9.4.3 The recommendation of a Certificate for Payment will constitute a representation by the A/E to the Owner, based on his observations at the site as provided in Article 2, Architect/Engineer, and the data comprising the Application for Payment, that the Work has progressed to the point indicated; that, to the best of his knowledge, information and belief: (1) the quality of the Work is in accordance with the Contract Documents (subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial or Final Completion, to the results of any subsequent tests required by or performed under the Contract Documents, to minor deviations from the Contract Documents correctable prior to completion, and to any specific qualifications stated in his Certificate); and that (2) the Contractor is entitled to payment in the amount certified. However, by recommending a Certificate for Payment, the A/E shall not thereby be deemed to represent that he has made exhaustive or continuous on-site inspections to check the quality or quantity of the Work or that he has reviewed the construction means, methods, techniques, sequences or procedures, or that he has made any examination to ascertain how or for what purpose the Contractor has used the moneys previously paid on account of the Contract Sum.

9.4.3.1.1 The Application for Payment shall be on a form approved by the City. Payment for stored material delivered but not incorporated in the work will be the invoiced amount only. Stored materials drawdown shall be approved by the Owner. Submit applicable invoices with Application for Payment. Monthly partial payment request shall be submitted in **TRIPLICATE** to Owner’s representative for approval by the 25th of the month so that the Owner can approve payment request by the first working day of the next month. Partial payments shall be made on a monthly basis on or before the end of the next month for which the Work was performed, in accordance with the Contract Documents.

9.4.3.1.2 The Owner shall pay to the Contractor 95 percent of the total amount due and the Owner shall retain five (5) percent of the amount due until all work has been performed strictly in accordance with the Contract Documents and until such work has been accepted by the Owner.

9.5.1 The Owner shall make payment in the manner and within thirty (30) calendar days after receipt of the Certificate of Payment from the A/E based upon the Owner's approval or adjustment of said Certificate. The Contractor shall be paid the amount approved or adjusted by the Owner, less 5% retainage which is being held to assure faithful performance; provided however, that said retainage is not applicable to Time and Material Change Orders.

9.5.1.1 In relation to punch list or other uncompleted Work and in lieu of a portion of the above-specified five-percent 5% retainage, the Owner may, at its sole discretion, elect to retain fixed amounts directly relating to the various items of uncompleted Work. All amounts withheld shall be included in the Final Payment.

9.5.2 The Contractor shall, within seven (7) days after receiving payment from the Owner, do one of the following:

9.5.2.1 Pay all Subcontractors for the proportionate share of the total payment received from the Owner for Work performed by each Subcontractor under the Contract; or

9.5.2.2 Notify the Owner and Subcontractor(s), in writing, of his intention to withhold all or part of the Subcontractor's payment with the reason for nonpayment.

9.5.3 The Contractor shall make payment to Subcontractors as heretofore specified. Each payment shall reflect the percentage actually retained, if any, from payments to the Contractor on account of such Subcontractor's Work.

9.5.4 The Contractor shall provide the Owner with his social security number, if an individual, or his federal identification number, if a corporation, partnership, or other entity.

9.5.5 The Contractor shall pay unpaid Subcontractors interest on payments that are not made in accordance with this Article 9.5, Progress Payments. The rate of interest shall be in compliance with the Prompt Payment section of the Virginia Public Procurement Act of the Code of Virginia. The Contractor shall, by an appropriate agreement with each Subcontractor, require each Subcontractor to make payments to his Sub-subcontractors according to all the same requirements as provided in this Article 9.5 Progress Payments.

9.5.6 The Owner may, upon written request, furnish to any Subcontractor, if practicable, information regarding the percentages of completion or the amounts applied for by the Contractor and the action taken thereon by the Owner on account of Work done by such Subcontractor.

9.5.7 Neither the Owner nor the A/E shall have any obligation to pay or to see to the payment of any monies to any Subcontractor except as may otherwise be required by law.

9.5.8 No Certificate for Payment, nor any payment, nor any partial or entire use or occupancy of the Project by the Owner, shall constitute an acceptance of any Work not in accordance with the Contract Documents, nor shall it waive any right or claim by Owner based upon the Work, or any portion of the Work, including Work for which payment has been made, not conforming to the requirements of the Contract Documents.

9.6 PAYMENTS WITHHELD

9.6.1 The Owner may withhold the payment in whole or in part, if necessary to reasonably protect the Owner. If the A/E is unable to make representations as provided in subparagraph 9.4.3 and to recommend payment in the amount of the application, he will notify the Owner as provided in subparagraph 9.4.1. If the Contractor and the Owner cannot agree on a revised amount, the Owner will promptly issue a Certificate for Payment for the amount for which he is able to make representations with respect to payment, due for Work performed. The Owner may also decline to certify or make payment because of subsequently discovered evidence or subsequent observations, and the Owner may nullify the whole or any part of any Certificate for Payment previously issued.

9.6.2 The Owner may withhold from the Contractor so much of any payment approved by the A/E, as may in the judgment of the Owner be necessary:

.1 To protect the Owner from loss due to defective work not remedied;

.2 To protect the Owner upon receipt of notice of the filing in court or in an arbitration proceeding as may be required in any third party contract, of verified claims of any persons supplying labor or materials for the Work, or other verified third party claims;

.3 To protect the Owner upon reasonable evidence that the Work will not be completed for the unpaid balance of the Contract Sum;

.4 To protect the Owner upon reasonable evidence that the Work will not be completed within the Contract Time established by this Contract; or

.5 To protect the Owner upon the Contractor's failure to properly schedule and coordinate the Work in accordance with or as required by the Contract Documents, or failure to provide progress charts, revisions, updates or other scheduling data as required by the Contract Documents, or upon the Contractor's failure to provide as-built drawings as required herein, or upon Contractor's failure to otherwise substantially or materially comply with the Contract Documents.

9.6.3 If required by the Contract Documents, the Contractor shall, concurrent with his submission of the Construction Schedule, submit a practicable and realistic payment schedule showing the dates on which the Contractor will submit each and every Application for Payment and the amount he expects to receive for each and every monthly progress payment. If during the performance of the Work, the Contractor expects to receive an amount for a monthly progress payment larger than that indicated on the payment schedule, the Contractor shall notify the Owner at least thirty (30) days in advance of that payment so that the necessary allocation of funds can be processed. If Contractor fails to submit a practicable and realistic payment schedule, the Contractor's Application for Payment shall be honored only to the extent that the Work is actually performed and that the proportion of payments made to the Contract Sum does not exceed the proportion of the Contract Time expired as of the time of the request.

9.7 FAILURE OF PAYMENT

If the Owner does not make payment to the Contractor within the thirty (30) calendar days after receipt of the Contractor's Application for Payment by the A/E through no fault of Contractor, and the Owner otherwise not being entitled under the Contract Documents or applicable law to withhold payment, then the Contractor may, upon fifteen (15) additional days' written Notice to the Owner and the A/E, stop the Work until payment of the amount owing has been received. In such event, the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, which shall be effected by appropriate Change Order as provided herein.

9.8 SUBSTANTIAL COMPLETION AND GUARANTEE BOND

9.8.1 Unless otherwise specified in Article 9.9, Final Completion and Final Payment, when the Contractor considers that the Work, or a designated portion thereof which is acceptable to the Owner, is substantially complete as defined in Article 8, Contract Time, the Contractor shall request in writing that the A/E and the Owner perform a Substantial Completion inspection. Prior to such inspection the Contractor shall:

.1 If applicable, secure a Certificate of Occupancy for the Project or a designated portion thereof; and

.2 Submit five (5) copies each of the Operations and Maintenance Manuals to the A/E as specified and one (1) copy to the Owner.

9.8.2 The Owner shall determine whether the Work is substantially complete and shall compile a punch list of items to be completed or corrected. 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.

9.8.3 When the Owner on the basis of his inspection determines that the Work or a designated portion thereof is substantially complete, the A/E will then prepare a Certificate of Substantial Completion which shall establish the Date of Substantial Completion and shall state the responsibilities of the Owner and the

Contractor for security, maintenance, heat, utilities, damage to the Work and insurance. The Certificate of Substantial Completion shall be submitted to the Owner and the Contractor for their written acceptance of the responsibilities assigned to them in such Certificate.

9.8.4 The Contractor shall have thirty (30) days from the Date of Substantial Completion to complete all items on the punch list to the satisfaction of the Owner. If the Contractor fails to complete all punch list items within the designated time, the Owner shall have the option to correct or conclude any remaining items by utilizing its own forces or by hiring others. The cost of such correction of remaining punch list items by the Owner or others shall be deducted from the final payment to the Contractor, and if the Owner has not retained sufficient funds to cover the cost, Contractor or its surety shall pay the difference within 30 days of a written demand by the Owner to do so.

9.8.5 Guarantees and warranties required by the Contract Documents shall commence on the Date of Final Completion of the Work, unless otherwise provided in the Certificate of Substantial or Final Completion, or the Contract Documents. Provided, however~~,~~ that if Contractor does not complete certain punch list items within the time period~~,~~ specified in 9.8.4, all warranties and guarantees for such incomplete Punch List items shall become effective upon issuance of final payment for the Work.

9.8.5.1 The Contractor shall guarantee for a term of one (1) year from the date of Final Completion or Final Payment, whichever comes later, (unless otherwise provided for in the Certificate(s) of Substantial or Final Completion or the Contract Documents): (1) the quality and stability of all materials equipment and Work; (2) all the Work against defects in materials, equipment or workmanship; and (3) all shrinkage, settlement or other faults of any kind which are attributable to defective materials or workmanship. The Contractor shall remedy at his own expense, when so notified in writing to do so by the Owner, and to the satisfaction of the Owner, the Work or any part thereof that does not conform to any of the warranties and guaranties described in the Contract Documents~~.~~ or that otherwise does not conform to the requirements of the Contract Documents

9.8.5.2 In order to make good the guarantee as herein required, the Contractor shall deposit with the Owner, after Substantial Completion but before Final Payment, a Guarantee Bond(s) issued by a surety licensed to do business in Virginia and otherwise acceptable to the Owner, for the faithful performance of the guarantee. Said Bond(s) shall be for a period of one (1) year from the date the guaranties and warranties commence and in the amount of five percent (5%) of the final gross value of the Contract.

9.8.5.3 The Contractor shall complete repairs during the guarantee period~~,~~ within five (5) working days after the receipt of Notice from the Owner, and if the Contractor shall fail to complete such repairs within the said five (5) working days, the Owner may employ such other person or persons as it may deem proper to make such repairs and pay the expenses thereof out of any sum retained by it, provided nothing herein contained shall limit the liability of the Contractor or his surety to the Owner for non-performance of the Contractor's obligations at any time.

9.8.6 The issuance of the Certificate of Substantial Completion does not indicate final acceptance of the Work by the Owner, and the Contractor is not relieved of any responsibility for the Work except as specifically stated in the Certificate of Substantial Completion.

9.8.7 Upon Substantial Completion of the Work, or designated portion thereof, and upon application by the Contractor and certification by the A/E, the Owner shall make payment, adjusted for retainage and payments withheld, if any, for such Work or portion thereof, as provided in the Contract Documents.

9.8.8 Should the Owner determine that the Work or a designated portion thereof is not substantially complete, he shall provide the Contractor a written Notice stating why the Work or designated portion is not substantially complete. The Contractor shall expeditiously complete the Work and shall re-request in writing that the Owner perform a Substantial Completion inspection.

9.9 FINAL COMPLETION AND FINAL PAYMENT

9.9.1 A Certificate of Final Completion shall be issued by the A/E prior to final payment. At the Owner's sole option, this Final Completion Certificate may be issued without a Certificate of Substantial Completion. The Contractor, prior to application for Final Payment and within the time specified for completion of the Work, shall complete all Work, to include punch list items and provide operation and maintenance manuals and as-built data, for the Work, as completed and in place. Said Certificate of Final Completion shall be issued, even if a Certificate of Substantial Completion has been issued previously and temporary authority to operate the Work has been granted.

9.9.1.1 The Certificate of Final Completion shall certify that all Work has been completed in accordance with Contract Documents and is ready for use by the Owner.

9.9.2 For all projects where Substantial Completion Certificates have been issued for various portions of the Work, at differing times, the Contractor shall request and the Owner shall, prior to final payment, issue a Certificate of Final Completion which certifies that all required Work, including punch list items, has been completed in accordance with the Contract Documents.

9.9.3 Neither the final payment nor any remaining retainage shall become due until the Contractor submits to the A/E the following:

.1 An Application for Payment for all remaining monies due under the -Contract.

.2 Consent of surety to final payment;

.3 If required by the Owner, other data establishing payment or satisfaction of all such obligations, such as receipts, releases and waivers of claims arising out of the Contract, to the extent and in such form as may be designated by the Owner. If any Subcontractor refuses to furnish waiver of claims satisfactory to the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify Owner against any such claim. If any such claim remains unsatisfied after all payments are made, the Contractor shall refund to the Owner all monies that the latter may be compelled to pay in discharging such claim, including all costs and reasonable attorneys' fees;

.4 As-built drawings, operation and maintenance manuals and other project closeout submittals, as required by the Contract Documents;

.5 Construction releases as required by the Contract Documents from each property owner on whose property an easement for construction of the Work has been obtained by the Owner, such release to be in the forms to be provided by the Owner. This release is for the purpose of releasing the Owner and the Contractor from liability, claims, and damages arising from construction operations on or adjacent to the easement and includes proper restoration of the property after construction. It shall be the Contractor's sole responsibility to obtain all such releases and furnish them to the Owner; and

.6 A written certification that:

.1 The Contractor has reviewed the requirements of the Contract Documents,

.2 The Work has been inspected by the Contractor for compliance with all requirements of the Contract Documents,

.3 Pursuant to this inspection, the Contractor certifies and represents that the Work complies in all respects with the requirements of the Contract Documents,

.4 The Contractor further certifies and represents that all equipment and systems have been installed in accordance with the Contract Documents and have been tested in accordance with specification requirements and are operational, and

.5 The Contractor hereby certifies and represents that the Work is complete in all respects and ready for final inspection.

9.9.4 Upon receipt of the documents required in subparagraph 9.9.3 and upon receipt of a final Application for Payment, the A/E and Owner will promptly make a final inspection. When the A/E finds the Work acceptable under the Contract Documents and the Contract fully performed, he will issue within seven (7) days a final Certificate for Payment and a Final Certificate of Completion.

The Certificate of Completion will state that to the best of his knowledge, information and belief, and on the basis of his observations and inspections, the Work has been completed in accordance with the terms and conditions of the Contract Documents and that the entire balance designated in the final Certificate for Payment is due and payable. The final Certificate for Payment will constitute a further representation that the conditions precedent to the Contractor's being entitled to final payment as set forth in Subparagraph 9.9.3 have been fulfilled. The Owner shall review the Certificate of Payment and shall accept it and issue final acceptance, or reject it and notify the Contractor, within ten (10) days. Final payment to the Contractor shall be made within thirty (30) days after final acceptance. All prior estimates and payments, including those relating to Change Order work, shall be subject to correction by this final payment.

9.9.5 The making of Final Payment shall constitute a waiver of all claims by the Owner, except those arising from:

.1 Unsettled claims;

.2 Faulty, defective, or non-conforming Work discovered or appearing after Substantial or Final Completion;

.3 Failure of the Work to comply with the requirements of the Contract Documents;

.4 Terms of any warranties or guarantees required by the Contract Documents; or

.5 Fraud or bad faith committed by the Contractor or any subcontractor or supplier during performance of Work but discovered by Owner after Final Payment.

9.9.6 The acceptance of Final Payment shall constitute a waiver of all claims by the Contractor, except those previously made in writing and so identified by the Contractor~~,~~ as unsettled at the time of the final Application for Payment. No payment, however, final or otherwise, shall operate to release the Contractor or his sureties from any obligations under this Contract or the Performance, Payment, or Guarantee Bonds.

ARTICLE l0 PROTECTION OF PERSONS AND PROPERTY

10.1 SAFETY PRECAUTIONS AND PROGRAMS

10.1.1 The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. The requirement applies continuously throughout the Contract performance, until Final Payment is made, and is not limited to regular working hours.

10.2 SAFETY OF PERSONS AND PROPERTY

10.2.1 The Contractor shall take all reasonable precautions for the safety of, and shall provide all reasonable protection to prevent damage, injury or loss to:

.1 All persons performing any of the Work and all other persons who may be affected thereby;

.2 All the Work and all materials and equipment to be incorporated therein, whether in storage on or off the site, under the care, custody or control of the Contractor or any of his Subcontractors or Sub-subcontractor's. Machinery, equipment and all hazards shall be guarded or eliminated in accordance with the safety provisions of the Manual of Accident Prevention in Construction published by the Associated General Contractors of America, to the extent that such provisions are not in contravention of applicable law; and

.3 Other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

10.2.2 The Contractor shall give all notices and comply with all applicable laws, ordinances, codes, rules, regulations, permits, resolutions and lawful orders of any public authority bearing on the safety of persons or property or their protection from damage, injury or loss.

The Contractor shall at all times safely guard the Owner's property from injury or losses in connection with the Contract. Contractor shall at all times safely guard and protect his Work and adjacent property as provided by law and the Contract Documents, from damage. All passageways, guard fences, lights and other facilities required for protection by local authorities or local conditions must be provided and maintained without additional cost to the Owner.

10.2.3 The Contractor shall erect and maintain, as required by existing conditions and progress of the Work, all reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent utilities.

10.2.4 When the use or storage of explosives or other hazardous materials or equipment is necessary for the execution of the Work, the Contractor shall exercise the utmost care and shall carry on such activities under the supervision of properly qualified personnel.

10.2.5 The Contractor is responsible for the proper packing, shipping, handling and storage (including but not limited to shipment or storage at the proper temperature and humidity) of materials and equipment to be incorporated in the Work, so as to insure the preservation of the quality and fitness of the materials and equipment for proper installation and incorporation in the Work, as required by the Contract Documents.

For example, but not by way of limitation, Contractor shall, when necessary, place material and equipment on wooden platforms or other hard and clean surfaces and not on the ground and/or place such material and equipment under cover or in any appropriate shelter or facility. Stored materials or equipment shall be located so as to facilitate proper inspection. Material and equipment that is delivered

crated shall remain crated until ready for installation. Lawns, grass plots or other private property shall not be used for storage purposes without the written permission of the owner or lessee unless otherwise within the terms of the easements obtained by the Owner.

10.2.6 In the event of any indirect or direct damage to public or private property referred to in Paragraphs 10.2.1.2 and 10.2.1.3, caused in whole or in part by an act, omission or negligence on the part of the Contractor, any Subcontractor, any Sub-subcontractor, or anyone directly or indirectly employed by any of them or by anyone for whose acts any of them may be liable, the Contractor shall at his own expense and cost promptly remedy and restore such property to a condition equal to or better than existing before such damage was done. The Contractor shall perform such restoration by underpinning, replacing, repairing, rebuilding, replanting, or otherwise restoring as may be required or directed by the Owner, or shall make good such damage in a satisfactory and acceptable manner. In case of failure on the part of the Contractor to promptly restore such property or make good such damage, the Owner may, upon two (2) calendar days written Notice, proceed to repair, replace, rebuild or otherwise restore such property as may be necessary and the cost thereof, or a sum sufficient in the judgment of the Owner to reimburse the owners of property so damaged, will be deducted from any monies due or to become due the Contractor under the Contract. If insufficient monies remain due or will become due to pay such sum, Contractor or its surety shall, within 30 days of receipt of a written demand from Owner to do so, pay Owner such sum.

10.2.7 The Contractor shall designate a responsible member of his organization at the site whose duty shall be the prevention of accidents and the protection of material, equipment and other property. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner.

10.2.8 The Contractor shall not load or permit any part of the Work to be loaded so as to endanger the safety of any portion of the Work.

10.2.9 The Contractor shall give notice in writing at least forty-eight (48) hours before breaking ground, to all persons, Public Utility Companies, owners of property having structures or improvements in proximity to site of the Work, superintendents, inspectors, or those otherwise in charge of property, streets, water pipes, gas pipes, sewer pipes, telephone cables, electric cables, railroads or otherwise, who may be affected by the Contractor's operation, in order that they may remove any obstruction for which they are responsible and have representative(s) on site to see that their property is properly protected. Such notice does not relieve the Contractor of responsibility for any damages and claims. Nor does such notice relieve the Contractor from his responsibility to defend and indemnify the Owner from actions resulting from the Contractor’s performance of such work in connection with or arising out of the Contract.

10.2.10 The Contractor shall protect all utilities encountered while performing its work, whether indicated on the Contract Drawings or not. The Contractor shall maintain utilities in service until moved or abandoned. The Contractor shall exercise due care when excavating around utilities and shall restore any damaged utilities to the same condition or better as existed prior to starting the Work, at no cost to the Owner. The Contractor shall maintain operating utilities or other services, even if they are shown to be abandoned on the drawings, in service until new facilities are provided, tested and ready for use.

10.2.11 The Contractor shall return all improvements on or about the site and adjacent property which are not shown to be altered, removed or otherwise changed to conditions which existed prior to starting the Work.

10.2.12 The Contractor shall protect the Work, including but not limited to, the site, stored materials and equipment, excavations, and excavated or stockpiled soil or other material, intended for use in the Work, and shall take all necessary precautions to prevent or minimize damage to same and to prevent detrimental effect upon his performance or that of his Subcontractors, caused by or due to rain, snow,

ice, run-off, floods, temperature, wind, dust, sand and flying debris. For example, but not by way of limitation, Contractor shall, when necessary, utilize temporary dikes, channels or pumping to carry-off, divert or drain water, and shall as necessary tie-down or otherwise secure the Work and employ appropriate covers and screens.

10.3 OBLIGATION OF CONTRACTOR TO ACT IN AN EMERGENCY

10.3.1 In case of an emergency that threatens immediate loss or damage to property and/or safety of life, the Contractor shall act to prevent threatened loss, damage, injury or death. The Contractor shall notify the Owner of the situation and all actions taken immediately thereafter. If the Contractor fails to act and any loss, damage, injury or death occurs that could have been prevented by the Contractor's prompt and immediate action, the Contractor shall be fully liable to the Owner or any other party for all costs, damages, claims, actions, suits, costs of defense, and all other expenses arising therefrom or relating thereto.

10.3.2 Prior to commencing the Work and at all times during the performance of the Work, the Contractor shall provide the Owner two, twenty-four hour (24) emergency phone numbers where his representatives can be contacted at any time.

ARTICLE 11 INSURANCE FOR CONTRACTS

11.1 CONTRACTOR'S INSURANCE

11.1.1 During the term of this Contract, the Contractor shall procure and maintain insurance coverages with insurance companies rated by A. M. Best Company as A – VIII or better. The company(ies) shall be authorized to do business under the laws of the Commonwealth of Virginia and be acceptable to the City of Lynchburg and shall provide the following minimum types of insurance:

a. **Commercial General Liability Insurance** – This will cover claims for Bodily Injury, Property Damage, Personal and Advertising Injury, Products and Completed Operations, which may arise from operations under the Contract, whether such operations be performed by the Contractor or by any Subcontractor or Independent Contractor, or by anyone directly or indirectly employed by any of them. Such insurance shall include coverages "X", "C" and "U" for explosion, collapse of other structures and underground utilities, as well as Contractual Liability Insurance covering the requirements outlined in the General Conditions. This insurance shall name the City, the City Council and its employees as additional insureds ***by endorsement*** to the Commercial General Liability policy. Such policy shall not have a restriction on the limits of coverage provided to the City of Lynchburg as an additional insured. The City of Lynchburg shall be entitled to protection up to the full limits of the Contractor's policy regardless of the minimum requirements specified in this Contract. If endorsements to the Commercial General Liability insurance policies cannot be made, then separate policies providing such protection shall be purchased by the Contractor.

1. The Policy shall have the following ***minimum*** limits:

$1,000,000 Each Occurrence Limit
$1,000,000 General Aggregate Limit
$1,000,000 Personal and Advertising Injury Limit
$1,000,000 Products and Completed Operations Aggregate Limit
$5,000 Medical Expense Limit

This insurance shall include the following provisions and /or endorsements:

1) The General Aggregate limit shall apply on a "per project" and on a "per location" basis;

2) Coverage shall apply to all liability arising from all premises and operations conducted by the Contractor, Subcontractors and independent contractors;

3) The Contractor agrees that liability arising from Products and Completed Operations will be covered. Such liability coverage will be maintained for two years after completion of the Work.

4) The Contractor shall require each of his Subcontractors to procure and maintain Commercial General Liability Insurance of the type specified in these Contract Documents in the minimum amounts required by the Owner and the Contractor (which shall be the amounts required by this paragraph 11.1.1. of Contractor unless otherwise agreed in writing by Owner), during the term of their subcontracts.

b. **Worker's Compensation and Employer's Liability Insurance** for the Contractor's employees engaged in the Work under this Contract, in accordance with statutory requirements of the Commonwealth of Virginia. The Contractor shall require each of his Subcontractors to provide Worker's Compensation and Employer's Liability Insurance for all of the Subcontractor's employees engaged on such subcontracts. If any class of employees engaged on Work under the Contract is not protected under the Worker's Compensation statute, the Contractor shall provide similar protection for these employees in amounts not less than the legal requirements. The amount of Employer's Liability Insurance for the Contractor and each of his Subcontractors shall be not less than:

$100,000 per employee for Bodily Injury.
$100,000 per employee for disease
$500,000 per policy for disease

The Worker's Compensation and Employer's Liability Insurance policy shall include an "all states" or "other states" endorsement.

c. **Commercial Automobile Liability Insurance**, including coverage for owned, hired, non owned and borrowed vehicles used in the work with ***minimum*** limits of $1,000,000 Combined Single Limit per occurrence. This insurance shall name the City, the City Council and its employees as additional insureds ***by endorsement*** to the Commercial Automobile Liability policy. Such policy shall not have a restriction on the limits of coverage provided to the City of Lynchburg as an additional insured. The City of Lynchburg shall be entitled to protection up to the full limits of the Contractor’s policy regardless of the minimum requirements specified in this Contract.

d. **Umbrella Liability or Excess Liability** Insurance with the following minimum limits of:

$5,000,000 Each Occurrence
$5,000,000 Annual Aggregate

The following policies shall be scheduled as underlying policies:

Commercial General Liability
Commercial Automobile Liability
Employers Liability

This insurance shall name the City, the City Council and its employees as additional insureds ***by endorsement*** to the Umbrella or Excess Liability policy. Such policy shall not have a restriction on the limits of coverage provided to the City of Lynchburg as an additional insured. The City of Lynchburg shall be entitled to protection up to the full limits of the Contractor’s policy regardless of the minimum requirements specified in this Contract.

11.1.2 Proof of insurance for each type of coverage listed herein shall be provided within 10 days after issuance of the award letter for the Contract, and no Work shall proceed unless all such insurance is in effect. The Contractor shall not allow any Subcontractor to commence work on his subcontract until all such insurance of the Subcontractor has been so obtained and approved by the Contractor and found to be in accordance with the requirements set forth herein. The Contractor certifies by commencement of the Work that his insurance and that of Subcontractors is in effect and meets the requirements set forth herein.

11.1.3 The Contractor shall purchase and maintain required liability and all other insurance as is appropriate for the Work being performed and furnished. The insurance shall provide protection from claims which may arise out of or result from Contractor's performance and furnishing of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed or furnished by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform or furnish any of the Work, or by anyone for whose acts any of them may be liable:

a. claims under Worker's Compensation, Employers Liability, disability benefits, and other similar employee benefit acts;

b. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees;

c. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees;

d. claims for damages insured by personal injury liability coverage which are sustained: (1) by any person as a result of an offense directly or indirectly related to the employment of such person by Contractor; or (2) by any other person for any other reason;

e. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom; and

f. claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance, or use of any motor vehicle.

11.1.4 The insurance required to be purchased and maintained by the Contractor shall:

a. include completed operations insurance;

b. with respect to any other insurance coverage written on a claims-made basis, remain in effect for at least 2 years after final payment (and Contractor shall furnish the City and A/E evidence satisfactory to the City of continuation of such insurance at final payment and 1 year thereafter);

c. contain a cross liability or severability of interest clause or endorsement. Insurance covering the specified additional insureds shall be primary insurance, and all other insurance carried by the additional insureds shall be excess insurance.

11.1.5 All of the aforesaid insurance policies must be endorsed to provide that the insurance company ***shall give 30 days written notice to the City*** if the policies are to be terminated or if any changes are made during the Contract period which will affect in any way the insurance provided pursuant to such policy. Before starting the Work, the Contractor shall provide the City with a copy of each policy that he and each of his Subcontractors is required to carry in accordance with this Article 11, together with receipted bills evidencing proof of premium payment. These policies shall contain endorsements to the policies naming the City of Lynchburg as an additional insured as required.

11.1.6 Nothing contained herein shall effect, or shall be deemed to affect, a waiver of the City's sovereign immunity under law.

ARTICLE 12 CHANGES AND MODIFICATIONS IN THE WORK

12.1 CHANGES IN THE WORK

12.1.1 The Owner, without invalidating the Contract and without notice to the surety, may order a change to the Work consisting of additions, deletions or other revisions to the general scope of the Contract, or changes in the sequence of the performance of the Work. The Contract Sum and the Contract Time shall be adjusted accordingly. All such changes in the Work shall be authorized by Change Order, Modification, or Change Directive, and all Work involved in a change shall be performed in accordance with the terms and conditions of the Contract Documents. If the Contractor should proceed with a change in the Work upon an oral order, by whomsoever given, it shall constitute a waiver by the Contractor of any claim for an increase in the Contract Sum and/or Contract Time, on account thereof.

12.2 FIELD ORDER

12.2.1 A Field Order is a written order to the Contractor signed by the Owner’s designated representative, interpreting or clarifying the Contract Documents or directing the Contractor to perform minor changes in the Work. Any work relating to the issuance of a Field Order shall be performed promptly and expeditiously and without additional cost to the Owner and within the Contract Time, unless the Contractor submits a Proposed Change Order, defined below, which is approved by the Owner. Field Orders shall be numbered consecutively by date of issuance by the Owner.

12.3 OWNER CHANGE REQUEST

12.3.1 An Owner Change Request is a written request from the Owner to the Contractor that describes a proposed change in the Work. The Contractor is required to submit a complete proposal for the total cost and additional time, if any, necessary to perform the proposed change in the Work. Owner Change Requests shall be numbered consecutively by date of issuance by the Owner.

12.4 CONTRACTOR'S PROPOSED CHANGE ORDER

12.4.1 A Contractor's Proposed Change Order is a written request from the Contractor to the Owner requesting a change in the Contract Sum and/or Contract Time. A Contractor's Proposed Change Order is submitted as a proposal in response to an Owner Change Request or as a claim for an increase in the Contract Sum or Contract Time pursuant to the issuance of a Field Order, or as a result of unforeseen circumstances, such as an unknown site conditions.

Change Orders for unforeseen site conditions will only be entertained if the Contractor has not accepted responsibility for the unforeseen site conditions pursuant to other provisions in the Contract Documents. A Contractor's Proposed Change Order must be submitted within twenty (20) calendar days of the issuance of an Owner Change Request or a Field Order or the discovery of an unforeseen circumstance. The Contractor shall not be entitled to any adjustment to the Contract Time or Contract Sum if Contractor fails to comply strictly with the requirements of the preceding sentence. Contractor's Proposed Change Orders shall be numbered consecutively by date of issuance by the Contractor. The Contractor shall also indicate on the Proposed Change Order the number of the Owner Change Request

or the Field Order to which it responds. The Contractor understands and agrees to the City's provisions and policy regarding Change Orders as outlined in Article 1, section 1.1.2 of these General Conditions.

12.4.2 In the case of unit price items, it is understood and agreed by the Contractor that the estimates of the quantities in unit price items are approximate only and are presented solely for the purpose of comparing bids and may not represent the actual amount of work to be performed. The Contractor, therefore, understands and agrees that the Owner reserves the right to increase, decrease or eliminate entirely the quantity of work to be done under any item. If called upon to do more work under any unit price item named in the Bid Documents, he will perform all such additional work and accept as payment the unit price named in the proposal, subject to the 20% deviation limitations specified in subparagraph 12.4.2.2.

12.4.2.1 The Contractor's Proposed Change Order shall be determined by applicable unit prices, if any, as set forth in the Contract.

12.4.2.2 However, if changes in quantities are of an item increase the actual work to more than twenty percent (20%) of the original bid quantity for that item, or decrease quantities of that item more than 20% of the original bid quantity for that item, then the Owner or the Contractor shall have the right to request a decrease or an increase in the unit price for the item for quantities greater than 120% or less than 80% of the original bid quantity for that item.

12.4.2.3 It shall be understood that such unit prices shall constitute full payment for the extra work performed, including, but not limited to, “general conditions” costs, plant, materials, labor, equipment, overhead, profit, and safety requirements.

12.4.3 If no such unit prices are set forth, the Contractor's proposal shall be on a lump sum basis and shall be itemized and segregated by labor, equipment, and materials for the various components of the change in the Work (no aggregate labor total will be acceptable) and shall be accompanied by signed proposals of any Subcontractors who will perform any portion of the change in the Work and of any persons who will furnish materials or equipment for incorporation therein.

12.4.3.1 The portion of the proposal relating to labor, whether by the Contractor's forces or the forces of any of its Subcontractors, may include reasonably anticipated gross wages of job site labor, including foremen, who will be directly involved in the change in the Work (for such time as they will be so involved), plus separately identified payroll costs (including premium costs of overtime labor, if overtime is authorized, Social Security, Federal or State unemployment insurance taxes and fringe benefits required by collective bargaining agreements entered into by the Contractor or any such Subcontractor in connection with such labor).

12.4.3.2 The portion of the proposal relating to materials may include the reasonably anticipated direct costs to the Contractor or to any of its Subcontractors of materials to be purchased for incorporation in the change in the Work, plus transportation and applicable sales or use taxes.

12.4.3.3 The proposal may further include the Contractor's and any of his Subcontractor's reasonably anticipated equipment rental costs, except small hand tools, in connection with the change in the Work.

12.4.4 Base Cost is defined as the total of labor, material and equipment rentals as described in subparagraphs 12.4.3.1, 12.4.3.2 and 12.4.3.3. The actual net cost in money to the Owner for the change in the Work shall be computed as follows:

.1 If the Contractor performs the change in the Work without use of Subcontractors or sub-subcontractors, his compensation will be the Base Costs as described above, plus a maximum mark-up of 15% for overhead and profit.

.2 If the work is performed by a bona fide Subcontractor, the Subcontractor's compensation will be the Base Costs as described above plus a maximum mark-up of 15% for overhead and profit. The Contractor's compensation will be a maximum mark-up of five percent (5%) of the Subcontractors Base Costs for his overhead and profit.

.3 If the Work is performed by a bona fide Sub-subcontractor, the Subcontractor's compensation will be the Base Costs as herein described, plus a maximum mark-up of 15% for overhead profits. The mark-up of any Sub-subcontractor's work by the Contractor and all intervening tiers of Subcontractors shall not exceed a total of 10%.

12.4.5 The mark-up on the cost of labor, materials, and equipment described in Paragraphs 12.4.4.1, 12.4.4.2, and 12.4.4.3 shall be all the compensation to which the Contractor, Subcontractors and Sub-subcontractor are entitled for all indirect costs associated with or relating to the change in the Work including, but not limited to, labor and/or equipment inefficiency, changes in sequence, delays, interferences, impact on unchanged work, gross receipts tax, superintendent, small tools, reproduction, administration, insurance, unrelated safety requirements, temporary structures and offices, all other general and administrative, home office and field office expenses.

12.4.6 The Proposed Change Order may also include the cost of increases in premiums for the Payment Bond and the Performance Bond, provided coverage for the cost of the change in Work results in such increased costs. At the Owner's request, the Contractor shall provide proof of his notification to the surety of the change in the Work and of the surety's agreement to include such change in its coverage. The cost of the increase in premiums shall not be marked up.

12.4.7 In the event that it is necessary to increase the Contract Time in order to perform the change in the Work, the Contractor shall provide an estimate of the increase in the Contract Time as part of the Proposed Change Order. The Contractor's request for a time extension shall be evaluated in accordance with the criteria described in Article 8.3, Claims for Time Extensions.

12.4.8 If the Contractor's Proposed Change Order is rejected by the Owner as being within the scope of the Work required by the Contract Documents, the Owner may, at its sole option and discretion, direct the Contractor to perform the Work which is the subject of the said Proposed Change Order, with claimed compensation to be accounted for pursuant to 12.6 and to be subject to the procedures of Article 13. The Contractor shall then promptly proceed with said Work. Nothing herein shall excuse the timely performance by the Contractor of the Work because any Proposed Change Order is pending.

12.5 CHANGE ORDER

12.5.1 A Change Order is a written order to the Contractor signed by the Owner, issued after execution of the Contract, authorizing a change in the Work or an adjustment in the Contract Sum and/or the Contract Time. The Contract Sum and the Contract Time may be changed only by Change Order. A Change Order signed by the Contractor indicates his agreement therewith, including the adjustment in the Contract Sum and/or the Contract Time. Change Orders shall be numbered consecutively by date of issuance by the Owner and shall, if applicable, indicate the number of the Field Order(s), Request for Proposal(s) and/or Proposed Change Order(s) to which they relate.

12.5.1.1 If the Owner determines that the Contractor's Proposed Change Order, submitted pursuant to Article 12.4 for a change in the Contract Sum or Contract Time, is

acceptable, the Owner shall prepare and issue a Change Order which will authorize the Contractor to proceed with the change in the Work with the adjustment to Contract Sum and Contract Time stated in the Proposed Change Order, or as otherwise may be agreed upon by the parties. The amounts stated in the Change Order for the adjustment to Contract Sum and Contract Time for the change in the Work shall be binding on the parties.

12.5.2 After issuance of the Change Order, the Contractor shall ensure that the amount of the Performance and Payment Bond coverage has been revised to reflect the increase in the Contract Sum due to the Change Order. Notwithstanding the foregoing, Contractor's failure to do so shall not release any surety from its obligations under any bonds.

12.6 CHANGE DIRECTIVE

12.6.1 If Owner and Contractor cannot agree as to whether something constitutes a change to the Work originally contemplated by the Contract Documents, or if they cannot agree as to the adjustment to the Contract Sum or Contract Time required for what Owner acknowledges to be a change to the Work constituting Extra Work, Owner may, in his sole discretion, issue a written Change Directive directing Contractor to perform such work. Contractor shall then promptly proceed with the work at issue. Owner may elect, in its sole discretion, to have the compensation or claimed compensation for such work accounted for on either a time and material basis or lump sum basis as described in 12.6.2 and 12.6.3.

12.6.2 If Owner elects to have the compensation and/or claimed compensation accounted for on a time and materials basis, the following procedures apply:

12.6.2.1 Change Directive work, the compensation or claimed compensation for which is being accounted for on a time and material basis shall be performed, whether by the Contractor's forces or the forces of any of its Subcontractors' or Sub-subcontractors', at actual cost to the entity performing the Work (without any charge for administration, clerical expense, supervision or superintendent of any nature whatsoever). The percent mark-ups for the Contractor, Subcontractors and Sub-subcontractor's shall be as described in subparagraphs 12.4.4 and 12.4.5.

12.6.2.2 Prior to starting the Change Directive work on a time and material basis, the Contractor shall notify the Owner in writing as to what labor, materials, equipment or rentals are to be used for the change or claimed change in the Work. During performance, the Contractor shall submit to the Owner daily time and material tickets, which shall list the categories and amounts of labor and equipment for which Change Directive compensation is to be charged for the previous work day. Such tickets shall specifically include the following information: location and description of the change in the Work, the classification of labor employed, including names and social security numbers of laborers, labor trades used, man hours, wage rates, insurance, taxes and fringe benefits, equipment and materials suppliers' quotations with detailed break-out and pricing, rental equipment hours and rates, and materials quantities and unit prices and such other evidence of cost as the Owner may require.

12.6.2.3 The Contractor shall commence submission of daily time and material tickets immediately upon commencement of the Change Directive work and continue to submit them until completion of the Change Directive work. The Owner may require authentication of all time and material tickets and invoices by persons designated by the Owner for such purpose.

12.6.2.4 No payment will be made to the Contractor for any portion of the Change Directive work that Owner acknowledges to be Extra Work unless and until such daily time and material tickets and invoices are submitted. The submission of any such ticket or invoice shall not constitute an acknowledgment by the Owner that the items thereon were reasonably required for the Change Directive work.

12.6.2.5. For any work performed on a time and material basis, the Contractor shall submit its complete submission of the reasonable actual cost and time to perform the change in the Work within twenty (20) days after such Work has been completed. If Change Directive work includes both Work that Owner acknowledges to be Extra Work and work that Owner disputes to be Extra Work, Contractor shall clearly segregate its accounting for the two. The Owner shall review the costs and time submitted by the Contractor on the basis of reasonable expenditures and savings of those performing the Change Directive work. If such costs and time are acceptable to the Owner, or if the parties otherwise agree to the actual reasonable cost to perform the Change Directive work, a Change Order will be issued for the cost and time agreed upon. The amounts stated in the Change Order for the cost and time to perform the Change Directive work shall be binding upon the parties.

12.6.3 If Owner elects to have the compensation or claimed compensation accounted for on a lump sum basis, Owner may make a unilateral determination of a reasonable adjustment in Contract Sum and Contract Time due to the Change Directive. Any unresolved dispute about the reasonableness of Owner's unilateral determination shall be subject to Article 13, Claims and Dispute Procedure.

12.7 DECREASES AND WORK NOT PERFORMED (Deductive Change Orders)

12.7.1 Should it be deemed expedient by the Owner to decrease the dimensions, quantity of material or Work, or vary in any other way the Work required by the Contract Documents, the Owner may direct by written Change Order, such decreases to be made or performed without in any way affecting the validity of the Contract. The Contractor shall~~,~~ comply with the Change Order from the Owner. The difference in expense occasioned by such decrease shall be deducted from the amount payable under this Contract.

12.7.2 When Work is deleted from the Contract by Owner, the amounts to be credited to the Owner shall reflect the same current pricing as if the Work were being added to the Contract at the time the deletion is ordered, and Contractor shall provide documentation for a credit as specified in Article 12.5.4. If such deleted materials and equipment shall have already been purchased and stored on site and cannot be used in other projects, cannot be returned for credit or cannot be returned for credit at the price paid by the Contractor at the time of purchase, the Contractor shall be entitled, upon proper documentation and certification, to an adjustment in the pricing of the credit to avoid hardship to the Contractor. If necessary in order to establish such reasonable value, the Contractor may be required to submit a detailed breakdown of his original bid and all documents upon which Contractor's bid was based for the items or Work involved.

12.7.3 If Work is not performed, and such deletion of Work was not directed or approved by the Owner, the Owner shall ascertain the amount of the credit due.

12.8 CHANGES IN LINE AND GRADE

12.8.1 The Owner reserves the right to make such alterations in the line and grade of various structures or pipe lines shown on the drawings, as may be necessitated by conditions found during construction or that in

the judgment of the Owner appears advisable. Such alterations shall in no way affect the validity of the Contract

12.8.1.1 In case of a unit price contract, if such changes increase the amount of the Work or materials, the Contractor will be paid according to the quantity of Work actually done at the prices established for such Work under the Contract.

12.8.1.2 In case of a lump sum contract, the price for the Work shall be determined as specified in Article 12.4, Proposed Change Order.

12.9 SUBSURFACE CONDITIONS FOUND DIFFERENT

12.9.1 Should the Contractor encounter subsurface and/or latent conditions at the site materially differing from those shown on the drawings or indicated in the specifications, he shall immediately give Notice to the Owner of such conditions before they are disturbed. The Owner shall thereupon promptly investigate the conditions and if he finds that they materially differ from those shown on the drawings or indicated in the specifications, he shall at once make such changes in the drawings and/or specifications as he may find necessary. Any increase or decrease of cost resulting from such changes shall be adjusted in the manner provided herein for adjustments as to extra and/or additional work and changes. Notwithstanding the foregoing, if the Contract Documents indicate elsewhere that excavation is to be on an unclassified basis, Contractor shall not be entitled to any adjustment to the Contract Sum or Contract Time based upon this 12.9.

12.10 OTHER CLAIMS

If the Contractor claims that additional cost or time is involved because of, but not limited to, (1) any written interpretation pursuant to Article 2, Architect/Engineer, (2) any order by the Owner to stop the Work pursuant to Article 3, Owner, where the Contractor was not at fault, (3) failure of payment by the Owner pursuant to Article 9 Payments and Completion, or (4) any written order for a minor change in the Work issued pursuant to Article 12.8, Changes in Line and Grade~~;~~, the Contractor shall make such claim as provided in Section 12, Changes and Modification in the Work~~.~~, and Article 13, Claims and Dispute Procedure.

ARTICLE 13 CLAIMS AND DISPUTE PROCEDURE

Any Claims by the Contractor arising under or relating to the Contract or the Contract Documents shall only be resolved as follows:

13.1. INITIAL NOTICE, SUBMISSION OF CLAIM, AND CONSIDERATION.

a. The Contractor shall give the Owner and the A/E written notice of any Claim within ten (10) days of the beginning of the occurrence of the event leading to the Claim. The written notice shall be a document from the Contractor addressed to the Owner's and A/E's officials or employees designated by the Contract Documents to receive such notice, or if no one is so designated, to the Owner's City Manager and to the A/E. The written notice shall clearly state the Contractor's intention to make a claim, shall describe the occurrence involved, and shall be transmitted in a manner to ensure receipt by the Owner and A/E within the ten (10) days. The Contractor shall submit the Claim and any supporting data to the Owner and A/E within thirty (30) days after the occurrence giving rise to the Claim ends. The burden shall be on the Contractor to substantiate that it has given written notice and submitted its Claim in accordance with this provision.

b. The Claim must (i) be certified under oath as true and correct by a principal of Contractor; (ii) must be for specific relief; (iii) if any money is sought, must specify the dollar amount sought; and (iv)

must contain sufficient supporting documentation to reasonably allow its consideration, including without limitation, any documentation required by the Contract Documents. The burden shall be on the Contractor to substantiate the Claim.

c. The Contractor shall comply with all other terms and conditions of the Contract Documents, including without limitation, those in Articles 8 and 12, as applicable. No decision by the A/E on a claim shall be binding on the Owner, but such decision shall have whatever effect on the Contractor that the Contract Documents provide.

d. Following consideration by the A/E, and following initial, informal consideration by the Owner's City Manager or his designee, the parties shall endeavor to resolve any Claim through direct negotiations, and if such direct negotiations fail, and if the Owner requests, by non-binding mediation conducted pursuant to the Rules of the American Arbitration Association, with the site of the mediation being Lynchburg, Virginia.

e. Should the Claim remain unresolved for more than 60 days after it is submitted, then the City Manager or his designee shall, within no later than 90 days after the Claim's submission, render a written decision on the Claim on behalf of the Owner . The Contractor may not institute any legal action with respect to the Claim until after the City Manager or his designee renders his written decision or 90 days from its receipt by the City Manager has passed, whichever comes first. The only effect of the failure by the City Manager or his designee to render a decision within this 90-day period is to allow the Contractor to institute a legal action pursuant to this provision without having to wait for a decision on the Claim concerned.

13.2 APPEAL OF DENIAL OF CLAIM.

a. If the Owner denies in whole or part a Claim by Contractor or more than 90 days have passed since the Claim was received by the City Manager but no written decision has been issued, the Contractor may appeal denial of the claim by instituting an action in the Lynchburg Circuit Court, Lynchburg, Virginia, or if the subject or amount in controversy is within its jurisdiction, the Lynchburg General District Court, Lynchburg, Virginia, and may thereafter pursue all available appeals in Virginia state courts, to the extent they have jurisdiction.

b. The Contractor must initiate its appeal of the Claim within 180 days of the date it first has the right to do so or the Claim will be barred and the Owner’s decision will be binding and conclusive.

c. The Contractor may not amend its Claim on appeal to increase the amount of money sought.

d. In the event of any Claim arising, Contractor shall continue its performance diligently during such Claim's pendency and thereafter as if no Claim had arisen. During the pendency of any Claim in connection with the payments of moneys, Contractor shall be entitled to receive payments for non-disputed items, subject to any right of set-off by Owner.

13.3 Notwithstanding anything in the Contract Documents to the contrary, the Owner may, in its discretion, assert a Claim without first resorting to any procedures contained in the Contract Documents.

13.4 "Claim" means a "claim" as defined in the Lynchburg Public Procurement Code.

13.5 Notwithstanding anything in the Contract Documents to the contrary, Owner shall not be liable to Contractor for any damages or increase in the Contract Sum due to delays to Contractor, any Subcontractor, or any other person except due to extent required by Virginia Code § 2.2-4335.

ARTICLE 14 UNCOVERING AND CORRECTION OF WORK

14.1 UNCOVERING OF WORK

14.1.1 If any portion of the Work should be covered contrary to: (1) the request of the A/E or Owner; (2) requirements specifically expressed in the Contract Documents; or (3) the requirements of applicable permits, it must, if required in writing by the Owner, be uncovered for the Owner's and A/E's observation and shall be replaced at the Contractor's expense.

14.1.2 If any other portion of the Work has been covered which the Owner has not specifically requested to observe prior to being covered, the Owner may request to see such Work and it shall be uncovered by the Contractor. If such Work be found in accordance with the Contract Documents, the cost of uncovering and replacement shall, by appropriate Change Order, be charged to the Owner. If such Work be found not in accordance with the Contract Documents, the Contractor shall pay such costs unless it is found that this condition was caused solely by the Owner, in which event the Owner shall be responsible for the payment of such costs. If such Work be found not in accordance with the Contract Documents and the condition was caused by a separate contractor, Contractor may proceed against said separate contractor as provided in Article 6, Work by Owner or by Separate Contractors.

14.2 WARRANTY AND CORRECTION OF WORK

14.2.1 The Contractor guarantees and warrants to the Owner all Work as follows:

.1 That all materials and equipment furnished under this Contract will be new and the best of its respective kind unless otherwise specified;

.2 That all Work will be of first-class quality and free of omissions and faulty, imperfect or defective material or workmanship;

.3 That the Work shall be entirely watertight and leakproof in accordance with all applicable industry customs and practices, and shall be free of shrinkage and settlement which are attributable to defective materials or workmanship;

.4 That the Work, including but not limited to, mechanical and electrical machines, devices and equipment shall be fit and fully usable for its intended and specified purpose and shall operate satisfactorily with ordinary care;

.5 That consistent with requirements of the Contract Documents the Work shall be installed and oriented in such a manner as to facilitate unrestricted access for the operation and maintenance of fixed equipment; and

.6 That the Work will be free of abnormal or unusual deterioration which occurs because of poor quality materials or workmanship.

14.2.2 All Work not conforming to guarantees and warranties specified in the Contract Documents, including substitutions not properly approved and authorized, may be considered defective. If required by the Owner, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment furnished and installed.

14.2.3 The Contractor shall within five (5) working days after receipt of written Notice from the Owner during the performance of the Work, reconstruct, replace or correct all Work rejected by the A/E or Owner as defective, as failing to conform to the Contract Documents, or as not in accordance with the guarantees

and warranties specified in the Contract Documents , whether observed before or after Substantial Completion and whether or not fabricated, installed or completed. The Contractor shall bear all costs of reconstructing, replacing or correcting such rejected Work, including compensation for the A/E's additional services made necessary thereby.

14.2.4 If, within one (1) year after the Date of Final Completion of the Work or designated portion thereof or within one (1) year after acceptance by the Owner of designated equipment or within such longer period of time as may be prescribed by law or by the terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be defective, not in accordance with the Contract Documents, or not in accordance with the guarantees and warranties specified in the Contract Documents, the Contractor shall correct it within five (5) working days after receipt of a written Notice from the Owner to do so unless the Owner has previously given the Contractor a written acceptance of such condition pursuant to 14.3, Acceptance of Faulty, Defective or Non-Conforming Work. This obligation shall survive termination of the Contract. The Owner shall give such Notice within a reasonable time after discovery of the condition.

14.2.5 Subject to limitation as prescribed by law, if at any time deficiencies in the Work are discovered which are found to have resulted from fraud or misrepresentation, or an intent or attempt to defraud the Owner by the Contractor, any Subcontractor or supplier, the Contractor will be liable for replacement or correction of such Work and any damages which Owner has incurred related thereto, regardless of the time limit of any guarantee or warranty.

14.2.6 Any materials or other portions of the Work, installed, furnished or stored on site which are not of the character or quality required by the specifications, or are otherwise not acceptable to the Owner, shall be immediately removed and replaced by the Contractor to the satisfaction of the Owner, when notified to do so by the Owner.

14.2.7 If the Contractor fails to correct defective or nonconforming Work as required by Articles 13.2.3 and 13.2.4, or if the Contractor fails to remove defective or nonconforming Work from the site, as required by Article 13.2.6, the Owner may elect to either correct such Work in accordance with Article 3.5, Owner’s Right to Carry Out the Work, or remove and store materials and equipment at the expense of the Contractor. If the Contractor does not pay the cost of such removal and storage within ten (10) days thereafter, the Owner may, upon ten additional days written Notice, sell such Work at auction or at public or private sale and shall account for the net proceeds thereof, after deducting the costs of the sale and all of the costs that should have been borne by the Contractor, including compensation for the A/E's additional services made necessary thereby. If such proceeds of sale do not cover all costs indicated in the previous sentence, the difference shall be charged to the Contractor and an appropriate Change Order shall be issued. If the payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor or its surety shall pay the difference to the Owner.

14.2.8 The Contractor shall bear the cost of making good all work of the Owner, separate contractors or others, destroyed or damaged by such correction or removal required under this Article.

14.3 ACCEPTANCE OF FAULTY, DEFECTIVE OR NON-CONFORMING WORK

If the Owner prefers to accept faulty, defective or nonconforming Work, he may do so instead of requiring its removal and correction, in which case a Change Order will be issued at Owner's option, to reflect a reduction in the Contract Sum in an amount to be determined by the Owner.

ARTICLE 15 TERMINATION OF THE CONTRACT

15.1 CONTRACTOR'S RIGHT TO STOP WORK OR TERMINATE CONTRACT

If the Work should be stopped under an order of any court or other public authority for a period of ninety (90) days through no fault of the Contractor or anyone providing services, materials or equipment through him, or if the Owner should fail to pay to the Contractor within thirty (30) days any sum for which a Certificate of Payment has been certified when no dispute exists as to the sum due and Owner has no right to withhold payment under any provision of the Contract Documents, then the Contractor may, upon ten (10) days written Notice to the Owner, stop Work or terminate the Contract and recover from the Owner payment for the cost of the Work actually performed, together with overhead and profit thereon, but profit on the Work performed shall be recovered only to the extent that the Contractor can demonstrate that he would have had profit on the entire Contract if he had completed the Work. The Contractor may not receive profit or any other type of compensation for parts of the Work not performed. The Contractor may recover the reasonable cost of physically closing down the Site, but no other costs of termination. The Owner may offset any claims it may have against the Contractor against the amounts due to the Contractor. In no event shall termination of the Contract by the Contractor terminate the obligations of the Contractor's surety on its payment and performance bonds.

15.2 OWNER'S RIGHT TO TERMINATE CONTRACT FOR CAUSE

15.2.1 The Owner may terminate the Contract for cause based upon any of the following grounds:

15.2.1.1 If the Contractor should be adjudged as bankrupt, or if he should make a general assignment for the benefit of his creditors, or if a receiver should be appointed on account of his insolvency.

15.2.1.2 If the Contractor should refuse or should repeatedly fail, except in cases for which extension of time is provided, to supply enough properly skilled workmen or proper materials and equipment.

15.2.1.3 If the Contractor should fail to make prompt payment to subcontractors or suppliers of material of labor.

15.2.1.4 If the Contractor should disregard laws, ordinances, codes, regulations, or the written instructions of the Architect/Engineer or the Owner.

15.2.1.5 If the Contractor be in substantial violation of any provision of the Contract Documents.

15.2.2 For termination for cause based upon the grounds in 15.2.1.1, Owner may terminate without prior notice and without giving Contractor any opportunity to rectify the basis for termination. For termination for cause based upon any other grounds, prior to termination of the Contract, the Owner shall give the Contractor and his surety Notice followed by a ten (10) day period during which the Contractor and/or his surety may rectify the basis for the Notice. If rectified to the satisfaction of the Owner within said ten (10) days, the Owner may rescind its notice of termination. If not, the termination for cause shall become effective at the end of the ten (10) day notice period. Notwithstanding the foregoing, the Owner may, in writing, postpone the effective date of the termination for cause, at its sole discretion, if it should receive reassurances from the Contractor and/or his surety that the basis for the termination will be remedied within a time and in a manner which the Owner finds acceptable. If at any time after such postponement, the Owner determines that Contractor and/or his surety has not or is not likely to rectify the causes of termination in an acceptable manner or within the time allowed, then the Owner may immediately terminate the Contract for cause, without the necessity of allowing any further opportunity by the Contractor and/or surety to rectify the basis for the Notice, by notifying the Contractor and his surety in writing of the termination. In no event shall termination for cause terminate the obligations of the Contractor's surety on its payment and performance bonds.

15.2.3 Upon termination of the Contract, the Contractor shall immediately cease Work, and the Owner may take possession of the site and of all materials, tools and equipment thereon and finish the Work by whatever method he may deem expedient. In such case, the Contractor shall not be entitled to receive any further payment until the Owner has finally completed the Work through its own resources or those of a subsequent contractor. If the Owner's damages, including the expense of finishing the Work, compensation for additional design, managerial and administrative services, any liquidated damages, and any claims by the Owner, shall exceed the unpaid balance of the Contract Sum, the Contractor shall pay the difference to the Owner, together with any other expenses of terminating the Contract and having it completed by others. If the unpaid balance of the Contract Sum exceeds Owner's damages, including the costs of finishing the Work, compensation for additional design, managerial and administrative services, any liquidated damages and any claims by Owner, together with any other expenses of terminating the Contract and having it completed by others, such excess shall be paid to the Contractor.

15.2.4 If it should be judicially determined that the Owner improperly terminated this Contract for cause, then the termination shall be deemed to be a termination for the convenience of the Owner, with Contractor's recovery limited to what is allowed for a termination for convenience under the Contract Documents.

15.2.5 Termination of the Contract under this Section is without prejudice to any other right or remedy of the Owner.

15.3 OWNER'S RIGHT TO TERMINATE CONTRACT FOR CONVENIENCE

15.3.1 Owner may terminate this Contract, in whole or in part, at any time without cause upon giving the Contractor written Notice of such termination. Upon such termination, the Contractor shall immediately cease Work and remove from the site all of its labor forces and such of its materials and equipment as Owner elects not to purchase or to assume in the manner hereinafter provided. Upon such termination, the Contractor shall take such steps as Owner may require to assign to the Owner the Contractor's interest in all subcontracts and purchase orders designated by Owner. After all such steps have been taken to Owner's satisfaction, the Contractor shall receive as full compensation for termination and assignment the following:

(2) Amounts due for Work performed in accordance with the Contract through the date of termination.

(3) 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 or damages for lost profits or for any other type of contractual compensation or damages other than those provided by the preceding sentence. Upon payment of the foregoing, Owner shall have no further obligations to Contractor of any nature.

15.3.2 In no event shall termination for the convenience of the Owner terminate the obligations of the Contractor's surety on its payment and performance bonds.

15.3.3 After receipt of a Notice of termination, the Contractor shall promptly submit to the Owner his termination claim. Such claim shall be submitted no later than forty-five (45) days from the effective date of termination. Upon failure of the Contractor to submit his termination claim within the time allowed, the Owner may determine, on the basis of information available to it, the amount, if any, due to the Contractor by reason of the termination.

15.4 CONTRACTOR'S RESPONSIBILITIES UPON TERMINATION

15.4.1 After receipt of a notice of termination pursuant to 15.3, Owner's Right to Terminate Contract for Convenience, the Contractor shall mitigate any damages to the extent reasonably possible.

15.4.2 In addition to the provisions of 15.4.1, the Contractor shall:

.1 At the option of the Owner, assign to the Owner, in the manner, at the time, and to the extent directed by the Owner, all of the right, title, and interest of the Contractor under the orders and subcontracts so terminated, in which case the Owner shall have the right, in its discretion, to settle or pay any or all claims arising out of the termination of such orders and subcontracts;

.2 Transfer title and deliver to the Owner in the manner, at the times, and to the extent, if any, directed by the Owner:

a) The fabricated or un-fabricated parts, work in process, completed Work, supplies, and other material and equipment procured as a part of, or acquired in connection with the performance of the Work terminated by the Notice of Termination, and

b) The completed or partially completed drawings, releases, information, manuals and other property which, if the Contract had been completed, would have been required to be furnished to the Owner;

.3 Complete performance of such part of the Work as shall not have been terminated by the Notice of Termination; and

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

PROJECT MANUAL
FOR
CITY OF LYNCHBURG

June 2, 2010

100 % Submittal

Renovation & Alterations
of the
College Hill Facilities – Historic Filter Building

CITY OF LYNCHBURG
CITY PROJECT NO. 09050-W

PROCUREMENT DIVISION
3RD FLOOR CITY HALL
900 CHURCH STREET
LYNCHBURG, VA 24504
TELEPHONE (434) 455-3961
FAX (434) 845-0711

PROJECT MANUAL
for
RENOVATION & ALTERATIONS
to the
COLLEGE HILL FACILITIES – HISTORIC FILTER BUILDING

100 % SUBMITTAL

CITY OF LYNCHBURG

CITY PROJECT No. 09050-W

CCAP DESIGN PROJECT NO. 07197

June 2, 2010

CITY OF LYNCHBURG – Owner's Representative
Scott Parkins, P.E., Utility Engineer
Department of Utilities
525 Taylor Street
Lynchburg, Virginia 24501

Architect

Craddock Cunningham
Architectural Partners
10 Ninth Street
Lynchburg, Virginia 24504
434.846.8456

MEP Engineers

Master Engineers and Designers, Inc
Lynchburg, Virginia

Civil

Hurt & Proffitt, Inc.
Lynchburg, Virginia

SECTION 000107

SEALS PAGE

CRADDOCK CUNNINGHAM ARCHITECTURAL PARTNERS, PC

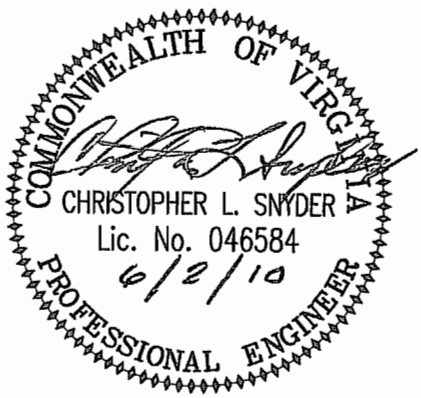
LYNCHBURG, VIRGINIA

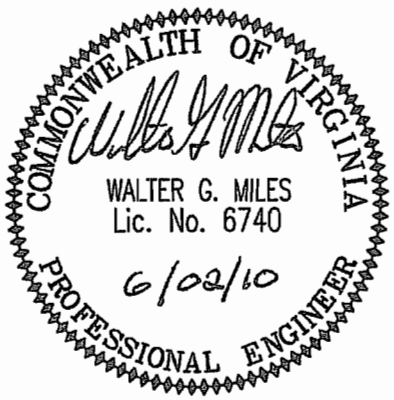




MASTER ENGINEERS AND DESIGNERS, INC.

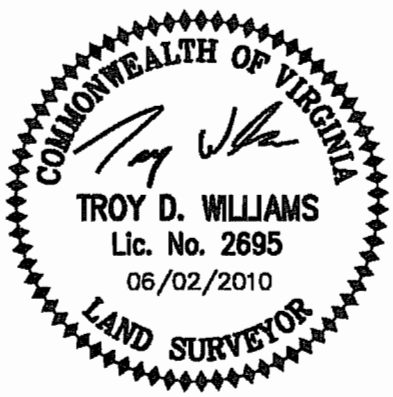
LYNCHBURG, VIRGINIA





HURT & PROFFITT, INC

LYNCHBURG, VIRGINIA





SECTION 000110

TABLE OF CONTENTS

PROCUREMENT AND CONTRACTING REQUIREMENTS

Division 00 -- Procurement and Contracting Requirements

000107 - Seals Page

000110 - Table of Contents

BIDDING AND CONTRACTING REQUIREMENTS – See separate volume for bidding and contracting requirements.

SPECIFICATIONS

Division 01 -- General Requirements

011000 - Summary

012100 - Allowances

012300 - Alternates

013000 - Administrative Requirements

014000 - Quality Requirements

015000 - Temporary Facilities and Controls

016000 - Product Requirements

017000 - Execution and Closeout Requirements

017800 - Closeout Submittals

Division 02 -- Existing Conditions / Civil / Site (also see Division 32)

02200 - Earthwork

02220 – Trenching, Backfilling and Compaction of Utilities

02400 – Curb & Gutter, Driveways & Sidewalks

02500 - Base Course and Paving

024100 – Selective Building Elements Demolition

024119 – Selective Structure Demolition

02720 – Storm Drainage

Division 03 -- Concrete

033000 - Cast-in-Place Concrete

033660 – Stained Concrete Floor

035400 – Cementitious Underlayment

039200 – Concrete Resurfacers

Division 04 -- Masonry

040100 - Maintenance of Masonry

040101 – Masonry Repointing and Cleaning Procedures for Historic Buildings

Division 05 -- Metals

055000 - Metal Fabrications

055100 - Metal Stairs

055213 - Pipe and Tube Railings

Division 06 -- Wood, Plastics, and Composites

061000 - Rough Carpentry

062000 – Finished Carpentry

064100 - Architectural Wood Casework

Division 07 -- Thermal and Moisture Protection

077200 - Roof Accessories

075400 – Thermoplastic Membrane Roofing

076200 – Sheet Metal Flashing and Trim

079005 - Joint Sealers

Division 08 -- Openings

081213 - Hollow Metal Frames

081433 - Stile and Rail Wood Doors

084126 – All-Glass Entrance

084313 - Aluminum-Framed Storefronts

084500 - Translucent Roof Assemblies

085200 - Wood Windows

085800 – Aluminum Sliding Service Window

087100 - Door Hardware

088000 - Glazing

Division 09 -- Finishes

092116 - Gypsum Board Assemblies

093000 - Tiling

095100 - Acoustical Ceilings

096500 - Resilient Flooring

096813 - Tile Carpeting

098400 – Acoustic Panel Components

099000 - Painting and Coating (including lead paint report)

099100 – Painting

099300 – Staining and Transparent Finishing

Division 10 -- Specialties

101400 - Signage

102113.20 - Plastic Toilet Compartments

102800 – Toilet Accessories

104400 - Fire Protection Specialties

105100 – Locker Bench

107314 - Canopies

Division 11 -- Equipment

113100 - Residential Appliances

Division 12 -- Furnishings

122113 - Horizontal Louver Blinds

124813 - Entrance Floor Mats and Frames

Division 13 -- Special Construction

Division 14 -- Conveying Equipment

Division 21 -- Fire Suppression

Division 22 – Plumbing

220500 - Common Work Results for Plumbing

220529 - Hangers and Supports for Plumbing Piping and Equipment

220553 - Identification for Plumbing Piping and Equipment

220700 - Plumbing Insulation

221116 - Domestic Water Piping

221119 - Domestic Water Piping Specialties

221316 - Sanitary Waste and Vent Piping

221319 - Sanitary Waste Piping Specialties

223301 – Electric Hybrid Domestic Water Heaters

224000 - Plumbing Fixtures

Division 23 -- Heating, Ventilating, and Air-Conditioning (HVAC)

230100 - Mechanical General Provisions

230513 – Motors

230514 – Adjustable Frequency Motor Drives (AFD's)

230593 - Testing, Adjusting, and Balancing for HVAC

230700 - HVAC Insulation

232113 - Hydronic Piping
232123 – Hydronic Pumps
232500 – Chemical Treatment Systems
233113 - Metal Ducts
233423 - HVAC Power Ventilators
233713 - Diffusers, Registers, and Grilles
238146 – Water to Air, Packaged Heat Pumps

Division 26 – Electrical

260100 - Electrical General Provisions
260120 - Coordination
260130 - Reworking Existing System
260173 - Short Circuit and Overcurrent Protective Device Coordination Study & Arc Flash Analysis
260200 - Fire Stopping Systems
260300 - Metallic Raceway
260313 - Surface Raceways
260400 - Nonmetallic Raceway
260519 - Wire, Cable, and Wiring (Single-Conductor) (600 Volt Max)
260526 - Grounding
260529 - Supporting Devices
260533 - Pull and Junction Boxes
260534 - Wiring Device Boxes
262213 - Dry Type Transformers
262416 - Panelboards
262726 - Wiring Devices
262813 - Fuses
262815 - Safety Switches
262816 - Molded Case Circuit Breakers (MCCB)
262913 - Motor Starters
265100 - Lighting, Interior
265110 - Lighting, Exterior
265120 - Lamps
265130 - Ballasts
265140 - Occupancy Sensors

Division 27 -- Communications

Division 28 -- Electronic Safety and Security

Division 31 -- Earthwork

Division 32 -- Exterior Improvements

321413 - Concrete Pavers

323100 – High Security Steel Fence System

Division 33 -- Utilities

END OF TABLE OF CONTENTS

SECTION 011000

SUMMARY

PART 1 GENERAL

1.01 PROJECT

A. Project Name: City of Lynchburg - College Hill Facilities Filter Building Renovation & Alterations.

B. City Project No. 09050-W

C. Owner's Name: City of Lynchburg.

D. Owner's Project Manager: Scott Parkins, P.E.

E. Architect's Name: Craddock Cunningham Architectural Partners.

F. Architect's Project Manager: Mark W. Smith, Architect

G. The Project consists of the renovation and alterations of a one story, approximately 8600 square feet, with at 1900 square feet second floor. Interior spaces include general administration and engineering offices; conference rooms; dispay area, general storage, toilets and breakroom.
   1. Site is located adjacent to Park Avenue, Taylor Street and Sixth Street. Existing loading dock will be removed to allow for parking use and accessible entrance.
   2. Site is generally developed as complete, however, minor landscaping, planting, handicapped ramp, site lighting and security fencing is required in a limited area.
   3. Existing building is constructed of exterior brick walls, steel trusses, wood deck and a recently installed single ply roof.
   4. Exterior openings include aluminum storefronts, wood -metal clad windows and wood stile and rail doors.
   5. Exterior masonry will be renovated by cleaning, pointing of joints and replacement of missing brick and limestone trim.
   6. Interior finishes include gypsum wallboard, acoustical panel ceilings, metal and wood doors, ceramic tile, linoleum flooring and stained concrete flooring.
   7. Mechanical system include heat-pumps and selected areas to have supplemental baseboard electric heat.
   8. Electrical systems include interior and exterior lighting, panelboards, photoelectric and occupancy sensor controls, security and fire alarm systems.
   9. Plumbing systems include low-flow fixtures, heat-pump water heaters and sanitary and storm drainage.

1.02 CONTRACT DESCRIPTION

A. Contract Type: A single prime contract based on a Stipulated Price as described in Owner-Contract Agreement.

1.03 WORK BY OWNER

A. Owner will supply and install the following:
   1. Office Furnishings.
   2. Office partitions (systems furnishings).
   3. Security card access system

1.04 FUTURE WORK

A. Project is designed for future upfit for a Display Area.

1.05 OWNER OCCUPANCY

A. Owner intends to occupy the Project upon Substantial Completion.

1.06 CONTRACTOR USE OF SITE AND PREMISES

A. Construction Operations: Limited to areas as noted on drawings and as specified in Section 015000 - Temporary Facilities and Controls.

B. Arrange use of site and premises to allow:
   1. Work by Owner.
   2. Ingress and egress of public and staff to adjacent buildings.
   3. Use of roadways, sidewalks and other public ways unless approved by permit.

C. Time Restrictions:
   1. Limit conduct of exterior work to Monday through Saturday from 7:00 am to 6:00 pm.

D. Utility Outages and Shutdown:
   1. Prevent accidental disruption of utility services to other facilities.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 012100

ALLOWANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cash allowances.

1.02 RELATED REQUIREMENTS

A. Section 012000 - Price and Payment Procedures: Additional payment and modification procedures.

1.03 CASH ALLOWANCES

A. Costs Included in Cash Allowances: Cost of product to contractor, less applicable trade discounts[<>].Includes applicable taxes.

B. Costs Not Included in Cash Allowances: Product delivery to site and handling at the site, including unloading, uncrating, and storage; protection of products from elements and from damage; and labor for installation and finishing..

C. Architect Responsibilities:
   1. Consult with Contractor for consideration and selection of products.
   2. Select products in consultation with Owner and transmit decision to Contractor.

D. Contractor Responsibilities:
   1. Assist Architect in selection of products.
   2. Obtain proposals from suppliers and installers and offer recommendations.
   3. On notification of which products have been selected, execute purchase agreement with designated supplier and installer.
   4. Arrange for and process shop drawings, product data, and samples. Arrange for delivery.
   5. Promptly inspect products upon delivery for completeness, damage, and defects. Submit claims for transportation damage.

E. Differences in costs will be adjusted by Change Order.

1.04 ALLOWANCES SCHEDULE

A. Section 101400- Signage: Include the stipulated sum of $750 for purchase and delivery and installation of Interior building signs. (exterior signs are not part of allowance).

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 012300

ALTERNATES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Procedures for pricing alternates.

1.03 RELATED REQUIREMENTS

A. Bid Form

1.04 ACCEPTANCE OF ALTERNATES

A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted alternates will be identified in the Owner-Contractor Agreement.

B. Coordinate related work and modify surrounding work to integrate the Work of each alternate.

1.05 SCHEDULE OF ALTERNATES

A. Alternative No. 1 - Jeld-Wen Windows

B. Alternative No. 2 - Kolbe- Kolbe Windows

C. Alternative No. 3 - Loewen Windows

D. Alternative No. 4 - Marvin Windows

E. Alternative No. 5 - Weathershield Windows

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 013000

ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preconstruction meeting.

B. Progress meetings.

C. Submittals for review, information, and project closeout.

D. Number of copies of submittals.

E. Submittal procedures.

1.02 RELATED REQUIREMENTS

A. Section 017000 - Execution and Closeout Requirements: Additional coordination requirements.

B. Section 017800 - Closeout Submittals: Project record documents.

1.03 PROJECT COORDINATION

A. Project Manager: Project Manager for the city will be selected and will attend the pre-bid meeting.

B. Cooperate with the Project Manager in allocation of mobilization areas of site; for field offices and sheds, for public and private access, traffic, and parking facilities.

C. During construction, coordinate use of site and facilities through the Project Manager.

D. Comply with Project Manager's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.

E. Comply with instructions of the Project Manager for use of temporary utilities and construction facilities.

F. Make the following types of submittals to Architect through the Project Manager:
   1. Requests for interpretation.
   2. Requests for substitution.
   3. Shop drawings, product data, and samples.
   4. Test and inspection reports.
   5. Manufacturer's instructions and field reports.
   6. Applications for payment and change order requests.
   7. Progress schedules.
   8. Coordination drawings.
   9. Closeout submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRECONSTRUCTION MEETING

A. Owner will schedule a meeting after Notice of Award.

B. Attendance Required:

1. Owner.
2. Architect.
3. Contractor

C. Agenda:
1. Execution of Owner-Contractor Agreement.
2. Submission of executed bonds and insurance certificates.
3. Distribution of Contract Documents.
4. Submission of list of Subcontractors, list of Products, schedule of values, submittals, and progress schedule.
5. Designation of personnel representing the parties to Contract, contractor, owner and Architect.
6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
7. Scheduling.
8. Scheduling activities of a Geotechnical Engineer.
9. Review of seperate contracts
10. Review of site for mobilization (site utilities, tmporary facilities, laydown area, staging, access, security, safety of public, etc.)

D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.02 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the Work at maximum monthly intervals.

B. Attendance Required: Job superintendent, major Subcontractors and suppliers, Owner, Architect, as appropriate to agenda topics for each meeting.

C. Agenda:
1. Review minutes of previous meetings.
2. Review of Work progress.
3. Field observations, problems, and decisions.
4. Identification of problems that impede, or will impede, planned progress.
5. Review of submittals schedule and status of submittals.
6. Maintenance of progress schedule.
7. Corrective measures to regain projected schedules.
8. Planned progress during succeeding work period.
9. Maintenance of quality and work standards.
10. Effect of proposed changes on progress schedule and coordination.
11. Other business relating to Work.

D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.03 CONSTRUCTION PROGRESS SCHEDULE

A. Within 15 days after date established in Notice to Proceed, submit preliminary schedule defining planned operations for the first 60 days of Work, with a general outline for remainder of Work.

B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.

C. Within 10 days after joint review, submit complete schedule.

D. Submit updated schedule with each Application for Payment.

3.04 SUBMITTALS FOR REVIEW

A. When the following are specified in individual sections, submit them for review:
   1. Product data.
   2. Shop drawings.
   3. Samples for selection.
   4. Samples for verification.

B. Submit to Architect for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.

C. Samples will be reviewed only for aesthetic, color, or finish selection.

D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 017800 - CLOSEOUT SUBMITTALS.

3.05 SUBMITTALS FOR INFORMATION

A. When the following are specified in individual sections, submit them for information:
   1. Design data.
   2. Certificates.
   3. Test reports.
   4. Inspection reports.
   5. Manufacturer's instructions.
   6. Manufacturer's field reports.
   7. Other types indicated.

B. Submit for Architect's knowledge as contract administrator or for Owner. No action will be taken.

3.06 SUBMITTALS FOR PROJECT CLOSEOUT

A. When the following are specified in individual sections, submit them at project closeout:
   1. Project record documents.
   2. Operation and maintenance data.
   3. Warranties.
   4. Bonds.
   5. Other types as indicated.

B. Submit for Owner's benefit during and after project completion.

3.07 NUMBER OF COPIES OF SUBMITTALS

A. Documents for Review:
   1. Small Size Sheets, Not Larger Than 11 x 17 inches: Submit the number of copies which the contractor requires, plus two copies which will be retained by the Architect and Owners representitive..
   2. Larger Sheets, Not Larger Than 30 x 42 inches: Submit one reproducible transparency and two opaque reproduction.

B. Documents for Information: Submit two copies.

C. Documents for Project Closeout: Make one reproduction of submittal originally reviewed. Submit one extra of submittals for information.

D. Digital Documents for Project Closeout: Make one digital copy of as-builts drawings (scan of field copy is acceptable, pdf format); field mark-ups for specifications (scan of field copy is acceptable, pdf format) for Owner's achieve file.

E. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
   1. After review, produce duplicates.
   2. Retained samples will not be returned to contractor unless specifically so stated.

3.08 SUBMITTAL PROCEDURES

A. Transmit each submittal with form as supplied by architect.

B. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.

C. Deliver submittals to Architect at business address.

D. Schedule submittals to expedite the Project, and coordinate submission of related items.

E. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.

F. Identify variations from Contract Documents and Product or system limitations that may be detrimental to successful performance of the completed Work.

G. Provide space for Contractor and Architect review stamps.

H. When revised for resubmission, identify all changes made since previous submission.

I. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.

J. Submittals not requested will not be recognized or processed.

END OF SECTION

SECTION 014000

QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. References and standards.

B. Mock-ups.

C. Control of installation.

D. Tolerances.

E. Testing and inspection services.

F. Manufacturers' field services.

1.02 RELATED REQUIREMENTS

A. Section 013000 - Administrative Requirements: Submittal procedures.

B. Section 016000 - Product Requirements: Requirements for material and product quality.

1.03 SUBMITTALS

A. Testing Agency Qualifications:
   1. Prior to start of Work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.

B. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents, or for Owner's information.

C. Test Reports: After each test/inspection, promptly submit three copies of report to Architect .
   1. Include:
      a. Date issued.
      b. Project title and number.
      c. Name of inspector.
      d. Date and time of sampling or inspection.
      e. Identification of product and specifications section.
      f. Location in the Project.
      g. Type of test/inspection.
      h. Date of test/inspection.
      i. Results of test/inspection.
      j. Conformance with Contract Documents.
      k. When requested by Architect, provide interpretation of results.

D. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
   1. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
   2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.

E. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

F. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Owner.
   1. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

G. Erection Drawings: Submit drawings for Architect's benefit as contract administrator or for Owner.
   1. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.
   2. Data indicating inappropriate or unacceptable Work may be subject to action by Architect or Owner.

1.04 REFERENCES AND STANDARDS

A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.

C. Obtain copies of standards where required by product specification sections.

D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.

E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.

F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.05 TESTING AND INSPECTION AGENCIES

A. Owner will employ and pay for services of an independent testing agency to perform specified testing and inspection.

B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

C. Contractor Employed Agency:
   1. Testing agency: Comply with requirements of ASTM E 329, ASTM E 543, ASTM C 1077, and ASTM C 1093.
   2. Inspection agency: Comply with requirements of ASTM D3740 and ASTM E329.
   3. Laboratory: Authorized to operate in Virginia.
   4. Laboratory Staff: Maintain a full time registered Engineer on staff to review services.
   5. Testing Equipment: Calibrated at reasonable intervals either by NIST or using an NIST established Measurement Assurance Program, under a laboratory measurement quality assurance program.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.

D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Have Work performed by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 MOCK-UPS

A. Tests will be performed under provisions identified in this section and identified in the respective product specification sections.

B. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.

C. Accepted mock-ups shall be a comparison standard for the remaining Work.

D. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, remove mock-up and clear area when directed to do so.

3.03 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

3.04 TESTING AND INSPECTION

A. See individual specification sections for testing and inspection required.

B. Testing Agency Duties:
   1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
   2. Perform specified sampling and testing of products in accordance with specified standards.
   3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
   4. Promptly notify Architect and Contractor of observed irregularities or non-conformance of Work or products.

5. Perform additional tests and inspections required by Architect.
6. Submit reports of all tests/inspections specified.

C. Limits on Testing/Inspection Agency Authority:
1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
2. Agency may not approve or accept any portion of the Work.
3. Agency may not assume any duties of Contractor.
4. Agency has no authority to stop the Work.

D. Contractor Responsibilities:
1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
3. Provide incidental labor and facilities:
   a. To provide access to Work to be tested/inspected.
   b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
   c. To facilitate tests/inspections.
   d. To provide storage and curing of test samples.
4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

E. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Architect.

F. Re-testing required because of non-conformance to specified requirements shall be paid for by Contractor.

3.05 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, as applicable, and to initiate instructions when necessary.

B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.06 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not conforming to specified requirements.

B. If, in the opinion of Owner's representitive, it is not practical to remove and replace the Work, representitive will direct an appropriate remedy or adjust payment.

END OF SECTION

SECTION 015000

TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary utilities.

B. Temporary sanitary facilities.

C. Temporary Controls: Barriers, enclosures, and fencing.

D. Security requirements.

E. Vehicular access and parking.

F. Waste removal facilities and services.

G. Project identification sign.

1.02 TEMPORARY UTILITIES

A. Provide and pay for all electrical power, lighting, heating and cooling, and ventilation required for construction purposes.
   1. Existing building electrical system can be used or contractor can use a temporary power installation from AEP. If contractor elects to use the existing building electrical service, contractor will be required to step down the building's 480 volt service to 120 volt and install meter.

B. Water is provided by owner. Contractor is responsible for connection.
   1. Use trigger-operated nozzles for water hoses, to avoid waste of water.

1.03 TEMPORARY SANITARY FACILITIES

A. Use of existing facilities is permitted.

B. New permanent facilities may not be used during construction operations.
   1. Provide and maintain temporary facilities once the permanent fixtures are installed.

C. Maintain daily in clean and sanitary condition.

1.04 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

B. Provide barricades and covered walkways required by governing authorities for public rights-of-way.

C. Provide protection for plants designated to remain. Replace damaged plants.

D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.05 SECURITY FENCING

A. Provide temporary security fence as indicated.
   1. Refer to temporary fence detail for additional anchorage, post, rail, chain link requirements.

2. Refer to site drawing for locations required for fencing. Entire site is required to be secured without breech.

1.06 SECURITY

A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.

B. Coordinate with Owner's security program.

1.07 VEHICULAR ACCESS AND PARKING

A. Provide and maintain access to fire hydrants, free of obstructions.

B. Provide means of removing mud from vehicle wheels before entering streets.

C. Designated existing on-site roads shall not be used for construction traffic.
   1. Access along Sixth Street shall be coordinated with Owner and will be discussed at the pre-bid meeting.

D. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

E. Existing parking areas may be used with some exclusions see site plans for areas to be used for construction parking.
   1. Parking areas will be reviewed at the pre-bid meeting.
   2. Site access will be reviewed at the pre-bid meeting.

F. Vehicle access will be limited along Sixth Street. This area can be used by contractor with limitations that will be discussed at the pre-bid meeting.

1.08 WASTE REMOVAL

A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.

B. Provide containers with lids if located outside of secured site. Open top containers can be used if inside fenced perimeter. Remove trash from site periodically.

C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.

D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.09 PROJECT IDENTIFICATION

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

1.10 FIELD OFFICE

A. Office: Weathertight, with lighting, electrical outlets, email, heating, ventilating equipment.

B. Contractor may use the existing building until permanate finishes are installed.

1.11 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, materials, prior to Final Application for Payment inspection.

B. Remove underground installations to a minimum depth of 2 feet.

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

D. Restore existing facilities used during construction to original condition.

E. Restore new permanent facilities used during construction to specified condition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 016000

PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General product requirements.

B. Re-use of existing products.

C. Transportation, handling, storage and protection.

D. Product option requirements.

E. Substitution limitations and procedures.

F. Procedures for Owner-supplied products.

G. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

A. Section 011000 - Summary: Lists of products to be removed from existing building.

B. Section 014000 - Quality Requirements: Product quality monitoring.

1.03 REFERENCE STANDARDS

1.04 SUBMITTALS

A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
   1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

A. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.

2.02 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by the Contract Documents.

B. Where all other criteria are met, Contractor shall give preference to products that:
   1. Are extracted, harvested, and/or manufactured closer to the location of the project.
   2. Have longer documented life span under normal use.
   3. Result in less construction waste.

2.03 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

2.04 MAINTENANCE MATERIALS

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.

B. Deliver to site and place in location as directed; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION PROCEDURES

A. Instructions to Bidders specify time restrictions for submitting requests for substitutions during the bidding period. Comply with requirements specified in this section.

B. Substitutions may be considered when a product becomes unavailable through no fault of the Contractor.

C. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.

D. A request for substitution constitutes a representation that the submitter:
   1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
   2. Will provide the same warranty for the substitution as for the specified product.
   3. Will coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.
   4. Waives claims for additional costs or time extension that may subsequently become apparent.
   5. Will reimburse Owner and Architect for review or redesign services associated with re-approval by authorities.

E. Substitution Submittal Procedure:
   1. Submit three copies of request for substitution for consideration. Limit each request to one proposed substitution.
   2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.
   3. Architect will notify in writing of decision to accept or reject request.

3.02 OWNER-SUPPLIED PRODUCTS

A. Owner's Responsibilities:
   1. Arrange and pay for product delivery to site.
   2. On delivery, inspect products jointly with Contractor.
   3. Submit claims for transportation damage and replace damaged, defective, or deficient items.
   4. Handle, store, install and finish products.
   5. Repair or replace items damaged after receipt.
   6. Arrange for manufacturers' warranties, inspections, and service.

3.03 TRANSPORTATION AND HANDLING

A. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

B. Transport and handle products in accordance with manufacturer's instructions.

C. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

D. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

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

F. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.04 STORAGE AND PROTECTION

A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.

B. Store and protect products in accordance with manufacturers' instructions.

C. Store with seals and labels intact and legible.

D. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.

E. For exterior storage of fabricated products, place on sloped supports above ground.

F. Provide bonded off-site storage and protection when site does not permit on-site storage or protection.

G. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

H. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

I. Prevent contact with material that may cause corrosion, discoloration, or staining.

J. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

K. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

SECTION 017000

EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.

B. Requirements for alterations work, including selective demolition.

C. Pre-installation meetings.

D. Cutting and patching.

E. Surveying for laying out the work.

F. Cleaning and protection.

G. Starting of systems and equipment.

H. Closeout procedures, except payment procedures.

I. General requirements for maintenance service.

1.02 RELATED REQUIREMENTS

A. Section 013000 - Administrative Requirements: Submittals procedures.

B. Section 014000 - Quality Requirements: Testing and inspection procedures.

C. Section 015000 - Temporary Facilities and Controls: Temporary exterior enclosures.

D. Section 017800 - Closeout Submittals: Project record documents, operation and maintenance data, warranties and bonds.

E. Section 260100 - Electrical General Provisions: Contractor's responsibilities in regard to operating and maintenenace data.

F. Individual Product Specification Sections:
   1. Advance notification to other sections of openings required in work of those sections.

G. Section 099000 - Painting and Coating: Lead analysis for content of paint in existing coatings.

1.03 REFERENCE STANDARDS

A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2004.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
   1. Structural integrity of any element of Project.
   2. Integrity of weather exposed or moisture resistant element.
      a. Roof alteration must be performed by company that is approved by roofing manufacturer.
   3. Efficiency, maintenance, or safety of any operational element.
   4. Mechanical, electrical or piping that is not indicated on drawings.

C. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.05 QUALIFICATIONS

A. For removal of lead based paint, employ a firm that meets the regulations of state and federal agencies.

1.06 PROJECT CONDITIONS

A. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

B. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

C. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.

D. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
   1. Minimize amount of bare soil exposed at one time.
   2. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
   3. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
   4. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

E. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
   1. At All Times: Excessively noisy tools and operations will not be tolerated outside the building at any time of day; excessively noisy includes jackhammers.
   2. Outdoors: Limit conduct of especially noisy exterior work to the hours of 8 am to 5 pm.

F. Pollution Control: 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. Comply with federal, state, and local regulations.

1.07 COORDINATION

A. Coordinate lead based paint removal with trades to prevent contamination of materials.

B. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

C. Notify affected utility companies and comply with their requirements.

D. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

E. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

F. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

G. Coordinate completion and clean-up of work of separate sections.

H. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 016000.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.

B. Examine and verify specific conditions described in individual specification sections.

C. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

D. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 PREINSTALLATION MEETINGS

A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.

B. Require attendance of parties directly affecting, or affected by, work of the specific section.

C. Notify Architect seven days in advance of meeting date.

D. Prepare agenda and preside at meeting:
   1. Review conditions of examination, preparation and installation procedures.
   2. Review coordination with related work.

E. Record minutes and distribute copies within two days after meeting to participants, with copy to Architect, Owner, participants, and those affected by decisions made.

3.04 LAYING OUT THE WORK

A. Verify locations of survey control points prior to starting work.

B. Promptly notify Architect of any discrepancies discovered.

C. Control datum for survey is that indicated on Drawings.

D. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

E. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

F. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.

G. Utilize recognized engineering survey practices.

H. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
   1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.

3.05 GENERAL INSTALLATION REQUIREMENTS

A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.06 ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
   1. Verify that construction and utility arrangements are as shown.
   2. Report discrepancies to Architect before disturbing existing installation.
   3. Beginning of alterations work constitutes acceptance of existing conditions.

B. Remove existing work as indicated and as required to accomplish new work.
   1. Remove items indicated on drawings.
   2. Relocate items indicated on drawings.
   3. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
   4. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.

C. Services (Including but not limited to HVAC, Plumbing, Electrical, and Telecommunications): Remove, relocate, and extend existing systems to accommodate new construction.
   1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
   2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
   3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
      a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
      b. Provide temporary connections as required to maintain existing systems in service.
   4. Verify that abandoned services serve only abandoned facilities.
   5. Remove abandoned pipe, ducts, conduits, and equipment; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.

D. Protect existing work to remain.
   1. Prevent movement of structure; provide shoring and bracing if necessary.
   2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
   3. Repair adjacent construction and finishes damaged during removal work.

E. Adapt existing work to fit new work: Make as neat and smooth transition as possible.
   1. When existing finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Architect.

F. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.

G. Refinish existing surfaces as indicated:
   1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
   2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.

H. Clean existing systems and equipment.

I. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.

J. Do not begin new construction in alterations areas before demolition is complete.

K. Comply with all other applicable requirements of this section.

3.07 CUTTING AND PATCHING

A. Whenever possible, execute the work by methods that avoid cutting or patching.

B. See Alterations article above for additional requirements.

C. Perform whatever cutting and patching is necessary to:

1. Complete the work.
2. Fit products together to integrate with other work.
3. Provide openings for penetration of mechanical, electrical, and other services.
4. Match work that has been cut to adjacent work.
5. Repair areas adjacent to cuts to required condition.
6. Repair new work damaged by subsequent work.
7. Remove samples of installed work for testing when requested.
8. Remove and replace defective and non-conforming work.

D. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.

E. Employ manufacturer approved installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

F. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

G. Restore work with new products in accordance with requirements of Contract Documents.

H. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

I. Patching:
   1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
   2. Match color, texture, and appearance.
   3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.08 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.09 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

F. 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.

G. Remove protective coverings when no longer needed; reuse or recycle plastic coverings if possible.

3.10 SYSTEM STARTUP

A. Coordinate schedule for start-up of various equipment and systems.

B. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.

C. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

D. Verify that wiring and support components for equipment are complete and tested.

E. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.

F. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

G. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.11 DEMONSTRATION AND INSTRUCTION

A. Demonstrate operation and maintenance of products to Owner's personnel two weeks prior to date of Substantial Completion.

B. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time, at equipment location.

C. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

D. Provide a qualified person who is knowledgeable about the Project to perform demonstration and instruction of owner personnel.

E. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.

F. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

3.12 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

B. Testing, adjusting, and balancing HVAC systems: See Section 230593.

3.13 FINAL CLEANING

A. Execute final cleaning prior to final project assessment.

1. Clean areas to be occupied by Owner prior to final completion before Owner occupancy.

B. Use cleaning materials that are nonhazardous.

C. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

D. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

E. Replace filters of operating equipment.

F. Clean debris from roofs, gutters, downspouts, and drainage systems.

G. Clean site; sweep paved areas, rake clean landscaped surfaces.

H. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.14 CLOSEOUT PROCEDURES

A. Make submittals that are required by governing or other authorities.
1. Provide copies to Owner.

B. Notify Architect when work is considered ready for Substantial Completion.

C. Submit written certification that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's review.

D. Correct items of work listed in executed Certificates of Substantial Completion and comply with requirements for access to Owner-occupied areas.

E. Notify Architect when work is considered finally complete.

F. Complete items of work determined by Architect's final inspection.

3.15 MAINTENANCE

A. Provide service and maintenance of components indicated in specification sections.

B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.

C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.

D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.

E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION

SECTION 017800

CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Project Record Documents.

B. Operation and Maintenance Data.

C. Warranties and bonds.

1.02 RELATED REQUIREMENTS

A. Section 00 7200 - General Conditions: Performance bond and labor and material payment bonds, warranty, and correction of work.

B. Section 013000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.

C. Section 017000 - Execution and Closeout Requirements: Contract closeout procedures.

D. Individual Product Sections: Specific requirements for operation and maintenance data.

E. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.

B. Operation and Maintenance Data:
   1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return one copy with comments.
   2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
   3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
   4. Submit two sets of revised final documents in final form within 10 days after final inspection.

C. Warranties and Bonds:
   1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
   2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
   3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:

1. Drawings.
2. Specifications.
3. Addenda.
4. Change Orders and other modifications to the Contract.

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress.

E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
   1. Manufacturer's name and product model and number.
   2. Changes made by Addenda and modifications.

F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
   1. Measured depths of foundations in relation to finish first floor datum.
   2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
   3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
   4. Field changes of dimension and detail.
   5. Details not on original Contract drawings.

3.02 OPERATION AND MAINTENANCE DATA

A. For Each Product or System: List names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

A. For Each Product, Applied Material, and Finish:
   1. Product data, with catalog number, size, composition, and color and texture designations.
   2. Information for re-ordering custom manufactured products.

B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. For Each Item of Equipment and Each System:
   1. Description of unit or system, and component parts.
   2. Identify function, normal operating characteristics, and limiting conditions.
   3. Include performance curves, with engineering data and tests.
   4. Complete nomenclature and model number of replaceable parts.

B. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.

C. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

D. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

E. Provide servicing and lubrication schedule, and list of lubricants required.

F. Include manufacturer's printed operation and maintenance instructions.

G. Include sequence of operation by controls manufacturer.

H. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

I. Provide control diagrams by controls manufacturer as installed.

J. Include test and balancing reports.

K. Additional Requirements: As specified in individual product specification sections.

3.05 OPERATION AND MAINTENANCE MANUALS

A. Prepare instructions and data by personnel experienced in maintenance and operation of described products.

B. Prepare data in the form of an instructional manual.

C. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.

D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.

E. Provide tabbed dividers for each separate product and system, with typed description of product and major component parts of equipment.

F. Text: Manufacturer's printed data, or typewritten data on 24 pound paper.

G. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

H. Arrange content by systems under section numbers and sequence of Table of Contents of this Project Manual.

I. Contents: Prepare a Table of Contents for each volume, with each product or system description identified, in three parts as follows:
   1. Part 1: Directory, listing names, addresses, and telephone numbers of Architect, Contractor, Subcontractors, and major equipment suppliers.
   2. 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:
      a. Significant design criteria.

b. List of equipment.
c. Parts list for each component.
d. Operating instructions.
e. Maintenance instructions for equipment and systems.
f. Maintenance instructions for special finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.

3. Part 3: Project documents and certificates, including the following:
   a. Shop drawings and product data.
   b. Air and water balance reports.
   c. Certificates.
   d. Photocopies of warranties and bonds.

J. Provide a listing in Table of Contents for design data, with tabbed dividers and space for insertion of data.

K. Table of Contents: Provide title of Project; names, addresses, and telephone numbers of Architect, Consultants, and Contractor with name of responsible parties; schedule of products and systems, indexed to content of the volume.

3.06 WARRANTIES AND BONDS

A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 30 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until the Date of Substantial completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties and bonds until time specified for submittal.

E. Include originals of each in operation and maintenance manuals, indexed separately on Table of Contents.

END OF SECTION

02200 - EARTHWORK

(Revised 10/25/04)

SELECTED LINKS TO SECTIONS WITHIN THIS SPECIFICATION

Part 1 – General	Clearing and Grubbing	Subgrade Preparation
Part 2 – Products	Compaction – Min Requirements	Testing Frequency
Part 3 – Execution	Earthwork Volume Measurement	

PART 1 – GENERAL

The Contractor shall furnish all labor, materials, and equipment to perform all work for all site clearing, site excavation, grading and embankment, excavation and filling and backfilling for structures. Complete all as shown on the contract drawings and in accordance with these Specifications and completely coordinated with all other trades.

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Requirements and Supplementary Conditions applicable to this specification.

B. Section 01000 – General Requirements.

C. Section 02220 – Trenching, Backfilling, and Compaction of Utilities.

D. Section 02660 – Water Distribution.

E. Section 02730 – Sanitary Sewer.

1.2 SUMMARY

A. This section includes:

1) Site clearing and grubbing.

2) Stripping and stockpiling topsoil.

3) Excavation and embankment placement.

4) Preparing subgrades for pavements, walks, curb & gutter, and turfed areas.

B. Construction and materials related to this section but specified in other sections:

1) Landscaping, Seeding, and Groundcover: Section 01000 - *General Requirements.*

2) Erosion Control: See Section 01000 - *General Requirements.*

1.3 DEFINITIONS

For the purposes of this specification, the following definitions refer to earthwork that come under the authority of the City of Lynchburg, Virginia as specified within this section and other sections of this manual.

A. **Borrow**: Borrow excavation shall consist of approved select fill material imported from off-site.

B. **Clearing**: Clearing shall consist in the felling, cutting up, and satisfactory disposal of trees and other vegetation designated for removal in accordance with these specifications.

C. **Fill (in terms of volume)**: In terms of volume, fill is defined as a compacted post-construction volume in-place.

D. **Grubbing**: Grubbing shall consist of the removal of roots 1 ½ inch and larger, organic matter and debris, and stumps having a diameter of three inches or larger, to a depth of at least 18 inches below the surface and or subgrade; which ever is lower, and the disposal thereof.

E. **Regular Excavation**: Removal and disposal of any and all material above subgrade elevation, except solid rock and undercut excavation, located within the limits of construction.

F. **Rock Excavation**: Removal and satisfactory disposal of all unsuitable materials, which, in the opinion of the City Engineer, cannot be excavated except by drilling, blasting, wedging, jack hammering or hoe ramming. It shall consist of undecomposed stone, hard enough to ring under hammer. All boulders containing a volume of more than ½ cubic yard and/or solid ledges, bedded deposits, unstratified masses and conglomerations of material so firmly cemented as to possess the characteristics of solid rock which cannot be removed without systematic drilling, blasting, or hoe ramming will be classified as rock.

G. **Select Fill Material**: Nonplastic material obtained from roadway cuts, borrow areas, or commercial sources used as foundation for subbase, shoulder surfacing, fill, backfill, or other specific purposes.

H. **Structures**: Incidental buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

I. **Subgrade**: Surface or elevation remaining after completing the excavation, or top surface of a fill or backfill immediately below subbase or topsoil materials, as applicable.

J. **Topsoil**: Topsoil shall consist of friable clay loam, free from roots, stones, and other undesirable material and shall be capable of supporting a good growth of grass.

K. **Undercut Excavation**: Undercut excavation shall consist of the removal and satisfactory disposal of all unsuitable material located below subgrade elevation. Where excavation to the finished grade section results in a subgrade or slopes of muck, peat, matted roots, etc., the Contractor shall remove such material below the grade shown on the plans or as directed; and areas so excavated shall be backfilled with approved select borrow as ordered by the City Engineer.

1.4 SUBMITTALS

A. Submit product data and a sample of separation fabric and fully document each with specific location or stationing information, date and other pertinent information.

B. **Product Data**

1) Stabilization/Separation fabric

C. **Material Test Reports**: Provide from a qualified testing agency test results and interpretation for compliance of the following requirements indicated:

1) Classification according ASTM D2487 of each on-site or borrow soil proposed for backfill, unless otherwise directed by the City Engineer.

2) Laboratory compaction curve according to ASTM D698 for each on-site or borrow soil material proposed for fill or backfill.

3) Laboratory compaction curve according to ASTM D1557 for each on-site borrow soil material proposed for fill and backfill.

D. **Blasting**: See Section 01000 – *General Requirements.*

1.5 QUALITY ASSURANCE

A. **Geotechnical Testing Agency Qualifications**: An independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock-definition testing as documented according to ASTM D 3740 and ASTM E 548.

B. Comply with all codes, laws, ordinances, and regulations of governmental authorities having jurisdiction over this part of the work.

C. The Contractor shall comply with the latest revision of the Virginia Occupational Safety and Health Standards for the Construction Industry as adopted by the Safety and Health Codes Commission of Virginia.

D. The Contractor shall comply with Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation, "Virginia Erosion and Sedimentation Control Handbook," latest revision.

E. Comply with applicable requirements of NFPA 495, *"Explosive Materials Code."*

F. Materials and operations shall comply with the latest revision of the Codes and Standards listed below:

American Society for Testing and Materials

ASTM C 33	Concrete Aggregates
ASTM C 136	Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates Sieve Analysis of Fine and Coarse Aggregate
ASTM D 422	Standard Test Method for Particle-Size Analysis of Soils (for classification purposes only)
ASTM D 698	Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3) (Standard Proctor)
ASTM D 1556	Standard Method of Test for Density of Soil in Place by the Sand-Cone Method
ASTM D 1557	Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3) (Modified Proctor)
ASTM D1883	Standard Test Method for CBR (California Bearing Ratio) of Laboratory-Compacted Soils
ASTM D 2049	Standard Method of Test for Relative Density of Cohesionless Soils
ASTM D2167	Standard Method of Test for Density of Soil in Place by the Rubber-Balloon Method
ASTM D 2487	Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2922	Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 4253	Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table
ASTM D 4254	Test Method for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density
ASTM D 4318	Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

American Association of State Highway & Transportation Officials

AASHTO T 99	The Moisture-Density Relations of Soils using a 5.5-pound hammer and a 12-inch drop
AASHTO T 180	The Moisture Density Relations of Soils using a 10-pound hammer and an 18-inch drop
AASHTO M 145	The Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes

1.6 STANDARD ABBREVIATIONS

ANSI	American National Standards Institute
AREA	American Railway Engineers Association
DCR	Virginia Department of Conservation and Recreation
MSDS	Material Safety Data Sheets
OHSA	Occupational Safety and Health Administration
VDH	Virginia Department of Health
VDOT	Virginia Department of Transportation

1.7 TESTING SERVICES

A. The Testing Laboratory shall be approved by the City Engineer and will be responsible for conducting and interpreting tests. The Testing Laboratory shall state in each report whether or not the test specimens conform to all requirements of the Contract Documents and specifically note any deviation.

B. Specific test and inspection requirements shall be as specified herein.

1.8 PROJECT CONDITIONS

A. **Demolition**: Demolish and completely remove from the site existing utilities, structures or surface features indicated on the plans to be removed. Coordinate with applicable utility companies to shut off services if lines are active.

B. **Environmental**: Before crossing or entering into any jurisdictional wetlands, Contractor shall verify whether or not a wetlands permit has been obtained for the encroachment and whether special restrictions have been imposed. Care shall be taken to prevent draining or otherwise destroying non-permitted wetlands. Restore as stated on either the project drawings, the contract documents, and/or as noted in the permit.

C. **Geotechnical Investigation**

1) Where a Geotechnical report has been provided to the Contractor, the data on sub-surface soil conditions is not intended as a representation or warranty of the continuity of such conditions between borings or indicated sampling locations. It shall be expressly understood that the City of Lynchburg will not be responsible for any interpretations or conclusions drawn there from by the Contractor. Data is made available for the convenience of the Contractor.

2) In addition to any report that may be made available to the Contractor, the Contractor is responsible for performing any other soil investigations he/they feel(s) is necessary for proper evaluation of the site for the purposes of planning and/or bidding the project, at no additional cost to the City of Lynchburg.

1.9 COORDINATION

A. At the direction of the City Engineer, temporary bypass pumping of sewerage flow may be required to be provided. See Section 02730 – *Sanitary Sewer* for bypass pumping requirements and procedures.

B. Refer to Section 02660 – *Water Distribution* for valve operation requirements.

C. Coordinate tie-ins to municipal system with the City of Lynchburg.

D. When traffic signals or their appurtenances are likely to be damaged or interfered with as a result of the construction, coordinate temporary operation with the City of Lynchburg Traffic Engineer. Provide a minimum of 48 hours notice prior to anticipated disturbance or interruption.

E. **Benchmark/Monument Protection**: Protect and maintain benchmarks, monuments or other established reference points and property corners. If disturbed or destroyed, replace at own expense to full satisfaction of Owner/City of Lynchburg.

PART 2 – PRODUCTS

2.1 SOIL MATERIALS

Provide borrow material when sufficient satisfactory soil material is not available from excavations.

2.1.1 MATERIAL CLASSIFICATION

A. **Excavation**: All excavation material shall be classified as either Regular, Rock, or Undercut Excavation.

B. **Off-site Borrow:** Off-site borrow shall be select fill material approved by the City Engineer from an off-site borrow source. See paragraph 1.3 of this specification for the definition of select fill material.

C. **Riprap and Riprap Bedding**: See the Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation, **Virginia Erosion and Sedimentation Control Handbook**, latest edition.

D. **Topsoil**: Topsoil meeting the definition prescribed in paragraph 1.3 obtained either from on-site or an off-site source.

2.1.2 SOIL CLASSIFICATION

A. **Satisfactory Soils**: Non-plastic soils as defined by ASTM D 2487 soil classification group (Unified Classification System) (such as SW, SM, and SC); free of rock or gravel larger than 3 inches in any dimension, debris, organic matter, waste, frozen materials, muck, roots, vegetation, and other deleterious matter.

B. **Unsatisfactory Soils**: Plastic soils as defined by ASTM D 2487 soil classification group (such as ML, CL CH, MH, OH, OL and PT); soils which contain rock or gravel larger than 3 inches in any dimension, debris, organic matter, waste frozen materials, vegetation, and other deleterious matter. Unsatisfactory soils also include satisfactory soils not maintained within 20-percent of optimum moisture content at time of compaction, unless otherwise approved by either the City Engineer or a Geotechnical Engineer.

2.2 MISCELLANEOUS

Geotextile Fabric: See the Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation, **Virginia Erosion and Sedimentation Control Handbook**, latest edition.

PART 3 – EXECUTION

3.1 GENERAL

3.1.1 GENERAL REQUIREMENTS APPLYING TO ALL AREAS

A. Contractor shall plan construction to minimize disturbance to properties adjacent to the project site and be within the construction limits shown on the plans.

B. The City Engineer reserves the right to limit the width of land to be disturbed and to designate on the drawings or in the field certain areas or items within this width to be protected from damage.

C. Any grading or excavation required for equipment travel during the course of construction as well as erosion control, access or haul road installation and removal, restoration, seeding and ground cover shall be provided by the Contractor.

D. The Contractor shall be responsible for damage to areas or items designated by the City Engineer to be protected. Repairs to, replacement of, or reparations for areas or items damaged shall be made at the Contractor's expense and to the satisfaction of the City Engineer before acceptance of the completed project.

E. Any fences disturbed by the Contractor shall be repaired to a condition equal to or better than their original condition or to the satisfaction of the City Engineer at no additional cost.

F. Contractor shall obtain written permission from property owners for use of any access other than ones located within rights-of-way. Written permission shall contain conditions for use and restoration agreements between property owner and Contractor. No additional compensation will be made for such access.

G. All areas disturbed shall be restored to a condition equal to or better than their original condition and shall be graded to drain.

H. The Contractor shall replace or repair all damaged or destroyed hedgerows and property corners. Protection of existing and restoration of damaged or destroyed property corners shall be in accordance with the requirements of Section 01000 – *General Requirements* – Construction Staking.

3.1.2 PROTECTION OF EXISTING UTILITIES

A. Contractor is responsible for protection of existing utilities in accordance with Section 01000 – *General Requirements.*

B. Should it become necessary to move the position of any underground structure, the Contractor may be required to do such work and shall be paid on a force account basis or on an extra work basis. Method of payment shall be agreed upon by the City Engineer and the Contractor prior to commencing work.

C. If existing utilities are found to interfere with the permanent facilities being constructed under this section, immediately notify the City Engineer and secure instructions. Do not proceed with permanent relocation of utilities until instructions are received from the City Engineer.

3.2 CLEARING AND GRUBBING

A. This work shall consist of clearing, grubbing, removing, and disposing of all vegetation and debris within the limits of construction, as designated on the plans or as required by the City Engineer. The Contractor shall remove only those trees and shrubs absolutely necessary to allow for the construction. The work shall also include the preservation from injury or defacement of all vegetation or objects designated to remain.

B. The area within the limits of construction or as designated shall be cleared and grubbed of all trees, stumps, roots, brush, undergrowth, hedges, heavy growth of grasses or weeds, debris and rubbish of any nature which, in the opinion of the City Engineer, is unsuitable for foundation material. Nonperishable items that will be a minimum of five feet below the finish elevation of the earthwork or slope of the embankment may be left in place.

C. The Contractor shall provide barricades, fences, coverings, or other types of protection necessary to prevent damage to existing improvements, not indicated to be removed, and improvements on adjoining property. All improvements damaged by this work shall be restored to their original condition or to a condition acceptable to the owner or other parties or authorities having jurisdiction.

D. **Protection of Trees and Vegetation**: Contractor shall protect existing trees and other vegetation indicated by the City Engineer to remain in place against cutting, breaking, or skinning of roots, skinning and bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular traffic, or parking of vehicles within drip line. Provide temporary fences or barricades as required to protect trees and vegetation to be left standing at no additional cost.

Trees and shrubs that are to remain within the construction limits will be indicated on the drawings or conspicuously marked on site. Unless otherwise noted, trees within the construction limits shall become the property of the Contractor and shall be removed from the site.

Carefully and cleanly cut roots and branches of trees indicated to remain where the roots and branches obstruct construction of the utility line. The Contractor shall provide protection for roots and branches over 1 ½ inches diameter that are cut during construction operations. Temporarily cover all exposed roots with wet burlap to prevent roots from drying out. Provide earth cover as soon as possible.

Damaged trees and vegetation designated to remain shall be repaired or replaced at Contractor's expense in a manner acceptable to the City Engineer if they are damaged by construction operations. Repair tree damage as directed by a qualified tree surgeon.

E. All brush, tree tops, stumps, and debris shall be hauled away and disposed of in accordance with all applicable laws and regulations. The contactor shall clean up debris resulting from clearing operations continuously with the progress of the work and remove promptly all salvageable material that becomes his property and is not to be reused in construction. Sale of material on the site is prohibited. Debris from the site shall be removed in such a manner as to prevent spillage. Keep pavement and area adjacent to site clean and free from mud, dirt, dust, and debris at all times.

F. The method of stripping, clearing and grubbing the site shall be at the discretion of the Contractor. However, all stumps, roots and other debris protruding through the ground surface or in excavated areas shall be completely removed to a minimum depth of 18 inches below surface and/or subgrade whichever is lower and disposed of off the site by the Contractor, at his expense.

G. **Marginal Areas**: In marginal areas, with the City Engineer's permission, remove trees where the following conditions exist.

1) **Root Cutting**: When clearing up to the "clearing limits," the Contractor shall also remove any tree which is deemed marginal such that when the roots are cut and the tree could be rendered unstable by the affects of high winds and in danger of toppling into either the right-of-way or onto private property.

2) **Slender Bending Trees**: Where young, tall, thin trees are left unsupported by the clearing operation, and are likely to bend over into the right-of-way, the Contractor, during the clearing operation, shall selectively remove those trees which are located outside and adjacent to the clearing limits and City right-of-way or easement as well. During the course of construction and during the one-year warranty period, the Contractor shall remove such young trees that overhang into the right-of-way or cleared area.

H. Remove the existing topsoil to a depth of 6 inches or to the depth encountered from all areas in which excavation will occur. The topsoil shall be stored in stockpiles, separate from the excavated material, if the topsoil is to be respread. Otherwise material shall be disposed of off-site at the Contractor's expense.

3.3 REGULAR EXCAVATION, UNDERCUTTING, BORROW, EMBANKMENT:

3.3.1 DESCRIPTION

Prior to beginning grading or embankment operations in any area, all necessary clearing and grubbing in that area shall have been performed in accordance with these specifications.

Should the Contractor, through negligence or other fault, excavate below the designated grades, he shall replace the excavation with approved satisfactory materials, in an approved method, at his own expense. All material determined unsatisfactory shall be disposed of in waste areas as directed. Topsoil shall not be used in embankments but shall be handled and placed as directed.

The Contractor shall satisfy himself as to the character, quantity, and distribution of all materials to be excavated. No payment will be made for any excavated material that is used for purposes other than those designated.

3.3.2 CONSTRUCTION METHODS

A. **Excavation**: Excavation shall be performed as indicated on the plans or as directed by the City Engineer to the lines, grades, and elevations, and shall be finished to a reasonable smooth and uniform surface. During the process of excavation, the grade shall be maintained and surface shall be rolled so that it will be well drained at all times.

When solid rock is incurred in the excavation, the rock shall be removed to a minimum depth of 12 inches below the surface of the subgrade. Material unsatisfactory for subgrade foundation shall be removed to a depth specified to provide a satisfactory foundation. The portion so excavated shall be refilled with suitable material obtained from the grading operations or borrow area and thoroughly compacted by rolling. Material obtained from on site grading operation must be approved by the City Engineer. For areas that do not require fill, scarify and compact to a depth of 6 inches.

Any removal, manipulation, aeration, replacement, and recompaction of suitable materials necessary to obtain the required density shall be considered as incidental to the construction operations, and shall be performed by the Contractor at no additional cost to the City.

No rock, stone, or rock fragments, larger than 3 inches in their greatest dimension will be permitted in the top 12 inches of the subgrade. No rock, stone, or rock fragments larger than 8 inches in their greatest dimension will be permitted in the remainder of the fill.

B. **Stabilization of Soft Subgrade with Geotextile**: The use of Geotextile material for subgrade stabilization shall be approved by the City Engineer and shall meet all applicable VDOT standards and specifications.

C. **Borrow**: Borrow shall not be used until all suitable, on-site, excavated material has been placed in the embankment, unless authorized by the City Engineer. Unless otherwise designated on the plans and contract documents, the Contractor shall make his own arrangements for obtaining select fill material for borrow and pay all costs involved. If the Contractor places more borrow than is required, and thereby causes a waste of excavation, the amount of such waste, unless authorized, will not be included for payment.

D. **Embankments**

1) **Evaluation of Subgrade**: Prior to placement of compacted fill, the City Engineer or his representative shall carefully inspect the exposed subgrade. The Contractor shall then proof roll the exposed subgrade, in the presence of the City Engineer or his representative. The inspection shall include, but not be limited to, proofrolling the prepared subgrade with a rubber-tired fully loaded dump truck that has a minimum gross weight of at least 20,000 pounds (10 tons). No other method will be acceptable. Any unsatisfactory materials thus exposed shall be removed and replaced with satisfactory select material as approved by the City Engineer. Provide the necessary amount of select fill compacted to the density requirements outlined in this specification.

2) **Preparation of Ground Surface for Embankments or Fills:** Before fill is placed, scarify existing grade to a minimum depth of 6 inches. In areas where the existing or proposed ground surface is steeper than one vertical to four horizontal, plow surface in a manner to bench and break up surface so that fill material will bind with the existing surface.

3) Embankments shall be made of satisfactory soil material and shall be built in successive horizontal layers of not more than 8 inches in loose depth for the full width of the cross sections.

The material entering the embankment in each of the layers shall be within a tolerance of plus or minus 20% of the optimum moisture content before rolling to obtain the prescribed density. Wetting or drying of the material and manipulation when necessary to secure uniform moisture content throughout the layer shall be required. Should the material be too wet to permit proper compaction or rolling, all work on the embankment shall be delayed until such time as the material has dried to the required moisture content. If high moisture is due to negligence of contractor due to improper drainage, the City Engineer may require removal and replacement of material.

Fill material shall not be placed on frozen ground or areas covered with ice and/or snow or areas with a moisture content above optimum.

E. **Preparation of areas to receive asphalt pavement or concrete**

1) **Areas to be Paved**: After all excavation, undercutting, and backfilling has been completed, the subgrade shall be properly shaped and thoroughly compacted. The compactive effort shall include all areas beneath pavement and shall extend at least a minimum of 1 foot behind the paving limits. Compaction shall be in accordance with Table 02200-1.

2) **Curb and Gutter, Sidewalks and Driveway Aprons**: The subgrade shall be constructed true to grade and cross section as may be shown on the drawings. Compaction shall be in accordance with Table 02200-1.

All subgrade shall be graded and protected as to prevent an accumulation or standing water, and consequent subgrade saturation, in the event of rain.

F. **Grading Tolerances of Finished Surface**: Earthwork shall conform to the lines, grades, and typical cross sections shown on the plans or as established by the City Engineer. Changes in grade shall be accomplished by smooth curves.

1) Shape subgrade under pavement and curb and gutter to within ½ inch of required subgrade elevations.

2) Finish pavement and curb and gutter to within ½ inch of required finish elevations.

3) Shape subgrade under sidewalks to within 0.10 foot of required subgrade elevations.

4) Finish sidewalks to within 0.10 foot of required finish elevations.

5) For all other areas, subgrade and finish elevations shall be within 0.10 foot of required corresponding elevations.

G. **Backfill of Curb and Gutter and Sidewalks**: Immediately after the removal of forms for curb and gutter, sidewalks and driveways, the space between the back of the curb, sidewalks, and driveways shall be backfilled and smoothed off in a manner to prevent the accumulation of standing water.

3.4 SUBGRADE COMPACTION TESTING AND CONTROL

A. **Municipal Projects**: For municipal projects, the City may employ and compensate a Geotechnical testing firm to provide soils testing and inspection services.

B. **Private Projects**: For private development projects which involves proposed City-owned infrastructure the developer, at the discretion of the City Engineer, may be required to employ a Geotechnical testing firm to perform the testing and provide copies of the tests reports to the City for approval and record.

C. **All Projects**

1) **Minimum Compaction Testing Frequency**

Location	Frequency
Buildings and structures	1 test group[a] for every 5,000 square feet
Road	1 test group[a] for every 300 feet of road
Parking Lots	1 test group[a] for every 10,000 square feet
Unpaved areas	1 test group[a] for every 20,000 square feet
Pipe Trench	1 test group for every 300 feet

[a] One test group consists of compaction tests on each layer of fill and backfill material.

2) In the absence of a pre-construction Geotechnical investigation, the Geotechnical testing firm is to perform laboratory Proctor tests to establish a moisture-density relationship for all materials that are proposed to be used as fill.

3) Contractor shall give a 24-hour notice to Geotechnical testing firm when ready for Proctor, compaction, or subgrade testing and inspection.

4) Should any moisture-density test fail to meet specification requirements, the Contractor shall perform corrective work necessary to bring the material in compliance and retest the failed area at no additional cost to the City.

3.5 SUBGRADE PREPARATION AND COMPACTION REQUIREMENTS

A. **Minimum Compaction Requirements**: Compaction percentages are percentages of maximum dry density as determined by indicated ASTM Standards. Unless otherwise directed by a Geotechnical Engineer, the material shall be placed at plus or minus 20% of optimum moisture content.

Table 2200.1	
Minimum Compaction Limits	
Location	**Density**
Beneath and within 25 feet of buildings	100% of the maximum dry density by ASTM D 698 (Standard Proctor), AASHTO T-99.
Areas under roadway pavement surfaces, shoulders, sidewalks, and curb and gutter	95% of the maximum dry density by ASTM D 698 (Standard Proctor), AASHTO T-99.
Under turf, sodded, planted, or seeded non-traffic areas	90% of the maximum dry density by ASTM D 698 (Standard Proctor), AASHTO T-99.

B. **Failure of Compactive Efforts**: If compaction efforts should fail to provide a stable subgrade, after subgrade materials have been shaped and brought to optimum moisture, such unstable materials shall be removed to the extent directed by either the Geotechnical Engineer or the City Engineer and replaced and compacted using new select material.

3.6 STRUCTURES: EXCAVATION, FILLING, AND BACKFILLING

See Section 02220 - *Trenching, Backfilling, and Compaction of Utilities* for excavation and backfilling for structures (manholes, etc.). See VDOT *Road and Bridge Specifications* for excavation and backfilling for retaining walls.

3.7 METHOD OF VOLUME MEASUREMENT

Contractors are required to furnish accurate counts of all excavation and/or fill moved which is to be paid for under the Contract unit price. The volumes shall be measured by either "truck tally" or by "cross-sectioning," whichever method is approved by the City Engineer or stated in the proposal and/or bid documents. When a truck count is used, the City Engineer or their representative shall verify the count independently.

A. **Truck Tally Method**

Excavation: When regular excavation or undercut volumes are to be counted by the truck tally method, "swell" is to be incorporated into the truck volume in the amount of 15%. Unless otherwise agreed to or justified by a Geotechnical Engineer, the following pay volumes are to be used for either regular or undercut excavation:

Tandem: 13 CY
Tri-axle: 15 CY

Borrow: When either off-site or on-site borrow is to be counted by the truck tally method, "shrinkage" is to be incorporated into the truck volume in the amount of 15% (shrinkage of truck volume placed compared to compacted fill volume) utilizing the following pay volumes:

Tandem: 10 CY
Tri-axle: 12 CY

Loading Truck: A qualified truck load is one that is loaded up to within approximately 6 inches of the top of the dump bed, prior to dumping.

B. **Average-End-Method**

Excavation and fill can be computed using the average-end-method. When used, this method is to be employed using the existing contours shown on the Contract Drawings and the Contractor's actual surveyed finished contours (surveyed by a licensed Professional Surveyor). In so doing, the finished contours are to be plotted at the same scale as the original drawing and a transparency furnished to the Engineer for comparison to design grades. The volume computations are also to be submitted along with the Surveyor's seal and a certification as to the volumes measured.

The Contractor, at his discretion and with the prior approval of the Engineer, may survey the "stripped" site (the site after topsoil has been removed) and compute the volumes based on the stripped site and the "designed" finished grade as shown on the Contract Drawings. As before, a transparency to the same scale and the Surveyor's computations and certification are to be submitted to the Engineer for comparison and verification.

C. **Volume Formulas**

Unless otherwise approved, the following formulas are to be used in computing cut and fill:

Fill Formula

Net Fill = Raw Fill Vol. – Regular Excavation X (1 - Shrink Factor) + Strip Vol. - Undercut or waste Fill placed in Fill Slopes X (1 - Shrink Factor) - Pavement Section or Building Floor Pad

Cut Formula

Net Cut = Raw Cut - Strip Vol. + Pavement Section or Building Floor Pad

End of Section 02200

Back to Top

02220 - TRENCHING, BACKFILLING AND COMPACTION OF UTILITIES

(Revised 11/16/09)

SELECTED LINKS TO SECTIONS WITHIN THIS SPECIFICATION

Part 1- General
Part 2 – Products
Part 3 – Execution
Backfilling Trenches
Bedding Definitions
Bedding for Structures
Bedding by Type of Pipe
Blasting
Clearing and Grubbing
Common Earth Backfill
Compaction – Min Require'ts
Construction Limits
Dewatering
Final Earth Backfill - Def
Flowable Fill Concrete
Initial Earth Backfill - Def
Minimum Pipe Cover
Select Earth Backfill
Trench Backfilling
Trench Preparation
Unclassified Trench Excavation

PART 1 – GENERAL

The Contractor shall furnish all labor, materials, tools, and equipment to perform all work and services necessary for or incidental to the completion of all underground utilities as shown on the drawings and as specified in the Contract Documents.

Contractor shall be responsible for coordination of work of all other trades.

1.1 RELATED DOCUMENTS

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

B. Section 01000 – GENERAL REQUIREMENTS.

C. Section 02720 – STORM DRAINAGE.

D. Section 02730 – SANITARY SEWER.

E. Section 02660 – WATER DISTRIBUTION.

F. Section 02500 – BASE COURSE AND PAVING.

G. Section 02200 – EARTHWORK.

1.2 SUMMARY

A. This section includes:

1) Excavating and backfilling trenches for buried water, sewer, and storm drainage pipe systems, buried utility structures, and appurtenances.

2) Preparing subgrade for buried water, sewer, and storm drainage systems, buried utility structures and appurtenances.

B. Construction and materials related to this section but specified in other specification sections:

1) Section 01000 – *General Requirements*: Landscaping, Seeding and Groundcover, and Erosion Control.

2) Section 02200 – *Earthwork*: site clearing, grubbing, topsoil removal, tree protection, roadway, and paving.

1.3 DEFINITIONS

For the purposes of this specification, the following definitions refer to sanitary sewer, storm drainage and water distribution systems that come under the authority of the City of Lynchburg, Virginia as specified within this section and other sections of this manual.

A. **Backfill**: Soil materials used to fill an excavated trench:

1) **Initial Backfill** (Select Earth Backfill): Backfill placed beside and 12 inches over the top of the pipe in a trench, including haunches to support sides of pipe.

2) **Final Backfill** (Common Earth Backfill): Backfill placed over the initial backfill to fill a trench.

B. **Bedding Course**: Layer placed over the excavated subgrade in a trench before laying pipe.

C. **Foundation Stone**: Clean well-graded stone, authorized by the City Engineer, used to strengthen and/or provide support to an otherwise weak subgrade. Foundation stone is placed, and the subgrade improved before bedding stone is placed.

D. **Trench Rock Excavation**: Removal and satisfactory disposal of all unsuitable materials, which, in the opinion of the City Engineer, cannot be excavated except by drilling, blasting, wedging, jack hammering or hoe ramming. It shall consist of undecomposed stone, hard enough to ring under hammer. All boulders containing a volume of more than ½ cubic yard and/or solid ledges, bedded deposits, unstratified masses and conglomerations of material so firmly cemented as to possess the characteristics of solid rock which cannot be removed without systematic drilling, blasting, or hoe ramming will be classified as rock.

E. **Structures**: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

F. **Subgrade**: Surface or elevation remaining after completing the trench excavation or, the top surface of a backfill (stone or soil) immediately below the pipe conduit or pipe bedding, as applicable.

G. **Trench Borrow (Select)**: Trench borrow shall consist of approved material imported from off-site for use as fill or backfill required to be placed in trenches either as initial select earth backfill or final common earth backfill. Trench borrow shall not be used until all suitable trench excavation material has been placed in the trench, unless authorized by the City Engineer. The Contractor shall make his own arrangements for obtaining borrow and pay all costs involved, unless otherwise designated on the plans and in the contract documents. Borrow material must be approved by the City Engineer prior to use.

H. **Regular Excavation**: Removal and disposal of any and all material above subgrade elevation, except solid rock and undercut excavation, located within the limits of construction.

I. **Undercut Excavation**: Undercut excavation shall consist of the removal and satisfactory disposal of all unsuitable material located below subgrade elevation. Where excavation to the finished grade section results in a subgrade or slopes of muck, peat, matted roots, etc., the Contractor shall remove such material below the grade shown on the plans or as directed; and areas so excavated shall be backfilled with approved select earth borrow or stone as directed by the City Engineer.

1.4 SUBMITTALS

A. Submit product data for and a sample of the following in accordance with Section 01000, *General Requirements*. Fully document each with specific location or stationing information, date and other pertinent information.

1) Stabilization/Separation fabric

2) Drainage Fabric

3) Metallic locating tape

B. **Material Test Reports**: Provide from a qualified testing agency test results and interpretation for compliance of the following requirements indicated:

1) Classification according to ASTM D2487 of each on-site or borrow soil proposed for backfill, unless otherwise directed by the City Engineer.

2) Laboratory compaction curve according to ASTM D698 for each on-site or borrow soil material proposed for backfill.

C. **Blasting**: See Section 01000 – *General Requirements.*

D. **Bury Depth Computations**: Computations justifying pipe bury when bury depth exceeds the allowable depth shown in this specification. Provide method, applicable charts/graphs, print outs, assumptions, etc.

1.5 QUALITY ASSURANCE

A. **Geotechnical Testing Agency Qualifications**: An independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock-definition testing as documented according to ASTM D 3740 and ASTM E 548.

B. Comply with all codes, laws, ordinances, and regulations of governmental authorities having jurisdiction over this part of the work.

C. The Contractor shall comply with the latest revision of the Virginia Occupational Safety and Health Standards for the Construction Industry as adopted by the Safety and Health Codes Commission of Virginia.

D. The Contractor shall comply with Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation, "Virginia Erosion and Sedimentation Control Handbook," latest revision.

E. Comply with applicable requirements of NFPA 495, *"Explosive Materials Code."*

F. Comply with *"Gravity Sanitary Sewer Design and Construction,"* ASCE Manuals and Reports on Engineering Practice – NO. 60, WPCF Manual of Practice NO. FD-5.

G. Comply with Uni-Bell PVC Pipe Association "*Handbook of PVC Pipe: Design and Construction,"* 3r ed. Dallas: UNI, 1991 for the installation of PVC piping, latest revision.

H. Materials and operations shall comply with the latest revision of the Codes and Standards listed below:

American Society for Testing and Materials

ASTM C 33	Concrete Aggregates.
ASTM D 698	Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3) (Standard Proctor).
ASTM D 1556	Standard Method of Test for Density of Soil in Place by the Sand-Cone Method.
ASTM D 1557	Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3) (Modified Proctor).
ASTM D 2049	Standard Method of Test for Relative Density of Cohesionless Soils.
ASTM D2167	Standard Method of Test for Density of Soil in Place by the Rubber-Balloon Method.
ASTM D 2487	Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).

ASTM D 2922	Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
ASTM D 4253	Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.
ASTM D 4254	Test Method for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.
ASTM D 4318	Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

American Association of State Highway & Transportation Officials

AASHTO T99	The Moisture-Density Relations of Soils using a 5.5-pound Rammer and a 12-inch drop.
AASHTO T180	The Moisture Density Relations of Soils using a 10-pound Rammer and an 18-inch drop.
AASHTO M 145	The Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes.

American Water Works Association

AWWA C600	Installation of Ductile Iron Water Mains and Their Appurtenances.

1.6 STANDARD ABBREVIATIONS

ANSI	American National Standards Institute
AREA	American Railway Engineers Association
DEQ	Department of Environmental Quality
DIP	Ductile Iron Pipe
MSDS	Material Safety Data Sheets
OHSA	Occupational Safety and Health Administration
PVC	Polyvinyl Chloride Plastic Pipe
RCP	Reinforced Concrete Pipe
PCP	Plain Concrete Pipe (Non-Reinforced)
VDH	Virginia Department of Health
VDOT	Virginia Department of Transportation

1.7 TESTING SERVICES

A. The Testing Laboratory shall be selected by the Contractor/Developer and approved by the City Engineer and will be responsible for conducting and interpreting tests. The Testing Laboratory shall state in each report whether or not the test specimens conform to all requirements of the Contract Documents and specifically note any deviation.

B. Specific test and inspection requirements shall be as specified herein.

1.8 PROJECT CONDITIONS

A. **Demolition**: Demolish and completely remove from the site existing underground utilities indicated on the plans to be removed.

B. **Environmental**: Before crossing or entering into any jurisdictional wetlands, Contractor shall verify whether or not a wetlands permit has been obtained for the encroachment and whether special restrictions have been imposed. Care shall be taken to prevent draining or otherwise destroying non-permitted wetlands. Restore as stated on either the project drawings, the contract documents, and/or as noted in the permit.

1.9 COORDINATION

A. At the direction of the City Engineer, temporary pumping/bypass of sewerage flow may be required to be provided. See Section 02730 - *Sanitary Sewer* for bypass pumping requirements and procedures.

B. See Section 02660 – *Water Distribution* for valve operation requirements.

C. Coordinate tie-ins to municipal system with the City of Lynchburg.

D. When traffic signals or their appurtenances are likely to be damaged or interfered with as a result of the construction, coordinate temporary operation with the City of Lynchburg Traffic Engineer. Provide a minimum of 48 hours notice prior to anticipated disturbance or interruption.

PART 2 – PRODUCTS

2.1 BEDDING AND BACKFILL

A. **Backfill Around Structures**: Backfill shall be approved by the City Engineer and shall be free from large or frozen lumps, wood, or rocks more than 3 inches in their greatest dimension or other extraneous material. Porous backfill shall conform to the requirements of applicable sections of the VDOT *Road and Bridge Specifications.*

B. **Bedding Material**: VDOT #57, #68, or #78 stone.

C. **Coarse Aggregate Backfill**: See applicable VDOT *Road and Bridge Specifications* for properties and gradation of VDOT #57 stone.

D. **Common Earth Backfill**

1) **Satisfactory Soils**: ASTM D 2487 soil classification group (Unified Classification System) GW, GP, GM, SW, SW, SM, SC, ML, and CL or a combination of these group symbols; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

2) **Unsatisfactory Soils**: ASTM D 2487 soil classification group CH, MH, OH, OL and PT; soils which contain rock or gravel larger than 3 inches in any dimension, debris, waste frozen materials, vegetation, and other deleterious matter. Unsatisfactory soils also include satisfactory soils not maintained within 20-percent of optimum moisture content at time of compaction, unless otherwise approved by the City Engineer.

E. **Dense Graded Aggregate Backfill**: VDOT #21A stone.

F. **Excavation**: All excavation material shall be classified as either Rock or Regular Earth Excavation.

G. **Flowable Fill Concrete Backfill**: Concrete strength shall be liquid enough to flow, be self-leveling, and have an ultimate minimum strength 225 psi (this product is a combination of sand and Portland cement).

H. **Foundation Stone**: Foundation/Trench Stabilization Material: VDOT #1 or #2 stone.

I. **Select Earth Backfill**: Select earth backfill shall be free of debris, roots, frozen materials, organic matter, rock, or gravel larger than 1 inch in any dimension, or other harmful matter and shall generally meet VDOT *Road and Bridge Specifications,* Section 207 – *Select Material* for properties and gradation. Sand and rock dust are acceptable materials.

J. **Topsoil**: Topsoil shall consist of friable clay loam, free from roots, stones, and other undesirable material and shall be capable of supporting a good growth of grass. Topsoil shall be free of material greater than 1 inch in any dimension.

2.2 MISCELLANEOUS

2.2.1 GEOTEXTILE FABRIC

See the Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation, *Virginia Erosion and Sedimentation Control Handbook*, latest edition.

2.2.2 NON -METALLIC WARNING TAPE

Acid and alkali resistant polyethylene film tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, colored as follows:

Blue: Water Systems
Green: Sewer systems

2.2.3 METALLIC LOCATING WIRE

Locating wire shall be 12 gauge copper wire jacketed with an acid and alkali resistant high density polyethylene coating; colored as follows:

Blue: Water Systems
Green: Sewer systems

PART 3 – EXECUTION

3.1 PREPARATION

3.1.1 GENERAL REQUIREMENTS APPLYING TO ALL AREAS

A. Contractor shall plan construction to minimize disturbance to properties adjacent to the sewer, water, and storm lines.

B. The City Engineer reserves the right to limit the width of land to be disturbed and to designate on the drawings or in the field certain areas or items within this width to be protected from damage.

C. Any grading or excavation required for equipment travel during the course of construction as well as erosion control, access or haul road installation and removal, restoration, seeding and ground cover shall be provided by the Contractor at no additional cost.

D. The Contractor shall be responsible for damage to areas or items designated by the City Engineer to be protected. Repairs to, replacement of, or reparations for areas or items damaged shall be made at the Contractor's expense to the satisfaction of the City Engineer before acceptance of the completed project.

E. The Contractor shall protect all buildings, structures, and existing utilities located along the utility line. Hand trenching, shoring, or other methods may be required at no additional cost.

F. Any fences disturbed by the Contractor shall be repaired to a condition equal to or better than their original condition or to the satisfaction of the City Engineer at no additional cost.

G. Contractor shall obtain written permission from property owners for use of any access other than ones located within rights-of-way. Written permission shall contain conditions for use and restoration agreements between property owner and Contractor. No additional compensation will be made for such access.

H. All areas disturbed shall be restored to a condition equal to or better than their original condition and shall be graded to drain.

I. The Contractor shall replace or repair all damaged or destroyed hedgerows and property corners. Protection of and restoration of damaged or destroyed property corners shall be in accordance with the requirements of Section 01000 – *General Requirements,* Construction Staking.

J. When a property owner requests that a tree(s) within construction limits remain, a waiver shall be signed between the property owner and the City.

3.1.2 CONSTRUCTION LIMITS

A. Contractor shall not disturb any areas outside the limits contained in this section without the express written permission from the City Engineer.

B. The following widths measured from the centerline of the sewer, water, and storm drainage lines shall be considered the allowable working area and be referred to as the "construction limits."

Pipe Size	Distance from C/L	Total Allowable Width
12" or smaller	15 feet	30 feet
15" to 18"	20 feet	40 feet
24" and larger	25 feet	50 feet

The Contractor shall protect all areas outside these construction limits unless written variations are granted by the City Engineer.

3.1.3 CLEARING AND GRUBBING

A. This work shall consist of clearing, grubbing, removing, and disposing of all vegetation and debris within the limits of construction, as designated on the plans or as required by the City Engineer. The work shall also include the preservation from injury or defacement of all vegetation or objects designated to remain.

B. The Contractor shall clear and grub the surface as required for the full length of the trench within the rights of way or easements or within the construction limits indicated on the drawings. The width shall not exceed that width as specified herein. The Contractor shall remove only those trees and shrubs absolutely necessary to allow for the construction.

C. Prior to commencement of clearing, Contractor shall notify the City Construction Coordinator 48 hours in advance.

D. The Contractor shall provide barricades, fences, coverings, or other types of protection necessary to prevent damage to existing improvements, not indicated to be removed, and improvements on adjoining property. All improvements damaged by this work shall be restored to their original condition or to a condition acceptable to the owner or other parties or authorities having jurisdiction.

E. **Protection of Trees and Vegetation**

Contractor shall protect existing tress and other vegetation indicated by the City Engineer to remain in place against cutting, breaking, or skinning of roots, skinning and bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular traffic, or parking of vehicles within drip line. Provide temporary fences or barricades as required to protect trees and vegetation to be left standing at no additional cost.

Trees and shrubs that are to remain within the construction limits will be indicated on the drawings or conspicuously marked on site.

Carefully and cleanly cut roots and branches of trees indicated to remain where the roots and branches obstruct construction of the utility line. If directed by the City Engineer, the Contractor shall provide protection for roots and branches over 1 ½ inches diameter that are cut during construction operations. Temporarily cover all exposed roots with wet burlap to prevent roots from drying out. Provide earth cover as soon as possible.

Damaged trees and vegetation designated to remain shall be repaired or replaced at Contractor's expense in a manner acceptable to the City Engineer if they are damaged by construction operations. Repair tree damage as directed by a qualified tree surgeon.

F. All brush, tree tops, stumps, and debris shall be hauled away and disposed of in accordance with applicable laws and regulations. The Contractor shall clean up debris resulting from clearing operations continuously with the progress of the work and remove promptly all salvageable material that becomes his property and is not to be reused in construction. Sale of material on the site is prohibited. Debris from the site shall be removed in such a manner as to prevent spillage. Keep pavement and area adjacent to site clean and free from mud, dirt, dust, and debris at all times. Unless otherwise noted, all trees with diameters of 6 inches or larger, measured at the base, cut on any project shall be cut into fireplace lengths, 24 inches, stacked within the "construction limits" at a location suitable to the property owner. Contractor shall not remove any wood from this project without written authorization from the City Engineer. No additional compensation shall be made if removal of trees from property is required.

G. The method of stripping, clearing, and grubbing the site shall be at the discretion of the Contractor. However, all stumps, roots and other debris protruding through the ground surface or in excavated areas shall be completely removed and disposed of off the site by the Contractor, at his expense.

H. Remove the existing topsoil to a depth of 6 inches or to the depth encountered from all areas in which excavation will occur. The topsoil shall be stored in stockpiles, separate from the excavated trench material, if the topsoil is to be respread. Otherwise, material shall be disposed of off-site at the Contractor's expense.

I. **Specific Requirements Applying to Developed Subdivision/Lots**

1) All trees located beyond 10 feet of the centerline of the sewer, water, or storm drainage line shall be protected by the Contractor. The City Engineer reserves the right to designate other trees located closer to the centerline for protection where possible.

2) All shrubs, hedges, or other ornamental plantings located along the line shall be protected or removed and replanted by the Contractor and guaranteed within the warranty period at no additional cost.

3) The Contractor shall protect septic systems, wells, or springs.

4) Damage to lawns shall be kept to the absolute minimum necessary for construction.

5) Excavated or blasted rock shall be removed from the site unless otherwise ordered by the City Engineer.

3.1.4 PROTECTION OF EXISTING UTILITIES

A. Contractor is responsible for protection of existing utilities in accordance with Section 01000 – *General Requirements.*

B. Should it become necessary to move the position of any underground structure, the Contractor may be required to do such work and shall be paid on a force account basis or on an extra work basis as specified in Section 01000 – *General Requirements.* Method of payment shall be agreed upon by the City Engineer and the Contractor prior to commencing work.

C. If existing utilities are found to interfere with the permanent facilities being constructed under this Section, immediately notify the City Engineer and secure instructions. Do not proceed with permanent relocation of utilities until instructions are received from the City Engineer.

3.1.5 PROTECTION OF SURFACE FEATURES

Refer to Section 01000 – *General Requirements.*

3.1.6 PROCEDURES FOR REPAIRING DAMAGED UTILITIES

Refer to Section 01000 – *General Requirements.*

3.1.7 PROTECTION OF PERSONS AND PROPERTY

Refer to Section 01000 – *General Requirements* for requirements relating to protection and restoration of property.

3.2 TRENCH EXCAVATION

3.2.1 GENERAL

A. **Pipe Cover**

Minimum Cover: Unless shown otherwise on the construction documents, provide minimum trench depth indicated to maintain a minimum cover over the top of the installed item. Minimum cover on pipe is measured from top of pipe to original ground or proposed finished grade as applicable and shall be per standard details. When minimum cover cannot be maintained, alternate construction shall be approved by the City Engineer. For minimum cover requirements, see Section 02730 – *Sanitary Sewer,* Section 02660 – *Water Distribution*, and Section 02720 – *Storm Drainage*, as applicable.

B. Remove all material from trench limits. Material of a compactible nature that can be re-used as trench backfill shall be re-installed and re-compacted to the requirements set forth in these specifications.

C. At the Contractor's expense, dispose of all unsatisfactory material, of what ever nature, to a site which legally can accept such material as fill. Adhere to all applicable laws and ordinances regarding permitting of waste site, erosion control, zoning, etc. as may be applicable.

D. Material of an uncompactable nature, material unsatisfactory for backfill, trash and excess material shall be removed from project site and disposed at the Contractor's expense. Where removal of unsatisfactory material is due to negligence on the part of the Contractor (i.e. resulting from inadequate shoring or bracing, failure to dewater, improper material storage exposing it to rain or flooding, or other failure to meet specified requirements), work shall be performed at no additional cost to the City. If additional material is required, the Contractor shall supply same from an approved borrow pit at no additional cost the City.

3.2.2 TRENCHING

A. Where the utility line is in an existing paved area, the pavement shall be saw cut in a straight line parallel to the pipe on each side. Saw cutting operations shall be performed prior excavation to avoid excessive removal of asphalt. Care shall also be taken during the installation of pipe to avoid damage to adjoining paved surfaces.

B. All trenches shall be excavated to the lines and grades as shown on the plans. Trenches for water lines may be curved within the limits of curvature of the pipe as allowed by AWWA C600.

1) **Trench Width**: The sides of trench shall be uniform and vertical. See **Standard Detail 27.01** for trench width for sanitary sewers and storm sewers and **Standard Detail 26.01** for water lines.

2) **Trench Depth**: All trenches shall be excavated to accommodate the bedding as required in Table 2220.1 and as shown in **Standard Details 27.01 and 26.01**, as applicable. No extra compensation will be made for stone bedding used to bring the trench up to grade other than that required in **Standard Details 27.01** and **26.01**, as applicable and specified in Table 2220.1.

   In excavating for the trench, it is essential that the trench bottom be uniform in grade and remains static during backfilling and under all subsequent trench conditions. The grade of the bottom of the trench shall be graded to within 0.04 foot (1/2-inch) of the plan specified grade. The stone shall be graded to the same tolerance.

   Care shall be taken not to over excavate the trench. Refer to paragraph 3.2.4 for over excavation specification.

3) **Open Trench Exposure**: Once trench is opened, proceed immediately to place specified materials in trench, or to otherwise utilize trench for intended purpose. Schedule work and order materials so that trenches are not left open for a longer period than is reasonably necessary and do not extend length limits specified in applicable specifications.

3.2.3 TRENCH ROCK

When rock is encountered in the trench, the City Construction Coordinator or City Engineer must be notified before any rock is blasted or removed. The City Engineer or his representative will measure the rock, after which, the rock shall be excavated. Rock shall be removed from the construction site unless otherwise approved by the City Engineer. See Section 01000 – *General Requirements* for blasting requirements.

3.2.4 PREPARATION OF FOUNDATION FOR PIPE LAYING

A. The bedding surface shall provide a firm, stable, and uniform support through the entire length of the pipe.

B. **Unsuitable Trench Subgrade/Foundation Improvement**: Notify the City when unstable materials are encountered and define by drawing station locations and limits where encountered. If the trench subgrade is found to be soft, spongy, excessively wet, unstable or in any other way unfit such that there is inadequate pipe support, when directed by the City Engineer or City Construction Coordinator, the material shall be removed for the full width of the trench, and the excavated area shall be strengthened for foundation purposes by furnishing and placing either approved crushed stone, a concrete cradle, concrete mud mat, concrete encasement or a combination of these materials. Whenever the bottom of the trench is such that it cannot be reasonably stabilized, the City Engineer may require the pipe to be laid in cradles supported on piles. These foundations shall be placed as directed by the City Engineer.

C. **Over Excavation**: Exercise care to avoid excavations below established grade where firm earth conditions exist. Unauthorized over-excavation consists of removal of material beyond indicated subgrade elevations or side dimensions, without specific approval of the City Engineer. Unauthorized excavation shall be replaced at Contractor's expense. Where unauthorized excavations have been carried beyond points required, restore these areas to the elevations and dimensions shown on the drawings with approved fill material and compact as specified. If over-excavation occurs, such over excavation shall be replaced with clean VDOT #57 stone.

3.2.5 DEWATERING

A. When ground water in encountered, the Contractor shall pump or otherwise remove any water that accumulates in the trenches or pits and shall perform all work necessary to keep the trenches or pits clear from water while pipe is being laid, masonry units are being placed, and structures are either being set or constructed. All water removed from the trench shall be conveyed in a proper manner to a suitable point of discharge and shall comply with applicable erosion and sediment control laws at no additional cost. If pumping is required between the hours of 8:00 p.m. and 6:00 a.m., engines shall be equipped as specified in Section 02730 - Sanitary Sewer, paragraph 3.5E, in order to keep noise to a minimum.

B. No pipe shall be constructed in water and water shall not be allowed to drain through the pipe. The open end of the pipe shall be kept closed with a tight fitting plug to prevent washing of any foreign matter into the line.

C. No structure shall be constructed in water and water shall not be allowed to flow over or rise upon any concrete or masonry structure until the work has been accepted.

D. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches. Reroute surface water runoff away from or around excavated areas.

3.2.6 TRENCH PREPARATION FOR PIPE

A. **Preparation of Trenches for Gravity Pipelines**

Depending upon the bedding class, the bottom of the trench for gravity pipelines shall be excavated to a minimum over depth as indicated in Table 2220.1 to provide for improved pipe bedding material for the entire length of the gravity pipeline, including sewer lateral connections, except in rock where bedding shall be a minimum of 6 inches deep (see **Standard Detail 27.01**). Rock larger than 3 inches shall be removed from the trench bottom and any voids filled with soil or clean stone. The bedding shall be shaped so that the bottom quadrant of the pipe rests on the bed. Bell holes and depressions as required of the joint shall be dug after the bedding has been graded and shaped, and shall be only of such length, depth, and width as required for properly making the particular type of joint. The trench for sanitary sewers, sanitary sewer lateral connections, and storm drainage lines shall then be backfilled as indicated in Section 3.4 - Backfilling.

B. **Preparation of Trenches for Water Mains**

When bedding is required, the bottom of the trench for pipe line shall be excavated to a minimum over depth as indicated in Table 02220.1. The trenches for water lines shall be graded to avoid local high points. Trenches shall be graded either level or on a continuous upslope to the high points designated on the drawings. Trenches shall be of such depth as to provide a minimum cover over the top of the pipe as noted in Section 1.8 – Project Conditions. Pipe shall not bridge any areas. Rock larger than 3 inches shall be removed from the trench bottom and any voids filled with soil or clean stone. Bell holes shall be provided at each joint to permit proper joint assembly and proper pipe support. Rock shall be removed 6 inches below pipe and bedding shall be a minimum of 6 inches. The trench for water lines shall then be backfilled as indicated in Section 3.4 – Backfilling.

3.2.7 TRENCHING IN FILLS

In areas where trenching for pipes will be in fills, the fills shall be brought to an elevation of at least 12 inches above the top of the pipe, and then the trench excavated in the compacted fill, as herein specified for trench excavation.

3.2.8 EXCAVATION FOR APPURTENANT STRUCTURES

A. Excavate for appurtenant structures to provide at least 12 inches (minimum) clear distance between outer surface of the structure and undisturbed earth.

B. Where rock is encountered so that a built-in-place manhole, precast structure (such as a manhole or vault), or other structure will bear over rock, remove the rock to a minimum of 12 inches below the foundation or footing of the structure and place an 12-inch cushion of VDOT #57 stone over the rock.

3.2.9 DEPOSITION OF EXCAVATED MATERIAL

All excavated material shall be placed in accordance with all applicable OHSA and State and local erosion and sedimentation regulations.

3.3 BEDDING

3.3.1 PIPE BEDDING CLASS DEFINITIONS

A. **Class D Bedding** is that condition existing when the ditch is excavated slightly above grade by excavation equipment and cut to finish grade by hand. Bell holes are dug, to prevent point loading the pipe bells, so that pipe bears uniformly upon the trench bottom. Existing soil should be shovel sliced or otherwise compacted under the haunching of the pipe to provide some uniform support. The backfill to the ground surface is to be compacted to the density specified in Table 02220.2. In poor soils, granular bedding material is generally a more practical, cost effective installation. The bedding factor for class D bedding is 1.1.

B. **Class C Bedding** is that condition where the pipe is bedded in compacted granular material. The granular bedding has a minimum thickness of one-eighth the outside pipe diameter, but not less than 4 inches or more than 6 inches, and shall extend up the sides of the pipe one-eighth of the pipe outside diameter. The backfill to ground surface is to be compacted to the density specified in Table 02220.2. The bedding factor for class C bedding is 1.5.

C. **Class B Bedding** is that condition where the pipe is bedded in carefully compacted granular material. The granular bedding has a minimum thickness of one-eighth the outside pipe diameter, but not less than 4 inches or more than 6 inches, between the barrel and the trench bottom, and covering the full width of the trench and shall extend to the spring line.

The haunch area of the pipe must be fully supported; therefore, the granular material should be shovel sliced or otherwise compacted under the pipe haunch to the springline of the pipe. Both granular haunching (to the springline) and initial backfill to a minimum depth of 12 inches over the top of the sewer pipe should be placed and compacted. The remainder backfill to the ground surface is to be compacted to the density specified in Table 02220.2. The bedding factor for class B bedding is 1.9.

D) **Class B-1 Bedding** (*PVC pipe applications*) is the same as Class B Bedding except that granular backfill is placed to the top of the pipe rather than to the springline of the pipe. The backfill to the ground surface is to be compacted to the density specified in Table 02220.2.

E) **Class A Bedding** is that condition when the pipe is bedded in a cast-in-place cradle of either plain or reinforced concrete having a thickness equal to one-fourth the inside pipe diameter, with a minimum of 4 inches and a maximum of 15 inches under the pipe barrel and extending up the sides for a height equal to one-fourth the outside pipe diameter. The cradle width shall have a width at least equal to the outside diameter of the sewer pipe barrel plus 8 inches. The bedding factor for class A bedding is 2.2.

The haunching and initial backfill material above the concrete cradle should be crushed stone or a well graded granular material and carefully compacted to 12 inches above the crown of the pipe. The backfill to the ground surface is to be compacted to the density specified in Table 02220.2.

3.3.2 MINIMUM BEDDING REQUIREMENTS (by application and type of pipe)

Table 2220.1
Minimum Bedding Class

Application	Pipe Material	Pipe Size	Minimum Bedding Class
Sewer			
	PVC	6-inches or smaller	Class B-1[a] (stone to top of pipe)
	PVC	8-inch thru 15-inch	Class B-1[a] (stone to top of pipe)
	DIP	4-inch thru 24-inch	Class C
	RCP	>24-inch	Class C
Water			
	DIP	Up to 16 inches	Class D
	DIP	≥ 16 inches	Class C
Storm			
	RCP inside R/W	Thru 36 inches	Class C
	RCP outside R/W	Thru 36 inches	Class D
	PCP outside R/W	Thru 24 inches	Class D
	RCP	> 36 inches	Class C
	DIP	15 thru 24 inches	Class C

[a]The approximate long-term deflection in different burial conditions (bedding classes, depth, degree of compaction, type backfill soil, etc.) generally can be calculated using the Modified Iowa Formula developed by Spangler and Watkins.

Bedding requirements when rock is encountered: When rock is encountered excavate to a depth of 6 inches below pipe and provide granular pipe bedding at a depth of 6 inches between pipe barrel and trench bottom. The bedding shall extend up the sides of the pipe 1/8 of the pipe outside diameter.

3.3.3 BEDDING FOR STRUCTURES

The bottom of structure excavations shall be excavated to minimum over depth of 12 inches below the bottom of the structure to provide for stone bedding. Bedding material shall be shaped and graded so that the entire bottom of the structure rests on the material for its entire area.

3.4 BACKFILLING

A. **General**

1) Reopen trenches that have been improperly backfilled, to a depth as required for proper compaction. Refill and compact as specified, or otherwise correct to the approval of the City Engineer and at no additional cost to the City.

2) Should any of the work be so enclosed or covered up before it has been approved, uncover all such work and, after approvals have been made, refill and compact as specified, all at no additional cost to the City.

3) Observe specific pipe manufacturer's recommendations regarding methods of backfilling and compaction.

4) Insure compaction of each lift to requirements stated in these specifications.

5) All trenches shall be backfilled prior to the completion of the day's work unless otherwise directed or permitted by the City Engineer.

6) Exercise extreme care in backfilling operations to avoid displacing joints and appurtenances or causing any horizontal or vertical misalignment, separation, or distortion. Repair damages, distortions, or misalignments to full satisfaction of the City Engineer.

B. **Methods**

1) **Select Earth Backfill**: Furnish select earth backfill where indicated on drawings and specified for compacted backfill conditions up to 12 inches above top of pipe. Comply with the following:

Care shall be taken to prevent any disturbance to the pipe or damage to newly made joints. The filling of the trench shall be carried on simultaneously on both sides of the pipe in such a manner that injurious side pressures do not occur such that the pipe could be displaced or dislodged. Do not backfill on muddy or frozen soil.

Sheeting and shoring generally should be removed only when the trench below it has become substantially filled, and every precaution shall be taken to prevent any slides of material from the sides of the trench onto or against the pipe.

a. Hand place, shovel slice, and pneumatically tamp all select earth backfill.

b. Place backfill in lifts not exceeding 6 inches (loose thickness).

2) **Common Earth Backfill**: Comply with the following:

a. Unless otherwise specified or approved by the City Engineer, backfill the remainder of the trench, from 1 foot above the pipe to grade, with common earth fill. Before placing any backfill, all rubbish, forms, blocks, wires, or other unsuitable material shall be removed from excavation. The backfilling shall be placed in layers not over 6 inches.

b. All areas within the limits designated on the drawings, including adjacent transition areas, shall be uniformly graded. The Contractor shall finish surfaces within the specified tolerances with uniform levels or slopes between points where elevations or existing grades are shown.

i. Finish subgrade areas that are to receive topsoil. Bring such areas to within 0.10 foot of required subgrade elevations.

ii. Shape subgrade under sidewalks to line, grade, and cross-section. Subgrade is to be brought to within 0.10 foot of required subgrade elevations.

iii. Shape subgrade under pavement to line, grade, and cross-section. Bring to within ½ inch of required subgrade elevations.

c. The Contractor shall protect newly graded areas from traffic and erosion and repair and re-establish grade in settled, eroded, or rutted areas. Where compacted areas are disturbed by subsequent construction or adverse weather, the Contractor shall scarify the surface, reshape, and re-compact to the required density. If the Contractor shall fail to maintain any trench within 2 days after receipt of written notice from the City Engineer, the City Engineer may refill the said depressions and the cost of such work may be retained from monies due the Contractor or billed directly to the Contractor. In case of emergency, the City Engineer may refill any dangerous depressions without prior notice to the Contractor.

3) **Structure Backfill**: Take care to prevent wedging action of the backfill against structure by carrying the material uniformly around the structure so approximately the same elevation is maintained in each lift. The Contractor shall refill all excavations as rapidly as practical after completion of the structural work therein, or after the excavations have served their purpose.

4) **Aggregate Backfill**

a. **Dense Graded Aggregate Backfill**: When select earth backfill/borrow cannot be obtained, dense graded aggregate may be substituted with the City Engineer's approval.

b. **Coarse Aggregate Backfill**: In confined areas where compaction cannot be achieved, coarse aggregate may be substituted with the City Engineer's approval.

3.5 COMPACTION/DENSITY

A. **Quality Assurance (QA)**: In the course of backfilling trenches for utility installations, the City Engineer may require "Field Density Determinations" or compaction tests. When compaction tests are called for, the City Engineer will determine the location of the tests and the Developer (Owner) shall engage a qualified testing firm to perform the test. Field density determinations shall be performed in accordance with AASHTO T191, T205, and T214, modified to include material sizes used in the laboratory determination of density with nuclear field density testing device or by other approved methods. A representative of the City Engineer will observe tests and a copy of the test results and inspection report will be submitted by the testing firm directly to the City Engineer or his/her representative. When the test results indicate that the density is less than the percent specified, the Contractor shall excavate and re-compact the areas that have failed at no expense to the City. Payment for failed compaction test shall be made by the Contractor by deducting the cost from the forthcoming retainage or billed directly to the Contractor.

B. Soil shall be compacted using equipment suitable for the material and the work area location.

C. **Compaction Requirements**: Unless noted otherwise on drawings or more stringently by other sections of these specifications, place and insure backfill and fill materials achieve an equal or "higher" degree of compaction than undisturbed materials adjacent to the work; however, in no case shall degree of compaction fall below the following percentages of the maximum density at optimum moisture content. Tolerance is to be within +/- 20 percent of the optimum moisture content.

Table 2220.2	
Minimum Compaction Limits	
Location	**Density**
Beneath and within 25 feet of buildings	100% of the maximum dry density by ASTM D 698 (Standard Proctor), AASHTO T-99.
Areas under roadway pavement surfaces, shoulders, sidewalks, and curb and gutter	95% of the maximum dry density by ASTM D 698 (Standard Proctor), AASHTO T-99.
Under turf, sodded, planted, or seeded non-traffic areas	90% of the maximum dry density by ASTM D 698 (Standard Proctor), AASHTO T-99.

D. **Minimum Compaction Testing Frequency**: Refer to Section 02200 – *Earthwork*, paragraph 3.4 – Subgrade Compaction Testing and Control.

3.6 SERVICE CUTS, DIRECTIONAL BORED OR PUNCHED SERVICES

A. **Open Trenches**: Sewer lateral and water service connections that cross paved streets shall be installed by saw cutting the pavement and opening the trench.

Lateral and service connection trenches shall be backfilled as specified for gravity sewers and for water lines, as applicable. See Section 1.8 – Project Conditions of this specification.

B. **Directional Boring or Punching**: At the direction of the City Engineer, service pipes may be required to be "punched" or "directional bored" beneath the pavement.

3.7 PAVEMENT REPAIR AND REPLACEMENT

Refer to specification Section 02500 – *Base Coarse and Paving.*

3.8 HIGHWAY CROSSING

Refer to specification Section 02730 – *Sanitary Sewer* and Section 02660 – *Water Distribution.*

3.9 MISCELLANEOUS

3.9.1 IDENTIFICATION OF NEW SANITARY SEWER LINES (Non-Metallic Warning Tape & Metallic Locating Wire)

Placement of locating tape and wire during backfill operations shall be required on all newly installed non-metallic mains and service laterals. The non-metallic warning tape and metallic locating wire shall be per paragraph 2.2.2 and paragraph 2.2.3 of this specification and located no more than 12 inches below the final grade and shall have 6 inches of separation. Locater wire shall be connected to manhole frames on mains within streets, daylighted to surface grade immediately adjacent to manholes on offroad mains, and daylighted to surface grade adjacent to cleanouts on service laterals.

3.9.2 FLOWABLE FILL CONCRETE BACKFILL

When directed by the City Engineer, the Contractor shall backfill trenches or undercut areas with flowable fill concrete plant mix. Except for structural applications, traffic can be placed on mixture within an hour or two after placement. Final surfacing of pavements; however, should be delayed if possible at least 24 hours to allow for shrinkage and hydration of concrete. Settlement of 2 to 3 inches is to be expected.

3.9.3 SALVAGE OF USEABLE MATERIALS

Useable materials include paving blocks, Belgium blocks, Bluestone, brick, castings, and pipe etc., removed during excavation that are useable on this project or future projects as determined by the City Engineer. Such material shall be stockpiled on site or as directed by the City Construction Coordinator at no additional cost to the City. Unnecessary abuse and damage to these items shall be the Contractor's responsibility and the cost of replacement may be deducted from the retainage.

End of Section 02220

Back to Top

02400 - CURB & GUTTER, DRIVEWAYS & SIDEWALKS

(Revised 10/25/04)

SELECTED LINKS TO SECTIONS WITHIN THIS SPECIFICATION

Part 1- General	Curing	Sidewalk
Part 2 – Products	Curb and Gutter	Reinforcement
Part 3 – Execution	Facedown Sidewalk	Testing
Concrete	Flumes & Ditches	Welded Wire Fabric

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

B. Section 01000 – GENERAL REQUIREMENTS.

C. Section 02200 – EARTHWORK.

D. Any Specifications or details not covered herein shall be per Virginia Department of Transportation, *Road and Bridge Specifications*, 2002 or latest revision.

1.2 SUMMARY

This section includes concrete curbs, combination curb and gutters, ramps, sidewalks, driveways, flumes, valley gutters, median strips, islands, retaining walls, steps, and headwalls on municipal roadways and its appurtenances.

1.3 DEFINITIONS

For the purposes of this specification, the following definitions refer to the streets and roadway system that comes under the authority of the City of Lynchburg, Virginia as specified within this section and other sections of this manual.

Street or Roadway: A publicly dedicated street or roadway right-of-way maintained by the City of Lynchburg Virginia

1.4 SUBMITTALS

Submit product data and shop drawings for the following in accordance with Section 01000, *General Requirements*:

A. Air Entrainment
B. Concrete cylinder break tests.
C. Concrete admixtures
D. Joint Sealants and expansion joint material
E. Job mix formula
F. Other embedded items

1.5 QUALITY ASSURANCE

Materials and operations shall comply with the latest revision of all applicable Codes and Standards.

1.6 STANDARD ABBREVIATIONS

AASHTO	American Association of State Highway Transportation Officials
ACI	American Concrete Institute
ANSI	American National Standards Institute
ASCE	American Society of Civil Engineers
ASTM	American Society for Testing and Materials
C&G	Concrete Curb and Gutter
CRSI	Concrete Reinforcing Steel Institute
FS	Federal Specifications
MSDS	Material Safety Data Sheets
VDOT	Virginia Department of Transportation
WWF	Welded Wire Fabric

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

A. **Concrete Handling/Transportation**

1) Hydraulic cement concrete plant operations shall comply with the latest revision of VDOT *Road and Bridge Specifications*.

2) Time limitations and intervals between deliveries shall be in accordance with Section 217.09 of the VDOT *Road and Bridge Specifications* or latest revision.

3) Forms required to be accompanied with delivery shall be in accordance with Section 217.09 of VDOT *Road and Bridge Specifications*.

4) See Part 3 - EXECUTION of these specifications for handling of materials during placement of hydraulic cement concrete.

B. **Steel Handling/Examination**

1) **Steel Reinforcing Storage**:
Reinforcing steel shall be stored on platforms, skids, or other supports that will keep the steel above ground, well drained, and protected against deformation. Upon deliver to site, epoxy coated steel shall be covered with an opaque covering. Coverings shall be placed to provide air circulation and prevent condensation.

2) **Steel Reinforcing Inspection**

a. **Plain Steel Reinforcing**: The Contractor shall be responsible for inspecting materials thoroughly upon arrival. Examine materials for damage or excessive rust. Remove damaged or rejected materials from site. A light coat of rust is permitted to develop on steel bars and fabric; however, rust scaling and flaking is not permitted.

b. **Coated Steel Reinforcing**: Handling and storage of coated bars shall conform to the requirements of AASHTO M284. Visible damage to the coating shall be patched or repaired with materials compatible to the existing coating in accordance with AASHTO M284.

3) **Pre-Installation Inspection**: Prior to being installed, inspect each bar of steel reinforcing for the presence of dirt, paint, oil, rust scaling, flaking or other foreign matter. Remove such matter with appropriate methods and to the satisfaction of the City Engineer.

C. Observe manufacturer's directions for delivery and storage of materials and accessories.

D. Hydraulic cement concrete plant shall be certified by Virginia Department of Transportation.

1.8 PROJECT CONDITIONS

1.8.1 PROTECTION OF STREAMS

Do not discharge excess concrete into a drainage pipe, catchbasin, ditch, stream, river, pond, lake, or on City property without the approval of the City Construction Engineer.

1.8.2 PROTECTION OF ROADWAYS

Do not discharge or allow concrete to spill onto any roadway or appurtenances either during placement or while in transit. Remove spills immediately or otherwise repair street as directed by the City Engineer. The contractor shall be responsible for cleanup of all waste/excess of concrete.

1.8.3 PROTECTION OF PROPERTY

Do not discharge excess concrete without written permission of the property owner.

1.9 COORDINATION

Coordinate placement of sidewalk and driveway connections to municipal streets and roadways with the City Engineer.

PART 2 – PRODUCTS

2.1 HYDRAULIC CEMENT CONCRETE

Ready mixed concrete shall comply with ASTM C94, *Standard Specification for Ready-Mixed Concrete.* Cement concrete shall meet the requirements of Section 217, VDOT *Road and Bridge Specifications* or latest revision. Concrete strength shall be as specified on Standard Details and drawings. Concrete class for combined curb and gutter, curbs, sidewalks, driveways, flumes, ditches, steps, headwalls, and islands shall be a minimum of A3, 3000 psi or as designated in the specifications or drawings. Unless otherwise specified, all concrete shall be Class A3, minimum.

All exposed concrete shall be air entrained with an air content conforming to the requirements of Table II-17, Section 217 of the VDOT *Road and Bridge Specifications*, latest revision. Air entrained admixtures for use in portland cement concrete shall meet the requirements of AASHTO designation M154. Only those admixtures shall be used which have been approved by the City Engineer.

Calcium chloride may be used as an admixture if approved by the City Engineer. Calcium chloride shall conform to AASHTO M144, type 2. The use of calcium chloride is not permitted in reinforced concrete construction.

Concrete admixtures, when specified, shall conform to Section 215 of VDOT *Road and Bridge Specifications.*

Concrete Classes (VDOT) to Design Compressive Strength at 28 days (f'c):

Class A4.5	General	4,500-psi
Class A4	General	4,000-psi
Class A3	General	3,000-psi
Class B2	Massive or Lightly Reinforced	2,200-psi

2.2 MISCELLANEOUS

2.2.1 HANDRAILS

Handrails shall conform to requirements of Section 410 of the VDOT *Road and Bridge Specifications.*

2.2.2 ASPHALT EXPANSION JOINT FILLER

Asphalt expansion joint filler material shall be in accordance with Section 212.02(c) of the VDOT *Road and Bridge Specifications*, latest revision. Material shall be approximately ½ inch in thickness and a width and depth equal to those of the incidental structure.

2.2.3 CURING MATERIALS

White pigmented liquid membrane curing compound, PE film, or water for curing shall meet the requirements of Section 220 of the VDOT *Road and Bridge Specifications*.

2.2.4 INSULATION BLANKET

In cold weather operations, insulated blankets must retain or supply moisture and maintain the temperature at the outermost surfaces of concrete above 50° F for at least 72 hours and above 32° F for at least an additional 48 hours.

2.2.5 POROUS BACKFILL AND WEEP HOLES

Porous backfill material and drain pipes for weep holes for retaining walls shall conform to requirements of Section 506 of the VDOT *Road and Bridge Specifications.*

2.2.6 PORTLAND CEMENT

Type I, CSA normal, ASTM C150 *Standard Specification for Portland Cement.*

2.2.7 REINFORCEMENT

A. **Reinforcing Bars**

Reinforcing bars shall conform to the requirements Section 223, Grade 40 or 60 of the VDOT *Road and Bridge Specifications*, latest revision.

B. **Welded Wire Fabric**

Wire mesh reinforcement shall be minimum 6 x 6, 10 Ga. shall conform to the requirements of Section 223 of VDOT *Road and Bridge Specifications*, latest revision.

2.2.8 AGGREGATE BASE MATERIAL

Aggregate base materials for foundation support shall be VDOT 21A, compacted, and in compliance with Section 208 of the VDOT *Road and Bridge Specifications*, latest revision.

PART 3 – EXECUTION

3.1 CONSTRUCTION – ALL CONCRETE ITEMS

3.1.1 CONSTRUCTION OF SUBGRADE

A. **Subgrade Preparation**: Excavation and subgrade preparation shall be in strict compliance with Section 02200, *Earthwork*. The subgrade upon which this work is to be placed shall be shaped and compacted to a firm, even surface conforming to the elevation and cross-sections shown on the plans, the Standard Details or as directed by the Engineer. All soft, frozen, and unsuitable material shall be removed and replaced with approved material. The subgrade shall be moist when the concrete is placed.

B. **Subgrade Fine Grading (Trimming)**: When forms have been set to exact grade and secured, fine grading to exact sub-grade elevation shall be completed by hand. Before pouring operations begin, the Contractor shall have forms set and grade tested and approved by the Construction Coordinator ahead of pouring operations. Subgrade fine grading shall be the responsibility of the Contractor to insure that the subgrade conforms to the Standard Details.

3.1.2 FORMS

Forms for this work shall be of wood, metal, or other approved material, shall extend to the full depth of the concrete and shall be straight, free from warps and of sufficient strength to withstand the pressure of the concrete without springing. Bracing and staking of the forms shall be such that the forms will remain in both horizontal and vertical alignment until their removal. Forms shall be cleaned of foreign matter and oiled before concrete is placed. No concrete shall be poured into forms that have not been checked and approved by the City Construction Coordinator.

3.1.3 CURING

A. **Curing – Year Round**

The following method of curing is required year round:

1) **Liquid Membrane Compound**: Apply membrane–curing compound for curing, sealing, and moisture retention. The entire surface of the concrete shall be sprayed uniformly with a white pigmented membrane-forming compound immediately following the texturing operation.

Perform application in accordance with manufacturer's directions but at a minimum rate of 100 to 150 square feet per gallon and not more than 350 square feet per gallon. Application shall be by a sprayer or long-nap roller and shall be an even, continuous membrane produced on the concrete surface. No puddling shall be produced. At the time of use, the compound shall be in a thoroughly mixed condition, with pigment uniformly dispersed through the vehicle.

The membrane shall harden 30 minutes after application. Personnel and equipment shall be kept off the freshly applied material to prevent damage to the seal for a minimum of 72 hours. If the membrane becomes damaged within the initial 72 hours, damaged portions shall be repaired immediately with additional compound. Other requirements for protection of the structural integrity of concrete from pedestrians, vehicular traffic, and equipment shall be per these specifications as stated in applicable sections.

If removal of forms is required, exposed sections shall be protected immediately to provide a curing treatment equal to that provided for the surface.

2) **PE Film**: Concrete shall be covered with PE film. Color of film shall be white. However, from November 1 to April 1, clear or opaque PE film will be permitted. Film shall be installed immediately after liquid membrane compound has obtained a sufficient set so that it is not damaged. Apply film so that marks from application are not produced.

3) No extra compensation will be made for curing of any type.

B. **Cold Weather Curing – Additional Requirements**

No concrete is to be poured when the outside ambient temperature is 40 degrees and falling. Cold weather curing shall be applied when the outside temperature is 50 degrees and falling.

1) **Concrete Temperature**: Conform to the requirements of paragraph 217.10 *Placement Limitation* of the VDOT *Road and Bridge Specifications*, latest revision for the required temperatures of concrete.

2) **Cold Subgrade**: No concrete is to be placed on a frozen subgrade.

3) In addition to year round curing, install insulated blankets that will retain or supply moisture and maintain the temperature of concrete at the outermost surfaces above 50° F for at least 72 hours and above 32° F for at least an additional 48 hours. Blankets shall be left in place for a minimum of 7 days.

4) In cold weather applications, calcium chloride may be used as an admixture, if approved by the City Engineer

C. **Hot Weather Curing – Additional Requirements**

Hot weather curing shall be applied when the outside temperature is 75 degrees and rising. Care shall be taken in hot, dry, or windy weather to protect the concrete from shrinkage cracking by applying at a minimum, liquid membrane compound and PE film as described in Section 3.1.3 A, above.

Routine hot weather measures shall include cooling forms and wetting subgrade in addition to any other measures as required by the City Engineer.

Other measures for curing may be required by the City Engineer, such as: fog spraying, sprinkling, ponding, windbreaks, shading, or wet covering with an approved light colored material.

Hot weather curing shall remain in place for a minimum of 7 days.

D. **Improper Curing**

Any work damaged due to improper curing, freezing, or rain, shall be replaced at the Contractor's expense.

3.1.4 PROTECTION OF CONCRETE

A. Protect new concrete sidewalks and appurtenances from pedestrian traffic for a minimum of 24 hours and driveway surfaces and curb and gutter from vehicular traffic for minimum of 7 days, unless otherwise approved by the City Engineer. Erect and maintain warning signs, lights, and watchmen to protect pedestrians and to direct traffic as needed.

B. No equipment shall be driven or moved across newly concreted surfaces unless such equipment is rubber-tired and only if concrete surface is designed for and capable of sustaining loads imposed by the equipment.

C. Protect new concrete from graffiti.

D. Protection of concrete shall meet requirements of Section 404.03 of the VDOT *Road and Bridge Specifications*, latest revision.

3.1.5 TESTING

Testing shall be in accordance with the requirements of Section 217.08 – *Acceptance* of the VDOT *Road and Bridge Specifications*, latest revision.

3.1.6 COORDINATION OF POURS

It will be the responsibility of the Contractor to coordinate the times of pours with the City Construction Coordinator. For miscellaneous concrete pours (i.e. sidewalk, curb & gutter, collars, etc), a minimum of 24 hours notice shall be given to the City Construction Coordinator so that he/she can check all aspects of the work before the pouring operations begin. For structural pours (i.e. retaining walls, bridge decks, box culverts, etc.), a minimum of 48 hours notice shall be given to the City Construction Coordinator. Under no circumstances shall the Contractor pour concrete until the Construction Coordinator has had time to make checks of the work.

3.1.7 PLACING AND FINISHING – ALL CONCRETE ITEMS

The concrete shall be placed in the forms in such a manner as to prevent the segregation of the mortar and the aggregate. The concrete shall be spaded, tamped, or vibrated sufficiently to bring the mortar to the surface.

Prior to and during pouring operations, the Contractor's foreman or formsetter shall carefully watch all alignment and grades to detect any errors in grade or misalignment. In the event any of the work is damaged from any cause or proves defective in any way, or is out of alignment or grade, the Contractor shall remove such work and replace at his own expense. The detection of poor subgrade shall also be his responsibility.

When sufficient concrete has been placed in the forms, it shall be well spaded along all areas in contact with the forms in order to eliminate all honeycombing. Concrete shall be floated to the proper grade and alignment, free from depressions or other irregularities, after which the exposed surfaces shall then be screeded with a straight edge and finished with a steel or wooden trowel.

The concrete shall be troweled smooth and, before the concrete obtains full set, very lightly brushed with a brush moistened with clear water. No mortar shall be used in the finishing. Immediately following finishing operations, the finished concrete shall be cured and protected in accordance with these specifications.

3.1.8 DEFECTIVE WORK

The City will require the removal and replacement of any concrete items where they have been broken, cracked, chipped, have become misaligned, grades are incorrect, does not meet dimensions as shown in the Standard Details, improperly cured, or of a substandard or non-approved product. Such areas designated by the City Engineer shall be replaced at no cost to the City. Items replaced shall conform to the requirements for new work as to strength and construction. During removal of defective work, an amount equal to the required lengths of construction joints for each item or the amount as directed by the City Engineer must be removed and replaced.

The Engineer may drill cores from the completed slab to make depth measurements. Sections showing a deficiency of more than 3/8 inch shall be removed and replaced to the specified depth at the Contractor's expense.

3.1.9 PLACEMENT LIMITATIONS

Conform to the requirements of paragraph 217.10 of the VDOT *Road and Bridge Specifications*, latest revision for concrete temperature.

3.1.10 REINFORCING STEEL OR WIRE MESH

Wire mesh or reinforcing steel will be used if recommended by the City Engineer, stated in the specifications, shown on plans, or Standard Details. For installation of mesh or steel, see the applicable Sections of the VDOT *Road and Bridge Specifications or Standards.* All wire mesh or steel shall be properly spaced and thoroughly tied, and approved by the City Construction Coordinator before concrete is placed.

3.2 STANDARD CONCRETE CURB AND COMBINED CURB AND GUTTER

3.2.1 GENERAL REQUIREMENTS – COMBINED CURB & GUTTER

This work shall consist of a single course of portland cement concrete, constructed on a prepared subgrade in accordance with these specifications. It shall have the dimensions, cross-section, and location as shown on the plans or as directed by the City Engineer. See **Standard Detail 25.04** for standard concrete curb, combined curb and gutter, and valley gutter sections.

Horizontal alignment of curbs and combined curb and gutter shall be in reasonably close conformity to the lines shown on the plans. Vertical alignment shall not exceed +/- 3/8 inch in 10 feet from plan grade.

Before concrete obtains full set, all exposed surfaces shall be finished with a brush moistened with clear water.

When constructing curb and gutter, the Contractor will be responsible for filling and compacting material in the space left behind the curb and gutter after the forms are removed. This shall take place within 3 to 7 days from pour and the material shall be compacted to the grade of the back of the curb. No extra compensation shall be made for this work.

When tying curb and gutter into inlets, dowels shall be placed in the throat plate, to tie gutter to plate as required in the use of conventional forms.

3.2.2 JOINTS FOR CURB AND GUTTER

A. **Transverse Joints**

1) Transverse joints for crack control for fixed forms shall be provided at the following locations:

   a. At approximately 10 foot intervals;

   b. At the gutter where the curb and gutter ties to the gutter apron of drop inlets;

   c. When time elapsing between consecutive concrete placements exceeds 45 minutes; and

   d. Where no section shall be less than 6 feet in length.

2) Transverse joints for crack control may be formed by using one of the following methods:

   a. Removable 1/8 inch thick templates;

   b. Scoring or sawing for a depth of not less than 3/4 inch when using curb machine; or

c. Approved "leave-in" type insert or may be formed or created using other approved methods which will successfully induce and control the location and shape of the transverse cracks. Approval by the City Engineer is required.

If templates are used for transverse joints, templates shall be removed by stages, but not entirely until the concrete has become thoroughly hard. After removal of the templates, there must be a clear division throughout between these sections. Edging tools will be used to form an edge along the back and front form and at each template.

B. **Expansion Joints**: See PRODUCTS, Section 2.2.3 of these specifications for approved expansion materials.

Expansion joints shall be formed at intervals of approximately 90 feet, at all radii points at concrete entrances and curb returns, at locations no less than 6 feet and no more then 10 feet from drop inlets, at the end of days work, and or all cold joints.

3.2.3 FORMS – COMBINED CURB & GUTTER

A. **Fixed Forms**

Fixed forms shall be straight, free from warp, and of such construction that there will be no interference with the inspection of grade and alignment. Forms shall extend the entire depth of the item and shall be braced and secured so that no deflection from alignment or grade will occur during concrete placement. Radial forms shall be sufficiently flexible or otherwise designed to provide a smooth, uniform, curved surface of the required radius. When sufficient concrete has been placed in the forms, it shall be well spaded along all areas in contact with the forms in order to eliminate all honeycombing. Face forms shall be removed as soon as concrete has attained sufficient set for the curb to stand without slumping. The exposed surface shall then be smoothed by the use of a suitable finishing tool.

B. **Slip Forms**

The contractor will be permitted to slipform combined curb & gutter provided that he has obtained approval by the City Engineer and that all slipform requirements stated in the VDOT, *Road and Bridge Specifications*, Section 502.03 (b), or latest revision are adhered to.

3.3 STANDARD PORTLAND CEMENT CONCRETE SIDEWALK AND DRIVEWAY ENTRANCES

3.3.1 GENERAL REQUIREMENTS

This work shall consist of the construction of portland cement concrete sidewalk 4 inches thick and in accordance with these specifications. Sidewalks crossing driveways entrances and the driveway entrances shall be constructed 7 inches thick. See **Standard Details 25.05** and **25.06** for sidewalk and **Standard Details 25.10, 25.11,** and **25.12** for driveway entrance openings.

Curb cuts for driveways and handicap ramps shall be constructed as shown on the Standard Details for the type driveway or ramp specified on the plans or as directed by the City Engineer.

Handicap ramps shall be constructed at all street intersection corners. The ramps shall be constructed as shown on the Standard Details for the type shown on the plans or as directed by the City Engineer.

Sidewalks shall not be opened to pedestrian traffic for the first 24 hours. Vehicular traffic shall be excluded for the first 7 days or until the minimum design compressive strength is attained, whichever is the lesser time.

Tolerances: Horizontal alignment of sidewalks shall be to the lines and grades as shown on the plans and details. Vertical alignment shall not exceed +/- 3/8 inch in 10 feet from the plan grade.

3.3.2 JOINTS FOR CONCRETE SIDEWALK AND DRIVEWAY ENTRANCES

Transverse expansion joints shall be constructed at intervals of approximately 30 feet. Slabs shall be separated by transverse preformed joint filler, 1/2 inch in thickness, that extends from the bottom of the slab to approximately 1/4 inch below the top surface.

The slab between expansion joints shall be divided into sections approximately 5 feet in length by transverse score joints formed by a jointing tool, trowel, or other approved means. Transverse control joints shall also be provided when the time period between consecutive concrete placements is more than 45 minutes. Control joints shall extend into concrete for at least 1/4 of the depth and shall be approximately 1/8 inch in width. Where slabs are more than 7 feet in width, control joints shall be formed longitudinally to obtain secure uniform blocks that are approximately square. Transverse control joints shall also be installed where the corners of the drop inlets project into the sidewalk.

Construction joints shall be formed around appurtenances extending into and through the sidewalk. Preformed joint filler 1/4-inch thick shall be installed in these joints except that joint filler shall not be used adjacent to drop inlets. Preformed joint filler shall be securely fastened. An expansion joint shall be formed and filled with 1/4 inch preformed joint filler no less than 6 feet and no more than 10 feet from drop inlets. Preformed joint filler shall also be installed between concrete sidewalk and any adjacent fixed structure which is not tied to the sidewalk with steel dowels.

3.3.3 PLACING AND FINISHING CONCRETE

The foundation shall be thoroughly moistened immediately prior to concrete placement. Concrete shall be placed in forms by methods that will prevent segregation. Concrete shall be spread to the full depth and brought to grade by screeding and straightedging. Concrete shall be spaded adjacent to forms to prevent a honeycomb appearance, and the surface shall be floated with a wooden float to produce a surface free from irregularities. The final finish shall be obtained with an approved hand float that will produce a uniform surface texture. Light brooming shall be used to hide trowel marks. Outside edges of the sidewalk slab and joints shall be edged with an edging tool having a radius of 1/4 inch.

See paragraph 3.1.3 *Curing* for requirements for curing concrete.

3.3.4 FORMS

A. **Fixed Forms**

See paragraph 3.2.3 A *Fixed Forms*, of these specifications.

B. **Slip Forms**

Slip form pouring shall be allowed with approval of the City Engineer. All portions of paragraph 3.2.3 B, *Slip Forms*, of these specifications, concerning pouring operations with slip forms shall apply.

3.4 FACEDOWN PORTLAND CEMENT CONCRETE SIDEWALK

This type of sidewalk construction shall consist of standard sidewalk as specified in above paragraph *3.3 - Standard Portland Cement Concrete Sidewalk and Driveway Entrances*, of these specifications, poured monolithically with a 12-inch curb as shown on **Standard Detail 25.06**. See also **Standard Details 25.10, 25.11,** and **25.12** for driveway entrance openings.

The methods of construction for facedown sidewalk shall be the same specified in paragraph 3.3 - *Standard Portland Cement Concrete Sidewalk and Driveway Entrances* of these specifications with the following additions:

A. A joint shall be cut with an approved edging tool 6 inches from the face of the curb and parallel thereto.

B. All expansion joints in the sidewalk shall extend across the top and face of the curb.

C. The final finish for the top of the curb shall be made with a brush dampened with water, to match the finish of the adjoining structure.

3.5 MISCELLANEOUS PORTLAND CEMENT CONCRETE STRUCTURES AND APPURTANCES

This work shall consist of portland cement concrete retaining walls, headwalls, steps, piers for stream crossings, flumes and ditches, median barriers, median strips, islands, etc. constructed in accordance with these specifications. Any specifications or details pertaining to these items that are not covered herein shall be per VDOT *Road and Bridge Specifications and Standards*, latest revision. These structures shall be constructed to the dimensions, cross-sections, and locations as shown on the plans, shown on the Standard Details, or as directed by the City Engineer.

END OF SECTION 02400

Back to Top

02500 – BASE COURSE AND PAVING

(Revised 11/10/09)

SELECTED LINKS TO SECTIONS WITHIN THIS SPECIFICATION

Part 1 – General	Asphalt Concrete Pavement	Seal Coat
Part 2 – Products	Asphalt Conc. Pavement Const.	Slurry Seal, Construction
Part 3 – Execution	Paving Operations	Slurry Seal, Materials
Agg. Base Course Mat'l.	Pavement Profiling	Tack Coat
Agg. Base Course Const.	Pavement Repair	

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

B. Section 01000 – GENERAL REQUIREMENTS.

C. Section 02200 – EARTHWORK.

D. Section 02220 – TRENCHING, BACKFILLING AND COMPACTION OF UTILITIES.

E. Section 02400 – CURB & GUTTER, DRIVEWAYS AND SIDEWALKS.

F. Any Specifications or details not covered herein shall be per Virginia Department of Transportation, *Road and Bridge Specifications*, 2002 or latest revision.

1.2 SUMMARY

This section includes all equipment, labor, material, and services required for complete installation of aggregate base courses and asphalt concrete pavement structures and specialties for municipal street systems.

1.3 DEFINITIONS

For the purposes of this specification, the following definitions refer to roadway and street systems that come under the authority of the City of Lynchburg, Virginia as specified within this section and other sections of this manual.

A. **Aggregate Base Course**: A layer of material of a specified thickness placed between the subbase and asphalt paving.

B. **Base Course**: A layer of material of a specified thickness placed between the subbase or aggregate base course and the intermediate or surface course.

C. **Public Road System**: Roadway, streets, and their appurtenances required for the conveyance of the motoring public that are maintained by either the City of Lynchburg or the Virginia Department of Transportation.

D. **Subbase Course**: A layer of material of a specified thickness that is placed on a subgrade to support a base course.

E. **Subgrade**: The top surface of a roadbed shaped to conform to the typical section on which the pavement structure and shoulders are constructed.

F. **Subgrade Stabilization**: The modification of roadbed soils by admixing with stabilizing or chemical agents that will increase the load bearing capacity, firmness, and resistance to weathering or displacement.

G. **Suitable Subgrade**: A subgrade that consists of a material type and density that is approved by the City Engineer for placing a subsequent layer of material.

H. **Surface Course/Wearing Surface**: The top layer of a pavement structure that resists skidding, traffic abrasion, and disintegrating effects of weather.

1.4 SUBMITTALS

A. Submit job-mix formula for each mixture to be supplied within 30 days after contract is awarded.

B. Submit product data and shop drawings for manhole, lampstack, and valve box adjustment rings in accordance with Section 01000, *General Requirements*.

1.5 QUALITY ASSURANCE

A. Asphalt concrete pavement thickness and density shall conform to the requirements of Section 315 of VDOT *Road and Bridge Specifications*, or latest revision. Asphalt concrete pavement coring sample thickness and density test reports shall be submitted at completion of project in accordance with the requirements of Section 315 of VDOT *Road and Bridge Specifications*, or latest revision.

B. Aggregate base course density shall conform to the requirements of Secton 308 and 309 of VDOT *Road and Bridge Specifications*, or latest revision.

C. Materials and operations shall comply with the latest revision of all applicable codes and standards.

1.6 STANDARD ABBREVIATIONS

AASHTO	American Association of State Highway Transportation Officials
ANSI	American National Standards Institute
AREA	American Railway Engineers Association

ASTM	American Society for Testing and Materials
BM	Base Mix
FS	Federal Specifications
HMA	Hot Mix Asphalt
IM	Intermediate Mix
MSDS	Material Safety Data Sheets
OSHA	Occupational Safety and Health Administration
RAP	Recycled Asphalt Pavement
SM	Surface Mix
VDOT	Virginia Department of Transportation

1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Plant operations shall be in accordance with Section 211 *Asphalt Concrete* of the VDOT *Road and Bridge Specifications*, latest revision.

B. Shipping and storing shall be in accordance with Section 210 *Asphalt Materials* of the VDOT *Road and Bridge Specifications*, latest revision.

C. Hauling equipment shall be in accordance with Section 315.03 *Equipment* of the VDOT *Road and Bridge Specifications*, latest revision.

D. **Delivery**

1) Hauling equipment shall be loaded in a manner to minimize segregation of the mix.

2) Haul trucks shall park in a designated area to minimize tracking of tack coats.

3) Once loaded, haul trucks shall proceed immediately to the job site.

1.8 PROJECT CONDITIONS

1.8.1 PROTECTION OF STREAMS

Do not discharge excess concrete into a drainage pipe, catchbasin, ditch, stream, river, pond, lake, or on City property without the approval of the City Construction Engineer.

1.8.2 PROTECTION OF ROADWAYS

Do not discharge or allow concrete to spill onto any roadway or appurtenances either during placement or while in transit. Remove spills immediately or otherwise repair street as directed by the City Engineer. The contractor shall be responsible for cleanup of all waste/excess of concrete.

1.8.3 PROTECTION OF PROPERTY

Do not discharge excess concrete without written permission of the property owner.

1.9 COORDINATION

A. Coordinate manhole, lampstack, and valve box adjusting with the City of Lynchburg, City Engineer.

B. Coordinate tie-in to municipal roadways with the City of Lynchburg, City Engineer.

PART 2 – PRODUCTS

2.1 AGGREGATE BASE COURSE

Aggregate base material shall be designated as Type 1 size 21A or 21B in accordance with Section 208 *Subbase and Aggregate Base Material* of the VDOT *Road and Bridge Specifications*, latest revision.

2.2 HYDRAULIC CEMENT STABILIZATION

Hydraulic cement stabilization shall be in accordance with Section 307 *Hydraulic Cement Stabilization* of the VDOT *Road and Bridge Specifications*, latest revision.

2.3 ASPHALT CONCRETE PAVEMENTS

Asphalt concrete pavements shall be in accordance with Section 211 *Asphalt Concrete Materials* of the VDOT *Road and Bridge Specifications*, latest revision.

The use of reclaimed asphalt pavement shall be in accordance with Section 211 *Asphalt Concrete Materials* of the VDOT *Road and Bridge Specifications*, latest revision.

The use of aggregate from Blue Ridge Stone Corporation, Lawyers Road Plant, Lynchburg, Virginia will be restricted from use in asphalt surface courses where the ADT exceeds 14,999 vehicles per day.

2.4 TACK COAT

Tack coat shall be in accordance with Section 310 *Tack Coat* of the VDOT *Road and Bridge Specifications*, latest revision.

2.5 ASPHALT SEAL COAT

Asphalt seal coat shall be in accordance with Section 312 *Seal Coat* of the VDOT *Road and Bridge Specifications*, latest revision.

2.6 EMULSIFIED ASPHALT SLURRY SEAL SURFACES

Emulsified asphalt slurry seal surfaces shall be in accordance with VDOT *Special Provision for Emulsified Asphalt Slurry Seal* dated October 14, 1994 or latest revision.

2.7 PAVEMENT REINFORCING FABRIC

Pavement reinforcing fabric shall be A/oMat C040 or equal and meet or exceed AASHTO M288-00, Paving Fabric requirements and conform under AASHTO National Transportation Product Evaluation program. The fabric is needle punched, non-woven and heat treated on one side. This fabric shall conform to the following:

Physical Properties			
Fabric Property	**Test Method**	**Units**	**C040**
Weight	ASTM D 3776	oz/yd^2	≥4.2 (142gm/m^2)
Grab tensile elongation	ASTM D 4632	Lbs.	102 (453N)
Grab elongation	ASTM D 4632	%	50
Trap tear	ASTM D 4533	Lbs.	45(.220 kN)
Puncture	ASTM D 4833	Lbs.	60 (.267kN)
Mullen burst	ASTM D 3786	psi	200(1378 kPa)
Asphalt retention	ASTM D 6140	Gal/yd^2	0.23 (1.04l/m^2)
Melting point	ASTM D 276	Degrees F	325 F (163 C)
Thickness	ASTM D 1777	Mils	30
Ultraviolet Degradation	ASTM D 4355	%Strength Retained @ 150 Hrs	70%

PART 3 – EXECUTION

3.1 GENERAL

Construction and testing shall conform to these specifications and standard drawings as well as any specifications or details not covered herein shall be per the applicable sections of Divisions I, II, III, V, and VII of the *Virginia Department of Transportation Road and Bridge Specifications*, latest revision and on the Standard Details shown in the VDOT *Road and Bridge Standards*, latest revision.

3.2 PAVEMENT, PATCHES, REPAIR AND REPLACEMENT (PERMANENT & TEMPORARY)

A. **General**: This work shall consist of replacing subbase stone, and asphalt material in the street in areas where it becomes necessary to remove the original pavement such as for roadway failures, sewer trenches, water main trenches, drainage pipe ditches, etc. Pavement repair depths shall be the type to match the existing street pavement as shown on the drawings or as determined by the City Engineer.

B. **Cutting Pavement**: For all areas that are patched, the edges of the pavement shall be cut in a straight line revealing a vertical face for the patch to abut against. Care shall be taken during excavation and construction to avoid damage to adjoining paved surfaces. If patching is performed as part of piping installations, perform cutting operations prior to installation of line to avoid excessive removal of pavement.

C. **Surface Tolerances**: The asphalt patched surface shall be tested using a 10-foot straightedge. The variation of the surface from the testing edge of the straightedge between any two contacts with the surface shall not exceed ½ -inch allowing for the contours of the existing pavement. All humps or depressions exceeding the specified tolerance shall be corrected or the defective work removed and replaced with new material. Any deviation from this standard will be at the discretion of the City Engineer.

D. **Excavation**: Excavation of the existing pavement and subbase shall be made to a depth as shown on the applicable **Standard Details 25.18 through 25.22**. Before the placement of any stone, concrete or asphalt material, a representative of the City Engineer shall inspect the underlying subgrade. The Contractor shall be responsible for correcting any ruts or soft yielding places to a depth of approved suitable subgrade before placing of the asphalt material. Any depths below 4 inches shall be paid as extra work.

3.2.1 PERMANENT PAVEMENT REPAIR

A. **Asphalt Pavement Repair**

Aggregate Base Stone: The aggregate base shall be installed in accordance with **Standard Detail 25.18** and compacted to the density specified in VDOT *Road and Bridge Specifications*, Section 309 *Aggregate Base Course*, latest revision.

Asphalt Concrete Pavement: The asphalt concrete pavement shall be installed in accordance with **Standard Detail 25.18**. Compact to the density specified in VDOT *Road and Bridge Specifications,* Section 315 *Asphalt Concrete Pavement,* latest revision.

Lift thickness shall not exceed those as referenced within these specifications. Before placing any asphalt material, all sides of the existing pavement and subbase shall be thoroughly tacked at the rate of 0.3 Gal/SY. The finished surface shall abut the existing pavement with no overlap allowed.

B. **Concrete Pavement Repair**

Aggregate Base Stone: The aggregate base shall installed in accordance with **Standard Detail 25.19** and compacted to the density specified in VDOT *Road and Bridge Specifications*, Section 309 *Aggregate Base Course*, latest revision.

Hydraulic Cement Concrete Pavement: The concrete pavement shall be installed in accordance with **Standard Detail 25.19** using a minimum 3000 psi concrete at 28 days. The City Engineer reserves the right to require that the Contractor pull concrete test cylinders for verifying concrete strength. Concrete shall meet VDOT *Road and Bridge Specifications*, Section 217 *Hydraulic Cement Concrete* and Section 316, *Hydraulic Cement Pavement.*

C. **Historical District with Asphalt Pavement Overlay or without Asphalt Overlay**

Sand: Four inches of sand shall be placed to the depth shown on **Standard Details 25.21 or 25.22**, as applicable. Sand shall be Unified Soil Classification type SW compacted in accordance with Table 2220.1 of this specification.

Aggregate Base Stone: The aggregate base shall be installed in accordance with **Standard Detail 25.21 or 25.22,** as applicable and compacted to the density specified in VDOT *Road and Bridge Specifications*, Section 309 *Aggregate Base Course*, latest revision.

Belgium Block, Cobble or Brick: The pavers shall be installed in accordance with **Standard Detail 25.21 or 25.22** as applicable. Before placing an asphalt mix over pavers (**Standard Detail 25.21**), fill joints between pavers with like material.

Asphalt Surface Course: **Standard Detail 25.21** specifies a finished surface course of asphalt mix over the pavers. Cut back the existing asphalt pavement as shown on **Standard Detail 25.21**. Care shall be taken to insure a uniform grade between the existing pavement and the new surface.

3.2.2 TEMPORARY PAVEMENT REPAIR

A. **Asphalt Pavement Repair**

When shown on the plans, during winter months when asphalt concrete is unavailable, or when directed by the City Engineer, temporary pavement patches conforming to **Standard Detail 25.20** shall be installed. The Contractor shall maintain the temporary repair to the satisfaction of the City Engineer until the permanent pavement repair is made.

Cold patch material shall be installed in accordance with manufacturer's recommendations.

Density shall conform to the applicable sections referenced above under permanent pavement repair for each particular product (i.e. aggregate base course).

B. Once hot asphalt mix is available, all temporary patch material shall be removed and replaced with a permanent hot asphalt patch within thirty calendar days.

3.3 AGGREGATE BASE COURSE

A. Subgrade Approval

The underlying course upon which the aggregate base course is to be placed shall be prepared in accordance with the requirements of Section 02200, *Earthwork*, of these specifications and applicable sections of VDOT *Road and Bridge Specifications,* Section 304, *Constructing Density Control Strips* and Section 305, *Subgrade and Shoulders,* latest revision. Prior to any spreading operations, the underlying course shall be checked and accepted by the City Engineer. Any ruts or soft yielding places shall be corrected and rolled before the base course is applied.

B. Installation of Aggregate Base Course

The aggregate base course shall be mixed in an approved central mixing plant of the pugmill type and water added during mixing operations in the amount necessary to provide the optimum moisture content for compacting. After mixing, the material shall be transported to the job site and placed on the roadbed by means of an approved aggregate spreader.

The aggregate base course shall be constructed in layers not less than 3 inches or more than 6 inches of compacted thickness. When vibrating with other approved types of special compacting equipment, the compacted depth of a single layer of the aggregate base course may be increased to 8 inches upon approval by the City Engineer. The aggregate, as spread, shall be uniform in gradation with no segregation or pockets of fine or course material.

C. Compaction Operations and Density Requirements

After mixing and spreading, the aggregate base course shall be thoroughly compacted at optimum moisture within +/- 20-percent of optimum. Rolling shall progress gradually from the sides to the center and shall continue until the entire area of the course has been rolled by the rear wheels. Rolling shall continue until the material has been compacted to not less than 100 percent density when tested in accordance with AASHTO T191, latest revision.

D. Grading Tolerances of Final Surface

After final rolling, the surface shall be inspected and any irregularities in excess of ½ inch shall be corrected. Aggregate base course shall conform to the lines, grades, and typical cross sections shown on the plans, details or as established by the City Engineer within a tolerance of +/- ½ inch. Any irregularities in the surface shall be corrected by scarifying, remixing, reshaping, and recompacting until a smooth surface is obtained. If directed by the City Engineer, the aggregate base shall be opened to public traffic for at least 2 weeks before being surfaced. During this time, the surface shall be protected against loss of shape, required grades, and material by the addition of moisture and any re-working as necessary. This shall be at no additional cost to the City.

3.4 HYDRAULIC CEMENT STABILIZATION

Placement of hydraulic cement stabilization shall be in accordance with VDOT *Road and Bridge Specifications,* Section 307, latest revision.

3.5 ASPHALT CONCRETE PAVEMENT

3.5.1 CONDITIONING EXISTING SURFACE

Preparation of Surface: Prior to beginning paving operations, the existing areas to be resurfaced shall be thoroughly cleaned by the contractor to the satisfaction of the City Engineer. This cleaning shall include sweeping of the streets with a power operated broom, cutting excess debris with a grader, washing with a water truck, and hand cleaning any debris left after this operation is complete. Cleaning operations shall commence just prior to the resurfacing of streets. In addition, the contractor shall expose any existing paving areas, which have been covered by soil, grass, or debris. These areas shall be thoroughly cleaned and tacked before resurfacing. Any excess material left over after this operation shall be removed or spread out to the satisfaction of the City Engineer. No additional payment shall be made for this work.

When the surface of the existing pavement or base is irregular, it shall be brought to a uniform grade and cross section as directed by the City Engineer. The surface on which the asphalt concrete is to be applied shall be prepared in accordance with the requirements of the applicable specifications.

When specified, prior to placement of asphalt concrete, longitudinal and transverse joints and cracks in hydraulic cement concrete shall be sealed by the application of an approved joint sealing compound.

Any surface casting such as water boxes, manholes, grates, cleanouts, etc. shall be set to grade prior to beginning of paving operation. All telephone manholes and gas boxes are to be adjusted by the utility companies or contractor if approved by the City Engineer. All such castings shall be adjusted within a tolerance of 1/8 inch below or flush with the asphalt finished elevation. See **Standard Details 25.08** and **25.09**. A maximum of three 2-inch riser rings will be allowed for adjusting to grade. Adjustments more than 6 inches above original grade will require excavation and frame adjustment. The contractor shall be required to coat the top of any such casting with a suitable coating material to prevent adhesion of the asphalt material to the casting. A tack coat of asphalt material, conforming to the requirements of these specifications, shall be applied prior to resurfacing operations.

A. **Tack Coat**

A tack coat of liquid asphalt shall be applied between the existing surface and each asphalt course placed thereafter. The tack coat shall conform to the applicable requirements of VDOT *Road and Bridge Specifications* Section 310.

Tack material shall be uniformly applied with a pressure distributor conforming to VDOT requirements. Hand spray equipment shall not be used except in areas inaccessible by a pressure distributor. Undiluted asphalt shall be applied at a rate of 0.05 to 0.10 gallons per square yard. Diluted asphalt shall be applied at a rate of 0.10 to 0.15 gallons per square yard. The time interval between applying the tack coat and placing the paving mixture shall be sufficient to ensure a tacky residue providing maximum adhesion of the paving mixture to the base. On rich sections or those that have been repaired by the extensive use of asphalt patching mixtures, the tack coat shall be eliminated only if approved by the City Engineer.

Application of tack at joints, adjacent to curbs, gutters, or other appurtenances shall be applied with a hand wand at the rate of 0.20 gallons per square yard. At joints, the hand wand applied tack shall be 2 feet in width with 4 to 6 inches protruding beyond the joint for the first pass. Tack for the adjacent pass shall completely cover the vertical face of the mat edge, so that slight puddling of asphalt occurs at the joint, and extends a minimum of 1 foot into the lane to be paved. Milled faces that are to remain in place shall be tacked as above for the adjacent pass. Use of tack at longitudinal joint vertical faces will not be required when paving in echelon. Care shall be taken to prevent spattering of adjacent pavement, structures, trees, and private property. Any spattering shall be cleaned up by the contractor at no cost to the City.

Tack shall be applied in such a manner as to offer the least inconvenience to traffic and to permit a minimum of one way traffic without pickup or tracking. Traffic shall be excluded from the any pavement that has received tack. New asphalt shall not be placed on tack or prime coats that have been damaged by traffic or contaminated by foreign material.

B. **Removing Depressions/Irregularities**

Where irregularities in the existing surface would result in a course more than 3 inches in thickness after compaction, the surface shall be brought to a uniform grade by scratching with a thin layer of asphalt concrete not exceeding the minimum thickness as recommended for that type of mix. Then the material shall be thoroughly compacted until it conforms to the surrounding surface. The mixture used shall be the same as that specified for the surface mix to be placed.

3.5.2 PAVEMENT PROFILING

The work included in this item shall consist of the removal of existing asphalt surfaces of in place pavements on various streets within the City of Lynchburg, to produce the desired profile, cross-section, and surface conditions as specified by the City Engineer. All removed material shall become the property of the Contractor.

The contractor shall plan and prosecute a schedule of operations so that milled roadways will be overlaid with asphalt concrete asphalt as soon as possible, and, in no instance, shall the time lapse exceed 7 days after the milling operations, unless otherwise specified. The milled areas of the roadway shall be kept free of irregularities and obstructions that may create a hazard or annoyance to traffic in accordance with the requirements of VDOT *Road and Bridge Specifications* Section 104, latest revision.

The Contractor shall plan and prosecute the milling operation to avoid trapping of water on the roadway. At the discretion of the City Engineer, cutting drainage slots in roadway shoulders or inlets may be required, at no additional cost. The Contractor shall also restore the cut drainage slots afterwards, at no additional cost.

Where asphalt pavement extends into the existing curb and gutter, the contractor shall be required to plane at different slopes. The first cuts shall remove the material existing above the gutter line. These cuts shall be made at the appropriate gutter slope (1/2":1') for 2-foot curb and gutter and (1":1') for 2.5-foot curb and gutter. Any curb and gutter with a different slope shall be planed at the existing curb and gutter slope. The last cuts shall remove the material to a depth of 1inch below the gutter line with a street cross-section slope of 1/4":1' or to slope of existing street.

Where curb and gutter exists but the pavement is at or below the existing gutter line, the pavement shall be cut to a depth of the thickness of overlay below the gutter line while adjusting street cross-section to 1/4":1' toward the centerline of the street.

Where existing straight curbing has pavement built up to expose less than 6 inches of curbing, the pavement shall be planed down on grade of 1/4":1' or whatever the existing grade of the street back to the street centerline until a desired height of curbing is exposed.

Where center of pavement has correct crown but pavement has rutting or ripples (possibly caused by vehicular braking), the pavement shall be planed to the depth necessary to remove all such defects.
Additional Procedures shall be in accordance with the requirements of VDOT *Road and Bridge Specifications* Section 515, latest revision.

3.5.3 PAVING OPERATIONS

A. Asphalt Concrete Pavement Equipment

Bituminous concrete pavement equipment shall be in accordance with Section 315.03 of the VDOT *Road and Bridge Specifications*, latest revision.

B. Placing and Finishing

Asphalt concrete asphalt shall not be placed until the surface upon which it is to be placed has been approved by the City Engineer.

The edge of the pavement shall be marked by means of a continuous line placed and maintained a sufficient distance ahead of the paving operation to provide proper control of the pavement width and horizontal alignment.

An asphalt paver shall be used to distribute the asphalt mix over the widest pavement width practicable. Wherever practicable and when the capacity of sustained production and delivery is such that more than one paver can be operated, pavers shall be used in echelon to place the wearing course in adjacent lanes. Crossovers, as well as areas containing manholes or other obstacles that prohibit the practical use of mechanical spreading and finishing equipment, may be constructed using hand tools. However, care shall be taken to obtain the required thickness, jointing, compaction, and surface smoothness.

The longitudinal joint in one layer shall offset that in the layer immediately below by approximately 6 inches. However, the joint in the wearing surface shall be at the centerline of the pavement if the roadway comprises two traffic lanes or at lane lines if the roadway is more than two lanes in width. Offsetting layers will not be required when adjoining lanes are paved in echelon and the rolling of both lanes occurs within 15 minutes after laydown.

The contractor shall have a certified Asphalt Concrete Paving Technician present during paving operations. Immediately after placement and screeding, the surface and edges of each layer shall be inspected and straightedged by the technician and necessary corrections performed prior to compaction. The finished pavement shall be uniform and smooth.

The placement of asphalt concrete shall be as continuous as possible and shall be scheduled such that the interruption occurring at the completion of each day's work will not detrimentally affect the partially completed work. Material that cannot be spread and finished in daylight shall not be dispatched from the plant unless the use of artificial lighting has been approved. When paving is performed at night, sufficient light shall be provided to properly perform and thoroughly inspect every phase of the operation. Such phases include cleaning planed surfaces, tack application, paving, compacting, and testing. Lighting shall be provided and positioned such as to not create a blinding hazard to the traveling public.

During paving operations, the Contractor shall be responsible for furnishing and erecting temporary "no parking" signs on each street that is to be paved. The signs shall be erected at least 24 hours prior to paving operations and on each side of the street as necessary.

C. **Layer Thickness**

Asphalt concrete SUPERPAVE pavement courses shall be placed in layers not exceeding 4.0 times the nominal maximum size aggregate in the asphalt mixture. The maximum thickness may be reduced if the mixture cannot be adequately placed in a single lift and compacted to required uniform density and smoothness. The minimum thickness for a pavement course shall be no less than 2.5 times the nominal maximum size aggregate in the asphalt mixture. Nominal maximum size aggregate for each mix shall be defined as one sieve size larger than the first sieve to retain more than 10 percent aggregate as shown in the design range specified in Section 211.03, table II-13 of VDOT *Road and Bridge Specifications*, latest revision.

Recommended Thickness Chart	
Mix Type	**Minimum Thickness (inches)**
SM 9.5	1.5
SM 12.5	2
IM 19.0	2
BM 25.0	4

D. **Joints**

Care shall be exercised when tying into curb and gutter and newly overlaid travel lanes to ensure a uniform grade and joint.

The contractor shall construct the final riding surface to tie into the existing surface by cutting a notch 1 inch deep by 1 inch wide for all tie-ins to existing pavement, including driveways and ramps. Suitable guidelines or devices shall be used to ensure cutting of the joint on a true line. The joint shall be thoroughly cleaned and dried prior to being sealed. This work shall be done at no additional cost to the City.

Method of temporary joints at the end of each workday shall be approved by the City of Lynchburg City Engineer.

E. **Compaction**

Immediately after the asphalt mixture is placed and struck off and surface irregularities are corrected, the mixture shall be thoroughly and uniformly compacted by rolling.

During compaction of asphalt concrete asphalt, the roller shall not pass over the end of freshly placed material except when a construction joint is to be formed. Edges shall be finished true and uniform.

The surface shall be rolled when the mixture is in the proper condition. Rolling shall not cause undue displacement, cracking, or shoving.

The number, weight, and type of rollers furnished shall be sufficient to obtain the required compaction while the mixture is in a workable condition. The sequence of rolling operations and the selection of roller types shall provide the specified pavement density.

Immediately after the hot mixture is placed, it shall be sealed with rollers. Thereafter, rolling shall be a continuous process, insofar as practicable, and all parts of the pavement shall receive uniform compaction.

Rolling shall begin at the sides and proceed longitudinally parallel to the center of the pavement, each trip overlapping at least ½ the roller width, gradually progressing to the crown of the pavement. When abutting a previously placed lane, the longitudinal joint shall be rolled first, followed by the regular rolling procedure. On superelevated curves, rolling shall begin at the low side and progress to the high side by overlapping of longitudinal trips parallel to the centerline.

Displacements occurring as a result of reversing the direction of a roller, or from other causes, shall be corrected at once by the use of rakes or lutes and addition of fresh mixture when required. Care shall be taken in rolling not to displace the line and grade of the edges of the asphalt mixture. All roller marks shall be eliminated.

To prevent adhesion of the mixture to the rollers, the wheels shall be kept properly moistened with water or water mixed with a very small quantity of detergent or other approved material. Excess liquid will not be permitted.

Along forms, curbs, headers, walls, and other places not accessible to rollers, the mixture shall be thoroughly compacted with hot hand tampers, smoothing irons, or mechanical tampers. On depressed areas, a trench roller may be used or cleated compression strips may be used under the roller to transmit compression to the depressed area.

Edges of asphalt pavement surfaces shall be true curves or tangents. Irregularities shall be corrected.

The surface of the compacted course shall be protected until the material has cooled sufficiently to support normal traffic without marring.

F. **Density**

Density requirements shall be in accordance with Section 315.05 (d) of the VDOT *Road and Bridge Specifications*, latest revision.

G. **Pavement Samples**

If requested by the City Engineer, the Contractor shall cut samples for testing depth and density. Samples shall be taken for full depth at the locations as selected by the City Engineer. The removed pavement shall be replaced with new mixture and refinished. No additional compensation will be made for such work.

H. **Placement Limitations**

Placement limitations, to include but not limited to, mixture temperatures, and cold weather paving shall be in accordance with Section 315.04 of the VDOT *Road and Bridge Specifications*, latest revision. Surface mix applications for A and D mixes shall not be placed until the ambient air temperature and the base surface temperature is 50 degrees and rising without prior approval from the City Engineer. Base mix applications shall not be placed until the ambient air temperature and the surface temperature is 40 degrees and rising.

I. **Pavement Tolerance**

The surface will be tested by using a 10-foot straightedge. The variation of the surface from the testing edge of the straightedge between any two contacts with the surface shall not be more than 1/4 inch. Humps and depressions exceeding the specified tolerance shall be corrected, or the defective work shall be removed and replaced with new material.

3.6 PRIME COAT

When a prime coat is required, it shall conform to the applicable requirements of VDOT *Road and Bridge Specifications* Section 311.

When asphalt concrete to be placed has a total thickness of 4 inches or more, priming with liquid asphalt material will not be required on aggregate subbase or base material.

3.7 SEAL COAT

Seal coat shall be in accordance with Section 312, *Seal Coat* of the *VDOT Road and Bridge Specifications*, latest revision.

3.8 EMULSIFIED ASPHALT SLURRY SEAL

Emulsified asphalt slurry seal shall be in accordance with *VDOT Special Provision for Emulsified Asphalt Slurry Seal* dated October 14, 1994, or latest revision.

3.9 PAVEMENT REINFORCING FABRIC

A. Asphalt Distributor

The distributor truck shall be metered and capable of spraying tack coat at a specified uniform application rate. The applicator shall provide uniform coverage without gaps, partial overlaps, or otherwise create heavy streaking. The truck shall be equipped with a hand spray nozzle to distribute tack coat in locations inaccessible by the truck.

B. Fabric Laydown Equipment

The fabric can be installed with a mechanical unit mounted on the front of a tractor or on the back of the distributor truck. Manual units can be used for small jobs. Provide stiff bristle brooms or pneumatic rollers to smooth fabric. Provide all tools such as scissors or blades for cutting fabric.
Do not permit traffic directly on fabric.

C. Surface Preparation

Air and pavement temperatures during installation shall be warm enough for the tack coat to remain tacky after placement. Ambient temperatures shall be at least 50°F and rising for bituminous cement tack coat or 60°F and rising for asphalt emulsions.

Clean old pavement of dirt, water, oil, and foreign materials. Fill cracks as directed by the City Engineer, with suitable filler (such as asphalt cement or rubberized asphalt). Repair larger cracks and potholes with a properly compacted hot mix or other similar filler as directed by the City Engineer.

Badly broken pavement is an indication of a failed subgrade and shall be dug out and replaced before overlaying. If the surface is rough but stable, the City Engineer may require milling or placement of a leveling course before installation of the pavement reinforcing fabric. The surface shall be dry prior to tack coat and fabric placement.

D. **Application of Tack**

The tack coat shall be applied uniformly at the specified rate with calibrated distributor truck. The application temperature shall be high enough to assure uniform distribution (290°F to 325°F for asphalt cements, up to 160°F for heavier grade emulsions). The tack coat shall be applied 2 to 3 inches wider than the edge of the fabric.

Fully saturate the fabric and provide a bond to the overlay without providing excess tack coat that could mix with the overlay of the asphalt. The optimum amount depends on the porosity of the old pavement, fabric weight, tack coat material, and other variables. Typically, 0.2 to 0.3 gal/yd^2 of pure asphalt cement tack coat is used with the fabric. Emulsion tack coat application rates are greater to provide the same amount of residual asphalt cement. Verify the applications rates with the geotextile manufacturer and coordinate with the City Engineer prior to application.

If asphalt emulsions are used, the water in the emulsion must be allowed to evaporate completely before the fabric is placed. Verify the cure times with the Geotextile manufacturer and coordinate with the City Engineer prior to application.

E. **Fabric Placement**

Place the fabric on the pavement surface, smooth side up, while the tack coat is still tacky. Drive the vehicle straight to avoid wrinkling. Turns shall be made gradually. For sharp curves or corners, cut fabric to size and place by hand. Hand broom or pneumatic roll to eliminate small wrinkles. Large wrinkles (with a height of 1 inch or more) shall be slit and laid flat in the direction of paving. Overlap joints 2 to 4 inches. Apply additional tack coat to joints and overlapped fabric layers to ensure proper fabric saturation. The tack coat temperature shall not exceed 325°F when the fabric is placed.

F. **Hot Mix Overlay**

Standard paving operations shall closely follow fabric laydown. All areas in which paving fabric has been placed shall be paved during the same day. If the fabric becomes wet, allow to dry before paving. Unless directed otherwise by the City of Engineer, a minimum compacted asphalt thickness of 1.5 inches shall be placed to provide adequate heat and pressure to bond the systems.

END OF SECTION 02500

Back to Top

SECTION 024100

SELECTIVE BUILDING ELEMENTS DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Selective demolition of building elements for alterations purposes.

1.02 RELATED REQUIREMENTS

A. Section 011000 - Summary: Limitations on Contractor's use of site and premises.

B. Section 015000 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.

C. Section 016000 - Product Requirements: Handling and storage of items removed for salvage and relocation.

D. Section 017000 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products.

E. Section 024119 - Selective Structure Demolition: Utilities and site related items.

F. Section 099000- Painting and Coating: Attached to this section is a lead content analysis for contractors use in demolition and repainting procedures.

1.03 REFERENCE STANDARDS

A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards; current edition.

B. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2004.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Site Plan: Showing:
   1. Areas for temporary construction and field offices.

C. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

PART 3 EXECUTION

2.01 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
   1. Obtain required permits.
   2. Comply with applicable requirements of NFPA 241.
   3. Provide, erect, and maintain temporary barriers and security devices.
      a. See drawings for barriers and fencing requirements.
      b. Provide a secured enclosure for Mechanical Room 115 during demolition and construction.
      c. Window and door openings created at the exterior walls due to brick removal shall be secured with plywood at non-working hours.

4. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
5. Do not close or obstruct roadways or sidewalks without permit.

B. Do not begin removal until built elements to be salvaged or relocated have been removed.

C. Protect existing structures and other elements that are not to be removed.
1. Provide bracing and shoring.

D. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

E. If hazardous materials are discovered during removal operations, stop work and notify Architect and Owner; hazardous materials include regulated asbestos containing materials, lead, PCB's, and mercury.

F. Perform demolition in a manner that maximizes salvage and recycling of materials.
1. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.

G. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.

2.02 SELECTIVE DEMOLITION FOR ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
1. Verify that construction and utility arrangements are as shown.
2. Report discrepancies to Architect before disturbing existing installation.
3. Beginning of demolition work constitutes acceptance of existing conditions.

B. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.

C. Remove existing work as indicated and as required to accomplish new work.
1. Remove items indicated on drawings.

D. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove existing systems and equipment as indicated.
1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components.
2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
3. Verify that abandoned services serve only abandoned facilities before removal.
4. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification.

E. Protect existing work to remain.
1. Prevent movement of structure; provide shoring and bracing if necessary.
2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
3. Repair adjacent construction and finishes damaged during removal work.
4. Patch as specified for patching new work.

2.03 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site.

B. Leave site in clean condition, ready for subsequent work.

C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

SECTION 024119

SELECTIVE STRUCTURE DEMOLITION

PART 1 - GENERAL

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

1.01 SUMMARY

A. This Section includes the following:

1. Demolition and removal of selected portions of building or structure.
2. Demolition and removal of selected site elements.
3. Salvage of existing items to be reused or recycled.

B. Related Sections include the following:

1. Division 01 Section "Summary" for use of premises and Owner-occupancy requirements.
2. Division 01 Section "Photographic Documentation" for preconstruction photographs taken before selective demolition operations.
3. Division 01 Section "Temporary Facilities and Controls" for temporary construction and environmental-protection measures for selective demolition operations.
4. Division 01 Section "Cutting and Patching" for cutting and patching procedures.
5. Division 01 Section "Construction Waste Management and Disposal" for disposal of demolished materials.
6. Division 31 Section "Site Clearing" for site clearing and removal of above- and below-grade improvements.

1.02 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Detach items from existing construction and deliver them to Owner.

C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.03 MATERIALS OWNERSHIP

A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Owner that may be encountered during selective demolition remain Owner's property. Carefully

remove and salvage each item or object in a manner to prevent damage and deliver promptly to Owner.

1.04 SUBMITTALS

A. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's representative on-site operations are uninterrupted.
2. Interruption of utility services. Indicate how long utility services will be interrupted.
3. Coordination for shutoff, capping, and continuation of utility services.
4. Means of protection for items to remain and items in path of waste removal from building.

B. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.

C. Predemolition Photographs: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by selective demolition operations. Comply with Division 01 Section "Photographic Documentation." Submit before Work begins.

D. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1. Comply with submittal requirements in Division 01 Section "Construction Waste Management and Disposal."

1.05 QUALITY ASSURANCE

A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.

B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

C. Standards: Comply with ANSI A10.6 and NFPA 241.

D. Predemolition Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

E. Predemolition Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to selective demolition including, but not limited to, the following:

1. Inspect and discuss condition of construction to be selectively demolished.
2. Review structural load limitations of existing structure.
3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.

4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
5. Review areas where existing construction is to remain and requires protection.

1.06 PROJECT CONDITIONS

A. Owner will occupy portions of the site immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

1. Comply with requirements specified in Division 01 Section "Summary."

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Owner will remove hazardous materials under a separate contract.

E. Storage or sale of removed items or materials on-site is not permitted.

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

1.07 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that utilities have been disconnected and capped.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

E. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.02 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.

1. Comply with requirements for existing services/systems interruptions specified in Division 01 Section "Summary."

B. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
2. Arrange to shut off indicated utilities with utility companies.
3. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
4. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.

    a. Where entire wall is to be removed, existing services/systems may be removed with removal of the wall.

3.03 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Comply with requirements for access and protection specified in Division 01 Section "Temporary Facilities and Controls."

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.

C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.

3.04 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
9. Dispose of demolished items and materials promptly.

B. Removed and Salvaged Items:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area designated by Owner.
5. Protect items from damage during transport and storage.

C. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.05 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in small sections. Cut concrete to a depth of at least 3/4 inch at junctures with construction to remain, using power-driven saw. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete indicated for selective demolition. Neatly trim openings to dimensions indicated.

B. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals, using power-driven saw, then remove concrete between saw cuts.

C. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.

D. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.

3.06 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
4. Comply with requirements specified in Division 01 Section "Construction Waste Management and Disposal."

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.07 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION

02720 – STORM DRAINAGE

(Revised 11/15/09)

SELECTED LINKS TO SECTIONS WITHIN THIS SPECIFICATION

Part 1 – General	Construction of Manholes/DI's	Manhole Frame & Cover Spec
Part 2 – Products	DIP Spec	Plain Concrete Pipe Spec
Part 3 – Execution	Drop Inlet Specs	Precast Structures Spec
		Reinforced Concrete Pipe Spec

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

B. Section 01000 – GENERAL REQUIREMENTS.

C. Section 02220 – TRENCHING, BACKFILLING, AND COMPACTION OF UTILITIES.

D. Section 02730 – SANITARY SEWER.

E. Any Specifications or details not covered herein shall be per Virginia Department of Transportation, *Road and Bridge Specifications*, 2002 or latest revision.

1.2 SUMMARY

This section includes all equipment, labor, material, appurtenances, and services required for complete installation of storm drainage piping, ditches, structures, and specialties for municipal drainage systems.

1.3 DEFINITIONS

For the purposes of this specification, the following definitions refer to storm water drainage systems and structures that come under the authority of the City of Lynchburg, Virginia as specified within this section and other sections of this manual.

Public Storm Drainage System: Drainage systems and their appurtenances required for the conveyance of public storm water from and across publicly maintained streets, roads, highways, and other public property and located within public rights-of-way and/or easements.

1.4 SUBMITTALS

A. Submit shop drawings on all non-standard products/materials.

B. Submit product data and shop drawings for the following in accordance with Section 01000, *General Requirements.*

1) Drop/curb inlets
2) Frame and covers
3) Head/end walls
4) Inlet grates
5) Pipe and piping specialties
6) Precast concrete manhole castings

1.5 QUALITY ASSURANCE

A. Materials and operations shall comply with the latest revision of all applicable Codes and Standards.

B. Piping materials shall be marked clearly and legibly.

1) Reinforced Concrete Pipe shall be marked as follows:

a. Pipe Class,
b. Manufacturer

2) Plain Concrete Pipe shall be marked as follows:

a. Pipe Class,
b. Manufacturer

3) Ductile Iron Pipe shall show identification marks on or near bell as follows:

a. Weight,
b. Class or nominal thickness,
c. The letters "DI" or "Ductile,"
d. Manufacturer's identifying mark,
e. Year in which pipe was made,
f. Casting period.

1.6 STANDARD ABBREVIATIONS

AASHTO	American Association of State Highway Transportation Officials
ACI	American Concrete Institute
ACPA	American Concrete Pipe Association
ANSI	American National Standards Institute

AREA	American Railway Engineers Association
ASCE	American Society of Civil Engineers
ASTM	American Society for Testing and Materials
CRSI	Concrete Reinforcing Steel Institute
DIP	Ductile Iron Pipe
FS	Federal Specifications
MSDS	Material Safety Data Sheets
NCMA	National Concrete Masonry Association
OSHA	Occupational Safety and Health Administration
PCP	Plain Concrete Pipe
RCP	Reinforced Concrete Pipe
VDOT	Virginia Department of Transportation

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

A. **Pipe Condition/Pipe Examination**

1) **New Pipe Inspection**: Inspect materials thoroughly upon arrival. Examine materials for damage. Remove damaged or rejected materials from site. Pipe shall be protected during handling against impact shocks and free fall. Pipe shall be kept clean at all times, and no pipe shall be used in the work that does not conform to the appropriate ASTM Specifications. Check bells and spigots closely for smoothness, roundness, and honeycombing (concrete pipe), which may be a source of infiltration. Check for cracks, chips, etc. on both ends. Reject any pipe that will not provide watertight seal or is otherwise structurally deficient.

2) **Pre-Installation Inspection**: Prior to being installed, each section of the pipe shall be carefully examined for damage and conformity with these specifications. All pipe damaged or deemed not to conform to these specifications shall be rejected and removed from site. All pipe in which the spigots and bells cannot be made to fit properly, or pipe, which has chipped bells or spigots, will be rejected. The faces of all spigots ends and of all shoulders on the bells must be true.

B. Protect pipe coating during handling using methods recommended by the manufacturer. Use of bare cables, chains, hooks, metal bars, or narrow skids in contact with coated pipe is not permitted.

C. Observe manufacturer's directions for delivery and storage of materials and accessories.

D. Protect stored piping from entry of water or dirt into pipe. Protect bells and flanges of special fittings from entry of moisture and dirt.

E. Handle precast concrete manholes and other structures according to manufacturer's written rigging instructions.

1.8 COORDINATION

Coordinate tie-in to municipal drainage systems with the City of Lynchburg City Engineer.

PART 2 – PRODUCTS

2.1 PIPE & FITTINGS

2.1.1 DUCTILE IRON PIPE

A. **Ductile Iron Pipe**

Ductile iron pipe shall be manufactured in accordance with all applicable requirements of AWWA C151/ANSI A21.51 and ASTM A746, *Standard Specification for Ductile Iron Gravity Sewer Pipe* for 4-inch and larger diameter pipe, thickness class rated, class 50 minimum. The thickness of Ductile Iron Pipe shall be determined by considering trench load in accordance with ANSI/AWWA C150/A21.50. Minimum laying length shall be 18 feet except for tie-in at a structure.

The ductile iron pipe shall be cement mortar lined with a seal coat in accordance with ANSI/AWWA C104/21.4. Outside coat shall be a minimum of 1 mil bituminous paint according to ANSI/AWWA C151/A21.21 Section 51-8.1.

Push-on and mechanical joint pipe shall be as manufactured by the American Cast Iron Pipe Company, United States Pipe and Foundry Company, Griffin Pipe Products Company, or McWane Cast Iron Pipe Company.

B. **Ductile Iron Joints**

Pipe joints may be either push-on or mechanical joint pipe sizes 4 inches through 48 inches in diameter. Rubber Gasket Joints and Mechanical Joints shall comply with AWWA C111/ANSI A21.11, ASTM A536 *Standard Specification for Ductile Iron Castings.* Acceptable pipe joints are as follows:

1) **Push-on Joint** Ductile Iron Pipe shall conform to AWWA C151/ANSI A21.51 (such as *"Fastite," "Tyton,"* or *"Bell-Tite."*). The dimensions of the bell, socket, and plain end shall be in accordance with the manufacturer's standard design dimensions and tolerances. The gasket shall be of such size and shape to provide an adequate compressive force against the plain end and socket after assembly to affect a positive seal. Gaskets shall be vulcanized natural or vulcanized synthetic rubber, and comply with AWWA C111/ANSI A21.11.

2) **Mechanical Joint, Ductile Iron Pipe** shall be used only at the specific locations indicated on the drawings or as approved by the City Engineer.

a. The mechanical joint shall consist of:

i. A bell cast integrally with the pipe or fitting and provided with an exterior flange having cored or drilled bolt holes and interior annular recesses for the sealing gasket and the spigot of the pipe or fitting;

ii. A pipe or fitting spigot;

iii. A sealing gasket;

iv. Separate ductile iron follower gland having cored or drilled bolt holes; and

v. Ductile iron tee head bolts and hexagon nuts.

b. The joint shall be designed to permit normal expansion, contraction, and deflection of the pipe or fitting while maintaining a leak proof joint connection. The mechanical joint shall conform to the requirements of Federal Specification WW-P-421, AWWA C111/ANSI A21.11, and ASTM A 536 Standard Specification of Ductile Iron Castings.

2.1.2 PLAIN CONCRETE PIPE

PCP shall be a minimum of Class III, Wall B. Concrete pipe joints shall be tongue and groove type unless otherwise specified. PCP pipe shall conform to the requirements of applicable sections of the latest revisions of the VDOT Road and Bridge Specifications.

PCP shall also meet ASTM C14, *Standard Specification for Concrete Sewer, Storm Drain, and Culvert Pipe,* Extra Strength.

Gasketed Joints in Concrete Pipe shall meet ASTM C990, *Standard Specification for Joints in Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants*, latest revision.

2.1.3 REINFORCED CONCRETE PIPE

RCP shall be a minimum of Class III, Wall B. Concrete pipe joints shall be tongue and groove type unless otherwise specified. RCP shall conform to the requirements of applicable sections of the latest revision of the VDOT *Road and Bridge Specifications.*

RCP Class III or IV shall also meet ASTM C76, *Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.*

Gasketed Joints in Concrete Pipe shall meet ASTM C990, *Standard Specification for Joints in Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants*, latest revision.

2.2 MISCELLANEOUS APPURTENANCES

2.2.1 BEDDING

See Section 02220, *Trenching, Backfilling, and Compaction of Utilities.*

2.2.2 CONCRETE BLOCK

Concrete block shall conform to the requirements of ASTM C139, *Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes.*

2.2.3 BRICK

Brick shall be hard clay, grade SM, ASTM C 32, *Standard Specification for Sewer and Manhole Brick (Made From Clay or Shale)* and AASHTO M91.

2.2.4 MORTAR FOR CONCRETE BLOCK & BRICK

Mortar shall be type M, ASTM C 270, *Standard Specification for Mortar for Unit Masonry* and ASTM C 144, *Standard Specification for Aggregate for Masonry Mortar.* Mortar shall be prepared from cement in perfect condition and shall be prepared in boxes for that purpose. No mortar that has stood beyond forty-five minutes shall be used. Proportion by volume for the different types of application shall be as follows:

Brick masonry = 1 part cement to 2 parts sand

Pointing = 1 part cement to 1 part sand

2.2.5 MISCELLANEOUS CONCRETE

Concrete Classes (VDOT) to Design Compressive Strength at 28 days (f'c):

Class A4.5	General	4,500-psi
Class A4	General	4,000-psi
Class A3	General	3,000-psi
Class B2	Massive or Lightly Reinforced	2,200-psi

Ready mixed concrete shall comply with ASTM C94, *Standard Specification for Ready-Mixed Concrete.* All exposed concrete shall be air entrained. Concrete strength shall be as specified on standard details and drawings. Unless otherwise specified, all concrete shall be Class A3, minimum.

2.2.6 PORTLAND CEMENT

Type I, CSA normal, ASTM C150 *Standard Specification for Portland Cement.*

2.2.7 PRECAST REINFORCED CONCRETE STRUCTURES

Manholes of precast reinforced concrete shall be designed and manufactured in accordance with ASTM C478, *Standard Specification for Precast Reinforced Concrete Manhole Sections*, or latest revision. Manhole diameters shall be 4-foot minimum. The wall shall be a minimum of 5 inches thick and have a 6-inch minimum base. Manholes shall be of precast concrete manhole risers with a tongue and groove joint and a monolithic precast bottom, except where doghouse bases are to be used when placing manholes over existing mains. Joints shall be sealed with a minimum of butile mastic in conformance with AASHTO M 198, latest revision.

Manhole steps are not permitted.

Unless otherwise approved by the City Engineer, manholes will be precast reinforced concrete.

Manholes over 12 feet in depth, as measured from top of casting to effluent invert, shall have extended bases with appropriate reinforcing.

2.2.8 MANHOLE FRAMES AND COVERS

Standard Frames and Covers: Manhole frames and covers shall be manufactured from Class 30 gray iron, meeting the requirements of ASTM A48, *Standard Specification for Gray Iron Castings*. Standard manhole frames and covers shall be manufactured to the dimensions and configurations shown on **Standard Details 27.10 and 27.11** and shall have a minimum of 4 1-inch diameter holes in the flange of the frame. Minimum inside diameter of the opening shall be 24 inches. Manholes castings may be either bituminous coated or plain. The bearing surface of the frames and covers shall be machined and the cover shall seat firmly into the frame without rocking. Covers are to be embossed along the perimeter with the words "Storm." Approved castings are the US Foundry 710 ring and DP cover, East Jordan Iron Works 2027 frame and cover, or approved equal. (See **Standard Details 27.10 & 27.11**).

A Vulcan V-1883 is to be used with flat top manholes.

2.2.9 DROP INLETS

A. Drop inlet tops shall be precast and shall conform to the requirements of all applicable sections of the latest revision of VDOT *Road and Bridge Specifications and Standards.*

B. Drop inlet bases shall be precast and shall conform to the requirements of all applicable sections of the latest revisions of the VDOT *Road and Bridge Specifications and Standards.*

C. Unless otherwise approved by the City Engineer, all drop inlet tops and bases will be precast reinforced concrete.

D. Inlet Grates shall conform to the requirements of all applicable sections of the latest revision of the VDOT *Road and Bridge Specifications and Standards.*

2.2.10 MISCELLANEOUS STORMWATER APPURTENANCES

All miscellaneous stormwater appurtenances including but not limited to endwalls, headwalls, and flared end sections shall conform to all applicable sections of the latest revision of VDOT *Road and Bridge Specifications and Standards.*

PART 3 – EXECUTION

3.1 PIPE INSTALLATION - GENERAL

3.1.1 CONSTRUCTION – ALL PIPE

A. **Trench Width**: Trench width shall be per **Standard Detail 27.01.**

B. **Minimum Bury Requirements**: Minimum cover shall be in accordance with manufacturer's recommendations.

C. **Pipe Laying Direction**: Place piping beginning at low point and progress uphill. Place on grade, with unbroken continuity in invert, horizontally and vertically, and on alignment as indicated on plans. Place bell ends of piping facing upstream. Install gaskets, seals, sleeve, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.

D. **Directional Changes in Gravity Lines**: Use manholes for changes in direction of gravity lines.

E. **Stringing out Pipe**: When pipe is strung out during unloading, it shall be set on high ground and in a position to prevent silt deposits, storm water, or other matter from entering the pipe prior to its placement in the trench.

F. **Pipe Laying**: Pipe shall be bedded per Section 02220 – *Trenching, Backfilling and Compaction of Utilities.* The pipe and fittings shall be laid in the trench so that its interior surface shall conform to the grade and alignment as shown on the plans. Pipe laying shall be done in such a way as to disturb as little as possible the pipe that has already been laid. The alignment and grade of the storm main may be field adjusted whenever, in the opinion of the City Engineer, it is necessary, so long as the changes are consistent with the City of Lynchburg policy in affect at the time of the change. Changes in either grade or alignment may only occur at manholes.

Before laying, the bell and spigot will be wiped free from any dirt or other foreign matter. All surfaces of the portion of the pipe to be joined, and the factory-made jointing material, shall be clean and dry. Jointing material shall be used as recommended by the pipe or joint manufacturer's specifications. The jointing material or factory-fabricated joints shall then be placed, fitted, and adjusted in such workmanlike manner as to obtain the degrees of water tightness required.

Trenches shall be kept as dry as possible during bedding, laying and jointing and for as long a period as required until the trench is backfilled. As soon as possible after the joint is made, sufficient backfill material shall be placed along each side of the pipe to offset conditions that might tend to move the pipe off line or grade.

The greatest care shall be used to secure water tightness and to prevent damage to or disturbing of the joints during the backfilling process, or at any other time.

After the trench foundation has been properly graded to receive the pipe, the pipe shall be carefully lowered into the trench with approved methods. Under no circumstances shall the pipe or accessories be dropped or dumped into the trench. All damaged pipe shall be replaced at the Contractor's expense.

At least 4 joints shall be left exposed for inspection purposes during the working day and a suitable ladder affording easy and safe access for such inspection shall be furnished.

Any defects due to settlement shall be made good by the Contractor at his own expense.

G. **Temporary Suspension of Work**: When the trench is left for the night or if pipe laying is suspended, the upper end of the pipe shall be plugged to keep out dirt, water, animals and other foreign matter or substances. This plug shall be kept in the end of the pipe line at all times when laying is not in actual progress.

H. **Cutting or Fitting Pipe**: Whenever a pipe requires cutting to bring a pipe to the required location, the work shall be done in a satisfactory manner with an approved cutting tool or tools which will leave a smooth end at right angles to the axis of the pipe and not otherwise damage the pipe. The method of cutting pipe shall be in accordance with manufacturer's recommendations. Such cuts shall be made by the Contractor without extra compensation.

3.1.2 DUCTILE IRON PIPE

A. Bury limitations shall govern as follows based on the type laying condition:

Table 27.1 Bury Limitations on DIP			
Pipe	**Maximum Bury to Invert of Pipe[a]**		
	Type 2 Laying Condition – Equivalent to Class D Bedding	**Type 4 Laying Condition - Equivalent to Class C Bedding (See Detail 27.01)**	**Type 5 Laying Condition - Equivalent to Class B Bedding (See Detail 27.01)**
8-inch DIP, Class 50	20 feet	34 feet	50 feet
10-inch DIP, Class 50	15 feet	28 feet	45 feet
12-inch DIP, Class 50	15 feet	28 feet	44 feet
14-inch DIP, Class 50	14 feet	27 feet	44 feet
16-inch DIP, Class 50	15 feet	28 feet	44 feet

[a]Laying condition **Type 2** is a flat bottom trench with backfill lightly compacted to centerline of pipe (equivalent to Class D). Laying condition **Type 4** is a 4-inch bed of stone with pipe embedded to 1/8 pipe diameter (equivalent to Class C bedding). **Type 5** laying condition is also a 4-inch bed of stone with pipe embedded to the spring line of the pipe (equivalent to a Class B).

B. Ductile Iron Pipe is approved for all storm uses within City Right-of-Way/Easements.

3.1.3 REINFORCED CONCRETE PIPE

A. Pipe support for pipe shall provide uniform bearing for the pipe barrel along its entire length.

B. **Minimum Pipe Bedding Class**: See Section 02220, *Trenching, Backfilling and Compaction of Utilities*, paragraph 3.3.2 for minimum bedding requirements.

C. Pipe with varying wall class must not be mixed between manholes or boxes.

D. **Bury Limitations**: **Table 27.2** shall govern as the maximum allowable bury for concrete storm pipe:

Table 27.2

Bury Limitations on RCP (15 through 60 inches)

Pipe Class	Maximum Depth of Bury[a]			
	Class III (feet)	Class IV (feet)	Class V (feet)	Max Trench Width (feet)
15-inch	9.5	14.5	23.0	4.0
18-inch	9.5	15.0	32.5	4.0
24-inch	11.5	23.0	50.0	4.0
30-inch	11.0	19.5	44.5	5.0
36-inch	10.5	18.0	35.0	6.0
42-inch	11.0	19.0	36.5	6.5
48-inch	11.5	19.5	37.5	7.0
54-inch	12.0	20.0	38.5	7.5
60-inch	12.0	20.5	38.5	8.0

[a] Based on saturated clay weighing 120 pcf, trench width as specified, class C stone bedding, 1350 plf per ft of internal diameter for class III and 2000 plf per ft of internal diameter for class IV, 3000 plf per ft of internal diameter for class V, $D_{0.01\ crack}$

E. Join concrete pipe using bitumastic material to seal joint.

F. As each joint is laid, visually inspect to be certain that no jointing compound gasket, or trash is protruding from the joint or lying inside the pipe.

3.1.4 PLAIN CONCRETE PIPE

A. Plain Concrete Pipe is approved for storm uses in non-traffic bearing situations only.

B. Pipe support for pipe shall provide uniform bearing for the pipe barrel along its entire length.

C. Minimum pipe bedding class: *see 3.1.3, paragraph B, above.*

D. Pipe with varying wall class must not be mixed between manholes or boxes.

E. **Bury Limitations**: *See **Table 27.3**, below.*

Table 27.3
Bury Limitations on PCP
(12 through 24 inches)

Pipe Diameter	Maximum Depth of Bury Non Reinforced (feet)
12-inch	9.5
15-inch	9.5
18-inch	10.5
21-inch	11.0
24-inch	11.5

F. Join concrete pipe using bitumastic material to seal joint.

G. As each joint is laid, visually inspect to be certain that no jointing compound, gasket, or trash is protruding from the joint or lying inside the pipe.

3.2 MANHOLE CONSTRUCTION FOR STANDARD MANHOLES AND DROP INLET BASES

A. **Standard Manholes and Drop Inlet Bases**: Manholes shall be constructed in accordance with **Standard Details 27.02** and **27.03** with the following exceptions:

Flexible boots and precast concrete inverts will not be required.

Joints will be as specified in the product section of this specification.

The pipe opening in precast units shall be at least 4 but not more than 8 inches larger than the outside diameter of the pipe. Pipe openings shall be formed, drilled, or neatly cut as approved by the Engineer.

The contractor may use brick and masonry block or concrete pipe cutoffs in conjunction with mortar to fill the void between pipe culverts and precast structures. Such materials shall be thoroughly wetted and bonded with mortar. The remaining exterior and interior void shall be filled and sealed/slicked with mortar to the contour of the precast structure.

The standard joint shall be sealed on the interior of the structure, after installation, with a non-shrink hydraulic cement mortar per VDOT *Road and Bridge Specifications*, Section 218.

Plug all weep holes with mortar.

Pour concrete inverts in all structures. Concrete shall be in compliance with products section for miscellaneous concrete of these specifications. Shape manhole channel with a smooth semicircular bottom matching inside diameter of the connecting pipe/pipes. Change directions of flow with a smooth curve of as large a radius as the manhole size will permit. Change size and grade of channels gradually and evenly. Shape the shelf to provide a slope between 1 and 2 inches per foot towards the invert.

Manholes shall be installed plumb.

B. **Grade Rings/Adjustments**: The contractor shall exercise care in the ordering of structures so that the use of grade rings or brick for leveling and adjustments can be minimized. Where adjustment of a manhole is required, grade rings shall be used unless otherwise approved by the City Engineer. Where adjustment of the inlet is required, the use of bricks or grade rings is approved, provided that the entire void between the flat-top and inlet is also filled with brick and mortar to uniformly distribute loading of the inlet. The combination of grade rings or depth of bricks shall not exceed 12 inches before removal of the cone or flat-top is necessary for adjustment.

On all storm manholes, a mastic joint material shall be placed between the frame and cover and the cone or grade ring.

When applicable, during the installation of manholes, if frame and cover is near or within wheel path in roadway, turn cone to place the frame out of wheel path.

C. **Replacement/Rehabilitation of Existing Manholes**

When a new manhole is necessary, the old manhole must be completely removed and a new precast manhole constructed in its place. Where the old manhole is of satisfactory quality, the Contractor will make connection thereto as directed by the City Engineer at no additional cost even if it is necessary to modify the bottom of the manhole to meet the new grade. Such extras are considered to be incidental to the manhole connection cost.

3.3 INLET CONSTRUCTION AND MISCELLANEOUS APPURTENANCES

Construct inlets, end walls, and other storm drainage items as detailed in the latest edition of the VDOT *Road and Bridge Specifications and Standards*.

Adjusting inlet tops and/or miscellaneous appurtenances shall follow same guidelines as prescribed in 3.2, *Manhole Construction for Standard Manholes and Drop Inlet Bases*, paragraph B. *Grade Rings/Adjustments*, above.

3.4 ABANDONING STORM LINES & MANHOLES

A. **Storm Lines**: When an existing storm line is designated to be abandoned in place, the low end of the line is to be plugged and lean concrete grout (flowable fill) pumped into the line until line is completely filled.

B. **Manholes**: When an existing manhole, either partially or wholly, is designated to be abandoned and the storm lines, either entering or exiting the manhole, have been abandoned according to the preceding paragraph, the upper portion of the manhole shall be removed to a minimum of 18 inches below the proposed finished grade, or as determined by the City Construction Coordinator, VDOT #57 stone dumped into the manhole, and the stone vibrated to consolidate the stone. The remainder of the fill between the top of the manhole and the finished subgrade is to be backfilled as follows. Where the manhole is located within a roadway right of way, backfill with VDOT # 57 Stone and consolidate. Outside roadway right of ways, filter fabric shall be placed over the stone, suitable material of a compactable nature shall be placed over the top of the manhole, and the material tamped.

3.5 SLOPE ANCHORS

All lines on slopes equal to or greater than 20% slope shall have concrete anchors placed around the pipe directly below the bell end of the line. The anchors shall be spaced every other joint unless otherwise shown on the plans and constructed to the dimensions shown in **Standard Detail 27.21**.

3.6 EXCAVATION OF DRAINAGE CHANNELS

A. Open storm drainage channels and ditches shall be graded and shaped in accordance with the elevations, slopes, widths, and lengths indicated on the plans. The outfall elevation of the new channels and ditches shall be graded to match the flow elevations of all existing or natural channels, unless indicated or specified otherwise.
B. The drainage channels shaped with fill materials shall be compacted within the limits and in accordance with the related backfill work specified elsewhere.

C. The drainage channels shall be prepared, seeded, and mulched in accordance with the related work specified elsewhere. Where indicated or specified, erosions control measures, such as temporary liners, rip rap, concrete, etc., shall be provided.

3.7 INSPECTION

Upon completion of entire pipe installation, the City Engineer may inspect the work in part or as a whole as will satisfy himself/herself that every portion of the contract has been faithfully carried out.

If, in the opinion of the City Engineer, a defect exists in the pipeline or its appurtenances, in some place not accessible except by uncovering, the City Engineer may order the line to be uncovered. If it is found that after the pipe has been uncovered at the order of the City Engineer, no defect exists or that the defects were not the fault of the contractor, then the expense so incurred by the contractor shall be borne by the City.

Flush all sand, dirt, and debris from the lines prior to inspection. Provide lights and mirrors and inspect lines in the presence of the Construction Coordinator.

Inspect the system for conformance with line and grades shown on the plans and provide record drawing measurements on record drawings.

Visual Inspection: All lines and manholes shall be visually inspected in the presence of the City Construction Coordinator by the contractor/developer from every manhole by use of mirrors and television cameras and in accordance with Section 02760- *Television Inspection of Sewer Lines*. The lines shall exhibit a fully circular pattern when viewed from one manhole to the next. Lines, which do not exhibit a true and correct line and grade, have obstruction or structural defects, shall be corrected to meet these specifications and the barrel left clean for its entire length.

END OF SECTION 02720

Back to Top

SECTION 033000

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete reinforcement.

B. Metal Decking

C. Concrete curing.

1.02 RELATED REQUIREMENTS

A. Section 02400 - Curb & Gutter, Driveways & Sidewalks: Sidewalks, exterior ramps, curbs and gutters.

PART 2 PRODUCTS

2.01 REINFORCEMENT

A. Reinforcing Steel: ASTM A 615/A 615M Grade 60 (420).
   1. Type: Deformed billet-steel bars.
   2. Finish: Unfinished, unless otherwise indicated.

2.02 ACCESSORY MATERIALS

A. Metal Floor Deck: As indicated on drawings.

2.03 CONCRETE MIX DESIGN

A. Normal Weight Concrete:
   1. Compressive Strength, when tested in accordance with ASTM C 39/C 39M at 28 days: 4,000 psi.

PART 3 EXECUTION

3.01 INSTALLING REINFORCEMENT

A. Comply with requirements of ACI 301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.

3.02 PLACING CONCRETE

A. Place concrete in accordance with ACI 304R.

3.03 CONCRETE FINISHING

A. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas 1/16 inch or more in height. Provide finish as follows:
   1. Smooth Rubbed Finish: Wet concrete and rub with carborundum brick or other abrasive, not more than 24 hours after form removal.

B. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:
   1. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI 301.1R; thin floor coverings include carpeting, resilient flooring, seamless flooring, thin set quarry tile, and thin set ceramic tile.

2. Other Surfaces to Be Left Exposed: "Steel trowel" as described in ACI 302.1R, minimizing burnish marks and other appearance defects.

3.04 CURING AND PROTECTION

A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

END OF SECTION

SECTION 033660

STAINED CONCRETE FLOOR

PART 1 - GENERAL

1.1 SUMMARY

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to Work of this Section.

B. Section Includes:
   1. Chemically stained concrete floor finish.
   2. Sealer.

C. Related Sections:
   1. Section 035400 - Cementitious Underlayment: for general applications of underlayment.
   2. Division 7 Section "Joint Sealants" for colored sealant for joints.

1.2 SUBMITTALS

A. Product Data: Manufacturer's technical data sheets and installation instructions for each product specified.

B. Samples for Initial Selection: Manufacturer's color charts showing full range of colors available.

C. Qualification Data: For firms indicated in "Quality Assurance" Article, including lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer of stain and sealer products shall have minimum 5 years experience in the production of the specified products.

B. Installer Qualifications: Minimum 3 years experience in staining applications and successfully completed not less than 5 projects comparable in scale and complexity.

C. Mock up:
   1. At location on Project selected by Architect, prepare mockup 4 by 4 feet for review and approval.
   2. Approved mockup may become part of the completed Work if undisturbed at time of Substantial Completion.

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver the specified products in original, unopened containers with legible manufacturer's identification and information.

B. Store specified products in conditions recommended by the manufacturer.

1.5 PROJECT CONDITIONS

A. Environmental Conditions: Maintain an ambient temperature of between 50° and 90° F during application and at least 48 hours after application.

B. Protection: Precautions shall be taken to avoid damage or contamination of any surfaces near the work zone. Protect completed stain work from moisture or contamination.

1.6 PRE-JOB CONFERENCE

A. One week prior to the placement of Chemical Stain a meeting will be held to discuss the project and application of materials.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Basis of Design Manufacturer: L.M. SCOFIELD COMPANY, Douglasville, Georgia and Los Angeles, California (800) 800-9900 or the appropriate local contact: Eastern Division – 201-672-9050; Western Division – 714-568-1870; Central Division Office – 630-377-5959

B. Equal manufacturers include:
   1. Clemons Concrete Coatings; www.ccc-usa.com
   2. Solomon Colors,Inc.; www.solomoncolors.com

2.2 MATERIALS

A. Chemical Stains: LITHOCHROME® Chemstain™; L.M. SCOFIELD COMPANY, reactive water-based solution of metallic salts which react with the calcium hydroxide in the cured concrete substrate to produce permanent, variegated or translucent color effects.
   1. Colors: As selected by Architect from manufacturer's full range.
      a. Colors: A blend to create a mottled and varied look. Color range will be in the bronze- grey- copper- rustic color palette.

B. Sealers:
   1. SCOFIELD® Selectseal-W™; L.M. SCOFIELD COMPANY, water-based, clear aliphatic polyurethane specifically formulated for protecting chemically stained concrete hardscapes and floors.

C. Sealants: LITHOSEAL™ Trafficalk-3G™; L.M. SCOFIELD COMPANY.
   1. Colors: As selected by Architect] from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Contractor shall examine areas and conditions under which work will be performed and identify conditions detrimental to proper and timely completion of work. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. New Concrete:
   1. Newly placed concrete shall be sufficiently cured to allow concrete to become reactive, minimum 14 days.
   2. If any of the following colors are used, the minimum cure time of the concrete shall be 30 to 60 days to meet water vapor transmission requirements.
      a. Copper Patina.
      b. Fern Green.
      c. Weathered Bronze.
   3. Do not use liquid curing materials. Cure concrete flatwork with new, unwrinkled, non-staining, high quality curing paper. Do not overlap curing paper.
   4. Surfaces shall be cured using the same method and different sections (pours) chemically stained when the concrete is the same age.
   5. Immediately prior to chemically staining, thoroughly clean the concrete. Sweep surfaces, then pressure wash or scrub using a rotary floor machine. Use suitable, high quality commercial detergents to facilitate cleaning. Rinse surfaces after cleaning until rinse water is completely clean. Allow floor to dry completely prior to application of floor stain.

B. Existing Concrete:
   1. Clean concrete surfaces so that surfaces are completely penetrable before receiving the initial application of chemical stain. Test surfaces to receive stain by spotting with water. Water should immediately darken the substrate and be readily absorbed. If water beads and does not penetrate or only penetrates in some areas, additional surface preparation and testing shall be performed. On denser floors, acid wash with a solution of one part muriatic acid (20° Baume or 31.4 percent pool acid) to 20 parts water, or sand lightly to open up surfaces. Retest and continue surface preparation until water spots immediately darken and uniformly penetrate concrete surfaces.
   2. Cleaning method used depends on the condition of the concrete surface. To remove dirt and other contaminates, detergents and other commercial grade cleaners should be considered and tested.
   3. Rinse concrete substrates until rinse water is completely clean.

C. Scoring: Score decorative jointing in concrete surfaces 1/8-inch (3.2 mm) deep with diamond blades. Rinse until water is completely clean. Score before staining.

3.3 APPLICATION OF CHEMICAL STAIN

A. Concrete surfaces shall be dry and properly prepared as described above. Protect surrounding areas from over-spray, run-off and tracking. Divide surfaces into small work sections using wall, joint lines, or other stationary breaks as natural stopping points.

B. Apply chemical stains full strength (undiluted) at the coverage rate recommended by the manufacturer and use application equipment described in the manufacturer's printed technical literature. The color of the liquid chemical stain has no resemblance to the final color produced on the concrete substrate.

C. Chemical stains normally fizz when reacting with the concrete. If fizzing does not occur, the substrate has not been adequately prepared or the concrete pH level is too low. If this should happen, contact the local representative for further recommendations.

D. Transfer chemical stain to the substrate by brush or spray and immediate scrub into surface.

E. Reaction time depends on wind conditions, temperatures, and humidity levels.

F. When multiple coats of one or more colors are required, washing and drying between colors is desirable to evaluate the color prior to the next coat.

G. After the final coat of chemical stain has remained on the surface for a minimum of four hours, remove all residue by wet scrubbing with commercial grade detergent. Rinse surfaces after scrubbing until rinse water is completely clean. Run off may stain the adjacent areas or harm plants. Collect rinse water by wet vacuuming or absorbing with an inert material.

3.4 APPLICATION OF SEALER

A. Concrete substrate shall be completely dry.

B. Sealer shall be produced by the chemical stain manufacturer.

C. Test surface for proper PH level prior to applying sealer.

D. Apply sealer according to manufacturer's written instructions at a rate of 300 to 500 square feet per gallon per coat.

E. Maintain a wet edge at all times.

F. Allow sealer to completely dry before applying additional coats.

G. Apply second coat of sealer at 90 degrees to the direction of the first coat using the same application method and rates.

H. Seal horizontal joints in areas subject to pedestrian or vehicular traffic.

3.5 PROTECTION

A. Protect floor from traffic for at least 72 hours after final application of sealer.

3.6 MAINTENANCE

A. Maintain chemically stained and sealed floors by sweeping. Clean spills when they occur and rinse dirt off with water. Wet-clean heavily soiled areas by mopping or by scrubbing with a rotary floor machine equipped with a scrubbing brush and a suitable, high quality commercial detergent. Maintain interior floors that require polishing by using a compatible, premium-grade, emulsion-type, commercial floor polish, following manufacturer's instructions and safety requirements.

END OF SECTION

SECTION 035400

CEMENTITIOUS UNDERLAYMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Liquid-applied self-leveling floor underlayment.
   1. Use cementitious type at existing concrete floor slabs as identified.
   2. Type 1 Cementitious Underlayment/Micro-Topping as identified on drawings.
   3. Type 2 Cementitious Underlayment/Leveler as identified on drawings.

1.02 RELATED REQUIREMENTS

A. Section 017000 - Execution and Closeout Requirements: Alteration project procedures; selective demolition for remodeling.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's data sheets documenting physical characteristics and product limitations of underlayment materials. Include information on surface preparation, environmental limitations, and installation instructions.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Keep dry and protect from direct sun exposure, freezing, and ambient temperature greater than 105 degrees F.

1.05 MOCK-UP

A. Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
   1. Prepare mock-up in location designated by Architect.
   2. Area: 6 ft x 6 ft.
   3. Do not proceed with underlayment work until workmanship of mock-up has been approved by Architect.

B. Mock-up may remain as part of the Work.

1.06 FIELD CONDITIONS

A. Do not install underlayment until floor penetrations and peripheral work are complete.

B. Maintain minimum ambient temperatures of 50 degrees F 24 hours before, during and 72 hours after installation of underlayment.

C. During the curing process, ventilate spaces to remove excess moisture.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Cementitious Underlayment/Micro-Topping Type 1. Product shall be X-Caliber Products; X-Roc LevelCem XT; www.x-caliber.net.

B. Equal products as follows:
   1. Ardex Engineered Cements Inc: www.ardex.com.

2. CoverTec Products; www.covertecproducts.com.
3. Mapei Corporation; www.mapei.com
4. Substitutions: See Section 016000 - Product Requirements.

C. Cementitious Underlayment/Leveler Type 2. Product shall be X-Caliber Products; X-Roc LevelCem 300; www.x-caliber.net.

D. Equal products as follows:
1. Ardex Engineered Cements Inc: www.ardex.com.
2. CoverTec Products; www.covertecproducts.com.
3. Mapei Corporation; www.mapei.com
4. Substitutions: See Section 016000 - Product Requirements.

E.

2.02 MATERIALS

A. Cementitious Underlayment: Blended cement mix, that when mixed with water in accordance with manufacturer's directions will produce self-leveling underlayment with the following properties:
1.

B. Water: Potable and not detrimental to underlayment mix materials.

C. Primer: Acrylic based bonding agent /primer as recommended by manufacturer.

D. Joint and Crack Filler: For repair of small gouges, indentations and holes, use manufacturers patching compound specifically for purpose.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are clean, dry, unfrozen, do not contain petroleum bi-products, or other compounds detrimental to underlayment material bond to substrate.

3.02 PREPARATION

A. Concrete: Mechanically prepare concrete to create a textured surface necessary to achieve the best bond; acceptable methods include bead blasting and scarifying. Do not use acid etching.

B. Remove substrate surface irregularities. Fill voids and deck joints with filler. Finish smooth.

C. Vacuum clean surfaces.

D. Prime substrate in accordance with manufacturer's instructions. Allow to dry.

E. Close floor openings.

3.03 APPLICATION

A. Install underlayment in accordance with manufacturer's instructions.

B. Place to required thickness, with top surface level to 1/8 inch in 10 ft. Make transitions at door and wall openings to adjust for floor level.

C. Place material is layers as recommended by manufacturer.

3.04 CURING

A. Once underlayment starts to set, prohibit foot traffic until final set has been reached.

B. Air cure in accordance with manufacturer's instructions.

END OF SECTION

SECTION 039200

CONCRETE RESURFACERS

PART1-GENERAL

1.01 SECTION INCLUDES

A. Cementitious toppings for traffic bearing exterior surface.

B. Type 3 Resurfacer as identified on drawings.

C. Type 3 Patch for spalling and damaged concrete surfaces.

1.02 RELATED SECTIONS

A. Section 035400 - Cementitious Underlayment.

1.03 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Manufacturer's data sheets on each product to be used, including:

C. Preparation instructions and recommendations.

D. Storage and handling requirements and recommendations.

E. Manufacturer's printed installation instructions for each product.

1.04 QUALITY ASSURANCE

A. Installation of the single component fast setting polymer modified concrete resurfacer must be carried out by an applicator using mixing equipment and tools approved by the manufacturer

B. Resurfacer shall be able to be installed from a featheredge to 1/2" in a single application.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Prevent damage or contamination to materials by water, freezing, foreign matter or other causes.

1.06 PROJECT CONDITIONS

A. Do not install below 50°F surface temperature. Install quickly if floor is warm and follow hot weather precautions from manufacturer.

B. Substrates that fail to pass a minimum 72 psi direct tensile pull off testing must be mechanically profiled in order to me the minimum requirement.

C. Proceed with underlayment's and toppings work after surface defects have been repaired and projections through substrate have been completed.

PART 2 -PRODUCTS

2.01 MANUFACTURERS

A. Type 3 Resurfacer. Product shall be X-Caliber Products. X-Roc Resurfacer; www.x-caliber.net.

B. Type 3 Concrete Patch (for spalling concrete surfaces) shall be X-Caliber Products. X-Roc FastPatch; www.x-caliber.net.

C. Equal Products as follows:
   1. Ardex Engineering Cements Inc; www.ardex.com
   2. CoverTec Products; www.covertecproducts.com
   3. Mapei Corporation; www.mapei.com.
   4. Substitutions: See Section 016000 - Product Requirements.

2.02 MATERIALS

A. Product: The single component fast setting polymer modified concrete resurfacer.

2.03 ACCESSORIES

A. Primer: Acrylic based bonding agent /primer as recommended by manufacturer.

B. Water: Clean potable water sufficiently cool (not warmer than 70°F)

PART 3-EXECUTION

3.01 EXAMINATION

A. Examine surfaces to receive concrete repair and toppings and conditions under which repairs and toppings will be installed.

B. Do not proceed with work until surfaces and conditions comply with requirements required by manufacturer's printed instructions.

3.02 PREPARATION

A. All concrete sub-floors and concrete floors with existing patching must be solid, sound, solid, thoroughly cleaned, and properly primed.

B. All concrete sub-floors must be of adequate strength, clean, and free of all oil, grease, dirt, curing compounds and any substance, which might act as a bond-breaker. Mechanically clean, if necessary, using shot blasting, grinding or similar to CSP1 minimum. Acid etching and the use of sweeping compounds and solvents are not acceptable.

C. All cracks in the sub-floor shall be repaired to minimize telegraphing into the topping. Expansion joints shall be reflected through the resurfacer. Larger static cracks shall be repaired with a cementitious patching compound such as FastPatch prior to applying resurfacer. Small non-moving cracks shall be "V" saw cut to a solid core and be filled with crack/joint filler.

3.03 PRIMING

A. Apply primer evenly with a soft bristled nylon push broom. Do not dilute with water. Do not leave any bare spots. Remove all puddles and excess primer. Allow to dry to a clear, thin film (minimum 45 minutes, maximum 24 hours). Test for dryness of primer by rubbing water on dry surface, it will be cloudy white if still wet.

3.04 APPLICATION OF RESURFACER

A. Install per manufacturers instructions.

3.05 PROTECTION

A. Prior to the installation of the any finish coating, the surface of the topping should be protected from abuse by other trades by the use of plywood, masonite or other suitable protection course

END OF SECTION

SECTION 040100

MAINTENANCE OF MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water and Chemical cleaning of brick and limestone surfaces.

B. Replacement of brick and limestone units.

C. Chemical removal of paint from existing interior brick surfaces.

D. Repointing mortar joints.

E. Repair of damaged masonry.

1.02 RELATED REQUIREMENTS

A. Section 040101 - Masonry Repointing and Cleaning Procedures for Historic Buildings.

B. Section 099000- Painting and Coating: Lead Content Analysis report.

1.03 REFERENCE STANDARDS

A. National Park Service - Historical Preservation Briefs No. 2 for masonry restoration.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week prior to commencing work of this section.
   1. Require attendance of parties directly affecting work of this section.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Samples: Submit two samples of face brick and stone units to illustrate matching color, texture and extremes of color range.

C. Manufacturer's Instructions: For cleaning materials, indicate special procedures, conditions requiring special attention.

1.06 QUALITY ASSURANCE

A. Restorer shall meet the quality level of repointing, cleaning and removal of paint as indicated in the mock-up area as provided by owner. This will be the standard for restorer's work.

B. Restorer: Company specializing in masonry restoration with minimum five years of documented experience.

C. Restorers:
   1. Lynchburg Restoration.
   2. Purvis Masonry Restoration.
   3. Price Masonry.
   4. Restorer as approved by architect. Qualifications, references and examples of work/projects must be submitted 14 days prior to bid date.

1.07 MOCK-UP

A. Restorer will be required to demonstrate method of work and materials used by performing mock-up panels as follows:

1. Restore and repoint an existing masonry wall are sized 6 feet long by 4 feet high; include in mock-up area instances of mortar, wall openings, flashings, and stone trim.
2. Clean a 5 ft by 5 ft panel of wall to determine extent of cleaning.
3. Remove paint from a 5 ft by 5 ft section of painted brick wall.
4. Locate where directed.

B. Acceptable panel and procedures employed will become the standard for work of this section.

C. Mock-up may remain as part of the Work.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Restoration and Cleaning Chemicals: Eaco Chem, Inc; Product SafeRestore: www.eacochem.com

B. Other manufacturers:
1. Diedrich Technologies, Inc: www.diedrichtechnologies.com.
2. HMK Stone Care System: www.hmkstonecare.com.
3. PROSOCO: www.prosoco.com.
4. Substitutions: See Section 016000 - Product Requirements.

2.02 CLEANING MATERIALS

A. Cleaning Agent: Acid solution type.

B. Repointing cleaning: Conform to Section 040101.

C. Paint Removal: Interior brick sufaces.
1. Eaco Chem, Inc; Product SafeRestore
2. Drummond Chemicals, Inc: Product: Peel-Away.
3. Substitutions: See Section 016000 - Product Requirements.

2.03 MORTAR MATERIALS

A. Conform to requirements of 040101.

2.04 MASONRY MATERIALS

A. Brick: Match existing if not enough salvaged brick available for repairs.

B. Stone: Limestone, match existing color and texture.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces to be cleaned are ready for work of this section.

3.02 PREPARATION

A. Protect surrounding elements from damage due to restoration procedures.

B. Carefully remove and store removable items located in areas to be restored, including fixtures, fittings, finish hardware, and accessories; reinstall upon completion.

C. Separate areas to be protected from restoration areas using means adequate to prevent damage.

D. Cover existing landscaping with tarpaulins or similar covers.

E. Mask immediately adjacent surfaces with material that will withstand cleaning and restoration procedures.

F. Protect roof membrane and flashings from damage with 1/2 inch plywood laid on roof surfaces over full extent of work area and traffic route.

G. When using cleaning methods that involve water or other liquids, install drainage devices to prevent runoff over adjacent surfaces unless those surfaces are impervious to damage from runoff.

H. Do not allow cleaning runoff to drain into sanitary or storm sewers.
   1. If cleaners proposed are acceptable to the city for run-off into stormsewer

3.03 REBUILDING

A. Cut out damaged and deteriorated masonry with care in a manner to prevent damage to any adjacent remaining materials.

B. Support structure as necessary in advance of cutting out units.

C. Cut away loose or unsound adjoining masonry to provide firm and solid bearing for new work.

D. Mortar Mix: Colored and proportioned to match existing work.

E. See Section 040101 - Masonry Repointing and Cleaning Procedures for Historic Buildings for supplementing requirements.

3.04 REPOINTING

A. Perform repointing prior to cleaning masonry surfaces.

B. Cut out loose or disintegrated mortar in joints to minimum 1/2 inch depth or until sound mortar is reached.

C. Use power tools only after test cuts determine no damage to masonry units will result.

D. When cutting is complete, remove dust and loose material by brushing.

E. Premoisten joint and apply mortar. Pack tightly in maximum 1/4 inch layers. Form a smooth, compact flush joint to match existing.

F. Moist cure for 72 hours.

G. See Section 040101 - Masonry Repointing and Cleaning Procedures for Historic Buildings for supplementing requirements.

3.05 RESTORATION CLEANING

A. Clean surfaces and remove large particles with wood scrapers or non-ferrous wire brush.

B. Spray coat masonry with chemical restoration cleaner, mixed into solution in accordance with manufacturer's instructions.

C. Provide a second application if required to match mock-up area.

D. Allow sufficient time for solution to remain on masonry and agitate with soft fiber brush or sponge.

E. Rinse from the bottom up with potable water applied at 400 psi and at a rate of 4 gal/min.

F. See Section 040101 - Masonry Repointing and Cleaning Procedures for Historic Buildings for supplementing requirements.

END OF SECTION

Section 040101

Masonry Repointing and Cleaning Procedures for Historic Buildings

Related Sections:
Reference Section 040100 – Maintenance of Masonry: Additional Project requirements.

Project Scope:
Examine mortar joints to determine which joints require repointing. Joints that are cracked, deteriorated, eroded, contain voids, or are poorly bonded to masonry should be repointed.
Mason shall repair and repoint masonry to extent as indicated in the owner's quality of work mock-up section located at various areas of the building. These mock-up panels will establish the extent of completeness as required of the contractor for the remaining portions of walls. This work includes interior brick walls, exterior brick and limestone trim. Mock-up of paint removal from the interior brick walls shall be included also.
All historic repointing projects should conform to Preservation Briefs No.2. A copy of this document can be obtained by request to the architect.

Project Conditions:
Do not repoint mortar joints or repair masonry unless air temperatures are between 40 to 95 degrees Fahrenheit and will remain so for at least 48 hours after completion of work.
Prevent mortar used in repointing and repair work from staining surface of surrounding masonry and other surfaces. Immediately remove mortar in contact with exposed masonry and other surfaces.
Protect sills, ledges and projections from mortar droppings.

Sequencing/Scheduling:
Perform masonry restoration in the following sequence:

1. Rake out existing mortar from joints indicated to be repointed to a minimum depth of 2 to 2-1/2 times the width of the joint (for most joints, this will approximately 1 inch). Remove mortar using hand tools only. Remove cleanly, leaving square corners at back of the cut. The use electric or pneumatic chisels must be approved by architect prior to work (demonstration of use by workman will be required prior to approval). Do not spall or chip masonry. Any damaged masonry must be repaired.

2. Clean joints with water rise with maximum 100-psi pressure. Masonry joint should be damp but without standing water.

3. Mix mortar carefully, measuring and mixing carefully to assure visual and physical characteristics. Dry ingredients should be measured and volume and be thoroughly mixed before the addition of any water (more information on mix below).

4. Perform field test of new repointing work on masonry (a 6' x 6' area on the least visible masonry facade). Notify architect for review and approval before proceeding. This field visit should occur at least 72 hours after the field test is performed to ensure that the repointing areas have cured. See additional information below.

5. Repoint existing mortar joints for remainder of structure or building, or as specified by project. (See additional information below).

6. Clean existing masonry surfaces after repointing work is completed. Clean mortar from masonry face promptly to prevent staining. If necessary after 24 hours of set time, scrub and wash surface to remove laitance using water and detergent, but no chemicals. Use natural sponges and bristle brushes. Do not use wire brushes.

Mortar Materials:
CEMENT: ASTM C 150, Type II, white, non-staining unless it can be established that the original mortar used grey cement. For stonework and other masonry indicated, provide non-staining white cement complying with staining requirement of ASTM C91 for not more than 0.03% water-soluble alkali.
HYDRATED LIME: ASTM C 207, Type S or SA, Hydrated Lime for Masonry Purposes. This is high plasticity lime (not air entrained) instead of quicklime.
AGGREGATE: ASTM C 144, unless otherwise indicated.
SAND: Use **natural** rounded sand, clean, sound and washed. Provide sands that will produce final mortar color and texture to match the existing, and with aggregate type and grading similar to existing mortar. The color of the sand shall be the primary factor used to make mortars that match original. Sand should generally meet ASTM C 144, although sieving the sand may be needed to match the historic particle appearance and gradation.
WATER: Clean, free of oils, acids, alkalis and organic matter. No antifreeze compounds or other admixture shall be used.
PIGMENTS: Pigments may be needed for red or black mortar. Pigments should not exceed 10 percent by weight of the Portland cement in the mix, and carbon black should be limited to no more than 2 percent.
CHEMICALS: No modern chemical additives should be used.

Mortar Analysis (If Required):
If analysis is required, the architect will provide information to the mason for matching purposes.

Mortar Mixes:
PRE-BLENDED MORTAR MIXES: Pre-blended masonry cement/mortar mix should not be used since it is designed to produce mortars with compressive strength beyond what is common on most historic mortars.
PRE-BLENDED LIME MORTAR: Pre-blended lime mortars are also not recommended in most cases since the mortar will often not be an exact match to historic mortar. Pre-blended lime mortar should never be used for "spot repointing" projects. If for complete repointing projects, the Historic Preservation Office confirms through a test panel that the pre-blended lime mortar is very close to color, composition and texture to historic mortar then it may be permissible. However, in no circumstances shall the mortar differ from the mortar proportions requirements specified below.
MEASUREMENT AND MIXING: Measure cementitious and aggregate material in a dry condition by volume or equivalent weight. Do not measure by shovel, use known measure, mix materials in a clean mechanical batch mixer.
MIXING MORTAR: Thoroughly mix cementitious and aggregate materials together before adding any water. Then mix again adding only enough water to produce a damp, unworkable mix that will retain its form when pressed into a ball. Maintain mortar in this dampened condition for one to two hours. Add remaining water in small portions until mortar of desired consistency is reached. Use mortar within 30 minutes of final mixing; do not retemper or use partially hardened material.
ADMIXTURES: Do not use admixtures of any kind in mortar.

TOOLS: Use a pointing tool sized and shaped to the proper width for the joint being pointed. Match the profile and tooling of the existing joints exactly. Apply mortar using wooden trowel to simulate the original mortar coating.

Mortar Proportions:
NEW MORTAR MUST MATCH ORIGINAL IN COLOR, COMPOSITION, TEXTURE AND TOOLING. New mortar must have greater vapor permeability and be softer than masonry units. It should also be as vapor permeable and at least as soft as the historic mortar (not harder).

For buildings dating from 1930 or earlier:
The final mortar mix shall have no more than 25% of total volume of the lime and Portland cement – combined – consisting of Portland cement unless testing of historic mortar demonstrates a higher Portland cement content. Generally, the proportions fall within ASTM Type K to L range. The range of acceptable mortar proportions is below:

1/10 part white Portland cement TO	1 part white Portland cement
3 parts lime	4 parts lime
12 parts natural sand	15 parts natural sand
water	Water

Test Sample:
Prepare one test sample at inconspicuous location. Test sample shall be approximately nine square feet in size, and let cure at least 72 hours. Protect test sample from dirt and moisture. Contact the architect to review the test sample once sample has cured, and only proceed with project once architect's approval is obtained.

Masonry Cleaning Procedures for Historic Buildings
For exterior masonry only

Cleaning Materials and Products:
Water: Clean, free of oils, acids, alkalis and organic matter.
Brushes: Densely packed natural fiber bristle only.
Spray Equipment: Fan type nozzle with 15 to 40 degrees Fahrenheit fan range. Water pressure not to exceed 400-600 PSI (pounds per square inch).
Detergent: Neutral pH non-ionic detergent or light bleach solution only.

Cleaning Existing Masonry, General:
Proceed with cleaning in an orderly manner; work from top to bottom of each scaffold width and from one end of each elevation to the other.
Use only those cleaning methods indicated for each masonry material and location.
Perform cleaning method indicated in a manner, which results in uniform coverage of all surfaces, including corners, moldings, interstices and which produces an even effect without streaking or damage to masonry surfaces.
Removal of Plant Growth: Remove plant, moss, and shrub growth completely from masonry surfaces. Carefully remove plants, creepers and vegetation by cutting at roots and allowing to dry as long as possible prior to removal. Remove loose soil or debris from open masonry joints to

whatever depth it occurs. Apply ammonium sulfamate or other acceptable root killing material to plant roots, in accordance with manufacturer's instructions. Do not apply materials to plants or vegetation to remain.

Water Application Method:
Clean masonry surfaces using lowest water pressure possible to remove dirt and fungal growth, not to exceed 400 PSI.
Rinse
Protect flashings, windows, doors and other vulnerable points from water penetration using appropriate pressure and angle of application.
Remove dirt, fungal growth and other discoloration using a natural bristle brush and neutral pH non-ionic detergent and/or bleach mixed to manufacturer's specifications.
Rinse surfaces thoroughly with clean water to insure that all chemicals have been removed.

END OF SECTION

SECTION 055000

METAL FABRICATIONS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Shop fabricated steel items.

1.03 RELATED REQUIREMENTS

A. Section 02400 - Curb & Gutter, Driveways and Sidewalks: Placement of metal fabrications in concrete.

B. Section 033000 - Cast-in-Place Concrete: Placement of metal fabrications in concrete.

C. Section 055100 - Metal Stairs.

D. Section 055213 - Pipe and Tube Railings. Exterior guardrail and handrails at exterior.

E. Section 099000 - Painting and Coating: Paint finish.

1.04 REFERENCE STANDARDS

A. ASTM A 36/A 36M - Standard Specification for Carbon Structural Steel; 2005.

B. ASTM A 53/A 53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2007.

C. ASTM A 123/A 123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2002.

D. ASTM A 153/A 153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2005.

E. ASTM A 283/A 283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2003 (Reapproved 2007).

F. ASTM A 325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2009.

G. ASTM A 325M - Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Tensile Strength (Metric); 2009.

H. ASTM A 500/A 500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2007.

I. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; 2008.

J. SSPC-Paint 15 - Steel Joist Shop Primer; Society for Protective Coatings; 1999 (Ed. 2004).

K. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings; 2002 (Ed. 2004).

L. SSPC-SP 2 - Hand Tool Cleaning; Society for Protective Coatings; 1982 (Ed. 2004).

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

A. Steel Sections: ASTM A 36/A 36M.

B. Steel Tubing: ASTM A 500, Grade B cold-formed structural tubing.

C. Plates: ASTM A 283.

D. Pipe: ASTM A 53/A 53M, Grade B Schedule 40, black finish.

E. Fasteners: Appropriate for metals fabricated and assembled.

F. Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, galvanized to ASTM A 153/A 153M where connecting galvanized components.

G. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

H. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

I. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Continuously seal joined members by continuous welds.

D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.03 FABRICATED ITEMS

A. Ledge Angles, Channels, and Plates Not Attached to Structural Framing: For support of metal decking, and masonry; prime paint finish.

B. Lintels: As detailed; prime paint finish.

C. Frames for Wall Openings: Channel, plate and angle sections; painted materials as indicated.

2.04 FINISHES - STEEL

A. Prime paint all steel items.
   1. Exceptions: Galvanize steel lintels.

B. Prepare surfaces to be primed in accordance with SSPC-SP2.

C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

D. Prime Painting: One coat.

E. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A 123/A 123M requirements.

2.05 FABRICATION TOLERANCES

A. Squareness: 1/8 inch maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch.

C. Maximum Misalignment of Adjacent Members: 1/16 inch.

D. Maximum Bow: 1/8 inch in 48 inches.

E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete.

3.03 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Field weld components indicated.

D. Perform field welding in accordance with AWS D1.1/D1.1M.

E. Obtain approval prior to site cutting or making adjustments not scheduled.

F. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

END OF SECTION

SECTION 055100

METAL STAIRS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Interior stairs with concrete treads.

B. Structural steel stair framing and supports.

C. Handrails and guards.

D. Pan treads to receive concrete fill, and landings.

1.03 RELATED REQUIREMENTS

A. Section 055000 - Metal Fabrications.

B. Section 055213 - Pipe and Tube Railings: Metal handrails and guardrails at exterior locations.

C. Section 062000 - Finish Carpentry: Wood rail.

D. Section 099000 - Painting and Coating: Paint finish.

1.04 REFERENCE STANDARDS

A. ASTM A 6/A 6M - Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling; 2008.

B. ASTM A 36/A 36M - Standard Specification for Carbon Structural Steel; 2005.

C. ASTM A 53/A 53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2007.

D. ASTM A 283/A 283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2003 (Reapproved 2007).

E. ASTM A 325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2009.

F. ASTM A 325M - Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Tensile Strength (Metric); 2009.

G. ASTM A 500/A 500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2007.

H. ASTM A 501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2007.

I. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; American Welding Society; 2007.

J. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; 2008.

K. SSPC-Paint 15 - Steel Joist Shop Primer; Society for Protective Coatings; 1999 (Ed. 2004).

L. SSPC-SP 2 - Hand Tool Cleaning; Society for Protective Coatings; 1982 (Ed. 2004).

1.05 DESIGN REQUIREMENTS

A. Design railing assemblies, wall rails, and attachments to resist lateral force of 200 lbs at any point without damage or permanent set.

1.06 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.
   1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

1.07 QUALITY ASSURANCE

A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in Virginia, or personnel under direct supervision of such an engineer.

PART 2 PRODUCTS

2.01 METAL STAIRS - GENERAL

A. Metal Stairs: Provide stairs of the design specified, complete with landing platforms, vertical and horizontal supports, railings, and guards, fabricated accurately for anchorage to each other and to building structure.
   1. Regulatory Requirements: Provide stairs and railings complying with the most stringent requirements of local, state, and federal regulations; where requirements of the contract documents exceed those of regulations, comply with the contract documents.
   2. Dimensions: As indicated on drawings.
   3. Shop assemble components; disassemble into largest practical sections suitable for transport and access to site.
   4. No sharp or rough areas on exposed travel surfaces and surfaces accessible to touch.
   5. Separate dissimilar metals using paint or permanent tape.

B. Metal Jointing and Finish Quality Levels:
   1. Commercial: Exposed joints as inconspicuous as possible, whether welded or mechanical; underside of stair not covered by soffit IS considered exposed to view.
      a. Welded Joints: Intermittently welded on back side, filled with body putty, and sanded smooth and flush.
      b. Welds Exposed to View: Ground smooth and flush.
      c. Mechanical Joints: Butted tight, flush, and hairline.
      d. Bolts Exposed to View: Countersunk flat or oval head bolts; no exposed nuts.
      e. Exposed Edges and Corners: Eased to small uniform radius.
      f. Metal Surfaces to be Painted: Sanded or ground smooth, suitable for satin or matte finish.

C. Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.

D. Anchors and Related Components: Same material and finish as item to be anchored, except where specifically indicated otherwise; provide all anchors and fasteners required.

2.02 METAL STAIRS WITH CONCRETE TREADS

A. Jointing and Finish Quality Level: Commercial, as defined above.

B. Risers: Closed.

C. Treads: Metal pan with field-installed concrete fill.
   1. Concrete Depth: 1-1/2 inches, minimum.
   2. Tread Pan Material: Steel sheet.
   3. Tread pan Thickness: 12 gage.
   4. Pan Anchorage to Stringers: Continuously welded, from top, to be exposed to view from bottom.
   5. Concrete Reinforcement: Welded wire mesh.
   6. Concrete Finish: Steel troweled.

D. Risers: Same material and thickness as tread pans.
   1. Riser/Nosing Profile: Sloped riser with rounded nosing of minimum radius.

E. Stringers: Rolled steel channels.
   1. Stringer Depth: 12 inches.
   2. End Closure: Sheet steel of same thickness as risers welded across ends.

F. Landings: Same construction as treads, supported and reinforced as required to achieve design load capacity.

G. Railings: Steel mesh railings.

H. Finish: Shop- or factory-prime painted.

2.03 HANDRAILS AND GUARDS

A. Wall-Mounted Rails: Round pipe or tube rails unless otherwise indicated.
   1. Outside Diameter: 1-1/4 inch, minimum, to 1-1/2 inches, maximum.

B. Guards:
   1. Top Rail: Wood- Coordinate with finish carpentry. Provide suitable connection for attachment of wood to steel.
   2. Infill at Mesh Railings: Woven wire mesh panels.
      a. Material and Finish: Same as stair.
      b. Wire Size: 3/16 inch.
      c. Wire Spacing: 2 inch.
      d. Mounting: Mesh welded to steel bar frame, frame welded to posts.
   3. End and Intermediate Posts: Same material and size as top rails.
      a. Horizontal Spacing: As indicated on drawings.
      b. Mounting: Welded to top surface of stringer.

2.04 MATERIALS

A. Steel Sections: ASTM A 36/A 36M.

B. Steel Tubing: ASTM A 500 or ASTM A 501 structural tubing, round and shapes as indicated.

C. Steel Plates: ASTM A 6/A 6M or ASTM A 283/A 283M.

D. Steel Tubing: ASTM A 500, Grade B cold-formed structural tubing.

E. Steel Plates: ASTM A 283.

F. Pipe: ASTM A 53/A 53M, Grade B Schedule 40, black finish.

G. Ungalvanized Steel Sheet: Cold-rolled only.
   1. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Designation CS (commercial steel).

H. Concrete Fill: Portland cement Type I, 3000 psi 28 day strength, 2 to 3 inch slump.

I. Steel Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, plain.

J. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; consistent with design of stair structure.

K. Welding Materials: AWS D1.1; type required for materials being welded.

L. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.05 SHOP FINISHING

A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

B. Do not prime surfaces in direct contact with concrete or where field welding is required.

C. Prime Painting: Use specified shop- and touch-up primer.
   1. Preparation of Steel: In accordance with SSPC-SP 2, Hand Tool Cleaning.
   2. Number of Coats: One.

2.06 COMPONENTS

A. Metal Pan Stair Treads: Concrete in metal pan; 2 inches deep; smooth surface; non-slip edge.

B. Concrete for Treads and Landings: Portland cement Type I, 3000 psi 28 day strength, 2 to 3 inch slump.

2.07 FABRICATION - GENERAL

A. Fit and shop assemble components in largest practical sections, for delivery to site.

B. Fabricate components with joints tightly fitted and secured.

C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

D. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

E. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

F. Fabricate components accurately for anchorage to each other and to building structure.

2.08 FABRICATION - PAN STAIRS AND LANDINGS

A. Fabricate stairs and landings with closed risers and treads of metal pan construction using ungalvanized steel sheet, ready to receive concrete.

B. Secure tread pans to stringers with clip angles; welded in place.

C. Form stringers with rolled steel channels, 12 inches deep unless noted otherwise.

D. Form landings with steel form deck and steel sheet stock. Reinforce underside with angles to attain design load requirements.

E. Form balusters as shown on drawings.

F. Prime paint components.

2.09 FINISHING

A. Prepare surfaces to be primed in accordance with SSPC-SP 2.

B. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

C. Do not prime surfaces in direct contact with concrete or where field welding is required.

D. Prime paint items with one coat.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. When field welding is required, clean and strip primed steel items to bare metal.

3.03 INSTALLATION

A. Install components plumb and level, accurately fitted, free from distortion or defects.

B. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Provide welded field joints where specifically indicated on drawings. Perform field welding in accordance with AWS D1.1.

D. Other field joints may be either welded or bolted provided the result complies with the limitations specified for jointing quality levels.

E. Field bolt and weld to match shop bolting and welding. Conceal bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

F. Mechanically fasten joints butted tight, flush, and hairline. Grind welds smooth and flush.

G. Obtain approval prior to site cutting or creating adjustments not scheduled.

H. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

3.05 SCHEDULES

A. Interior Stair to Mezzanine: Concrete-filled pan treads and landings, primed finish.

END OF SECTION

SECTION 055213

PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Steel handrails and guard railing for exterior stair, sidewalks and ramp.

1.03 RELATED REQUIREMENTS

A. Section 02400 - Curb & Gutter, Driveways & Sidewalks: Site concrete placement.

B. Section 055100 - Metal Stairs: Handrails other than those specified in this section.

C. Section 099000 - Painting and Coating: Paint finish.

1.04 REFERENCE STANDARDS

A. ASTM A 123/A 123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2002.

B. ASTM A 500/A 500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2007.

C. ASTM E 935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings; 2000 (Reapproved 2006).

D. SSPC-Paint 15 - Steel Joist Shop Paint; The Society for Protective Coatings; 1999 (Ed. 2004).

1.05 DESIGN REQUIREMENTS

A. Design railing assembly, wall rails, and attachments to resist lateral force of 200 lbs at any point without damage or permanent set.

1.06 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

PART 2 PRODUCTS

2.01 RAILINGS - GENERAL REQUIREMENTS

A. Design railing assembly, wall rails, and attachments to resist lateral force of 75 lbs at any point without damage or permanent set. Test in accordance with ASTM E 935.

B. Dimensions: See drawings for configurations and heights.

C. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
   1. For anchorage into existing and new concrete, core drill and set post in non-shrink grout as indicated.

D. Provide welding fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

E. All welds to be ground and sanded smooth to finish to match the aluminum tubing.

2.02 STEEL RAILING SYSTEM

A. Steel Tube: ASTM A 500, Grade B cold-formed structural tubing.

B. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.

C. Exposed Fasteners: No exposed bolts or screws.

D. Pickets: Solid steel. Size and spacing as indicated.

E. Fittings: Elbows, T-shapes, wall brackets, escutcheons; machined steel.

F. Straight Splice Connectors: Steel welding collars.

G. Galvanizing: In accordance with requirements of ASTM A 123/A 123M.

H. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.03 FABRICATION

A. Accurately form components to suit specific project conditions and for proper connection to building structure.

B. Fit and shop assemble components in largest practical sizes for delivery to site.

C. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.

D. Welded Joints:

E. Provide anchors and plates required for connecting railings to structure.

F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

G. Exterior Components: Continuously seal joined pieces by intermittent welds and plastic filler. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.

H. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

I. Accurately form components to suit specific project conditions and for proper connection to building structure.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply items required to be cast into concrete with setting templates, for installation as work of other sections.

3.03 INSTALLATION

A. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.

B. Anchor railings securely to structure.

C. Conceal anchor bolts and screws whenever possible.

D. Assemble with spigots and sleeves to accommodate tight joints and secure installation.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per floor level, non-cumulative.

B. Maximum Offset From True Alignment: 1/8 inch.

C. Maximum Out-of-Position: 1/4 inch.

3.05 SCHEDULE

A. Park Avenue entry- guard railing and stairs handrail.

B. Stairwell at Door 123.

C. Sidewalk and ramp handrail.

END OF SECTION

SECTION 061000

ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-structural dimension lumber framing.

B. Rough opening framing for doors, windows, and roof openings.

C. Roofing nailers.

D. Roofing cant strips.

E. Preservative treated wood materials.

F. Communications and electrical room mounting boards.

G. Concealed wood blocking, nailers, and supports.

H. Miscellaneous wood nailers, furring, and grounds.

1.02 RELATED REQUIREMENTS

A. Section 09260 - Gypsum Board Assemblies: Blocking and nailers concealed in walls.

1.03 REFERENCE STANDARDS

A. AFPA (WFCM) - Wood Frame Construction Manual for One- and Two-Family Dwellings; American Forest and Paper Association; 2001.

B. ASTM A 153/A 153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2005.

C. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2008.

D. AWPA C2 - Lumber, Timber, Bridge Ties and Mine Ties -- Preservative Treatment by Pressure Processes; American Wood-Preservers' Association; 2003.

E. AWPA U1 - Use Category System: User Specification for Treated Wood; American Wood-Protection Association; 2007.

F. PS 1 - Structural Plywood; 2007.

G. PS 20 - American Softwood Lumber Standard; National Institute of Standards and Technology (Department of Commerce); 2005.

H. SPIB (GR) - Grading Rules; Southern Pine Inspection Bureau, Inc.; 2002.

1.04 QUALITY ASSURANCE

A. Lumber: Comply with PS 20 and approved grading rules and inspection agencies.

B. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
   1. If no species is specified, provide any species graded by the agency specified; if no grading agency is specified, provide lumber graded by any grading agency meeting the specified requirements.
   2. Grading Agency: Any grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

A. Grading Agency: Southern Pine Inspection Bureau, Inc. (SPIB).

B. Sizes: Nominal sizes as indicated on drawings, S4S.

C. Moisture Content: Kiln-dry or MC15.

D. Stud Framing (2 by 2 through 2 by 6):
   1. Grade: No. 2.

E. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
   1. Lumber: S4S, No. 2 or Standard Grade.
   2. Boards: Standard or No. 3.

F. Miscellaneous Blocking, Furring, and Nailers:
   1. Lumber: S4S, No. 2 or Standard Grade.
   2. Boards: Standard or No. 3.

2.03 CONSTRUCTION PANELS

A. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E 84.

B. Other Applications:
   1. Plywood Exposed to View But Not Exposed to Weather: PS 1, A-D, or better.
   2. Other Locations: PS 1, C-D Plugged or better.

2.04 ACCESSORIES

A. Fasteners and Anchors:
   1. Metal and Finish: Hot-dipped galvanized steel per ASTM A 153/A 153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.

2.05 FACTORY WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
   1. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

B. Preservative Treatment:
   1. Manufacturers:
      a. Arch Wood Protection, Inc.:

b. Chemical Specialties, Inc.
c. Osmose, Inc.
d. Substitutions: See Section 016000 - Product Requirements.

C. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative to 0.25 lb/cu ft retention.
1. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
2. Treat lumber in contact with roofing, flashing, or waterproofing.
3. Treat lumber in contact with masonry or concrete.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.02 FRAMING INSTALLATION

A. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength.

B. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes and AFPA Wood Frame Construction Manual.

3.03 BLOCKING, NAILERS, AND SUPPORTS

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

B. In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to code authorities may be used in lieu of solid wood blocking.

C. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.

D. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

E. Specifically, provide the following non-structural framing and blocking:
1. Cabinets and shelf supports.
2. Wall brackets.
3. Handrails.
4. Grab bars.
5. Toilet and bath accessories.
6. Wall-mounted door stops.
7. Backing for equipment mounted to walls or ceiling.
8. Owner furnished equipment that requires mounting to walls or ceiling.
9. Other locations as indicated on drawings.

3.04 ROOF-RELATED CARPENTRY

A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

3.05 INSTALLATION OF CONSTRUCTION PANELS

A. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.
   1. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
   2. Install adjacent boards without gaps.

END OF SECTION

SECTION 062000

FINISH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior standing and running trim

B. Stair railings.

C. Wood door frames, glazed frames.

D. Wood casings and moldings.

E. Hardware and attachment accessories.

1.02 RELATED REQUIREMENTS

A. Section 05500 - Metal Stairs: Posts for wood top rail.

B. Section 061000 - Rough Carpentry: Support framing, grounds, and concealed blocking.

C. Section 064100 - Architectural Wood Casework: Shop fabricated custom cabinet work.

D. Section 081416 - Flush Wood Doors.

E. Section 081433 - Stile and Rail Wood Doors.

F. Section 085200 - Wood Windows.: Interior casing and trim.

G. Section 099000 - Painting and Coating: Painting and finishing of finish carpentry items.

1.03 REFERENCE STANDARDS

A. PS 1 - Structural Plywood; 2007.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, accessories, to a minimum scale of 1-1/2 inch to 1 ft.

C. Samples: Submit two samples of finish plywood, 12x12 in size illustrating wood grain and specified finish.

D. Samples: Submit two samples of wood trim 12 inch long.

1.05 QUALITY ASSURANCE

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect work from moisture damage.

PART 2 PRODUCTS

2.01 MATERIALS - GENERAL

2.02 LUMBER MATERIALS

A. Softwood Lumber: pine species, plain sawn, maximum moisture content of 6 percent; with vertical grain, for opaque finish.

B. Softwood Lumber: Douglas fir species, clear, quarter sawn, maximum moisture content of 6 percent; with vertical grain, for transparent finish.

2.03 SHEET MATERIALS

A. Softwood Plywood Not Exposed to View: Any face species, veneer core; PS 1 Grade A-B; glue type as recommended for application.

2.04 FABRICATION

A. Shop assemble work for delivery to site, permitting passage through building openings.

B. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

2.05 SHOP FINISHING

A. Sand work smooth and set exposed nails and screws.

B. On items to receive transparent finishes, use wood filler that matches surrounding surfaces and is of type recommended for the applicable finish.

C. Back prime woodwork items to be field finished, prior to installation.

PART 3 EXECUTION

3.01 INSTALLATION

A. Set and secure materials and components in place, plumb and level.

B. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

3.02 PREPARATION FOR SITE FINISHING

A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.

B. Site Finishing: See Section 099000.

3.03 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch.

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

END OF SECTION

SECTION 064100

ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Specially fabricated cabinet units composed of plastic laminate and/or solid surfacing material.

B. Open shelving.

C. Countertops.

D. Cabinet hardware.

E. Factory finishing.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Support framing, grounds, and concealed blocking.

B. Section 06402 - Interior Architectural Woodwork.

C. Section 081433 - Stile and Rail Doors: Door at coat rack for attachment of shelving and rod.

D. Section 099000 - Painting and Coating: Site finishing of cabinet exterior.

1.03 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard; 1999.

B. ANSI A208.2 - American National Standard for Medium Density Fiberboard for Interior Use; 2002.

C. AWI/AWMAC (QSI) - Architectural Woodwork Quality Standards Illustrated; Architectural Woodwork Institute and Architectural Woodwork Manufacturers Association of Canada; 2005, 8th Ed., Version 2.0.

D. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; Hardwood Plywood & Veneer Association; 2004 (ANSI/HPVA HP-1).

E. NEMA LD 3 - High-Pressure Decorative Laminates; National Electrical Manufacturers Association; 2005.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate materials, component profiles and elevations, assembly methods, joint details, fastening methods, accessory listings, hardware location and schedule of finishes.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with AWI/AWMAC Architectural Woodwork Quality Standards Illustrated, Custom quality, unless other quality is indicated for specific items.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years of experience.

1.06 MOCK-UP

A. Provide mock-up of typical base cabinet, including hardware, and finishes.

B. Mock-up may remain as part of the Work.

1.07 FIELD CONDITIONS

A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

PART 2 PRODUCTS

2.01 LUMBER MATERIALS

A. Softwood Lumber: Graded in accordance with AWI/AWMAC Architectural Woodwork Quality Standards Illustrated, Grade II/Custom; average moisture content of 5-10 percent; species as follows:
   1. Exposed Surfaces: Species vertical grain douglas fir.
   2. Semi-Exposed Surfaces: Species vertical grain douglas fir.
   3. Concealed Surfaces: Species pine.

2.02 PANEL MATERIALS

A. Veneer Faced Plywood Finish: HPVA HP-1; graded in accordance with AWI/AWMAC Architectural Woodwork Quality Standards Illustrated, core of veneer, particleboard, medium density fiberboard, or strawboard; type of glue recommended for specific application; thickness as required; face veneer as follows:
   1. Exposed Surfaces: Grade AA, douglas fir, quarter cut, book-matched.
   2. Concealed Surfaces: Grade B, Lauan, rotary cut, random-matched.

B. Particleboard: ANSI A208.1; medium density industrial type as specified in AWI/AWMAC Architectural Woodwork Quality Standards Illustrated, composed of wood chips bonded with moisture resistant adhesive under heat and pressure; sanded faces; thickness as indicated; use for concealed components.

C. Medium Density Fiberboard (MDF): ANSI A208.2; type as specified in AWI/AWMAC Architectural Woodwork Quality Standards Illustrated; composed of wood fibers pressure bonded with interior grade adhesive to suit application; sanded faces; thickness as indicated.
   1. Use for painted components.

D. Hardwood Edgebanding: Use solid hardwood edgebanding matching species, color, grain, and grade for exposed portions of cabinetry.

2.03 LAMINATE MATERIALS

A. Manufacturers:
   1. Formica Corporation: www.formica.com.
   2. Panolam Industries International, Inc\Nevamar: www.nevamar.com.
   3. Wilsonart International, Inc: www.wilsonart.com.
   4. Substitutions: See Section 016000 - Product Requirements.

B. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications and as follows:
   1. Horizontal and Vertical Surfaces: HGS, 0.048 inch nominal thickness, color as selected, finish as selected.
   2. Laminate Backer: BKL, 0.020 inch nominal thickness, undecorated; for application to concealed backside of panels faced with high pressure decorative laminate.

2.04 COUNTERTOPS

A. Plastic Laminate Countertops: Medium density fiberboard substrate covered with HPDL, conventionally fabricated and self-edge banded.

2.05 ACCESSORIES

A. Adhesive: Type recommended by AWI/AWMAC to suit application.

B. Fasteners: Size and type to suit application.

C. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel finish in exposed locations.

D. Concealed Joint Fasteners: Threaded steel.

2.06 HARDWARE

A. Adjustable Shelf Supports: Standard side-mounted system using multiple holes for pin supports and coordinated self rests, satin chrome finish, for nominal 1 inch spacing adjustments.

B. Drawer and Door Pulls: "U" shaped wire pull, steel with satin finish, 4 inch centers.

C. Catches: Magnetic.

D. Drawer Slides:
   1. Type: Full extension.
   2. Static Load Capacity: Commercial grade.
   3. Mounting: Bottom mounted.
   4. Stops: Integral type.
   5. Features: Provide self closing/stay closed type.
   6. Manufacturers:
      a. Accuride International, Inc: www.accuride.com.
      b. Grass America Inc: www.grassusa.com.
      c. Knape & Vogt Manufacturing Company: www.knapeandvogt.com.
      d. Substitutions: See Section 016000 - Product Requirements.

E. Hinges: European style concealed self-closing type, steel with polished finish.
   1. Manufacturers:
      a. Grass America Inc: www.grassusa.com.
      b. Hardware Resources: www.hardwareresources.com.
      c. Julius Blum, Inc: www.blum.com.
      d. Substitutions: See Section 016000 - Product Requirements.

F. Coat Rod: 1-1/4 inch black iron pipe. Seal with one coat of polyurethane. Attachment -see drawings.

2.07 FABRICATION

A. Cabinet Style: Reveal overlay on face frame.

B. Cabinet Doors and Drawer Fronts: Stile and rail, flat panel style.

C. Drawer Construction Technique: As recommended by fabricator.

D. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.

E. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.

F. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.

G. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises.
   1. Cap exposed plastic laminate finish edges with material of same finish and pattern.

H. Mechanically fasten back splash to countertops with steel brackets at 16 inches on center.

2.08 FACTORY FINISHING

A. On items to receive transparent finishes, use wood filler matching or blending with surrounding surfaces and of types recommended for applied finishes.

B. Finish work in accordance with AWI/AWMAC Architectural Woodwork Quality Standards Illustrated, Section 1500, Nitrocellulose Lacquer, Transparent.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify location and sizes of utility rough-in associated with work of this section.

3.02 INSTALLATION

A. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.

B. Use fixture attachments in concealed locations for wall mounted components.

C. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.

D. Secure cabinets and counter bases to floor using appropriate dowels and anchorages.

3.03 ADJUSTING

A. Test installed work for rigidity and ability to support loads.

B. Adjust moving or operating parts to function smoothly and correctly.

END OF SECTION

SECTION 077200

ROOF ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufactured curbs.

1.02 REFERENCE STANDARDS

A. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2007.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used.

PART 2 PRODUCTS

2.01 MANUFACTURED CURBS

A. Manufactured Curbs, Equipment Rails, and Other Roof Mounting Assemblies:
   1. AES Manufacturing Inc.: www.aescurb.com.
   2. The Pate Company: www.patecurbs.com.
   3. RPS Accessories: www.rpscurbs.com.
   4. Substitutions: See Section 016000 - Product Requirements.

B. Manufactured Curbs: Factory-assembled hollow sheet metal construction with fully mitered and welded corners, integral counterflashing, internal reinforcing, and top side and edges formed to shed water.
   1. Sheet Metal: Hot-dip zinc coated steel sheet complying with ASTM A 653/A 653M, SS Grade 33 ; G60 coating designation; 18 gage, 0.048 inch thick.
   2. Manufacture curb bottom and mounting flanges for installation directly on roof blocking, not on insulation; match slope and configuration of roof deck.
   3. Provide the layouts and configurations shown on the drawings. Coordinate sizes with mechanical equipment.

C. Curbs Adjacent to Roof Openings: Provide curb on all sides of opening, with top of curb horizontal for equipment mounting.
   1. Provide preservative treated wood nailers along top of curb.
   2. Insulate inside curbs with 1-1/2 inch thick fiberglass insulation.
   3. Height Above Finished Roof Surface: 12 inches, minimum.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

3.02 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.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions, in manner that maintains roof's weather integrity.

END OF SECTION

SECTION 075400

THERMOPLASTIC MEMBRANE ROOFING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Alterations to adhered system with thermoplastic roofing membrane.

B. Roofing stack boots.

1.03 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Wood blocking.

B. Section 076200 - Sheet Metal Flashing and Trim: Counterflashings.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this section:
   1. Approved by membrane manufacturer and approved for work on this roof due to existing warranty requirements.

1.05 WARRANTY

A. System Warranty: Work shall not void the existing manufacturer's system warranty.

PART 2 PRODUCTS

2.01 ROOFING

A. Thermoplastic Membrane Roofing: One ply membrane, fully adhered, over insulation.

B. Roofing Requirements:
   1. Match existing roof system. Install roof penetration flashings per manufacturers instructions.

2.02 ACCESSORIES

A. Stack Boots: Prefabricated flexible boot and collar for pipe stacks through membrane; elastomeric material compatible with membrane.

B. Membrane Adhesive: As recommended by membrane manufacturer.

C. Surface Conditioner for Adhesives: Compatible with membrane and adhesives.

D. Thinners and Cleaners: As recommended by adhesive manufacturer, compatible with membrane.

E. Sealants: As recommended by membrane manufacturer.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

A. Install per manufacturers instructions.

B. Coordinate the work with installation of associated counterflashings installed by other sections as the work of this section proceeds.

3.02 CLEANING

A. Clean roof of all markings and adhesives. Roof is visible from adjacent buildings and all major defects from spills and marking will be removed prior to completion.

B. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and conform to their instructions.

C. Repair or replace defaced or damaged finishes caused by work of this section.

END OF SECTION

SECTION 076200

SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Fabricated sheet metal items, including counterflashings.

1.03 RELATED REQUIREMENTS

A. Section 040100 - Maintenance of Masonry : Flashings in masonry and installation of counterflashing at coping.

B. Section 079005 - Joint Sealers.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

PART 2 PRODUCTS

2.01 SHEET MATERIALS

A. Stainless Steel: ASTM A 666 Type 304, soft temper, 0.015 inch thick; smooth No. 4 finish.

2.02 ACCESSORIES

A. Sealant: Type as specified in Section 07900

2.03 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Fabricate cleats of same material as sheet, minimum 1 inches wide, interlocking with sheet.

C. Form pieces in longest possible lengths.

D. Hem exposed edges on underside 1/2 inch; miter and seam corners.

E. Form material with flat lock seams, except where otherwise indicated. At moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

F. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.

G. Fabricate vertical faces with bottom edge formed outward 1/4 inch (6 mm) and hemmed to form drip.

PART 3 EXECUTION

3.01 INSTALLATION

A. Cut out existing sealant as indicted for installation of the new counterflashing at coping.

B. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.

C. Apply sealant to hold flashing into joint.

D. Seal metal joints watertight.

3.02 SCHEDULE

A. Counterflashing at all copings - profile as indicated.

B. Miscellaneous flashing at curbs for roofing tie-in.

END OF SECTION

SECTION 079005

JOINT SEALERS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Sealants and joint backing.

1.03 RELATED REQUIREMENTS

A. Section 092116 - Gypsum Board Assemblies: Acoustic sealant.

1.04 REFERENCE STANDARDS

A. ASTM C 834 - Standard Specification for Latex Sealants; 2005.

B. ASTM C 920 - Standard Specification for Elastomeric Joint Sealants; 2005.

C. ASTM C 1193 - Standard Guide for Use of Joint Sealants; 2009.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data indicating sealant performance criteria, substrate preparation, limitations, and color availability.

C. Manufacturer's Installation Instructions: Indicate special procedures, surface preparation, and perimeter conditions requiring special attention.

1.06 COORDINATION

A. Coordinate the work with all sections referencing this section.

1.07 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective work within a five year period after Date of Substantial Completion.

C. Warranty: Include coverage for installed sealants and accessories which fail to achieve airtight seal and watertight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Silicone Sealants:
   1. Bostik Inc: www.bostik-us.com.
   2. GE Plastics: www.geplastics.com.
   3. Pecora Corporation: www.pecora.com.
   4. BASF Construction Chemicals-Building Systems: www.chemrex.com.
   5. Substitutions: See Section 016000 - Product Requirements.

B. Polyurethane Sealants:

1. Bostik Inc: www.bostik-us.com.
2. Pecora Corporation: www.pecora.com.
3. BASF Construction Chemicals-Building Systems: www.chemrex.com.
4. Substitutions: See Section 016000 - Product Requirements.

C. Acrylic Latex Sealants:
1. Bostik Inc: www.bostik-us.com.
2. Pecora Corporation: www.pecora.com.
3. BASF Construction Chemicals-Building Systems: www.chemrex.com.
4. Substitutions: See Section 016000 - Product Requirements.

2.02 SEALANTS

A. Type 1 - General Purpose Exterior Sealant: Polyurethane; ASTM C 920, Grade NS, Class 25, Uses M, G, and A; multi- component.
1. Color: Standard colors matching finished surfaces.
2. Product: Dynatrol II manufactured by Pecora.

B. Type 2 - General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C 834, single component, paintable.
1. Color: Standard colors matching finished surfaces.
2. Product: AC-20 -FTR manufactured by Pecora.

C. Type 3 - Bathtub/Tile Sealant: White or translucent silicone; ASTM C 920, Uses M and A; single component, mildew resistant.
1. Product: 898 Silicone Sanitary Sealant manufactured by Pecora.

D. Type 5 - Nonsag Polyurethane Sealant: ASTM C 920, Grade NS, Class 25, Uses NT, I, M, A, G, O; single component, chemical curing, non-staining, non bleeding, non-sagging type.
1. Color: Standard colors matching finished surfaces.
2. Product: Dynatred manufactured by Pecora.

E. Type 6 - Self-Leveling Polyurethane Sealant: ASTM C 920, Grade P, Class 25, Uses T, I, M, A, O; single component, chemical curing, non staining, non bleeding, self-leveling type.
1. Color: Color as selected.
2. Product: NR 201 manufactured by Pecora.

2.03 ACCESSORIES

A. Primer: Non-staining type, P-150 primer by Pecora for exterior sealants and as recommended by sealant manufacturer to suit application.

B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

C. Joint Backing: Round foam rod compatible with sealant; closed cell polyethylene; oversized 30 to 50 percent larger than joint width.

D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

B. Verify that joint backing and release tapes are compatible with sealant.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean and prime joints in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C 1193.

D. Protect elements surrounding the work of this section from damage or disfigurement.

3.03 INSTALLATION

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Perform installation in accordance with ASTM C 1193.

C. Install bond breaker where joint backing is not used.

D. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

E. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

F. Tool joints concave.

3.04 SCHEDULE

A. Exterior Joints for Which No Other Sealant Type is Indicated: Type 1.

B. Control, Expansion, and Soft Joints in Masonry, and Between Masonry and Adjacent Work: Type 1.

C. Joints Between Exterior Metal Frames and Adjacent Work (except masonry): Type 1.

D. Under Exterior Door Thresholds: Type 1.

E. Interior Joints for Which No Other Sealant is Indicated: Type 2; None; N/A.

F. Control and Expansion Joints in Interior Concrete Slabs and Floors: Type 6.

G. Joints Between Plumbing Fixtures and Walls and Floors, and Between Countertops and Walls: Type 3.

END OF SECTION

SECTION 081213

HOLLOW METAL FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated steel frames.

B. Interior glazed light frames.

1.02 RELATED REQUIREMENTS

A. Section 087100 - Door Hardware: Hardware and weatherstripping.

B. Section 088000 - Glazing: Glass for borrowed lites.

C. Section 099000 - Painting and Coating: Field painting.

1.03 REFERENCE STANDARDS

A. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 2003.

B. ANSI A250.8 - SDI-100 Recommended Specifications for Standard Steel Doors and Frames; 2003.

C. ANSI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 1998 (R2004).

D. BHMA A156.115 - Hardware Preparation in Steel Doors and Steel Frames; 2006.

E. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames; The National Association of Architectural Metal Manufacturers; 2007.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced grade standard.

C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and identifying location of different finishes, if any.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Steel Frames:
   1. Assa Abloy Ceco, Curries, or Fleming: www.assaabloydss.com.
   2. Windsor Republic Doors: www.republicdoor.com.
   3. Steelcraft; Product ____: www.steelcraft.com.
   4. Substitutions: See Section 016000 - Product Requirements.

2.02 STEEL DOOR FRAMES

A. Requirements for All Frames:
   1. Accessibility: Comply with ANSI/ICC A117.1.
   2. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.
   3. Hardware Preparation: In accordance with bhma a156.115, with reinforcement welded in place, in addition to other requirements specified in door grade standard.
   4. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with all the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.
   5. Frames Wider than 48 Inches: Reinforce with steel channel fitted tightly into frame head, flush with top.

B. Interior Door Frames, Non-Fire-Rated: Knock-down type.
   1. Grade: Comply with frame requirements specified in ANSI A250.8 for Level 1, 18 gage
   2. Finish: Factory primed, for field finishing.

C. Frames for Interior Glazing or Borrowed Lights: Construction and face dimensions to match door frames, and as indicated on drawings.

D. Mullions for Interior Glazing and Borrowed Lites: Fixed, size as indicated.

2.03 ACCESSORY MATERIALS

A. Silencers: Resilient rubber, fitted into drilled hole; 3 on strike side of single door, 3 on center mullion of pairs, and 2 on head of pairs without center mullions.

2.04 FINISH MATERIALS

A. Primer: Rust-inhibiting, complying with ANSI A250.10, door manufacturer's standard.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with the requirements of the specified door grade standard and NAAMM HMMA 840.

B. Coordinate frame anchor placement with wall construction.

C. Coordinate installation of glazing.

D. Coordinate installation of hardware.

3.02 TOLERANCES

A. Maximum Diagonal Distortion: 1/16 inch measured with straight edges, crossed corner to corner.

3.03 SCHEDULE

A. Refer to Door and Frame Schedule on the drawings.

END OF SECTION

SECTION 081433

STILE AND RAIL WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wood doors, stile and rail design.

B. Panels of wood and glass.

1.02 RELATED REQUIREMENTS

A. Section 081213 - Hollow Metal Frames.

B. Section 087100 - Door Hardware.

C. Section 088000 - Glazing.

D. Section 099000 - Painting and Coating: Site finishing doors.

1.03 REFERENCE STANDARDS

A. AWI/AWMAC (QSI) - Architectural Woodwork Quality Standards Illustrated; Architectural Woodwork Institute and Architectural Woodwork Manufacturers Association of Canada; 2005, 8th Ed., Version 2.0.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Indicate stile and rail core materials and construction; veneer species, type and characteristics.

C. Specimen warranty.

D. Shop Drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts required, special beveling, special blocking for hardware, factory machining criteria, factory finishing criteria, identify cutouts for glazing.

E. Samples: Submit two samples of door construction, 12x12 inch in size cut from top corner of door.

F. Manufacturer's Installation Instructions: Indicate special installation instructions.

G. Warranty, executed in Owner's name.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Package, deliver and store doors in accordance with AWI/AWMAC Quality Standards Illustrated, Section 1300.

B. Protect doors with resilient packaging. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges with tinted sealer if stored more than one week. Break seal on site to permit ventilation.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Interior Doors: Provide manufacturer's warranty for 5 years.

C. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Stile and Rail Wood Doors:
   1. Eggers Industries: www.eggersindustries.com.
   2. Graham Wood Doors: www.grahamdoors.com
   3. Maiman Company: www.maiman.com.
   4. Marshfield DoorSystems, Inc; None - N/A: www.marshfielddoors.com.
   5. VT industries.www.vtindustries.com
   6. WoodharborDoors and Cabinetry; www.woodharbor.com.
   7. Doors can be made by local woodworking shop if prior approval is given by the architect for the proposed shop.
   8. Substitutions: See Section 016000 - Product Requirements.

2.02 DOOR TYPES

A. Exterior Doors: 2-1/4 inches thick unless otherwise indicated; solid lumber construction; mortised and tenoned joints.

B. Interior Doors: 1-3/4 inches thick; veneer and lumber stile and rail construction; mortised and tenoned joints.

2.03 DOOR AND PANEL FACING

A. Exterior Doors: Wood veneer, douglas fir species, quarter sliced, with book matched grain, for transparent finish.

B. Interior Doors: Wood veneer, douglas fir species, quarter sliced, with book matched grain, for transparent finish.

C. Adhesive: Type I - waterproof.

2.04 ACCESSORIES

A. Molding: Wood, of same species as door facing, beaded shape, mitered corners; prepared for countersink style screws.

2.05 FABRICATION

A. Fabricate in accordance with AWI/AWMAC Quality Standards Illustrated, Section 1400, Custom grade.

B. Vertical Exposed Edge of Stiles: Of same species as veneer facing.

C. Factory machine doors for finish hardware in accordance with hardware requirements and dimensions. Do not machine for surface hardware.

D. Factory fit doors for frame opening dimensions identified on shop drawings.

2.06 FINISH

A. Factory finish doors in accordance with AWI Quality Standards Section 1500:
   1. Transparent Finish: Transparent catalyzed polyurethane, Custom quality, satin sheen.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install doors in accordance with manufacturer's instructions and AWI/AWMAC Quality Standards requirements.

B. Trim door width by cutting equally on both jamb edges.

C. Trim door height by cutting bottom edges to a maximum of 3/4 inch.

D. Machine cut for hardware.

E. Coordinate installation of doors with installation of frames and hardware.

F. Coordinate installation of glazing.

3.02 TOLERANCES

A. Conform to AWI/AWMAC Quality Standards requirements for fit, clearance, and joinery tolerances.

3.03 ADJUSTING

A. Adjust doors for smooth and balanced door movement.

B. Adjust closers for full closure.

3.04 SCHEDULE - See Drawings

END OF SECTION

SECTION 084126

ALL-GLASS ENTRANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. All-glass entrances.

B. Swinging doors.

1.02 RELATED REQUIREMENTS

A. Section 055000 - Metal Fabrications: Supplementary supports.

1.03 REFERENCE STANDARDS

A. ASTM A 666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2003.

B. ASTM C 920 - Standard Specification for Elastomeric Joint Sealants; 2005.

C. ASTM C 1036 - Standard Specification for Flat Glass; 2006.

D. ASTM C 1048 - Standard Specification for Heat-Treated Flat Glass--Kind HS, Kind FT Coated and Uncoated Glass; 2004.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's descriptive literature for each component in all-glass entrance assembly.

C. Shop Drawings: Drawings showing layout, dimensions, identification of components, and interface with adjacent construction.
   1. Include field measurements of openings.
   2. Include elevations showing:
      a. Appearance of all-glass entrance layouts.
      b. Locations and identification of manufacturer-supplied door hardware and fittings.
      c. Locations and sizes of cut-outs and drilled holes for other door hardware.
   3. Include details of:
      a. Requirements for support and bracing at openings.
      b. Installation details.
      c. Appearance of manufacturer-supplied door hardware and fittings.
   4. Schedule: Listing of each type component in all-glass entrance assemblies, cross-referenced to shop drawing plans, elevations, and details.

D. Operation and Maintenance Data: For manufacturer-supplied operating hardware.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Minimum three years of experience installing entrance assemblies similar to those specified in this section.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. All-Glass Entrances:
   1. Avanti Systems USA, Inc: www.avantisystemsusa.com.
   2. C. R. Laurence Co., Inc; www.crlaurence.com.1-800-421-6144
   3. InKan Limited: www.inkan.on.ca; 1-800-387-2481
      a. Product: 200 Series
   4. Vitro America; www.vitroamerica.com; 1-800-238-6057
   5. Substitutions: See Section 016000 - Product Requirements.

2.02 ASSEMBLIES

A. Entrances and Storefronts: Factory fabricated assemblies consisting of frameless glass panels fastened with metal structural fittings in configuration indicated on the drawings.
   1. Operational Loads: Designed to withstand door operation under normal traffic without damage, racking, sagging, or deflection.
   2. Prepared for all specified hardware whether specified in this section or not.
   3. Finished metal surfaces protected with strippable film.
   4. Factory assembled to greatest extent practicable; may be disassembled to accommodate shipping constraints.

2.03 FITTINGS

A. Exposed Fittings: Stainless steel, Number 4, satin polish finish.

B. Sidelight Fittings:
   1. Provide top and bottom installation track for sidelite installation.

C. Swinging Door Fittings: Patch fitting at top pivot corner of door; continuous rail at bottom of door.
   1. Rail Cross-Section: 1-3/4 inches wide by 3-1/2 inches high.
   2. Rail Profile: Tapered.

2.04 DOOR HARDWARE

A. Finish of Exposed Metals: Match finish of fittings.

B. Swinging Door Hardware: Provided by manufacturer:
   1. Hinges: Standard with manufacturer.
   2. Closers: Recessed in floor.
   3. Push/pulls: Standard with manufacturer.

2.05 MATERIALS

A. Glass: Tempered float glass meeting requirements of ASTM C 1036, Type I, Quality Q3, fully tempered in accordance with ASTM C 1048, Kind FT, and as follows:
   1. Thickness: 1/2 inch.
   2. Color: Clear, Class 1.
   3. Prepare glazing panels for indicated fittings and hardware before tempering.
   4. Polish edges that will be exposed in finished work to bright flat polish.
   5. Temper glass materials horizontally; visible tong marks or tong mark distortions are not permitted.

B. Stainless Steel Components: Conforming to ASTM A 666, Type 304.

C. Sealant: One-part silicone sealant, conforming to ASTM C 920, clear.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that openings are acceptable.

B. Do not begin installation until substrates and openings have been properly prepared.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean substrates thoroughly prior to installation.

B. Prepare substrates using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Tolerances:
   1. Horizontal Components and Sight Lines: Not more than 1/8 inch in 10 feet variation from level, non-cumulative.
   2. Vertical Components and Sight Lines: Not more than 1/8 inch in 10 feet variation from plumb, non-cumulative.
   3. Variation from Plane or Indicated Location: Not more than 1/16 inch.

3.04 ADJUSTING

A. Adjust doors to operate correctly, without binding to frame, sill, or adjacent doors.

B. Adjust door hardware for smooth operation.

3.05 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 084313

ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Aluminum-framed storefront windows with vision glass.

B. Infill panels of metal and glass.

C. Aluminum doors.

D. Weatherstripping.

E. Door hardware.

F. Preparation for electronic hardware.

G. Perimeter sealant.

1.03 RELATED REQUIREMENTS

A. Section 079005 - Joint Sealers: Perimeter sealant and back-up materials.

B. Section 087100 - Door Hardware: Hardware items other than specified in this section.

C. Division 16 and 17- Electrical: For rough-in of electronic hardware.

1.04 REFERENCE STANDARDS

A. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; American Architectural Manufacturers Association; 2004.

B. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels; 2005.

C. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2007.

D. ASTM B 209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2007.

E. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2008.

F. ASTM B 221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric]; 2007.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, internal drainage details.

C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related Work, expansion and contraction joint location and details, and field welding required.

D. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.

E. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Handle products of this section in accordance with AAMA CW-10.

B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.07 WARRANTY

A. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Kawneer Company, Inc: www.kawneer.com.
   1. Product: VG 451-T for storefront frames and 500 Tuffline for doors.

B. Other Acceptable Manufacturers:
   1. United States Aluminum Corp: www.usalum.com.
   2. Vistawall Architectural Products: www.vistawall.com.
   3. EFCO: www.efcocorp.com
   4. Substitutions: See Section 016000 - Product Requirements.

2.02 STOREFRONT

A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members, anchorage and attachment devices.
   1. Finish: Superior performance organic coating.
   2. Color: As selected from manufacturer's standards.

2.03 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.
   1. Cross-Section: As indicated on drawings.
   2. Thermal Sub-sill flashing: For exterior framing, use thermally broken aluminum subsills to direct water to the exterior.
      a. Color: Match frames

B. Infill Panels: Insulated, aluminum sheet face and back, with edges formed to fit glazing channel and sealed.
   1. Finish: Same as storefront.

C. Doors: Glazed and Paneled.
   1. Thickness: 2.25 inches.
   2. Opening Size: Custom.
   3. Top Rail: 5 inches wide.

4. Vertical Stiles: 5 inches wide.
5. Bottom Rail: 10 inches wide.
6. Glazing Stops: Square.
7. Finish: Same as storefront.

2.04 MATERIALS

A. Extruded Aluminum: ASTM B 221 (ASTM B 221M).

B. Sheet Aluminum: ASTM B 209 (ASTM B209M).

C. Fasteners: Stainless steel.

D. Perimeter Sealant: Type as specified in Section 079005.

E. Glass: 1 inch insulated, clear, tempered.

F. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

2.05 FINISHES

A. High Performance Organic Finish: AAMA 2604; multiple coats, thermally cured fluoropolymer system.

B. Color: To be selected by Architect from manufacturer's standard range.

C. Touch-Up Materials: As recommended by coating manufacturer for field application.

2.06 HARDWARE

A. Door Hardware: Storefront manufacturer's standard type to suit application.
   1. Finish on Hand-Contacted Items: Polished stainless steel.

B. Sill Sweep Strips: EPDM seal type, concealed fasteners; provide on all doors.

C. Door drip edge trim at sill.

D. Threshold: Extruded aluminum, one piece, meeting accessibility requirements.

E. Hinges: Continuous geared type hinge. Clear aluminum finish.
   1. Provide on all doors.

F. Push/Pull Set: Kawneer # CO-12/CP-II.
   1. Provide at following doors:
      a. 3 individual CP-II bars in stacked form.

G. Locks: Three-point locking system- Adams Rite MS 1850-S hook shaped deadbolt with MS 1415 threshold bolt and MS 1416 header bolt.

H. Lock Cylinder: See hardware specification. Master keyed to building system.

I. Closers: LCN concealed in transom/head or equal by Rixon or Norton.
   1. Provide on all doors.

J. Door stops: Floor or overhead to suit conditions.

K. Electronic Hardware: Rough-in by contractor.
   1. Coordinate with electrical requirements and owner furnished devices.

2.07 FABRICATION

A. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.

B. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.

C. Prepare components to receive anchor devices. Fabricate anchors.

D. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.

E. Arrange fasteners and attachments to conceal from view.

F. Reinforce components internally for door hardware.

G. Size of transom member to acccept concealed closer.

H. Reinforce framing members for imposed loads.

I. Finishing: Apply factory finish to all surfaces that will be exposed in completed assemblies.
   1. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify that wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

3.02 INSTALLATION

A. Install wall system in accordance with manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

F. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.

G. Coordinate attachment and seal of perimeter air and vapor barrier materials.

H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

I. Set thresholds in bed of mastic and secure.

J. Install hardware using templates provided.
   1. See Section 087100 for hardware installation requirements.

K. Install perimeter sealant in accordance with Section 079005.

L. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 ADJUSTING

A. Adjust operating hardware for smooth operation.

3.04 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

C. Remove excess sealant by method acceptable to sealant manufacturer.

END OF SECTION

SECTION 084500

TRANSLUCENT ROOF ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sandwich panels of translucent skins separated with an aluminum grid.

B. Perimeter sealant.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of glazing at vestibule and metal framing.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, panel configuration, internal drainage details.

C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, anticipated deflection under load, affected related Work, weep drainage network, expansion and contraction joint location and details, and field welding required.

D. Samples: Submit __1__, 14x28 inch in size, illustrating prefinished aluminum surface, specified panel with skins, glazing materials illustrating edge and corner.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Sandwich Panel Manufacturers:
   1. Kalwall: www.kalwall.com.
   2. Skywall Translucent Systems, Division of Butler Manufacturing Company: www.skywall.com.
   3. Substitutions: See Section 016000 - Product Requirements.

2.02 MATERIALS

A. Extruded Aluminum: ASTM B 221 (ASTM B 221M).

B. Fasteners: Stainless steel.

2.03 COMPONENTS

A. Structurally reinforced translucent panel with battens and cap strips as required for a complete horizontal installation.

B. Panels: Bonded to both sides of structural extruded aluminum grid of vertical pattern; exposed surfaces of exterior sheet chemically and permanently treated to protect against surface erosion and extreme weather conditions:

2.04 SEALANT MATERIALS

A. Sealant and Backing Materials: As specified in Section 079005 of Types described below.

2.05 FABRICATION

A. Fabricate system components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.

B. Accurately fit and secure joints and corners. Make joints flush, hairline.

C. Arrange fasteners and attachments to ensure concealment from view.

2.06 FINISHES

A. Interior Exposed Aluminum Surfaces:
   1. Mill finish.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

3.02 INSTALLATION

A. Install translucent panel system in accordance with manufacturer instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances and align with adjacent work.

E. Install perimeter sealant, backing materials, and installation criteria in accordance with Section 079005.

3.03 CLEANING

A. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

END OF SECTION

SECTION 085200

WOOD WINDOWS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General outline for windows. The outline in this section is considered **minimum** requirements. If a requirement listed is not achievable, the manufacturer shall notify the architect 14 days prior to bid. Each manufacturer listed will provide a specification that is for the window they propose to submit. Each window manufacturer shall be listed as an alternate in the bid form.

B. Factory fabricated metal clad wood windows with fixed, and operating sash.

C. Operating hardware.

D. Insect screens.

E. Associated trim and mouldings

F. Perimeter sealant.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Rough opening framing.

B. Section 079005 - Joint Sealers: Perimeter sealant and back-up materials.

1.03 REFERENCE STANDARDS

A. AAMA/WDMA/CSA 101/I.S.2/A440 - Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors; American Architectural Manufacturers Association; 2005.

B. ASTM E 330 - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2002.

C. WDMA I.S.4 - Water-Repellent Preservative Non-Pressure Treatment for Millwork; National Wood Window and Door Association; 2007a.

1.04 PERFORMANCE REQUIREMENTS

A. Performance Requirements: As specified in PART 2, with the following additional requirements.

B. Design and size windows to withstand dead loads and positive and negative wind loads acting normal to plane of wall calculated in accordance with IBC code , when tested in accordance with ASTM E 330, using test loads equal to 1.5 times the design wind loads and 10 second duration of maximum load.

C. Window manufacturer shall submit full working unit of the double-hung window proposed with fixed transom for review prior to acceptance of alternates. Size shall be approximately 2 feet by 4 feet. Unit will be returned to representative after submittal.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.

1.06 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Show component dimensions, anchorage and fasteners, and glass.

C. Shop Drawings: Indicate opening dimensions.

D. Window manufacturer shall submit full working unit of the double-hung window proposed with fixed transom for review prior to acceptance of alternates. Size shall be approximately 2 feet by 4 feet. Unit will be returned to representative after submittal.

1.07 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F.

1.08 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a 10 year period after Date of Substantial Completion.

C. Provide 10 year manufacturer warranty for insulated glass units from seal failure, interpane dusting or misting, and replacement of same.

D. Warranty: Include coverage for:
   1. Degradation of color finish.
   2. Delamination or separation of finish cladding from window member.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Jeld-Wen; Product: Epic www.jeld-wen.com

B. Kolbe Kolbe; Product: Kolbe & Kolbe clad wood Ultra series Sterling double hung & casement / awning picture units, ; www.kolbe-kolbe.com

C. Loewen; Product:Double Hung; www.loewen.com

D. Marvin: Product;Double Hung; www.marvin.com

E. Weather Shield Manufacturing, Inc; Product Weather Shield Aluminum Clad Exterior / Wood Interior Double-Hung Tilt Windows: www.weathershield.com.

2.02 WINDOW COMPONENTS

A. Windows: Wood frame and sash, factory fabricated and assembled.
   1. Performance Requirements: AAMA/WDMA/CSA 101/I.S.2/A440 HC40.
   2. Exterior Finish: Metal clad, painted.
      a. Finish shall be 70% PVDF fluoropolymer, such as, Kynar 500.
   3. Interior Finish: primed finish by manufacturer.
   4. Color(s): As selected by Architect from manufacturer's standard and premium range.
      a. Exterior color range shall be white to cream/tan. Manufacturer shall offer a minimum of 4 colors within this range.
      b. Interior color shall be field applied. Window manufacturer will provide factory primer.
   5. Configuration: As indicated on drawings.
   6. Factory glazed; dry glazing method.
      a. 3/4 inch minimum insulated glass. LowE2- 270, argon filled , clear glass.
      b. 20 year minimum warranty on glass failure.

B. Frames, trim and sills: See drawings.

C. Simulated Divided Lite: Muntins shall be extruded aluminum on exterior and wood on interior.
   1. Exterior Muntin: 3/4 to 7/8 inch putty stop type.

2. Interior Muntin: 3/4 to 7/8 inch beaded type.

D. Insect Screens: Black fiberglass type. High visibility type as offered by manufacturer.

E. Accessories: Provide all related flashings, and anchorage and attachment devices.
1. Casing moulding profile may vary in shape as provided by manufacturer. Residential style ogee type is not accepted. Quarter round and ovolo are preferred. See profiles as indicated.
2. Subsill: See profile as indicated.

2.03 MATERIALS

A. Wood: Clear pine or fir, clear preservative treated using treatment type suitable for opaque finish.

B. Metal Cladding: Extruded or formed aluminum, factory finished, factory fit to profile of wood members.

2.04 HARDWARE

A. Double Hung Sash: Counterbalances concealed at jamb liners.

B. Sash lock: Lever handle with cam lock.
1. Material: Satin Nickel

C. Pulls/lifts: Domed, satin nickel.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.

C. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.

D. Install operating hardware.

3.02 ADJUSTING

A. Adjust hardware for smooth operation and secure weathertight closure.

END OF SECTION

SECTION 08580

ALUMINUM SLIDING SERVICE WINDOW

PART 1 – GENERAL

1.01 SUMMARY

A. This section includes:
   1. Aluminum, heavy-duty commercial sliding service windows as indicated in drawings and in sections.

1.02 SUBMITTALS

A. Product Data: Submit Manufacturer's technical product data substantiating that products comply.
B. Shop drawings: Submit for fabrication and installation of windows. Include details, elevations and installation requirement of finish hardware and cleaning.
C. Certification: Provide printed data in sufficient detail to indicate compliance with the contract documents.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Deliver windows crated to provide protection during transit and job storage
B. Inspect windows upon delivery for damage. Unless minor defects can be made to meet the Architect's specifications and satisfaction, damaged parts should be removed and replaced.
C. Store windows at building site under cover in dry location.

1.04 PROJECT CONDITIONS

A. Field measurements: Check opening by accurate field measurement before fabrication. Show recorded measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of work.

1.05 WARRANTY

All material and workmanship shall be warranted against defects for a period of one (1) year from the original date of purchase.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURER'S

A. Manufacturers:
   1. C.R. Laurence Co., Inc., www.crlaurence.com
   2. Metal Craft Doors; www.metalcraftdoors.com
   2. Nissen & Company; www.nissenco.com

2.02 MATERIALS

A. Frames: 4" Aluminum frame modules shall be constructed of 6063-T5 extruded aluminum. Replacement and servicing of glass shall be from the reception side of the window by means of an access panel in the top header and does not require the removal of the frame from the opening. Window glides on top-hung heavy-duty ball bearing slides. Poly-pile weather stripping and self-latching handle. Overall frame sizes are to be in accordance with the contract drawings.
B. Finish: All aluminum to be powder or Kynar painted (color to be selected by architect).
C. Glazing: The glazing is ¼" to ½" in thickness, tempered.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Install window in accordance with manufacturer's printed instructions and recommendations. Repair damaged units as directed (if approved by the manufacturer and the architect) or replace with new units.

3.02 CLEANING

A. Clean frame and glazing surfaces after installation, complying with requirements contained in the manufacturer's instructions. Remove excess glazing sealant compounds, dirt or other substances.

3.03 PROTECTION

A. Institute protective measures required throughout the remainder of the construction period to ensure that all the windows do not incur any damage or deterioration, other than normal weathering, at the time of acceptance.

END OF SECTION

SECTION 087100

DOOR HARDWARE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Hardware for wood doors.

B. Thresholds.

C. Weatherstripping, seals and door gaskets.

1.02 RELATED REQUIREMENTS

A. Section 081213 - Hollow Metal Frames.

B. Section 084313 - Aluminum-Framed Storefronts: Hardware for same except cylinders; installation of cylinders.

1.03 REFERENCE STANDARDS

A. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 2003.

B. DHI (LOCS) - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames; Door and Hardware Institute; 2004.

C. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures; National Fire Protection Association; 2006.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the manufacture, fabrication, and installation of products onto which door hardware will be installed.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:
   1. Indicate locations and mounting heights of each type of hardware, schedules, catalog cuts,.

C. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.

D. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.

E. Keys: Deliver with identifying tags to Owner by security shipment direct from hardware supplier.

F. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Hardware Supplier Qualifications: Company specializing in supplying institutional door hardware with 5 years of experience.

B. Hardware Supplier Personnel: Employ an Architectural Hardware Consultant (AHC) to assist in the work of this section.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Package hardware items individually; label and identify each package with door opening code to match hardware schedule.

1.08 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide ten year warranty for door closers and three years for locks and exit devices.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Hinges:
   1. Assa Abloy McKinney: www.assaabloydss.com.
   2. H.B. Ives
   3. Hager Companies: www.hagerco.com.
   4. Stanley Hardware: www.stanleyworks.com.

B. Lock and Latch Sets:
   1. Assa Abloy Corbin Russwin: www.assaabloydss.com.
   2. No substitution- building master system.

C. Push/Pulls:
   1. Hager Companies: www.hagerco.com.
   2. H.B. Ives
   3. Trimco

D. Cylindrical Locksets:
   1. Assa Abloy Corbin Russwin: www.assaabloydss.com.
   2. No substitution- building master system.

E. Exit Devices:
   1. Assa Abloy Sargent or Yale: www.assaabloydss.com.
   2. Von Duprin: www.vonduprin.com.

F. Closers: Cobin Russwin DC 8200
   1. Assa Abloy Corbin Russwin or Sargent: www.assaabloydss.com.
   2. LCN: www.lcnclosers.com.
      a. Model 4011-4111

G. Overhead Holders/Stops:
   1. Assa Abloy Rixson: www.assaabloydss.com.
   2. Glynn-Johnson: www.glynn-johnson.com.
   3. ABH.

H. Wall and Floor Stops/Holders:
   1. H.B. Ives
   2. Hager
   3. Trimco

I. Manual Bolts:
   1. Hager Companies: www.hagerco.com.
   2. H.B. Ives
   3. Door Controls International

J. Gasketing and Thresholds:
   1. National Guard Products, Inc: www.ngpinc.com.
   2. Pemko Manufacturing Co: www.pemko.com.
   3. Zero International, Inc: www.zerointernational.com.

K. Protection Plates:
   1. Hager Companies: www.hagerco.com.
   2. H.B. Ives
   3. Trimco

L. Historic Repoduction Type Hardware is by Rocky Mountain Hardware or equal. See hardware schedule for types.

M. Substitutions: See Section 016000 - Product Requirements.

2.02 GENERAL REQUIREMENTS FOR DOOR HARDWARE PRODUCTS

A. Provide products that comply with the following:
   1. Applicable provisions of Federal, State, and local codes.
   2. ANSI/ICC A117.1, American National Standard for Accessible and Usable Buildings and Facilities.
   3. Applicable provisions of NFPA 101, Life Safety Code.

B. Finishes: Satin stainless steel.
   1. The use of satin chrome shall be used at hardware items specified that are not manufacturered in stainless steel.

2.03 KEYING

A. Door Locks: Keyed differently.
   1. Include construction keying.
   2. Key to existing keying system.

B. Supply keys in the following quantities:
   1. To be determined- Keying is by owner.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that doors and frames are ready to receive work and dimensions are as indicated on shop drawings.

3.02 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and applicable codes.

B. Use templates provided by hardware item manufacturer.

C. Mounting heights for hardware from finished floor to center line of hardware item:
   1. For steel doors and frames: Comply with DHI "Recommended Locations for Architectural Hardware for Steel Doors and Frames."

3.03 ADJUSTING

A. Adjust work under provisions of Section 017000.

B. Adjust hardware for smooth operation.

3.04 PROTECTION

A. Protect finished Work under provisions of Section 017000.

B. Do not permit adjacent work to damage hardware or finish.

3.05 SCHEDULE- See attached.

END OF SECTION

Hardware Sets

Hardware Set 1

Doors: 113A, 113B, 115B

1	Cylinder as Required	COR
	Balance of hardware by Alum Door Supplier	

Hardware Set 2

Door: 124

8	Hinges	5BB1 4 ½ x 4 ½	652	Ives
2	Push Plates	8200 4 x 16	630	Ives
2	Pull Plates	8302 4 x 16	630	Ives
1	Set Foot Bolt x Chain Bolt 1055			Stanley

Hardware Set 3

Doors: 117, 120, 121, 122, 125, 203

3	Hinges	5BB1 4 ½ x 4 ½	652	Ives
1	Lock Set	CL 3357 NZD LT6	626	COR
1	Stop	WS 407 CCV	630	Ives

Hardware Set 4

Door: 109

6	Hinges	5BB1 4 ½ X 4 ½	652	Ives
2	Push Plates	8200 4 x 16	630	Ives
2	Pull Plates	8302 4 x 16	630	Ives
2	Closers	4111 x 689		LCN
2	Kick Plates	10x 34 .050	630	Ives
1	Stops	WS 407 CCV	630	Ives

Hardware Set 5

Doors: 102, 103, 104, 106A, 113.1, 111, 204

3	Hinges	5BB1 4 ½ X 4 ½ NRP	652	Ives
1	Lock Set	CL 3351 NZD CT6	626	COR
1	Stop	WS 407 CCV	630	Ives

Hardware Set 6

Doors: 107, 116, 118, 119, 202

3	Hinges	5BB1 4 ½ X 4 ½	652	Ives
1	Privacy Set	CL 3320 NZD	630	COR
1	Stop	WS 407 CCV	630	Ives

Hardware Set 7

Door: 115 A

6	Hinges	5BB1 4 ½ X 4 ½	652	Ives
2	Flush Bolts	FB 458	626	Ives
1	Lockset	CL 3351 NZD CT6	626	COR
1	Closer (Active Leaf)	4111 H S CUSH	689	LCN
2	Armor Plates	34 x 34 .050	630	Ives

Hardware Set 8

Door: 110A

8 Hinges 4 ½ X 4 ½ White Bronze finish
Rocky Mountain Hardware

2 Closer Adjust existing

2 Thumb latch Keyed/dummy turn piece G770 White Bronze finish
Rocky Mountain Hardware

2 Push Escutcheon to match G770 entry White Bronze finish
Rocky Mountain Hardware

1 Surface mounted Surface bolt MB1-12" long –Top and bottom-White Bronze finish Rocky Mountain Hardware

Hardware Set 9

Door: 123

3	Hinges	5BB1 4 ½ X 4 ½	652	Ives
1	Lockset	CL 3351 NZD CT6	626	COR
1	Closer	4111 x 689		LCN
1	Stops	WS 407 CCV	630	Ives

SECTION 088000

GLAZING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Glass.

B. Plastic glazing film.

C. Glazing compounds and accessories.

1.03 RELATED REQUIREMENTS

A. Section 081213 - Hollow Metal Frames: Glazed borrowed lites.

B. Section 081433 - Stile and Rail Wood Doors: Glazed doors.

C. Section 084313 - Aluminum-Framed Storefronts: Glazing at doors and storefront system and interior aluminum framed openings.

D. Section 085113 - Aluminum Windows: Glazed windows.

E. Section 084500 - Translucent Roof Panel.

1.04 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; current edition.

B. ASTM C 864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005.

C. ASTM C 1036 - Standard Specification for Flat Glass; 2006.

D. ASTM C 1048 - Standard Specification for Heat-Treated Flat Glass--Kind HS, Kind FT Coated and Uncoated Glass; 2004.

E. ASTM C 1172 - Standard Specification for Laminated Architectural Flat Glass; 2003.

F. ASTM E 2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2008.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data on Glass Types: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.

C. Product Data on Glazing Compounds: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Sealed Insulating Glass Units: Provide a ten (10) year warranty to include coverage for seal failure, interpane dusting or misting, including replacement of failed units.

C. Laminated Glass: Provide a five (5) year warranty to include coverage for delamination, including replacement of failed units.

PART 2 PRODUCTS

2.01 GLASS MATERIALS

A. Manufacturers:
1. AGC Flat Glass North America, Inc: www.afgglass.com.
2. Guardian Industries Corp: www.sunguardglass.com.
3. Goldray Industries: www.goldrayindustries.com
4. Pilkington North America Inc: www.pilkington.com.
5. Old Castle Glass: www.oldcastleglass.com.
6. PPG Industries, Inc: www.ppg.com.
7. Viracon, Apogee Enterprises, Inc: www.viracon.com
8. Substitutions: Refer to Section 016000 - Product Requirements.

B. Float Glass: All glazing is to be float glass unless otherwise indicated.
1. Annealed Type: ASTM C 1036, Type I, transparent flat, Class 1 clear, Quality Q3 (glazing select).
2. Heat-Strengthened and Fully Tempered Types: ASTM C 1048.
3. Tinted Types: Color and performance characteristics as indicated.
4. Thicknesses: As indicated; for exterior glazing comply with specified requirements for wind load design regardless of specified thickness.

C. Laminated Glass: Float glass laminated in accordance with ASTM C 1172.
1. Plastic Interlayer: 0.060 inch thick, minimum.
2. Where fully tempered is specified or required, provide glass that has been tempered by the tong-less horizontal method.
3. Manufacturers:
   a. AGC Flat Glass North America, Inc: www.afgglass.com.
   b. Cardinal Glass Industries: www.cardinalcorp.com.
   c. Viracon, Apogee Enterprises, Inc: www.viracon.com.
   d. Substitutions: Refer to Section 016000 - Product Requirements.

D. Laminated Wired Glass: UL- or WH-listed as fire-protection-rated glazing and complying with 16 CFR 1201 test requirements for Category II with or without the use of a surface-applied film.
1. Manufacturers:
   a. O'Keeffe's Inc. SAFTI Division; SAFTIFIRST SuperLite I-W.
   b. Technical Glass Products; Wirelite NT.
   c. Substitutions: Refer to Section 016000 - Product Requirements.

E. Patterned Glass: Cast or molded glass.
1. Pattern: diffused.
2. Manufacturers:
   a. AGC Flat Glass North America, Inc: www.afgglass.com.
   b. Oldcastle Glass: www.oldcastleglass.com.
   c. Substitutions: Refer to Section 016000 - Product Requirements.

2.02 SEALED INSULATING GLASS UNITS

A. Manufacturers as list above:

B. Sealed Insulating Glass Units: Types as indicated.
   1. Exterior glass at storefronts, doors and windows: Insulated 1-inch Low-E.
      a. Clear Insulating-Glass Units:
      b. Interspace Content: 1/2 inch air space.
      c. Outdoor and Indoor Lite: 1/4 inch, minimum, Class 1 float glass.
         1) Tempered as required by code.
   2. Durability: Certified by an independent testing agency to comply with ASTM E 2190.
   3. Edge Spacers: Aluminum, bent and soldered corners.
   4. Edge Seal: Glass to elastomer with supplementary silicone sealant.
   5. Purge interpane space with dry hermetic air.
   6. Visible Light Transmittance: 17% surface 1 and 2.
   7. Winter Nightime U-Factor: .48 maximum.
   8. Summer Daytime U-Factor: .56-.57 maximum.
   9. Solar Heat Gain Coefficient: .29 on surface 1; .32 on surface 2 maximum.

2.03 PLASTIC FILMS

A. Manufacturers:
   1. CPFilms, Inc: www.cpfindusprod.com.
   2. 3M Window Film: www.3m.com/US/arch_construct/scpd/windowfilm.
   3. Substitutions: Refer to Section 016000 - Product Requirements.

B. Plastic Film: Obaque (black) at Mechanical Room Window- see drawings. Use translucent diffused film at wire glass panels if wire glass can not be made with diffused glass.

2.04 GLAZING COMPOUNDS

A. Manufacturers:
   1. Bostik Inc: www.bostik-us.com.
   2. Pecora Corporation: www.pecora.com.
   3. BASF Construction Chemicals-Building Systems: www.chemrex.com.
   4. Substitutions: Refer to Section 016000 - Product Requirements.

B. Glazing Putty: Polymer modified latex recommended by manufacturer for outdoor use, knife grade consistency; grey color.

2.05 GLAZING ACCESSORIES

A. Setting Blocks: Neoprene, 80 to 90 Shore A durometer hardness, ASTM C 864 Option I. Length of 0.1 inch for each square foot of glazing or minimum 4 inch x width of glazing rabbet space minus 1/16 inch x height to suit glazing method and pane weight and area.

B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness, ASTM C 864 Option I. Minimum 3 inch long x one half the height of the glazing stop x thickness to suit application, self adhesive on one face.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that openings for glazing are correctly sized and within tolerance.

B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and ready to receive glazing.

3.02 PREPARATION

A. Clean contact surfaces with solvent and wipe dry.

B. Install sealant in accordance with manufacturer's instructions.

3.03 INSTALLATION

A. Install glazing using the recommendations of manufacturers of glass, sealants, gaskets, and other glazing materials except where more stringent requirements are indicated, including those in "GANA Glazing Manual".

3.04 CLEANING

A. Remove glazing materials from finish surfaces.

B. Remove labels after Work is complete.

C. Clean glass and adjacent surfaces.

END OF SECTION

SECTION 092116

GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Metal stud interior wall framing.

B. Acoustic insulation.

C. Acoustical sealant.

D. Gypsum wallboard.

E. Joint treatment and accessories.

1.03 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Wood blocking product and execution requirements.

1.04 REFERENCE STANDARDS

A. ASTM C 475/C 475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2002 (Reapproved 2007).

B. ASTM C 645 - Standard Specification for Nonstructural Steel Framing Members; 2007.

C. ASTM C 665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2006.

D. ASTM C 754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2007.

E. ASTM C 840 - Standard Specification for Application and Finishing of Gypsum Board; 2007.

F. ASTM C 954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2007.

G. ASTM C 1002 - Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2007.

H. ASTM C 1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base; 2005.

I. ASTM C 1396/C 1396M - Standard Specification for Gypsum Board; 2006a.

J. ASTM E 72 - Standard Test Methods of Conducting Strength Tests of Panels for Building Construction; 2005.

K. GA-216 - Application and Finishing of Gypsum Board; Gypsum Association; 2007.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C 840 and GA-216.

B. Type of gypsum board material as indicated on drawings and within this section.

2.02 METAL FRAMING MATERIALS

A. Manufacturers - Metal Framing, Connectors, and Accessories:
   1. Clark Western Building Systems: www.clarkwestern.com.
   2. Dale/Incor: www.daleincor.com.
   3. Dietrich Metal Framing: www.dietrichindustries.com.
   4. Marino\Ware: www.marinoware.com.
   5. Substitutions: See Section 016000 - Product Requirements.

B. Non-Loadbearing Framing System Components: ASTM C 645; galvanized sheet steel, of size and properties necessary to comply with ASTM C 754 for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf.
   1. Exception: The minimum metal thickness and section properties requirements of ASTM C 645 are waived provided steel of 40 ksi minimum yield strength is used, the metal is continuously dimpled, the effective thickness is at least twice the base metal thickness, and maximum stud heights are determined by testing in accordance with ASTM E 72 using assemblies specified by ASTM C 754.
      a. Acceptable Products:
         1) Dietrich Metal Framing; UltraSteel (tm): www.dietrichindustries.com.
         2) Clark Western Building Systems; UltraSteel (tm): www.clarkwestern.com.
   2. Studs: "C" shaped with flat or formed webs with knurled faces.
   3. Runners: U shaped, sized to match studs.
   4. Furring: Hat-shaped sections, minimum depth of 7/8 inch.

2.03 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:
   1. Georgia-Pacific Gypsum LLC: www.gp.com/gypsum.
   2. National Gypsum Company: www.nationalgypsum.com.
   3. USG Corporation: www.usg.com.
   4. Substitutions: See Section 016000 - Product Requirements.

B. Wallboard: Paper-faced gypsum wallboard as defined in ASTM C 1396/C 1396M; sizes to minimize joints in place; ends square cut.
   1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
   2. Thickness:
      a. Vertical Surfaces: 5/8 inch.
      b. Ceilings: 1/2 inch.
   3. Paper-Faced Products: Use at concealed walls and ceiling only.
      a. Georgia-Pacific Gypsum LLC; ToughRock Gypsum Wallboard.
      b. National Gypsum Company; Gold Bond Brand Gypsum Wallboard.
      c. USG Corporation; Sheetrock Brand Gypsum Panels.
      d. Substitutions: See Section 016000 - Product Requirements.

2.04 ACCESSORIES

A. Acoustic Insulation: ASTM C 665; preformed glass fiber, friction fit type, unfaced.

B. Acoustic Sealant: Non-hardening, non-skinning, for use in conjunction with gypsum board.
   1. Product: AC20 FTR for fire rated walls manufactured by Pecora or equal.

2. Product: AIS 919 for non-fire rated walls manufactured by Pecora or equal.

C. Finishing Accessories: ASTM C 1047, galvanized steel, rolled zinc, or rigid plastic, unless otherwise indicated.
   1. Types: As detailed or required for finished appearance.
   2. Special Shapes: In addition to conventional corner bead and control joints, provide L-bead and LC-bead at exposed panel edges.

D. Joint Materials: ASTM C 475 and as recommended by gypsum board manufacturer for project conditions.
   1. Tape: 2 inch wide, creased paper tape for joints and corners, except as otherwise indicated.
   2. Ready-mixed vinyl-based joint compound.

E. Screws for Attachment to Steel Members Less Than 0.03 inch In Thickness, to Wood Members, and to Gypsum Board: ASTM C 1002; self-piercing tapping type; cadmium-plated for exterior locations.

F. Screws for Attachment to Steel Members From 0.033 to 0.112 inch in Thickness: ASTM C 954; steel drill screws for application of gypsum board to loadbearing steel studs.

G. Screws: ASTM C 1002; self-piercing tapping type.

PART 3 EXECUTION

3.01 FRAMING INSTALLATION

A. Metal Framing: Install in accordance with ASTM C 754 and manufacturer's instructions.

B. Studs: Space studs as indicated.
   1. Extend partition framing as indicated on drawings.
   2. Brace walls as required for lateral support independent of ceiling. Coordinate bracing and extended framing from floor runner to structure above. Coordinate with mechanical and electrical components. Framing design as indicated.

C. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.

D. Standard Wall Furring: Install at concrete and masonry walls scheduled to receive gypsum board, not more than 4 inches from floor and ceiling lines and abutting walls. Secure in place on alternate channel flanges at maximum 24 inches on center.

E. Blocking: Install blocking for support of plumbing fixtures, toilet partitions, wall cabinets, toilet accessories, hardware, and recessed cabinets. Comply with Section 06100 for wood blocking.

3.02 ACOUSTIC ACCESSORIES INSTALLATION

A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

B. Acoustic Sealant: Install as follows:
   1. Place one bead continuously on substrate before installation of perimeter framing members.
   2. Place continuous bead at perimeter of each layer of gypsum board.
   3. In non-fire-rated construction, seal around all penetrations by conduit, pipe, ducts, and rough-in boxes.

3.03 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as follows:
   1. Not more than 30 feet apart on walls and ceilings over 50 feet long.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials and as indicated.

3.04 JOINT TREATMENT

A. Paper Faced Gypsum Board: Use paper joint tape, bedded with ready-mixed vinyl-based joint compound and finished with ready-mixed vinyl-based joint compound.

B. Finish gypsum board in accordance with levels defined in ASTM C 840, as follows:
   1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
   2. Level 5: Walls and ceilings to receive semi-gloss or gloss paint finish and other areas specifically indicated.
   3. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
   4. Level 0: Temporary partitions and surfaces indicated to be finished in later stage of project.

C. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   1. Feather coats of joint compound so that camber is maximum 1/32 inch.

END OF SECTION

SECTION 093000

TILING

PART 1 GENERAL

2.01 SECTION INCLUDES

A. Tile for floor applications.

B. Tile for wall applications.

C. Stone thresholds.

D. Ceramic trim.

2.02 RELATED REQUIREMENTS

A. Section 079005 - Joint Sealers.

2.03 REFERENCE STANDARDS

A. ANSI A108 Series/A118 Series/A136.1 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium); 2005.
   1. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar; 2005.
   2. ANSI A108.1b - American National Standard Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex Portland Cement Mortar; 1999 (R2005).
   3. ANSI A108.1c - Specifications for Contractors Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Bed with Dry-Set or Latex Portland Cement Mortar; 1999 (R2005).
   4. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile-Setting Epoxy Adhesive; 1999 (R2005).
   5. ANSI A108.5 - American National Standard Specifications for Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar; 1999 (R2005).
   6. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy; 1999 (R2005).
   7. ANSI A108.8 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout; 1999 (R2005).
   8. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout; 1999 (R2005).
   9. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework; 1999 (R2005).
   10. ANSI A118.6 - American National Standard Specifications for Standard Cement Grouts for Tile Installation; 1999 (R2005).
   11. ANSI A118.7 - American National Standard Specifications for Polymer Modified Cement Grouts for Tile Installation; 1999 (R2005).
   12. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2008.

B. TCA (HB) - Handbook for Ceramic Tile Installation; Tile Council of North America, Inc.; 2007/2008.

2.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.

C. Samples: Selection of tile from manufacturers board.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Extra Tile: 1 percent percent of each size, color, and surface finish combination.

2.05 QUALITY ASSURANCE

A. Maintain one copy of TCA Handbook and ANSI A108 Series/A118 Series on site.

2.06 DELIVERY, STORAGE, AND HANDLING

A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

2.07 FIELD CONDITIONS

A. Do not install adhesives in an unventilated environment.

B. Maintain ambient and substrate temperature of 50 degrees F during installation of mortar materials.

PART 2 PRODUCTS

3.01 TILE

A. Manufacturers: All products by the same manufacturer.
   1. American Olean: www.americanolean.com.
   2. Dal-Tile Corporation: www.daltile.com.
   3. Summitville Tiles, Inc: www.summitville.com.
   4. Substitutions: See Section 016000 - Product Requirements.

B. Ceramic Mosaic Tile: ANSI A137.1, and as follows:
   1. Size and Shape: 1 inch square.
   2. Edges: Square.
   3. Surface Finish: Unglazed.
   4. Colors: To be selected by Architect from manufacturer's standard range.

C. Glazed Wall Tile: ANSI A137.1, and as follows:
   1. Size and Shape: 3x6 inch (subway tile).
   2. Edges: Cushioned.
   3. Surface Finish: High gloss.
   4. Colors: To be selected by Architect from manufacturer's standard range.
   5. Trim Units: Matching bullnose and base shapes in sizes coordinated with field tile.

3.02 TRIM AND ACCESSORIES

A. Ceramic Trim: Matching bullnose, surface bullnose, and cove base ceramic shapes in sizes coordinated with field tile.
   1. Applications: Use in the following locations:
      a. Open Edges: Bullnose.
      b. Inside Corners: Jointed.
      c. Floor to Wall Joints: Cove base.
   2. Manufacturer: Same as for tile.

B. Thresholds: Marble, white or gray, honed finish; 3 inches wide by full width of wall or frame opening; 1/2 inch thick; beveled one long edge with radiused corners on top side; without holes, cracks, or open seams.

3.03 ADHESIVE MATERIALS

A. Manufacturers:
   1. Bostik Inc: www.bostik-us.com.
   2. Mapei Corporation: www.mapei.com.
   3. Substitutions: See Section 016000 - Product Requirements.

3.04 MORTAR MATERIALS

A. Manufacturers:
   1. Bonsal American, Inc: www.sakrete.com
   2. Bostik Inc: www.bostik-us.com.
   3. Custom Building Products: www.custombuildingproducts.com.
   4. Substitutions: See Section 016000 - Product Requirements.

B. Mortar Bond Coat Materials:

3.05 GROUT MATERIALS

A. Manufacturers:
   1. Bonsal American, Inc: www.sakrete.com
   2. Bostik Inc: www.bostik-us.com.
   3. Custom Building Products: www.custombuildingproducts.com.
   4. Substitutions: See Section 016000 - Product Requirements.

B. Standard Grout: Any type specified in ANSI A118.6 or A118.7.

PART 3 EXECUTION

4.01 EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.

4.02 PREPARATION

A. Protect surrounding work from damage.

B. Vacuum clean surfaces and damp clean.

C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

4.03 INSTALLATION - GENERAL

A. Install tile and thresholds and grout in accordance with applicable requirements of ANSI A108.1 through A108.13, manufacturer's instructions, and TCA Handbook recommendations.

B. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.

C. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, without voids, cracks, excess mortar, or excess grout.

D. Form internal angles square and external angles bullnosed.

E. Install thresholds where indicated.

F. Sound tile after setting. Replace hollow sounding units.

G. Allow tile to set for a minimum of 48 hours prior to grouting.

H. Grout tile joints. Use standard grout unless otherwise indicated.

I. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

4.04 INSTALLATION - FLOORS - MORTAR BED METHODS

A. Over interior concrete substrates, install in accordance with TCA Handbook Method F112, bonded.

B. Mortar Bed Thickness: 5/8 inch, unless otherwise indicated.

4.05 INSTALLATION - WALL TILE

A. Over gypsum wallboard on wood or metal studs install in accordance with TCA Handbook Method W243, thin-set with dry-set or latex-portland cement bond coat, unless otherwise indicated.

4.06 CLEANING

A. Clean tile and grout surfaces.

4.07 PROTECTION

A. Do not permit traffic over finished floor surface for 4 days after installation.

END OF SECTION

SECTION 095100

ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical units.

C. Exposed grid only type ceiling.

1.02 REFERENCE STANDARDS

A. ASTM C 635 - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2004.

B. ASTM E 1264 - Standard Classification for Acoustical Ceiling Products; 2008.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on suspension system components.

C. Samples: Submit two samples 6x6 inch in size illustrating material and finish of acoustical units.

D. Samples: Submit two samples each, 8 inch long, of suspension system main runner.

PART 2 PRODUCTS

2.01 ACOUSTICAL UNITS

A. Manufacturers:
   1. Armstrong World Industries, Inc: www.armstrong.com.
   2. CertainTeed Corporation: www.certainteed.com.
   3. Hunter Douglas Contract: www.hunterdouglascontract.com.
   4. Pinta Acoustic, Inc: www.pinta-acoustic.com/link.
   5. USG: www.usg.com.
   6. Substitutions: See Section 016000 - Product Requirements.

B. Acoustical Units - General: ASTM E 1264, Class A.

C. Acoustical Panels: Painted mineral fiber, ASTM E 1264 Type III, with the following characteristics:
   1. Size: 24 x 24 inches.
   2. Thickness: 5/8 inches.
   3. Surface Color: White.
   4. Surface Pattern: Perforated, small holes.

2.02 SUSPENSION SYSTEM(S)

A. Manufacturers:
   1. Same as for acoustical units.

B. Suspension Systems - General: ASTM C 635; die cut and interlocking components, with splices and perimeter moldings as required.

C. Exposed Steel Suspension System: Formed steel, commercial quality cold rolled; intermediate-duty.
   1. Profile: Tee; 15/16 inch wide face.
   2. Construction: Double web.
   3. Finish: White painted.

D. Exposed Steel Suspension System Type Open Grid System- as indicated on drawings: Formed steel, commercial quality cold rolled; intermediate-duty.
   1. Product: Armsrong Prelude XL 360.
   2. Product: USG Gridware.
   3. Product: equals by other manufacturers listed above.
      a. Profile: Tee; 15/16 inch wide face.
      b. Finish: as selected from standard colors.

2.03 ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application and ceiling system flatness requirement specified.

B. Perimeter Moldings: Same material and finish as grid.
   1. At Exposed Grid: Provide L-shaped molding for mounting at same elevation as face of grid.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install system per manufacturer's printed instructions.

3.02 INSTALLATION - SUSPENSION SYSTEM

A. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

B. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.

C. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

D. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

E. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

F. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

G. Do not eccentrically load system or induce rotation of runners.

H. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
   1. Use longest practical lengths.
   2. Overlap and rivet corners.

3.03 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Fit border trim neatly against abutting surfaces.

D. Install units after above-ceiling work is complete.

E. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

F. Cutting Acoustical Units:
   1. Make field cut edges of same profile as factory edges.

END OF SECTION

SECTION 096500

RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resilient tile flooring.

B. Resilient base.

C. Resilient stair accessories.

D. Installation accessories.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors.

1.03 REFERENCE STANDARDS

A. ASTM F 1861 - Standard Specification for Resilient Wall Base; 2008.

B. ASTM F 2195 - Standard Specification for Linoleum Floor Tile; 2007.

C. BAAQMD 8-51 - Bay Area Air Quality Management District Regulation 8, Rule 51, Adhesive and Sealant Products; www.baaqmd.gov; 2002.

D. FS RR-T-650 - Treads, Metallic and Nonmetallic, Skid Resistant; Federal Specifications and Standards; Revision E, 1994.

E. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition; www.aqmd.gov.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.

1.05 FIELD CONDITIONS

A. Maintain temperature in storage area between 55 degrees F and 90 degrees F.

B. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

PART 2 PRODUCTS

2.01 TILE FLOORING

A. Linoleum Tile: Homogeneous wear layer bonded to backing, with color and pattern through wear layer thickness:
   1. Minimum Requirements: Comply with ASTM F 2195, Type corresponding to type specified.
   2. Backing: Synthetic fabric.

3. Wear Layer Thickness: 0.098 inch, minimum, excluding backing.
4. Pattern: Marbleized.
5. Color: To be selected from manufacturer's full color range.
6. Manufacturers:
   a. Forbo Linoleum, Inc: www.forbo-industries.com.
   b. Tarkett Inc: www.tarkett.com.
   c. Substitutions: See Section 016000 - Product Requirements.

2.02 STAIR COVERING

A. Stair Treads and Landing: Rubber; full width and depth of stair tread in one piece; tapered thickness; nosing not less than 1-5/8 inch deep.
   1. Minimum Requirements: Comply with FS RR-T-650 requirements corresponding to type specified.
   2. Nominal Thickness: 0.1875 inch.
   3. Nosing: Round.
   4. Style: Ribbed, diamond grid, or raised profile.
   5. Color: Solid.
   6. Manufacturers:
      a. Burke Flooring: www.burkemercer.com.
      b. Johnsonite, Inc: www.johnsonite.com.
      c. Roppe Corp: www.roppe.com.
      d. Substitutions: See Section 016000 - Product Requirements.

B. Stair Risers: Full height and width of tread in one piece, matching treads in material and color:
   1. Thickness: 0.080 inch.
   2. Manufacturers:
      a. Burke Flooring: www.burkemercer.com.
      b. Johnsonite, Inc: www.johnsonite.com.
      c. Roppe Corp: www.roppe.com.
      d. Substitutions: See Section 016000 - Product Requirements.

2.03 RESILIENT BASE

A. Resilient Base: ASTM F 1861, Type TV, vinyl, thermoplastic; top set style as shown on drawings, and as follows:
   1. Height: As identified on drawings.
   2. Thickness: 0.125 inch thick.
   3. Finish: Satin.
   4. Length: Roll.
   5. Color: Color as selected from manufacturer's standards.
   6. Accessories: Premolded external corners and end stops.
   7. Manufacturers:
      a. Burke Flooring: www.burkemercer.com.
      b. Johnsonite, Inc: www.johnsonite.com.
      c. Roppe Corp: www.roppe.com.
      d. Substitutions: See Section 016000 - Product Requirements.

2.04 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

B. Primers, Adhesives, and Seaming Materials: Waterproof; types recommended by flooring manufacturer.

1. Provide only products having lower volatile organic compound (VOC) content than required by the more stringent of the South Coast Air Quality Management District Rule No.1168 and the Bay Area Air Quality Management District Regulation 8, Rule 51.

C. Filler for Coved Base: Plastic.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.

3.02 PREPARATION

A. Prepare sub-floor surfaces as recommended by flooring and adhesive manufacturers.

B. Remove sub-floor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.

C. Prohibit traffic until filler is cured.

3.03 INSTALLATION

A. Starting installation constitutes acceptance of sub-floor conditions.

B. Install in accordance with manufacturer's instructions.

C. Spread only enough adhesive to permit installation of materials before initial set.

D. Fit joints tightly.

E. Set flooring in place, press with heavy roller to attain full adhesion.

F. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.

G. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.

H. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

3.04 TILE FLOORING

A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless manufacturer's instructions say otherwise.

B. Install tile to basket weave pattern. Allow minimum 1/2 full size tile width at room or area perimeter.

3.05 RESILIENT BASE

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.

B. Miter internal corners. At external corners, use premolded units. At exposed ends, use premolded units.

C. Install base on solid backing. Bond tightly to wall and floor surfaces.

D. Scribe and fit to door frames and other interruptions.

3.06 STAIR COVERINGS

A. Install stair coverings in one piece for full width and depth of tread.

B. Adhere over entire surface. Fit accurately and securely.

END OF SECTION

SECTION 096813

TILE CARPETING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Carpet tile, fully adhered.

1.02 RELATED REQUIREMENTS

A. Section 09500-Resilient Flooring: Termination edging of adjacent floor finish.

B. Section 260534-Wiring Device Boxes: Electrical floor cover plates with recess for carpet.

1.03 REFERENCE STANDARDS

A. CRI (CIS) - Carpet Installation Standard; Carpet and Rug Institute; 2009.

B. CRI (GLA) - Green Label Testing Program - Approved Adhesive Products; Carpet and Rug Institute; Current Edition.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.

C. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.

D. Submit two, 8 inch long samples of edge strip.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Extra Carpet Tiles: Quantity equal to 5 percent of total installed of each color and pattern installed.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Lees /Mohawk; Product MetallicGrid Modular.www.leescarpets.com.

B. Other Acceptable Manufacturers:
   1. Interface, Inc: www.interfaceinc.com.
   2. Milliken & Company: www.milliken.com.
   3. Patcraft: www.patcraft.com
   4. Shaw.www.shawfloors.com
   5. Substitutions: See Section 016000 - Product Requirements.

2.02 MATERIALS

A. Carpet Tile: textured loop, manufactured in one color dye lot.
   1. Tile Size: 24x24 inch, nominal.
   2. Thickness: 0.102 inch.
   3. Color: As selected- allow for two seperate colors in different spaces..
   4. Pattern: As selected.

5. Gage: 5/64 inch.
6. Stitches: 11.5 per inch.
7. Pile Weight: 24 oz/sq yd.

2.03 ACCESSORIES

A. Sub-Floor Filler: White premix latex; type recommended by flooring material manufacturer.

B. Edge Strips: Rubber, color as selected.

C. Adhesives: Acceptable to carpet tile manufacturer, compatible with materials being adhered; maximum VOC of 50 g/L; CRI Green Label certified; in lieu of labeled product, independent test report showing compliance is acceptable.

PART 3 EXECUTION

3.01 INSTALLATION

A. Starting installation constitutes acceptance of sub-floor conditions.

B. Install carpet tile in accordance with manufacturer's instructions and CRI Carpet Installation Standard.

C. Blend carpet from different cartons to ensure minimal variation in color match.

D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.

E. Lay carpet tile in square pattern, with pile direction parallel to next unit, set parallel to building lines.

F. Fully adhere carpet tile to substrate.

G. Trim carpet tile neatly at walls and around interruptions.

H. Complete installation of edge strips, concealing exposed edges.

END OF SECTION

SECTION 098400

ACOUSTIC PANEL COMPONENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabric-covered fiberglass core panels and mounting accessories.

1.02 RELATED REQUIREMENTS

A. Section 095100 - Acoustical Ceilings.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's printed data sheets for products specified.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acoustical Panels: Manufacturer shall be All Noise Control,LLC; www.allnoisecontrol.com; Products as listed below:
   1. Product: Noise Control Panel- Fiberglass Coated Industrial Baffle.
   2. Location: Mechanical Room 115 and 203.
   3. Size: 2"x24"x48"
   4. Facing: Vinyl or fabric.
   5. Color: Black.
   6. Quantity: 6 panels ceiling mounted in each room.

B. Acoustical Panels: Manufacturer shall be All Noise Control,LLC; www.allnoisecontrol.com; Products as listed below:
   1. Product: Noise Control Panel- Ceiling Baffle SR-600.
   2. Location: Room 102, 103, 104, 111 and 113.1.
   3. Size: 1.5"x24"x48"
   4. Facing: Fabric.
   5. Color: #408 Black
   6. Quantity: 2 panels ceiling mounted in each room except for 4 panels mounted in Room 111.

C. Substitutions: See Section 016000 - Product Requirements.

2.02 ACCESSORIES

A. Ceiling-Suspended Accessories: Manufacturer's standard through-threaded eyelets bolted through concealed perimeter frame at 1/4 points on each panel, sized appropriately for weight of panels.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install panels in locations and quantity of panels as indicated. Attach to structure above with wire. Install accessories and trim as per manufacturers instructions.

END OF SECTION

SECTION 099000

PAINTING AND COATING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish all interior and exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
   1. Wood windows, interior side of sash, frames and trim.
   2. Exposed surfaces of steel lintels and ledge angles.
   3. Mechanical and Electrical:
      a. In finished areas, paint all insulated and exposed pipes, conduit, boxes, and hangers, brackets, collars and supports, unless otherwise indicated.
      b. In finished areas, paint shop-primed items.
      c. Ducts located in the space above the open grid ceilings in offices and conference room.
      d. Paint interior surfaces of air ducts, scheduled to be painted at offices and conference rooms, that are visible through grilles and louvers with one coat of flat black paint to visible surfaces.

D. Do Not Paint or Finish the Following Items:
   1. Items fully factory-finished unless specifically so indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
   5. Floors, unless specifically so indicated.
   6. Brick, architectural concrete, cast stone, integrally colored plaster and stucco.
   7. Glass.
   8. Concealed pipes, ducts, and conduits.
   9. Exposed ducts in exposed ceilings except for ducts located in the space above the open grid ceilings in offices and conference room.

1.02 RELATED REQUIREMENTS

A. Lead Content Analysis Report- attached to this section.

B. Section 055000 - Metal Fabrications: Shop-primed items.

C. Section 055100 - Metal Stairs: Shop-primed items.

1.03 REFERENCE STANDARDS

A. ASTM D 4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials; 2007.

1.04 SUBMITTALS

A. Product Data: Provide data on all finishing products, including VOC content.

B. Samples: Submit two paper chip samples, 4x4 inch in size illustrating range of colors available for each surface finishing product scheduled.

1.05 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 5 years experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

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. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.07 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

D. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide all paint and coating products from the same manufacturer to the greatest extent possible.

B. Paints:
   1. Base Manufacturer: See Section 099100.
   2. Duron, Inc: www.duron.com.
   3. ICI Paints: www.icipaintsinna.com.
   4. Benjamin Moore & Co: www.benjaminmoore.com.
   5. PPG Architectural Finishes, Inc: www.ppgaf.com.
   6. Sherwin Williams : www.sherwin-williams.com

C. Transparent Finishes:
   1. Base Manufacturer: See Section 099300.

D. Substitutions: See Section 016000 - Product Requirements.

2.02 PAINTS AND COATINGS - GENERAL

A. Paints and Coatings: Ready mixed, unless intended to be a field-catalyzed coating.

1. Provide paints and coatings of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
3. Supply each coating material in quantity required to complete entire project's work from a single production run.
4. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.

B. Primers: Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.

C. Volatile Organic Compound (VOC) Content:
1. Provide coatings that comply with the most stringent requirements specified in the following:
a. Architectural coatings VOC limits of State in which the project is located.

D. Colors: To be selected from manufacturer's full range of available colors.
1. Selection to be made by Architect after award of contract.
2. Allow for minimum of three colors for each system, unless otherwise indicated, without additional cost to Owner.
3. In finished areas, finish pipes, ducts (located in the open grid ceiling spaces), conduit, and equipment the same color as the wall/ceiling they are mounted on/under.

2.03 PAINT SYSTEMS - SEE SECTION 099100

2.04 STAINS AND TRANSPARENT FINISH SYSTEMS - SEE SECTION 099300

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

C. Test shop-applied primer for compatibility with subsequent cover materials.

D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
1. Gypsum Wallboard: 12 percent.
2. Interior Wood: 15 percent, measured in accordance with ASTM D 4442.
3. Exterior Wood: 15 percent, measured in accordance with ASTM D 4442.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to coating application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Surfaces: Correct defects and clean surfaces which affect work of this section. Remove or repair existing coatings that exhibit surface defects.

E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

F. Concrete and Unit Masonry Surfaces to be Painted: 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.

G. Gypsum Board Surfaces to be Painted: Fill minor defects with filler compound. Spot prime defects after repair.

H. Aluminum Surfaces to be Painted: Remove surface contamination by steam or high pressure water. Remove oxidation with acid etch and solvent washing. Apply etching primer immediately following cleaning.

I. Galvanized Surfaces to be Painted: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.

J. Corroded Steel and Iron Surfaces to be Painted: Prepare using at least SSPC-PC 2 (hand tool cleaning) or SSPC-SP 3 (power tool cleaning) followed by SSPC-SP 1 (solvent cleaning).

K. Uncorroded Uncoated Steel and Iron Surfaces to be Painted: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand 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. Prime paint entire surface; spot prime after repairs.

L. Shop-Primed Steel Surfaces to be Finish Painted: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.

M. Interior Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.

N. Interior Wood Surfaces to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats. Prime concealed surfaces with gloss varnish reduced 25 percent with thinner.

O. Exterior Wood Surfaces to Receive Opaque Finish: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior calking compound after prime coat has been applied. Back prime concealed surfaces before installation.

P. Wood Doors to be Field-Finished: Seal wood door top and bottom edge surfaces with clear sealer.

Q. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Exterior Wood to Receive Opaque Finish: If final painting must be delayed more than 2 weeks after installation of woodwork, apply primer within 2 weeks and final coating within 4 weeks.

C. Apply products in accordance with manufacturer's instructions.

D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

E. Apply each coat to uniform appearance.

F. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

G. Wood to Receive Transparent Finishes: Tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.

H. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

A. Protect finished coatings until completion of project.

B. Touch-up damaged coatings after Substantial Completion.

END OF SECTION

The following Lead Paint Analysis is included with the Section 099000 – Painting and Coatings and referenced in 071000 - Execution and Closeout Requirements and in 024100 – Selective Building Elements Demolition

report as follows.....

SCHNEIDER LABORATORIES

INCORPORATED

2512 W. Cary Street • Richmond, Virginia • 23220-5117

804-353-6778 • 800-785-LABS (5227) • (FAX) 804-359-1475

Excellence in Service and Technology

AIHA/ELLAP 100527, NVLAP 101150-0, NYELAP/NELAC 11413, CAELAP 2078, NC 593, SC 93003

LABORATORY ANALYSIS REPORT

Lead Analysis based on EPA 7000B Method

Using SLI P26 A14

ACCOUNT #:	4018-10-1	**DATE COLLECTED:**	12/14/2009
CLIENT:	Hurt & Proffitt, Inc	**DATE RECEIVED:**	1/8/2010
ADDRESS:	2524 Langhorne Rd	**DATE ANALYZED:**	1/12/2010
	Lynchburg, VA 24501	**DATE REPORTED:**	1/13/2010
PROJECT NAME:	College Hill Plnt		
JOB LOCATION:	Lynchburg, VA		
PROJECT NO.:	20080114		
PO NO.:		**Sample Type:**	PAINT

SLI Sample No.	Client Sample No.	Sample Description	Sample Wt (mg)	Total Lead (µg)*	Lead Conc (% by wt)	Lead Conc PPM
30446124	1	Warehouse Roof Deck	635	1,486.1	0.234	2,340
30446125	2	2nd Flr Str. Steel	623	3,292.2	0.528	5,285
30446126	3	Yellow Grn Wall	655	2,058.4	0.314	3,143
30446127	4	Tan Wall	661	6,478.7	0.980	9,801
30446128	5	Hand Rail 2nd Flr	112	3,274.6	2.924	29,238
30446129	6	Concrete Wall@Strs	685	1,514.3	0.221	2,211
30446130	7	Win Brick Inlay Yellow	170	235.4	0.138	1,385
30446131	8	Brick Inlay	294	4,085.4	1.390	13,896
30446132	9	1st Flr CMU Yellow	236	< 20.0	< 0.008	< 85
30446133	10	1st Flr CMU Tan	325	20.4	0.006	63
30446134	11	Wood Dr Brown	227	26,400.7	11.630	116,303
30446135	12	Blue Pump Pipe	133	736.0	0.553	5,534
30446136	13	Red Pump Pipe	421	11,878.4	2.821	28,215
	Sample contains substrate which may affect the calculation of weight percent.					
30446137	14	Blue Filter Pipe	289	13,905.4	4.812	48,116
30446138	15	Silver Tank	180	14,346.1	7.970	79,700
30446139	16	Yellow Deck@Fert	633	1,204.1	0.190	1,902
30446140	17	Brown Filter Pipe	294	6,408.2	2.180	21,797

Total Number of Pages in Report: 2

Results relate only to samples as received by the laboratory.

*Minimum Reporting Limit: 20.0 µg. Lead Based Paint contains 0.5% lead by weight per Federal statute. The OSHA Lead in Construction Standard, 29 CFR 1926.62, is invoked if any lead is present in the sample. Lead-free paint is defined as <0.06% by weight (CPSC). *Data precision justifies 2 significant figures. All internal QC parameters were met. Unusual sample conditions, if any, are described.*

SLI Sample No.	Client Sample No.	Sample Description	Sample Wt (mg)	Total Lead (µg)*	Lead Conc (% by wt)	Lead Conc PPM
30446141	18	Blue Filter Pipe				
	Quantity not sufficient.					
30446142	19	Yellow Plaster	236	461.0	0.195	1,954
30446143	20	Tan Plaster	584	3,080.7	0.528	5,275
30446144	21	Concrete Deck@Pest	695	1,507.3	0.217	2,169
30446145	22	Gray Pipe	159	< 20.0	< 0.013	< 126
30446146	23	Green Pipe	381	20.4	0.005	53
30446147	24	Dr Deck Trim	266	105.0	0.039	395

Analysis Run ID: 44941

Analyst: **MUSAAB HASHIM**

Total Number of Pages in Report: 2

Results relate only to samples as received by the laboratory.

Julie S. Litz

Reviewed By **Julie S. Litz, Lab Manager/Tech Dir**

Visit www.slabinc.com for current certifications.

*Minimum Reporting Limit: 20.0 µg. Lead Based Paint contains 0.5% lead by weight per Federal statute. The OSHA Lead in Construction Standard, 29 CFR 1926.62, is invoked if any lead is present in the sample. Lead-free paint is defined as <0.06% by weight (CPSC). *Data precision justifies 2 significant figures. All internal QC parameters were met. Unusual sample conditions, if any, are described.*

SECTION 099100

PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Opaque paint systems for field application.

B. Additional product requirements, execution, and surfaces not to be finished are specified in Section 099000.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Base Manufacturer:
   1. Pratt & Lambert Paints: www.prattandlambert.com.
   2. Equal manufacturers are:
      a. Benjamin Moore
      b. Duron, Inc.
      c. ICI Paints
      d. PPG Architectural Finishes. Inc.
      e. Sherwin Williams
   3. Products of other manufacturers may be used under conditions specified in Section 099000.

B. Primers: Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.

2.02 EXTERIOR PAINT SYSTEMS

A. Exterior Abuse- and Corrosion-Resistant Finish: For items so indicated on drawings and steel railings.
   1. Preparation as specified by manufacturer.
   2. 1 coat primer recommended by manufacturer.
   3. Gloss: 2 coats Tech-gard Maintenance Gloss Enamel (Alkyd/oil).

2.03 INTERIOR PAINT SYSTEMS

A. All Interior Surfaces To Be Painted, Unless Otherwise Specified: Including gypsum board, concrete, concrete masonry, wood, and metals.
   1. Preparation as specified by manufacturer.
   2. 1 coat of primer recommended by manufacturer.
   3. On Concrete and Concrete Masonry: 1 heavy coat Pro-Hide Silver Heavy Duty Latex Block Filler (100 percent Acrylic) squeegeed into pores.
   4. Flat (at Ceilings above the exposed grid): 2 coats Pro-Hide Bronze Interior Latex Flat.
   5. Eggshell (at all walls scheduled for painted unless noted otherwise in this section): 2 coats Accolade Interior Velvet (100 percent Acrylic).
   6. Satin (at Walls at Toilets): 2 coats Accolade Interior Satin Enamel (100 percent Acrylic).
   7. Semi-Gloss (at metal, wood trim, wood ceiling decking, steel trusses, piping): 2 coats Accolade Interior Semi-Gloss (100 percent Acrylic).

B. Interior Abuse- and Corrosion-Resistant Finish: Mechanical Rooms:
   1. Preparation as specified by manufacturer.
   2. 1 coat primer recommended by manufacturer.
   3. Satin: 2 coats Palgard Epoxy (Epoxy polyamide).

C. Interior Metal Surfaces Subject to Frequent Contact by Occupants: Including doors, door frames, guardrails, railings, handrails, and balustrades:
   1. Preparation as specified by manufacturer.
   2. 1 coat of primer recommended by manufacturer.
   3. Semi-Gloss: 2 coats Enducryl DTM Acrylic Semi-Gloss (100 percent Acrylic).

PART 3 EXECUTION (SEE SECTION 099000)

APPLY PER MANUFACTURER'S INSTRUCTIONS.

END OF SECTION

SECTION 099300

STAINING AND TRANSPARENT FINISHING

PART 1 GENERAL

1.01 SUMMARY

A. Transparent wood finish systems for field application.

B. Additional product requirements, execution, and surfaces not to be finished are specified in Section 099000.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Base Manufacturer:
   1. Pratt & Lambert Paints: www.prattandlambert.com.
   2. Products of other manufacturers may be used under conditions specified in Section 099000.

B. Sanding Sealers: Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.

2.02 INTERIOR TRANSPARENT FINISH SYSTEMS

A. Interior Wood - Oil Stain with Clear Finish: For stair rail, doors (not factory finished) and as identified on drawings, all douglas fir trim, casings and mouldings, wood as identified on drawings.
   1. Preparation as specified by manufacturer.
   2. Open-Grained Wood: Fill and stain simultaneously with filler mixture as specified by manufacturer, using Tonetic Oil Wood Stain.
   3. Close-Grained Wood: 1 coat Tonetic Oil Wood Stain.
   4. 1 coat Sanding Sealer recommended by manufacturer.
   5. Satin: 2 coats Varmor Clear Urethane Finish.

PART 3 EXECUTION (SEE SECTION 099000)

END OF SECTION

SECTION 101400

SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cash allowance for signs.

B. Room and door signs; by allowance.

C. Interior directional and informational signs; by allowance.

D. Building identification signs. (wall mounted and post mounted).

1.02 PRICE AND PAYMENT PROCEDURES

A. See Section 012100 - Allowances, for cash allowances affecting only the interior signage.

B. Allowance amount covers purchase, delivery, and installation.

C. Exterior building mounted and post mounted signs as indicated on civil drawings are not covered by the allowance.

1.03 REFERENCE STANDARDS

A. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 2003.

B. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines; 2002.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.

C. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
   1. When room numbers to appear on signs differ from those on the drawings, include the drawing room number on schedule.
   2. When content of signs is indicated to be determined later, request such information from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
   3. Submit for approval by Owner through Architect prior to fabrication.

D. Samples: Submit one sample of each type of sign, of size similar to that required for project, illustrating sign style, font, and method of attachment.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Flat Signs:
   1. Best Sign Systems, Inc: www.bestsigns.com.
   2. Mohawk Sign Systems, Inc: www.mohawksign.com.
   3. Seton Identification Products: www.seton.com/aec.

4. Substitutions: See Section 016000 - Product Requirements.

2.02 SIGNAGE APPLICATIONS

A. Accessibility Compliance: All signs are required to comply with ADAAG and ANSI/ICC A 117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.

B. Interior Directional and Informational Signs:
   1. Design as approved within allowance.

C. Exterior Signs and Posts:
   1. Design as shown on civil drawings.
   2. Post: Galvanized steel with powder coated painted finish, color to be selected by architect.
   3. Post Cap: Cast Iron, pyramid with banding.
   4. Sign Type: Aluminum painted with applied letters, color to be selected by architect. (Post and wall mounted type).
   5. Locations: As indicated on civil drawings.

2.03 ACCESSORIES

A. Concealed Screws: Stainless steel, galvanized steel, chrome plated, or other non-corroding metal.

B. Tape Adhesive: Double sided tape, permanent adhesive.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install exterior signage as shown on civil drawings.

C. Install neatly, with horizontal edges level.

D. Locate signs where indicated:

E. Protect from damage until Substantial Completion; repair or replace damage items.

END OF SECTION

SECTION 102113.20

PLASTIC TOILET COMPARTMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Solid Color Reinforced Composite (SCRC) toilet compartments.

B. Solid Color Reinforced Composite (SCRC) Urinal screens.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Blocking and supports.

B. Section 102800 - Toilet Accessories.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall supports, door swings.

C. Product Data: Provide data on panel construction, hardware, and accessories.

D. Samples: Submit two samples of partition panels, 4x4 inch in size illustrating panel finish, color, and sheen.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Plastic Toilet Compartments:
   1. Bobrick; Product SCRC.
   2. Substitutions: Not permitted.

2.02 COMPONENTS

A. Toilet Compartments: Solid molded plastic panels, doors, and pilasters, floor-mounted headrail-braced.

B. Door and Panel Dimensions:
   1. Panel Thickness: 1/2 inch.
   2. Door Width for Handicapped Use: 36 inch.
   3. Height: 58 inch.
   4. Thickness of Doors and Pilasters: 3/4 inch.

C. Urinal Screens: Wall mounted with continuous stainless steel satin finish, U-shape bracket.

2.03 ACCESSORIES

A. Pilaster Shoes: Formed ASTM A 666, Type 304 stainless steel with 6 finish, 3 in high, concealing floor fastenings.

B. Head Rails: Hollow stainless steel tube, 1 x 1-5/8 inch size, with anti-grip strips and cast socket wall brackets.

C. Pilaster Brackets: Satin stainless steel.

D. Wall Brackets: Continuous type, polished stainless steel.

E. Hardware: Polished stainless steel:
   1. Pivot hinges, gravity type, adjustable for door close positioning; two per door.
   2. Door Latch: Slide type with exterior emergency access feature.
   3. Door strike and keeper with rubber bumper; mounted on pilaster in alignment with door latch.
   4. Coat hook with rubber bumper; one per compartment, mounted on door.
   5. Provide door pull for outswinging doors.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify correct spacing of and between plumbing fixtures.

3.02 INSTALLATION

A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.

B. Maintain 3/8 to 1/2 inch space between wall and panels and between wall and end pilasters.

C. Attach panel brackets securely to walls using anchor devices.

D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.

END OF SECTION

SECTION 102800

TOILET ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Accessories for toilet rooms and utility rooms.

B. Grab bars.

1.02 RELATED REQUIREMENTS

A. Division 6: Placement of reinforcement for backing plate reinforcement.

B. Section 102113.19 - Plastic Toilet Compartments.

1.03 REFERENCE STANDARDS

A. ASTM A 666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2003.

B. ASTM C 1036 - Standard Specification for Flat Glass; 2006.

C. GSA CID A-A-3002 - Mirrors, Glass; U.S. General Services Administration; 1996.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on accessories describing size, finish, details of function, attachment methods.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Products listed are made by Bradley Corporation: www.bradleycorp.com- see schedule on drawings for model numbers if not identified in this specification.

B. Other Acceptable Manufacturers:
   1. A & J Washroom Accessories Inc: www.ajwashroom.com.
   2. American Specialties, Inc: www.americanspecialties.com.
   3. Bobrick: www.bobrick.com
   4. Substitutions: Section 016000 - Product Requirements.

C. All items of each type to be made by the same manufacturer.

2.02 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.

B. Stainless Steel Sheet: ASTM A 666, Type 304.

C. Mirror Glass: Float glass, ASTM C 1036 Type I, Class 1, Quality Q2, with silvering, copper coating, and suitable protective organic coating to copper backing in accordance with GSA CID A-A-3002.

D. Fasteners, Screws, and Bolts: Hot dip galvanized, tamper-proof, security type.

E. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.03 FINISHES

A. Stainless Steel: No. 4 satin brushed finish, unless otherwise noted.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

3.02 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Mounting Heights and Locations: As required by accessibility regulations and as indicated on drawings

3.03 SCHEDULE

A. Toilet Accessories
   1. See drawings for location and quantity.

END OF SECTION

SECTION 104400

FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire extinguishers.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Extinguishers:
   1. JL Industries, Inc: www.jlindustries.com.
   2. Larsen's Manufacturing Co: www.larsensmfg.com.
   3. Potter-Roemer: www.potterroemer.com.
   4. Substitutions: See Section 016000 - Product Requirements.

2.02 FIRE EXTINGUISHERS

A. Fire Extinguisher: Provide fire extinguisher in the following locations and as indicated on drawings, wall mounted with manufacturers standard hook.

B. Dry Chemical Type Fire Extinguishers: Cast steel tank, with pressure gage.
   1. Class 3A-40B:C at Mechanical Room, location as shown on drawings.
   2. Size 6 pound.
   3. Finish: Baked enamel, red color.

C. Dry Chemical Type Fire Extinguishers: Cast steel tank, with pressure gage.
   1. Class 1A-10B:C at Office Areas, location as shown on drawings.
   2. Size 2.5 pound.
   3. Finish: Baked enamel, red color.

2.03 FIRE EXTINGUISHER CABINETS

A. Metal: Formed primed steel sheet; 0.036 inch thick base metal.

B. Cabinet Configuration: Semi-recessed type.
   1. Sized to accommodate accessories.

C. Door Glazing: Glass, clear, 1/8 inch thick tempered. Set in resilient channel gasket glazing.

D. Finish of Cabinet Exterior Trim and Door: Satin chrome.

E. Finish of Cabinet Interior: White enamel.

2.04 ACCESSORIES

A. Extinguisher Brackets: Formed steel, chrome-plated.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.02 SCHEDULES

A. See drawings and type as indicated in this specification.

END OF SECTION

SECTION 105100

LOCKER BENCH

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Locker benches.

1.02 SUBMITTALS

A. Product Data: Provide data on locker bench.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Lyon Workspace Products: www.lyonworkspace.com.

B. Penco Products, Inc: www.pencoproducts.com.

C. Republic Storage Systems Co: www.republicstorage.com.

2.02 MATERIALS

A. Locker Benches: Stationary type; bench top of laminated maple species wood, stained, sealed and varnished; pedestals of aluminum, 16 inches high.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

END OF SECTION

SECTION 107314

CANOPIES

Part 1: General

1.1 Description of Work

A. Work in this section includes furnishing and installation of extruded aluminum overhead hanger rod style canopies.

1.2 Field Measurement

A. Confirm dimensions prior to preparation of shop drawings when possible.
B. If requested, supply manufacturer's standard literature and specifications for canopies.
C. Submit shop drawings showing structural component locations/positions, material dimensions and details of construction and assembly.

1.3 Performance Requirements

A. Canopy must conform to local building codes for structural dead and live loadings.
B. Engineering stamped calculations are required for location in which canopy is installed.

1.4 Deliver, Storage, Handling

A. Deliver and store all canopy components in protected areas.

Part 2: Products

2.1 Manufacturer

A. Mapes Canopies
Lincoln, Nebraska
Phone: 1-888-273-1132.
Fax: 1-877-455-6572.
B. Substitutions: See Section 016000 – Product Requirements.

2.2 Materials

A. Decking to be 3" extruded flat soffit .078 decking
B. Fascia shall be as indicated in drawings (minimum .125 aluminum)
C. Hanger rods and attachment hardware shall be powder coated to match canopy.
D. Decorative star escutcheon plate shall be used at wall to hanger rod connection.
E. Decking and fascia shall be extruded aluminum, alloy 6063-T6, in profile as shown.

2.3 Finishes

A. Finishes shall be custom Kynar 500 color.

2.4 Fabrication

A. All connections shall be mechanically assembled utilizing 3/16" fasteners with a minimum shear stress of 350 lb. Pre-welded or factory-welded connections are not acceptable.
B. Decking shall be designed with interlocking extruded aluminum members with mechanical fasteners field applied to provide structural integrity for the completed assembly.
C. Concealed drainage. Water shall drain from covered surfaces into integral rear gutter and directed to ground level discharge via one or more designated downspouts.
D. Concrete splashblocks shall be provided by general contractor where indicated on the drawings.

Part 3: Execution

3.1 Inspection

A. Confirm that surrounding area is ready for the canopy installation.
B. Installer shall confirm dimensions and elevations to be as shown on drawings.
C. Erection shall be performed by an approved installer and scheduled after all concrete, masonry and roofing in the area is completed.

3.2 Installation

A. Installation shall be in strict accordance with manufacturer's shop drawings. Particular attention should be given to protecting the finish during handling and erection.
B. Install sealants to make canopy weathertight at wall connections. Include penetrations at wall anchors.

3.3 After installation, entire system shall be left in a clean condition.

END OF SECTION

SECTION 113100

RESIDENTIAL APPLIANCES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Kitchen type appliances.

1.03 RELATED REQUIREMENTS

A. Section 221116 and 221319 - Plumbing Piping: Plumbing connections for appliances.

B. Section 262726 - Equipment Wiring: Electrical connections for appliances.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data indicating dimensions, capacity, and operating features of each piece of residential equipment specified.

1.05 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide one (1) year manufacturer warranty for parts and labor.

PART 2 PRODUCTS

2.01 KITCHEN APPLIANCES

A. Refrigerator at Break Room: Free-standing, top-mounted freezer, frost-free.
   1. Capacity: Total minimum storage of 18 cubic ft; minimum 15 percent freezer capacity.
   2. Outside Dimensions: Approximate size for coordination of cabinetry shall be 28-inches W x 32-inches D x 66-inches H.
   3. Energy Usage: Energy Star compliant.
   4. Features: Include glass shelves, automatic icemaker, light in freezer compartment, and frost free.
   5. Finish: Porcelain enameled steel, color white.
   6. Manufacturers:
      a. Basis of design: GE Appliances; Product Model GTS18XCSWW: www.geappliances.com.
      b. Other acceptable manufacturers:
         1) Frigidaire Home Products: www.frigidaire.com.
         2) Whirlpool Corp: www.whirlpool.com.
      c. Substitutions: See Section 016000 - Product Requirements.

B. Microwave at Break Room: Countertop - installed in shelving.
   1. Capacity: 1.1 cubic ft.
   2. Power: 1100 watts.
   3. Features: Include turntable.
   4. Finish: White.

5. Outside Dimensions: Approximate size for coordination of cabinetry shall be 21-inches W x 16-inches D x 12-inches H.
6. Manufacturers:
   a. Frigidaire Home Products: www.frigidaire.com.
   b. GE Appliances: www.geappliances.com.
   c. Whirlpool Corp: www.whirlpool.com.
   d. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

END OF SECTION

SECTION 122113

HORIZONTAL LOUVER BLINDS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Horizontal slat louver blinds.

B. Operating hardware.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data indicating physical and dimensional characteristics.

C. Shop Drawings: Indicate opening sizes, tolerances required, method of attachment, clearances, and operation.

D. Samples: Submit two samples, 12 inch long illustrating slat materials and finish, color, cord type and color.

E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.04 EXTRA MATERIALS

A. Provide ten additional slats.

B. Provide 2 extra lift cords and control cords.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Horizontal Louver Blinds:
   1. Hunter Douglas; Product Everwood: www.hunterdouglas.com.
   2. Levolor Contract: www.levolorcontract.com.
   3. Graber, division of Springs Window Fashions: www.graberblinds.com.
   4. Substitutions: See Section 016000 - Product Requirements.

2.02 BLINDS AND BLIND COMPONENTS

A. Blinds: Horizontal slat louvers hung from full-width headrail with full-width bottom rail; manual control of raising and lowering by cord with full range locking; blade angle adjustable by cord; complying with WCMA A100.1.

B. Plastic Slats: Polymer composite, radiused slat corners.
   1. Width: 2 inch.
   2. Thickness: 0.15 inch.
   3. Color: as selected from manufacturers standard.
   4. Texture: Smooth.

C. Slat Support: Woven polypropylene cord, ladder configuration.

D. Head Rail: Pre-finished, formed Polymer composite box, with end caps; internally fitted with hardware, pulleys, and bearings for operation; same depth as width of slats
   1. Height: 2 inches.(approximate).
   2. Style: Moulding profile as selected from manufacturers standand line.
   3. Color: Same as slats .

E. Bottom Rail: Pre-finished, formed polymer composite; with end caps. Color: Same as headrail.

F. Lift and Control Cord: Braided nylon; continuous loop.
   1. Free end weighted.
   2. Color: As selected.

G. Headrail Attachment: To suit condition as indicated on drawings.

H. Accessory Hardware: Type recommended by blind manufacturer.

2.03 FABRICATION

A. Determine sizes by field measurement.

B. Fabricate blinds to fit within openings with uniform edge clearance of 0.5 inch.

C. Fabricate blinds to cover window frames completely.

D. At openings requiring multiple blind units, provide separate blind assemblies with space of 0.5 inch between blinds, located at window mullion centers.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install blinds in accordance with manufacturer's instructions.

B. Secure in place with flush countersunk fasteners.

3.02 CLEANING

A. Clean blind surfaces just prior to occupancy.

3.03 SCHEDULE

A. At each double hung window as indicated on drawings.

B. At each fixed transom as indicated on drawings.

C. At each arch transom as indicated on drawings.

END OF SECTION

SECTION 124813

ENTRANCE FLOOR MATS AND FRAMES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Chenille Mat.

B. Recessed mat frames.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data indicating properties of walk-off surface, component dimensions.

C. Samples: Submit one samples, 12x12 inch in size illustrating pattern, color, finish, edging.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Floor Mats:
   1. American Floor Products Company, Inc: www.afco-usa.com.
   2. R.C. Musson Rubber Co: www.mussonrubber.com.
   3. Pawling Corporation: www.pawling.com.
   4. Substitutions: See Section 016000 - Product Requirements.

2.02 CHENILLE MAT

A. Chanille Mat: Surface mounted type.
   1. Location as follows:
      a. At door 113A
      b. At door 115B
      c. At door 123

B. Chanille Mat: Recessed type.
   1. Location as follows:
      a. At door 113B

C. Components:
   1. Chenille Mat basis of design is Pawling Dura-Tile, 12"x12" tile. Equal products from listed manufacturers may be submitted for approval.
      a. Recycled rubber mat with alternating parquet pattern surface fiber, color as selected.
   2. Recessed Frame: 3/8 inch thick zinc exposed top strip, zinc coated steel concealed bottom strip, 3/8 inch deep, with anchoring features.
   3. Provide manufacturers aluminum transition strip at perimenter of mat.
   4. Size: As indicted on drawing A1.1.

2.03 FABRICATION

A. Construct recessed mat frames square, tight joints at corners, rigid. Coat surfaces with protective coating where in contact with cementitious materials.

B. Fabricate mats in single unit sizes; fabricate multiple mats where indicated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that floor opening for mats are ready to receive work.

3.02 PREPARATION

A. Mats: Verify size of floor recess before fabricating mats.

B. Vacuum clean floor recess.

3.03 INSTALLATION

A. Install frames to achieve flush plane with finished floor surface.
   1. Layout wall-to-wall mat with tiles not less than 50% remaining. Floor transition strip required at the mat to floor edge only.

B. Install walk-off surface in floor recess flush with finish floor after cleaning of finish flooring.

END OF SECTION

DIVISION 22

PLUMBING TABLE OF CONTENTS

SECTION	TITLE
220500	Common Work Results for Plumbing
220529	Hangers and Supports for Plumbing Piping and Equipment
220553	Identification for Plumbing Piping and Equipment
220700	Plumbing Insulation
221116	Domestic Water Piping
221119	Domestic Water Piping Specialties
221316	Sanitary Waste and Vent Piping
221319	Sanitary Waste Piping Specialties
223301	Electric Hybrid Domestic Water Heaters
224000	Plumbing Fixtures

END OF SECTION

SECTION 220500

COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Piping materials and installation instructions common to most piping systems
2. Sleeves

1.2 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.3 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Electrical Characteristics for Plumbing Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.5 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for plumbing installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

C. Coordinate requirements for access panels and doors for plumbing items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

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

2.2 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 22 piping Sections for pipe, tube, and fitting materials and joining methods.

2.3 JOINING MATERIALS

A. Refer to individual Division 22 piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
   a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
   b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

E. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

F. Solvent Cements for Joining Plastic Piping:

1. CPVC Piping: ASTM F 493.
2. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

2.4 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.

1. Available Manufacturers:
   a. Hart Industries, International, Inc.
   b. Watts Industries, Inc.; Water Products Div.
   c. Zurn Industries, Inc.; Wilkins Div.

2.5 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

2.6 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 22 Sections specifying piping systems.

B. 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.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. 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.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Select system components with pressure rating equal to or greater than system operating pressure.

L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:

1. New Piping:
   a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
   b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
   c. Insulated Piping: One-piece, stamped-steel type with spring clips.
   d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.

M. Sleeves are not required for core-drilled holes.

N. Permanent sleeves are not required for holes formed by removable PE sleeves.

O. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.

P. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.
   a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
   a. PVC Steel Pipe Sleeves: For pipes smaller than NPS 6.
   b. Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions.
4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.

Q. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches in diameter.
2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.
3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

R. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 Section "Penetration Firestopping" for materials.

S. Verify final equipment locations for roughing-in.

T. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.3 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 22 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
3. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
4. PVC Nonpressure Piping: Join according to ASTM D 2855.

F. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.

G. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.

3.4 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.5 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install plumbing equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

3.6 PAINTING

A. Painting of plumbing systems, equipment, and components is specified in Division 09 Sections "Interior Painting" and "Exterior Painting."

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

END OF SECTION

SECTION 220529

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 Piping systems shall be supported in accordance with ANSI B 31.1 "Power Piping" so as to maintain required pitch of lines, prevent vibration and provide for expansion and contraction movement.

PART 2 - PRODUCTS

2.1 RIGID SUPPORTS OR HANGERS:

A. Adjustable swivel split ring hanger shall be fabricated of black malleable iron and be approved by Factory Mutual and be UL listed. Hanger shall be Grinnell Fig. 104 or equal by Carpenter & Patterson.

B. Adjustable clevis type hanger shall be black carbon steel and be approved by Factory Mutual and be UL listed. Hanger shall be Grinnell Fig. 260 or equal by Carpenter & Patterson.

2.2 Protection saddle for insulation shall be fabricated from curved steel plate. Saddles shall be 12 in. long and shall be designed for the insulation thickness used.

2.3 Hanger rods shall be ASTM A575 or A576 hot rolled carbon steel and meet mechanical property requirements of ASTM A663.

2.4 Beam clamps shall be fabricated specifically for the structure to which the hanger rod is attached.

2.5 Seals: Pipe, duct, or conduit penetrations at fire rated ceilings and walls shall be with the Proset system.

PART 3 - EXECUTION

3.1 Install rigid pipe hangers as follows. The use of Grinnell figure numbers is intended to serve as a guide only.

A. Uninsulated pipe 2 inches and smaller - Grinnell Fig. 104

B. Insulated pipe 2 inches and smaller - Grinnell Fig. 260

C. All piping 2-1/2 inches and larger - Grinnell Fig. 260

3.2 Where necessary due to space limitations provide Grinnell Fig. 171 pipe roll hanger for piping 2-1/2 in. and larger.

3.3 Provide protection saddle for insulated piping without a vapor barrier.

3.4 Protect pipes, which are to receive a vapor barrier insulation from pipe hangers by using Grinnell Figure 167 or equal insulation protection shields between the hanger and the insulation. The insulation between the shield and the pipe shall be calcium silicate having a minimum density of 13 lb. per cu. ft. and a minimum compressive strength of 100 psi. The calcium silicate insulation shall be covered with a vapor barrier.

3.5 Space supports or hangers for horizontal piping as follows. This spacing does not apply where there are concentrated loads between supports such as valves or specialties.

		Maximum Span in Feet	
A.	**Nominal Pipe**	**Size, Inches**	**Water Service Steam or Gas**
	1-1/2 in. & below	7	9
	2 in. & 2-1/2 in.	10	13
	3 in.	12	15
	4 in. & 5 in.	14	17

B. Provide pipe hanger or support within 18 inches of every change in direction for piping 1-1/2 inches and below and within three feet of every change in direction for piping two inches and above.

C. Provide supports or guides as required to restrict excessive horizontal motion in vertical piping.

3.6 Support hangers by using malleable iron or galvanized steel concrete inserts, beam clamps with lock nuts or retaining straps, or other special fastening devices, as required, for the support of hangers.

A. Where pipe cannot be suspended from overhead supports, use substantial cast iron or welded steel wall brackets to support the hangers, pipe seats, or roll stands, as conditions demand.

3.7 Use hot rolled steel hanger rods sized as follows:

A. For 2 inch pipe and smaller - 3/8 inch diameter

B. For 2-1/2 inch through 3-1/2 inch - 1/2 inch diameter

C. For 4 inch and 5 inch pipe - 5/8 inch diameter

3.8 Horizontal pipelines, passing through interior walls and partitions, and vertical pipe lines, passing through floors, shall be provided with Schedule 40 black steel pipe sleeves. Sleeve diameters shall be sufficient to accommodate insulated pipe. See detail on drawings.

A. Length of horizontal sleeve shall be equal to the thickness of the partition or wall through which it passes.

B. Length of vertical sleeve passing through non-watertight floors shall be sufficient to give a 1/2 inch projection above finished floor elevations.

3.9 Pipes passing through waterproofed floors shall have 16 ounce soft sheet copper flashing extending nine inches beyond sleeve in all directions. Secure to waterproofing, turn down flashing into space between sleeve and pipe, insert gasket, pour lead and caulk watertight.

3.10 Pipes passing through exterior walls, or other waterproofed walls shall be provided with Schedule 40 black steel pipe sleeves, and shall have space between pipe and sleeve caulked with lead wool and lead.

3.11 Flash non-pressure, cast iron pipes passing through the roof with 16 ounce soft sheet copper flashing extending 9 inches beyond pipe in all directions. Secure to waterproofing and turn down flashing into top of pipe.

END OF SECTION

SECTION 220553

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipe labels
2. Valve tags

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

D. Valve numbering scheme.

E. Valve Schedules: For each piping system to include in maintenance manuals.

1.3 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

C. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches high.

2.2 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.

1. Tag Material: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Fasteners: Brass S-hook.

B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

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 PIPE LABEL INSTALLATION

A. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

B. Pipe Label Color Schedule:

1. Domestic Water Piping:
   a. Background Color: White
   b. Letter Color: Blue

3.3 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. 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 220700

PLUMBING INSULATION

PART 1 - GENERAL

1.1 The contract documents apply to this section.

1.2 The intent of this specification is to provide a quality installation which may not be attainable through the use of a standard composite consisting of insulation, vapor barrier and jacket assembled by an insulation manufacturer. However, in some installations, composites will be acceptable provided they meet the requirements of the specifications relating to referenced standards for individual components.

1.3 Finished spaces shall be defined as all areas except pipe and duct tunnels and shafts, attic spaces and spaces above furred ceilings.

A. Concealed spaces shall be defined as all areas other than finished spaces.

1.4 Acceptable manufacturers shall be the following referred to hereafter by abbreviation.

A. Insulation

1. Manville
2. Owens / Corning (O/C)
3. Knauf

B. Vapor Barriers and Jackets

1. Manville
2. O/C
3. Knauf

1.5 JOB QUALITY CONTROL:

A. Insulation jackets shall be drawn tight, fitted smoothly and wrinkle-free.

B. Do not use short pieces of insulation where a full length section will fit.

1.6 Fire hazard ratings for insulation, fasteners and jacketing materials shall not exceed flame spread of 25, fuel contribution of 50 and (when used indoors) smoke development of 50 as determined by ASTM E84, NFPA 255, UL 723 tunnel test ratings, unless specifically stated otherwise.

A. Flameproofing and fireproofing treatments are not acceptable.

1.7 Submit catalog information or shop drawings or both for insulation and related material.

1.8 Contractor shall submit certificates stating that materials meet specified requirements prior to installation.

1.9 INSULATION SCHEDULE:

SERVICE	TYPE INSUL.	THKNS, INCHES	FINISH IN CONCEALED AREAS	FINISH IN FINISHED AREAS	NOTES
A. PIPING					
Domestic HW	Glass fiber	1.0	Integral fire retardant ASJ		
Domestic CW	Glass fiber	1.0	Integral fire retardant vapor barrier ASJ		

PART 2 - PRODUCTS

2.1 MOLDED GLASS FIBER INSULATION, PIPES AND CIRCULAR DUCTS:

A. Insulation shall meet ASTM C 547 for preformed pipe insulation, Class I for 450 F service.

B. k value of 0.23 maximum at 75 mean temperature.

C. Insulation shall be Manville Micro-Lok 650 or approved equal.

2.2 FOAMED PLASTIC INSULATION:

A. Pipe:

1. Insulation shall meet ASTM C534 for preformed flexible elastomeric cellular thermal insulation, Type I (tubular) and Type II (sheet).
2. Density range shall be 4.5 to 8.5 pounds/cubic foot with a 220 degree F maximum service temperature.
3. k value of 0.28 maximum at a 75 F mean temperature.
4. Water vapor permeability shall be less than 0.2 perm and water absorption less than six percent by weight.
5. Smoke developed shall be less than 150 for 2 inch thickness or less as determined by ASTM E84.
6. Insulation shall be equal to ACC Armaflex II or Manville Aerotube II.

2.3 VAPOR BARRIER JACKETS:

A. Premolded PVC fitting covers, pipe-self-extinguishing: flame spread 25 or less. Fuel contributed 0, k value 0.27 at 75 degree F mean temperature 0 to 500 degree F temperature limits. Manville Zeston 25/50 or an approved equal.

B. Kraft and Foil, Pipes: Outer ply shall be 40 pounds white bleached embossed kraft. Inner ply shall be aluminum foil reinforced with fiberglass yarn 1/16 inch o.c. both directions. Flame extinguishing ply bonding adhesive. Water vapor permeance 0.02 perm or less, minus 20 to plus 450 degree F service temperature plain joint laps for field applied adhesive or laps with pressure sensitive adhesive acceptable. Manville Type AP, O/C 25 ASJ or an approved equal.

2.4 ADHESIVES, FIRE RESISTANCE:

A. For securing field applied glass cloth jackets with or without vapor barrier to insulation. Dry flame spread rating 5 by ASTM E162, 0 to 180 degrees F service temperature bonding time 5 to 20 minutes.

B. For sealing laps of all vapor barrier jackets. Dry flame spread rating 5 by ASTM E 162, minus 20 to plus 180 F service temperature, bonding time for lap sealing two to ten minutes.

2.5 SEALANTS, VAPOR BARRIER: For all interior field constructed vapor barrier finishes for equipment, fittings, valves, flanges, surface patches, lap edges and flashings. Dry flame spread rating less than 25 by ASTM E 162, 20 to 150 degrees F service temperature, water vapor permeance 0.002 at 0.040 inch dry film thickness.

PART 3 - EXECUTION

3.1 Inspect all surfaces and verify that work of other trades requiring insulation has been completed and is ready to receive insulation, specifically check for obvious defects such as leaking pipe, broken fittings, hanger supports, and the like, that would result in damage to the completed insulation job, or that would adversely affect the execution and quality of the insulation systems as specified. Do not proceed with application of insulation until defects are corrected.

3.2 Remove all dirt, scale or other extraneous loose material from surfaces to be insulated.

3.3 Install specified materials either as sequentially applied components or as a composite system if applicable.

3.4 On long vertical runs of pipe provide insulation supports at intervals required to prevent the weight of the insulation from exceeding its compressive strength.

3.5 PIPE AND EQUIPMENT INSULATION:

A. Molded Glass Fiber: Apply thickness shown in insulation schedule.

1. Cover fittings with one piece UL 25/50 rated PVC premolded fitting covers stapled or tacked in place. Apply over proper shape factory precut insulation blanket. Wrap circumferential edges of cover with vapor-barrier pressure sensitive color matching tape. Overlap tape two inches on adjacent insulation and on cover.
2. Fastening: secure insulation jacket with lagging adhesive if not provided with self-sealing pressure-sensitive adhesive. In areas not accessible after construction, also secure insulation with aluminum bands on 12 to 18 inch centers.

3.6 FIRE RETARDANT VAPOR BARRIER JACKETS FOR PIPE:

A. Apply adhesive and jacket over insulation unless insulation is supplied with an integral jacket. Seal lap with field applied adhesive or factory applied pressure sensitive lap adhesive.

B. Apply sealant to fittings, valves, flanges and similar items. Vapor seal these items by embedding glass fabric between two 1/16 inch thick coats of adhesive. Lap seal fabric one to two inches on itself and two inches on adjoining insulation.

END OF SECTION

SECTION 221116

DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 The contract documents apply to this section.

1.2 Drawings show approximate general routing of principal service lines and drains, however, execution of the work shall be coordinated more precisely as described in Part 3 of this section.

1.3 DEFINITIONS:

A. Outside shall mean five feet beyond the perimeter of buildings.

B. Inside shall mean inside buildings and within 5 feet of the perimeter of buildings.

1.4 SCOPE:

A. All inside piping.

1.5 QUALITY ASSURANCE:

A. Welding procedures used and the performance of welders shall meet the requirements of the ASME Boiler and Pressure Vessel Code (Section IX).

PART 2 - PRODUCTS

2.1 Copper tube type K & L: ANSI/ASTM 388

2.2 PVC pipe, Schedule 40, Grade PVC 2116: ASTM D1785 and ASTM D2241.

2.3 PIPE FITTINGS:

A. Brazed, or soldered fittings for ferrous or copper piping shall meet the requirements of the standards specified in this section.

B. PVC Fittings: ANSI/ASTM D2464, D2466, D2467.

C. Cast solder fittings: ANSI B16.18.

D. Unions:

1. Copper pipe two inches and smaller: wrought or extruded copper for braze joints meeting requirements of ANSI B16.22.
2. PS brass or bronze, chromium plated (standard weight) pipe: ANSI B16.15.

E. Nipples:

1. Comply with National Bureau of Standards C.S. 5, entitled "Pipe Nipples, Brass, Copper, Steel and Wrought Iron".
2. Nipples shall be of same material and weight as pipe with which used, except that nipples having an unthreaded section of one inch or less shall be extra heavy. The use of running thread nipples will not be approved.

PART 3 - EXECUTION

3.1 INSPECTION AND PREPARATION:

A. Prior to all piping work, carefully inspect the installed work or excavation by other trades and verify that all such work is complete to the point where the piping may be installed in accordance with these documents.

B. Follow the drawings in laying out work and check drawings of other trades to verify sufficient space to install piping.

C. When pipe is to be insulated, allow a clearance equal to the insulation thickness plus at least two inches.

D. Undimensioned drawings are intended to indicate the general arrangement of piping systems and are not intended to convey precise locational information.

E. Coordinate with other trades to permit the work of all trades to be installed.

F. Offsets, fittings, and extra pipe necessary to avoid interference, or provide maximum headroom and space shall be furnished and installed without additional expense to the Owner.

G. If the piping is installed without coordinating with other trades and so as to cause interference with work of other trades, the necessary changes shall be made at no extra charge.

3.2 INSTALLATION:

A. General:

1. Run piping concealed in finished areas unless otherwise indicated.
2. Run piping exposed in equipment rooms, service areas, or areas with no means or need for concealment.
3. Excessive cutting and similar operations likely to weaken a building structure to facilitate the piping installation will not be permitted.
4. Take care and implement suitable measures throughout the construction period to prevent trash and dirt from entering pipes, before, during, and after installation.
5. Unless otherwise indicated, run piping parallel to the walls of the building. Erect vertical piping straight and plumb, with risers centered in pipe sleeves.
6. Offsets shall conform to offsets in the building construction.
7. Where pipe is to be insulated, provide a clearance equal to the insulation thickness plus a minimum of 2 inches.
8. Coordinate the work to insure that sleeves and inserts are positioned accurately along with other built-in items, before concrete pouring takes place and before walls, partitions, and ceilings or roofs are erected, so as to reduce to an absolute minimum the necessity for cutting or patching at a later stage.

B. Changes in direction of pipe shall be accomplished by bending or by the use of factory made fittings of the long radius type if applicable to the piping type. Gas pipe, steam pipe and high temperature hot water piping shall not be bent unless otherwise indicated on drawings. Bending shall be done uniformly by a device made especially for bending. Mitered joint elbows shall be used only with specific written approval by Engineer.

C. Make changes in pipe size by using factory made reducers. Bushings, grooved reducing couplings, and field made reducers will not be permitted. Use eccentric reducers in steam systems with the flat side on bottom.

D. Install unions on each side of threaded valves, regulators, and similar items and on one side of each threaded check valve and at all pieces of equipment, so that such equipment might be readily disconnected and removed. Unions shall not be placed in a location which will be inaccessible after completion of the building.

E. Provide drain valves for domestic water piping system, including all valved branches, with drain valves in accessible locations to permit branch or complete system drainage.

F. Install soil, waste and vent stacks of sizes indicated on the drawings and in compliance with the requirements of the plumbing code. Make offsets at an angle of 45 deg. run branch soil, waste and vent connections to the soil stack, waste stack, building drain or vent stacks as shown or as required to meet requirements of plumbing code.

G. Install horizontal drainage piping inside the building in practical alignment with the building.

1. The horizontal piping shall be installed as high as possible in order to maintain ceiling heights indicated on architectural drawings.
2. Special hangers shall be furnished where required for this purpose.
3. Make changes in direction in drainage piping by the appropriate use of 45 degree wyes, one-half wyes, long sweep quarter bends, sixth, eighth or sixteenth bends or a combination of these fittings.
4. No changes in direction greater than 90 degrees shall be made in drainage piping. Where different sizes of drainage pipes or pipes and fittings are to be connected, use correctly sized standard increasers or reducers.
5. Tees and crosses may be used in vent pipes only.
6. Drilling and tapping of house drains, soil, waste or vent pipes and the use of saddle hubs and bends are prohibited. Double hub, double T or double sanitary T branches shall not be used on soil or waste lines. Protect drain pipes passing under or through walls from damage by the use of sleeves or arches or other approved method.
7. Protect pipes passing through or under cinder concrete or similar corrosive material from external corrosion by a heavy coating of bitumastic paint.
8. Provide vent connections required by the plumbing code for floor drains, or similar items, whether shown on the drawings or not.

H. Provide for expansion by using swing joints, turns, expansion loops or long offsets, anchors and guides as to allow for, and for control of, pipe movement, in accordance with ANSI B31.1.

I. Piping to be insulated and supported by roller or trapeze hangers or other surfaces providing approximate point support shall be provided with a steel protection saddle as specified in Section 220529.

J. Provide concrete anchor blocks for underground mechanically joined domestic water and fire protection services. Install anchor blocks at all pipe bends requiring fittings.

3.3 CLEANING OF PIPING SYSTEMS:

A. The interior surfaces of piping shall be smooth and entirely free from obstructions to flow. Clean the systems before connecting to equipment or other systems.

B. Cleaning and disinfecting of service waterlines:

1. Disinfect new service waterlines after being cleaned, using a solution of water with 50 parts per million of available chlorine.
2. Liquid chlorine, H.T.H., hypo-chlorite of lime or perchloron may be used to produce the chlorine.
3. The solution shall be introduced into the system and the necessary number of valves, hydrants and similar outlets opened to allow escape of air and to insure that the interior of the entire system comes in contact with the disinfecting solution.
4. The solution shall remain in the system for a period of not less than four hours at which time the chlorine residual shall not be less than five parts per million.
5. Valves and faucets shall be opened and closed frequently, to insure that all their operating parts are disinfected during the four-hour disinfection process.
6. After the disinfection period is completed, the solution shall be thoroughly flushed from the system until the replacement water throughout is both chemically and bacteriologically safe.

3.4 ADJUSTING PIPING SYSTEMS:

A. Inspect and adjust flush valves after installation to insure quiet operation and proper closing.

B. Adjust closed water system pressurization controls as follows:

1. Normally pressurized systems:
Establish proper water level in compression tank,
Vent all air from system,
Adjust makeup valve setting as noted on drawings,
Operate pumps for at least four hours, and
Vent all air from system and recheck water level in compression tank.

3.5 FIRE RESISTING SEALS: All piping passing through fire rated walls, floors and ceilings shall be provided with fire seals in accordance with NFPA and approved by local inspectors.

3.6 PIPE SCHEDULE

SERVICE	SIZE	PIPE TYPE	FITTING TYPE	VALVE TYPE	MFG. & NO.
Domestic cold water supply above ground	4 in. & smaller	Type L copper	Wrt. copper solder	Gate Globe Check	Nibco S-111 Nibco S-211 Nibco S-413B
Domestic cold water supply below grnd	3 in to 10 in	Cast iron coated, inside cement, outside coated	B&S tyton or belltite or mech joint	Gate	Stockham Fig. G743-0
Domestic Hot Water supply	2 in. & smaller	Type L copper	Wrt. copper solder	Gate Globe	Nibco S-134 Nibco S-235Y
Soil, waste & vent below gnd inside	1 ½ in. & larger	Sch 40 PVC	As recommended by mfg.		

END OF SECTION

SECTION 221119

DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals: Product Data.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Reduced-Pressure-Principle Backflow Preventers: ASSE 1013.

B. Hose Bibbs: Bronze body in chrome-plated finish, with removable composition disc, threaded or soldered inlet, garden-hose threaded outlet, and wheel handle.

C. Wall Hydrant: ASME A112.21.3M, ASSE 1019, projecting nonfreeze, automatic draining, antibackflow type, with key operator and threaded inlet, garden-hose threaded outlet, and chrome finish.

D. Stop-and-Waste Drain Valves: MSS SP-110 for ball valves or MSS SP-80 for gate valves.

E. Water Hammer Arrester: Bellows or piston type with pressurized cushioning chamber.

F. Strainers: Y-pattern, bronze body, 125-psig minimum steam working pressure.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install backflow preventers at each water-supply connection to mechanical equipment and where required by authorities having jurisdiction.

B. Install hose bibbs with integral or field-installed vacuum breaker.

END OF SECTION

SECTION 221316

SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Minimum Pressure Requirement for Soil, Waste, and Vent: 10-foot head of water.

B. Comply with NSF 14, "Plastic Piping Components and Related Materials," for plastic piping components.

PART 2 - PRODUCTS

2.1 PIPES AND FITTINGS

A. PVC Plastic, DWV Pipe and Fittings: ASTM D 2665, Schedule 40, plain ends with PVC socket-type, DWV pipe fittings.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. Comply with requirements in Division 22 Section "Common Work Results for Plumbing" for basic piping installation requirements.

B. Install wall penetration system at each pipe penetration through foundation wall. Make installation watertight. Comply with requirements in Division 22 Section "Common Work Results for Plumbing" for wall penetration systems.

C. 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 2 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.

D, 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.

E. 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.

F. Install PVC soil and waste drainage and vent piping according to ASTM D 2665.

G. Install underground PVC soil and waste drainage piping according to ASTM D 2321.

H. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

I. Comply with requirements in Division 22 Section "Common Work Results for Plumbing" for basic piping joint construction.

J. Comply with requirements in Division 22 Section "Common Work Results for Plumbing" for pipe hanger and support devices.

3.2 PIPE SCHEDULE

A. Aboveground Applications: PVC plastic, DWV pipe and fittings with solvent-cemented joints.

B. Belowground Applications: PVC plastic, DWV pipe and drainage-pattern fittings with cemented joints.

END OF SECTION

SECTION 221319

SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals: Product Data.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Cleanouts:

1. Application: Floor cleanout.
2. Body or Ferrule Material: Plastic.
3. Clamping Device: Required.
4. Outlet Connection: Threaded.
5. Closure: Plastic plug.
6. Adjustable Housing Material: Plastic with threads.
7. Frame and Cover Material and Finish: Nickel-bronze, copper alloy.
8. Frame and Cover Shape: Round.
9. Top Loading Classification: Heavy Duty.

B. Floor Drains:

1. Basis-of-Design Product: Josam
   a. Wade
2. Application: Floor drain.
3. Body Material: Gray iron.
4. Seepage Flange: Required.
5. Clamping Device: Required.
6. Outlet: Bottom.
7. Top or Strainer Material: Nickel bronze.
8. Top of Body and Strainer Finish: Nickel bronze.
9. Top Shape: Round
10. Top Loading Classification: Heavy Duty.
11. Trap Material: PVC.
12. Trap Pattern: Standard P-trap.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.

B. Install floor drains at low pints of surface areas and where indicated. Set tops of drains flush with finished floor.

1. Trap drains connected to sanitary building drain.

2. Install drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes.

END OF SECTION

SECTION 223301

ELECTRIC HYBRID DOMESTIC WATER HEATERS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals: Product Data.

B. Comply with requirements of applicable NSF, AWWA, or FDA and EPA regulatory standards for tasteless and odorless, potable-water-tank linings.

C. Comply with performance efficiencies prescribed in ASHRAE 90.2, "Energy Efficient Design of New Low-Rise Residential Buildings."

D. Warranties: Submit a written warranty executed by manufacturer agreeing to repair or replace water heaters that fail in materials or workmanship within ten years from date of Substantial Completion. Failures include, but are not limited to, tanks and elements.

PART 2 - PRODUCTS

2.1 WATER HEATERS, GENERAL

A. Insulation: Suitable for operating temperature and required insulating value. Include insulation material that surrounds entire tank except connections and controls.

B. Anode Rods: Premium resistored anode rod

C. Combination Temperature and Pressure Relief Valve: ASME rated and stamped and complying with ASME PTC 25.3. Include relieving capacity at least as great as heat input and pressure setting less than water heater working-pressure rating. Select relief valve with sensing element that extends into tank.

D. Drain Valve: Factory or field installed.

2.2 ELECTRIC WATER HEATERS

A. Available Products:

1. Rheem HP50RH heat pump water heater or equal.

B. Storage, Electric Water Heaters: UL 1listed and labeled, 50-gal. capacity; steel with 150-psig working-pressure rating. Two electric, screw-in, immersion-type heating elements with adjustable thermostat for each element (2000 watts) and wiring arrangement for nonsimultaneous operation.

C. Operating Modes: Heat pump, heat pump with electric background 2 KW elements.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install temperature and pressure relief valves and extend to closest floor drain.

B. Install vacuum relief valves in cold-water-inlet piping.

C. Install shutoff valves and unions at hot- and cold-water piping connections.

D. Make piping connections with dielectric fittings where dissimilar piping materials are joined.

E. Electrically ground units according to authorities having jurisdiction.

END OF SECTION

SECTION 224000

PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals: Product Data for each type of plumbing fixture, including trim, fittings, accessories, appliances, appurtenances, equipment, and supports.

B. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act"; for plumbing fixtures for people with disabilities.

C. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.

D. NSF Standard: Comply with NSF 61, "Drinking Water System Components - Health Effects," for fixture materials that will be in contact with potable water.

PART 2 - PRODUCTS

2.1 WATER CLOSET

A. Vitreous-China Water Closet: Elongated, siphon-jet type, floor-mounted, floor outlet with close-coupled, gravity-type tank.

1. Basis-of-Design Product: American Standard or comparable product by one of the following:
   a. Crane or Kohler.
2. Design Consumption: 1.6 gal./flush.

B. Toilet Seat: Elongated, solid plastic open front without cover with bumpers and hardware, Commercial, Standard class.

1. Basis-of-Design Product: BEMIS or comparable product by one of the following:
   a. Church.

2.2 URINAL

A. Vitreous-China Urinal: Wall-mounting, back-outlet, siphon-jet type.

1. Basis-of-Design Product: American Standard or comparable product by one of the following:
   a. Crane or Kholer.
2. Design Consumption: 1 gal./flush.

B. Flushometer Valve: Cast-brass body, brass or copper pipe or tubing inlet with wall flange and tailpiece with spud, screwdriver check stop, and vacuum breaker. Polished, chrome-plated, exposed metal parts. Consumption: 1.0 gal./flush.

1. Basis-of-Design Product: Sloan-Royal or comparable product by one of the following:
   a. Zurn.

C. Fixture Support: Type I, with fixture support plates and coupling with seal and fixture bolts and hardware matching fixture.

2.3 LAVATORY

A. Enameled, Cast-Iron Lavatory: Wall]-mounting.

1. Basis-of-Design Product: American Standard or comparable product by one of the following:
   a. Crane or Kohler.

B. Faucets: ASME A112.18.1; solid brass.

1. Basis-of-Design Product: Moen or comparable product by one of the following:
   a. American Standard.
2. Type: Center set with inlets on 4-inch centers without pop-up waste.
3. Finish: Polished chrome-plate.
4. Handle(s): Single-lever toggle.
5. Maximum Flow Rate: 0.5 gpm.

C. Drain: Grid strainer with NPS 1-1/4 tailpiece.

D. Trap: Chrome-plated, tubular brass with slip-joint inlet and wall flange.

E. Supply and Drain Insulation: Soft-plastic covering; removable at stops.

F. Fixture Support: Concealed arm for wall-mounting, lavatory-type fixture.

2.4 SERVICE SINK

A. Terrazzo Mop-Service Basin:

1. Basis-of-Design Product: Williams or comparable product by one of the following:

B. Faucet: Widespread, chrome plated with supplies on 8-inch centers. Wall braced spout with integral vacuum breaker, pail hook, and hose-thread outlet.

1. Basis-of-Design Product: Williams or comparable product by one of the following:
   a. T & S Brass.

C. Mounting: Floor.

D. Rim Guard: Manufacturer's standard.

E. Drain: NPS 3 with grid strainer.

F. Mop Rack

2.5 ELECTRIC WATER COOLER

A. Description: Wall-mounted type, vinyl-covered steel cabinet.

1. Basis-of-Design Product: Product indicated on Drawings or comparable product by one of the following:
   a. Elkay.

PART 3 - EXECUTION

3.1 INSTALLATIONS

A. Install fitting insulation kits on fixtures for people with disabilities.

B. Install fixtures with flanges and gasket seals.

C. Install tanks for accessible, tank-type water closets with lever handle mounted on wide side of compartment.

D. Fasten wall-hanging plumbing fixtures securely to supports attached to building substrate when supports are specified, and to building wall construction where no support is indicated.

E. Fasten floor-mounted fixtures to substrate. Fasten fixtures having holes for securing fixture to wall construction, to reinforcement built into walls.

F. Fasten wall-mounted fittings to reinforcement built into walls.

G. Secure supplies to supports or substrate within pipe space behind fixture.

H. Install individual supply inlets, supply stops, supply risers, and tubular brass traps with cleanouts at fixture.

I. Install water-supply stop valves in accessible locations.

J. Install traps on fixture outlets.

K. Install escutcheons at wall, floor, and ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons where required to conceal protruding pipe fittings.

L. Seal joints between fixtures and walls, floors, and counters using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color.

M. Install piping connections between plumbing fixtures and piping systems and plumbing equipment. Install insulation on supplies and drains of fixtures for people with disabilities.

END OF SECTION

DIVISION 23

MECHANICAL TABLE OF CONTENTS

SECTION	TITLE
230100	Mechanical General Provisions
230513	Motors
230514	Adjustable Frequency Motor Drives (AFD's)
230593	Testing, Adjusting, and Balancing for HVAC
230700	HVAC Insulation
232113	Hydronic Piping
232123	Hydronic Pumps
232500	Chemical Treatment Systems
233113	Metal Ducts
233423	HVAC Power Ventilators
233713	Diffusers, Registers, and Grilles
238146	Water to Air, Packaged Heat Pumps

END OF SECTION

SECTION 230100

MECHANICAL GENERAL PROVISIONS

PART 1 - GENERAL

1.1 The contract documents apply to this section.

1.2 Provide necessary items for a complete installation of mechanical equipment specified in this project manual.

1.3 Material, equipment and installation under this division shall meet the requirements of the applicable codes and standards listed below.

A. References:

1. Air Conditioning and Refrigeration Institute ..... ARI
2. Air Moving and Conditioning Association ..... AMCA
3. American National Standards Institute ..... ANSI
4. American Society for Testing and Materials ..... ASTM
5. American Society of Heating Refrigeration & A/C Engineering ..... ASHRAE
6. American Society of Mechanical Engineers ..... ASME
7. American Society of Sanitary Engineering ..... ASSE
8. American Water Works Association, Inc. ..... AWWA
9. International Mechanical Code ..... IMC
10. International Plumbing Code ..... IPC
11. Commercial Standards ..... CS
12. National Electrical Code (NFPA 70) ..... NEC
13. National Fire Protection Association ..... NFPA
14. Plumbing and Drainage Institute ..... PDI
15. Sheet Metal and Air Conditioning Contractors National Association ..... SMACNA
16. Underwriters Laboratories ..... UL

1.4 Work under this division shall meet requirements of local building codes and ordinances and the applicable requirements of the following codes and standards.

A. Plumbing work shall meet requirements of Local Plumbing Code.

1.5 Submit shop drawings for the following products:

A. Vibration isolators

B. Refrigerant valves

C. Insulation

D. Refrigerant control valves and specialities

E. Flexible connections

F. Heat Pumps

G. Refrigeration accessories

H. Air handling units

I. Fans and ventilators

J. Flexible ductwork

K. Dampers

L. Duct access doors, panels and test holes

M. Diffusers

N. Louvers

O. Grilles

P. Filters

Q. Thermostats

1.6 INSTRUCTIONS AND MAINTENANCE:

A. Instruct Owner's operators in proper operation and maintenance of all equipment and controls. Supervise the operation of the system for two days at the beginning of the first heating season, and the cooling system for two days at the beginning of the first cooling season, or until the Owner's operators are familiar with the equipment and controls.

1.7 PLACING IN SERVICE:

A. Before being placed into operation, all equipment requiring preoperational attention shall be serviced in accordance with the requirements of these specifications and the manufacturer's recommendations.

B. This servicing shall include lubrication, refrigerant charges, instrument liquids, instrument and control calibrations and adjustments, testing and adjusting of all safety devices, testing and adjusting of operating controls.

C. At the completion of performance tests and following approval of test results, the Contractor shall recheck all equipment and verify that each item is functioning correctly.

1.8 EQUIPMENT IDENTIFICATION (NAMEPLATE):

A. All major items of mechanical and plumbing equipment furnished under this division, shall be identified by nameplates.

B. Nameplates shall identify the piece of equipment as to use, and number if applicable, and shall be securely affixed to each individual piece of equipment and also to each starter, relay, or switch which controls that equipment.

C. Nameplates shall be aluminum, 2-1/2 inches x 3/4 inch with a black enamel background, with etched or engraved natural aluminum lettering.

D. Plates shall be as manufactured by Seton Name Plate Company, Inc., New Haven, Connecticut or an approved equal.

1.9 VALVE IDENTIFICATION:

A. Each valve shall be identified with brass identification tag two inches in diameter, with markings spelled out in full, securely attached to valve.

1. The service code, valve number, and flow direction shall be stenciled on the pipe immediately upstream of each valve.
2. A chart giving valve number, valve location, service and area or fixtures controlled by the valve shall be furnished and shall be mounted in a glass or clear plastic covered frame. Locate where directed by Engineer.

1.10 PIPE IDENTIFICATION (PAINTING):

A. This scheme concerns only the identification of piping systems, including fittings, valves (do not paint valve stems), and pipe coverings. It does not cover pipes buried in the ground or electrical conduits.

Refrigerant - yellow

B. Identify the content, service, and the direction of flow for all piping systems (whether insulated or uninsulated) by stenciling near each valve, near where the pipe passes through a wall or floor, adjacent to abrupt pipe directional change, and at intervals of 50 feet along exposed pipe. Use contrasting paint colors and the abbreviated code as follows, combined with a directional arrow:

	Content - service	Code
1.	Cold water - service supply	CW
2.	Refrigerant	REF
3.	Domestic hot water	DOM HW
4.	Domestic cold water	DOM CW

1.11 Access doors shall be provided for concealed equipment furnished under this division requiring periodic inspection, servicing, or maintenance where such equipment is located above nonremovable ceilings or behind walls. "B" label doors shall be used where installed in fire partitions. Access doors shall be "Milcor" as manufactured by Milcor, Inc. or equal and be of the styles indicated for the finishes scheduled below. Access doors shall have concealed hinges and cylinder locks.

A. Finish Schedule:

Style		Size	Installation Finish
1.	"K"	12" x 12" or larger as required	Plaster ceilings or walls
2.	"M"	12" x 12" or larger as required	Masonry block or tile walls
3.	"A"	12" modules as required	Nonremovable acoustical tile areas

B. Provide shop prime coat or manufacturer's standard primer. Final finish for door in finished areas shall comply with Division 9, Section "Painting".

1.12 Electric motors shall be furnished as a part of the equipment to be driven and shall meet applicable requirements of Section 230513 and Division 26 of the specifications and the schedules and wiring diagrams on the Drawings.

A. Enclosures shall be drip-proof except where other enclosure types are indicated.

B. Motors shall be sized so as not to overload or to exceed nameplate current under any conditions of operation of the driven equipment.

1.13 Motor starters and combination starters shall be furnished with all electric motors furnished under this division of the specifications unless shown in motor control centers in electrical drawings. Starters shall meet applicable requirements of Division 26 - Electrical of the Specifications and the schedules and wiring diagrams on the Drawings.

1.14 Equipment Support and Foundations:

A. Equipment support - items of equipment installed overhead or supported above floor level on walls shall be securely anchored. Steel supports and fastening media shall be of structural quality.

B. Concrete bases or pads shall be provided for equipment designated on the drawings and as required for leveling and elevation.

C. Concrete shall conform to requirements of Division 3 - Concrete - Section 033000.

1. Unless otherwise shown on drawings, bases or pads over six square feet in area shall be reinforced with one layer of 6 x 6 - 6/6 welded wire mesh.
2. Bases or pads shall have a rubbed finish and have top edges chamfered 45 degrees.

1.15 VIBRATION ISOLATION:

A. All mechanical equipment and systems shall be installed in a manner which minimizes noise and vibration.

1. Isolators - All rotating or reciprocating machinery such as fans, compressors or air handling units shall be supported on sound and vibration isolation units selected with due consideration of the prevailing machine frequencies and guaranteed by the manufacturer to prevent transmission of objectionable noise or vibration to the building structure. Isolation units shall contain no wood or other hygroscopic material and shall be resistant to or fully protected from deterioration caused by oil.

1.16 PAINTING: Touch up or repaint completely, equipment on which factory paint has been damaged. All exposed piping in finished spaces except for insulated pipe shall be painted.

PART 2 - PRODUCTS

2.1 "Products" mean new material, machinery, components, equipment, fixtures, and systems forming the Work. It does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work. Products may also include existing materials or components required for reuse.

2.2 TRANSPORTATION AND HANDLING:

A. Transport and handle products in accordance with manufacturer's instructions.

B. Promptly inspect shipments to assure that products comply with requirements, quantities are correct, and products are undamaged.

C. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

2.3 STORAGE AND PROTECTION:

A. Store and protect products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weathertight, climate controlled enclosures.

B. For exterior storage of fabricated products, place on sloped supports, above ground.

C. Provide off-site storage and protection when site does not permit onsite storage or protection.

D. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation.

E. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

F. Arrange storage of products to permit access for inspection. Periodically inspect to assure products are undamaged and are maintained under specified conditions.

2.4 Warranties shall be in writing and written for the time periods and terms specified, but in no case less than a one-year period. When any item or a constituent part of any assembly or product is required to be replaced, the original full warranty period and terms on that item shall be reinstated, beginning on the date the replacement is deemed acceptable by the Owner.

2.5 PRODUCT OPTIONS:

A. Products specified by reference standards or by description only: Any product meeting those standards or description.

B. Products specified by naming one or more manufacturers: Products of manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products specified by naming one or more manufacturers with a provision for substitutions (i.e., "or equal"): Submit a request for substitution for any manufacturer not named.

2.6 SUBSTITUTIONS:

A. All requests for substitutions shall be received in writing ten (10) days prior to the time of receipt of bids.

B. Substitutions may be considered when a product becomes unavailable through no fault of the Contractor.

C. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.

D. A request constitutes a representation that the Contractor:

1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
2. Will provide the same warranty for the substitution as for the specified product.
3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
4. Waives claims for additional costs or time extension which may subsequently become apparent.

5. Will reimburse Owner for review or redesign services associated with re-approval by authorities.

E. Substitutions may not be considered when they are indicated or implied on shop drawing or product data submittals or when acceptance will require revision to the Contract Documents.

F. Substitution Submittal Procedure:

1. Submit three copies of request for substitution for consideration. Limit each request to one proposed substitution.
2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence.
3. The Engineer will notify Contract Document holders in writing of decision to accept or reject request.

PART 3 - EXECUTION

3.1 The ductwork and piping plans indicate the optimum anticipated location and routing. The HVAC contractor is required to coordinate the actual final locations using the plans as a guide and coordinate the actual final locations with the locations of plumbing and electrical design elements. Coordinate location of ductwork and piping through or above ceilings so that dampers, controls, valves, plumbing valves, equipment, cleanouts and electrical outlets, switches, conduits cable trays and junction boxes are accessible.

3.2 This Contractor shall provide the necessary access and service clearance to all components of equipment as required by Code and/or the equipment manufacturer.

3.3 All equipment shall be installed, inspected, tested, and operated in accordance with the manufacturer's instructions, to the extent that those instructions are more explicit or stringent than requirements contained in the Contract Documents.

3.4 The Contractor shall be responsible for furnishing and installing all components required, valves, dampers, controls, etc., for a complete and operating system.

3.5 As-built plans and specifications with all addenda shall be maintained intact on the jobsite and kept current by marking changes not less than weekly. This set of working as-built documents shall be made available to the Engineer for review at each project site visit up to the time of submittal for final approval.

3.6 As-built to-scale floor plan drawings with specifications and addenda shall accompany bound installation and maintenance manuals which shall cover all elements requiring periodic inspection and/or maintenance. These documents shall be provided to the Engineer prior to request for final payment and are subject to approval by the Architect and Engineer.

3.7 MAINTENANCE SERVICE:

A. Initial Maintenance Service: Beginning at Substantial Completion, provide 12 months full maintenance service by skilled, competent employees of the equipment installer. Include monthly preventive maintenance, repair or replacement of worn or defective components,

lubrication, cleaning, and adjusting as required for proper operation at rated capacity. Use parts and supplies as used in the manufacture and installation of original equipment.

1. Perform maintenance, including emergency callback service, during normal working hours. Response time: 2 hours or less.

END OF SECTION

SECTION 230513

MOTORS

PART 1 - GENERAL

1.1 REFERENCES: NEMA PUBLICATIONS

A. MG 1 Motors and Generators.

B. MG 2 Safety Standard for Construction and Guide for Selection, Installation, and Use of Electric Motors and Generators.

C. MG 13 Frame Assignments for Alternating-current Integral-horsepower Induction Motors.

1.2 QUALITY ASSURANCE

A. Motors shall be furnished as part of the equipment which they drive. Their characteristics shall be such as to provide proper operation of the driven equipment without exceeding motor ratings. Motor enclosures shall be appropriate for the location and provide physical protection from external source of motor damage.

PART 2 - PRODUCTS

2.1 Unless otherwise specified or indicated on the drawings, the following features and ratings apply.

A. Motor winding insulation shall be NEMA MG 1 Class "B".

B. Motor frequency shall be 60 hertz.

2.2 Motor enclosures, types, and features specifically indicated on drawings or in other portions of specifications shall be provided.

2.3 Motors shall be suitable for starting by type of starters indicated.

2.4 Phase and voltage ratings shall be NEMA standard ratings indicated on electrical drawings.

2.5 Single-speed polyphase squirrel-cage integral-horsepower motors in the range 1 through 125 horsepower shall have their efficiencies indicated by a NEMA nominal efficiency rating on the nameplate. Unless otherwise indicated, the nominal efficiency shall be at least that indicated by the following table.

2.6 Motors to be controlled by variable frequency drives shall be designed and coordinated for such use.

NEMA Nominal Efficiency (High Efficiency Motors)

Motor rating (HP)	900 RPM	1,200 RPM	1,800 RPM	3,600 RPM
1-1.99	72	75.5	81.5	75.5
2-2.99	81.5	84	81.5	78.5
3-4.99	84	86.5	84	81.5
5-9.99	84	86.5	86.5	84
10-19.99	86.5	88.5	88.5	86.5
20-29.99	88.5	90.2	90.2	88.5
30-49.99	90.2	91.7	91.7	90.2
50-99.99	91.7	93	91.7	90.2
100-125.00	93	94.1	93	93

2.7 Single phase motors shall be equipped with integral, thermal overloads.

PART 3 - EXECUTION

3.1 Perform tests as specified in Division 26.

END OF SECTION

SECTION 230514

ADJUSTABLE FREQUENCY MOTOR DRIVES (AFD'S)

PART 1 - GENERAL

1.1 MECHANICAL GENERAL PROVISIONS

A. Provisions of Division 260000 shall be made an integral part of this section.

1.2 This section specifies AFD's shown on the drawings individually mounted or provided integral to a piece of mechanical equipment.

1.3 REFERENCES

A. IEE519 Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems.

B. NEMA Standards Publications

1. ICS 1 General Standards for Industrial Controls and Systems.
2. ICS 2 Standards for Industrial Control Devices, Controllers, and Assemblies.
3. ICS 6 Enclosures for Industrial Controls and Systems.
4. MG 1 Motors and Generators.
5. MG 2 Safety Standard for Construction and Guide for Selection, Installation, and Use of Electric Motors and Generators.
6. MG 13 Frame Assignments for Alternating-current Integral-horsepower Induction Motors.

1.4 When motors are supplied with characteristics different from those indicated on the drawings, drives, feeders, overloads, disconnects, and associated devices of the correct size, type, and rating shall be provided.

1.5 LOAD

A. For each drive required, drive output current rating, load and speed range requirements shall match the motor which they serve.

B. Drive selection shall be determined by motor type, full load motor current and special requirements (if any).

C. The motor shall operate over a frequency range of 0 to 60 HZ, reaching rated nameplate horsepower (hp) at 60 HZ.

1.6 MOTOR OPERATION: The adjustable frequency drive shall be capable of generating a controlled adjustable frequency / adjustable voltage output at suitable power levels to operate the motor served.

1.7 The drives shall be built to applicable NEMA standards and be suitable for use as a component to meet NEC requirements. Drive is to be listed by Underwriters Laboratories (UL).

1.8 SUBMITTALS: Submit the following to the Engineer:

A. Master drawing index.

B. Dimensioned outline drawing.

C. Schematic diagram.

D. Component list.

E. Conduit entry / exit locations.

F. Assembly rating, including:

1. Short circuit rating.
2. Voltage
3. Continuous current.

G. Cable terminal sizes.

H. Total voltage harmonic distortion calculation.

I. Descriptive bulletins.

J. Product sheets.

1.9 OPERATION AND MAINTENANCE MANUALS:

A. Prior to project closeout, submit ten (10) copies of the equipment operation and maintenance manuals.

B. Operation and maintenance manuals shall include the following information:

1. Instruction books and / or leaflets.
2. Recommended renewal parts list.
3. Drawings and information required by Section 1.06.

1.10 SPARE PARTS: Recommended spare parts list and prices shall be provided.

PART 2 - PRODUCTS

2.1 ADJUSTABLE FREQUENCY DRIVES (AFD)

A. The AFD's shall provide microprocessor-based speed adjustment of three-phase motors. The variable frequency and voltage output shall provide constant volts per hertz excitation for the motor up to 60 hertz. As a minimum, the full load output current of the drives shall be 125% of the equivalent motor horsepower as listed by National Electric Code.

B. The AFD's shall be of the Pulse Width Modulated (PWM) design converting the utility input voltage and frequency to a variable voltage and frequency output via a two-step operation. Adjustable Current Source AFD's are not acceptable. Transistors shall be used in the inverter section. GTO's and SCR's are not acceptable.

C. The AFD's shall have an efficiency that exceeds 96% at 100% speed and load. The efficiency shall exceed 80% at 50% speed and load.

D. The AFD's shall maintain the line side displacement power factor no less than 0.95 regardless of speed and load.

E. The AFD's shall have a one (1) minute overload current rating of 110% for variable torque loads and 150% for constant torque loads.

F. The AFD's shall be capable of operating any NEMA B squirrel cage induction motor, regardless of manufacturer, with a load rating within the capacity of the AFD's.

G. Power line considerations

1. The AFD's shall be provided such that they will operate to specifications in an environment with up to 10% total harmonic distortion of the voltage (THD) as defined in IEEE-519-1992. The point of common coupling shall be the panelboard from which the drives are served.
2. The AFD manufacturer shall perform a harmonic analysis of the electrical system at the building service entrance switchboard bus to define that full compliance to IEEE-519-1992, General Category, 5% maximum THD, and all other requirements, is attained. The analysis shall be computer generated which performs the Fourier analysis of the system. The results shall list the % voltage and current harmonic amplitudes and current amperes of all harmonics up to the 49th at the defined points of common coupling. A summary of all harmonics shall detail the % total THD, % total TDD, total power factor, and RMS line current.
3. The contractor shall provide the required data for the AFD manufacturer to complete the harmonic analysis. Information shall include the utility short circuit amperes capability; the distribution transformer kVA and impedance; the length, size, and number of wires per phase to the motor control centers feeding the AFD's; the wire data to the AFD's from the motor control centers; the wire data to the motors from the AFD's; and all motor nameplate data. Electrical one lines shall be provided by the manufacturer which include the kVA and impedance for each transformer, the resistance and impedance of each wire run, and configuration of the electrical system used to perform the harmonic analysis.
4. The AFD manufacturer shall verify compliance to IEEE-519-1992 in the field after all equipment is placed in operation by instrument measurement of the THD and TDD.
5. Throughout the entire warranty period the AFD manufacturer shall be responsible for the cost of all equipment required to meet IEEE-519-1992, General or Dedicated Category, at no additional cost to the Owner. Equipment may include input isolation transformers, input reactors, DC bus reactors, output reactors, output filters, common mode filters, etc.

H. Starting a Spinning Motor:

1. The AFD's shall be able to start into a spinning motor. The AFD's shall be able to determine the motor speed in any direction and resume operation without tripping. If the motor is spinning in the reverse direction, the AFD's shall start into the motor in the reverse direction, bring the motor to a controlled stop, and then accelerate the motor in the preset method of starting; or,
2. AFD shall have sensing and logic that will prevent the drive from attempting to energize a spinning motor.

I. Standard Operating Conditions:

1. Incoming Power: Nominal voltage stated above +10% to -10%, and 50 / 60 hertz (+/- 2 hertz) power to a fixed potential DC bus level.
2. Frequency stability of +/- 0.5% for 24 hours with voltage regulation of +/-2% of maximum rated output voltage.

3. Motor slip dependent speed regulation of 3%.
4. Five cycle carry-over during utility loss.
5. Insensitive to input line rotation.
6. Humidity: 0 to 95% (noncondensing and noncorrosive).
7. Altitude: 0 to 3,300 feet above sea level.
8. Ambient Temperature: 0 to 40 degrees C.

J. Control Functions:

1. All AFD programmable parameters shall be adjustable from a digital operator keypad located on the front door of the AFD. Parameters shall include:
   a. Programmable frequency command (keypad, remote).
   b. Programmable start command (keypad, remote).
   c. Forward or reverse start, stop, and digital speed control via digital operator keypad.
   d. Programmable maximum and minimum frequency limits.
   e. Programmable acceleration and deceleration times.
   f. Programmable carrier frequencies, V / Hz, and critical frequency avoidance lockout zones.
   g. Programmable electronic overload and torque limits.
   h. Programmable multiple attempt restart.
   i. Programmable jog and preset speeds.
   j. Programmable dwell time at start to maximize motor starting torque.
   k. Programmable "Catch a Spinning Motor" function, if applicable.
2. The AFD's shall be equipped with the following door-mounted devices:
   a. Digital or potentiometer speed control.
   b. Hand-Off-Auto control selector switch.
   c. Local-remote speed control selector switch.
   d. Status lights for run, fault alarm and drive-ready statii.

K. The AFD's shall have the following system interfaces:

1. Inputs:
   a. Process control speed reference interface to receive either a 0-10 Vdc, 4-20 mAdc or speed potentiometer signal. See drawings for type to be used for this project.
   b. Remote mode start contact.
2. Outputs:
   a. Run relay with an isolated set of Form C contacts.
   b. Dry contact output to indicate protective function trip.
   c. Analog output signal proportional to output frequency.

L. Monitoring and Displays: The AFD's shall have at least an LED or LCD display indicating monitored functions as described in the following:

1. Output current.
2. Output frequency.
3. Motor rpm.
4. Trip cause.

M. Protection Functions: The AFD shall include the following protective features:

1. AC input line current limiting fuses rated 200,000 AIC for fault current protection of AC to DC converter section.
2. Overcurrent protection.

3. Overvoltage protection.
4. Undervoltage protection.
5. Overfrequency protection.
6. Phase loss and phase reversal protection.
7. Overtemperature protection.
8. Ground fault protection.
9. Adjustable current limit.
10. Line-to-line and line-to-ground output short circuit protection.
11. Variable torque overload capability shall be 125% of the motor FLA based on the NEC ratings for 60 seconds.
12. After shutdown due to overvoltage / undervoltage, phase loss or phase reversal, drive shall restart after voltage(s) have returned to within limits.

N. Enclosures shall have the following features:

1. Front accessibility with easily removable assemblies.
2. NEMA 1 rating.
3. Forced ventilation where required to dissipate heat assuming maximum ambient temperature of 40 degrees C.
4. 16-gauge steel, 30 HP and above.
6. Surfaces thoroughly cleaned and phosphatized prior to painting. They shall be primed with a corrosion-resisting coating, ANSI 61 gray finish paint.
6. Doors shall include knock-outs for mounting up to 6 operator devices. Factory mounted operator devices shall be wired at the factory.
7. Safety switch type disconnect.

O. Accessories

1. 120 vac, 3-wire control to all AFD to interface with remote dry contacts up to 500 feet away.
2. Auxiliary drive status relay with two, Form C relay pairs, rated 2 amps resistance at 120 vac.

2.2 ACCEPTABLE MANUFACTURERS

A. Allen-Bradley

B. Cutler-Hammer / Westinghouse

C. General Electric

D. Siemens

E. Square D

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Install in accordance with manufacturer's printed instructions.

B. Mounting of AFD's not packaged in mechanical equipment.

1. AFD's 66 inches high and less:
   a. Bolt to wall
      (1) Install so that top of enclosure is 72 inches above finished floor.
      (2) If wall is an exterior wall or other wall subject to condensation, install stand-off channels on wall and bolt enclosure thereto.
      (3) Or,
   b. Mount on floor-mounted channel frame such that top of enclosure is 72 inches above finished floor.
2. AFD's greater than 66 inches high:
   a. 24 inches deep or greater: Install on 4-inch high concrete housekeeping pad having chamfered edges.
   b. Less than 24 inches deep: Install on 4-inch high concrete housekeeping pad having chamfered edges and bolt to wall for stability.

C. WARNING SIGNAGE conforming to NFPA 70E shall be installed on the equipment.

3.2 FIELD QUALITY CONTROL

A. Provide the services of a qualified factory-trained manufacturer's representative to assist the Contractor in installation and start-up of the equipment specified under this Section. The manufacturer's representative shall provide technical direction and assistance to the Contractor in general assembly of the equipment, connections and adjustments, and testing of the assembly and components contained herein.

B. The following minimum work shall be performed by the Contractor under the technical direction of the manufacturer's service representative.

1. Inspection and final adjustments.
2. Operational and functional checks of AFD's and spare parts.

C. The Contractor shall provide three (3) copies of the manufacturer's field start-up report before final payment is made.

3.3 MANUFACTURER'S CERTIFICATION:

A. A qualified factory-trained manufacturer's representative shall certify in writing that the equipment has been installed, adjusted, and tested in accordance with the manufacturer's recommendations.

B. The Contractor shall provide three (3) copies of the manufacturer's representative's certification before final payment is made.

3.4 TRAINING

A. The Contractor shall provide a training session for up to three Owner's representatives for one normal workday at a jobsite.

B. The training session shall be conducted by a manufacturer's qualified representative.

END OF SECTION

SECTION 230593

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 The contract documents apply to this section.

A. Perform testing specified in this section in the presence of the Engineer's representative or the Owner's duly authorized representative. Local or state authorities having jurisdiction shall be given due notice of the tests as may be required by them, and acceptance of the work will be contingent upon acceptance by the public authority.

B. Furnish all necessary equipment and assume all costs involved to perform all testing, cleaning, and balancing operations required.

C. Tests of piping systems shall be conducted before connections to equipment are made and before piping is concealed.

D. Systems found to have leaks shall be retested after leaks have been repaired.

E. Test duct systems under normal fan pressure with all air handling equipment, connecting ductwork and supply or exhaust outlets in place.

F. Take all readings with clean filters in place.

G. After cleaning, balancing, and testing of individual equipment items, test the system to determine that all items perform as integral parts of the system and temperatures and conditions are evenly controlled throughout the areas served. Make corrections and adjustments to produce the specified conditions.

1.2 ADJUSTING AND BALANCING:

A. The General Trades Contractor shall engage the services of an independent contractor who specializes in the practice of testing, adjusting and balancing mechanical equipment and systems, to test, adjust and balance all systems until design function and operation are achieved.

B. Supervision - Testing, adjusting and balancing shall be performed in accordance with the procedures of the Associated Air Balance Council.

C. Instruments shall be calibrated prior to balancing. Types, serial numbers, and dates of calibration of all instruments shall be listed in the final air and water balance reports.

D. Air balance and testing shall not begin until the system has been completed and is in full operation.

E. Make changes in pulleys, belts, motors, and dampers or add dampers as required for correct air balance.

1.3 SUBMITTALS:

A. Submit typewritten copies of schedules of readings taken during balancing and testing operations indicating the required reading, the first reading taken, and the final balance reading for the items listed in test data schedule at the end of this section.

B. A schematic of each system balanced shall be included and shall note locations of all readings taken as listed in schedules of readings.

PART 2 - PRODUCTS

2.1 Not Applicable

PART 3 - EXECUTION

3.1 Test the following mechanical piping systems as specified, repair all leaks and repeat test until specifications are met.

A. Test field-assembled refrigerant piping and apparatus for one hour with dry carbon dioxide or nitrogen, plus a small amount of refrigerant. Test pressures shall be in accordance with the American Standard Safety Code for Mechanical Refrigeration.

B. Subject all field-assembled refrigeration piping systems to the following leak test before evacuating and charging the system.

1. Install gauges as necessary to read test pressures.
2. Close the compressor suction and discharge valves to prevent damage to unloader bellows or other internal parts peculiar to the compressor model. Remove all relief valves and all controls which could be damaged by test pressures.
3. Open the liquid line shutoff valve and liquid solenoid valve. Charge the system with enough refrigerant to raise the system pressure to 15 psig.
4. Apply pressure to the system by introducing dry nitrogen or dry carbon dioxide through the front seat port of the compressor discharge valve. Oxygen or acetylene shall not be used.
5. Raise the entire system pressure to 150 psig or 50 psi above the design low side pressure, whichever is the higher. Then close the liquid line shutoff valve and increase the high side pressure to 350 psig or 50 psi above the design high side-pressure, whichever is higher.
6. With the test pressures in the system tap all brazed connections with a rubber or rawhide mallet to start leaks in poor connections before testing for leaks with a halide torch.
7. Check all fittings, couplings and valves with the torch.
8. Each leak shall be repaired after bleeding off the test charge by taking the joint apart and thoroughly cleaning, and remaking as a new joint.
9. After repairing all leaks, apply the test pressures as described above, remove the charging cylinder, and allow the system to stand with test pressure for 24 hours.
10. There shall be no change in gauge pressure after 24 hours, except that attributable to ambient temperature change.
11. Leaks indicated by this test shall be located as described in Section 15060, and remade as described above until the 24 hour test can be passed.
12. Upon passing the 24 hour test blow off the test pressure and replace relief valves and controls removed.

C. Duct systems shall be balanced to produce air quantities within ten percent of specified requirements.

D. Fan performances shall be checked by pitot traverse. Air quantities shall be within 10% percent of specified requirements.

E. Ducts, casings, and housings shall not leak sufficiently under normal operating conditions to cause audible sound or blowing detectable to the hand.

3.2 ADJUSTING AND BALANCING:

A. Remove and replace prefilters or disposable type filters in each air conditioning unit used during construction.

B. Adjust blower rpm to deliver specified cfm.

C. Measure air quantities in main and branch ducts by traversing cross sectional area of duct with pitot tube.

1. Ducts having velocities of 1000 feet per minute or more shall be measured with inclined manometers (draft gage) or magnehelic gages.
2. Ducts having velocities of less than 1000 feet per minute shall be measured with micromanometers, hook gages, or similar low pressure instruments.
3. Openings in ducts for pitot tube insertion shall be provided by installation of instrument ports.
4. Diffuser, grille, and register air quantities shall be determined by direct reading velocity meters.

D. Obtain design air quantities in main ducts by adjusting fan speeds. Then adjust branch duct air quantities by volume or splitter dampers. Permanently scribe or punch mark dampers after air balance is complete to enable them to be restored to their correct position if disturbed at any time.

E. Opposed blade dampers at diffusers and registers may be used to balance air quantities providing final adjustments do not provide objectionable drafts or sound levels. Final air quantities shall be within ten percent of design requirements. Air quantity adjustments by outlet deflectors, grids, or air scoops will not be permitted.

F. In cooperation with the temperature control manufacturer's representative, set adjustment of automatically operated dampers to operate as specified.

G. Operating controls and safety devices. Adjust and record set point of all automatic temperature controls and all automatic operating and safety controls for boilers, chiller, water heater, and other similar equipment, listing:

1. Type of control
2. Function
3. Location
4. Setting

3.3 HVAC CONTROLS TESTING:

A. Test and adjust all controls completed to date prior to turning over any area of the building to the Owner for occupancy. Verify adjustment and scheduled test data point by point to assure compliance with the plans and specifications.

1. The contractor shall assume all costs associated with readjustment and retesting control points set prior to completion of the project.
2. Submit all scheduled test data and other information as set forth below.

3.4 TEST DATA SCHEDULES: (Both initial and final, as applicable to intermediate and overall project completion)

A. Air Balance Test Data:

1. Fan Name Plate Data:
   Unit designation
   Manufacturer and model
   Size
   Arrangement, discharge, class
   Motor, hp, volts, phase, cycles, full load amps
2. Design Conditions:
   CFM
   Static pressure, inches of water
   CFM outside air at minimum outside air
   Inlet, outlet, and outdoor air dry & wet bulb temperatures, degrees F
3. Field Test Results:
   CFM
   Suction and discharge static pressure, inches of water
   Fan rpm
   Fan motor operating amps
4. Velocity Tests for Main and Branch Ducts and
   Fresh Air Intake Duct:
   Duct location or designation
   Duct size
   Number of velocity readings
   Duct average velocity, fpm
   Total air quantity, cfm
5. Individual Diffusers, Registers, and Grilles:
   Diffuser, register, or grille identification as to location and area
   Manufacturer, type and size
   E.F.A. factor, core area or neck area
   Required and resultant test velocities, fpm
   Required and resultant test quantities, cfm
   Deflector and/or diffuser core setting

B. Miscellaneous Test Data:

1. Operating Controls: Adjust and record set point and record operating point of all automatic controls listing the following:
   Type of control
   Function
   Location
   Set point
   Operating point

   (Provide date and time for each point and reading above)

END OF SECTION

SECTION 230700

HVAC INSULATION

PART 1 - GENERAL

1.1 The contract documents apply to this section.

1.2 The intent of this specification is to provide a quality installation which may not be attainable through the use of a standard composite consisting of insulation, vapor barrier and jacket assembled by an insulation manufacturer. However, in some installations, composites will be acceptable provided they meet the requirements of the specifications relating to referenced standards for individual components.

1.3 Finished spaces shall be defined as all areas except pipe and duct tunnels and shafts, attic spaces and spaces above furred ceilings.

A. Concealed spaces shall be defined as all areas other than finished spaces.

1.4 ACCEPTABLE MANUFACTURERS shall be the following referred to hereafter by abbreviation.

A. Insulation

1. Manville
2. Owens / Corning (O/C)
3. Knauf

B. Vapor Barriers and Jackets

1. Manville
2. O/C
3. Knauf

C. Mastics, Adhesives, Sealants, Coatings

1. Childers
2. Celotex Corporation
3. Karnak Chemical

D. Tapes

1. Morgan Adhesives Company
2. Ideal
3. Armstrong Cork Company (ACC)

1.5 JOB QUALITY CONTROL:

A. Insulation jackets shall be drawn tight, fitted smoothly and wrinkle-free.

B. Do not use short pieces of insulation where a full length section will fit.

C. Do not insulate manholes, handholes, cleanouts, inspection stamps and nameplates. Bevel and flash around insulation on adjacent surfaces.

1.6 Fire hazard ratings for insulation, fasteners and jacketing materials shall not exceed flame spread of 25, fuel contribution of 50 and (when used indoors) smoke development of 50 as determined by ASTM E84, NFPA 255, UL 723 tunnel test ratings, unless specifically stated otherwise.

A. Flameproofing and fireproofing treatments are not acceptable.

1.7 Submit catalog information or shop drawings or both for insulation and related material.

1.8 Contractor shall submit certificates stating that materials meet specified requirements prior to installation.

1.9 INSULATION SCHEDULE:

SERVICE	TYPE INSUL.	THKNS, INCHES	FINISH IN CONCEALED AREAS	FINISH IN FINISHED AREAS	NOTES
A. PIPING					
Refrigerant low temp, all sizes	Flexible elastomeric	0.75	None	Two coats UV armaflex finish	
B. DUCTWORK					
Air cond supply	Flexible glass fiber	1.5	FSK vapor barrier jacket		1,2
Outside air intake ducts	Flexible glass fiber	1.5	FSK vapor barrier jacket	FSK vapor barrier jacket	1,2
Return air	Flexible glass fiber	1.0	None	FSK vapor barrier jacket	1,2

NOTES:

1. Apply flexible glass fiber insulation in concealed areas only.
2. Apply rigid insulation at locations where ducts are supported from below and anywhere ductwork is exposed.
3. Apply flexible elastomeric insulation on piping exposed outdoors.

PART 2 - PRODUCTS

2.1 MOLDED GLASS FIBER INSULATION, PIPES AND CIRCULAR DUCTS:

A. Insulation shall meet ASTM C 547 for preformed pipe insulation, Class I for 450 F service.

B. k value of 0.23 maximum at 75 mean temperature.

C. Insulation shall be Manville Micro-Lok 650 or approved equal.

2.2 FOAMED PLASTIC INSULATION:

A. Pipe, Ductwork and Equipment:

1. Insulation shall meet ASTM C534 for preformed flexible elastomeric cellular thermal insulation, Type I (tubular) and Type II (sheet).
2. Density range shall be 4.5 to 8.5 pounds/cubic foot with a 220 degree F maximum service temperature.
3. k value of 0.28 maximum at a 75 F mean temperature.
4. Water vapor permeability shall be less than 0.2 perm and water absorption less than six percent by weight.
5. Smoke developed shall be less than 150 for 2 inch thickness or less as determined by ASTM E84.
6. Insulation shall be equal to ACC Armaflex II or Manville Aerotube II.

B. Pipe, Ductwork and Equipment:

1. Insulation shall meet ASTM C591 for rigid preformed cellular urethane thermal insulation, Type II, Grade 2.
2. Density shall be 2 lb/cu. ft. with a minus 100 degree F to plus 200 degree F service temp.
3. k value 0.16 maximum at 75 degree F mean temperature.
4. Smoke developed rating shall be 155 or less for one inch.
5. Thickness as determined by ASTM E84.
6. Insulation shall be O/C Urethane F/S 25 or approved equal.

2.3 FLEXIBLE GLASS FIBER INSULATION, DUCTWORK AND EQUIPMENT:

A. Insulation shall meet requirements of ASTM C553 for mineral fiber blanket and felt insulation (industrial type), Type I (resilient, flexible), Class B-2.

B. Density shall be 0.60 pounds/cubic foot minimum with a 250 degree F service temperature.

C. k value of 0.31 maximum at 75 degree F mean temperature.

D. Insulation shall be O/C Faced Duct Wrap-FRK 25, Manville R-Series Microlite FSK1, or approved equal.

2.4 RIGID BOARD INSULATION, DUCTWORK AND EQUIPMENT:

A. Insulation shall meet requirements of ASTM C612 for mineral fiber block and board thermal insulation Class 2.

B. Density shall be 6.0 pounds/cubic foot with a 400 degree F service temperature.

C. k value of 0.24 maximum at 75 degree F mean temperature, compressive strength 25 pounds/square foot minimum to produce ten (10%) percent deformation.

D. Insulation shall be O/C Industrial Insulating Board 705 FRK, Manville Spin-Glas 817 FSK, or approved equal.

2.5 VAPOR BARRIER JACKETS:

A. Premolded PVC fitting covers, pipe-self-extinguishing: flame spread 25 or less. Fuel contributed 0, k value 0.27 at 75 degree F mean temperature 0 to 500 degree F temperature limits. Manville Zeston 25/50 or an approved equal.

B. Kraft and Foil, Pipes: Outer ply shall be 40 pounds white bleached embossed kraft. Inner ply shall be aluminum foil reinforced with fiberglass yarn 1/16 inch o.c. both directions. Flame extinguishing ply bonding adhesive. Water vapor permeance 0.02 perm or less, minus 20 to plus 450 degree F service temperature plain joint laps for field applied adhesive or laps with pressure sensitive adhesive acceptable. Manville Type AP, O/C 25 ASJ or an approved equal.

C. Glass Cloth, Pipe, Ductwork and Equipment: Reinforcing open mesh, continuous filament glass fabric to be used with vapor barrier adhesives. Glass cloth shall be Manville Duramesh Type 205 or equal.

D. Foil-Scrim-Kraft ductwork shall meet NFPA 90 requirements. Outer ply - 40 pounds flame resistant paper, inner ply - aluminum foil, ply bonding adhesive - flame extinguishing, water vapor permeance 0.05 or less, 40 to 250 degree F service temperature, Manville Type FSK, O/C FRK 25 or an approved equal.

2.6 ADHESIVES, FIRE RESISTANCE:

A. For securing field applied canvas jackets, with or without vapor barrier, to insulation. Dry flame spread rating 5 by ASTM E162, 0 to 180 degrees F service temperature.

B. For securing field applied glass cloth jackets with or without vapor barrier to insulation. Dry flame spread rating 5 by ASTM E162, 0 to 180 degrees F service temperature bonding time 5 to 20 minutes.

C. For securing flexible glass fiber duct insulation to ductwork. Dry flame spread rating 5 by ASTM E 162, minus 20 to plus 180 F service temperature, bonding time for insulation attachment 0 to 15 minutes.

D. For sealing laps of all vapor barrier jackets. Dry flame spread rating 5 by ASTM E 162, minus 20 to plus 180 F service temperature, bonding time for lap sealing two to ten minutes.

E. For sealing all joints on foamed plastic pipe or sheet insulation. Synthetic rubber base with synthetic resins and fillers added - hydrocarbon and ketone-type solvents. Flammability dry by ASTM E 84 method less than 5, smoke density factor 0, service temperature up to 220 degrees F, instantaneous bonding.

2.7 SEALANTS, VAPOR BARRIER: For all interior field constructed vapor barrier finishes for equipment, fittings, valves, flanges, surface patches, lap edges and flashings. Dry flame spread rating less than 25 by ASTM E 162, 20 to 150 degrees F service temperature, water vapor permeance 0.002 at 0.040 inch dry film thickness.

2.8 COATINGS, FOAMED PLASTIC PIPE AND DUCT INSULATION: Indoor and outdoor service, protective and decorative finish, dry flame spread rating less than 5 by ASTM E 162, service temperature minus 20 to plus 250 degrees F, drying time to touch two hours and through 24 hours, vinyl finish lacquer white or gray color.

2.9 TAPE:

A. For sealing foil-scrim-kraft vapor barrier jacket for ductwork insulation. O/C FRK tape, Morgan Adhesives Co. "Mactac" three inch width or approved equal.

B. For insulating short lengths of pipe and fittings in congested or hard to reach areas, may be used in conjunction with elastomeric pipe and sheet insulation, k value 0.27 at 75 degrees F mean temperature. Use limit 160 degree F, water vapor permeance 0.1 perm or less, ozone resistant.

PART 3 - EXECUTION

3.1 Inspect all surfaces and verify that work of other trades requiring insulation has been completed and is ready to receive insulation, specifically check for obvious defects such as leaking pipe or duct joints, broken fittings, hanger supports, and the like, that would result in damage to the completed insulation job, or that would adversely affect the execution and quality of the insulation systems as specified. Do not proceed with application of insulation until defects are corrected.

3.2 Remove all dirt, scale or other extraneous loose material from surfaces to be insulated.

3.3 Install specified materials either as sequentially applied components or as a composite system if applicable.

3.4 On large vertical tanks or long vertical runs of pipe provide insulation supports at intervals required to prevent the weight of the insulation from exceeding its compressive strength.

3.5 PIPE AND EQUIPMENT INSULATION:

A. Molded Glass Fiber: Apply thickness shown in insulation schedule.

1. Cover fittings with one piece UL 25/50 rated PVC premolded fitting covers stapled or tacked in place. Apply over proper shape factory precut insulation blanket. Wrap circumferential edges of cover with vapor-barrier pressure sensitive color matching tape. Overlap tape two inches on adjacent insulation and on cover. On chilled water piping, apply a vapor barrier mastic bead 1/8 inch in diameter around pipe covering close to end of covering before applying PVC cover.
2. Flanges, strainers, automatic and manual valves and bonnets: cover with plain duct wrap of one pound/cubic foot minimum density, wrapped firm under compression, and wired in place. Finish with 1/4 inch layer of hydraulic insulating cement to a thickness equal to adjoining insulation.
3. Fastening: secure insulation jacket with lagging adhesive if not provided with self-sealing pressure-sensitive adhesive. In areas not accessible after construction, also secure insulation with aluminum bands on 12 to 18 inch centers.

B. Flexible Elastomeric Insulation: Apply thickness shown in insulation schedule.

1. Insulate screwed fittings with over-sized covering of the same material, mitering elbows and lapping the adjacent sections. Adhere fittings and seal butt joints.
2. Apply vinyl finish lacquer in two coats where exposed either indoors or outdoors.

C. Urethane Insulation: Apply thickness shown in insulation schedule.

1. Cover fittings, flanges, valves and bonnets with fabricated, mitered segments of molded urethane of thickness as insulation on adjacent pipe. Wire in place and cover with a 1/4 inch coat of fiber cement.

2. Where desired, fittings may be insulated with pre-molded urethane or foamed-in-place urethane insulation using molds supplied by the insulation manufacturer.
3. Cover fittings with one piece UL 25/50 rated PVC pre-molded fitting covers stapled or tacked in place. Apply over proper shape factory pre-cut insulation blanket.
4. Wrap circumferential edges of cover with vapor barrier pressure sensitive color matching tape, over-lapping two inches on adjacent insulation and on cover.

3.6 DUCTWORK INSULATION:

A. Flexible Glass Fiber: Apply thickness shown in insulation schedule.

1. Wrap insulation tightly around ducts. Adhere to metal with fire resistive adhesive, 100 percent coverage. Add mechanical fasteners at not more than 18 inches on center on ducts over 24 inches wide.

B. Rigid Board Glass Fiber: Apply thickness shown in insulation schedule.

1. Cut insulation to fit between standing seams and stiffeners.
2. Secure to metal with welded pins and self-locking caps installed flush with adjacent insulation surface.
3. Pins shall be spotted 18 inches on center with not less than two rows of pins per side and with one pin spaced three inches in from each corner.
4. Apply a heavy bead of vapor barrier sealant around each weld pin before installing cap.
5. Caps shall match color of glass cloth jacket if used.
6. Cover fittings with material of same type and thickness. Score as necessary for curved surfaces.

C. Apply a 2-1/2 inch minimum wide pressure sensitive tape to all longitudinal and circumferential joints and rub in carefully. Center tape over edge of stapling flap. Heat seal if temperature is below 50 degrees F.

D. Make all connections to metallic equipment with sheet metal screws and washers and apply a 2-1/2 inch minimum wide pressure sensitive tape.

E. Fiber glass ductwork shall be reinforced in accordance with SMACNA "Fibrous Glass Duct Construction Standards," latest edition.

F. Apply flashing on pipe, ductwork and equipment for a complete moisture and vapor seal at all metal-to-insulation joints, exposed edges of insulation and other protrusions through jackets.

1. Apply a continuous bead or fillet of flashing compound to completely seal the joint. Extend a 1/16 inch film of flashing compound over adjacent insulation and metal surfaces at least three inches. Embed glass fabric into the wet coating over entire surface, smoothing out all wrinkles. Immediately apply a 1/8 inch film of flashing compound to the entire membrane surface leaving a large bead or fillet over the joint. Allow compound to dry, then extend adjacent finish over the flashing a minimum of three inches.

END OF SECTION

SECTION 232113

HYDRONIC PIPING

PART 1 - GENERAL

1.1 The contract documents apply to this section.

1.2 Drawings show approximate general routing of principal service lines and drains, however, execution of the work shall be coordinated more precisely as described in Part 3 of this section.

1.3 DEFINITIONS:

A. Outside shall mean five feet beyond the perimeter of buildings.

B. Inside shall mean inside buildings and within 5 feet of the perimeter of buildings.

1.4 SCOPE:

A. All inside piping.

1.5 QUALITY ASSURANCE:

A. Welding procedures used and the performance of welders shall meet the requirements of the ASME Boiler and Pressure Vessel Code (Section IX).

PART 2 - PRODUCTS

2.1 CVPC pipe, Schedule 80 - Cell class of 24448 for pipe and 23447 for fittings as per ASTM D 1784. Additionally, all pipe and fittings shall conform to NSF standards 14 and 61, be listed by NSF International for reclaimed water, and bear the mark "NSF-rw".

½" through 2" sizes: ReUze™ made with FlowGuard Gold® CPVC Copper Tube Size manufactured to standard dimension ratio (SDR) 11 and shall conform to ASTM D 2846. Pipe to be purple pigmented and labeled Charlotte Pipe ReUze™ Made with FlowGuard Gold® and include "Caution: Non-Potable Water. Do Not Drink". Fittings to be either tan or purple in color. Transition fittings to have brass male or female connections with integral CPVC socket connections as manufactured by Charlotte Pipe and Foundry Company, or approved equal.

All pipe and fittings shall be produced by a single manufacturer and to be installed in accordance with manufacturer's recommendations and local code requirements. Charlotte Pipe ReUze™ with FlowGuard Gold® CPVC Copper Tube Size shall be joined using approved one-step solvent cement conforming to ASTM F 493. Pipe and fittings shall be manufactured by Charlotte Pipe and Foundry Company, or approved equal and are intended for hot and cold non-potable water distribution systems.

2.2 Copper tube type K & L: ANSI/ASTM 388

2.3 PVC pipe, Schedule 40, Grade PVC 2116: ASTM D1785 and ASTM D2241.

2.4 PIPE FITTINGS:

A. Welded, flanged, screwed, brazed, or soldered fittings for ferrous or copper piping shall meet the requirements of the standards specified in this section.

B. Cast iron no-hub fittings for cast iron pipe: CISPI 301.

C. Schedules 40 and 80 steel butt welded fittings: ANSI B16.9 and ANSI/ASTM A234, Grade B.

D. PVC Fittings: ANSI/ASTM D2464, D2466, D2467.

E. Cast solder fittings: ANSI B16.18.

F. Dielectric fittings: Where ferrous and nonferrous piping materials are connected by fittings, use EPCO dielectric fittings, Model HA in sizes two inches and smaller and Model GX for larger sizes.

G. Unions: Copper pipe two inches and smaller: wrought or extruded copper for braze joints meeting requirements of ANSI B16.22.

H. Nipples:

1. Comply with National Bureau of Standards C.S. 5, entitled "Pipe Nipples, Brass, Copper, Steel and Wrought Iron".
2. Nipples shall be of same material and weight as pipe with which used, except that nipples having an unthreaded section of one inch or less shall be extra heavy. The use of running thread nipples will not be approved.

PART 3 - EXECUTION

3.1 INSPECTION AND PREPARATION:

A. Prior to all piping work, carefully inspect the installed work or excavation by other trades and verify that all such work is complete to the point where the piping may be installed in accordance with these documents.

B. Follow the drawings in laying out work and check drawings of other trades to verify sufficient space to install piping.

C. When pipe is to be insulated, allow a clearance equal to the insulation thickness plus at least two inches.

D. Undimensioned drawings are intended to indicate the general arrangement of piping systems and are not intended to convey precise locational information.

E. Coordinate with other trades to permit the work of all trades to be installed.

F. Offsets, fittings, and extra pipe necessary to avoid interference, or provide maximum headroom and space shall be furnished and installed without additional expense to the Owner.

G. If the piping is installed without coordinating with other trades and so as to cause interference with work of other trades, the necessary changes shall be made at no extra charge.

3.2 INSTALLATION:

A. General:

1. Run piping concealed in finished areas unless otherwise indicated.

2. Run piping exposed in equipment rooms, service areas, or areas with no means or need for concealment.
3. Excessive cutting and similar operations likely to weaken a building structure to facilitate the piping installation will not be permitted.
4. Take care and implement suitable measures throughout the construction period to prevent trash and dirt from entering pipes, before, during, and after installation.
5. Unless otherwise indicated, run piping parallel to the walls of the building. Erect vertical piping straight and plumb, with risers centered in pipe sleeves.
6. Offsets shall conform to offsets in the building construction.
7. Where pipe is to be insulated, provide a clearance equal to the insulation thickness plus a minimum of 2 inches.
8. Coordinate the work to insure that sleeves and inserts are positioned accurately along with other built-in items, before concrete pouring takes place and before walls, partitions, and ceilings or roofs are erected, so as to reduce to an absolute minimum the necessity for cutting or patching at a later stage.

B. Changes in direction of pipe shall be accomplished by bending or by the use of factory made fittings of the long radius type if applicable to the piping type. Gas pipe, steam pipe and high temperature hot water piping shall not be bent unless otherwise indicated on drawings. Bending shall be done uniformly by a device made especially for bending. Mitered joint elbows shall be used only with specific written approval by Engineer.

C. Make changes in pipe size by using factory made reducers. Bushings, grooved reducing couplings, and field made reducers will not be permitted. Use eccentric reducers in steam systems with the flat side on bottom.

D. Tees: Weldolets, sockolets, and threadolets or factory made tee fittings shall be used for branch connections when the diameter of the branch connection does not exceed 50 percent of the diameter of the main, otherwise, factory made tee fittings shall be used for tee connections.

E. Welding, Soldering and Brazing:

1. Welded, soldered or brazed joints between sections of pipe and between pipe and fittings shall be in strict compliance with ANSI B31.1, Chapter 5, Section 127.
2. Make joints in piping system for all services tight and leak-proof against the design pressure.
3. Peening of welded joints to correct leaks will not be permitted.
4. Brazed or soldered joints that leak shall be disassembled, cleaned and made again.

F. Install unions on each side of threaded valves, regulators, and similar items and on one side of each threaded check valve and at all pieces of equipment, so that such equipment might be readily disconnected and removed. Unions shall not be placed in a location which will be inaccessible after completion of the building.

G. Provide drain valves for piping system, including all valved branches, with drain valves in accessible locations to permit branch or complete system drainage.

H. Provide for expansion by using swing joints, turns, expansion loops or long offsets, anchors and guides as to allow for, and for control of, pipe movement, in accordance with ANSI B31.1.

I. Closed Recirculating Systems:

1. Install air vents at all high points, and at points that will tend to trap air.
2. Provide the system with at least one capped low point fill valve and at least one capped drain valve.

3. Do not install piping in a manner that creates low pockets unless specifically shown on the drawings.

J. Assemble flanges as specified by piping manufacturer.

K. Install refrigeration piping with sufficient pitch to allow adequate oil drainage. Use copper pipe which has been factory cleaned, filled with nitrogen, and sealed specifically for refrigerant use. Valves, fittings, and other accessories used in refrigeration piping systems shall be delivered to the jobsite capped or plugged and shall be inspected prior to final assembly. While being brazed, joints shall be continuously purged with dry nitrogen to prevent formation of scale within the tubing. Pipe, fittings and piping system shall be capped when work is not in progress.

L. Piping to be insulated and supported by roller or trapeze hangers or other surfaces providing approximate point support shall be provided with a steel protection saddle.

M. Protect pipes which are to receive a vapor barrier insulation from pipe hangers by using pipe saddles specifically designed for this purpose.

3.3 LEAK TESTING OF PIPING SYSTEMS:

A. Perform leak tests according to the applicable paragraphs in Section 230593.

3.4 CLEANING OF PIPING SYSTEMS:

A. The interior surfaces of piping shall be smooth and entirely free from obstructions to flow. Clean the systems before connecting to equipment or other systems.

3.5 EVACUATION AND DEHYDRATION OF FIELD CONNECTED REFRIGERATION SYSTEMS:

A. Before evacuation, test the systems for leaks according to the applicable paragraph of Section 230593.

B. The evacuation, dehydration, and charging of the refrigeration systems shall be supervised by the refrigeration equipment manufacturer's representative.

3.6 ADJUSTING PIPING SYSTEMS:

A. Inspect and adjust flush valves after installation to insure quiet operation and proper closing.

B. Adjust closed water system pressurization controls as follows:

1. Normally pressurized systems:
   Establish proper water level in compression tank
   Vent all air from system
   Adjust makeup valve setting
   Operate pumps for at least four hours, and
   Vent all air from system and recheck water level
2. Mechanically pressurized systems.

3.7 FIRE RESISTING SEALS: All piping passing through fire rated walls, floors and ceilings shall be provided with fire seals in accordance with NFPA and approved by local inspectors.

PART 4 - PIPING SCHEDULE

SERVICE	SIZE	PIPE TYPE	FITTING TYPE	VALVE TYPE	MFG. & NO.
HW & CW	2 in. & smaller	Sch. 80-CPVC Note 1	As recommended by mfg.	Gate Globe Check Ball	Nibco T-111 Nibco T-211Y Nibco T-413B Nibco T-585-70
HW Htg. under 100 psi	2-1/2 in. to 10 in.	Sch. 80-CPVC Note 1	As recommended by mfg.	Gate Globe Check	Nibco F-617O Nibco F-718-B Nibco F-918B
Chilled Water	2-1/2 in. to 6 in.	Sch. 80-CPVC Note 1	As recommended by mfg.	Gate Globe Check	Nibco F-617O Nibco F-718-B Nibco F-918B
A-C Cond. Drains	All sizes	Sch. 40 PVC Note 1	As recommended by mfg.		
Refrigerant	All sizes	Type K copper cleaned and capped or ACR	Wrought copper braze		

NOTE 1 - HW, CW, HW Htg., Chilled Water, and A-C Cond. piping installed within spaces serving as air plenums shall be type L copper sweat fit.

END OF SECTION

SECTION 232123

HYDRONIC PUMPS

PART 1 - GENERAL

1.1 The contract documents apply to this section.

PART 2 - PRODUCTS

2.1 Furnish and install as shown on the drawings, in-line pumps with gpm and head as indicated in pump schedule on the drawings.

A. Pump shall be single stage, split case design, with internals capable of being serviced without disturbing piping connections. Pumps shall be rated for 125 psi working pressure.

B. Impeller shall be enclosed type, dynamically and hydraulically balanced, keyed to the shaft and secured with a suitable locknut.

C. Pump shall employ a mechanical seal, with a carbon seal ring and ceramic seat, unless noted otherwise in the pump schedule on the drawings.

D. Pump bearing frame assembly shall be furnished with oil lubricated bronze journal bearings and hardened alloy steel shaft.

E. A flexible coupling capable of absorbing torsional vibration shall be employed between the pump and motor.

F. Pump shall be bronze fitted construction, unless noted otherwise in the pump schedule on the drawings.

G. Pump shall be factory tested at the operating conditions, thoroughly cleaned, and painted with one coat of machinery enamel prior to shipment.

H. Pumps shall be manufactured by Armstrong or equal.

PART 3 - EXECUTION

3.1 Install one pipe hanger on each side of each pipe hung pump, with neoprene hanger isolator having 0.3 inch minimum deflection with five horsepower and below, and with spring and neoprene hanger isolator having 1.0 inch minimum deflection when 7-1/2 horsepower or over.

3.2 Install all pumps in accordance with manufacturer's recommendations.

3.3 Inspect each pump for proper alignment before starting. After start-up, check each pump and motor bearing with a stethoscope. Replace any bearings noticeably noisier than rest. Using vibration meter, measure vibrations at all bearing locations perpendicular, both vertical and horizontal, and axial to the shaft. If pump exceeds two mils maximum displacement at 1750 rpm, or one mil at 3500 rpm, it shall be replaced, or imbalance corrected by a factory representative to above limits. If pump is installed on an inertia block, the above displacement limitation shall be reduced by the ratio of equipment weight to total weight of equipment and inertia block.

3.4 Check pump seals. There shall be no leakage from mechanical seals.

END OF SECTION

SECTION 232500

CHEMICAL TREATMENT SYSTEMS

PART 1 - GENERAL

1.1 The contract documents apply to this section.

1.2 **DESIGN CRITERIA:** Provide equipment and chemicals for treating the boiler steam system, loop water system and the tower water system to maintain the following system tolerances.

A. Corrosion inhibition shall maintain carbon steel surface loss to less than or equal to 2.0 mils per year.

B. Scale inhibition shall maintain the system free of scale deposit.

1.3 The manufacturer shall provide the services of a specialist during construction and for period of one year from the day the air conditioning system is first put into normal and continuous operation to supervise and advise the operating personnel in correct water treatment. The specialist shall be certified by the water treatment system manufacturer as competent in the operation of the system provided. Services shall include:

A. Supervision of the pretreatment, and the start-up and adjustment of automatic water treatment systems.

B. Minimum of six inspections, at start-up and during the cooling and heating seasons for water analysis, and to analyze and recommend changes in treatment as operating conditions vary during the adjustment period.

C. Inspections at intervals of not less than five weeks and additional inspections upon request from the Owner.

PART 2 - PRODUCTS

2.1 Bypass type chemical feeder for water treatment shall be designed for use with cake, powder or liquid of required capacity and suitable for working pressures up to 125 psi. ASME stamp not required. Provide necessary accessories for installation and shall include, but not limited to, 1/4 inch i.p.t. petcock, check valve, manual adjustment control valve, drain valve, globe or gate valves to allow bypass type installation.

2.2 Manufacturer shall be Betz Shot Feeder, Dearborn, Nalco or Mogul.

PART 3 - EXECUTION

3.1 Provide chemical treatment during operation of pumps while project is under construction.

3.2 Adjust the composition of recirculated water chemically to control scale and corrosion, without the use of chromates.

END OF SECTION

SECTION 233113

METAL DUCTS

PART 1 - GENERAL

1.1 The contract documents apply to this section.

1.2 Duct systems shall be in accordance with the latest SMACNA Duct Construction Standards, the National Fire Protection Association and manufacturer's recommendations where applicable.

1.3 **CLASSIFICATION OF DUCTWORK:** All systems shall be classified as low velocity.

1.4 **OFFSETS, BENDS, AND RELATED WORK:** The drawings covering the work of other trades shall be thoroughly examined and arrangements made to provide all necessary offsets, bends, or changes, including duct enlargements and streamlined pipe and hanger rod casings, as required to eliminate conflict with other trades.

PART 2 - PRODUCTS

2.1 **SYSTEMS AND MATERIALS:**

	SERVICE	MATERIAL	NOTES
A.	Low Velocity A/C	galvanized steel	
B.	Exhaust, General Use	galvanized steel	
C.	Flexible Ductwork	metal reinforced fabric w/ integral insulation	

2.2 Fittings for all duct systems shall be of the same material as the duct.

2.3 Round elbows shall be smooth, stamped type or five-piece type having centerline radius of 1-1/2 times the duct diameter.

2.4 Fittings for factory manufactured duct system shall be of same manufacturer as the duct system with all dimensions and components compatible.

2.5 Air turning vanes for square or short radius elbows in rectangular ducts shall be double turning vanes, air foil in shape.

2.6 Materials:

A. Galvanized steel shall meet requirements of ASTM A 527, "Steel Sheet, Zinc Coated by the Hot-Dip Process, Loc-forming Quality".

B. Insulated flexible ductwork shall be Flexmaster Type 9M or equal in compliance with NFPA 90A and UL listed for Air Duct.

2.7 Duct tape shall be by the 3-M Co., Permacel Co., the Kendall Co., or equal.

A. Tape shall be minimum 12.0 mils thick and shall be plastic coated cloth type for non-metallic ductwork and metal foil for metallic ductwork.

B. Do not use a sealer with these types of tapes. Tapes shall be approved by SMACNA.

2.8 Duct sealants shall be premium grade S2 duct sealer by Duro Dyne, Foster 30-02 duct sealant by the Fuller Co., or approved equal. If a tape is used in conjunction with the sealant, it shall be compatible with it and shall be recommended by the sealant manufacturer.

2.9 Manual damper operators shall be locking type as manufactured by Ventfabrics, Inc. or Young Regulator Company.

2.10 Instrument ports shall be Young Regulator Company No. 1100 or 1101 with neoprene gaskets.

2.11 Access door latch shall be Ventfabrics, Inc. No. 260 "Ventlock" latch for doors large enough to enter only.

2.12 Quadrants, controls, indicating instruments and similar equipment shall be provided with extensions and/or brackets for mounting on the surface of the insulation of insulated ducts.

2.13 Support and bracing material for galvanized ductwork shall be galvanized steel and for stainless steel ductwork shall be stainless steel and have the same finish as the stainless steel ductwork. Supports for factory manufactured duct systems other than single-wall sheet metal systems, shall be in accordance with manufacturer's recommendations.

2.14 Flexible connections shall be made with "Ventglas" woven glass fabric double coated with neoprene, as manufactured by Ventfabrics, Inc.

2.15 Splitter, butterfly and multi-blade dampers shall be in accordance with SMACNA low velocity duct construction standards.

2.16 Duct sleeves through floor shall be at least 14 gage galvanized steel.

PART 3 - EXECUTION

3.1 Install special items of equipment in the duct systems, including automatic dampers, sensors and controls, under the direct supervision of the controls contractor.

3.2 Mount quadrants, controls, indicating instruments and similar equipment on the surface of the insulation of insulated ductwork.

3.3 Enlarge ducts designated to be lined by an amount equal to the lining thickness, so as to maintain the indicated air flow dimensions. Provide duct lining in accordance with Section 15250 - Insulation.

3.4 Cross break or bead ductwork having a width or depth in excess of 12 inches.

3.5 Seal unwelded round and rectangular duct joints with duct sealer, duct sealer and tape or gasket. Tape shall be compatible with sealer.

3.6 Provide volume control and balancing dampers of the splitter, butterfly or multi-louver type for controlling air volume and direction and for balancing the system. Stiffen ducts at damper locations to provide adequate rigidity.

3.7 Install duct systems so that when complete and under operating conditions system shall be free from chatter or vibration.

3.8 Provide access doors in duct for all automatic dampers, fire dampers, controls, filters and similar equipment. Doors shall be equal to Ruskin ADH12. Doors shall have hinges and latches and be

fitted with neoprene gaskets. Doors large enough to enter shall have latches operable from both sides.

3.9 FLEXIBLE DUCTWORK:

A. To connect flexible ductwork to sheet metal duct or equipment, apply duct sealer to inside of the flexible duct and secure with sheet metal screws through the metal spiral at three points around the duct.
   1. Apply an additional bead of sealer around the duct end and over the screws.
   2. Do not pressurize duct system for a minimum of 48 hours or as recommended by the manufacturer to allow sealant to dry.
   3. After the connection has been made on insulated duct reshape the insulation and vapor barrier over the duct end wrap twice around with duct tape, compatible with sealer, taking two or three tucks in the vapor barrier while taping.
   4. Where flexible duct is used for elbows, construct so that length shall be sufficient to provide a radius not less than 1.5 times the diameter.
   5. Support flexible ducts to prevent sagging.
   6. Limit continuous flexible duct runs to not more than 10 feet.

B. Flexible ductwork lengths shall be at least 12 inches long and shall be of the same nominal size as sheet metal duct to which it connects.

3.10 SLEEVES THROUGH FLOORS:

A. Provide sleeves through floors for all ducts passing through floors, except where ducts are enclosed in a sealed chase or passageway. Sleeve shall extend two inches above finished floor and shall be secured permanently in place.

B. Construct watertight joint between sleeve and floor with sufficient reinforcing to assure permanent watertightness.

C. Provide cover at the bottom of the sleeve and pack space between sleeve and duct with fiberglass insulation.

D. Where fire dampers are required, omit the sleeves but make the joint between the fire damper collar and the floor watertight.

3.11 Install fire dampers in accordance with manufacturer's printed instructions or SMACNA's fire damper guide for air handling system, whichever is more stringent.

A. Adjust fire dampers as follows:
   1. Disconnect fusible link
   2. Operate the fire damper several times.
   3. Adjust and correct all fire dampers to assure free, positive operation and proper latching.
   4. Reconnect fusible link

3.12 Provide instrument ports in ductwork for pitot tube test where required for air flow measurement.

3.13 Seal cloth flexible connections and firmly band at each connection point. Flexible connections shall be not less than four inches in length. Upon completion, recheck connections so that none or left in tension or fully compressed.

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. This Section includes the following:

1. In-line centrifugal fans.

1.3 SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated and 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: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring.

C. Operation and Maintenance Data: For power ventilators to include operation and maintenance manuals.

1.4 QUALITY ASSURANCE

A. AMCA Compliance: Products shall comply with performance requirements and shall be licensed to use the AMCA-Certified Ratings Seal.

B. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.

C. UL Standard: Power ventilators shall comply with UL 705.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver fans as factory-assembled unit, to the extent allowable by shipping limitations, with protective crating and covering.

B. Disassemble and reassemble units, as required for moving to final location, according to manufacturer's written instructions.

C. Lift and support units with manufacturer's designated lifting or supporting points.

1.6 COORDINATION

A. Coordinate size and location of structural-steel support members.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Belts: One set(s) for each belt-driven unit.

PART 2 - PRODUCTS

2.1 INLINE CENTRIFUGAL FANS AND CEILING EXHAUST FANS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

C. Basis-of-Design Product: Subject to compliance with requirements, fans and accessories by Loren Cook or a comparable product by one of the following:

1. Greenheck
2. Penn Ventilator

D. Description: Direct and belt-driven centrifugal fans consisting of housing, wheel, fan shaft, bearings, motor and disconnect switch, drive assembly, and accessories as indicated on drawings.

E. Accessories:

1. As indicated on drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install power ventilators level and plumb.

B. Support units using spring isolators.

C. Ceiling Units: Suspend units from structure; use steel wire or metal straps.

D. Support suspended units from structure using threaded steel rods and spring hangers.

E. Install units with clearances for service and maintenance.

3.2 CONNECTIONS

A. Install ducts adjacent to power ventilators to allow service and maintenance.

3.3 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Verify that shipping, blocking, and bracing are removed.
2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
3. Verify that cleaning and adjusting are complete.
4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
5. Adjust belt tension.
6. Adjust damper linkages for proper damper operation.
7. Verify lubrication for bearings and other moving parts.
8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
9. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
10. Shut unit down and reconnect automatic temperature-control operators.
11. Remove and replace malfunctioning units and retest as specified above.

B. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.4 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Replace fan and motor pulleys as required to achieve design airflow.

D. Lubricate bearings.

END OF SECTION

SECTION 233713

DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 The contract documents apply to this section.

1.2 **QUALITY ASSURANCE:** Diffusers, grilles and registers shall be the products of MetalAire or Price, whose catalog numbers are used in this section or equal.

1.3 Refer to floor plans for actual device quantities. In some instances the devices listed in the schedule may not be used.

PART 2 - PRODUCTS

2.1 **CEILING DIFFUSERS:** Metal Aire Model 5500 louvered face, aluminum diffuser with pattern and accessories as indicated on drawings.

2.2 **SUPPLY REGISTERS:** Metal Aire Model V4004D double-deflection, aluminum register with vertical face vanes, gasket for surface mounting and accessories as indicated on the drawings.

2.3 **RETURN REGISTERS:**

A. Metal Aire Model RHD single-deflection, aluminum return register with accessories as indicated on the drawings.

B. Metal Aire Model 7000R, perforated, aluminum return register with accessories as indicated on the drawings.

2.4 **EXHAUST REGISTERS:** Metal Aire Model CC5D cube-core, aluminum exhaust register with accessories as indicated on the drawings.

PART 3 - EXECUTION

3.1 Fit surface mounted outlets tight against the surface on which they are mounted with no perceivable gaps between the outlet and the mounting surface.

3.2 Touch-up or replace any device on which the factory finish is blemished in any way.

END OF SECTION

SECTION 238146

WATER TO AIR, PACKAGED HEAT PUMPS

PART 1 - GENERAL

1.1 The contract documents apply to this section.

1.2 Units shall be water source heat pump units as scheduled on drawings. Units shall be Water Furnace, or equal by Trane or McQuay.

PART 2 - PRODUCTS

2.1 Heat pump units shall be completely factory assembled consisting of compressor, coils, heat exchanger fans, and required heat pump controls.

A. Conditioner performance shall be A.R.I. certified and listed by a nationally recognized safety testing laboratory, or agency, such as Underwriter's Laboratories (UL) or Electrical Testing Laboratory (ETL).

B. Casing shall be corner post and panel construction with a 14 gauge galvanized steel base pan. Access panels be lined internally with acoustic fibrous glass insulation, overcoated, and with edges sealed or tucked under flanges, to prevent the introduction of glass fibers into the discharge air. All construction shall meet the National Fire Protection Association Standard 90-A. All internal sheet metal parts subject to water exposure shall be coated with a baked-on, thermo-setting plastic coat.

C. Conditioner shall contain a sealed refrigerant circuit, consisting of a hermetric motor-compressor, air-to-refrigerant finned tube coil, refrigerant flow metering device, water-to-refrigerant coaxial tube type heat exchanger, High pressure and low pressure safety cutouts, fusible pressure relief plug factory installed on the refrigerant circuit. Heat pump conditioners shall additionally contain a pilot operated refrigerant reversing valve. Cooling only unit shall provide a schraeder type access valve to permit the field installation of a pressure operated water flow regulating valve in the leaving water line.

D. High and low pressure safety switches and pilot duty compressor thermal or current switches shall be reset electrically by interrupting the power supply to the conditioner. Manual reset at the unit or by any means of thermostat cycling or switching will not be allowed.

E. Manufacturer shall guarantee heat pump conditioners to start and operate in an ambient of 40 degrees F. with air at 40 degrees F., with entering water at 70 degrees F., with both air and water at the flow rates used in the ARI standard rating test, for initial system start-up in winter.

F. A control panel shall be factory mounted within the conditioner enclosure, containing control logic for blower, compressor and reversing valve, auxiliary heat, and a low voltage control circuit transformer, completely factory wired.

G. Conditioner control logic shall provide for heating or cooling as required by the set points and switch positions of the remote, field installed, low voltage wall thermostat. Internally, the conditioner control logic shall provide for cycled fan operation simultaneous with compressor operation, to prevent compressor damage. Conditioner control logic shall permit user selection of continuous or automatic fan operation where the specified thermostat switching provides this feature. Compressor control logic shall provide anti-short-cycle and random

start, and shall suspend compressor operation in the event of excess condensate accumulation in the drain pan.

H. Heat pump conditioner control logic shall provide for delayed de-energization of reversing valve solenoid.

I. Conditioner control logic shall contain logic circuit to provide equipment status signal to either a central monitoring panel or an indicator light integral to the thermostat sub-base. Low voltage signal output shall be interrupted in the event of conditioner "fault" including high or low pressure safety cutout, or condensate overflow, or loss of power to the unit.

J. Capacitors used with single phase motors shall utilize a non-PCB dielectric.

K. Conditioner blower may be either direct or belt drive, s shown on the plans. Blower wheels shall be forward curved centrifugal type.

L. A multi-speed blower motor shall be provided on all units. Factory wiring shall be for high speed, with means provided for fast, easy, terminal block field reconnection to low speed, where shown on the plans. Field wire cutting, stripping or terminal application shall not be allowed for motor speed change.

M. All direct drive blowers shall provide mechanical means, external to the cabinet, of adjusting air volume to a value less than maximum at the specified external static pressure.

N. Conditioner shall separate the air handling section from the compressor and control section with a sound insulated divider panel.

O. All blower motors shall have a normal two year lubrication capacity and shall be initially lubricated at the factory.

P. All conditioners shall be provided with a one inch thick, throw-away type fiberglass filter, installed in a two-sided filter frame, arranged for "side-pull". Contractor shall remount the frame to accommodate up or down pull, as required, to ensure that the completed installation is serviceable. Piping and electrical connections shall be located to eliminate any interference with removal and replacement of the filter.

Q. Supply and return connections shall be IPT copper fittings, brazed to copper water tubes. Connection sub-assembly shall be mechanically fastened to the conditioner base pan. Condensate drain connections shall not be less than 3/4 inch.

R. Each unit shall be supplied with two fire rated flexible hoses with ASTM ratings of Flame Spread 25, Fuel Contribution 25, and Smoke Density 50 for connection to loop piping. Hose shall be covered with braided stainless steel.

S. Each unit shall be supplied with one combination balancing and shut-off valve with adjustable memory stop on return connection, and one ball valve on supply connection.

T. Provide five year warranty of entire assembled heat pumps.

PART 3 - EXECUTION

3.1 After assembly and piping, check all equipment for unremoved blocking and bracing which might prevent operation of moving equipment, or restrict freedom of vibration isolators. Check for loosened or missing nuts, bolts, set screws, keyways, and the like. Check for proper rotation of all fans.

3.2 Prior to flushing loop piping, disconnect supply and return hoses at heat pumps and bypass by using one hose to connect supply to return.

END OF SECTION

DIVISION 26

ELECTRICAL TABLE OF CONTENTS

SECTION	TITLE
260100	Electrical General Provisions
260120	Coordination
260130	Reworking Existing System
260173	Short Circuit and Overcurrent Protective Device Coordination Study & Arc Flash Analysis
260200	Fire Stopping Systems
260300	Metallic Raceway
260313	Surface Raceways
260400	Nonmetallic Raceway
260519	Wire, Cable, and Wiring (Single-Conductor) (600 Volt Max)
260526	Grounding
260529	Supporting Devices
260533	Pull and Junction Boxes
260534	Wiring Device Boxes
262213	Dry Type Transformers
262416	Panelboards
262726	Wiring Devices
262813	Fuses
262815	Safety Switches
262816	Molded Case Circuit Breakers (MCCB)
262913	Motor Starters
265100	Lighting, Interior
264110	Lighting, Exterior
265120	Lamps
265130	Ballasts
265140	Occupancy Sensors

END OF DIVISION 26 TABLE OF CONTENTS

SECTION 260100

ELECTRICAL GENERAL PROVISIONS

PART 1 - GENERAL

1.1 GENERAL CONDITIONS

A. Each Section within Division 26 - Electrical, shall conform to the requirements of the General Conditions of the Contract, including Supplementary General Conditions, Special Conditions, and all requirements of Division 1.

B. Each Section within Division 26 - Electrical, shall conform to the additional requirements of this Section, Electrical General Provisions.

1.2 REFERENCE STANDARDS

A. Material, equipment and installation shall meet requirements of applicable codes and standards listed below. Electrical material and equipment shall bear the UL label except where UL does not label such types of material and equipment.

B. Reference standards are referred to by abbreviation as follows:

1. American National Standards Institute ..... ANSI
2. American Society for Testing and Materials ..... ASTM
3. Certified Ballasts Mfg ..... CBM
4. Electrical Testing Lab ..... ETL
5. National Electrical Code (NEC) ..... NFPA 70
6. National Electrical Manufacturers Association ..... NEMA
7. National Electrical Safety Code ..... NESC
8. National Electrical Testing Association ..... NETA
9. National Fire Protection Association ..... NFPA
10. Standard for Electrical Safety in the Workplace ..... NFPA 70E
11. Underwriters Laboratories, Inc. ..... UL
12. Uniform Federal Accessibility Standards ..... UFAS
13. Virginia Uniform State Building Code ..... USBC

1.3 APPLICABLE PUBLICATIONS

A. The publications listed in each Section form a part of that Section to the extent referenced. The publications are referenced to in the text by the basic designation only.

B. When a standard is specified by reference, comply with requirements and recommendations stated in that standard, except when requirements are modified by the Contract Documents, or applicable codes establish stricter standards.

C. When a standard is not specified by reference in a Section, the work of that Section shall comply with applicable codes listed in the General Conditions, and Supplementary General Conditions.

D. The publication date is the publication in effect as of the bid date, except when a specific publication date is specified.

E. Obtain copies of referenced standards direct from publication source, when needed for proper performance of work, or when required for submittal by Contract Documents.

1.4 RECORD DRAWINGS: For record drawing requirements, refer to the General Conditions.

1.5 INTENT OF DRAWINGS AND SPECIFICATIONS

A. The implied and stated intent of the drawings and specifications is to establish minimum acceptable quality standards for materials, equipment and workmanship, and to provide an operable electrical system complete in every respect.

B. The drawings are diagrammatic, intending to show general arrangement and location of system components, and are not intended to be rigid in detail.

C. Due to the small scale of the drawings, and to unforeseen job conditions, all required offsets and fittings may not be shown but shall be provided at no change in Contract price.

1.6 SHOP DRAWINGS

A. Submit Shop Drawings in accordance with the General Conditions and Supplementary Conditions.

B. Designate in the construction schedule, or in a separate coordinated schedule, the dates for submission and the dates that reviewed Shop Drawings will be needed.

C. Shop Drawings shall be presented in a clear and thorough manner.

D. Identify details by reference to sheet and detail, schedule or room numbers shown on Contract Drawings.

E. Submit for approval all drawings prepared by the Contractor, for the Contractor's use.

F. Prepare product data as follows:

1. Clearly mark each copy to identify pertinent products or models.
2. Show performance characteristics and capacities.
3. Show dimensions and clearances required.
4. Show wiring diagrams and controls.

G. Manufacturer's standard schematic drawings and diagrams:

1. Modify drawings and diagrams to delete information which is not applicable to the work.
2. Supplement standard information to provide information specifically applicable to the work.

H. The Contractor shall:

1. Review Shop Drawings prior to submission.
2. Determine and verify:
   a. Field measurements.
   b. Field construction criteria.
   c. Catalog numbers and similar data.
   d. Conformance with specifications.

3. Coordinate each submittal with requirements of the work and of the Contract Documents.
4. Notify the Architect in writing, at time of submission, of any deviations in the submittals from requirements of the Contract Documents.
5. Begin no fabrication or work which requires submittals until return of submittals with Architect approval.
6. Make submittals promptly in accordance with approved schedule, and in such sequence as to cause no delay in the work or in the work of any other trade.

I. Submittals shall contain:

1. The date of submission and the dates of any previous submissions.
2. The Project title and number.
3. Contract identification.
4. The names of:
   a. Contractor.
   b. Supplier.
   c. Manufacturer.
5. Identification of the product, with the specification section number.
6. Field dimensions, clearly identified as such.
7. Relation to adjacent or critical features of the work or materials.
8. Applicable standards.
9. Identification of deviations from Contract Documents.
10. Identification of revisions on resubmittals.
11. Copy of Shop Drawing Review Stamp Sheet as found in Part 4 of this Section with Electrical Contractor's section executed certifying to review of submittal, verification of products, field measurements and field construction criteria, and coordination of the information within the submittal with requirements of the work and of Contract Documents.
12. Each submittal shall be limited to a single specification section. Submittals shall not be grouped with other sections in common binders or under common control sheets. Each submittal shall have a cover/control sheet containing the information listed above (1 thru 11).
13. Submittals which do not comply with these requirements may be returned with no action taken at the reviewer's discretion.

J. For resubmission requirements the Contractor shall:

1. Make required corrections and changes in the submittals and resubmit until approved.
2. Revise initial drawings or data, and resubmit as specified for the initial submittal.
3. Indicate any changes which have been made other than those requested in the previous submittal.

O. Submit shop drawings for the following:

260173	Short Circuit and Overcurrent Protective Device Coordination Study & Arc Flash Analysis
260200	Fire Stopping Systems
260300	Metallic Raceway
260313	Surface Raceway
260400	Nonmetallic Raceway
260520	Multi-Conductor Cable (600 Volt Max)
262213	Dry Type Transformers
262416	Panelboards
262813	Fuses

262815	Safety Switches
262816	Molded Case Circuit Breakers (MCCB)
262913	Motor Starters
265100	Lighting, Interior
265110	Lighting, Exterior
265120	Lamps
265130	Ballasts
265140	Occupancy Sensors

1.7 CUTTING AND PATCHING: Cutting and patching shall be done in a workmanlike manner using tools and materials suitable for the purpose.

1.8 OPERATING AND MAINTENANCE DATA

A. Compile product data and related information appropriate for Owner's maintenance and operation of products furnished under Contract.

B. Prepare data in form of an instructional manual for use by Owner's personnel.

C. Format:

1. Size: 8 1/2 in. x 11 in.
2. Paper: 20 pound minimum, white, for typed pages.
3. Text: Manufacturer's printed data, or neatly typewritten.
4. Drawings:
   a. Provide reinforced punched binder tab, bind in with text.
   b. Fold larger drawings to size of text pages.
5. Provide fly-leaf for each separate product, or each piece of operating equipment.
   a. Provide typed description of product, and major component parts of equipment.
   b. Provide indexed tabs.
6. Cover: Identify each volume with typed or printed title "OPERATING AND MAINTENANCE INSTRUCTIONS". List:
   a. Title of Project.
   b. Identity of separate structure as applicable.
   c. Identity of general subject matter covered in the manual.

D. Binders:

1. Commercial quality three-ring binders with durable and cleanable plastic covers.
2. Minimum ring size: 1 inch.
3. When multiple binders are used, correlate the data into related consistent groupings.

E. Manual shall contain a neatly typewritten table of contents for each volume, arranged in systematic order.

1. Contractor, name of responsible principal, address and telephone number.
2. A list of each product required to be included, indexed to content of the volume.
3. List, with each product, name, address and telephone number of:
   a. Subcontractor or installer.
   b. Maintenance contractor, as appropriate.
   c. Identify area of responsibility of each.
   d. Local source of supply for parts and replacement.
4. Identify each product by product name and other identifying symbols as set forth in Contract Documents.

F. Product Data:

1. Include only those sheets which are pertinent to the specific product.
2. Annotate each sheet to:
   a. Clearly identify specific product or part installed.
   b. Clearly identify data applicable to installation.
   c. Delete references to inapplicable information.

G. Drawings:

1. Supplement product data with drawings as necessary to clearly illustrate:
   a. Relations of component parts of equipment and systems.
   b. Control and flow diagrams.
2. Coordinate drawings with information in Project Record Documents to assure correct illustration of completed installation.
3. Do not use Project Record Documents as maintenance drawings.

H. Written text, as required to supplement product data for the particular installation:

1. Organize in consistent format under separate headings for different procedures.
2. Provide logical sequence of instructions for each procedure.

K. Copy of each warranty, bond and service contract issued. Provide information sheet for Owner's personnel, stating:

1. Proper procedures in event of failure.
2. Instances which might affect validity of warranties or bonds.

I. Submittals:

1. For review: Submit two hard copies of complete manual. If provider has the capability of publishing O&M Manuals on CD-ROM, also submit a CD-Rom in addition to the hard copies.
2. For archives: After the review manual has been approved, submit four hard copies of the complete manual in final form. If provider has the capability of publishing O&M Manuals on CD-ROM, submit one hard copy and a CD-ROM containing the manual.

J. Submit operating and maintenance data on the following:

260173	Short Circuit and Overcurrent Protective Device Coordination Study & Arc Flash Analysis
265100	Lighting, Interior
265110	Lighting, Exterior
265111	Lighting
265140	Occupancy Sensors

PART 2- PRODUCTS

2.1 NAMEPLATES

A. Material:

1. Equipment nameplates shall be constructed of laminated phenolic with a black center core sandwiched between white layers.

2. Warning nameplates shall be constructed of laminated phenolic with a white center core sandwiched between red layers.

B. Inscription: Letters shall be engraved in the phenolic to form letters 3/8 inches high, unless indicated otherwise on drawings.

PART 3 - EXECUTION

3.1 All electrical work shall be performed by or under the direct supervision of a master electrician licensed to work in the project location.

3.2 Provide equipment connections complete with motor controls, switches, wiring devices, control devices, protective devices, wiring, and other accessories. All equipment and connections shall be as recommended by the manufacturer or as indicated on drawings or required by specifications.

3.3 Equipment connections for equipment furnished by the Owner or under separate contract shall be complete as specified in paragraph above.

3.4 Mount on each panelboard, starter, safety switch and all similar controls, a nameplate descriptive of the equipment or equipment controlled.

3.5 Install on each transformer, safety switch, panelboard, individually enclosed circuit breaker, motor starter, and contactor, a sign stating the category of protective clothing and equipment required for personnel to access the interior of the equipment for the purpose of inspection, adjustment, maintenance and replacement.

3.6 When equipment is supplied with electrical requirements other than those specified or shown on the drawings, associated electrical devices and circuitry of the correct sizes and ratings shall be provided.

PART 4.0 - SHOP DRAWING REVIEW STAMP SHEET

4.1 See following page.

ELECTRICAL CONTRACTOR'S SHOP DRAWING REVIEW			
PROJECT NO.:			
PROJECT NAME: City of Lynchburg - College Hill Facilities Historic Filter Building - Renovations and Alterations			
SPECIFICATION SECTION			
APPROVED	☐	APPROVED AS NOTED	☐
ELECTRICAL CONTRACTOR'S COMPANY NAME: _____ By:_____ Date:_____			

ENGINEER'S SHOP DRAWING REVIEW			
PROJECT NO.: 423-125A			
APPROVED	☐	APPROVED AS NOTED	☐
NOT APPROVED	☐	REVISE & RESUBMIT	☐
Approval is only for conformance with the design concept of the project and compliance with the information given in the Contract Documents. Contractor is responsible for dimensions to be confirmed and correlated at the job site; for information that pertains solely to the fabrication process or to techniques of construction; and for coordination of the work of all trades. Master Engineers and Designers, Inc. By: _____ Date:_____			

END OF SECTION

SECTION 260120

COORDINATION

PART 1 - GENERAL

1.1 ELECTRICAL GENERAL PROVISIONS

A. Provisions of Section 260100 - Electrical General Provisions shall be made an integral part of this section.

1.2 DESCRIPTION: Reasonable design effort has been made to coordinate the trades involved. Field coordination shall be the responsibility of all subcontractors on this project. Coordinate all portions of electrical work with that of other trades.

1.3 QUALITY ASSURANCE: Arrange equipment substantially as shown on the drawings. Make deviations only where necessary to avoid interference. Check equipment size against available space prior to shipment to avoid interference.

PART 2 - PRODUCTS (Not applicable)

PART 3 - EXECUTION

3.1 CEILINGS

A. Center all devices in ceiling tiles as shown and where appropriate.

B. With the exception of surface-mounted light fixtures, hang all devices independent of lay-in ceiling systems.

C. Cut holes in ceiling tiles in a neat and workmanlike manner using tools appropriate for the task.

3.2 EQUIPMENT LOCATION

A. Gang-mount similar devices shown in close proximity and equip with a common device cover plate.

B. Because equipment supplied may have connection points different than shown on the drawings, locate conduit runs and locations of disconnects, control stations and the like based upon shop drawings of the associated equipment.

C. In new walls in finished areas, install all devices flush with associated surface.

D. Relocate existing work as required to accommodate work included in this Contract.

E. Coordinate location of conduits, outlets and junction boxes with mechanical equipment so that outlets and junction boxes are accessible for servicing and HVAC ductwork can be connected directly to diffusers.

F. In all cases, locate equipment so that working clearances, clear space, access to equipment and headroom conforms to the requirements of National Electrical Code.

G. Where conflicts occur, bring to attention of the Architect for resolution. Make adjustments as directed at no additional cost.

END OF SECTION

SECTION 260130

REWORKING EXISTING SYSTEM

PART 1- GENERAL

1.1 ELECTRICAL GENERAL PROVISIONS

A. Provisions of Section 260100 - Electrical General Provisions shall be made an integral part of this section.

1.2 DESCRIPTION: Make indicated changes to existing facilities and equipment. Where indicated changes to nonelectrical facilities require minor associated electrical changes, these changes shall be accomplished even if not specifically indicated.

1.3 Provide material and labor necessary for temporary electrical facilities required to maintain facility in full operation for the duration of the project.

PART 2 - PRODUCTS

2.1 Products shall be new and as specified in this Division unless reuse of existing facilities is specifically indicated on the drawings.

PART 3 - EXECUTION

3.1 PROTECTION OF EXISTING PREMISES

A. Protect the existing premises, including the buildings, grounds and appurtenances, from damage which might be done or caused by work performed under this DIVISION. Repair damage so as to restore the damaged areas to their original condition.

B. Provide protective materials and coverings where necessary, to guard building surfaces and building contents from damages due to the operations of this work.

3.2 ELECTRICAL DEMOLITION

A. Disconnect and remove all electrical materials and equipment within the new construction limits not specifically indicated to be reused, to remain, or to be reconnected. This includes, but is not limited to, conduit, conductors, panelboards, lighting fixtures, motor controls, wiring devices, outlet and junction boxes, and auxiliary equipment.

B. Coordinate all phasing of demolition work with the Owner's representative to minimize interruption of power and the functioning of surrounding spaces.

C. Disconnect and remove cable and conduit to equipment being removed.

D. Remove exposed conduit and wiring abandoned prior to this Contract.

E. Cut back exposed portions of abandoned, concealed conduit to facilitate patching.

F. Dispose of removed equipment and material.

END OF SECTION

SECTION 260173

SHORT CIRCUIT AND OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY & ARC FLASH ANALYSIS

PART 1 - GENERAL

1.1 ELECTRICAL GENERAL PROVISIONS

A. Provisions of Section 260100 - Electrical General Provisions shall be made an integral part of this section.

1.2 SUBMITTALS

A. Submit short circuit and overcurrent protective device coordination study and arc flash analysis at the same time as the distribution equipment shop drawings.

1.3 SCOPE

A. Provide a complete short circuit study, equipment interrupting evaluation, withstand rating evaluation, and a protective device coordination study and arc flash analysis for the electrical distribution system.

B. Study shall include all portions of the electrical distribution system from the normal and alternate sources of power throughout the low-voltage distribution system. Normal system operating method, alternate operation, and operations which could result in maximum fault conditions shall be thoroughly covered in the study.

C. Coordination shall be as selective as possible given the devices specified and scheduled.

1.4 QUALITY CONTROL

A. Coordination study shall be performed by one of the following organizations:

1. MET Electrical Testing Co., Inc.
   1457 Miller Store Road, Suite 105
   Virginia Beach, Virginia 23455
   757 - 819-1246
2. Cutler-Hammer / Westinghouse
3. General Electric
4. Siemens
5. Square D

B. Calculations and studies shall be prepared by a licensed professional engineer. Submittal shall be sealed by the professional engineer.

PART 2 - PRODUCTS

2.1 SHORT CIRCUIT STUDY

A. The study shall be in accordance with applicable ANSI and IEEE Standards.

B. The study input shall include the utility company's short-circuit single- and three-phase contribution, with the X / R ratio, the resistance and reactance components of each branch

impedance, motor and generator contributions, base quantities selected, and all other applicable circuit parameters.

C. Study shall be prepared using the per-unit method of calculation, 10 MVA base.

2.2 EQUIPMENT INTERRUPTING EVALUATION AND WITHSTAND RATING EVALUATION: Verify that all equipment has an interrupting or withstand rating, as applicable, greater than the available fault current at the point of application.

2.3 PROTECTIVE DEVICE COORDINATION STUDY

A. A protective device coordination study shall be performed to select low-voltage circuit breaker trip characteristics and ratings.

B. The coordination study shall include all voltage classes of equipment from the utility's incoming line protective device down to and including each panelboard. The phase and ground overcurrent protection shall be included, as well as settings for all other adjustable protective devices.

C. The time-current characteristics of the selected protective devices shall be plotted on log-log paper.

1. Submitted curves shall be for actual devices to be installed.
2. The plots shall include complete titles, representative one line diagram and legends, associated power company's fuse characteristics, significant motor starting characteristics, complete parameters of transformers and complete operating bands of low-voltage circuit breaker trip curves.
3. The coordination plots shall indicate the types of protective devices selected, time dial and instantaneous trip settings, ANSI transformer magnetizing inrush and withstand curves per ANSI C37.91, cable damage curves, symmetrical and asymmetrical fault currents.
4. Adhere to all requirements of the current National Electrical Code.
5. Maintain reasonable coordination intervals and separation of characteristic curves. Provide coordination plots for phase and ground protective devices on a complete system basis.
6. Use sufficient curves to clearly indicate the coordination achieved.

D. Provide the selection and settings of the protective devices separately in a tabulated form listing circuit identification, manufacturer, type, range of adjustment, and recommended settings. Provide a tabulation of the recommended power fuse selection for all fuses in the system. Document discrepancies, problem areas, and inadequacies.

2.4 ARC FLASH ANALYSIS

A. Shall conform to NFPA 70E.

B. Shall include the following equipment:

1. Switchboard
2. Generator
3. Automatic transfer switch
4. Safety switches
5. Transformers
6. Panelboards

7. Individually-enclosed circuit breakers
8. Individually-enclosed motor starters
9. Individually-enclosed adjustable frequency drives
10. Safety switches
11. HVAC equipment such as heat pumps

C. Shall include a tabulation of the types of signage to be installed on each piece of equipment.

2.5 LOG-LOG PAPER shall be five cycle logarithmic paper similar to K&E 485258.

PART 3 - EXECUTION

3.1 Prepare short circuit and coordination study and arc flash analysis as specified above.

3.2 Install signage on all equipment, new and existing, involved in the project in accordance with NFPA 70E.

END OF SECTION

SECTION 260200

FIRE STOPPING

PART 1 - GENERAL

1.1 ELECTRICAL GENERAL PROVISIONS

A. Provisions of Section 260100 - Electrical General Provisions shall be made an integral part of this section.

PART 2 - PRODUCTS

2.1 FIRE STOP MATERIALS shall be one of the following:

A. 3M Electrical Products Division, CP25 Series.

B. CSD Sealing Systems

C. International Protective Coatings Corporation, FS and FST Series.

D. Nelson Firestop Products

PART 3 - EXECUTION

3.1 COORDINATION: Refer to architectural drawings to determine which floors and walls are fire rated and which partitions are smoke partitions.

3.2 APPLICATION

A. Fire stop materials

1. Install where conduits penetrate floors whether fire rated or not.
2. Install where conduits penetrate walls which are fire rated.

B. Caulk: Where conduits penetrate non-fire-rated walls, seal penetrations using caulk compatible with the wall materials.

3.3 PENETRATIONS: Where conduits or cables penetrate walls or floors, make penetrations in a workmanlike manner using drills, core drills or other appropriate tools.

END OF SECTION

SECTION 260300

METALLIC RACEWAYS

PART 1 - GENERAL

1.1 ELECTRICAL GENERAL PROVISIONS

A. Provisions of Section 260100 - Electrical General Provisions shall be made an integral part of this section.

1.2 REFERENCES: ANSI PUBLICATIONS

A. C80.1 Rigid Steel Conduit, Zinc Coated

B. C80.3 Electrical Metallic Tubing, Zinc Coated

1.3 SCOPE OF CONDUIT WORK

A. Detailed conduit work has not been shown on the drawings.

1. For lighting: Conduit work has been detailed only to the extent required to show switching functions and circuit groupings.
2. For miscellaneous receptacle power: Conduit work has been detailed only to the extent required to show circuit groupings.
3. For mechanical loads: Circuit numbers are shown on homeruns.

B. Provide and install conduit necessary to enclose all wiring.

C. Conduit size and fill shall be determined in the field by the Contractor.

PART 2 - PRODUCTS

2.1 RIGID STEEL CONDUIT (RSC): Low carbon, hot-dipped galvanized inside and outside, with threaded ends, minimum size 3/4 inch. Threaded fittings - cast iron or alloy steel, galvanized.

2.2 ELECTRICAL METALLIC TUBING (EMT)

A. High strength galvanized, 3/4 inch minimum size, 4 inch maximum size.

B. Fittings of same finish and material as tubing. Use compression type fittings only.

2.3 FLEXIBLE METAL CONDUIT: Galvanized, single strip.

2.4 LIQUID TIGHT FLEXIBLE METAL CONDUIT: Sealtite Type U.A. by Anaconda, Liquatite Type LA by Electri-flex Company, Type GU by International Metal Hose Company, or Sealflex-U by Universal Metal Hose Company. Fittings shall be Thomas & Betts Series 6000.

2.5 CONDUIT BUSHINGS

A. Insulated

1. Type B or SBT as applicable, by O-Z / Gedney
2. Series 1100 or series 2800, as applicable by Raco

3. Series BU500 or series TC700, as applicable by Steel City.

B. Grounding:

1. O-Z / Gedney Type BLG
2. Raco series 1222 thru 1236
3. Steel City Type BG.

2.7 PULL ROPE: 5/32 inch polyethylene rope.

2.8 THREAD LUBRICANT / SEALANT: Thread lubricant / sealant shall be Crouse-Hinds Type STL or equal by Ideal or O-Z / Gedney.

PART 3 - EXECUTION

3.1 APPLICATION

A. Install rigid steel conduit outdoors and in the 525 Taylor Street Filtration Plant.

B. Install electrical metallic tubing indoors in the Historic Filter Building.

C. Flexible metal conduit

1. Install flexible metal conduit for connections to motors and other equipment subject to vibration, and for connections to recessed or semi-recessed lighting fixtures in the Historic Filter Building.
2. Install liquid tight flexible metal conduit for connections to motors and other equipment subject to vibration outdoors and in the 525 Taylor Street Filtration Plant.

3.2 CONDUIT INSTALLATION:

A. Cut all conduit with hacksaw or approved cutting machine and ream after threading to remove all burrs.

B. Arrangement

1. Space groups of conduits uniformly. For bends and offsets, use an approved hickey or bending machine.
2. Install runs of conduit parallel or perpendicular to walls, structural members, or intersections of vertical planes and ceilings.
3. Provide right angle turns consisting of fittings or symmetrical bends.
4. Avoid condensation pockets in installations.
5. Not more than one exposed conduit shall be run down to an exposed wall switch or outlet box.

C. Join conduit with approved couplings. No running threads will be allowed.

D. Keep conduit, fittings, and boxes free from foreign matter, before, during, and after installation.

3.3 CONNECTION OF CONDUIT TO SHEET METAL BOXES AND ENCLOSURES:

A. Fasten conduit securely to outlets, junctions, and pull boxes to ensure electrical continuity of the raceway system.

B. Connection to NEMA 1 type boxes and enclosures;

1. Rigid conduit: Install insulated bushings and double locknuts.
2. EMT: Install compression type box connectors with insulated throats.
3. Flexible conduit: Insulating bushings and double locknuts.

C. Connection to NEMA 3R, 4, 4X, and 12 type boxes: Install insulated bushings and sealing locknuts or hubs for both rigid conduit and liquidtight flexible conduit.

D. Install conduit bushings on all threaded connections (rigid and flexible conduit) to enclosures.

3.4 EMPTY CONDUIT: Install empty conduit for future use as indicated on the drawings. Conduit shall be complete with pull wire or rope, junction and outlet boxes.

END OF SECTION

SECTION 260313

SURFACE RACEWAYS

PART 1 - GENERAL

1.1 ELECTRICAL GENERAL PROVISIONS

A. Provisions of Section 260100 - Electrical General Provisions shall be made an integral part of this section.

1.2 SCOPE OF WORK

A. Provide and install raceway necessary to enclose wiring as shown on the drawings.

B. Size shall be determined by the Contractor.

PART 2 - PRODUCTS

2.1 GENERAL:

A. Surface raceway system shall be complete with all fittings, elbows, connectors, covers, grounding devices, boxes, extensions and closures required by the National Electrical Code.

B. Size raceway per the National Electrical Code for the conductor fill indicated.

2.2 RACEWAY

A. Shall be Wiremold Access 5000 Nonmetallic or Wiremold 2300 surface raceway systems as indicated on the drawings.

B. Wiremold Access 5000 raceway finish shall be wood veneer.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Cut with hacksaw or approved cutting machine.

B. After cutting, remove all burrs.

C. Arrangement

1. Install runs parallel or perpendicular to walls, structural members, or intersections of vertical planes and ceilings.
2. Locate devices and device plates as indicated on the drawings.
3. Stain and seal Wiremold Access 5000 surface raceway wood veneer as directed by the Architect.

END OF SECTION

SECTION 260400

NONMETALLIC RACEWAY

PART 1 - GENERAL

1.1 ELECTRICAL GENERAL PROVISIONS

A. Provisions of Section 260100 - Electrical General Provisions shall be made an integral part of this section.

1.2 REFERENCES

A. NEMA TC-2 Electrical Plastic Tubing and Conduit.

B. NEMA TC-3 PVC Fittings for use with Rigid PVC Conduit and Tubing.

C. NEC Article 347 - Rigid Nonmetallic Conduit.

D. UL 651 Rigid Nonmetallic Electrical Conduit.

E. UL 514 Electrical Outlet Boxes and Fittings.

F. ASTM D 2564 Solvent Cements for PVC Plastic Pipe and Fittings.

1.3 SCOPE: This section applies to nonmetallic raceway installed exposed or concealed indoors or above grade outdoors.

PART 2 - PRODUCTS

2.1 SCHEDULE 40 ELECTRICAL PLASTIC CONDUIT: Designed for underground installation without concrete encasement and normal duty application above ground and made of polyvinyl chloride (EPC-40-PVC for Type II and III applications). Minimum size shall be 3/4".

2.2 PVC PLASTIC FITTINGS: Designed to be joined in the field by means of a solvent cement system.

2.3 SOLVENT CEMENT: ASTM D 2564 or in accordance with raceway manufacturer's printed recommendations.

2.4 CLAMPS, STRAPS, WALL HANGERS, AND OTHER HARDWARE: Nylon, PVC or PVC-coated to provide the same corrosion resistance as the raceway.

PART 3 - EXECUTION

3.1 APPLICATION: Install EPC-40-PVC for above or below ground without concrete encasement applications when PVC conduit is indicated on the drawings without further definition.

3.2 CONDUIT CONNECTION

A. Join raceway by means of solvent cement in accordance with the suggested methods indicated in the appendix of NEMA TC-2 for "normal" service conditions.

B. Install socket type couplings for joining raceway.

C. Install female adapters with female threads on one end and socket end on the other for adapting nonmetallic raceway to threaded metallic raceway.

D. Install terminal adapters for adapting nonmetallic raceway to boxes, threaded fitting, and metallic systems. Male threads on one end, socket end on the other.

1. Connection to NEMA 1 type, metallic boxes: Secure with locknut.
2. Connection to NEMA 3R, 4, 4X, and 12 type, metallic boxes: Install O-ring seal on exterior and sealing locknut on interior.

3.3 BENDS

A. Bends shall be made with factory elbows or with electric heaters designed specifically for the purpose. The use of torches or other flame-type devices will not be permitted. Sections of raceway showing evidence of scorching (brownish color) will be disapproved.

B. Field bends for 2-inch diameter and larger raceway shall be made using internal support to prevent crimping or deforming during the bending process.

3.4 SUPPORT: Support raceways based on the temperatures at the application, but in no case shall the distance between supports be less than the requirements of NEC. Install raceway at least 6 inches away from steam lines and other heat sources.

END OF SECTION

SECTION 260519

WIRE, CABLE, AND WIRING (SINGLE-CONDUCTOR) (600 VOLT MAXIMUM)

PART 1 - GENERAL

1.1 ELECTRICAL GENERAL PROVISIONS

A. Provisions of Section 260100 - Electrical General Provisions shall be made an integral part of this section.

1.2 This section specifies single-conductor wire, cable and wiring for power, lighting and control systems, generally 24 through 600 volts ac.

1.3 REFERENCES: NEMA PUBLICATIONS

A. WC 5 Thermoplastic-insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

B. WC 7 Cross-linked-thermosetting-polyethylene-insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

1.4 SCOPE OF WIRING WORK

A. Detailed conductor quantities and sizes have not been shown on the drawings:

1. For lighting: Conductor sizes have been scheduled but detailed quantification for specified switching functions has not been shown.
2. For miscellaneous power: Conductor sizes have been scheduled but detailed quantification has not been shown.
3. For mechanical loads: Conductor sizes have been scheduled but detailed quantification has not been shown.

B. Provide and install wiring required by applicable codes and necessary for a complete and functioning system.

PART 2 - PRODUCTS

2.1 CONDUCTOR CODING

A. Color code insulated grounding conductors in accordance with NEC 210-5(B).

B. Color code current carrying conductors following the system used in the existing, 7-story filter plant on the site.

1. No. 12 thru No. 6 conductors shall have continuous insulation color.
2. Color code conductors larger than No. 6 which do not have continuous insulation color by application of at least two laps of colored tape on each conductor at all points of access including junction boxes.

C. Each coil of wire shall be delivered to the job in its original package bearing the UL label. Wire shall be marked with size and type every two feet. The neutral and each phase wire shall be furnished with different color insulation in sizes up to and including No. 6 AWG. Sizes

No. 4 and larger may be provided in black, if identified by a series of two or more colored bands completely encircling the conductor, located at or near each terminal point, in all junction boxes and at all other points so designated by the inspecting authority. Colored bands shall not be less than 3 inch nor less than two conductor diameters in width, whichever is greater. The same color shall be used for each phase wire throughout the system for all three phase and feeder circuits as applicable for each voltage category, i.e., 120/208 volts, 277/480 volts.

2.2 CONDUCTORS

A. Conductors shall be soft annealed copper.

B. Provide No. 12 conductors, unless otherwise indicated.

C. Conductors No. 8 AWG and larger shall be stranded.

D. Conductors No. 10 AWG and smaller may be solid.

E. Insulation

1. Shall be type THW, THWN, XHHW.
2. Shall be rated for 600 volts, 75 deg C unless otherwise indicated..

2.3 MOTOR CONNECTIONS

A. Connection lugs shall be one or two-hole, compression type, Thomas and Betts Catalog Number Series 53000 and 54000.

B. Insulation shall be one of the following:

1. Motor stub splice insulators, Thomas and Betts Catalog Numbers MSC8, 2, 20, 250, 500 as applicable.
2. 3M Electrical Products Division, unshielded cable motor lead connection, Series 5300 thru 5314.
3. Raychem stub connection insulation kit, Series RVC-1V thru RVC-4V.

2.4 SPLICES

A. Splices for conductors No. 10 and 12 AWG shall have the following features:

1. Pre-insulated spring connector encased in a steel shell and rated at not less than 105 degrees C.
2. Insulated vinyl cap with a minimum 3/8 inch skirt to cover the bare wires.
3. UL approved for use in enclosures, junction boxes and fixtures.
4. Manufacturer and type:
   a. 3M Company, "Scotch Lok" Type Y, R and B
   b. Ideal Industries, Wire Nut
   c. Approved equal.

B. For run and tap applications, in fixture wiring, for wire sizes 18 through 10: 3M Scotch-Lok tap connectors.

C. No. 8 and larger wires:

1. Compression connectors or splices as manufactured by Burndy, or T&B.
2. Insulate to at least 200 pct. of wire insulation. Use pre-stretched tubing connector insulators, 3M Company, Type PST.

2.5 PULLING COMPOUND: Pulling compound shall be Ideal Industries Yellow 77, Polywater Lubricant J or WJ, or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Furnish and install all wire and cable of AWG sizes indicated on the drawings and as specified hereinafter or required for the complete installation.

B. Install wiring in conduit or surface raceway.

1. Complete and clean out system before pulling wire.
2. Use compound as required to facilitate pulling.
3. Pull conductors using recognized methods and equipment leaving ample lengths of wire at junctions for connections.

C. Form and tie all wiring in panelboards and switchboards.

1. Bundle wiring and tie at 6 inch intervals.
2. Train bundles parallel to adjacent enclosure surfaces and in such a manner as to prevent abrasion due to rubbing or contact with bus work or other non-associated wiring.

F. Identify all wiring at all points of access including junction and pull boxes.

1. Identify lighting and receptacle branch circuits by name of panelboard from which they originate and circuit number.
2. Identify motor branch circuits by name of equipment from which they originate, circuit number, and phase.
3. Identify feeders by name of equipment from which they originate, circuit number, and phase.

3.2 SPLICING: Install conductors continuous from outlet to outlet with splices made only in junction and outlet boxes, and in pull boxes only.

3.3 TERMINATION: Verify that all equipment to which wiring is connected is rated for connection to wire having 75 degC or higher rated insulation. Notify Architect if any equipment is not so rated.

3.4 MOTOR CONNECTIONS

A. Make motor connections using connection lugs with motor stub splice insulators.

B. Install cable connectors on all flexible cables entering enclosures.

END OF SECTION

SECTION 260526

GROUNDING

PART 1 - GENERAL

1.1 ELECTRICAL GENERAL PROVISIONS

A. Provisions of Section 260100 - Electrical General Provisions shall be made an integral part of this section.

1.2 SCOPE

A. Grounding shall be in accordance with NEC as a minimum. Additional grounding requirements shall be as specified or indicated on drawings.

PART 2 - PRODUCTS

2.1 GROUND RODS shall be copper clad steel, 10 feet in length and ¾ inch in diameter.

2.2 CONDUCTORS

A. Grounding electrode conductors shall be bare copper.

B. Equipment grounding conductors in raceways shall be insulated copper.

2.3 CONNECTORS

A. GENERAL

1. All ground connectors shall be designed for fault-duty loading and shall have the fault capacity of the maximum sized conductor for which it is designed.
2. Pad terminals and in-line splices shall accommodate only one conductor size. All other ground connectors may be range taking.
3. Structural steel and bus bar ground connectors shall accommodate only one conductor.
4. All mechanical bonding connectors shall be designed to withstand 150% of the recommended installation torque.

B. Exothermic type connectors shall be Cadweld, Thermoweld, or approved equal.

C. Compression connectors shall have the following features:

1. Manufactured from pure, wrought copper in compliance with ASTM B30.
2. Shall be provided with a corrosion-inhibiting compound pre-applied to the contact surfaces. The compound shall be compatible with the conductors accommodated by the contractor.
3. Shall be provided with tin plating where required by the application.
4. Shall be clearly and permanently marked with the following information:
   a. Manufacturer's inspection symbol
   b. Catalog number
   c. Conductor accommodation(s)
   d. Installation die index or die catalog number (compression)
   e. Underwriter's Laboratories Listing Mark

f. The words "Suitable for Direct Burial", or "Direct Burial", or "Burial" as specified per ANSI/UL467

5. Shall be Burndy HYGROUND or equal.
6. Compression dies shall provide embossment of the connector upon successful installation. The embossed index shall match the marking on the installed connector.

D. Cable-to-pipe (water or process) connectors shall be as follows.

1. General: Bolts ("u" and straight), nuts, and lock washers shall be stainless steel.
2. For connections to 2 to 1-1/2 inch (IPS) pipe: O-Z / Gedney Company Type ABG, Burndy Type GAR series, Thomas & Betts Cat No 2-TB or 3-TB, or approved equal.
3. For connections to 2 to 8 inch (IPS) pipe: O-Z / Gedney Company Type CB, Burndy Type GAR series, Thomas & Betts Cat No 3900 series, or approved equal.

PART 3 - EXECUTION

3.1 GROUNDING ELECTRODE CONDUCTORS AND GROUND COUNTERPOISE

A. Use bare copper for ground grid and for connecting ground rods.

B. Install ground grid conductors and ground rod tops a minimum of 30 inches below finished grade.

C. Connect grounding electrode conductors to pipes using cable-to-pipe connectors. Remove all finishes and oxidation from pipe sufficiently to allow 100 percent contact of connector with pipe.

D. If earth resistance of these service grounding electrode is more than 25 ohms, install one additional ground rod a minimum of 16 feet from other electrode.

3.2 EQUIPMENT GROUNDING

A. Install equipment grounding conductors in all raceways containing conductors having 100 volts or more to ground.

B. Ground all enclosures.

C. Make certain that the metallic raceway system is electrically continuous.

3.3 CONNECTORS:

A. Use compression or exothermic connectors for all connections that will be direct buried or inaccessible for inspection after construction is complete.

B. Compression Connectors: Install compression connectors in accordance with the manufacturer's recommendations for conductor preparation (cleaning, pre-crimp), installation tool and die selection, and application of the proper number of crimps.

END OF SECTION

SECTION 260529

SUPPORTING DEVICES

PART 1 - GENERAL

1.1 ELECTRICAL GENERAL PROVISIONS

A. Provisions of Section 260100 - Electrical General Provisions shall be made an integral part of this section.

B. Supporting material shall be complete with hangers, connectors, bolts, clamps, and necessary accessories to make a complete installation.

1.2 LOADING

A. Spans up to 5 Feet: Deflection shall not exceed 1 / 240 of span.

B. Spans 5 Feet and Greater: Deflection shall not exceed 1 / 360 of span.

C. Compressive loading shall not exceed 33 percent of manufacturer's published ratings.

PART 2 - PRODUCTS

2.1 GENERAL

A. Supporting material shall be complete with hangers, connectors, bolts, clamps, and necessary accessories to make a complete installation.

B. Indoors: Materials shall be galvanized or cadmium plated steel.

C. Outdoors: Threaded materials shall be stainless steel or fiberglass-reinforced plastic. All other materials shall be aluminum, stainless steel, and / or fiberglass-reinforced plastic.

D. Support systems shall be composed of standard structural shapes or factory fabricated. Acceptable manufacturers of factory fabricated support systems are:

1. B-Line Systems, Inc.
2. Midland-Ross Corporation, Electrical Products Division (Kindorf)
3. T.J. Cope, Inc . (Aickinstrut)
4. Unistrut

PART 3 - EXECUTION

3.1 LAYOUT

A. Install supports suspended from above to maintain minimum 7'-6" clear headroom.

B. Install supports from walls to meet ADA requirements.

3.2 SUPPORT

A. General: Support all equipment which is not inherently self-supporting in such a manner as to effect a rigid and permanent installation.

1. Use factory-fabricated channel, support systems, and as appropriate, other structural shapes such as angles, "C" channels, pipe, and the like.
2. Do not support equipment from roof deck.

B. Conduit support

1. Runs along walls:
   a. Single runs: Galvanized conduit straps or ring bolt type hangers with specialty spring clips.
   b. Single runs: Use clamp and nest back spacers.
   c. Multiple runs: Channel support with conduit fittings, 25 percent spare capacity.
2. Suspended runs: Trapeze rack with 25 percent spare capacity.

3.3 ANCHOR METHODS

A. Hollow masonry: Toggle bolts or spider type expansion anchors.

B. Solid masonry: Lead expansion anchors or preset inserts.

C. Metal surfaces: Machine screws, bolts, or welded studs.

D. Wood surfaces: Wood screws or sheet metal screws

E. Concrete surfaces: Self-drilling anchors or powder- driven studs.

END OF SECTION

SECTION 260533

PULL AND JUNCTION BOXES

PART 1 - GENERAL

1.1 ELECTRICAL GENERAL PROVISIONS

A. Provisions of Section 260100 - Electrical General Provisions shall be made an integral part of this section.

1.2 DESCRIPTION

A. This section specifies boxes installed within buildings and outside above grade.

PART 2 - PRODUCTS

2.1 SHEET METAL BOXES

A. NEMA 1 BOXES shall have the following features:

1. Constructed of code gage, hot-rolled sheet steel.
2. Removable covers suitable for surface or flush mounting as applicable.
3. Finish:
   a. Hot-dipped galvanized finish for boxes 4 x 4 inches and smaller.
   b. Paint for boxes larger than 4 x 4 inches.
4. Cadmium plated hardware.
5. Manufacturer and type
   a. Boxes 4 by 4 inches and smaller: Steel City 52141, 52151, and 52171 series, with 52-C series covers.
   b. Boxes larger than 4 by 4 inches: Hoffman Bulletin A-90.

B. NEMA 4X SERIES BOXES shall have the following features:

1. Acceptable Materials
   a. Type 5052 aluminum, minimum 0.080 inch thick, or
   b. Type 304 stainless steel, minimum 14 gage.
2. Continuously welded seams.
3. No knockouts.
4. Rolled lip around door.
5. Neoprene gasketed covers.
6. Stainless steel hardware.
7. Manufacturer and Type: Hoffman Bulletin A-4 or A-51.

2.2 CONDUIT BODIES

A. Where of sufficient size, conduit bodies may be used in lieu of pull and junction boxes provided they meet the requirements of the NEMA standards referenced above.

B. Material: Cast copper-free aluminum.

C. Finish: Gray epoxy powder

D. Hardware: Stainless steel.

E. Manufacturer: Appleton, Crouse-Hinds, or Killark.

PART 3 - EXECUTION

3.1 APPLICATION

A. Install NEMA 1 boxes indoors in the Historic Filter Building.

B. Install NEMA 4X boxes outdoors and indoors in the 525 Taylor Street Filtration Plant..

3.2 Provide pull and junction boxes where shown on the drawings, and where required for changes in direction, at junction points, and to facilitate wire pulling. Provide additional boxes as required so that wire and cable manufacturer's maximum recommended pulling tensions are not exceeded.

3.3 Size boxes in accordance with NEC unless larger boxes are indicated.

END OF SECTION

SECTION 260534

WIRING DEVICE BOXES

PART 1 - GENERAL

1.1 ELECTRICAL GENERAL PROVISIONS

A. Provisions of Section 260534 - Electrical General Provisions shall be made an integral part of this section.

PART 2 - PRODUCTS

2.1 WALL BOXES

A. Sheet metal boxes shall be steel, zinc coated, or cadmium plated inside and out.

1. Box size:
   a. For single gang boxes, 4-11/16" high x 4-11/16" wide.
   b. For multi-gang boxes, 4-11/16" high, length as required for number of gangs.
2. Device support trim shall be raised to match thickness of the wall materials concealing the box.

B. Cast boxes shall have the following features:

1. Materials: copper-free aluminum
2. Finish: grey epoxy powder

C. Gang boxes shall be one piece. Provide permanently installed barriers between adjacent switches used to control 277 volt circuits.

D. Boxes installed in masonry construction shall be fabricated specifically for such application. They shall be of squared corner construction and shall have no openings through which mortar or water can enter the box.

2.2 PLATES

A. Provide cover or device plates for outlet boxes as follows unless otherwise noted.

1. Finished Areas: Flush type stainless steel, satin finish fastened with stainless steel, recessed, slot-head machine screws.
2. Unfinished Areas: Zinc coated sheet metal, aluminum, or cast metal as appropriate for type of box.
3. Exterior Areas:
   a. Corrosion resistant, injection molded plastic compatible with non-metallic raceway system.
   b. Corrosion resistant metallic hardware.
   c. Gasket for weatherproof seal.
   d. Manufacturer and type: Carlon Electrical Products, E98 series, or equal.

PART 3 - EXECUTION

3.1 APPLICATION

A. Install sheet metal boxes indoors.

B. Install cast boxes outdoors.

3.2 INSTALLATION

A. For boxes flush mounted in finished walls.

1. Install boxes so that face of device support trim falls flush with or slightly behind the face of the wall.

2. 3/16 Inch maximum gaps allowed for noncombustible walls.

3. Adjust location of outlets in masonry or tile construction to occur in the nearest joint to the height specified.

B. Support all boxes to maintain alignment and rigidity.

C. Clean boxes of all foreign matter prior to installation of wiring or devices.

3.3 PLATES: Provide boxes complete with cover or device plate for switches receptacles, or other similar devices.

END OF SECTION

City of Lynchburg – College Hill Facilities
Historic Filter Building – Renovations & Alterations
City Project No. 09050-W

SECTION 262213

DRY TYPE TRANSFORMERS

PART 1 - GENERAL

1.1 ELECTRICAL GENERAL PROVISIONS

A. Provisions of Section 260100 - Electrical General Provisions shall be made an integral part of this section.

1.2 DESCRIPTION

A. Transformer ratings and special features shall be as indicated on drawings.

1.3 REFERENCES

A. NEMA Publications

1. ST 1 Specialty Transformers.
2. ST 20 Dry-type Transformers for General Applications.
3. TR 27 Commercial, Institutional, and Industrial Dry-type Transformers.

PART 2 - PRODUCTS

2.1 GENERAL: Transformers shall be continuously rated isolating type for 60 hertz service unless otherwise indicated.

2.2 ENCLOSURE

A. Enclosures shall be metallic, suitable for indoor or outdoor installation as applicable and rodent proof.

B. The structure shall be a rigid, self-supporting, completely metal-enclosed structure.

C. The enclosure shall completely enclose the equipment except for requisite ventilation openings. Such openings shall be covered with diamond-pattern expanded metal which will prevent the insertion 0.375-inch diameter rod into the interior of the enclosure.

2.3 TAPS: The primary shall have two 2.5% full capacity taps above and four 2.5% full capacity taps below rated voltage.

2.4 INSULATION

A. Insulation systems shall be 220 degrees C (150 degrees C rise) for 37.5 KVA and above, single phase, or 30 KVA and above, three phase units.

B. Insulation systems shall be 185 degrees C (115 degrees C rise) for 0.25 KVA through 25 KVA, single phase, or 3 through 15 KVA, three phase units.

2.5 **AUDIBLE SOUND LEVELS**

A. Audible sound levels shall not exceed the following:

15 - 50 KVA	45 dB
51 - 150 KVA	50 dB
151 - 300 KVA	55 dB
301 - 500 KVA	60 dB

B. Acceptable manufacturers:

1. Acme
2. Cutler-Hammer / Westinghouse
3. General Electric
4. Hevi-Duty
5. Siemens
6. Square D

PART 3 - EXECUTION

3.1 INSTALLATION

A. Securely mount transformers at location indicated on drawings.

B. Install floor-mounted transformers on concrete housekeeping pads.

C. Mount transformers so that vibrations are not transmitted to the structural parts of building.

3.2 CONNECTION: Make conduit connections with flexible conduit.

3.3 GROUNDING

A. Ground the transformer case and the electrostatic shield via a full size, grounding electrode conductor.

B. Bond the transformer neutral to the grounding electrode conductor.

3.4 WARNING SIGNAGE conforming to NFPA 70E shall be installed on the equipment.

END OF SECTION

SECTION 242416

PANELBOARDS

PART 1 - GENERAL

1.1 ELECTRICAL GENERAL PROVISIONS

A. Provisions of Section 260100 - Electrical General Provisions shall be made an integral part of this section.

PART 2 - PRODUCTS

2.1 GENERAL

A. Panelboards shall be of dead front construction utilizing thermal magnetic circuit breakers and shall conform to the requirements established by UL, NEMA and the NEC, except where modified herein. Each shall be suitable for its intended application as scheduled, considering voltage, phase, frequency and intended service. All panelboards shall be UL listed and shall be so labeled.

B. Panels known as "loadcenters" will not be accepted.

C. Panelboards shall consist of cabinet or back box, bus assembly, circuit breakers, trim, and all accessories as indicated and required. All characteristics shall be as shown or scheduled on the drawings.

2.2 CABINETS

A. Cabinets or back boxes shall be fabricated from galvanized or equivalent rust resistant sheet steel of thickness to meet code requirements.

B. Cabinet depths shall be the manufacturer's standard except where specific requirements indicate otherwise.

C. Gutter space shall meet UL and NEC requirements.

2.3 BUS

A. The bus assembly shall consist of copper or aluminum bus structure, secured and arranged to receive breakers as indicated.

B. All bussing shall be designed in accordance with UL standards to suit the loading requirements as scheduled and shall be braced to withstand mechanical stresses created by faults of magnitude equivalent to the rating of breakers to be installed.

C. Bus assembly shall include main lugs and main breakers where indicated. Arrangement shall also include double row construction of breakers and allowance for breaker replacement from the front without disturbing adjacent units or main bus connections. Bus and mounting pan shall be designed so that circuit breakers may be changed or added without additional machining, drilling or tapping.

D. Connections to aluminum bus bars shall have special coating, such as plating or inhibiting compound, to prevent electrolysis. Belleville washers shall be used to prevent cold flow.

E. Phase and neutral bus supports shall be insulated.

F. Construction shall be such that the bus will not be exposed upon removal of trim.

G. Provisions shall be included for adjustment of bus assembly and breakers for some vertical alignment and front-to-back position without removal of the assembly.

H. Neutral bus: All panelboards shall be provided with solid neutrals, where indicated on the drawings.

I. Ground bus

1. Grounding bars with lugs shall be provided on all panelboards.
2. Ground busses shall be bonded to panel enclosure.

J. Space where shown in panel schedules designates space for future protective devices and shall include bus and support components.

2.4 CIRCUIT BREAKERS: Circuit breakers shall as specified in Section 262816 - Molded Case Circuit Breakers.

2.5 PANELBOARD FRONTS

A. Panelboard fronts shall be of cold rolled steel in accordance with gauges required by code.

B. Trim shall be fastened to box by means of clamps which indicate their position from the front. Trim clamps shall be concealed to present a flat smooth appearance. The use of screws engaging holes in the box flange for fastening trim will not be acceptable.

C. Doors

1. Doors shall be fastened to trim by flush concealed hinges.
2. Doors shall be equipped with a flush type combination catch and keyed lock. Two milled type keys shall be provided with each panel, and all locks shall be keyed alike.
3. Doors shall be equipped with a neat directory frame secured to the inside of the door.

D. Trim and doors shall be properly cleaned and finished with one rust-inhibiting priming coat and a finish coat of light gray enamel, ANSI Z55.1-1967 No. 61. All circuits shall be identified as specified hereinafter.

2.6 MINIMUM SHORT CIRCUIT RATING

A. The minimum short circuit rating for the panelboard shall be the rating of the device within the assembly having the lowest short circuit rating.

B. Maximization of selective tripping coordination is the intent of this design. Use of series rated equipment will not be approved.

2.7 ACCEPTABLE MANUFACTURERS

A. Cutler-Hammer / Westinghouse

B. General Electric

C. Siemens

D. Square D

PART 3 - EXECUTION

3.1 INSTALLATION

A. Mounting

1. Flush mount where shown on drawings. Install cabinet such that center of top breaker or switch does not exceed 78 inches above finished floor.
2. Surface mount where shown on drawings.
3. Bolt to wall such that top of enclosure is 72 inches above finished floor.

B. Arrange and number circuits exactly as indicated in drawing schedules. If circuit arrangement does no match schedules, Contractor will be back-charged for the cost incurred by the Engineer in editing schedules for As-Built Drawings.

C. Type entries on directory cards completely and accurately. Equip each circuit breaker with an identification label (as recommended by manufacturer) showing circuit number served. Numbers on identification labels shall match respective circuit numbers on directory cards.

3.2 WARNING SIGNAGE conforming to NFPA 70E shall be installed on the equipment.

END OF SECTION

SECTION 262726

WIRING DEVICES

PART 1 - GENERAL

1.1 ELECTRICAL GENERAL PROVISIONS

A. Provisions of Section 260100, Electrical General Provisions, shall be made an integral part of this section.

1.2 REFERENCES

A. National Electrical Manufacturers Association (NEMA) Publications.

1. WD 1 General Purpose Wiring Devices.
2. WD 3 Alternating-current General Use Snap Switches.
3. WD 5 Specific-purpose Wiring Devices.

B. Underwriters Laboratories (UL) Publications

1. UL 20 General-use Snap Switches.
2. UL 943 Ground-fault Circuit Interrupters.

PART 2 - PRODUCTS

2.1 GENERAL: Furnish and install wiring devices at all locations shown on the drawings, complete with all mounting devices and other appurtenances where required. All wiring devices shall be the product of a single manufacturer except as specifically stated otherwise. The catalog numbers of the devices herein specified are based on those of Bryant Electric Co. However, equal devices as manufactured by General Electric, Leviton, or Hubbell will be acceptable. If other than Bryant devices are to be used, a list of comparative catalog numbers shall be furnished to the Architect.

2.2 AC GENERAL USE SNAP SWITCHES shall be specification grade, full size, heavy duty, composition enclosed, AC type, rated for 20 amperes at 120-277 volts, Nos. 4901-G, 4902-G, 4903-G and 4904-G. Standard, competitive, residential grade and interchangeable line switches will not be acceptable.

2.3 RECEPTACLES

A. All single convenience receptacles shall be specification grade, back and side wired, three wire grounding type with U-shaped slotted ground, straight blades, catalog numbers as follows:

1. 20 amperes, 2P3W, 125 volts, Cat. No. 5361-G.
2. 20 amperes, 2P3W, 250 volts, Cat. No. 5461-G.
3. 30 amperes, 2P3W, 125 volts, Cat. No. 9530-FR.
4. 30 amperes, 2P3W, 250 volts, Cat. No. 9630-FR.

B. Duplex convenience outlets shall be heavy duty grade, back and side wired, U slotted ground, and be rated at 20 amperes, 125 volts, Cat. No. 5362-G.

C. Ground fault interrupter receptacles shall have the following features:

1. UL listed: UL 943 Class A

2. Configuration: Duplex, NEMA 5-20R
3. Trip current sensitivity: 5 milliamperes plus or minus 1 milliampere
4. Trip speed: 0.025 second maximum for a fault of 264 milliamperes
5. Electronic amplifier protection: 6000 volt transients, ringwave configuration
6. Withstand rating: 2000 amperes
7. Operating temperature range: minus 35 to plus 66 degrees C
8. Front-accessible test and reset push buttons
9. Color shall match non-ground fault, duplex, convenience receptacles.
10. Manufacturer and type: Bryant GFR53FT series or equal by Hubbell, Leviton, or Pass & Seymour.

D. Blank face ground fault interrupters shall have the following features:

1. Ratings and features similar to ground fault interrupter receptacles except no ports for receptacle prongs.
2. Manufacturer and type: Bryant GF53INT series or equal by Hubbell, Leviton, or Pass & Seymour.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install A.C. general-use snap switches for switching lighting or other branch circuit loads as indicated on the drawings. Where adjacent to doors, coordinate with architectural drawings to ensure switches are installed on strike side of door.

1. Locate centerline at the height of 48" above finished floor.
2. Long dimension of switches shall be vertical unless otherwise indicated or required.

B. Install receptacles as indicated on the drawings with grounding pole up.

1. Locate centerline at the height of 18" above finished floor.
2. Long dimension of receptacles shall be vertical unless otherwise indicated or required.

C. Where receptacles are shown on the drawings as being equipped with ground fault interrupters, it is intended that each such receptacle be equipped with ground fault interrupters. Do not use the feed thru feature to protect downstream equipment unless specifically noted on the drawings.

END OF SECTION

SECTION 262813

FUSES

PART 1 - GENERAL

1.1 ELECTRICAL GENERAL PROVISIONS

A. Provisions of Section 260100 - Electrical General Provisions shall be made an integral part of this section.

1.2 REFERENCES

A. American National Standards Institute (ANSI) Publication: C97.1 Low Voltage Cartridge Fuses 600 Volts or Less.

B. Underwriters Laboratories, Inc. (UL) Standards.

1. 198C High-interrupting-capacity Fuses, Current-limiting Types.
2. 198E Class R Fuses.

PART 2 - PRODUCTS

2.1 FUSES

A. General: All fuses shall be non-renewable type.

B. Class R:

1. 0 to 600 ampere fuses for motor circuit protection, when not otherwise indicated on drawings, shall be UL 198E Class RK1 with time delay, 200,000 AIC, 250 and 600 volts as applicable, moderate degree current limiting.
2. Class R fuse holders shall be equipped with fuse rejection feature.

2.2 ACCEPTABLE MANUFACTURERS

A. Bussman

B. Reliance

C. Ferraz Shawmut

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install fuses where indicated on drawings.

B. At each point of fuse application, fuse all ungrounded conductors.

C. Install on the outside of the door of each fusible switch an engraved phenolic nameplate stating fuse ampere rating, manufacturer, and type.

3.2 SPARE FUSES: Provide 10 percent spare fuses (or three, whichever is greater) of each size and type installed.

END OF SECTION

SECTION 262815

SAFETY SWITCHES

PART 1 - GENERAL

1.1 ELECTRICAL GENERAL PROVISIONS

A. Provisions of Section 260100 - Electrical General Provisions shall be made an integral part of this section.

1.2 REFERENCES: NEMA PUBLICATION

A. KS 1 Enclosed Switches

1.3 SCOPE: Provisions of this section shall govern switches and fused switches provided as part of panelboards or other equipment.

PART 2 - PRODUCTS

2.1 SAFETY SWITCHES

A. Switches referred to as disconnect switches or motor circuit switches on the drawings shall be safety switches.

B. Safety switches shall be the enclosed heavy duty type (Type HD) with quick-make, quick-break mechanism and external padlockable operating handle.

C. Safety switches shall be rated for 240 or 600 volts as applicable. They shall be horsepower rated when used in motor circuits.

D. Safety switches shall be:

1. Fusible or non-fusible, as indicated on drawings.
2. Single-phase circuits: two-pole
3. Three-phase circuits: three pole
4. Single throw unless otherwise indicated on the drawings.

2.2 ENCLOSURES: Enclosures shall be NEMA 1 indoors and NEMA 4X outdoors unless otherwise indicated on drawings.

2.3 ACCEPTABLE MANUFACTURERS

A. Cutler-Hammer / Westinghouse

B. General Electric

C. Siemens

D. Square D

PART 3 - EXECUTION

3.1 APPLICATION

A. Provide safety switches where indicated on the drawings or required by NEC.

B. Provide safety switches within sight from and readily accessible from air-conditioning or refrigerating equipment when switches are not provided integral with equipment.

3.2 INSTALLATION

A. Mount safety switches securely between 3 and 6 foot levels above floor unless otherwise indicated on the drawings.

B. Furnish fuses for fusible switches of the size indicated on the drawings.

3.3 WARNING SIGNAGE conforming to NFPA 70E shall be installed on each switch.

END OF SECTION

SECTION 262816

MOLDED CASE CIRCUIT BREAKERS (MCCB)

PART 1 - GENERAL

1.1 ELECTRICAL GENERAL PROVISIONS

A. Provisions of Section 260100 - Electrical General Provisions shall be made an integral part of this section.

1.2 REFERENCES

A. NEMA AB 1 1993 - (National Electrical Manufacturers Association) Molded Case Circuit Breakers and Molded Case Switches

B. UL 489 - (Underwriters Laboratories Inc.) Molded Case Circuit Breakers and Circuit Breaker Enclosures

1.3 SCOPE: This section applies to all MCCB whether individually enclosed, group mounted or part of other equipment

1.4 SUBMITTALS: Provide outline drawings with dimensions, and ratings for voltage, amperage and maximum interruption. Include instructions for identification and receiving inspection, circuit breaker mounting, trip unit functions and adjustments, trouble shooting, accessories and wiring diagrams.

1.5 QUALIFICATIONS

A. To be considered for approval, the manufacturer shall furnish products listed by Underwriters Laboratories Incorporated (UL), or testing firm acceptable to the authority having jurisdiction as suitable for application specified.

B. The overcurrent protection device manufacturing facility shall be Registered by Underwriters Laboratories Inc. to the International Organization for Standardization ISO 9000 Series Standards for quality.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Cutler-Hammer / Westinghouse

B. General Electric

C. Siemens

D. Square D

2.2 GENERAL

A. Circuit breakers shall be constructed using glass reinforced insulating material. Current carrying components shall be completely isolated from the handle and the accessory mounting area.

B. Circuit breakers shall have an over center, trip free, toggle operating mechanism which will provide quick-make, quick-break contact action. The circuit breaker shall have common tripping of all poles.

C. The circuit breaker handle shall reside in a tripped position between ON and OFF to provide local trip indication. Circuit breaker escutcheon shall be clearly marked ON and OFF in addition to providing International I/O markings.

D. The maximum ampere rating and UL or other certification standards with applicable voltage systems and corresponding interrupting ratings shall be clearly marked on face of circuit breaker.

E. Circuit breakers shall be equipped with UL Listed electrical accessories as noted on the associated drawing.

F. Provide provisions for locking handle in the ON and OFF position as follows:

1. All circuit breakers 225 ampere frame and larger.
2. Where shown on drawings, regardless of location and size.

G. All circuit breakers shall be UL Listed for reverse connection without restrictive line and load markings and be suitable for mounting in any position

H. Circuit breakers shall be fixed construction with factory installed mechanical lugs. All circuit breakers shall be UL Listed to accept field installable/removable lugs (except Quick Lug type). Lug body shall be bolted in place; snap in design is not acceptable. All lugs shall be UL Listed to accept solid (not larger than #8 AWG) and/or stranded copper and aluminum conductors. Quick Lug breakers shall be the bolt-on type.

I. All circuit breakers shall be capable of accepting bus connections.

J. Minimum short circuit rating

1. The minimum short circuit rating for a breaker shall be its stand alone rating.
2. Maximization of selective tripping is the intent of this design. Use of series rated equipment will not be approved.

2.3 THERMAL-MAGNETIC CIRCUIT BREAKERS

A. Circuit breakers shall have a permanent trip unit containing individual thermal and magnetic trip elements in each pole.

B. Thermal trip elements shall be factory preset and sealed. Circuit breakers shall be true rms sensing and thermally responsive to protect circuit conductor(s) in a 40° C ambient temperature.

C. Circuit breaker frame sizes above 100 amperes shall have a single magnetic trip adjustment located on the front of the circuit breaker (except type Q2, Q2H and Q2-H).

2.4 ENCLOSURES: Enclosures for individually enclosed MCCB shall be NEMA 1 indoors and NEMA 4X outdoors.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install MCCB's in switchboards and panelboards as shown on the drawings.

B. Individually enclosed MCCB's: Install securely between the 3 and 6 foot levels above the floor unless otherwise indicated on the drawings.

3.2 ADJUSTING: Circuit breaker pick-up level and time delay settings shall be adjusted to values indicated on the coordination study.

3.3 WARNING SIGNAGE conforming to NFPA 70E shall be installed on each individually-enclosed MCCB.

END OF SECTION

SECTION 262913

MOTOR STARTERS

PART 1 - GENERAL

1.1 ELECTRICAL GENERAL PROVISIONS

A. Provisions of Section 260100 - Electrical General Provisions shall be made an integral part of this section.

1.2 SCOPE

A. This section specifies starters shown on the drawings individually mounted; i.e., not an integral part of a piece of mechanical equipment.

1.3 REFERENCES: NEMA PUBLICATIONS

A. ICS 1 General Standards for Industrial Control and Systems.

B. ICS 2 Standards for Industrial Control Devices, Controllers, and Assemblies.

C. ICS 6 Enclosures for Industrial Controls and Systems.

PART 2 - PRODUCTS

2.1 GENERAL

A. Starters shall be NEMA-rated. IEC-rated equipment will not be accepted.

B. Starters and associated devices unless otherwise indicated shall have NEMA 1 enclosures where mounted indoors and NEMA 4X enclosures where mounted outdoors.

C. Starters shall disconnect all un-grounded circuit conductors.

D. Starters shall have $75^{O}C$ - rated line and load lugs.

2.2 MANUAL STARTERS

A. Overload:

1. Thermal overload protection shall be trip-free and the hand reset type. Overload relays shall be Class 10.
2. Each ungrounded phase or motor lead shall have overload protection in its starter.
3. Overload relays in outdoor starters shall be ambient compensated.
4. Elements sized upon nameplate running amperes of the actual motor installed.

B. Shall have "quick-make" and "quick-break" mechanisms and be trip-free. They shall have provision for padlocking in the "on" and "off" positions.

2.3 MAGNETIC STARTERS

A. General

1. Starters shall be electro-mechanical.
2. Overload:
   a. Thermal overload protection shall be trip-free and the hand reset type. Overload relays shall be Class 10.
   b. Each ungrounded phase or motor lead shall have overload protection in its starter.
   c. Overload relays in outdoor starters shall be ambient compensated.
   d. Manual reset in cover
   e. Elements sized upon nameplate running amperes of the actual motor installed.
3. Pilot devices
   a. Pilot devices shall be heavy-duty, oil-tight, rated for 600 volts.
   b. Provide an HOA switch for starters under automatic control.
   c. Provide momentary contact, start-stop pushbuttons (seal-in contact paralleling start pushbutton) for starters under manual control.
   d. Pilot lights: Red (run) and green (stopped)
4. Control power
   a. For starters having utilization voltage of 480 volts, control voltage shall be 120 volts obtained from within starter.
   b. Control power transformers shall be part of starter.
   c. Ungrounded control wiring, including the primary to control transformers, shall be fused.
   d. Each control power transformer shall have sufficient capacity for the proper operation of all the devices within the associated system.
5. Coils shall be equipped with surge suppressors connected in parallel.
6. Auxiliary contacts: Two sets, form “C” in addition to those shown on the control wiring diagrams.

B. Combination Starters

1. Disconnecting means, safety switch type:
   a. Shall be "quick-make" and "quick-break" mechanisms, trip-free with provision for padlocking in the "on" and "off" positions.
   b. For fusible safety switch type, fuses shall be as specified in Section 262813 - Fuses.

2.4 ACCEPTABLE MANUFACTURERS:

A. Allen-Bradley

B. Cutler-Hammer / Westinghouse

C. Furnas

D. General Electric

E. Siemens

F. Square D

PART 3 - EXECUTION

3.1 GENERAL

A. When motors are supplied with characteristics different from those indicated on the drawings, starters, feeders, overloads, disconnects, and associated devices of the correct size, type, and rating shall be provided.

B. Provide full-voltage starters unless otherwise indicated.

3.2 INSTALLATION

A. Install in accordance with manufacturer's printed instructions.

B. Mounting: Install so that top of enclosure is 72 inches above finished floor.

3.3 **WARNING SIGNAGE** conforming to NFPA 70E shall be installed on each individually-enclosed, magnetic motor starter.

END OF SECTION

SECTION 265100

LIGHTING, INTERIOR

PART 1 - GENERAL

1.1 ELECTRICAL GENERAL PROVISIONS

A. Provisions of Section 260100 - Electrical General Provisions shall be made an integral part of this section.

1.2 REFERENCES: NEMA PUBLICATIONS

A. LE 1 Fluorescent Luminaries

B. LE 2 H-I-D Lighting System Noise Criterion (LS-NC) Ratings

C. LE 3 High-Intensity-Discharge (H-I-D) Lamps

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. Section 265120 - Lamps

B. Section 265130 - Ballasts

1.4 LIGHTING FIXTURES SCHEDULE: The lighting fixture schedule lists an acceptable manufacturer and catalog number for each type of fixture. At Contractor's option, he may also offer an alternate based upon other manufacturers provided that the quality of the alternate is equal to or exceeds that specified.

1.5 SUBMITTALS: Submit photometrics, coefficient of utilization tables, efficiency, ballast manufacturer, gage of fixture metal, lens material, thickness and style, lens frame material and hinge arrangement, and a copy of a test report by an independent testing laboratory.

PART 2 - PRODUCTS

2.1 GENERAL

A. Catalog numbers given in the fixture schedules are series numbers only and may not necessarily cover all necessary appurtenances.

1. Lighting fixtures shall be as indicated on drawings with applicable design features specified in this section.
2. Provide quantity of ballasts necessary for the switching functions shown on the drawings.
3. Where fixtures are shown to be controlled by dimmers, provide dimming ballasts.

2.2 FLUORESCENT FIXTURES

A. Fluorescent fixtures shall meet the requirements of NEMA LE 1.

B. Support wire shall be #12 AWG, steel.

C. Hold down clips shall function to hold fixture in place in a lay-in ceiling in opposition to upward pressure on the bottom of the fixture that might be caused by high wind entering the building through broken windows during a storm.

PART 3 - EXECUTION

3.1 GENERAL: Provide lamps, plates, rings, hangers, trim, and all accessories necessary for a complete and secure installation.

3.2 FIXTURE INSTALLATION

A. Coordination

1. Carefully examine the Architectural and Mechanical drawings so as to become acquainted with the structural features of the building, and the location of pipe and ductwork which would alter the location and spacing of outlets for fixtures.
2. Adjust fixture locations as required to avoid interference with other trades or to provide maximum practical illumination for personnel areas.
3. Lighting fixture arrangements and mounting heights shall be as indicated on the drawings. Where job conditions require arrangements or mounting heights different from those shown or specified to avoid equipment, structural features, etc., such changes in mounting height shall be as directed without additional cost to the Owner.

B. Support:

1. Fixtures installed in lay-in ceilings
   a. Support fixtures weighing 56 pounds or less by means of two, 12-gauge, slack wires attached at diagonal corners of the fixture and running up to and attached to the building structure. These wires shall be independent of wires used to support lay-in ceiling grid.
   b. Support fixtures weighing more than 56 pounds by means of two, 12-gauge, taught wires attached at diagonal corners of the fixture and running up to and attached to the building structure. These wires shall be independent of wires used to support lay-in ceiling grid. The weight of the fixture shall not be borne by the ceiling system.
   c. Fasten fluorescent fixtures installed in lay-in ceilings by means of hold down clips at each corner.
2. Pendant-mounted fixtures: Support pendant-mounted fixtures directly from the building structure.

END OF SECTION

SECTION 265110

LIGHTING, EXTERIOR

PART 1 - GENERAL

1.1 ELECTRICAL GENERAL PROVISIONS

A. Provisions of Section 260100 - Electrical General Provisions shall be made an integral part of this section.

1.2 RELATED WORK:

A. Section 265120 - Lamps

B. Section 265130- Ballasts

1.3 REFERENCES: NEMA PUBLICATIONS

A. LE 1 Fluorescent Luminaries

1.4 LIGHTING FIXTURE SCHEDULE: The lighting fixture schedule lists an acceptable manufacturer and catalog number for each type of fixture. At Contractor's option, he may also offer an alternate based upon other manufacturers provided that the quality of the alternate is equal to or exceeds that specified.

1.5 SUBMITTALS: Submit photometrics, coefficient of utilization tables, efficiency, ballast manufacturer, gage of fixture metal, lens material, thickness and style, lens frame material and hinge arrangement, and a copy of a test report by an independent testing laboratory.

PART 2 - PRODUCTS

2.1 GENERAL: Catalog numbers given in the fixture schedules are series numbers only and may not necessarily cover all necessary appurtenances. Provide fixtures as indicated on drawings with applicable design features specified in this section.

2.2 FLUORESCENT FIXTURES shall meet the requirements of NEMA LE 1.

PART 3 - EXECUTION

3.1 Provide lamps, plates, rings, hangers, trim, and all accessories necessary for a complete and secure installation.

3.2 FIXTURE INSTALLATION

A. Lighting fixture arrangements and mounting elevations shall be as indicated on the drawings.

B. Adjust fixture locations as required to avoid interference with other trades or to provide maximum practical illumination for personnel areas.

C. For building- mounted fixtures, support outlet boxes and fixtures from building structure. Affix in such a manner as to maintain the weather integrity of the building.

END OF SECTION

SECTION 265120

LAMPS

PART 1 - GENERAL

1.1 ELECTRICAL GENERAL PROVISIONS

A. Provisions of Section 260100 - Electrical General Provisions shall be made an integral part of this section.

1.2 REFERENCES: NEMA PUBLICATIONS

A. LE 1 Fluorescent Luminaries

1.3 RELATED WORK

A. Section 265100 - Lighting, Interior

B. Section 265120 - Lighting, Exterior

C. Section 265130 - Ballasts

1.4 SUBMITTALS

A. Submit cut sheet on each type of lamp to be provided.

B. In a table similar to the Lighting Fixture Schedule, list the manufacturer's name and catalog number of lamp that will be provided for each fixture type. Include a letter from the manufacturer's representative(s) providing the fixtures that the scheduled lamps are the correct types for the fixture types being supplied.

PART 2 - PRODUCTS

2.1 LAMPS

A. Provide lamp types as indicated on drawings.

B. Acceptable manufacturers:

1. General Electric
2. Philips
3. Sylvania
4. Westinghouse

PART 3 - EXECUTION

3.1 Provide and install lamps, and all accessories necessary for a complete installation.

END OF SECTION

SECTION 265130

BALLASTS

PART 1 - GENERAL

1.1 ELECTRICAL GENERAL PROVISIONS

A. Provisions of Section 26010 - Electrical General Provisions shall be made an integral part of this section.

1.2 REFERENCES: NEMA PUBLICATIONS

A. LE 1 Fluorescent Luminaries

1.3 RELATED WORK

A. Section 235100 - Lighting, Interior

B. Section 265110 - Lighting, Exterior

C. Section 265120 - Lamps

PART 2 - PRODUCTS

2.1 GENERAL

A. Catalog numbers given in the fixture schedules are series numbers only and may not necessarily cover all necessary appurtenances.

1. Lighting fixtures shall be as indicated on drawings with applicable design features specified in this section.
2. Provide quantity of ballasts necessary for the switching functions shown on the drawings.
3. Where fixtures are shown to be controlled by dimmers, provide dimming ballasts.

2.2 **BALLASTS, FLUORESCENT**, shall have the following features:

A. Rapid Start Ballasts

1. Parallel circuit allowing remaining lamp(s) to maintain full light output if one or more lamps fail (except T12 high output).
2. Operate from 60Hz input source of 120, 277 volts, and sustained variations of +/- 10% (voltage and frequency) with no damage to the ballasts.
3. High frequency electronic type and operate lamps at a frequency above 20kHz.
4. Lamp Current Crest Factor (ratio of peak to RMS current) 1.7 or less in accordance with lamp manufacturer recommendation and ANSI C82.11-1993.
5. Tolerate operation in ambient temperatures up to 105°F (40°C) without damage.
6. Comply with FCC Part 18 Non-Consumer Equipment for EMI (power line conducted) and RFI (Radiated).
7. Transient immunity as recommended by ANSI C62.41-1991, Location A2.
8. Operate lamps with no visible flicker (<3% flicker index).
9. Tolerate sustained open circuit and short circuit output conditions without damage.

10. Underwriters Laboratory (UL 935) listed, Class P, Type 1 Outdoor, CSA Certified where applicable.
11. Ballast Factor greater than .85, per ANSI C82.11-1993.
12. Input current Total Harmonic Distortion less than 10% for primary lamp applications.
13. Power factor greater than 0.98 primary applications.
14. Non-PCB
15. Warranted against defects in material or workmanship, including replacement, for five years from date of manufacture.
16. Rapid starting sequence consistent with ANSI standard C82.11-1993.

B. Electronic Compact Fluorescent Ballasts shall have the following:

1. Programmed rapid start.
2. Incorporate lamp shutdown circuitry for end of lamp life protection.
3. Allow for re-lamping without the need to cycle power.
4. Operate from 50/60Hz input source of 108-305 Volts with no damage to the ballasts.
5. Metal can construction to meet all plenum requirements and to eliminate the need for extra grounding wires.
6. High frequency electronic type, and operate lamps at a frequency above 50kHz to minimize interference with infrared control systems.
7. Lamp Current Crest Factor (ratio of peak to RMS current): 1.7 or less in accordance with lamp manufacturer recommendation and ANSI C82.11-1993.
8. Tolerate operation in ambient temperatures up to 140°F (55°C) without damage.
9. Maximum case temperature test point of 75°C printed on the label for easy fixture testing and troubleshooting.
10. Maximum case temperature rise of 15°C.
11. Comply with FCC Part 18 Non-Consumer Equipment for EMI (power line conducted) and RFI (Radiated).
12. Transient immunity as recommended by ANSI C62.41-1991.
13. Operate lamps with no visible flicker (<3% flicker index).
14. Tolerate sustained open and short circuit output conditions without damage.
15. Underwriters Laboratory (UL 935) listed, Class P, Type 1 Outdoor.
16. Input current Total Harmonic Distortion less than 10% for the primary lamp.
17. Power factor greater than .98.
18. Non-PCB.
19. Warranted against defects in material or workmanship, including replacement, for five years from date of manufacture.

2.3 ACCEPTABLE MANUFACTURERS:

A. Advance

B. General Electric

C. Jefferson Transformer

D. Magnatek

E. Universal

PART 3 - EXECUTION

3.1 Provide ballasts and all accessories necessary for a complete installation.

3.2 Install low temperature ballasts for all exterior fixtures.

END OF SECTION

SECTION 265140

OCCUPANCY SENSORS

PART 1 - GENERAL

1.1 ELECTRICAL GENERAL PROVISIONS

A. Provisions of Section 260100 - Electrical General Provisions shall be made an integral part of this section.

1.2 WORK INCLUDED

A. Provide and install all materials necessary for a completely operational occupancy sensor lighting control system, as described herein.

B. Examine all general specification provisions and drawings for related electrical work required as work under Division 16.

C. Coordinate all work described in this section with all other applicable plans and specifications, including but not limited to wiring, conduit, fixtures, HVAC systems and building management systems.

1.3 EQUIPMENT QUALIFICATION

A. Products supplied shall be from a manufacturer that has been continuously involved in the manufacturing of occupancy sensors for a minimum of five (5) years.

B. All components shall be UL listed, offer a five (5) year warranty and meet all state and local applicable code requirements.

C. Products shall be manufactured by an ISO 9002 certified manufacturing facility and shall have a defect rate of less than 1/3 of 1%.

D. Wall switch products must be capable of withstanding the effects of inrush current. Submittals shall clearly indicate the method used.

1.4 SYSTEM DESCRIPTION

A. The objective of this section is to ensure the proper installation of the occupancy sensor based lighting control system so that lighting is turned off automatically after reasonable time delay when a room or area is vacated by the last person to occupy said room or area.

B. The occupancy sensor based lighting control shall accommodate all conditions of space utilization and all irregular work hours and habits.

C. Where an occupancy sensor symbol is shown in a space, provide proper type of sensor for the space's use and sufficient quantity of sensors to provide adequate coverage.

D. Contractor shall warrant all equipment furnished in accordance to this specification to be undamaged, free of defects in materials and workmanship, and in conformance with the specifications. The supplier's obligation shall include repair or replacement, and testing without charge to the owner, all or any parts of equipment which are found to be damaged, defective or non-conforming and returned to the supplier. The warranty shall commence

upon the owner's acceptance of the project. Warranty on labor shall be for a minimum period of one (1) year.

1.5 SUBMITTALS

A. Manufacturer shall substantiate conformance to this specification by supplying the necessary documents, performance data and wiring diagrams. Any deviations to this specification must be clearly stated by letter and submitted.

B. Submit a lighting plan clearly marked by manufacturer showing proper product, location and orientation of each sensor.

C. Submit interconnection diagrams per major subsystem showing proper wiring.

D. Submit standard catalog literature which includes performance specifications indicating compliance to the specification.

E. Catalog sheets must clearly state any load restrictions when used with electronic ballasts.

1.6 SYSTEM OPERATION

A. It shall be the contractor's responsibility to make all proper adjustments to assure owner's satisfaction with the occupancy system, or;

B. It shall be the manufacturer's responsibility to verify all proper adjustments and train owner's personnel to ensure owner's satisfaction with the occupancy system.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. The Watt Stopper, Lighting Control and Design, or equal.

B. The listing of any manufacturer as "acceptable" does not imply automatic approval. It is the sole responsibility of the electrical contractor to ensure that any substitutions are for equipment which meets or exceeds the specifications included herein.

2.2 PRODUCTS

A. All products numbers listed below are those of the Watt Stopper Company.

1. Ceiling sensors: WT-605, WT-600, WT-1105, WT-1100, WT-2205, WT-2200, WT-2250, WT-2255, WP-605, WP-1105, WP-2255, WP-2205, W-500A, W-1000A, W-2000A, W-2000H, UT-300, UT-305, UT-355, WPIR, HB-100, HB-150, DT-200, DT-205, DT-300, DT-305, DT-355, CX-100, CX-105, CI-200, CI-205, CI-300, CI-305, CI-355, CI-12, CI-24
2. Wall Sensors: WS-200, WI-200, WI-300, WA-200, WA-300, WD-170, WD-180, WD-270, WD-280, WN-100
3. Power and Slave Packs: B120E-P, B277E-P, BZ-100, LC-100, C120E-P, C277E-P, S120/277-P, AT-120, AT-277
4. InteliSwitch: TS-400, TS-400-24

B. Wall switch sensors

1. Shall be capable of detection of occupancy at desktop level up to 300 square feet, and gross motion up to 1000 square feet.
2. Shall accommodate loads from 0 to 800 watts at 120 volts; 0 to 1200 watts at 277 volts and shall have 180 deg. coverage capability.
3. Shall utilize Zero Crossing Circuitry which increases relay life, protects from the effects of inrush current, and increases sensor's longevity.
4. Shall have no leakage current to load, in manual or in Auto/Off mode, for safety purposes and shall have voltage drop protection.
5. Where specified, shall provide a field selectable option to convert sensor operation from automatic-ON to manual-ON.
6. Where specified, vandal resistant sensors shall utilize a hard lenses with a minimum 1.0 mm thickness. Products utilizing a soft lense will not be considered.

C. Passive infrared sensors

1. Shall utilize Pulse Count Processing and Digital Signature Analysis to respond only to those signals caused by human motion.
2. Shall utilize mixed signal ASIC which provides high immunity to false triggering from RFI (walkie talkies) and EMI (electrical noise on the line), superior performance, and greater reliability.
3. Shall have a multiple segmented Lodif Fresnel lens, in a multiple-tier configuration, with grooves-in to eliminate dust and residue build-up.

D. Where specified, passive infrared and dual technology sensors shall offer daylighting footcandle adjustment control and be able to accommodate dual level lighting.

E. Dual Technology sensors

1. Shall be corner mounted to avoid detection outside the controlled area when doors are left open.
2. Shall consist of passive infrared and ultrasonic technologies for occupancy detection. Products that react to noise or ambient sound will not be considered.

F. Ultrasonic sensors

1. Shall utilize Advanced Signal Processing to adjust the detection threshold dynamically to compensate for constantly changing levels of activity and air flow through controlled space.
2. Shall be crystal controlled at 25 kHz +/- 0.005% tolerance, 32 kHz within +/- 0.002% tolerance, or 40 kHz +/- 0.002% tolerance to assure reliable performance and eliminate sensor cross-talk. Sensors using multiple frequencies are not acceptable.

G. All sensors

1. Shall be capable of operating normally with electronic ballasts, PL lamp systems and rated motor loads.
2. Coverage shall remain constant after sensitivity control has been set. No automatic reduction shall occur in coverage due to the cycling of air conditioner or heating fans.
3. Shall have readily accessible, user adjustable controls for time delay and sensitivity. Controls shall be recessed to limit tampering.
4. Shall have a bypass manual override so that, in the event of a failure, bypass can be utilized so that lighting remains on constantly until sensor is replaced. This control shall be recessed to prevent tampering.

5. Shall provide an LED as a visual means of indication at all times to verify that motion is being detected during both testing and normal operation.
6. Where specified, shall have an internal additional isolated relay with Normally Open, Normally Closed and Common outputs for use with HVAC control, Data Logging and other control options. Sensors utilizing separate components or specially modified units to achieve this function are not acceptable.
7. Shall have UL rated, 94V-0 plastic enclosures.

2.3 CONTROL RELAYS

A. For ease of mounting, installation and future service, control relays shall be able to externally mount through a 1/2" knock-out on a standard electrical enclosure and be an integrated, self-contained unit consisting internally of an isolated load switching control relay and a transformer to provide low-voltage power. Control relay shall provide power to a minimum of two (2) sensors.

B. Relay Contacts shall have ratings of:

13A - 120 VAC Tungsten
20A - 120 VAC Ballast
20A - 277 VAC Ballast

C. Control wiring between sensors and control relays shall be Class II, 18-24 AWG, stranded U.L. Classified, PVC insulated or TEFLON jacketed cable suitable for use in plenums, where applicable.

D. Minimum acceptable wire gauge from the circuit control hardware relays shall be # 14 AWG.

E. Provide control units where sensors do not have the capacity to serve the load controlled.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Locate and aim sensors for complete and proper volumetric coverage within the range of coverage(s) of controlled areas per the manufacturer's recommendations. Rooms shall have ninety (90) to one hundred (100) percent coverage to completely cover the controlled area to accommodate all occupancy habits of single or multiple occupants at any location within the room(s). The locations and quantities of sensors shown on the drawings are diagrammatic and indicate only the rooms which are to be provided with sensors. Provide additional sensors if required to properly and completely cover the respective room.

B. Arrange a pre-installation meeting with the manufacturer's factory authorized representative, at the site, to verify placement of sensors and installation criteria.

C. Coordinate with other trades to ensure the best possible installation in the available space and to overcome local difficulties due to space limitations or interference of other building components. Provide, at the site, the training necessary to familiarize the owner's personnel with the operation, use, adjustment, and problem solving diagnosis of the occupancy sensing devices and systems.

3.2 FACTORY COMMISSIONING

A. Upon completion of the installation, the system shall be completely commissioned by the manufacturer's factory authorized technician who will verify all adjustments and sensor

placement to ensure a trouble-free occupancy-based lighting control system. This service is provided at an additional cost.

B. Provide both the manufacturer and the Architect with ten working days written notice of the scheduled commissioning date. Upon completion of the system fine tuning the factory authorized technician shall provide the proper training to the owner's personnel in the adjustment and maintenance of the sensors.

END OF SECTION

SECTION 321413

CONCRETE PAVERS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Interlocking concrete paver units.

1.03 REFERENCES

A. ASTM C 936 - Standard Specification for Solid Concrete Interlocking Paving Units; 2001.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide characteristics of paver unit, dimensions, and special shapes.

C. Samples: Submit two samples of each paver type, illustrating style, size, color range and surface texture of units being provided.
   1. Size: 4"x9"

D. Manufacturer's Installation Instructions: Indicate substrate requirements, setting bed, and installation methods. Refer also to the civil drawings for drainage base.

1.05 EXTRA MATERIALS

A. See Section 016000 - Product Requirements, for additional provisions.

B. Provide 10 of each paver size.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Concrete Pavers:
   1. Hanover Architectural Products, Inc; Product 4"x9" pavers: www.hanoverpavers.com.
   2. Substitutions: See Section 016000 - Product Requirements.

2.02 MATERIALS

A. Interlocking Concrete Pavers: Hydraulically pressed concrete, configured for interlocking with adjacent units and complying with ASTM C 936.
   1. Compressive Strength: 8000 psi average, with minimum of 7200 psi.
   2. Thickness: 2-3/8 inches.
   3. Style: Rectangular.
   4. Color: Natural.

B. Aggregate Fill and Base: See civil drawings.

C. Edging: As indicated on drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate is level or to correct gradient, smooth, capable of supporting pavers and imposed loads, and ready to receive work of this Section.

B. Verify gradients and elevations of substrate are correct.

3.02 PREPARATION

A. Treat soil with herbicide to retard plant growth.

3.03 INSTALLATION OF SOLID PAVER UNITS

A. Place paver units in herringbone pattern, from straight reference edge.

B. Cut paver units at edges with masonry saw.

C. Place half units at edge and interruptions. Maintain evenly spaced joints.

D. Tamp and level paver units with mechanical vibrator until units are firmly bedded, level, and to correct elevation and gradients. Do not tamp unrestrained edges.

END OF SECTION

SECTION 323100
High Security Steel Fence System

PART 1 - GENERAL

1.01 WORK INCLUDED

The contractor shall provide all labor, materials and appurtenances necessary for installation of the steel corrugated pale security fence system defined herein and as located on drawings.

1.02 RELATED WORK

Section 02200 - Earthwork

1.03 SYSTEM DESCRIPTION

The manufacturer shall supply a total system for an 8'-0" high steel ornamental pale high security fence system of the Ameristar® Impasse™ Trident design. The system shall include all components (i.e., pales, rails, posts, and hardware) required.

1.04 QUALITY ASSURANCE

The contractor shall provide laborers and supervisors who are thoroughly familiar with the type of construction involved and materials and techniques specified.

1.05 REFERENCES

- ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
- ASTM B117 - Practice for Operating Salt-Spray (Fog) Apparatus.
- ASTM D523 - Test Method for Specular Gloss.
- ASTM D714 - Test Method for Evaluating Degree of Blistering in Paint.
- ASTM D822 - Practice for Conducting Tests on Paint and Related Coatings and Materials using Filtered Open-Flame Carbon-Arc Light and Water Exposure Apparatus.
- ASTM D1654 - Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.
- ASTM D2244 - Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.
- ASTM D2794 - Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
- ASTM D3359 - Test Method for Measuring Adhesion by Tape Test.
- ASTM F2408 – Ornamental Fences Employing Galvanized Steel Tubular Pickets.

1.06 SUBMITTAL

The manufacturer's submittal package shall be provided prior to installation.

1.07 PRODUCT HANDLING AND STORAGE

Upon receipt at the job site, all materials shall be checked to ensure that no damage occurred during shipping or handling. Materials shall be stored in such a manner to ensure proper ventilation and drainage, and to protect against damage, weather, vandalism and theft.

PART 2 - MATERIALS

2.01 MANUFACTURER

A. The steel ornamental pale high security fence system shall conform to Ameristar Impasse Trident, 3-Rail style manufactured by Ameristar Fence Products, Inc., in Tulsa, Oklahoma.

2.02 MATERIAL

A. Steel material for fence framework (i.e., corrugated pales, rails and posts), when galvanized prior to forming, shall conform to the requirements of ASTM A924/A924M, with a minimum yield strength of 45,000 psi (310 MPa). The steel shall be hot-dip galvanized to meet the requirements of ASTM A653/A653M with a minimum zinc coating weight of 0.90 oz/ft^2 (276 g/m^2), Coating Designation G-90.

B. Material for corrugated pales shall be a nominal 2.75" x .75" x 0.075 inches. The cross-sectional shape of the rails shall conform to the manufacturer's Impasse™ rail design a nominal 2.5" x 2" x 1.5" x 0.100 inches. Pre-drilled holes in the Impasse rail shall be spaced 6" on center, providing a pale airspace of no greater than 3.25". Tamperproof fasteners shall be used to fasten each pale to rail at every intersection. Posts shall conform to the manufacturer's Impasse I-Beam

design with a nominal 4" x 1.75" x 0.100". Fence posts and gate posts shall meet the minimum size requirements of Table 1.

2.03 FABRICATION
A. Pales, rails and posts shall be pre-cut to specified lengths. Impasse rails shall be pre-punched to accept the tamperproof security fasteners. Post shall be pre-punched to accept bracket, rail, and post attachment.

B. The manufactured galvanized framework shall be subjected to the PermaCoat® thermal stratification coating process (high-temperature, in-line, multi-stage, multi-layer) including, as a minimum, a six-stage pretreatment/wash (with zinc phosphate), an electrostatic spray application of an epoxy base, and a separate electrostatic spray application of a polyester finish. The base coat shall be a thermosetting epoxy powder coating (gray in color) with a minimum thickness of 2 mils (0.0508mm). The topcoat shall be a "no-mar" TGIC polyester powder coat finish with a minimum thickness of 2 mils (0.0508mm). The color shall be Black. The stratification-coated framework shall be capable of meeting the performance requirements for each quality characteristic shown in Table 2.

C. Completed panels shall be capable of supporting a 400 lb. load (applied at midspan) without permanent deformation. Panels shall be biasable to a 30° change in grade.

PART 3 - EXECUTION
3.01 PREPARATION
All new installation shall be laid out by the contractor in accordance with the construction plans.

3.02 FENCE INSTALLATION
Fence post shall be spaced according to Table 3, plus or minus ½". For installations that must be raked to follow sloping grades, the post spacing dimension must be measured along the grade. Fence panels shall be attached to posts with brackets supplied by the manufacturer. Posts shall be set in concrete footers having a minimum depth of 36" and 12" in diameter. Concrete shall be 3500 psi.

3.03 FENCE INSTALLATION MAINTENANCE
When cutting/drilling rails or posts adhere to the following steps to seal the exposed steel surfaces; 1) Remove all metal shavings from cut area. 2) Apply zinc-rich primer to thoroughly cover cut edge and/or drilled hole; let dry. 3) Apply 2 coats of custom finish paint matching fence color. Failure to seal exposed surfaces per steps 1-3 above will negate warranty. Ameristar spray cans or paint pens shall be used to prime and finish exposed surfaces; it is recommended that paint pens be used to prevent overspray. Use of non-Ameristar parts or components will negate the manufactures' warranty.

3.04 GATE INSTALLATION
Gate posts shall be spaced according to the manufacturers' gate drawings, dependent on standard out-to-out gate leaf dimensions and gate hardware selected. Type and quantity of gate hinges shall be based on the application; weight, height, and number of gate cycles. The manufacturers' gate drawings shall identify the necessary gate hardware required for the application. Gate hardware shall be provided by the manufacture of the gate and shall be installed per manufacturer's recommendations.

3.05 CLEANING
The contractor shall clean the jobsite of excess materials; post-hole excavations shall be scattered uniformly away from posts.

Table 1 – Minimum Sizes for Impasse Posts	
Fence Posts	Panel Height
4" x 1.75" x 0.100" I-beam	Up to & Including 10' Height
4" x 4" x 11 Ga.	Over 10' Height

Gate Leaf	Gate Height			
	Up to & Including 6'	Over 6' Up to & Including 8'	Over 8' Up to & Including 10'	Over 12'
Up to 4'	3" x 12Ga.	3" x 12 Ga.	4" x 11 Ga.	4" x 11 Ga.
4'1" to 6'	3" x 12Ga.	3" x 12 Ga.	4" x 11 Ga.	4" x 11 Ga.
6'1" to 8'	4" x 11 Ga.	6" x 3/16"	6" x 3/16"	6" x 3/16"
8'1" to 10'	4" x 11 Ga.	6" x 3/16"	6" x 3/16"	6" x 3/16"
10'1" to 12'	6" x 3/16"	6" x 3/16"	6" x 3/16"	8" x 1/4"
12'1" to 16'	6" x 3/16"	6" x 3/16"	8" x 1/4"	8" x 1/4"

Table 2 – Coating Performance Requirements		
Quality Characteristics	ASTM Test Method	Performance Requirements
Adhesion	D3359 – Method B	Adhesion (Retention of Coating) over 90% of test area (Tape and knife test).
Corrosion Resistance	B117, D714 & D1654	Corrosion Resistance over 3,500 hours (Scribed per D1654; failure mode is accumulation of 1/8" coating loss from scribe or medium #8 blisters).
Impact Resistance	D2794	Impact Resistance over 60 inch lb. (Forward impact using 0.625" ball).
Weathering Resistance	D822 D2244, D523 (60° Method)	Weathering Resistance over 1,000 hours (Failure mode is 60% loss of gloss or color variance of more than 3 delta-E color units).

Table 3 – Impasse – Post Spacing By Bracket Type				
Span	8' Nominal (92.25" Rail)			
Post Size	1-3/4" x 4" I-beam	3" Sq.	4" Sq.	6" Sq.
Bracket Type	Impasse Line (BB601)	Impasse End (BB602)		
		w/3GPBB3	w/3GPBB4	w/3GPBB6
Post Settings ± ½" O.C.	96"	98.75"	99.75"	101.75"
Span	6' Nominal (71.25" Rail)			
Post Size	1-3/4" x 4" I-beam	3" Sq.	4" Sq.	6" Sq.
Bracket Type	Impasse Line (BB601)	Impasse End (BB602)		
		w/3GPBB3	w/3GPBB4	w/3GPBB6
Post Settings ± ½" O.C.	72"	74.75"	75.75"	77.75"