PROJECT MANUAL

FOR

City of Lynchburg, Virginia

Abert Filter Plant
Sodium Hypochlorite Improvements

City Project No. 05-039-W

July 12, 2006

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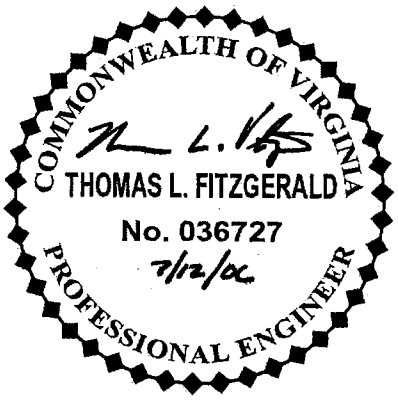

ADVERTISEMENT

BIDS FOR ABERT WATER TREATMENT PLANT CHEMICAL FEED SYSTEMS WILL BE RECEIVED BY THE CITY OF LYNCHBURG, PROCUREMENT DIVISION, THIRD FLOOR, CITY HALL, UNTIL 3:00 PM, AUGUST 30, 2006, AND WILL BE PUBLICLY OPENED AND READ ALOUD IN THE BIDDER'S ROOM, THIRD FLOOR, CITY HALL.

THE WORK CONSISTS OF INSTALLATION OF NEW CHEMICAL STORAGE AND FEED SYSTEMS FOR SODIUM HYPOCHLORITE, SODIUM HYDROXIDE AND ALUM, AND RELATED BUILDING AND SITE IMPROVEMENTS AT THE CITY'S ABERT WATER TREATMENT PLANT.

BID DOCUMENTS MAY BE OBTAINED FROM WILEY & WILSON, UPON RECEIPT OF A NONREFUNDABLE PAYMENT OF $75.00 FOR EACH SET. BID DOCUMENTS MAY BE VIEWED AND PRINTED DIRECTLY FROM THE CITY'S WEBSITE AT WWW.LYNCHBURGVA.GOV. DOCUMENTS ARE OPEN TO THE PUBLIC FOR INSPECTION AT THE FOLLOWING LOCATIONS: WILEY & WILSON; DODGE PLAN ROOM, ROANOKE; VALLEY CONSTRUCTION NEWS, ROANOKE; AND THE DEPARTMENT OF MINORITY BUSINESS ENTERPRISES, LYNCHBURG.

A **PRE-BID SITE CONFERENCE** WILL BE HELD AT 10:00 A.M., AUGUST 17, 2006, AT THE ABERT TREATMENT PLANT SITE, LYNCHBURG, VIRGINIA. DIRECTIONS: 501 NORTH (BOONSBORO ROAD) FROM LYNCHBURG, RIGHT ONTO HOLCOMB ROCK ROAD (ROUTE 761) ABOUT A MILE PAST THE VILLAGE OF BOONSBORO, RIGHT FORK ON TO ABERT ROAD AND GO THE END OF THE ROAD. PLANT PHONE NUMBER: (434)847-1311.

ALL REQUESTS FOR CLARIFICATION OR ADDITIONAL INFORMATION MUST BE MADE IN WRITING BY 5:00 PM, AUGUST 23, 2006 TO STEPHANIE SUTER, PROCUREMENT DIVISION, FACSIMILE: (434)845-0711, E-MAIL: STEPHANIE.SUTER@LYNCHBURGVA.GOV.

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BID FORM

Stephanie Suter
Buyer-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 "THE ABERT FILTER PLANT SODIUM HYPOCHLORITE IMPROVEMENTS" for the City of Lynchburg, Virginia, hereby proposes to furnish all labor, equipment, materials, and services and 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
($_____), referred to hereinafter as the Base Bid.

The undersigned also agrees to perform Additive Option A as described below for the additional sum of: _____
DOLLARS
($_____), referred to hereinafter as the Additive Option A Bid.

Additive Option A: Additive Option A shall include replacement of the existing exterior alum tank with a new tank identical to the 7,200 gallon exterior alum (T-4) as described and included in the base bid package specifications. Bid for this Additive Option A shall include cleaning and purging of the existing tank, removal and off-site disposal of the existing tank, and installation and commissioning of the new tank. This work shall be conducted in a sequenced manner after successful commissioning of the alum tank installed under the base bid package prior to removal of the existing tank. This alternate bid item will eliminate all retrofit work required on the existing alum tank as it will be decommissioned under this Additive Option A.

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 60 days from this date.

CURRENT VIRGINIA CLASS A CONTRACTOR'S LICENSE/ REGISTRATION NUMBER:

_____

Respectfully submitted,

CONTRACTOR:_____DATE:_____

ADDRESS:_____

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 $_____

2._____

_____ Amount $_____

3._____

_____ Amount $_____

Reference (for Projects listed above):

1._____

_____ Tel.No._____

2._____

_____ Tel.No._____

3._____

_____ 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 _____, 2006, 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).

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 substantially complete the Work within 280 days of Notice to Proceed. 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 $275.00 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_____, 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_____, 200_.

_____(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_____200 .

_____(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 _____.

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 _____, 20_____ 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 No. and Name:_____("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 ABERT FILTER PLANT SODIUM HYPOCHLORITE IMPROVEMENTS", 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 "THE ABERT FILTER PLANT SODIUM HYPOCHLORITE IMPROVEMENTS", may be obtained from Wiley & Wilson, Inc. upon receipt of a non-refundable payment of $125.00 per set by contacting Lori Burnette at (434) 947-1901. The manual and drawings may also be downloaded from the City's website: http://www.lynchburgva.gov/home/index.asp?page=981. The Manual of Specifications and Standard Details, for the City of Lynchburg may be obtained at the same location upon receipt of a non-refundable payment of $25.00 per disc, or the manual may be downloaded from the City's website: http://www.lynchburgva.gov/home/index.asp?page=149. Send non-refundable payment to the above address to the attention of Cheryl Foxx, telephone number (434) 455-3950, indicating if sender is general contractor or other than general contractor. Please include complete street address with zip code for use for hand-deliveries as well as complete mailing address with zip code, to avoid delay in receiving transmittals. Also include telephone number, fax number with area code, and e-mail address.

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

   Bidding documents will be provided as indicated in the Advertisement for Bids.

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.

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 "THE ABERT FILTER PLANT SODIUM HYPOCHLORITE IMPROVEMENTS";

b. Project Number 05-039-W;

c. The bidder's name and address;

d. 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 Contractors will indicate a lump sum bid for on the bid form. The lump sum bid shall contain all necessary costs required for completion of the Work. 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
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ARTICLE 10	PROTECTION OF PERSONS AND PROPERTY
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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. 05-039-W dated July 12, 2006, and any addenda; (3) the Contractor's bid recieved August 30, 2006; (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 Public Works	Procurement Division	City Attorney
2nd Floor, City Hall 900 Church Street Lynchburg, Virginia 24504	3rd Floor, City Hall 900 Church Street Lynchburg, Virginia 24504	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, 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 be 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 reimburse 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 with 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 a 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 observationthat 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 a 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 a 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.

SECTION 01000 - GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. SUMMARY OF WORK

1. WORK COVERED BY THE CONTRACT DOCUMENTS CONSISTS OF PROVIDING ALL WORK INDICATED ON DRAWINGS OR REQUIRED BY PROJECT MANUAL COMPLETE, NECESSARY FOR:

   CONSTRUCTION OF CHEMICAL STORAGE AND FEED SYSTEM IMPROVEMENTS AT THE ABERT WATER TREATMENT PLANT, INCLUDING: PROVISION OF A TEMPORARY SODIUM HYPOCHLORITE SYSTEM, DEMOLITION AND REMOVAL OF THE EXISTING CHLORINE GAS SYSTEM, INSTALLATION OF A NEW PERMANENT SODIUM HYPOCHLORITE SYSTEM, INSTALLATION OF NEW SODIUM HYDROXIDE AND ALUM SYSTEMS, IMPROVEMENTS TO THE EXISTING SODIUM HYDROXIDE AND ALUM SYSTEMS, MISCELLANEOUS RELATED BUILDING IMPROVEMENTS, CONSTRUCTION OF A NEW SECONDARY CONTAINMENT STRUCTURE, AND REPLACEMENT OF AN EXISTING DIESEL FUEL FEED SYSTEM WITH A NEW ABOVEGROUND TANK.

B. COORDINATION, OCCUPANCY, AND AVAILABILITY OF UTILITIES

1. COORDINATION: PHASES OF THE CONSTRUCTION WHICH INVOLVE THE TEMPORARY INTERRUPTION OF ESSENTIAL SERVICES SHALL BE SCHEDULED IN CONSULTATION WITH THE OWNER OR HIS REPRESENTATIVE AND SHALL NOT BE OF LONGER DURATION THAN ESSENTIAL TO ACCOMPLISH THE PURPOSE FOR SUCH INTERRUPTIONS. LIAISON WITH OWNER IN THIS MATTER SHALL BE A SALIENT FEATURE OF THIS CONTRACT. THE TEMPORARY SODIUM HYPOCHLORITE FEED SYSTEM SHALL BE INSTALLED AND SHALL BE IN CONTINUOUS OPERATION SATISFACTORY TO THE OWNER FOR A MINIMUM PERIOD OF 60 DAYS PRIOR TO THE OWNER AUTHORIZING ANY DECOMMISSIONING OF THE CHLORINE GAS SYSTEM. LIKEWISE, THE NEW SODIUM HYDROXIDE AND ALUM SYSTEMS SHALL BE INSTALLED AND FULLY OPERATIONAL PRIOR TO WORKING ON THE EXISTING SYSTEMS.

2. OCCUPANCY: IF THE OWNER OCCUPIES THE BUILDING UNDER PARTIAL UTILIZATION, CONTINUED OCCUPANCY, OR IN ANY WAY ELECTS TO OCCUPY THE PROJECT SITE PRIOR TO PROJECT FINAL ACCEPTANCE, NEITHER WILEY & WILSON NOR THE CONTRACTOR SHALL BE HELD RESPONSIBLE FOR THE SAFETY OR WELL-BEING OF THOSE OCCUPANTS BEYOND THE NORMAL CARE AND PRACTICE OF THE CONSTRUCTION INDUSTRY. SHOULD SUCH AN OCCUPANT BE HARMED OR PLACED AT RISK BY EXPOSURE OR CONTACT WITH PROJECT RELATED MATERIALS OR BYPRODUCTS, THE OWNER SHALL EXCLUSIVELY BE HELD RESPONSIBLE UNLESS THE CONTRACTOR, BY NOT ADHERING TO RECOGNIZED CONSTRUCTION PRACTICES, HAS INCREASED THE HEALTH RISK OF THE OCCUPANTS. IN NEITHER CASE SHALL WILEY & WILSON BE HELD RESPONSIBLE FOR INJURY OR ILLNESS OF OCCUPANTS ON SITE PRIOR TO PROJECT FINAL ACCEPTANCE.

3. UTILITIES: PORTIONS OF THE PROJECT ARE NEAR OVERHEAD HIGH VOLTAGE LINES. MEET THE REQUIREMENTS OF THE VIRGINIA OVERHEAD HIGH VOLTAGE LINE SAFETY ACT. THE COSTS INVOLVED IN MEETING THESE REQUIREMENTS SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.

4. THE CONTRACTOR SHALL COMPLY WITH UNDERGROUND UTILITY LOCATION NOTIFICATION, MARKING AND LOCATING REQUIREMENTS TO AVOID DAMAGE TO UNDERGROUND UTILITIES TO REMAIN.

5. THIS CONTRACT REQUIRES WORK WITH AND AROUND HAZARDOUS INDUSTRIAL CHEMICALS, TANKS, PUMPS AND PIPING. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COMPLYING WITH OSHA REQUIREMENTS INCLUDING BUT NOT LIMITED TO HAZCOMM TRAINING AND INSTRUCTION TO ALL SITE EMPLOYEES AND SUBCONTRACTORS. THE CONTRACTOR SHALL UTILIZE PROTECTIVE MEASURES TO PROTECT EXISTING SYSTEMS FROM DAMAGE DURING CONSTRUCTION, AND SHALL NOTIFY THE OWNER IMMEDIATELY IF DAMAGE OR LEAKAGE OCCURS.

6. THE CITY WILL DRAW DOWN CHEMICAL INVENTORIES TO MINIMUM PRACTICAL OPERATIONAL LEVEL WITH REASONABLE SCHEDULE NOTIFICATION TO ACCOMMODATE CONTRACTOR WORK; THIS SHALL INCLUDE CHLORINE GAS AND BULK STORAGE TANKS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVAL AND DISPOSAL OF RESIDUALS LEFT, RENDERING CONTAINERS SAFE FOR OFF-SITE DISPOSAL OR ON-SITE RELOCATION, AND ON-SITE MOVEMENT OF THE CONTAINERS AS REQUIRED FOR CONSTRUCTION. CHLORINE CYLINDERS WILL BE DISPOSED OF BY THE CITY.

1.2 SUBMITTAL: PROVIDE THE FOLLOWING IN A TIMELY MANNER IN ACCORDANCE WITH THE APPROVED SUBMITTALS SCHEDULE AS SPECIFIED IN DIVISION 1 - GENERAL REQUIREMENTS.

A. SUBMITTAL: SCHEDULE OF VALUES

B. SUBMITTAL: PROGRESS SCHEDULE

C. SUBMITTAL: MATERIAL SCHEDULE

D. SUBMITTAL: PRODUCTS LIST

E. SUBMITTAL: OPERATIONS AND MAINTENANCE DATA

1.3 PRICE AND PAYMENT PROCEDURES

A. CONTRACT MODIFICATION PROCEDURES

1. CHANGE ORDERS: NO AMOUNT, IN PART OR IN WHOLE, OF A CHANGE ORDER SHALL BE INCLUDED IN A REQUISITION FOR PAYMENT BY THE CONTRACTOR UNTIL THE CHANGE ORDER HAS BEEN EXECUTED AND COPIES OF THE CHANGE ORDER HAVE BEEN DISTRIBUTED TO THE OWNER AND CONTRACTOR.

2. PROCEED ORDERS: A PROCEED ORDER IS A DEVICE WHICH ENABLES THE OWNER TO PROMPTLY ORDER CHANGES IN THE WORK WHICH MAY INVOLVE CHANGES IN COST OR CONTRACT TIME, OR BOTH PENDING PREPARATION AND EXECUTION OF A FORMAL CHANGE ORDER.

3. REQUEST FOR CHANGE ORDER PROPOSAL: THE OWNER MAY REQUEST THE CONTRACTOR TO SUBMIT A CHANGE ORDER PROPOSAL FOR CHANGES IN CONTRACT WORK. THE CONTRACTOR SHALL SUBMIT THE PROPOSAL IN ACCORDANCE WITH CONTRACT REQUIREMENTS WITHIN A REASONABLE TIME. THE OWNER MAY ISSUE TO THE CONTRACTOR A PROCEED ORDER AUTHORIZING THE REQUIRED CHANGES FOR AN ADDITIONAL AMOUNT NOT TO EXCEED, OR A DEDUCTION OF NOT LESS THAN THE AMOUNT SHOWN IN THE PROCEED ORDER. IF THE CONTRACTOR IS NOT IN AGREEMENT WITH THE AMOUNT STIPULATED IN THE PROCEED ORDER HE SHALL, WITHIN A REASONABLE TIME AFTER THE ISSUE DATE OF THE ORDER, SUBMIT TO THE OWNER AN EQUITABLE PROPOSAL AND DEVELOP WITH THE OWNER A MUTUALLY ACCEPTABLE PRICE FOR THE REQUIRED CHANGE IN WORK.

4. CHANGE ORDER PROPOSAL: WITHOUT FURTHER REQUEST AND WITHIN A REASONABLE TIME FROM THE ISSUE DATE OF A PROCEED ORDER THE CONTRACTOR SHALL SUBMIT A WRITTEN CHANGE ORDER PROPOSAL COVERING THE WORK AUTHORIZED IN THE PROCEED ORDER SO THAT A CHANGE ORDER MAY BE PREPARED FOR EXECUTION.

B. PAYMENT PROCEDURES

1. APPLICATIONS AND CERTIFICATES FOR PAYMENT: THE FORM OF EACH APPLICATION FOR PAYMENT SHALL BE AIA DOCUMENT G702 ENTITLED, "APPLICATION AND CERTIFICATE FOR PAYMENT" ACCOMPANIED BY, "CONTINUATION SHEET," AIA DOCUMENT G703. EACH APPLICATION FOR PAYMENT BY THE CONTRACTOR, EXCLUDING THE FIRST, SHALL BE ACCOMPANIED BY A "CONTRACTOR'S AFFIDAVIT OF PAYMENT OF DEBTS AND CLAIMS," AIA DOCUMENT G706. EACH APPLICATION SHALL BE SUBMITTED ON FORMS, COPIES OF WHICH ARE INCLUDED IN THIS PROJECT MANUAL. PAYMENT FOR STORED MATERIAL DELIVERED BUT NOT INCORPORATED IN THE WORK WILL BE THE INVOICED AMOUNT ONLY. SUBMIT APPLICABLE INVOICES WITH APPLICATION FOR PAYMENT.

2. UPON RECOMMENDATION BY RPR OF THE CONTRACTOR'S REQUEST FOR PARTIAL PAYMENT, THE OWNER SHALL PAY TO THE CONTRACTOR 95 PERCENT OF THE TOTAL AMOUNT DUE AND THE OWNER SHALL RETAIN 5 PERCENT OF THE AMOUNT DUE UNTIL FINAL COMPLETION AND ACCEPTANCE OF ALL WORK COVERED BY THE CONTRACT.

3. SCHEDULE OF VALUES: SUBMIT COMPLETE SCHEDULE OF VALUES AT LEAST 10 DAYS PRIOR TO FIRST APPLICATION FOR PAYMENT.

1.4 ADMINISTRATIVE REQUIREMENTS

A. PROJECT MANAGEMENT AND COORDINATION

1. PROJECT MEETINGS

PRECONSTRUCTION CONFERENCES WITH THE CONTRACTOR WILL BE HELD WITHIN 20 DAYS AFTER THE EFFECTIVE DATE OF THE AGREEMENT.

PROGRESS MEETINGS: EACH MONTH THE CONTRACTOR SHALL HOLD A PROGRESS MEETING TO REVIEW PROGRESS TO DATE AND TO RESOLVE ALL QUESTIONS FOR THE UPCOMING MONTH. NOTIFY RPR AND THE OWNER AT LEAST 1 WEEK IN ADVANCE OF THE MEETING TO ENSURE SUITABLE DATE AND TIME. INCLUDE MEETING AGENDA WITH NOTIFICATION.

2. PROJECT SITE ADMINISTRATION

THE CONTRACTOR SHALL BE RESPONSIBLE FOR MANAGING ALL SITE ACTIVITIES SO CONSTRUCTION DOES NOT INFERE WITH ONGOING OPERATION OF THE WATER TREATMENT FACILITY

B. CONSTRUCTION PROGRESS DOCUMENTATION

1. PROGRESS SCHEDULES: SUBMIT A DETAILED CONSTRUCTION SCHEDULE PRIOR TO THE PRECONSTRUCTION CONFERENCE. REVISE THE SCHEDULE BEFORE EACH PROGRESS MEETING.

C. SUBMITTAL PROCEDURES

1. SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES: WITHIN 20 DAYS OF NOTICE TO PROCEED PREPARE A SUBMITTAL SCHEDULE SATISFACTORY TO RPR FIXING THE DATES FOR SUBMISSION OF SHOP DRAWINGS, PRODUCT DATA, SAMPLES, AND THE LIKE AND UPDATE THIS SCHEDULE AT EACH PROGRESS MEETING TO REFLECT THE STATUS OF EACH SUBMITTAL ITEM.

   SUBMIT 5 COPIES OF ALL SHOP DRAWINGS.

   A MAXIMUM OF 2 MARKED COPIES WILL BE RETURNED TO THE CONTRACTOR.

   SUBMIT SHOP DRAWINGS, PRODUCT DATA, SAMPLES, AND THE LIKE AS REQUIRED BY APPLICABLE SPECIFICATION SECTIONS AND OTHER PORTIONS OF THE CONTRACT DOCUMENTS.

   CLEARLY IDENTIFY EACH ITEM SUBMITTED USING APPLICABLE SPECIFICATION SECTION NUMBER AND PARAGRAPH REFERENCE OR DRAWING OR DETAIL BOOK REFERENCE. SUBSTITUTE ITEMS SHALL BE CLEARLY MARKED AS SUBSTITUTE FOR SPECIFIED MANUFACTURER(S) OR EQUIPMENT.

   SUBMITTALS SHALL BE APPROVED BY CONTRACTOR AND THOSE SUBCONTRACTORS WHOSE WORK IS ASSOCIATED WITH THE SUBJECT EQUIPMENT AS BEING IN ACCORDANCE WITH CONTRACT DOCUMENTS, PRIOR TO SUBMISSION TO RPR. ALL SUBMITTALS SHALL BEAR THE CONTRACTOR’S STAMP THAT INDICATES HIS REVIEW AND APPROVAL OF THE SUBMITTAL.

   FAILURE TO COMPLY WITH THESE REQUIREMENTS WILL RESULT IN THE SUBMITTAL BEING RETURNED UNPROCESSED.

2. MATERIAL SCHEDULE: WITHIN 20 DAYS AFTER EFFECTIVE DATE OF THE AGREEMENT, SUBMIT TO RPR FOR APPROVAL A SCHEDULE LISTING MANUFACTURER OF THE ITEMS OF EQUIPMENT AND MATERIALS PROPOSED FOR THE CONSTRUCTION. FOLLOWING APPROVAL OF THE SCHEDULE, NO CHANGES IN MATERIAL OR EQUIPMENT FROM THOSE LISTED WILL BE ALLOWED EXCEPT IN UNUSUAL OR EXTENUATING CIRCUMSTANCES. WHEN SUCH CIRCUMSTANCES ARISE, THE CONTRACTOR SHALL REQUEST, IN WRITING, RPR APPROVAL OF THE PROPOSED CHANGE, STATING THE CIRCUMSTANCES NECESSITATING SUCH A CHANGE. THE INTENT OF THIS SCHEDULE IS TO NAME THE MANUFACTURERS OF MATERIAL SPECIFIED BY A PRODUCT STANDARD AND TO DESIGNATE WHICH MANUFACTURER WILL BE USED WHEN MORE THAN ONE HAS BEEN NAMED FOR AN ITEM IN THE SPECIFICATIONS. THE SCHEDULE SHALL NOT BE INTERPRETED AS ALLOWING ANY CHANGE FROM BASE BID ITEMS OR THOSE SUBSTITUTE ITEMS OFFERED WITH THE BID AND ACCEPTED IN THE AGREEMENT.

3. SPECIAL PROJECT PROCEDURES

JOB SITE ADMINISTRATION – THE CONTRACTOR SHALL DESIGNATE AN ON-SITE SUPERINTENDENT RESPONSIBLE FOR ALL PROJECT CONSTRUCTION ACTIVITIES TO BE ON SITE AT ALL TIMES DURING PROJECT WORK WITH FULL AUTHORITY TO ACT ON THE CONTRACTOR’S BEHALF.

D. QUALITY CONTROL

1. TESTING LABORATORY SERVICES: THE OWNER WILL EMPLOY AND PAY FOR THE SERVICES OF AN INDEPENDENT TESTING LABORATORY TO PERFORM TESTING SPECIFIED TO BE DONE BY AN INDEPENDENT TESTING LABORATORY, UNLESS SPECIFICALLY STATED OTHERWISE IN OTHER SECTIONS OF THE SPECIFICATIONS.

CONTRACTOR SHALL COOPERATE WITH THE LABORATORY TO FACILITATE THE EXECUTION OF ITS REQUIRED SERVICES.

EMPLOYMENT OF THE LABORATORY SHALL IN NO WAY RELIEVE CONTRACTOR'S OBLIGATIONS TO PERFORM THE WORK OF THE CONTRACT.

RELATED REQUIREMENTS IN OTHER PARTS OF THE PROJECT MANUAL:

INSPECTIONS AND TESTING REQUIRED BY LAWS, ORDINANCES, RULES, REGULATIONS, ORDERS, OR APPROVALS OF PUBLIC AUTHORITIES: CONDITIONS OF THE CONTRACT.

RELATED REQUIREMENTS SPECIFIED IN OTHER SECTIONS:

CERTIFICATION OF PRODUCTS: THE RESPECTIVE SECTIONS OF SPECIFICATIONS.

TEST, ADJUST, AND BALANCE OF EQUIPMENT: THE RESPECTIVE SECTIONS OF SPECIFICATIONS.

LABORATORY TESTS REQUIRED AND STANDARDS FOR TESTING.

LIMITATIONS OF AUTHORITY OF TESTING LABORATORY: LABORATORY IS NOT AUTHORIZED TO:

RELEASE, REVOKE, ALTER, OR ENLARGE ON REQUIREMENTS OF CONTRACT DOCUMENTS.

APPROVE OR ACCEPT ANY PORTION OF THE WORK.

PERFORM ANY DUTIES OF THE CONTRACTOR.

CONTRACTOR'S RESPONSIBILITIES

COOPERATE WITH LABORATORY PERSONNEL AND PROVIDE ACCESS TO WORK.

SECURE AND DELIVER TO THE LABORATORY ADEQUATE QUANTITIES OF REPRESENTATIONAL SAMPLES OF MATERIALS PROPOSED TO BE USED AND WHICH REQUIRE TESTING.

PROVIDE TO THE LABORATORY THE PRELIMINARY DESIGN MIX PROPOSED TO BE USED FOR CONCRETE, AND OTHER MATERIAL MIXES WHICH REQUIRE CONTROL BY THE TESTING LABORATORY.

FURNISH COPIES OF PRODUCT'S TEST REPORTS AS REQUIRED.

FURNISH INCIDENTAL LABOR AND FACILITIES:

TO PROVIDE ACCESS TO WORK TO BE TESTED

TO OBTAIN AND HANDLE SAMPLES AT THE PROJECT SITE OR AT THE SOURCE OF THE PRODUCT TO BE TESTED

TO FACILITATE INSPECTIONS AND TESTS

NOTIFY LABORATORY SUFFICIENTLY IN ADVANCE OF OPERATIONS TO ALLOW FOR LABORATORY ASSIGNMENT OF PERSONNEL AND SCHEDULING OF TESTS.

WHEN TESTS OR INSPECTIONS CANNOT BE PERFORMED AFTER SUCH NOTICE, REIMBURSE OWNER FOR LABORATORY PERSONNEL AND TRAVEL EXPENSES INCURRED DUE TO CONTRACTOR'S NEGLIGENCE.

MAKE ARRANGEMENTS WITH LABORATORY AND PAY FOR ADDITIONAL SAMPLES AND TESTS REQUIRED FOR CONTRACTOR'S CONVENIENCE.

EMPLOY AND PAY FOR THE SERVICES OF A SEPARATE, EQUALLY QUALIFIED INDEPENDENT TESTING LABORATORY TO PERFORM ADDITIONAL INSPECTIONS, SAMPLING, AND TESTING REQUIRED WHEN INITIAL TESTS INDICATE WORK DOES NOT COMPLY WITH CONTRACT DOCUMENTS.

1.5 TEMPORARY FACILITIES AND CONTROLS

A. TEMPORARY UTILITIES

1. TEMPORARY ELECTRICITY: THE CONTRACTOR SHALL MAKE ALL NECESSARY ARRANGEMENTS FOR OBTAINING ELECTRIC POWER FOR CONSTRUCTION PURPOSES. NO SEPARATE PAYMENT FOR ELECTRIC POWER FOR CONSTRUCTION PURPOSES OR TESTING OTHER THAN THE PAYMENT INCLUDED IN THE CONTRACT LUMP SUM OR UNIT PRICES WILL BE ALLOWED.

2. TEMPORARY HEAT AND VENTILATION: PROVIDE APPROVED TYPE TEMPORARY HEATING AS REQUIRED DURING THE PROGRESS OF THE PROJECT AND BEAR ALL EXPENSES RELATED THERETO. AFTER THE BUILDING IS ENCLOSED AND THE PERMANENT HEATING SYSTEM IS INSTALLED, SUITABLE FOR SAFE OPERATION, THE CONTRACTOR MAY, WITH THE WRITTEN PERMISSION OF THE OWNER, USE THE PERMANENT SYSTEM FOR TEMPORARY HEATING. APPROVED USE OF THE PERMANENT HEATING SYSTEM TO PROVIDE TEMPORARY HEAT SHALL NOT IN ANY WAY BE INTERPRETED AS A FINAL ACCEPTANCE OF THE HEATING SYSTEM OR THE BEGINNING OF ANY GUARANTEE PERIODS.

TEMPORARY HEAT SHALL BE SUPPLIED BY THE CONTRACTOR UNDER THE FOLLOWING CONDITIONS:

TO PROTECT WORK AND MATERIALS FROM DAMAGE DUE TO COLD AND DAMPNESS

FOR A PERIOD OF 10 DAYS PRIOR TO AND DURING ERECTION AND/OR APPLICATION OF MILLWORK, PAINT, FLOORING, OR OTHER INTERIOR FINISH WORK. MINIMUM TEMPERATURE SHALL BE 70 DEGREES F. MAINTAIN THIS TEMPERATURE UNTIL OWNER'S ACCEPTANCE OF BUILDING.

DURING CONSTRUCTION, VENTILATE THE BUILDING TO PROVIDE SUITABLE CURING AND DRYING-OUT CONDITIONS FOR VARIOUS MATERIALS AND TYPES OF CONSTRUCTION WORK.

3. TEMPORARY LIGHTING: PROVIDE APPROVED TYPE TEMPORARY LIGHTING AS REQUIRED DURING THE PROGRESS OF THE PROJECT AND BEAR ALL EXPENSES RELATED THERETO.

4. TEMPORARY WATER: WATER FOR CONSTRUCTION PURPOSES WILL BE AVAILABLE AT THE SITE.

B. CONSTRUCTION FACILITIES

1. FIELD OFFICES: THE CONTRACTOR MAY ELECT TO PROVIDE AND MAINTAIN A WEATHERTIGHT, HEATED, AND PROPERLY LIGHTED TEMPORARY FIELD OFFICE. LOCATION OF THE BUILDING SHALL BE APPROVED BY THE OWNER AND INSURANCE AGENCY HAVING JURISDICTION. WOOD OR KEROSENE STOVES SHALL NOT BE USED FOR HEATING.

2. THE CONTRACTOR SHALL PROVIDE TEMPORARY FIRST AID FACILITIES FOR HIS EMPLOYEES AS REQUIRED BY OSHA.

3. TEMPORARY SANITARY FACILITIES: CONTRACTOR SHALL PROVIDE AND MAINTAIN IN A NEAT AND SANITARY CONDITION TEMPORARY SANITARY FACILITIES FOR THE USE OF HIS EMPLOYEES AS REQUIRED BY LABOR STANDARDS.

C. TEMPORARY CONTROLS

1. EROSION AND SEDIMENT CONTROL

2. POLLUTION CONTROL: THE CONTRACTOR SHALL PROVIDE ALL NECESSARY TEMPORARY STRUCTURES AND EQUIPMENT TO PRECLUDE BYPASS OF UNTREATED OR IMPROPERLY TREATED SEWAGE, CHEMICALS OR POLLUTANT TO ANY STREAM, DITCH, OR UPON THE GROUND DURING THE CONSTRUCTION AND CONNECTION PHASES OF THE PROJECT.

D. PROJECT IDENTIFICATION

1. CONTRACTOR MAY ERECT ONE BUSINESS SIGN ON THE SITE FOR THE DURATION OF THE PROJECT. DESIGN AND SIZE OF THE PROPOSED SIGN SHALL BE SUBMITTED TO THE OWNER FOR APPROVAL. SIGNS SHALL MEET REQUIREMENTS OF ALL LOCAL CODES AND ORDINANCES.

1.6 PRODUCT REQUIREMENTS

A. QUALITY OF MATERIAL AND EQUIPMENT INCORPORATED INTO THE WORK:

1. CONFORM TO APPLICABLE SPECIFICATIONS AND STANDARDS.

2. COMPLY WITH SIZE, MAKE, TYPE, AND QUALITY SPECIFIED, OR AS SPECIFICALLY APPROVED IN WRITING BY RPR.

3. MANUFACTURED AND FABRICATED PRODUCTS

DESIGN, FABRICATE, AND ASSEMBLE IN ACCORD WITH THE BEST ENGINEERING AND SHOP PRACTICES.

MANUFACTURE LIKE PARTS OF DUPLICATE UNITS TO STANDARD SIZES AND GAGES, TO BE INTERCHANGEABLE.

TWO OR MORE ITEMS OF THE SAME KIND SHALL BE IDENTICAL, BY THE SAME MANUFACTURER.

PRODUCTS SHALL BE SUITABLE FOR SERVICE CONDITIONS.

EQUIPMENT CAPACITIES, SIZES, AND DIMENSIONS SHOWN OR SPECIFIED SHALL BE ADHERED TO UNLESS VARIATIONS ARE SPECIFICALLY APPROVED IN WRITING.

4. DATE SENSITIVE COMPUTERS, COMPUTER CONTROLS, MICROPROCESSORS, AND PROGRAMS SHALL ACCOMMODATE ALL CALENDAR DATES INCLUDING LEAP YEARS WITHOUT CAUSING PROBLEMS.

5. DO NOT USE MATERIAL OR EQUIPMENT FOR ANY PURPOSE OTHER THAN THAT FOR WHICH IT IS DESIGNED OR IS SPECIFIED.

6. EXCEPT AS SPECIFICALLY INDICATED OR SPECIFIED, MATERIALS AND EQUIPMENT REMOVED FROM THE EXISTING STRUCTURE SHALL NOT BE USED IN THE COMPLETED WORK.

7. FOR MATERIAL AND EQUIPMENT SPECIFICALLY INDICATED OR SPECIFIED TO BE REUSED IN THE WORK:

   USE SPECIAL CARE IN REMOVAL, HANDLING, STORAGE, AND REINSTALLATION TO ASSURE PROPER FUNCTION IN THE COMPLETED WORK.

   ARRANGE FOR TRANSPORTATION, STORAGE, AND HANDLING OF PRODUCTS WHICH REQUIRE OFF-SITE STORAGE, RESTORATION, OR RENOVATION. PAY ALL COSTS FOR SUCH WORK.

8. MANUFACTURER'S INSTRUCTIONS

   WHEN CONTRACT DOCUMENTS REQUIRE THAT INSTALLATION OF WORK SHALL COMPLY WITH MANUFACTURER'S PRINTED INSTRUCTIONS, OBTAIN AND DISTRIBUTE COPIES OF SUCH INSTRUCTIONS TO PARTIES INVOLVED IN THE INSTALLATION, INCLUDING TWO COPIES TO RPR.

      MAINTAIN ONE SET OF COMPLETE INSTRUCTIONS AT THE JOB SITE DURING INSTALLATION AND UNTIL COMPLETION.

   HANDLE, INSTALL, CONNECT, CLEAN, CONDITION, AND ADJUST PRODUCTS IN ACCORDANCE WITH SUCH INSTRUCTIONS AND IN CONFORMITY WITH SPECIFIED REQUIREMENTS.

      SHOULD JOB CONDITIONS OR SPECIFIED REQUIREMENTS CONFLICT WITH MANUFACTURER'S INSTRUCTIONS, CONSULT WITH RPR FOR FURTHER INSTRUCTIONS.

      DO NOT PROCEED WITH WORK WITHOUT CLEAR INSTRUCTIONS.

   PERFORM WORK IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS. DO NOT OMIT ANY PREPARATORY STEP OR INSTALLATION PROCEDURE UNLESS SPECIFICALLY MODIFIED OR EXEMPTED BY CONTRACT DOCUMENTS.

B. PRODUCT OPTIONS

1. PRODUCTS LIST: WITHIN 30 DAYS AFTER EFFECTIVE DATE OF THE AGREEMENT, SUBMIT TO RPR A COMPLETE LIST OF MAJOR PRODUCTS PROPOSED TO BE USED, WITH THE NAME OF THE MANUFACTURER AND THE INSTALLING SUBCONTRACTOR.

C. PRODUCT SUBSTITUTIONS

1. SUBSTITUTION PROCEDURES DURING BIDDING: THE CONTRACTOR MAY OFFER WITH HIS BID, SUBSTITUTE ITEMS OF EQUIPMENT AND MATERIALS TO THOSE OF SPECIFIED MANUFACTURERS CALLED FOR IN THE SPECIFICATION SECTIONS, PROVIDED THAT, IF APPROVED:

   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.

   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.

   THE PROVISIONS OF THE GENERAL CONDITIONS AND 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.

2. TECHNICAL DATA COVERING THE PROPOSED SUBSTITUTION SHALL BE FURNISHED WITH THE BID WHEN POSSIBLE, AND NOT LATER THAN 10 DAYS AFTER BID SUBMISSION.

3. WHERE MORE THAN ONE MANUFACTURER IS NAMED FOR AN ITEM IN THE SPECIFICATIONS, ANY OF THE NAMED MANUFACTURER'S ITEMS WILL BE ACCEPTABLE FOR THE BASE BID.

D. TRANSPORTATION AND HANDLING

1. ARRANGE DELIVERIES OF PRODUCTS IN ACCORDANCE WITH CONSTRUCTION SCHEDULES. COORDINATE TO AVOID CONFLICT WITH WORK AND CONDITIONS AT THE SITE.

   DELIVER PRODUCTS IN UNDAMAGED CONDITION, IN MANUFACTURER'S ORIGINAL CONTAINERS OR PACKAGING, WITH IDENTIFYING LABELS INTACT AND LEGIBLE.

   IMMEDIATELY ON DELIVERY, INSPECT SHIPMENTS TO ASSURE COMPLIANCE WITH REQUIREMENTS OF CONTRACT DOCUMENTS AND APPROVED SUBMITTALS, AND THAT PRODUCTS ARE PROPERLY PROTECTED AND UNDAMAGED.

2. PROVIDE EQUIPMENT AND PERSONNEL TO HANDLE PRODUCTS BY METHODS TO PREVENT SOILING OR DAMAGE TO PRODUCTS OR PACKAGING.

3. THE OWNER WILL ARRANGE FOR ALL CHEMICAL DELIVERIES TO THE TEMPORARY AND PERMANENT STORAGE TANKS WITHIN TEN CALENDAR DAYS OF NOTIFICATION BY THE CONTRACTOR THAT THEY ARE READY TO BE PLACED IN SERVICE AND SHALL ORDER SUBSEQUENT REFILLS ACCORDING TO OPERATIONAL NEEDS AT NO COST TO THE CONTRACTOR. ANY COSTS RELATED TO SERVICING THESE CONTAINERS RELATED TO EQUIPMENT FAILURE OR CONSTRUCTION PRACTICES SHALL BE THE CONTRACTOR’S RESPONSIBILITY.

E. STORAGE AND PROTECTION

1. STORE PRODUCTS IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS, WITH SEALS AND LABELS INTACT AND LEGIBLE.

STORE PRODUCTS SUBJECT TO DAMAGE BY THE ELEMENTS IN WEATHERTIGHT ENCLOSURES.

MAINTAIN TEMPERATURE AND HUMIDITY WITHIN THE RANGES REQUIRED BY MANUFACTURER'S INSTRUCTIONS.

2. EXTERIOR STORAGE

STORE FABRICATED PRODUCTS ABOVE THE GROUND, ON BLOCKING OR SKIDS; PREVENT SOILING OR STAINING; COVER PRODUCTS WHICH ARE SUBJECT TO DETERIORATION WITH IMPERVIOUS SHEET COVERINGS; AND PROVIDE ADEQUATE VENTILATION TO AVOID CONDENSATION.

STORE LOOSE GRANULAR MATERIALS IN A WELL-DRAINED AREA ON SOLID SURFACES TO PREVENT MIXING WITH FOREIGN MATTER.

TEMPORARY TANKS AND EQUIPMENT SHALL BE SECURED TO PREVENT OVERTURNING OR RELEASE OF CHEMICALS DUE TO EARTH MOVEMENT OR 100 MPH WIND FORCES. THIS SHALL INCLUDE PROVISION OF SECONDARY CONTAINMENT SUFFICIENT TO CONTAIN 110 PERCENT OF THE LARGEST TANK VOLUME WITHIN THE CONTAINED AREA PRIOR TO FILLING TANKS WITHIN THE CONTAINED AREA.

3. ARRANGE STORAGE IN A MANNER TO PROVIDE EASY ACCESS FOR INSPECTION. MAKE PERIODIC INSPECTIONS OF STORED PRODUCTS TO ASSURE THAT PRODUCTS ARE MAINTAINED UNDER SPECIFIED CONDITIONS AND FREE FROM DAMAGE OR DETERIORATION.

4. PROTECTION AFTER INSTALLATION: PROVIDE SUBSTANTIAL COVERINGS AS NECESSARY TO PROTECT INSTALLED PRODUCTS FROM DAMAGE FROM TRAFFIC AND SUBSEQUENT CONSTRUCTION OPERATIONS. REMOVE WHEN NO LONGER NEEDED.

1.07 EXECUTION REQUIREMENTS

A. PREPARATION

1. CONSTRUCTION LAYOUT

2. FIELD ENGINEERING

GRADES, LINES, AND LEVELS: THE OWNER HAS ESTABLISHED CONTROL POINTS. FROM THESE POINTS, THE CONTRACTOR SHALL FURNISH NECESSARY PERSONNEL AND EQUIPMENT TO ESTABLISH LINE AND GRADE AS REQUIRED FOR THE WORK.

THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PRESERVATION OF ALL STAKES AND MARKS ESTABLISHED BY THE OWNER, AND IF ANY OF THE STAKES AND MARKS ARE CARELESSLY OR WILLFULLY DISTURBED, THE COST OF REPLACING THEM SHALL BE CHARGED AGAINST THE CONTRACTOR.

B. CLEANING

1. FINAL CLEANING: CLEAN ALL GLASS AND WALL PANELS; REPLACE ALL BROKEN ITEMS; REMOVE STAINS, SPOTS, MARKS, AND DIRT; CLEAN HARDWARE; REMOVE PAINT SPOTS AND SMEARS FROM ALL SURFACES; CLEAN FIXTURES; WASH ALL CONCRETE AND TILE; AND VACUUM THE BUILDING.

C. SYSTEM COMMISSIONING

1. SYSTEMS DEMONSTRATIONS

UPON COMPLETION OF UNITS, EQUIPMENT, AND SYSTEMS REQUIRED TO BE PHASED INTO SERVICE, FLUSH ALL UNITS AND EQUIPMENT; CONDUCT HYDAULIC TEST OF EACH CONTAINMENT AREA TO CONFIRM ABSENCE OF LEAKS, CRACKS, AND DEFECTS; CHECK TO SEE THAT ALL MECHANICAL, ELECTRICAL, AND PLUMBING EQUIPMENT IS IN GOOD WORKING ORDER AND PROPERLY CONNECTED; INSTALL THE INITIAL INVENTORY OF CHEMICALS (THROUGH OWNER); MAKE SUCH TESTS AS REMAIN TO BE MADE; MAKE PRELIMINARY RUN-INS OF THE VARIOUS PUMPS AND EQUIPMENT; PERFORM ALL OTHER TASKS THAT SHALL BE NEEDED FOR PREPARING AND CONDITIONING SYSTEMS FOR OPERATION; CALIBRATE ALL INSTRUMENTS AND CONTROLS THROUGH THE FULL RANGE; AND MAKE ALL OTHER NECESSARY ADJUSTMENTS THEREON USING SUCH SKILLED PERSONNEL AS SHALL BE NEEDED FOR THIS WORK.

2. ACCEPTANCE FOR OPERATION

AS SOON AS THE UNIT, EQUIPMENT, OR SYSTEM HAS BEEN PROPERLY PREPARED FOR OPERATION AND IT IS NECESSARY TO BE PLACED INTO SERVICE, BRING IT ON-LINE; THEN MAKE AN ON-LINE PERFORMANCE TEST BY OPERATING IT UNDER APPROXIMATELY NORMAL CONDITIONS FOR A PERIOD OF 14 CONSECUTIVE DAYS TO DEMONSTRATE THAT ALL MATERIALS AND COMPONENTS ARE IN PROPER WORKING ORDER AND FREE FROM DEFECTS. DURING THIS TIME, OWNER WILL RECEIVE SPECIFIED INSTRUCTION ON THE UNIT OR SYSTEM BY QUALIFIED PERSONNEL, AND BE FURNISHED ALL APPROPRIATE OPERATION AND MAINTENANCE MANUALS. IN EVENT OF FAILURE TO DEMONSTRATE SUCCESSFUL PERFORMANCE ON THE FIRST OR ANY SUBSEQUENT ATTEMPT, MAKE ALL ALTERATIONS, ADJUSTMENTS, REPAIRS, AND REPLACEMENTS THAT MAY BE NEEDED; AND, IF IT BECOMES NECESSARY TO SHUT DOWN THE UNIT OR SYSTEM, OR ANY PORTION THEREOF BEFORE THE ON-LINE TEST IS SATISFACTORILY COMPLETED, PROVIDE ALL APPROPRIATE MEASURES TO RESUME WATER TREATMENT OPERATIONS WITHOUT THE UNIT OR SYSTEM. WHEN THE UNIT OR SYSTEM IS AGAIN READY FOR OPERATION, BRING IT ON-LINE AND START A NEW ON-LINE TEST. THIS PROCEDURE SHALL BE REPEATED AS OFTEN AS NECESSARY UNTIL THE UNIT OR SYSTEM SHALL HAVE OPERATED CONTINUOUSLY TO THE SATISFACTION OF OWNER, FOR A TEST PERIOD DURATION OF 14 CONSECUTIVE DAYS. OWNER WILL FURNISH ALL OPERATING PERSONNEL (OTHER THAN VENDOR'S OR SUBCONTRACTOR'S SERVICE ENGINEERS) NEEDED TO OPERATE EQUIPMENT DURING THE ON-LINE TEST PERIOD; HOWEVER, SAID PERSONNEL WILL PERFORM THEIR DUTIES UNDER CONTRACTOR'S DIRECTION AND SUPERVISION. UNTIL PERFORMANCE TESTS ARE COMPLETED AND UNITS AND SYSTEMS ARE ACCEPTED BY THE OWNER FOR

OPERATION, THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR SUPERVISING THEIR OPERATION.

WHEN THE ON-LINE TEST HAS BEEN COMPLETED, OWNER WILL NOTIFY CONTRACTOR TO THIS EFFECT IN WRITING AND WILL THEN TAKE OVER THE UNIT OR SYSTEM FOR PURPOSE OF OPERATION. NEITHER THIS NOTICE NOR THE ACT OF TAKING OVER ANY ITEM FOR OPERATION SHALL RELIEVE CONTRACTOR FROM HIS OBLIGATIONS TO COMPLETE THE FACILITY OR PERFORM ANY OTHER OBLIGATIONS OR RESPONSIBILITIES WHICH EXTEND BEYOND THE COMPLETION OF THE ON-LINE TESTS.

THE CONTRACTOR SHALL MAINTAIN FULL RESPONSIBILITY FOR THE MAINTENANCE OF ALL UNITS AND SYSTEMS PLACED ON-LINE UNTIL THEY HAVE BEEN DETERMINED SUBSTANTIALLY COMPLETE. NO WARRANTY PERIODS SHALL BEGIN PRIOR TO THE DATE OF SUBSTANTIAL COMPLETION.

3. ACCEPTANCE FOR MAINTENANCE AND BEGINNING OF WARRANTY

ANY TIME AFTER THE ACCEPTANCE FOR OPERATION BY THE OWNER OF ANY UNIT OR SYSTEM REQUIRED TO REMAIN ON-LINE, THE CONTRACTOR MAY REQUEST A FINAL INSPECTION AND ISSUANCE OF CERTIFICATE OF SUBSTANTIAL COMPLETION OF THAT UNIT OR SYSTEM. SHOULD THE UNIT OR SYSTEM BE DETERMINED SUBSTANTIALLY COMPLETE, SAID CERTIFICATE WILL BE ISSUED ALONG WITH A PUNCH LIST OF RELATED ITEMS TO BE CORRECTED, AT WHICH TIME THE DATE OF SUBSTANTIAL COMPLETION WILL BE SET. THE OWNER WILL THEREAFTER BE RESPONSIBLE FOR MAINTENANCE OF THE UNIT OR SYSTEM, AND THE WARRANTY PERIOD WILL BEGIN AS OF THE DATE OF SUBSTANTIAL COMPLETION.

NO EARLY CERTIFICATE OF SUBSTANTIAL COMPLETION WILL BE ISSUED ON ANY UNIT, SYSTEM, OR ITEM THAT DOES NOT HAVE TO BE PHASED INTO FULL TIME SERVICE TO MAINTAIN OPERABILITY OF THE WATER TREATMENT PROCESS.

NO CERTIFICATE OF SUBSTANTIAL COMPLETION WILL BE ISSUED ON ANY UNIT, SYSTEM, OR ITEM THAT HAS NOT SATISFACTORILY PASSED THE ON-LINE PERFORMANCE TEST, ON WHICH THE SPECIFIED INSTRUCTION PERIOD HAS NOT BEEN FULFILLED, ON WHICH THE APPROPRIATE MANUFACTURER'S OPERATION AND MAINTENANCE MANUALS HAVE NOT BEEN RECEIVED, OR SPECIFIED SPARE PARTS HAVE NOT BEEN FURNISHED.

D. CONTRACT CLOSEOUT PROCEDURES

1. PUNCH LIST: CORRECT ALL PUNCH LIST ITEMS.

E. CLOSEOUT SUBMITTALS

1. FINAL SITE SURVEY

2. MAINTENANCE CONTRACTS

3. OPERATIONS AND MAINTENANCE DATA: OBTAIN, ASSEMBLE, AND SUBMIT TO THE OWNER THREE MANUALS CONTAINING COMPREHENSIVE OPERATING AND MAINTENANCE INSTRUCTIONS AND PARTS LISTS. EACH MANUAL SHALL BE SELF-CONTAINED AND INCLUDE INFORMATION FOR EFFICIENT SERVICING OF SPECIFIC EQUIPMENT SUPPLIED AND INSTALLED CONFIGURATIONS UNDER THE CONTRACT.

OPERATING INSTRUCTIONS SHALL EXPLAIN MAINTENANCE PROCEDURES, METHODS OF CHECKING THE SYSTEMS FOR SAFE AND NORMAL OPERATION, AND THE RECOMMENDED PROCEDURE FOR SAFELY STOPPING AND STARTING THE EQUIPMENT AND SYSTEMS.

THESE REQUIREMENTS SHALL BE FULFILLED BEFORE ANY GUARANTEE PERIODS BECOME EFFECTIVE SO AS TO LIMIT THE POSSIBILITY OF CLAIMS ARISING FROM THE ABSENCE OF PERTINENT INFORMATION.

4. GUARANTEES, WARRANTIES, AND BONDS: SUBMIT ALL REQUIRED GUARANTEES, WARRANTIES, AND BONDS.

5. PROJECT RECORD DOCUMENTS

PROVIDE ONE COMPLETE SET OF DRAWINGS RECORDING ALL CHANGES TO THE WORK TO INDICATE ACTUAL INSTALLATION. CHANGES SHALL BE NOTED IN LEGIBLE RED LETTERS AT LEAST 1/8 INCH HIGH. THESE CHANGES SHALL INCLUDE BUT ARE NOT LIMITED TO THE FOLLOWING:

SIZE, DEPTH, OR POSITION OF FOUNDATIONS

EXACT LOCATION AND ELEVATION OF ALL UNDERGROUND UTILITY SERVICES

CHANGES IN GENERAL CONSTRUCTION, MECHANICAL, OR ELECTRICAL WORK ABOVE OR BELOW GROUND

THESE RECORDS ARE A SPECIFIC CONTRACT REQUIREMENT, AND FINAL PAYMENT WILL NOT BE MADE UNTIL THESE DRAWINGS AND PROJECT MANUAL HAVE BEEN SUBMITTED IN AN ACCEPTABLE FORM.

6. SPARE PARTS AND MAINTENANCE MATERIALS REQUIRED BY THESE CONTRACT DOCUMENTS SHALL BE DELIVERED TO OWNER AS DIRECTED BY OWNER.

7. LIST OF MANUFACTURERS AND SUPPLIERS: AT THE CONCLUSION OF THE PROJECT, THE CONTRACTOR SHALL FURNISH RPR WITH A COMPLETE LIST OF SUBCONTRACTORS, MANUFACTURERS, AND SUPPLIERS WHO PARTICIPATED IN THE CONSTRUCTION OR WHO FURNISHED MATERIALS OR EQUIPMENT. THE ADDRESS OF EACH FIRM SHALL BE INCLUDED, TOGETHER WITH TYPES OF MATERIALS OR WORK PERFORMED.

8. STATEMENT OF PAYMENT OF TAXES

9. AFFIDAVIT OF PAYMENT OF DEBTS AND CLAIMS

10. AFFIDAVIT OF RELEASE OF LIENS

11. CONSENT OF SURETY IF RETAINAGE IS IN ESCROW ACCOUNT

END OF SECTION

SECTION 02050 - DEMOLITION

PART 1 - GENERAL

1.01 DESCRIPTION: THIS SECTION SPECIFIES REMOVAL AND OFF-SITE DISPOSAL OF THE FOLLOWING:

A. BUILDINGS, STRUCTURES, AND EQUIPMENT AS INDICATED ON DRAWINGS

B. PAVEMENT, CURBING, AND MISCELLANEOUS CONCRETE SITE IMPROVEMENTS REQUIRED TO BE REMOVED FOR NEW CONSTRUCTION.

C. FUEL TANK FOUNDATION PAD TO A UNIFORM DEPTH OF 12 INCHES OR THICKNESS OF THE PAD WHICHEVER IS GREATER.

D. DISCONNECTING, DRAINING, CAPPING, SEALING, AND ABANDONING IN PLACE AND REMOVING EXISTING SITE UTILITIES AS SPECIFIED ON THE DRAWINGS.

1.02 DEFINITIONS

A. REMOVE: REMOVE AND LEGALLY DISPOSE OF ITEMS EXCEPT THOSE INDICATED TO BE REINSTALLED, SALVAGED, OR TO REMAIN THE OWNER'S PROPERTY.

B. REMOVE AND SALVAGE: ITEMS INDICATED TO BE REMOVED AND SALVAGED REMAIN THE OWNER'S PROPERTY. REMOVE, CLEAN, AND PACK OR CRATE ITEMS TO PROTECT AGAINST DAMAGE. IDENTIFY CONTENTS OF CONTAINERS AND DELIVER TO OWNER'S DESIGNATED STORAGE AREA.

C. REMOVE AND REINSTALL: REMOVE ITEMS INDICATED; CLEAN, SERVICE, AND OTHERWISE PREPARE THEM FOR REUSE. STORE AND PROTECT AGAINST DAMAGE. REINSTALL ITEMS IN LOCATIONS INDICATED.

D. EXISTING TO REMAIN: PROTECT CONSTRUCTION INDICATED TO REMAIN AGAINST DAMAGE AND SOILING DURING DEMOLITION. WHEN PERMITTED BY THE OWNER, ITEMS MAY BE REMOVED TO A SUITABLE, PROTECTED STORAGE LOCATION DURING DEMOLITION AND THEN CLEANED AND REINSTALLED IN THEIR ORIGINAL LOCATIONS.

1.03 MATERIALS OWNERSHIP

A. EXCEPT FOR ITEMS OR MATERIALS INDICATED TO BE REUSED, SALVAGED, OR OTHERWISE INDICATED TO REMAIN THE OWNER'S PROPERTY, DEMOLISHED MATERIALS SHALL BECOME THE CONTRACTOR'S PROPERTY AND SHALL BE REMOVED FROM THE SITE AND DISPOSED OF BY THE CONTRACTOR.

1.04 QUALITY ASSURANCE

A. DEMOLITION AND PARTIAL DEMOLITION WORK SHALL BE COMPLETED IN A MANNER TO LIMIT DAMAGE TO AREAS TO REMAIN. ALL DAMAGED AREAS TO REMAIN SHALL BE REPAIRED OR REPLACED TO MATCH EXISTING BY THE CONTRACTOR AS PART OF PROJECT WORK AT NO ADDITIONAL COST TO THE OWNER.

1.05 REFERENCE STANDARDS AND SPECIFICATIONS ARE REFERRED TO BY ABBREVIATION AS FOLLOWS:

A. ENVIRONMENTAL PROTECTION AGENCY ..... EPA

1.06 SUBMITTALS: PROVIDE THE FOLLOWING IN A TIMELY MANNER IN ACCORDANCE WITH THE APPROVED SUBMITTALS SCHEDULE AS SPECIFIED IN DIVISION 1 - GENERAL REQUIREMENTS.

A. SUBMITTAL: PROPOSED DUST-CONTROL MEASURES

B. SUBMITTAL: SCHEDULE OF DEMOLITION ACTIVITIES INDICATING THE FOLLOWING:

(1) DETAILED SEQUENCE OF DEMOLITION AND REMOVAL WORK TO ENSURE UNINTERRUPTED PROGRESS OF OWNER'S ON-SITE OPERATIONS WITH STARTING AND ENDING DATES FOR EACH ACTIVITY.

(2) DATES FOR SHUTOFF, CAPPING, AND CONTINUATION OF UTILITY SERVICES.

C. SUBMITTAL: INVENTORY OF ITEMS TO BE REMOVED AND SALVAGED.

D. SUBMITTAL: PHOTOGRAPHS OR VIDEOTAPE, SUFFICIENTLY DETAILED, OF EXISTING CONDITIONS OF ADJOINING CONSTRUCTION AND SITE IMPROVEMENTS THAT MIGHT BE MISCONSTRUED AS DAMAGE CAUSED BY DEMOLITION OPERATIONS.

1.07 PROJECT CONDITIONS

A. BUILDINGS AND STRUCTURES TO BE DEMOLISHED WILL BE VACATED AND USE DISCONTINUED PRIOR TO START OF WORK.

B. OWNER ASSUMES NO RESPONSIBILITY FOR ACTUAL CONDITION OF BUILDINGS AND STRUCTURES TO BE DEMOLISHED.

(1) CONDITIONS EXISTING AT TIME OF INSPECTION FOR BIDDING PURPOSE WILL BE MAINTAINED BY OWNER AS FAR AS PRACTICABLE.

C. ASBESTOS: IT IS NOT EXPECTED THAT ASBESTOS WILL BE ENCOUNTERED IN THE COURSE OF THIS CONTRACT. IF ANY MATERIALS SUSPECTED OF CONTAINING ASBESTOS ARE ENCOUNTERED, DO NOT DISTURB THE MATERIALS AND IMMEDIATELY NOTIFY THE OWNER.

1.08 SCHEDULING

A. ARRANGE DEMOLITION SCHEDULE SO AS NOT TO INTERFERE WITH OWNER'S ON-SITE OPERATIONS.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS: SHALL BE SPECIFIED IN SECTION 02300 - EARTHWORK.

A. OBTAIN APPROVED BORROW SOIL MATERIALS OFF-SITE WHEN SUFFICIENT SATISFACTORY SOIL MATERIALS ARE NOT AVAILABLE ON-SITE.

2.02 PERMITS

A. BEFORE DEMOLITION STARTS ON ANY AREA, ALL REQUIRED PERMITS FOR THAT AREA SHALL BE OBTAINED BY THE CONTRACTOR.

B. THE CONTRACTOR SHALL SATISFY THE BUILDING OFFICIAL THAT THE REQUIREMENTS OF THE BUILDING DEMOLITION PERMITS HAVE BEEN MET.

PART 3 - EXECUTION

3.01 EXAMINATION

A. VERIFY THAT UTILITIES HAVE BEEN DISCONNECTED AND CAPPED PRIOR TO BEGINNING DEMOLITION OPERATIONS.

B. SURVEY EXISTING CONDITIONS AND CORRELATE WITH REQUIREMENTS INDICATED TO DETERMINE EXTENT OF DEMOLITION REQUIRED.

C. INVENTORY AND RECORD THE CONDITION OF ITEMS TO BE REMOVED AND REINSTALLED AND ITEMS TO BE REMOVED AND SALVAGED.

D. SURVEY THE CONDITION OF THE BUILDING TO DETERMINE WHETHER REMOVING ANY ELEMENT MIGHT RESULT IN A STRUCTURAL DEFICIENCY OR UNPLANNED COLLAPSE OF ANY PORTION OF THE STRUCTURE OR ADJACENT STRUCTURES DURING DEMOLITION.

E. PERFORM SURVEYS AS THE WORK PROGRESSES TO DETECT HAZARDS RESULTING FROM DEMOLITION ACTIVITIES.

3.02 UTILITY SERVICES

A. MAINTAIN EXISTING UTILITIES INDICATED TO REMAIN IN SERVICE AND PROTECT THEM AGAINST DAMAGE DURING DEMOLITION OPERATIONS.

(1) DO NOT INTERRUPT EXISTING UTILITIES SERVING OCCUPIED OR OPERATING FACILITIES, EXCEPT WHEN AUTHORIZED IN WRITING BY OWNER AND AUTHORITIES HAVING JURISDICTION. PROVIDE TEMPORARY SERVICES DURING INTERRUPTIONS TO EXISTING UTILITIES, AS ACCEPTABLE TO OWNER AND TO GOVERNING AUTHORITIES.

PROVIDE NOT LESS THAN 72 HOURS' NOTICE TO OWNER IF SHUTDOWN OF SERVICE IS REQUIRED DURING CHANGEOVER.

B. OWNER WILL PUMP DOWN THE 1,000 GALLON FUEL TANK TO MINIMAL LEVEL FOR CONTRACTOR REMOVAL TO OWNER’S SALVAGE LOCATION.

C. UTILITY REQUIREMENTS: LOCATE, IDENTIFY, DISCONNECT, AND SEAL OR CAP OFF INDICATED UTILITY SERVICES SERVING STRUCTURES TO BE DEMOLISHED.

3.03 PREPARATION

A. DRAIN, PURGE, OR OTHERWISE REMOVE, COLLECT, AND DISPOSE OF CHEMICALS, GASES, EXPLOSIVES, ACIDS, FLAMMABLES, OR OTHER DANGEROUS MATERIALS BEFORE PROCEEDING WITH DEMOLITION OPERATIONS.

B. CONDUCT DEMOLITION OPERATIONS AND REMOVE DEBRIS TO ENSURE MINIMUM INTERFERENCE WITH ROADS, STREETS, WALKS, AND OTHER ADJACENT OCCUPIED AND USED FACILITIES.

C. CONDUCT DEMOLITION OPERATIONS TO PREVENT INJURY TO PEOPLE AND DAMAGE TO ADJACENT BUILDINGS AND FACILITIES TO REMAIN. ENSURE SAFE PASSAGE OF PLANT PERSONNEL, EQUIPMENT, AND MATERIALS AROUND THE DEMOLITION AREA.

(1) ERECT TEMPORARY PROTECTION, SUCH AS WALKS, FENCES, RAILINGS, CANOPIES, AND COVERED PASSAGEWAYS, WHERE REQUIRED BY AUTHORITIES HAVING JURISDICTION.

(2) PROTECT EXISTING SITE IMPROVEMENTS, APPURTENANCES, AND LANDSCAPING TO REMAIN.

D. PROVIDE AND MAINTAIN INTERIOR AND EXTERIOR SHORING, BRACING, OR STRUCTURAL SUPPORT TO PRESERVE STABILITY AND PREVENT MOVEMENT, SETTLEMENT, OR COLLAPSE OF AREAS TO BE DEMOLISHED AND ADJACENT AREAS TO REMAIN.

(1) STRENGTHEN OR ADD NEW SUPPORTS WHEN REQUIRED DURING PROGRESS OF DEMOLITION.

3.04 EXPLOSIVES

A. EXPLOSIVES: USE OF EXPLOSIVES WILL NOT BE PERMITTED.

3.05 POLLUTION CONTROLS

A. USE WATER MIST, TEMPORARY ENCLOSURES, AND OTHER SUITABLE METHODS TO LIMIT THE SPREAD OF DUST AND DIRT. COMPLY WITH GOVERNING ENVIRONMENTAL PROTECTION REGULATIONS.

(1) DO NOT CREATE HAZARDOUS OR OBJECTIONABLE CONDITIONS, SUCH AS ICE, FLOODING, AND POLLUTION, WHEN USING WATER.

B. REMOVE AND TRANSPORT DEBRIS IN A MANNER THAT WILL PREVENT SPILLAGE ON ADJACENT SURFACES AND AREAS.

(1) REMOVE DEBRIS FROM ELEVATED PORTIONS OF BUILDING BY CHUTE, HOIST, OR OTHER DEVICE THAT WILL CONVEY DEBRIS TO GRADE LEVEL.

C. CLEAN ADJACENT BUILDINGS AND IMPROVEMENTS OF DUST, DIRT, AND DEBRIS CAUSED BY DEMOLITION OPERATIONS. RETURN ADJACENT AREAS TO CONDITION EXISTING BEFORE START OF DEMOLITION.

3.06 DEMOLITION

A. BUILDING AND STRUCTURE DEMOLITION: DEMOLISH AREAS SHOWN COMPLETELY AND REMOVE FROM SITE. USE SUCH METHODS REQUIRED TO COMPLETE WORK WITHIN LIMITATIONS OF GOVERNING REGULATIONS AND AS FOLLOWS:

(1) REMOVE DEBRIS AND MATERIALS SO AS NOT TO IMPOSE EXCESSIVE LOADS ON SUPPORTING WALLS, FLOORS, OR FRAMING.

(2) DISPOSE OF DEMOLISHED ITEMS AND MATERIALS PROMPTLY. ON-SITE STORAGE OR SALE OF REMOVED ITEMS IS PROHIBITED.

(3) PROCEED WITH DEMOLITION IN A SYSTEMATIC MANNER, FROM THE TOP OF STRUCTURE TO GROUND. COMPLETE DEMOLITION WORK ABOVE EACH FLOOR OR TIER BEFORE DISTURBING SUPPORTING MEMBERS ON LOWER LEVELS.

(4) DEMOLISH CONCRETE AND MASONRY IN SMALL SECTIONS.

(5) REMOVE STRUCTURAL FRAMING MEMBERS AND LOWER TO GROUND BY METHODS SUITABLE TO AVOID FREE FALL AND TO PREVENT GROUND IMPACT OR DUST GENERATION.

(6) BREAK UP AND REMOVE CONCRETE SLABS ON GRADE, UNLESS OTHERWISE SHOWN TO REMAIN.

(7) REMOVE AIR-CONDITIONING EQUIPMENT WITHOUT RELEASING REFRIGERANTS.

(8) REMOVE ABOVE-GRADE IMPROVEMENTS SUCH AS POSTS, POLES, FENCES, WALLS, AND OTHER WORK AS SPECIFICALLY INDICATED OR NECESSARY TO PERMIT NEW CONSTRUCTION.

B. BELOW-GRADE CONSTRUCTION: DEMOLISH FOUNDATION WALLS AND OTHER BELOW-GRADE CONSTRUCTION AS FOLLOWS: REMOVE CONCRETE SLABS TO A FULL DEPTH OR NOT LESS THAN 12 INCHES BELOW GRADE

C. FILLING BELOW GRADE AREAS: COMPLETELY FILL BELOW-GRADE AREAS AND VOIDS RESULTING FROM DEMOLITION OF BUILDINGS, STRUCTURES, AND PAVEMENTS WITH SOIL MATERIALS AS DEFINED IN ASTM D 2487, CONSISTING OF STONE, GRAVEL, AND SAND, FREE FROM DEBRIS, TRASH, FROZEN MATERIALS, ROOTS, AND OTHER ORGANIC MATTER IN ACCORDANCE WITH SECTION 02300 - EARTHWORK.

(1) PRIOR TO PLACEMENT OF FILL MATERIALS, ENSURE THAT AREAS TO BE FILLED ARE FREE OF STANDING WATER, FROST, FROZEN MATERIAL, TRASH, AND DEBRIS.

(2) PLACE FILL MATERIALS IN HORIZONTAL LAYERS NOT EXCEEDING 6 INCHES IN LOOSE DEPTH. COMPACT EACH LAYER AT OPTIMUM MOISTURE CONTENT OF FILL MATERIAL TO A DENSITY EQUAL TO ORIGINAL ADJACENT GROUND, BUT NOT LESS THAN 90 PERCENT DENSITY WHEN TESTED IN ACCORDANCE WITH ASTM D 1556, UNLESS SUBSEQUENT EXCAVATION FOR NEW WORK IS REQUIRED.

(3) AFTER FILL PLACEMENT AND COMPACTION, GRADE SURFACE TO MEET ADJACENT CONTOURS AND TO PROVIDE FLOW TO SURFACE DRAINAGE STRUCTURES.

D. DAMAGES: PROMPTLY REPAIR DAMAGES TO ADJACENT FACILITIES CAUSED BY DEMOLITION OPERATIONS.

3.07 DISPOSAL OF DEMOLISHED MATERIALS

A. PROMPTLY DISPOSE OF DEMOLISHED MATERIALS AT AN APPROVED OFF-SITE LOCATION. DO NOT ALLOW DEMOLISHED MATERIALS TO ACCUMULATE ON-SITE.

B. BURNING IS NOT PERMITTED.

C. LEAVE SITE CLEAN, NEAT, AND ORDERLY AND IN CONDITION TO BEGIN NEW CONSTRUCTION.

D. REMOVE ALL TOOLS, EQUIPMENT, AND MATERIALS FROM THE DEMOLITION SITE UPON COMPLETION OF THE WORK.

END OF SECTION

SECTION 02100 - SITE PREPARATION

1. GENERAL

1.01 PROVIDE BARRICADES, COVERINGS, OR OTHER TYPES OF PROTECTION NECESSARY TO PREVENT DAMAGE TO EXISTING IMPROVEMENTS ON ADJOINING PROPERTIES.

A. RESTORE ALL IMPROVEMENTS DAMAGED BY THIS WORK TO THEIR ORIGINAL CONDITION, AND ACCEPTABLE TO THE OWNER OR OTHER PARTIES OR AUTHORITIES HAVING JURISDICTION, UNLESS INDICATED OTHERWISE.

1.02 PROTECT EXISTING TREES AND OTHER VEGETATION INDICATED 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, BARRICADES, OR GUARDS AS REQUIRED TO PROTECT TREES AND VEGETATION TO BE LEFT STANDING.

1.03 COMPLY WITH ALL REQUIREMENTS OF THE VIRGINIA EROSION AND SEDIMENT CONTROL AND STORMWATER REGULATIONS AS ADMINISTERED BY THE VIRGINIA DEPARTMENT OF CONSERVATION AND RECREATION.

2. PRODUCTS: NOT USED.

3. EXECUTION

3.01 CLEARING

A. REMOVE FROM THE SITE TREES, BRUSH, SHRUBS, DOWN TIMBER, ROTTEN WOOD, RUBBISH, OTHER VEGETATION, AS WELL AS FENCES AND INCIDENTAL STRUCTURES NECESSARY TO ALLOW FOR NEW CONSTRUCTION.

B. CLEARING WORK SHALL BE RESTRICTED TO MINIMUM REQUIRED TO CONSTRUCT IMPROVEMENTS SHOWN ON THE DRAWINGS.

C. UNDISTURBED STUMPS AND ROOTS, A MINIMUM OF 5 FEET BELOW FINISHED GRADE AND NOT LOCATED UNDER OR WITHIN 10 FEET OF ANY STRUCTURE, MAY BE LEFT IN PLACE. TOPS OF STUMPS LEFT IN PLACE SHALL NOT BE MORE THAN 6 INCHES ABOVE ORIGINAL GRADE.

3.02 EXISTING TREES AND SHRUBS

A. TREES AND SHRUBS THAT ARE TO REMAIN WITHIN "CONSTRUCTION LIMITS" WILL BE INDICATED ON DRAWINGS OR CONSPICUOUSLY MARKED ON SITE.

B. OWNERSHIP OF TREES: UNLESS OTHERWISE NOTED, TREES REMOVED TO ALLOW FOR NEW CONSTRUCTION SHALL BECOME THE PROPERTY OF THE CONTRACTOR AND SHALL BE REMOVED FROM THE SITE.

C. PROVIDE PROTECTION FOR ROOTS AND BRANCHES OVER 1-1/2 INCHES DIAMETER THAT ARE CUT DURING CONSTRUCTION OPERATIONS. COAT THE CUT FACES WITH AN EMULSIFIED ASPHALT OR OTHER COATING, ESPECIALLY

FORMULATED FOR HORTICULTURAL USE ON CUT OR DAMAGED PLANT TISSUES. TEMPORARILY COVER ALL EXPOSED ROOTS WITH WET BURLAP TO PREVENT ROOTS FROM DRYING OUT. PROVIDE EARTH COVER AS SOON AS POSSIBLE.

3.03 GRUBBING

A. GRUB AREAS WITHIN AND TO A POINT OF 10 FEET OUTSIDE OF ALL STRUCTURES, AREAS TO RECEIVE FILL WHERE FINISHED GRADE WILL BE LESS THAN 3 FEET ABOVE EXISTING GRADE, CUT AREAS WHERE FINISHED GRADE WILL BE LESS THAN 2 FEET BELOW EXISTING GRADE, TRANSITIONAL AREAS BETWEEN CUT AND FILL, AND ANY AREA TO RECEIVE CONTROL FILL.

B. REMOVE FROM THE GROUND TO A DEPTH OF 18 INCHES ALL STUMPS, ROOTS 1/2-INCH DIAMETER AND LARGER, ORGANIC MATERIAL, AND DEBRIS.

C. USE ONLY HAND METHODS FOR GRUBBING INSIDE THE DRIP LINES OF TREES WHICH ARE TO REMAIN.

D. ALL TOPSOIL REMOVED DURING LAND PREPARATION SHALL BE STOCKPILED ON SITE AND REUSED FOR RESTORING TURF AREAS DAMAGED DURING CONSTRUCTION.

3.04 CLEAN UP DEBRIS RESULTING FROM SITE CLEARING OPERATIONS CONTINUOUSLY WITH THE PROGRESS OF THE WORK.

3.05 REMOVE ALL WASTE MATERIAL FROM THE OWNER'S PROPERTY.

3.06 REMOVE DEBRIS FROM SITE IN SUCH A MANNER AS TO PREVENT SPILLAGE. KEEP PAVEMENT AND AREA ADJACENT TO SITE CLEAN AND FREE FROM MUD, DIRT, AND DEBRIS AT ALL TIMES.

END OF SECTION

SECTION 02300 - EARTHWORK

1. GENERAL

1.01 REFERENCE SPECIFICATIONS WHERE APPLICABLE TO WORK UNDER THIS SECTION ARE REFERRED TO BY ABBREVIATION AS FOLLOWS:

A. AMERICAN SOCIETY FOR TESTING AND MATERIALS.....ASTM

B. AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS.....AASHTO

C. VIRGINIA DEPARTMENT OF TRANSPORTATION.....VDOT

1.02 EXPLOSIVES SHALL NOT BE USED.

1.03 THE CONTRACTOR SHALL PROVIDE COMPACTION TESTING USING A GEOTECHNICAL ENGINEER LICENSED TO PRACTICE ENGINEERING IN VIRGINIA.

1.04 LOCATE EXISTING UTILITIES, CULVERTS, AND STRUCTURES ABOVE OR BELOW GROUND BEFORE ANY EXCAVATION STARTS. PROTECT, MAINTAIN IN SERVICE, AND PREVENT DAMAGE TO UTILITIES NOT DESIGNATED TO BE REMOVED. WHEN UTILITIES ARE ENCOUNTERED AND ARE NOT SHOWN ON DRAWINGS OR WHEN LOCATIONS DIFFER FROM THOSE SHOWN ON DRAWINGS, NOTIFY THE OWNER FOR INSTRUCTIONS BEFORE PROCEEDING.

1.05 ALL EXCAVATION SHALL BE UNCLASSIFIED REGARDLESS OF MATERIAL ENCOUNTERED.

1.06 UNAUTHORIZED EXCAVATION CONSISTS OF REMOVAL OF MATERIALS BEYOND INDICATED SUBGRADE ELEVATIONS OR SIDE DIMENSIONS, WITHOUT SPECIFIC APPROVAL OF THE OWNER. UNAUTHORIZED EXCAVATION SHALL BE REPLACED AT CONTRACTOR'S EXPENSE.

2. PRODUCTS

2.01 FILL MATERIALS

A. AGGREGATE FILL/DRAINAGE COURSE SHALL BE UNIFORMLY GRADED MIXTURE OF CRUSHED STONE, OR CRUSHED AND UNCRUSHED GRAVEL WITH 100 PERCENT PASSING A 1-1/2 INCH SIEVE AND NOT MORE THAN 5 PERCENT PASSING A NO. 4 SIEVE, ASTM D 448, SIZE NO. 56.

B. FILTERING MATERIAL SHALL BE A GRADED MIXTURE OF NATURAL OR CRUSHED GRAVEL, CRUSHED STONE, OR NATURAL SAND WITH 100 PERCENT PASSING A 1/2-INCH SIEVE AND NONE PASSING A NO. 50 SIEVE, ASTM D 448, SIZE NO. 8.

C. CLEAN EARTH FILL SHALL BE FREE OF DEBRIS, ROOTS, FROZEN MATERIALS, ORGANIC MATTER, ROCK OR GRAVEL LARGER THAN 1-INCH IN ANY DIMENSION, OR OTHER HARMFUL MATTER. SATISFACTORY SOILS SHALL BE FROM ASTM D 2487 CLASSIFICATION GROUPS GW, GP, GM, SW, SP, AND SM.

D. EARTH FILL SHALL BE FREE OF DEBRIS, ROOTS, FROZEN MATERIALS, ORGANIC MATTER, ROCK LARGER THAN 5 INCHES IN ANY DIMENSION, OR OTHER HARMFUL MATTER.

E. PIPE BEDDING FILL SHALL BE ONE OF THE FOLLOWING TWO MATERIALS:

(1) FINE GRANULAR FILL SHALL MEET REQUIREMENTS FOR FINE AGGREGATE, ASTM C 33.

(2) COARSE GRANULAR FILL SHALL MEET REQUIREMENTS FOR COARSE AGGREGATES, ASTM C 33, SIZE NO. 56, 57, 67, OR 68.

2.02 TOPSOIL FROM OFF SITE SHALL BE A SANDY LOAM, CLAY LOAM, LOAM, SILT LOAM, SANDY CLAY LOAM, OR TOPSOIL FROM THE SITE SHALL HAVE SUFFICIENT ORGANIC MATERIAL TO PROMOTE THE GROWTH OF TURF GRASS. IT SHALL NOT HAVE A MIXTURE OF SUBSOIL OR CONTAIN SLAG, CINDERS, STONES, LUMPS OF SOIL, STICKS, ROOTS, WEEDS, TRASH, OR OTHER EXTRANEOUS MATERIALS LARGER THAN 1-INCH IN ANY DIMENSION.

2.03 RIPRAP SHALL BE VDOT DRY RIPRAP, CLASS INDICATED ON DRAWINGS, WITH ENOUGH SMALL PIECES TO FILL IN THE VOID SPACES BETWEEN THE LARGER STONES.

3. EXECUTION

3.01 STRIP EXISTING ON-SITE TOPSOIL, LEAF MOLD, AND ORGANIC MATERIALS MEETING TOPSOIL REQUIREMENTS OF SECTION 02930 - SEEDING. DEPOSIT IN STORAGE PILES SEPARATE FROM OTHER EXCAVATED MATERIAL. WHEN A SUFFICIENT TOPSOIL QUANTITY IS NOT AVAILABLE ON SITE, PROVIDE TOPSOIL FROM OFF SITE.

3.02 WHEN CHANGES ARE AUTHORIZED FROM THE ELEVATIONS AND DIMENSIONS SHOWN ON THE DRAWINGS RESULTING IN MORE EXCAVATION THAN ORIGINALLY INDICATED, THE CONTRACTOR SHALL BE PAID FOR THE ADDITIONAL VOLUME OF EXCAVATION. WHEN AUTHORIZED CHANGES RESULT IN A DECREASED VOLUME, THE CONTRACTOR SHALL ALLOW A CREDIT FOR THE OMITTED VOLUME.

A. THE EXTRA OR CREDIT SHALL BE SUBMITTED AS A CHANGE ORDER PROPOSAL.

3.03 WHERE UNAUTHORIZED EXCAVATIONS HAVE BEEN CARRIED BELOW OR BEYOND POINTS REQUIRED, RESTORE THESE AREAS TO THE ELEVATIONS AND DIMENSIONS SHOWN ON THE DRAWINGS WITH MATERIAL APPROVED BY THE GEOTECHNICAL REPRESENTATIVE AND COMPACT AS SPECIFIED.

3.04 WHERE REMOVAL OF UNSATISFACTORY MATERIAL IS DUE TO FAULT OR NEGLIGENCE OF THE CONTRACTOR BY INADEQUATE SHORING OR BRACING, DEWATERING, MATERIAL STORAGE, OR OTHER FAILURE TO MEET SPECIFIED REQUIREMENTS, WORK SHALL BE PERFORMED AT NO ADDITIONAL COST TO THE OWNER.

3.05 WHEN EXCAVATION IS ADJACENT TO STRUCTURAL FOUNDATIONS, WALLS, PIPELINES, AND OTHER UNDERGROUND UTILITIES, PROTECT ADJACENT ITEMS AS REQUIRED TO PREVENT DAMAGE TO THEM.

3.06 UTILITIES TO BE ABANDONED OR REMOVED

A. WHEN UNDERGROUND UTILITIES ARE TO BE ABANDONED IN PLACE, PLUG, CAP, OR SEAL WITH CONCRETE AT THE "CONSTRUCTION LIMITS" OR AT POINTS SHOWN.

B. REMOVE UNDERGROUND UTILITIES INDICATED ON THE DRAWINGS TO BE REMOVED AND BACKFILL RESULTING EXCAVATION WITH SUITABLE MATERIAL, COMPACTED AS SPECIFIED. PLUG, CAP, OR SEAL UTILITIES WITH CONCRETE AT THE CONSTRUCTION LIMITS OR AT POINTS SHOWN.

3.07 EXCAVATION

A. AREAS THAT RECEIVE SEEDING SHALL BE GRADED BELOW FINISHED GRADES SHOWN, LEAVING SPACE FOR TOPSOILING.

B. STOCKPILE EXCAVATED SOIL MATERIAL SATISFACTORY FOR BACKFILL OR FILL UNTIL REQUIRED. PLACE, GRADE, SHAPE AND STABILIZE STOCKPILES FOR PROPER DRAINAGE AND EROSION CONTROL.

C. REMOVE EXISTING PAVEMENT AS REQUIRED.

D. REMOVE FROM PROJECT SITE AND DISPOSE OF MATERIAL UNSATISFACTORY FOR BACKFILL OR FILL, TRASH AND DEBRIS, AND ALL EXCESS MATERIAL CONTINUOUSLY WITH THE PROGRESS OF THE WORK. KEEP PAVEMENT AND AREA ADJACENT TO SITE CLEAN AND FREE FROM MUD, DIRT, AND DEBRIS AT ALL TIMES.

E. KEEP EXCAVATIONS FREE OF WATER WHILE WORK IS BEING PERFORMED.

F. WHERE UNDERGROUND STREAMS OR SPRINGS ARE FOUND, PROVIDE TEMPORARY DRAINAGE AND NOTIFY THE OWNERS GEOTECHNICAL REPRESENTATIVE.

G. EXCAVATE SO THAT BANKS OF EXCAVATION WILL NOT BE UNDERCUT AND STRATUM FOR FOUNDATIONS WILL NOT BE DISTURBED.

H. EXCAVATE UNSATISFACTORY SOIL MATERIALS ENCOUNTERED THAT EXTEND BELOW REQUIRED ELEVATIONS TO THE ADDITIONAL DEPTH AS DIRECTED BY THE OWNERS GEOTECHNICAL REPRESENTATIVE.

I. REMOVE SHORING AND ALL FORM MATERIALS.

3.08 EXCAVATION FOR STRUCTURES

A. CONFORM TO ELEVATIONS AND DIMENSIONS SHOWN ON THE DRAWINGS. EXTEND EXCAVATION SUFFICIENT DISTANCE FROM FOOTINGS AND FOUNDATIONS TO PERMIT PLACING AND REMOVAL OF CONCRETE FORMWORK, INSTALLATION OF SERVICES, AND FOR OTHER CONSTRUCTION REQUIRED. FOUNDATION CONCRETE SHALL NOT BE PLACED UNTIL THE BEARING STRATUM HAS BEEN EXAMINED AND FOUND SATISFACTORY FOR THE DESIGN BEARING CAPACITY.

B. A THOROUGHLY COMPACTED AGGREGATE FILL SHALL BE PROVIDED AS PER THE DIMENSIONS SHOWN ON THE DRAWINGS. IF NO DIMENSIONS ARE SHOWN ON THE DRAWINGS, EXCAVATE 8 INCHES BELOW THE BOTTOM OF FLOORS OR FOOTINGS AND BACKFILL WITH AGGREGATE FILL AND COMPACT IN ACCORDANCE WITH PARAGRAPH 3.11, A., (1) OF THIS SECTION.

3.09 EXCAVATION FOR TRENCHES

A. FOR ALL PIPE BENEATH STRUCTURES THAT ARE GREATER THAN 6 INCHES IN DIAMETER, EXCAVATE 12 INCHES BELOW THE BOTTOM OF THE PIPE FOR PIPE BEDDING FILL. FOR ALL PIPES BENEATH STRUCTURES THAT ARE 6 INCHES AND SMALLER, EXCAVATE 6 INCHES BELOW THE BOTTOM OF THE PIPE FOR PIPE BEDDING.

B. EXCAVATE TRENCHES FOR PIPE TO A DEPTH 4 INCHES BELOW THE PIPE FOR PIPE BEDDING FILL. BED ALL PIPES TO THE CROWN OF THE PIPE WITH STONE BEDDING.

C. WHERE ROCK OR UNSUITABLE SOIL IS ENCOUNTERED, EXCAVATE ROCK OR UNSUITABLE MATERIAL ENCOUNTERED 6 INCHES BELOW THE PIPE FOR PIPE BEDDING FILL. THIS EXCAVATION WILL BE PAID FOR AS ADDITIONAL EXCAVATION AS REQUIRED.

3.10 PIPE BEDDING

A. BEDDING FOR PIPE SHALL BE FINE GRANULAR FILL.

B. EXCAVATE BELL HOLES IN THE BEDDING TO INSURE THAT THE PIPE BARREL IS SUPPORTED BY THE BEDDING.

C. COMPACT PIPE BEDDING BY TAMPING OR RODDING TO PREVENT SETTLEMENT.

3.11 COMPACTION

A. PERCENTAGE OF MAXIMUM DENSITY REQUIREMENTS.

(1) COMPACT EACH LAYER OF FILL OR BACKFILL TO NOT LESS THAN THE FOLLOWING PERCENTAGES.

95 PERCENT BY ASTM D 1557 BENEATH AND WITHIN 25 FEET OF BUILDINGS AND STRUCTURES, INCLUDING THOSE SHOWN FOR FUTURE CONSTRUCTION 95 PERCENT BY ASTM D 698 BENEATH PAVEMENTS, WALKS, AND ROAD SHOULDERS, INCLUDING THOSE SHOWN FOR FUTURE CONSTRUCTION

90 PERCENT BY ASTM D 698 IN OTHER UNPAVED AREAS

(2) IF THE DENSITY OF THE ADJACENT SOIL IS MORE THAN THE DENSITY SPECIFIED, COMPACT TO A DENSITY NOT LESS THAN THE DENSITY OF THE ADJACENT SOIL.

B. COMPACT SOIL MATERIALS USING EQUIPMENT SUITABLE FOR MATERIALS TO BE COMPACTED AND WORK AREA LOCATIONS. USE POWER-DRIVEN HAND TAMPERS FOR COMPACTING MATERIALS ADJACENT TO STRUCTURES.

C. PROVIDE EQUIPMENT CAPABLE OF ADDING MOISTURE TO THE SOIL MATERIAL AS DETERMINED BY MOISTURE-DENSITY TESTS.

D. WHERE REQUIRED, UNIFORMLY APPLY WATER TO THE SURFACE OF SUBGRADE OR LAYER OF SOIL MATERIAL IN SUCH MANNER AS TO PREVENT FREE WATER APPEARING ON THE SURFACE, EITHER DURING OR SUBSEQUENT TO COMPACTION OPERATIONS.

3.12 FILL AND BACKFILL

A. REMOVE VEGETATION, DEBRIS, UNSATISFACTORY MATERIALS, AND HARMFUL MATERIALS PRIOR TO PLACEMENT OF FILL. PLOW, STRIP, OR BREAK UP SLOPED SURFACES STEEPER THAN 4 TO 1 SO THAT FILL MATERIAL WILL BOND WITH EXISTING SURFACE.

B. PROOFROLLING: IN AREAS TO RECEIVE FILL, OR UNDISTURBED AREAS THAT WILL BE PAVED, PROOFROLL WITH A 20 TO 25 TON RUBBER-TIRED ROLLER TO LOCATE ALL SOFT SURFACE AREAS. MAKE AT LEAST FOUR SYSTEMATIC PASSES OVER EACH AREA, THE FIRST AND THIRD PASSES PERPENDICULAR TO THE OTHER TWO. REPLACE SOIL THAT DEFLECTS AND WILL NOT COMPACT WITH MATERIAL WHICH CAN BE COMPACTED IN ACCORDANCE WITH THESE SPECIFICATIONS. COMPACT SUCH AREAS BEFORE FILLING.

C. OBTAIN FILL FROM EXCAVATION, BORROW AREAS, OR OTHER APPROVED SOURCES. THE MATERIAL SHALL BE SUCH THAT IT CAN BE COMPACTED IN ACCORDANCE WITH THESE SPECIFICATIONS. MAXIMUM ROCK SIZE SHALL BE 75 PERCENT OF COMPACTED LAYER THICKNESS OR MAXIMUM OF 6 INCHES DIAMETER. PREVENT NESTING OF LARGE ROCKS AND COMPACT FILL TO

PREVENT VOIDS. MAXIMUM ROCK SIZE WITHIN 12 INCHES OF FOOTINGS SHALL BE 2-INCH DIAMETER.

D. REMOVE AND REPLACE, OR SCARIFY AND AIR DRY, SOIL MATERIAL THAT IS TOO WET TO PERMIT COMPACTION TO SPECIFIED PERCENTAGE OF MAXIMUM DENSITY.

E. DO NOT COMPACT MATERIAL THAT IS FROZEN.

F. SOIL MATERIAL THAT HAS BEEN REMOVED AS TOO WET TO PERMIT COMPACTION MAY BE STOCKPILED OR SPREAD TO DRY. WHEN MOISTURE CONTENT IS REDUCED TO A SATISFACTORY VALUE, SOIL MATERIAL MAY BE USED AS FILL OR BACKFILL.

G. PLACE CLEAN EARTH FILL TO OBTAIN ELEVATIONS SHOWN ON THE DRAWINGS. DO NOT PLACE FILL ON MUDDY OR FROZEN AREAS.

H. EXCAVATE DEPRESSIONS CAUSED BY REMOVAL OF STUMPS OR OTHER CLEARING OPERATIONS TO FIRM SUBGRADE, FILL WITH CLEAN EARTH FILL, AND COMPACT AS SPECIFIED.

I. WHEN THE EXISTING GROUND SURFACE HAS BEEN DISTURBED AND HAS A DENSITY OF LESS THAN THAT SPECIFIED FOR THE PARTICULAR AREA CLASSIFICATION, SCARIFY THE GROUND SURFACE, PULVERIZE, ADJUST MOISTURE CONDITION TO OPTIMUM MOISTURE CONTENT, AND COMPACT TO REQUIRED DEPTH AND PERCENTAGE OF MAXIMUM DENSITY.

J. PLACE BACKFILL AND FILL MATERIALS IN LAYERS NOT MORE THAN 8 INCHES IN LOOSE DEPTH. BEFORE COMPACTION, MOISTEN OR AERATE EACH LAYER AS NECESSARY TO PROVIDE OPTIMUM MOISTURE CONTENT. COMPACT EACH LAYER TO THE REQUIRED DENSITY.

K. PLACE BACKFILL AND FILL MATERIALS EVENLY ADJACENT TO STRUCTURES. PREVENT WEDGING ACTION OF THE BACKFILL AGAINST STRUCTURES BY CARRYING THE MATERIAL UNIFORMLY AROUND THE STRUCTURE TO APPROXIMATELY THE SAME ELEVATION IN EACH LIFT.

L. PLACE AGGREGATE FILL MATERIAL UNDER ALL BUILDING SLABS ON GRADE AND OTHER STRUCTURES AS REQUIRED. NO COMPACTION WILL BE REQUIRED BEYOND THE CONSOLIDATION RESULTING FROM THE USE OF THE PLACING EQUIPMENT.

3.13 PIPE BACKFILL

A. DO NOT USE PAVEMENT, CURB, GUTTER, OR SIDEWALK MATERIAL FOR PIPE BACKFILL.

B. DO NOT USE ROCK THAT HAS BEEN REMOVED FROM THE TRENCH WITH ROCK EXCAVATION EQUIPMENT AS PIPE BACKFILL.

C. BACKFILL TRENCH TO A COMPACTED DEPTH OF 1 FOOT OVER THE PIPE WITH CLEAN EARTH FILL. BACKFILL SHALL BE PLACED BY HAND, UNIFORMLY ON EACH SIDE OF THE PIPE, AND COMPACTED IN LAYERS NOT EXCEEDING 6 INCHES. DO NOT BACKFILL ON MUDDY OR FROZEN SOIL, OR WITH MUDDY OR FROZEN MATERIALS.

D. BACKFILL PVC PIPE TRENCH WITH FINE GRANULAR FILL TO A COMPACTED DEPTH OF 4 INCHES OVER PIPE AND WITH CLEAN EARTH FILL TO A COMPACTED DEPTH OF 1 FOOT OVER THE PIPE.

E. BACKFILL TRENCH FROM 1 FOOT ABOVE THE PIPE TO GRADE WITH EARTH FILL FREE OF STONES OR OTHER MATERIAL LARGER THAN 5 INCHES OR 1/2 THE LAYER THICKNESS IN ANY DIMENSION, WHICHEVER IS SMALLER. LAYERS SHALL NOT EXCEED 12 INCHES, EXCEPT THAT UNDER ROAD SHOULDERS AND UNDER EXISTING OR FUTURE PAVED AREAS AND STRUCTURES, LAYERS SHALL NOT EXCEED 8 INCHES. BACKFILL SHALL BE COMPACTED TO THE DENSITY SPECIFIED FOR THE AREAS IN WHICH IT IS LOCATED EXCEPT THAT MINIMUM COMPACTION IN ANY AREA SHALL BE TO THE DENSITY OF THE ADJACENT SOIL.

3.14 GRADING

A. UNIFORMLY GRADE ALL AREAS WITHIN THE LIMITS DESIGNATED ON THE DRAWINGS, INCLUDING ADJACENT TRANSITION AREAS. FINISH SURFACES WITHIN SPECIFIED TOLERANCES WITH UNIFORM LEVELS OR SLOPES BETWEEN POINTS WHERE ELEVATIONS ARE SHOWN AND EXISTING GRADES.

B. FINISH ALL SURFACES FREE FROM IRREGULAR CHANGES.

C. FINISH AREAS TO RECEIVE TOPSOIL TO WITHIN 0.10-FOOT OF REQUIRED SUBGRADE ELEVATIONS.

D. SHAPE SUBGRADE UNDER WALKS TO LINE, GRADE, AND CROSS-SECTION TO WITHIN 0.10-FOOT OF REQUIRED SUBGRADE ELEVATION.

E. SHAPE SUBGRADE UNDER PAVEMENT TO LINE, GRADE, AND CROSS-SECTION TO WITHIN 1/2-INCH OF REQUIRED SUBGRADE ELEVATIONS.

F. GRADE FOR FLOOR SLABS TO REQUIRED ELEVATION WITHIN TOLERANCE OF 1/4-INCH. WHERE SPACE PERMITS, TEST TOLERANCE WITH 10-FOOT STRAIGHTEDGE.

G. PROTECT NEWLY GRADED AREAS FROM TRAFFIC AND EROSION. REPAIR AND REESTABLISH GRADE IN SETTLED, ERODED, OR RUTTED AREAS TO THE SPECIFIED TOLERANCES.

H. WHERE COMPACTED AREAS ARE DISTURBED BY SUBSEQUENT CONSTRUCTION OR ADVERSE WEATHER, SCARIFY THE SURFACE, RESHAPE, AND COMPACT TO THE REQUIRED DENSITY. USE HAND TAMPER FOR RECOMPACTION OVER UNDERGROUND UTILITIES AND UNDERFLOOR SUBDRAINS.

I. PLACE TOPSOIL IN AREAS TO BE SEEDED.

3.15 EROSION CONTROL

A. PERMANENT OR TEMPORARY SOIL STABILIZATION SHALL BE APPLIED TO DENUDED AREAS WITHIN 7 DAYS AFTER FINAL GRADE IS REACHED ON ANY PORTION OF THE SITE. SOIL STABILIZATION SHALL ALSO BE APPLIED WITHIN 7 DAYS TO DENUDED AREAS WHICH MAY NOT BE AT FINAL GRADE BUT WILL REMAIN DORMANT (UNDISTURBED) FOR LONGER THAN 30 DAYS. SOIL STABILIZATION PRACTICES INCLUDE VEGETATIVE ESTABLISHMENT, MULCHING, AND THE EARLY APPLICATION OF GRAVEL BASE ON AREAS TO BE PAVED.

B. COMPLY WITH ALL LOCAL REQUIREMENTS AND WITH THE VIRGINIA EROSION AND SEDIMENT CONTROL REGULATIONS BY THE VIRGINIA SOIL AND WATER CONSERVATION BOARD TO CONTROL EROSION AND SEDIMENTATION.

C. INSTALL STRAW BALE DAM OR SILT FENCE AROUND SOIL STOCKPILES AND EXCAVATIONS.

D. ALL APPLICABLE EROSION AND SILTATION CONTROL MEASURES SHALL BE TAKEN PRIOR TO GRADING.

E. PROTECT AND MAINTAIN STORM SEWER INLETS WITH SILT TRAPS.

F. INSPECT ALL EROSION AND SEDIMENT CONTROL DEVICES AT THE CLOSE OF EACH WORK DAY AND AFTER EACH RAINSTORM. MAKE NECESSARY REPAIRS OR CLEAN UP IMMEDIATELY TO MAINTAIN THE EFFECTIVENESS OF THE DEVICE.

G. WHERE CONSISTENT WITH JOB SAFETY REQUIREMENTS, EASEMENT CONDITIONS, AND CONSTRUCTION METHODS, PLACE ALL EXCAVATED MATERIAL ON THE UPHILL SIDE OF THE TRENCH. WHEN THE SOIL IS PLACED ON THE DOWNHILL SIDE OF THE TRENCH, DIVERT MAXIMUM DRAINAGE TOWARD THE TRENCH.

3.16 RIPRAP SHALL BE INSTALLED IN ACCORDANCE WITH SECTION 418.07 "DRY AND DUMPED RIPRAP PLACEMENT" OF THE VDOT ROAD AND BRIDGE SPECIFICATIONS.

3.17 PROTECT GRADED AREAS FROM THE ACTION OF THE ELEMENTS. SETTLEMENT OR OTHER DAMAGE THAT OCCURS PRIOR TO ACCEPTANCE OF THE WORK SHALL BE REPAIRED AND GRADES SATISFACTORILY REESTABLISHED.

3.18 REPAIR AFTER CLEANUP: UPON COMPLETION OF CONSTRUCTION WORK AND AFTER SPOILS AND DEBRIS HAVE BEEN REMOVED; REGRADE ANY AREAS DISTURBED BY THE OPERATIONS.

END OF SECTION

SECTION 02500 - PAVING AND SURFACING

1. GENERAL

1.01 REFERENCE SPECIFICATIONS WHERE APPLICABLE TO WORK UNDER THIS SECTION ARE REFERRED TO BY ABBREVIATION AS FOLLOWS:

A. AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS.....AASHTO

B. AMERICAN SOCIETY FOR TESTING AND MATERIALS.....ASTM

C. VIRGINIA DEPARTMENT OF TRANSPORTATION.....VDOT

1.02 ESTABLISH AND MAINTAIN REQUIRED LINES AND ELEVATIONS.

1.03 APPLY PRIME, TACK AND SEAL COATS ONLY WHEN AMBIENT TEMPERATURE IS ABOVE 50 DEGREES F AND WHEN TEMPERATURE HAS NOT BEEN BELOW 35 DEGREES F FOR 12 HOURS IMMEDIATELY PRIOR TO APPLICATION. CONSTRUCT ASPHALT CONCRETE SURFACE COURSE ONLY WHEN ATMOSPHERIC TEMPERATURE IS ABOVE 40 DEGREES F AND BASE IS DRY. BASE COURSE MAY BE LAID WHEN TEMPERATURE IS ABOVE 30 DEGREES F AND RISING.

1.04 CONSTRUCTION AND TESTING SHALL CONFORM TO THESE SPECIFICATIONS AND STANDARD DETAILS. ANY ADDITIONAL CONSTRUCTION AND TESTING 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 THE STANDARD DETAILS SHOWN IN THE VDOT ROAD AND BRIDGE STANDARDS, LATEST REVISION.

1.05 THE CONTRACTOR SHALL HAVE A CERTIFIED ASPHALT CONCRETE PAVING TECHNICIAN PRESENT DURING PAVING OPERATIONS TO ENSURE PROPER PLACEMENT, ALIGNMENT, GRADING AND QUALITY OF PAVING OPERATION. THE FINISHED PAVEMENT SHALL BE UNIFORM AND SMOOTH. A 10-FOOT STRAIGHTEDGE WILL BE USED TO TEST THE SURFACE ALIGNMENT. THE SURFACE SHALL NOT VARY MORE THAN 1/4 INCH FROM THIS STRAIGHT EDGE, BASED ON TWO BEARING POINTS ON EITHER END OF THE STRAIGHTEDGE. HUMPS AND DEPRESSIONS EXCEEDING THE SPECIFIED TOLERANCE SHALL BE CORRECTED, OR THE DEFECTIVE WORK SHALL BE REMOVED AND REPLACED WITH NEW MATERIAL AT CONTRACTOR EXPENSE.

2. PRODUCTS

2.01 AGGREGATE BASE COURSE SHALL BE TYPE I, SIZE 21 OR 21A, GRADED AGGREGATE BASE MATERIAL AS DEFINED IN VDOT, ROAD AND BRIDGE SPECIFICATIONS, SECTION 208, "SUBBASE AND AGGREGATE BASE MATERIAL."

2.02 MATERIALS FOR USE WITH ASPHALT CONCRETE AS SPECIFIED AS FOLLOWS:

A. PRIME COAT SHALL BE CUT-BACK ASPHALT RC-70 OR RC-250, MEETING REQUIREMENTS OF ASTM D 2028 AND AASHTO M81.

B. TACK COAT SHALL BE EMULSIFIED ASPHALT CRS-1, MEETING REQUIREMENTS OF VDOT ROAD AND BRIDGE SPECIFICATIONS, SECTION 210.

C. SEAL COAT LIQUID ASPHALT SHALL MEET REQUIREMENTS OF VDOT SECTION 210, (CRS-2) – VARIABLE BY ONE PERFORMANCE GRADE.

D. ASPHALT CONCRETE BASE COURSE SHALL BE VDOT BM-25.0 (PG 64-22) MEETING REQUIREMENTS OF VDOT ROAD AND BRIDGE SPECIFICATIONS, SECTION 211 (E).

E. ASPHALT CONCRETE SURFACE COURSE SHALL BE VDOT SM-12.5D (PG 64-22) MEETING REQUIREMENTS OF VDOT ROAD AND BRIDGE SPECIFICATIONS, SECTION 211(E).

2.03 CONCRETE PAVING MATERIALS SHALL MEET REQUIREMENTS OF VDOT SPECIFICATION FOR HYDRAULIC CEMENT CONCRETE PAVEMENT - SECTION 217 EXCEPT AS INDICATED ON THE DRAWINGS OR AS MODIFIED BY THE FOLLOWING:

A. CONCRETE: 28-DAY STRENGTH 3,000 PSI.

B. PLAIN AND DEFORMED BARS FOR DOWELS AND REINFORCING STEEL: ASTM A 615, GRADE 60.

C. JOINT SEALER SHALL BE SILICONE SEALER IN ACCORDANCE WITH VDOT SECTION 212.02.

D. JOINT FILLER SHALL BE EXPANDED RUBBER MEETING REQUIREMENTS OF VDOT SECTION 212.02.

2.04 CONCRETE FOR SIDEWALKS AND CURB AND GUTTER SHALL BE CLASS A3 AS SPECIFIED IN SECTION 217 OF VDOT ROAD AND BRIDGE SPECIFICATIONS.

2.05 WELDED WIRE FABRIC SHALL MEET THE REQUIREMENTS OF SECTION 223 OF THE VDOT ROAD AND BRIDGE SPECIFICATIONS.

3. EXECUTION

3.01 NEW PAVEMENT SECTION

A. SUBGRADE PREPARATION: SUBGRADE PREPARATION SHALL CONSIST OF THE FINAL MACHINING OF THE SUBGRADE IMMEDIATELY PRIOR TO PLACING THE AGGREGATE BASE COURSE. THE SURFACE SHALL BE TRUE TO LINE AND GRADE. CONSTRUCTION METHODS AND EQUIPMENT SHALL CONFORM TO APPLICABLE PORTIONS OF SECTION 305, “SUBGRADE AND SHOULDERS," OF VDOT ROAD AND BRIDGE SPECIFICATIONS.

B. AGGREGATE BASE COURSE CONSTRUCTION METHODS AND EQUIPMENT SHALL CONFORM TO REQUIREMENTS OF SECTION 309, "AGGREGATE BASE COURSE," OF VDOT ROAD AND BRIDGE SPECIFICATIONS.

C. ASPHALT CONCRETE PAVEMENT CONSTRUCTION METHODS SHALL CONFORM TO SECTION 315(E), "ASPHALT CONCRETE PAVEMENT," OF VDOT ROAD AND BRIDGE SPECIFICATIONS.

(1) APPLY PRIME COAT AT RATE OF 0.20 TO 0.50 GALLON PER SQUARE YARD OVER 4 INCHES OF COMPACTED AGGREGATE BASE IN ACCORDANCE WITH VDOT ROAD AND BRIDGE SPECIFICATIONS, SECTION 311(E), "PRIME COAT."

(2) APPLY TACK COAT TO SAWCUT EDGES OF ADJOINING ASPHALT OR ADJOINING HYDRAULIC CEMENT CONCRETE SURFACES ABUTTING OR PROJECTING INTO NEW PAVEMENT SECTION. APPLY AT RATE OF 0.05 TO 0.15 GALLON PER SQUARE YARD OF SURFACE IN ACCORDANCE WITH VDOT ROAD AND BRIDGE SPECIFICATIONS, SECTION 310(E), "TACK COAT."

(3) PLACE A BASE COURSE OF 6 INCHES OF VDOT BM-25 AND THEN OVERLAY WITH 2 INCHES OF SM-12.5D WEARING COURSE. APPLY INTERMEDIATE TACK COATS AS REQUIRED DUE TO CONSTRUCTION SEQUENCING.

3.02 RESURFACING

A. 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 ENGINEER. THIS CLEANING SHALL INCLUDE SWEEPING OF THE STREETS WITH A REGENERATIVE POWER-OPERATED BROOM, CUTTING EXCESS DEBRIS WITH A GRADER, WASHING WITH A WATER TRUCK, AND HAND CLEANING ANY DEBRIS LEFT OVER 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 THAT HAVE BEEN COVERED BY SOIL, GRASS, OR DEBRIS. ALL HORIZONTAL AND VERTICAL SURFACES TO BE IN CONTACT WITH NEW PAVEMENT 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 ENGINEER. DRY POWER BROOMING WILL NOT BE PERMITTED.

B. ADJUSTMENT OF MANHOLES, GRATES, VALVE BOXES, ETC.: PRIOR TO RESURFACING OF THE STREETS, ALL NEW AND EXISTING MANHOLES, GRATES, AND VALVE BOXES SHALL BE RAISED TO MATCH THE NEW GRADE OF THE STREET WITHIN A TOLERANCE OF ±0.01 FEET OF FINISHED GRADE.

C. THE USE OF RECYCLED ASPHALT OR AGGREGATE IN ANY ASPHALT CONCRETE SURFACE SHALL BE IN ACCORDANCE WITH SECTION 211, “ASPHALT CONCRETE MATERIALS’, OF THE VDOT ROAD AND BRIDGE SPECIFICATIONS, LATEST REVISION.

3.03 CONCRETE WALKS: CONSTRUCT AS SHOWN ON DRAWINGS IN ACCORDANCE WITH CITY OF LYNCHBURG SPECIFICATIONS AND STANDARD DETAILS.

3.04 CONCRETE CURBS AND COMBINATION CURB AND GUTTER: CONSTRUCT TO MATCH EXISTING IN ACCORDANCE WITH CITY OF LYNCHBURG SPECIFICATIONS AND STANDARD DETAILS. PROVIDE APPROPRIATELY COMPACTED STONE BEDDING AND BACKFILL PRIOR TO PLACING CONCRETE. UPON REMOVAL OF FORMS, BACKFILL BEHIND CURB WITH SUITABLE FILL TO MATCH EXISTING, ADJACENT TO PAVEMENT ITEMS USE STONE OR ASPHALT AS DIRECTED BY THE ENGINEER.

3.05 THE CONTRACTOR SHALL PROTECT THE PORTLAND CEMENT CONCRETE AND ITS APPURTENANCES AGAINST RAIN, PUBLIC TRAFFIC, AND TRAFFIC CAUSED BY HIS OWN EMPLOYEES AND AGENTS UNTIL IT HAS OBTAINED ITS FINAL SET. THIS SHALL INCLUDE FURNISHING WATCHMEN AND FLAGMEN TO DIRECT TRAFFIC, THE ERECTION AND MAINTENANCE OF WARNING SIGNS, LIGHTS, PAVEMENT BRIDGES OR CROSSOVERS, AND PROPER COVER MATERIAL TO PROTECT AGAINST THE EFFECTS OF RAIN.

3.06 PAVEMENT REPAIRS

A. WHEN PAVEMENT, CURB AND GUTTER, OR SIDEWALKS MUST BE CUT, MAKE THE CUT IN A STRAIGHT LINE, PARALLEL TO, AND 6 INCHES WIDER THAN TRENCH, ON EACH SIDE, TO PROVIDE AN UNDISTURBED SHOULDER UNDER THE NEW WORK.

B. AVOID PLACEMENT OF EXCAVATED MATERIAL ON EXISTING PAVEMENT WHEREVER POSSIBLE. CLEAN THE PAVEMENT BY AN APPROVED METHOD. USE NO CLEATED EQUIPMENT ON PAVEMENTS.

3.07 RESTORE CONCRETE WALKS AND CURB AND GUTTER TO MATCH EXISTING.

3.08 UPON COMPLETION OF CONSTRUCTION WORK AND AFTER SPOILS AND DEBRIS HAVE BEEN REMOVED, REGRADE ANY AREAS DISTURBED BY PAVING OPERATIONS.

END OF SECTION

SECTION 02660 - WATER SYSTEM PIPING

1. GENERAL

1.01 SYSTEM DESCRIPTION: THIS SECTION SPECIFIES ALL WATER SYSTEM WORK ON THIS PROJECT.

1.02 REFERENCE SPECIFICATIONS ARE REFERRED TO BY ABBREVIATION AS FOLLOWS:

A. AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS..... AASHTO

B. AMERICAN NATIONAL STANDARDS INSTITUTE..... ANSI

C. AMERICAN RAILWAY ENGINEERING ASSOCIATION..... A.R.E.A.

D. AMERICAN SOCIETY FOR TESTING AND MATERIALS..... ASTM

E. AMERICAN WATER WORKS ASSOCIATION..... AWWA

F. COMMERCIAL STANDARD (NATIONAL BUREAU OF STANDARDS)..... CS

1.03 SUBMITTALS: PROVIDE THE FOLLOWING IN A TIMELY MANNER IN ACCORDANCE WITH THE APPROVED SUBMITTALS SCHEDULE AS SPECIFIED IN DIVISION 1 - GENERAL REQUIREMENTS.

A. SUBMITTAL: NONRISING STEM GATE VALVE DETAILS

1.04 PROJECT CONDITIONS: SEPARATION OF WATER LINES AND SANITARY AND/OR COMBINED SEWERS.

A. FOLLOW STATE HEALTH DEPARTMENT STANDARDS FOR SEPARATION OF WATER MAINS AND SEWER LINES.

B. PARALLEL INSTALLATION

(1) NORMAL CONDITIONS - WATER LINES SHALL BE CONSTRUCTED AT LEAST 10 FEET HORIZONTALLY FROM A SEWER OR SEWER MANHOLE WHENEVER POSSIBLE, THE DISTANCE SHALL BE MEASURED EDGE-TO-EDGE.

(2) UNUSUAL CONDITIONS - WHEN LOCAL CONDITIONS PREVENT A HORIZONTAL SEPARATION OF AT LEAST 10 FEET, THE WATER LINE MAY BE LAID CLOSER TO A SEWER OR SEWER MANHOLE PROVIDED THAT:

a. THE BOTTOM OF THE WATER LINE IS AT LEAST 18 INCHES ABOVE THE TOP OF THE SEWER.

b. WHERE THIS VERTICAL SEPARATION CANNOT BE OBTAINED, THE SEWER SHALL BE CONSTRUCTED OF AWWA APPROVED WATER PIPE PRESSURE-TESTED IN PLACE TO 50 PSI WITHOUT LEAKAGE PRIOR TO BACKFILLING. THE SEWER MANHOLE SHALL BE OF WATERTIGHT CONSTRUCTION AND TESTED IN PLACE.

C. CROSSING

(1) NORMAL CONDITIONS - WATER LINES CROSSING OVER SEWERS SHALL BE LAID TO PROVIDE A SEPARATION OF AT LEAST 18 INCHES BETWEEN THE BOTTOM OF THE WATER LINE AND THE TOP OF THE SEWER WHENEVER POSSIBLE.

(2) UNUSUAL CONDITIONS - WHEN LOCAL CONDITIONS PREVENT A VERTICAL SEPARATION DESCRIBED IN CROSSING, NORMAL CONDITIONS, PARAGRAPH ABOVE, THE FOLLOWING CONSTRUCTION SHALL BE USED.

a. SEWERS PASSING OVER OR UNDER WATER LINES SHALL BE CONSTRUCTED OF THE MATERIALS DESCRIBED IN PARALLEL INSTALLATION, UNUSUAL CONDITIONS - PARAGRAPH (2) ABOVE.

b. WATER LINES PASSING UNDER SEWERS SHALL, IN ADDITION, BE PROTECTED BY PROVIDING:

(1) A VERTICAL SEPARATION OF AT LEAST 18 INCHES BETWEEN THE BOTTOM OF THE SEWER AND THE TOP OF THE WATER LINE,

(2) ADEQUATE STRUCTURAL SUPPORT FOR THE SEWERS TO PREVENT EXCESSIVE DEFLECTION OF THE JOINTS AND SETTLING ON AND BREAKING WATER LINE,

(3) THAT THE LENGTH OF THE WATER LINE BE CENTERED AT THE POINT OF THE CROSSING SO THAT JOINTS SHALL BE EQUIDISTANT AND AS FAR AS POSSIBLE FROM THE SEWER.

D. SANITARY AND/OR COMBINED SEWERS OR SEWER MANHOLES - NO WATER PIPES SHALL PASS THROUGH OR COME IN CONTACT WITH ANY PART OF A SEWER OR SEWER MANHOLE.

2. PRODUCTS

2.01 DUCTILE IRON PIPE SHALL MEET REQUIREMENTS OF ANSI/AWWA C151 FOR A PRESSURE CLASS OF 350 PSI FOR PIPE 12 INCHES AND SMALLER AND 250 PSI FOR PIPE 14 INCHES AND LARGER. THICKNESS CLASSES SHALL MEET REQUIREMENTS OF ANSI/AWWA C150.

A. FITTINGS FOR DUCTILE IRON PIPE

(1) FITTINGS FOR DUCTILE IRON PIPE SHALL MEET THE REQUIREMENTS OF ASSI/AWWA C110 OR C153 AND SHALL HAVE A PRESSURE RATING OF 250 PSI. PROVIDE TAPPING BOSSES ON ALL FITTINGS REQUIRING TAPS.

B. MECHANICAL JOINTS AND JOINTING MATERIALS SHALL MEET REQUIREMENTS OF ANSI/AWWA C111.

(1) MECHANICAL JOINT RESTRAINT SHALL BE "MEGALUG" MANUFACTURED BY EBAA IRON INC.

(2) LOCKED TYPE MECHANICAL JOINTS MAY BE USED WHERE RESTRAINED JOINTS ARE REQUIRED.

C. PUSH-ON JOINT AND RUBBER GASKET SHALL MEET REQUIREMENTS OF ANSI/AWWA C111.

(1) RESTRAINED PUSH-ON JOINTS MAY BE USED WHERE RESTRAINED JOINTS ARE REQUIRED.

D. FLANGED JOINTS FOR GRAY IRON FITTINGS AND DUCTILE IRON PIPE AND FITTINGS SHALL MEET REQUIREMENTS OF ANSI B16.1.

E. FLANGED JOINT GASKETS SHALL BE FULL-FACE, MADE OF RUBBER, AND SHALL MEET REQUIREMENTS OF ANSI B16.21.

F. RESTRAINT DEVICES: ANY CHANGE IN DIRECTION WILL REQUIRE AN APPROPRIATE RESTRAINT DEVICE OR METHOD.

(1) MECHANICAL JOINT RESTRAINTS SHALL BE UNIFLANGE SERIES 3000 OR MEG-A-LUG TYPE JOINT RESTRAINTS.

(2) PUSH-ON JOINT RESTRAINTS SHALL BE GRIPPER GASKET TYPE JOINT RESTRAINTS.

(3) RESTRAINED JOINT DUCTILE IRON PIPE WILL VARY FROM MANUFACTURER TO MANUFACTURER. MANUFACTURER'S RESTRAINED JOINT PIPE SHALL BE AS DESIGNED BY PIPE MANUFACTURER.

(4) THREADED ROD APPLICATIONS: ALL THREADED RODS, NUTS, AND WASHERS SHALL BE GALVANIZED STEEL. TO FACILITATE THE RESTAINING OF PIPE AND MECHANICAL JOINT FITTINGS, DUCTILE LUGS (ASTM A536) SHALL BE USED FOR ALL THREADED ROD APPLICATIONS. EYE BOLTS SHALL NOT BE ALLOWED.

G. CEMENT MORTAR LINING WITH BITUMINOUS SEAL COAT FOR GRAY IRON FITTINGS AND DUCTILE IRON PIPE AND FITTINGS SHALL MEET REQUIREMENTS OF ANSI/AWWA C104. CEMENT MORTAR LINING SHALL BE STANDARD THICKNESS.

H. EXTERIOR, BITUMINOUS COATING FOR GRAY IRON FITTINGS AND DUCTILE IRON PIPE AND FITTINGS SHALL MEET REQUIREMENTS OF ANSI/AWWA C151 AS APPLICABLE. PIPE AND FITTINGS TO BE PAINTED SHALL HAVE A STANDARD FACTORY PRIME.

2.02 GALVANIZED STEEL PIPE FOR SMALL PIPING SHALL MEET THE FOLLOWING REQUIREMENTS: DIMENSIONS, ANSI B36.10; MATERIAL, ASTM A 53; AND GALVANIZING, ASTM A 153. PIPE SHALL BE SCHEDULE 40 UNLESS OTHERWISE NOTED.

A. SCREWED FITTINGS FOR GALVANIZED STEEL PIPE SHALL BE 150-POUND STANDARD, MALLEABLE IRON MEETING THE FOLLOWING REQUIREMENTS: DIMENSIONS, ANSI B16.3; THREADS, ANSI B2.1; MATERIAL, ASTM A 47; AND GALVANIZING, ASTM A 153.

2.03 COPPER PIPING SHALL MEET REQUIREMENTS OF ASTM B 88 FOR TYPE "L" COPPER, HARD DRAWN, FOR ABOVE GROUND AND TYPE "K" HARD DRAWN FOR BELOW GROUND.

A. FITTINGS FOR COPPER PIPING SHALL MEET REQUIREMENTS OF ANSI B16.22 FOR WROUGHT COPPER, SWEAT JOINT.

2.04 METAL TIE ROD RESTRAINTS SHALL BE GALVANIZED RODS AND CLIPS AS DETAILED ON DRAWINGS.

2.05 NIPPLES SHALL MEET REQUIREMENTS OF CS 5. NIPPLES SHALL BE OF SAME MATERIAL AND WEIGHT OF PIPE WITH WHICH USED, EXCEPT THAT NIPPLES HAVING AN UNTHREADED SECTION OF 1 INCH OR LESS SHALL BE EXTRA HEAVY. THE USE OF RUNNING THREAD NIPPLES SHALL NOT BE APPROVED.

2.06 DETECTABLE TAPE SHALL HAVE A METALLIC CORE PROTECTED BY A PLASTIC JACKET. THE TAPE SHALL BE CONTINUOUSLY MARKED INDICATING THAT A WATER MAIN IS BURIED BENEATH THE TAPE.

2.07 SLEEVES THROUGH CONCRETE OR MASONRY WALLS OR SLABS SHALL BE EITHER CAST IRON OR GALVANIZED, SCHEDULE 40 STEEL WITH WATERSTOP RINGS APPROPRIATE FOR APPLICATION.

2.08 PIPE TO SLEEVE SEALANT GROUTING COMPOUND SHALL BE AS MANUFACTURED BY 3M COMPANY OR BE AN EQUIVALENT PRODUCT HAVING STRENGTH PROPERTIES OF 80 PSI TENSILE AND 700 PERCENT ELONGATION IN ACCORDANCE WITH ASTM D 3574 TEST E, AND LINEAR DIMENSION CHANGE SHALL NOT EXCEED 18 PERCENT WHEN SUBJECT TO WET AND DRY CYCLES IN ACCORDANCE WITH ASTM D 756, PROCEDURE G AND D 1042.

2.09 MECHANICAL TYPE PIPE TO WALL SLEEVE SEALS: SEALS SHALL BE "LINK-SEAL" PIPE TO WALL CLOSURES MANUFACTURED BY THUNDERLINE CORPORATION, WAYNE, MICHIGAN. SEALS SHALL BE MODULAR MECHANICAL TYPE, CONSISTING OF INTERLOCKING SYNTHETIC RUBBER LINKS SHAPED TO FILL ANNULAR SPACE BETWEEN PIPE AND WALL OPENING AND SHALL PROVIDE WATERTIGHT SEAL BETWEEN PIPE AND WALL OPENING.

2.10 GATE VALVES

A. NONRISING STEM GATE VALVES 3 INCHES AND LARGER SHALL MEET REQUIREMENTS OF AWWA C500 "AWWA STANDARD FOR GATE VALVES FOR WATER AND SEWERAGE SYSTEMS, OR VALVES 3 INCHES THROUGH 12 INCHES SHALL MEET REQUIREMENTS OF AWWA C509 "AWWA STANDARD FOR RESILIENT SEATED GATE VALVES FOR WATER AND SEWERAGE SERVICE." WORKING PRESSURE SHALL BE AT LEAST 200 PSI FOR VALVE SIZES 3 THROUGH 12 INCHES AND AT LEAST 150 PSI FOR SIZES LARGER THAN 12 INCHES OR AT THE PRESSURE RATING SPECIFIED FOR ADJACENT PIPING, WHICHEVER IS GREATER. VALVE ENDS SHALL BE COMPATIBLE WITH PIPING SYSTEMS IN WHICH VALVES ARE INSTALLED. VALVE SHALL BE CAST IRON BODY, BRONZE MOUNTED. VALVES SHALL HAVE O-RING SEALS AND SHALL OPEN COUNTERCLOCKWISE. ASBESTOS PACKING WILL NOT BE ACCEPTABLE.

B. VALVES LISTED ABOVE SHALL BE MANUFACTURED BY EDDY-IOWA DIVISION OF CLOW CORP.; KENNEDY VALVE MANUFACTURING COMPANY, INC.; M & H VALVE AND FITTINGS DIVISION OF DRESSER INDUSTRIES; OR MUELLER COMPANY.

C. TAPPING VALVES SHALL MEET REQUIREMENTS OF GATE VALVES SPECIFIED ABOVE EXCEPT THAT SEAT OPENING SHALL BE LARGER THAN NOMINAL SIZE AND VALVE OUTLET END SHALL HAVE MECHANICAL JOINT.

D. GATE VALVES SMALLER THAN 3 INCHES SHALL BE BRONZE, SOLID WEDGE, RISING STEM, AT LEAST 200 PSI WORKING PRESSURE, JENKINS 47-U THREADED ENDS, OR JENKINS 1242 SOLDER ENDS.

2.11 VALVE BOXES SHALL BE ADJUSTABLE CAST IRON VALVE BOXES OF THE THREE PIECE TYPE, CONSISTING OF LID, TWO PIECE SLIDING EXTENSION, AND BASE. BASE SHALL BE PROPER TYPE AND SIZE FOR THE VALVE WITH WHICH IT IS USED. THE WORD "WATER" SHALL BE CAST OR EMBOSSED ON THE VALVE BOX LID IN LETTERS NOT LESS THAN 1 INCH HIGH. VALVE BOX SHALL BE MANUFACTURED BY MUELLER COMPANY, RICHARD FOUNDRY, TYLER, OR BINGHAM-TAYLOR.

2.12 TAPPING SLEEVES SHALL MEET REQUIREMENTS OF ANSI/AWWA C110 FOR PRESSURE RATINGS SHOWN ON THE DRAWINGS. SLEEVES SHALL BE BUILT IN TWO SECTIONS AND SHALL BE MECHANICAL JOINT TYPE WITH FLANGED OUTLET. THE TAPPING SLEEVE SHALL BE FOR THE SIZE AND TYPE OF PIPE SHOWN ON THE DRAWINGS.

2.13 FLEXIBLE COUPLING SHALL BE OF A GASKETED, SLEEVE TYPE. EACH COUPLING SHALL CONSIST OF A STEEL MIDDLE RING, TWO STEEL FOLLOWERS, TWO RUBBER COMPOUNDED WEDGE SECTION GASKETS, AND SUFFICIENT GALVANIZED TRACK, HEAD STEEL BOLTS TO PROPERLY COMPRESS THE GASKETS. COUPLINGS SHALL BE OF THE TYPE TO MATCH PIPNG IN WHICH INSTALLED. COUPLINGS SHALL BE MANUFACTURED BY DRESSER MANUFACTURING DIVISION OF DRESSER INDUSTRIES, SMITH-BLAIR PRODUCTS OF ROCKWELL INTERNATIONAL, OR APPROVED EQUAL.

2.14 PRESSURE GAGES SHALL BE OPEN FRONT CASE TYPE WITH BRONZE BOURDON TUBE SOLDERED TO SOCKET AND TIP, STAINLESS STEEL MOVEMENT, AND A 4-1/2 INCH

WHITE COATED DIAL GRADUATED AS SHOWN ON THE DRAWINGS. GAGES SHALL BE BY MCDANIEL.

3. EXECUTION

3.01 PIPE LAYING

A. TAKE ALL PRECAUTIONS NECESSARY TO INSURE THAT PIPE, VALVES, FITTINGS, AND OTHER ACCESSORIES ARE NOT DAMAGED IN UNLOADING, HANDLING, AND INSTALLATION. EXAMINE EACH PIECE OF MATERIAL JUST PRIOR TO INSTALLATION TO DETERMINE THAT NO DAMAGE HAS OCCURRED. REMOVE ANY DAMAGED MATERIAL FROM THE SITE AND REPLACE WITH UNDAMAGED MATERIAL.

B. EXERCISE CARE TO KEEP FOREIGN MATERIAL AND DIRT FROM ENTERING PIPE DURING STORAGE, HANDLING, AND INSTALLATION. CLOSE ENDS OF IN-PLACE PIPE AT THE END OF ANY WORK PERIOD TO PRECLUDE THE ENTRY OF ANIMALS AND FOREIGN MATERIAL.

C. BEDDING OF PIPE SHALL BE AS SPECIFIED IN SECTION 02200 - EARTHWORK.

D. DO NOT LAY PIPE WHEN TRENCH BOTTOM IS MUDDY OR FROZEN, OR HAS STANDING WATER.

E. USE ONLY THOSE TOOLS SPECIFICALLY INTENDED FOR CUTTING THE SIZE AND MATERIAL AND TYPE PIPE INVOLVED. MAKE CUT TO PREVENT DAMAGE TO PIPE OR LINING AND TO LEAVE A SMOOTH END AT RIGHT ANGLES TO THE AXIS OF THE PIPE.

F. LAY PIPE WITH BELL ENDS FACING UPHILL.

G. WHERE NONFERROUS METALLIC PIPE (FOR EXAMPLE, COPPER TUBING) CROSSES ANY FERROUS PIPING MATERIAL, MAINTAIN A MINIMUM VERTICAL SEPARATION OF 1 FOOT.

3.02 JOINING OF MECHANICAL JOINT PIPE

A. THOROUGHLY CLEAN INSIDE OF THE BELL AND 8 INCHES OF THE OUTSIDE OF THE SPIGOT END OF THE JOINING PIPE TO REMOVE OIL, GRIT, EXCESS COATING, AND OTHER FOREIGN MATTER. PAINT THE BELL AND THE SPIGOT WITH SOAP SOLUTION (HALF CUP GRANULATED SOAP DISSOLVED IN 1 GALLON WATER). SLIP CAST-IRON GLAND ON SPIGOT END WITH LIP EXTENSION OF GLAND TOWARD END OF PIPE. PAINT RUBBER GASKET WITH OR DIP INTO THE SOAP SOLUTION AND PLACE ON THE SPIGOT END WITH THICK EDGE TOWARD THE GLAND.

B. PUSH THE SPIGOT END FORWARD TO SEAT IN THE BELL. THEN PRESS THE GASKET INTO THE BELL SO THAT IT IS LOCATED EVENLY AROUND THE JOINT. MOVE THE GLAND INTO POSITION, INSERT BOLTS, AND SCREW NUTS UP FINGER TIGHT. THEN TIGHTEN ALL NUTS TO TORQUE LISTED BELOW:

BOLT SIZE - INCHES	TORQUE FEET - POUNDS
5/8	40 - 60
3/4	60 - 90
1	70 - 100
1-1/4	90 - 120

TIGHTEN NUTS ON ALTERNATE SIDE OF THE GLAND UNTIL PRESSURE ON THE GLAND IS EQUALLY DISTRIBUTED.

C. JOIN LOCK-TYPE MECHANICAL JOINT PIPE ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.

D. PERMISSIBLE DEFLECTION IN MECHANICAL JOINT PIPE SHALL NOT BE GREATER THAN LISTED IN AWWA C600.

E. PERMISSIBLE DEFLECTION IN LOCK-TYPE MECHANICAL JOINT PIPE SHALL BE AS RECOMMENDED BY MANUFACTURER.

3.03 JOINING OF PUSH-ON JOINT PIPE

A. THOROUGHLY CLEAN INSIDE OF THE BELL AND 8 INCHES OF THE OUTSIDE OF SPIGOT END OF THE JOINING PIPE TO REMOVE OIL, GRIT, EXCESS COATING, AND OTHER FOREIGN MATTER. FLEX RUBBER GASKET AND INSERT IN THE GASKET RECESS OF THE BELL SOCKET. APPLY A THIN FILM OF GASKET LUBRICANT SUPPLIED BY PIPE MANUFACTURER TO EITHER THE GASKET OR THE SPIGOT END OF THE JOINING PIPE. START THE SPIGOT END OF THE PIPE INTO THE SOCKET WITH CARE. THEN COMPLETE THE JOINT BY FORCING THE PLAIN END TO THE BOTTOM OF THE SOCKET WITH A FORKED TOOL OR JACK-TYPE DEVICE. FILE THE END OF FIELD CUT PIPE TO MATCH THE MANUFACTURED SPIGOT END.

B. JOIN RESTRAINED PUSH-ON JOINTS ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.

C. PERMISSIBLE DEFLECTION IN PUSH-ON JOINT PIPE SHALL NOT BE GREATER THAN LISTED IN AWWA C600.

D. PERMISSIBLE DEFLECTION IN RESTRAINED PUSH-ON JOINT PIPE SHALL BE AS RECOMMENDED BY MANUFACTURER.

3.04 JOIN COPPER PIPE USING 95-5 SOLDER AND SUITABLE FLUX. DO NOT USE ACID CORE SOLDER.

3.05 USE SLEEVES WHERE PIPES, VALVES, STEM EXTENSIONS, OR EQUIPMENT PARTS PASS THROUGH CONCRETE OR MASONRY WALLS OR SLABS. SLEEVES SHALL BE OF SUFFICIENT SIZE TO ALLOW SEALING AROUND PIPES AND CLEARANCE FOR VALVE STEMS OR EQUIPMENT. EXTEND VERTICAL SLEEVES THROUGH SLABS 1 INCH ABOVE TOP SURFACE. USE CAST IRON OR STEEL SLEEVES WITH INTERMEDIATE COLLARS TO ANCHOR AND PROVIDE WATER STOPS ON SLEEVES THAT PASS THROUGH EXTERIOR WALLS BELOW GRADE. SEAL AROUND PIPES USING GROUTING COMPOUND OR MECHANICAL PIPE TO WALL SLEEVES. GROUTING COMPOUND SHALL BE MIXED AND PLACED IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE MANUFACTURER. MECHANICAL PIPE TO WALL SEALS SHALL BE INSTALLED IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE MANUFACTURER. FLANGED PIPE SLEEVES USED AS CARRIER PIPES MAY BE USED AS APPROVED BY THE OWNER PROVIDED SUITABLE EXPANSION JOINTS ARE PROVIDED WITH THE FITTING.

3.06 SETTING OF VALVES AND VALVE BOXES

A. INSTALL VALVES WITH OPERATOR STEMS IN THE VERTICAL PLANE THROUGH THE PIPE AXIS AND PERPENDICULAR TO THE PIPE AXIS. LOCATE VALVES WHERE SHOWN ON DRAWINGS. THOROUGHLY CLEAN BEFORE INSTALLATION. CHECK VALVES FOR SATISFACTORY OPERATION.

B. EQUIP ALL UNDERGROUND VALVE OPERATORS WITH VALVE BOXES. SET BOX IN ALIGNMENT WITH VALVE STEM CENTERED ON VALVE NUT. SET THE VALVE BOX TO PREVENT TRANSMITTING SHOCK OR STRESS TO THE VALVE. SET THE BOX COVER FLUSH WITH THE FINISHED GROUND SURFACE OR PAVEMENT.

3.07 INSTALLATION OF TAPPING SLEEVES AND TAPPING VALVES

A. ALL TAPPING SLEEVES SHALL BE SET TO AVOID INTERFERENCE WITH EXISTING PIPE JOINTS.

B. AFTER ALL TAPPING SLEEVES AND VALVES HAVE BEEN SET IN PLACE, A PRESSURE TEST OF 150 PSI SHALL BE MADE TO INSURE THAT THERE ARE NO LEAKS AROUND THE SLEEVE OR THROUGH THE VALVE PRIOR TO TAPPING. ALL LEAKAGE SHALL BE CORRECTED.

C. THE ACTUAL TAP SHALL BE MADE IN THE PRESENCE OF DEPARTMENT OF PUBLIC UTILITIES INSPECTION PERSONNEL. THE DEPARTMENT OF PUBLIC UTILITIES SHALL BE NOTIFIED 48 HOURS IN ADVANCE OF MAKING THE TAP.

D. PROVIDE KYNAR DIAPHRAGM CHECK VALVES AT EACH TAP POINT FOR SODIUM HYPOCHLORITE FEED TO LIMIT POTENTIAL FOR MOTIVE WATER TO BACKFEED INTO CHEMICAL FEED TUBING. TAP INTO EXISTING CHEMICAL FEED POINTS TO ENABLE UTILIZATION OF EITHER THE EXISTING CHLORINE GAS FEED OR NEW HYPOCHLORITE FEED DEPENDING ON OPERATOR PREFERENCE. TAPS SHALL BE MADE INTO THE EXISTING FEED LINE JUST UPSTREAM OF THE INJECTION POINT – NOT INTO MAIN DISTRIBUTION PIPING.

3.08 ACCEPTANCE TESTS

A. ALL VISIBLE LEAKS SHALL BE REPAIRED REGARDLESS OF THE AMOUNT OF LEAKAGE.

3.09 DISINFECT AND TEST WATER MAINS AND ACCESSORIES IN ACCORDANCE WITH THE PROCEDURES LISTED BELOW AND MEET REQUIREMENTS OF AUTHORITIES HAVING JURISDICTION.

A. PRELIMINARY FLUSHING: THE MAIN SHALL BE FLUSHED PRIOR TO DISINFECTION, EXCEPT WHEN THE TABLET METHOD IS USED. FLUSHING SHALL BE AT A VELOCITY OF NOT LESS THAN 2.5 FEET PER SECOND. ADEQUATE PROVISIONS SHALL BE MADE FOR DRAINAGE OF FLUSHING WATER.

B. FORM OF CHLORINE FOR DISINFECTION

(1) LIQUID CHLORINE SHALL BE USED ONLY WHEN SUITABLE EQUIPMENT IS AVAILABLE AND ONLY UNDER THE DIRECT SUPERVISION OF A PERSON FAMILIAR WITH THE PHYSIOLOGICAL, CHEMICAL, AND PHYSICAL PROPERTIES OF THIS ELEMENT AND WHO IS PROPERLY TRAINED AND EQUIPPED TO HANDLE ANY EMERGENCY THAT MAY ARISE. INTRODUCTION OF CHLORINE-GAS DIRECTLY FROM THE SUPPLY CYLINDER IS UNSAFE AND SHALL NOT BE PERMITTED.

(2) CALCIUM HYPOCHLORITE CONTAINS 70 PERCENT AVAILABLE CHLORINE BY WEIGHT. IT SHALL BE EITHER GRANULAR OR TABULAR IN FORM. THE TABLETS, SIX TO EIGHT TO THE OUNCE, ARE DESIGNED TO DISSOLVE SLOWLY IN WATER. A CHLORINE-WATER SOLUTION SHALL BE PREPARED BY DISSOLVING THE GRANULES OR TABLETS IN WATER IN THE PROPORTION REQUISITE FOR THE DESIRED CONCENTRATION.

(3) SODIUM HYPOCHLORITE IS SUPPLIED IN STRENGTHS FROM 5.25 TO 16 PERCENT AVAILABLE CHLORINE. THE CHLORINE-WATER SOLUTION SHALL BE PREPARED BY ADDING HYPOCHLORITE TO WATER. PRODUCT DETERIORATION SHALL BE RECKONED WITH IN COMPUTING THE QUANTITY OF SODIUM HYPOCHLORITE REQUIRED FOR THE DESIRED CONCENTRATION.

(4) APPLICATION: THE HYPOCHLORITE SOLUTIONS SHALL BE APPLIED TO THE WATER MAIN WITH A GASOLINE OR ELECTRICALLY-POWERED CHEMICAL FEED

PUMP DESIGNED FOR FEEDING CHLORINE SOLUTIONS. FOR SMALL APPLICATIONS, THE SOLUTIONS MAY BE FED WITH A HAND PUMP; FOR EXAMPLE, A HYDRAULIC TEST PUMP. FEED LINES SHALL BE OF SUCH MATERIAL AND STRENGTH AS TO WITHSTAND SAFELY THE MAXIMUM PRESSURES THAT MAY BE CREATED BY THE PUMPS. ALL CONNECTIONS SHALL BE CHECKED FOR TIGHTNESS BEFORE THE HYPOCHLORITE SOLUTION IS APPLIED TO THE MAIN.

C. METHODS OF CHLORINE APPLICATION

(1) CONTINUOUS FEED METHOD: WATER FROM THE EXISTING DISTRIBUTION SYSTEM OR OTHER APPROVED SOURCES OF SUPPLY SHALL BE MADE TO FLOW AT A CONSTANT, MEASURED RATE INTO THE NEWLY-LAID PIPELINE. THE WATER SHALL RECEIVE A DOSE OF CHLORINE, ALSO FED AT A CONSTANT, MEASURED RATE. THE TWO RATES SHALL BE PROPORTIONED SO THAT THE CHLORINE CONCENTRATION IN THE WATER IN THE PIPE IS MAINTAINED AT A MINIMUM OF 50 MG/L AVAILABLE CHLORINE. TO ASSURE THAT THIS CONCENTRATION IS MAINTAINED, THE CHLORINE SHALL BE MEASURED AT INTERVALS NOT EXCEEDING 2,000 FEET IN ACCORDANCE WITH THE PROCEDURES DESCRIBED IN THE CURRENT EDITION OF "STANDARD METHODS" AND AWWA M12 - "SIMPLIFIED PROCEDURES FOR WATER EXAMINATION." IN THE ABSENCE OF A METER, THE RATE MAY BE DETERMINED EITHER BY PLACING A PITOT GAGE AT THE DISCHARGE OR BY MEASURING THE TIME TO FILL A CONTAINER OF KNOWN VOLUME. TABLE 1 GIVES THE AMOUNT OF CHLORINE REQUIRED FOR EACH 100 FEET OF PIPE OF VARIOUS DIAMETERS. SOLUTIONS OF 1 PERCENT CHLORINE MAY BE PREPARED WITH SODIUM HYPOCHLORITE OR CALCIUM HYPOCHLORITE. THE LATTER SOLUTION REQUIRES APPROXIMATELY 1 POUND OF CALCIUM HYPOCHLORITE IN 8.5 GALLONS OF WATER.

TABLE 1
CHLORINE REQUIRED TO PRODUCE 50 MG/L CONCENTRATION
IN 100 FEET OF PIPE - BY DIAMETER

PIPE SIZE INCHES	100 PERCENT CHLORINE POUNDS	1 PERCENT CHLORINE SOLUTIONS GALLONS
4	0.027	0.33
6	0.061	0.73
8	0.108	1.30
10	0.170	2.04
12	0.240	2.88
16	0.430	5.12
20	0.675	8.00
24	0.972	11.50
30	1.500	18.01
36	2.187	25.92
42	2.977	35.28

DURING THE APPLICATION OF THE CHLORINE, VALVES SHALL BE MANIPULATED TO PREVENT THE TREATMENT DOSAGE FROM FLOWING BACK INTO THE LINE SUPPLYING THE WATER. CHLORINE APPLICATION SHALL NOT CEASE UNTIL THE ENTIRE MAIN IS FILLED WITH THE CHLORINE SOLUTION. THE CHLORINATED WATER SHALL BE RETAINED IN THE MAIN FOR AT LEAST 24 HOURS, DURING WHICH TIME ALL VALVES AND HYDRANTS IN THE SECTION TREATED SHALL BE OPERATED IN ORDER TO DISINFECT THE APPURTENANCES. AT THE END OF THIS 24-HOUR PERIOD, THE TREATED WATER SHALL CONTAIN NO LESS THAN 25 MG/L CHLORINE THROUGHOUT THE LENGTH OF THE MAIN.

(2) SLUG METHOD (USE ONLY IF AUTHORIZED BY UTILITIES DEPARTMENT): WATER FROM THE EXISTING DISTRIBUTION SYSTEM OR OTHER APPROVED SOURCE OF SUPPLY SHALL BE MADE TO FLOW AT A CONSTANT, MEASURED RATE INTO THE NEWLY LAID PIPELINE. THE WATER SHALL RECEIVE A DOSE OF CHLORINE, ALSO FED AT A CONSTANT, MEASURED RATE. THE TWO RATES SHALL BE PROPORTIONED SO THAT THE CONCENTRATION IN THE WATER ENTERING THE PIPELINE IS MAINTAINED AT NO LESS THAN 300 MG/L. THE CHLORINE SHALL BE APPLIED CONTINUOUSLY AND FOR A SUFFICIENT PERIOD TO DEVELOP A SOLID COLUMN OR "SLUG" OF CHLORINATED WATER THAT WILL, AS IT PASSES ALONG THE LINE, EXPOSE ALL INTERIOR SURFACES TO A CONCENTRATION OF AT LEAST 300 MG/L FOR AT LEAST 3 HOURS. THE APPLICATION SHALL BE CHECKED AT A TAP NEAR THE UPSTREAM END ON THE LINE BY CHLORINE RESIDUAL MEASUREMENTS.

AS THE CHLORINATED WATER FLOWS PAST TEES AND CROSSES, RELATED VALVES AND HYDRANTS SHALL BE OPERATED SO AS TO DISINFECT APPURTENANCES.

(3) TABLET METHOD: USE ONLY WHEN SCRUPULOUS CLEANLINESS HAS BEEN EXERCISED BECAUSE PRELIMINARY FLUSHING CANNOT BE USED. DO NOT USE THIS METHOD IF TRENCH WATER OR FOREIGN MATERIAL HAS ENTERED THE MAIN OR IF THE WATER IS BELOW 41 DEGREES F (5 DEGREES C). THIS METHOD MAY BE USED FOR MAINS UP TO 12 INCHES IN DIAMETER AND WHERE THE TOTAL LENGTH OF THE MAIN IS LESS THAN 2,500 FEET.

PLACE TABLETS IN EACH SECTION OF PIPE AND ALSO IN HYDRANTS, HYDRANT BRANCHES, AND OTHER APPURTENANCES. ENOUGH TABLETS SHALL BE USED TO ENSURE THAT A CHLORINE CONCENTRATION OF 25 MG/L IS PROVIDED IN THE WATER. ATTACH TABLETS USING PERMATEX NO. 1 ADHESIVE OR OTHER ADHESIVE APPROVED BY WILEY & WILSON, EXCEPT FOR THE TABLETS PLACED IN HYDRANTS AND IN THE JOINTS BETWEEN THE PIPE SECTIONS. TABLETS SHALL BE FREE OF ADHESIVE EXCEPT ON THE ONE BROAD SIDE TO BE ATTACHED. PLACE ALL TABLETS AT THE TOP OF THE MAIN. IF THE TABLETS ARE ATTACHED BEFORE THE PIPE SECTION IS PLACED IN THE TRENCH, MARK THE POSITION OF THE TABLET IN THE PIPE AND ASSURE THAT THE PIPE IS PLACED WITH THE TABLET AT THE TOP.

THE FOLLOWING TABLE SHOWS THE NUMBER OF 5 GRAIN HTH TABLETS NECESSARY PER JOINT OF PIPE TO OBTAIN 50 PPM CHLORINE.

PIPE SIZE	TABLETS PER JOINT
3 INCH	1
4 INCH	1
6 INCH	2
8 INCH	3
10 INCH	4
12 INCH	7

WHEN INSTALLATION IS COMPLETED, FILL THE MAIN WITH WATER AT A VELOCITY OF LESS THAN 1 FOOT PER SECOND. THE WATER SHALL REMAIN IN THE PIPE FOR AT LEAST 24 HOURS. OPERATE VALVES SO THAT THE STRONG CHLORINE SOLUTION WILL NOT FLOW BACK INTO THE LINE SUPPLYING THE WATER.

D. FINAL FLUSHING: AFTER THE APPLICABLE RETENTION PERIOD, THE HEAVILY CHLORINATED WATER SHALL BE FLUSHED FROM THE MAIN UNTIL THE CHLORINE CONCENTRATION IN THE WATER LEAVING THE MAIN IS NO HIGHER THAN THAT GENERALLY PREVAILING IN THE SYSTEM, OR LESS THAN 1 MG/L. CHLORINE

RESIDUAL DETERMINATION SHALL BE MADE TO ASCERTAIN THAT THE HEAVILY CHLORINATED WATER HAS BEEN REMOVED FROM THE PIPELINE.

E. BACTERIOLOGIC TESTS

(1) AFTER FINAL FLUSHING AND BEFORE THE WATER MAIN IS PLACED IN SERVICE, SAMPLES SHALL BE COLLECTED AND TESTED FOR BACTERIOLOGIC QUALITY AND SHALL SHOW THE ABSENCE OF COLIFORM ORGANISMS. AT LEAST TWO SAMPLES SHALL BE COLLECTED AT LEAST 24 HOURS APART AT INTERVALS NOT EXCEEDING 2,000 FEET, AND TESTED BY A STATE HEALTH DEPARTMENT APPROVED LABORATORY AND RESULTS SUBMITTED TO WILEY & WILSON.

(2) SAMPLES FOR BACTERIOLOGICAL ANALYSIS SHALL BE COLLECTED IN STERILE BOTTLES TREATED WITH SODIUM THIOSULFATE. IF LABORATORY RESULTS INDICATE THE PRESENCE OF COLIFORM BACTERIA, THE SAMPLES ARE UNSATISFACTORY AND DISINFECTION SHALL BE REPEATED UNTIL THE SAMPLES ARE SATISFACTORY.

(3) A SAMPLING TAP CONSISTING OF A CORPORATION COCK WITH METAL PIPE SHALL BE INSTALLED WITHIN 2 FEET OF VALVES. THE CORPORATION STOP INLET SHALL BE MALE, 1 INCH IN SIZE, AND THE OUTLET SHALL HAVE 1 INCH I.P. THREADS AND A CAP.

F. CLEANING, DISINFECTION, AND TESTING WILL BE THE RESPONSIBILITY OF THE CONTRACTOR. WATER FOR THESE OPERATIONS WILL BE FURNISHED BY THE OWNER.

G. TESTING AND DISINFECTION OF THE COMPLETED SECTIONS SHALL NOT RELIEVE THE CONTRACTOR OF HIS RESPONSIBILITY TO REPAIR OR REPLACE ANY CRACKED OR DEFECTIVE PIPE. ALL WORK NECESSARY TO SECURE A TIGHT LINE SHALL BE DONE AT THE CONTRACTOR'S EXPENSE.

END OF SECTION

SECTION 02720 - STORM SEWER SYSTEMS

1. GENERAL

1.01 SYSTEM DESCRIPTION

A. WORK IN THIS SECTION INCLUDES ALL STORM DRAINAGE WORK 2 FEET OR MORE OUTSIDE OF BUILDING.

1.02 REFERENCE SPECIFICATIONS ARE REFERRED TO BY ABBREVIATION AS FOLLOWS:

A. AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS ..... ASHTO

B. AMERICAN SOCIETY FOR TESTING AND MATERIALS ..... ASTM

C. VIRGINIA DEPARTMENT OF TRANSPORTATION ..... VDOT

D. CAST IRON SOIL PIPE INSTITUTE ..... CISPI

1.03 SUBMITTALS: PROVIDE THE FOLLOWING IN A TIMELY MANNER IN ACCORDANCE WITH THE APPROVED SUBMITTALS SCHEDULE AS SPECIFIED IN DIVISION 1 - GENERAL REQUIREMENTS.

A. SUBMITTAL: TEMPORARY SECONDARY CONTAINMENT LINER MATERIAL

2. PRODUCTS

2.01 REINFORCED CONCRETE PIPE AND FITTINGS SHALL MEET REQUIREMENTS OF ASTM C 76, "REINFORCED CONCRETE CULVERT, STORM DRAIN, AND SEWER PIPE," FOR CLASS OF PIPE AS INDICATED ON THE DRAWINGS.

2.02 CONCRETE PIPE AND FITTINGS SHALL MEET REQUIREMENTS OF ASTM C 14, "CONCRETE SEWER, STORM DRAIN, AND CULVERT PIPE," FOR CLASS OF PIPE AS INDICATED ON DRAWINGS.

2.03 RUBBER GASKETS FOR CONCRETE PIPE JOINTS SHALL MEET REQUIREMENTS OF ASTM C 443, "JOINTS FOR CIRCULAR CONCRETE SEWER AND CULVERT PIPE, USING RUBBER GASKETS."

2.04 ACRYLONITRILE-BUTADIENE-STYRENE (ABS) PIPE AND FITTINGS SHALL MEET REQUIREMENTS OF ASTM D 2751.

2.05 POLYVINYLCHLORIDE (PVC) PIPE SHALL MEET REQUIREMENTS OF ASTM D 2729.

2.06 CAST IRON SOIL PIPE AND FITTINGS SHALL BE EXTRA HEAVY GRADE AND MEET REQUIREMENTS OF CAST IRON SOIL PIPE INSTITUTE SPECIFICATIONS HS-74. NEOPRENE RUBBER GASKETS FOR HUB AND SPIGOT CAST IRON SOIL PIPE AND FITTINGS SHALL MEET THE REQUIREMENTS OF CISPI SPECIFICATIONS HSN 78.

2.07 DUCTILE IRON PIPE SHALL MEET REQUIREMENTS OF ANSI/AWWA C151 FOR A PRESSURE CLASS OF 350 PSI FOR PIPE 12 INCHES AND SMALLER AND 250 PSI FOR PIPE 14 INCHES AND LARGER. THICKNESS CLASSES SHALL MEET REQUIREMENTS OF ANSI/AWWA C150.

A. FITTINGS FOR DUCTILE IRON PIPE

(1) FITTINGS FOR DUCTILE IRON PIPE SHALL MEET THE REQUIREMENTS OF ASSI/AWWA C110 OR C153 AND SHALL HAVE A PRESSURE RATING OF 250 PSI. PROVIDE TAPPING BOSSES ON ALL FITTINGS REQUIRING TAPS.

B. MECHANICAL JOINTS AND JOINTING MATERIALS SHALL MEET REQUIREMENTS OF ANSI/AWWA C111.

(1) MECHANICAL JOINT RESTRAINT SHALL BE "MEGALUG" MANUFACTURED BY EBAA IRON INC.

(2) LOCKED TYPE MECHANICAL JOINTS MAY BE USED WHERE RESTRAINED JOINTS ARE REQUIRED.

C. PUSH-ON JOINT AND RUBBER GASKET SHALL MEET REQUIREMENTS OF ANSI/AWWA C111.

(1) RESTRAINED PUSH-ON JOINTS MAY BE USED WHERE RESTRAINED JOINTS ARE REQUIRED.

D. CEMENT MORTAR LINING WITH BITUMINOUS SEAL COAT FOR GRAY IRON FITTINGS AND DUCTILE IRON PIPE AND FITTINGS SHALL MEET REQUIREMENTS OF ANSI/AWWA C104. CEMENT MORTAR LINING SHALL BE STANDARD THICKNESS.

E. EXTERIOR, BITUMINOUS COATING FOR GRAY IRON FITTINGS AND DUCTILE IRON PIPE AND FITTINGS SHALL MEET REQUIREMENTS OF ANSI/AWWA C151 AS APPLICABLE. PIPE AND FITTINGS TO BE PAINTED SHALL HAVE A STANDARD FACTORY PRIME.

2.08 SLEEVES THROUGH CONCRETE OR MASONRY WALLS OR SLABS SHALL BE EITHER CAST IRON OR SCHEDULE 40 STEEL. SLEEVES SHALL HAVE INTERMEDIATE COLLARS FOR ANCHORING AND WATER STOPS IF USED ON EXTERIOR WALLS BELOW GRADE.

2.09 PIPE TO SLEEVE SEALANT SHALL BE GROUTING COMPOUND.

A. GROUTING COMPOUND SHALL BE AS MANUFACTURED BY 3M COMPANY OR BE AN EQUIVALENT PRODUCT HAVING STRENGTH PROPERTIES OF 80 PSI TENSILE AND 700 PERCENT ELONGATION IN ACCORDANCE WITH ASTM D 3574 TEST E, AND LINEAR DIMENSION CHANGE SHALL NOT EXCEED 18 PERCENT WHEN SUBJECT TO WET AND DRY CYCLES IN ACCORDANCE WITH ASTM D 756, G AND D 1042.

2.10 MECHANICAL TYPE PIPE TO WALL SLEEVE SEALS

A. MECHANICAL TYPE PIPE TO WALL SLEEVE SEALS SHALL BE "LINK-SEAL" PIPE TO WALL CLOSURES MANUFACTURED BY THUNDERLINE CORP., WAYNE, MICHIGAN. SEALS SHALL BE MODULAR MECHANICAL TYPE, CONSISTING OF INTERLOCKING SYNTHETIC RUBBER LINKS SHAPED TO FILL ANNULAR SPACE

BETWEEN PIPE AND WALL OPENING AND SHALL PROVIDE WATER-TIGHT SEAL BETWEEN PIPE AND WALL OPENING.

2.11 MECHANICAL JOINT ADAPTER SLEEVES SHALL BE F-1429 AS MANUFACTURED BY JAMES B. CLOW & SONS, INC.

2.12~~1~~ THE GEOMEMBRANE SHALL BE A CONTINOUS SHEET OF HIGH-DENSITY POLYETHYLENE (HDPE) LINER 60 MILS THICK WITH ANY PIPE PENETRATIONS SEALED WITH RTV SILICONE AND MEDIUM CLOSED CELL NEOPRENE GASKETS, 1/4-INCH THICK, 2 INCHES WIDE. ALL METAL BATTENS, STAPLES BANDING OR CLAMPS AND HARDWARE SHALL BE STAINLESS STEEL. THE GEOMEMBRANE SHALL BE MANUFACTURED OF POLYETHYLENE COMPOUNDED AND MANUFACTURED SPECIFICALLY FOR CHEMICAL CONTAINMENT LINING RESISTANT TO SUNLIGHT/UV EXPOSURE. THE LINER SHALL MEET THE FOLLOWING PROPERTIES:

PROPERTY	TEST METHOD	HDPE REQUIREMENTS
SHEET DENSITY, G/CC	ASTM D 1505/D 792	0.940
TENSILE PROPERTIES1	ASTM D 6693	
1. YIELD STRENGTH, LB/IN		126
2. BREAK STRENGTH, LB/IN		228
3. YIELD ELONGATION, %		12
4. BREAK ELONGATION, %		700
TEAR RESISTANCE, LB	ASTM D 1004	42
PUNCTURE RESISTANCE, LB	ASTM D 4833	108
STRESS CRACK RESISTANCE2, HRS	ASTM D 5397 (APP.)	300
CARBON BLACK CONTENT3, %	ASTM D 1603	2.0 - 3.0
CARBON BLACK DISPERSION	ASTM D 5596	9 VIEWS
MELT INDEX, G/10 MIN.	ASTM D 1238	<0.4

THE GEOMEMBRANE SHALL BE SUPPLIED IN 23 FOOT WIDE ROLLS, WITH LABELS IMPRINTED ON THE FABRIC IDENTIFING THE THICKNESS OF THE MATERIAL, THE WIDTH OF THE ROLL, LOT AND ROLL NUMBERS, AND NAME OF MANUFACTURER.

3. EXECUTION

3.01 MAINTAIN DRAINAGE ON SITE TO PREVENT EROSION, DAMAGING WATER, AND STANDING WATER DURING ALL PHASES OF CONSTRUCTION.

3.02 KEEP EXCAVATIONS CLEAR OF WATER WHILE WORK IS BEING INSTALLED. CONTROL SUBSURFACE WATER ENCOUNTERED AND REPORT TO WILEY & WILSON.

3.03 LAY PIPE TRUE TO LINE AND GRADE. DO NOT LAY PIPE WHEN TRENCH CONDITIONS OR WEATHER ARE UNSUITABLE FOR SUCH WORK. KEEP PIPE INTERIOR CLEAN AND FREE FROM DIRT OR WASTE MATERIALS.

3.04 LAY PIPE UPGRADE WITH BELL OR GROOVE ENDS UPSTREAM.

3.05 CONSTRUCT INVERT CHANNELS FOR ALL CONTAINMENT AREA DRAINS WITH SMOOTH SEMICIRCULAR BOTTOMS MATCHING INSIDE DIAMETERS OF THE CONNECTING PIPE. FLOORS OUTSIDE THE CHANNELS SHALL BE SMOOTH WITH A CROSS SLOPE BETWEEN 1 AND 2 INCHES PER FOOT TOWARD THE CHANNELS.

3.06 CONSTRUCT INLETS, ENDWALLS, AND OTHER STORM DRAINAGE ITEMS AS DETAILED IN THE LATEST EDITION OF THE VIRGINIA DEPARTMENT OF TRANSPORTATION "ROAD DESIGNS AND STANDARDS" OR ON DRAWINGS, AS APPLICABLE.

3.07 JOIN CONCRETE PIPE IN ACCORDANCE WITH ASTM C 443, "JOINTS FOR CIRCULAR CONCRETE SEWER AND CULVERT PIPE USING RUBBER GASKETS."

3.08 JOIN PVC PIPE IN ACCORDANCE WITH ASTM D 2855, "MAKING SOLVENT-CEMENTED JOINTS WITH PVC PIPE AND FITTINGS."

3.09 JOIN ABS PIPE IN ACCORDANCE WITH ASTM D 2235, "SOLVENT CEMENT FOR ABS PLASTIC PIPE AND FITTINGS."

3.10 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.

3.11 USE SLEEVES WHERE PIPES, VALVE STEM EXTENSIONS, OR EQUIPMENT PARTS PASS THROUGH CONCRETE OR MASONRY WALLS OR SLABS. SLEEVES SHALL BE EITHER CAST IRON OR SCHEDULE 40 STEEL OF SUFFICIENT SIZE TO ALLOW SEALING AROUND PIPES AND CLEARANCE FOR VALVE STEMS OR EQUIPMENT. EXTEND VERTICAL SLEEVES THROUGH SLABS 1-INCH ABOVE TOP SURFACE.

3.12 USE CAST IRON OR STEEL SLEEVES WITH INTERMEDIATE COLLARS TO ANCHOR AND PROVIDE A WATER STOP ON OUTSIDE OF SLEEVES THAT PASS THROUGH EXTERIOR WALLS BELOW GRADE. SEAL AROUND PIPES USING MECHANICAL JOINT ADAPTER, GROUTING COMPOUND, OR "LINK-SEAL" PIPE TO WALL CLOSURES MANUFACTURED BY THUNDERLINE CORP., WAYNE, MICHIGAN. MIX GROUTING COMPOUND AND PLACE IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE MANUFACTURER. INSTALL MECHANICAL PIPE TO WALL SEALS IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE MANUFACTURER. INSTALL MECHANICAL JOINT ADAPTERS IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE MANUFACTURER.

END OF SECTION

SECTION 02930 - SEEDING

1. GENERAL

1.01 REFERENCE SPECIFICATIONS ARE REFERRED TO BY ABBREVIATION AS FOLLOWS:

A. AMERICAN SOCIETY FOR TESTING AND MATERIALS.....ASTM

1.02 SUBMITTALS AND CERTIFICATIONS: PROVIDE THE FOLLOWING IN A TIMELY MANNER IN ACCORDANCE WITH THE APPROVED SUBMITTALS SCHEDULE AS SPECIFIED IN SECTION 01000 – GENERAL REQUIREMENTS. THE OWNER RESERVES THE RIGHT TO REVIEW MATERIAL CERTIFICATIONS AND REJECT MATERIAL THAT DOES NOT MATCH THE QUALITY, CAPACITY, CONSTRUCTION, PERFORMANCE, APPEARANCE, SIZE, ARRANGEMENT, AND GENERAL UTILITY AND ECONOMY OF OPERATION OF PRODUCT SPECIFICATIONS IN THIS MANUAL.

A. SUBMITTAL: PROVIDE SIGNED CERTIFICATIONS THAT MATERIALS LISTED BELOW MEET OR EXCEED PROJECT SPECIFICATIONS:

1. CERTIFICATION: FERTILIZER PRODUCT

2. CERTIFICATION: PERMANENT AND TEMPORARY SEED MIXES

1.03 MATERIALS SHALL BE DELIVERED IN UNBROKEN CONTAINERS, CLEARLY MARKED BY THE MANUFACTURER AS TO CONTENTS. SEED, LIMESTONE, AND FERTILIZER SHALL BE LABELED AS TO PROPORTIONS, ANALYSIS, AND QUALITY. STORE ALL MATERIALS IN A MANNER AFFORDING PROTECTION FROM DAMAGE BY WEATHER OR VANDALISM.

1.04 SEED ONLY WHEN WIND VELOCITY IS LESS THAN 15-MILES PER HOUR.

1.05 ALL SOIL AREAS DISTURBED BY THE CONTRACTOR DURING OR BY HIS CONSTRUCTION OPERATIONS SHALL BE PREPARED AND/OR SEEDED. ALL AREAS TO BE GRASSED SHALL BE HAND RAKED TO REMOVE ROCKS AND CLODDED DIRT TO THE SATISFACTION OF THE OWNER. THE CONTRACTOR SHALL RESEED ANY AREAS WHERE A SUFFICIENT STAND OF GRASS IS NOT OBTAINED AS DETERMINED BY THE OWNER.

2. PRODUCTS

2.01 TOPSOIL SHALL BE THE TOP 6 INCHES OF ORIGINAL SOIL FROM THE SITE, UNLESS OTHERWISE NOTED ON THE DRAWINGS. TOPSOIL OBTAINED OFF-SITE SHALL BE FERTILE, FRIABLE LOAM, CONTAINING NOT LESS THAN 2 PERCENT BY WEIGHT OF FINELY DIVIDED, DECOMPOSED VEGETABLE MATTER. TOPSOIL SHALL BE FREE OF SUBSOIL, CLAY LUMPS, BRUSH, WEEDS, ROOTS LARGER THAN 1/2-INCH DIAMETER, STONES LARGER THAN 1/2 INCH DIAMETER, AND OTHER MATERIAL TOXIC OR HARMFUL TO GROWTH.

2.02 FERTILIZER SHALL BE COMPLETE, INORGANIC, UNIFORM IN COMPOSITION, AND SUITABLE FOR APPLICATION WITH APPROVED EQUIPMENT. FERTILIZER SHALL BE DELIVERED IN BAGS OR OTHER CONVENIENT CONTAINERS, EACH FULLY LABELED, AND COMPLY WITH APPLICABLE STATE AGRICULTURAL STANDARDS. FERTILIZER SHALL BE A CONTROLLED RELEASE TYPE WITH NUTRIENT MULTIPLES OF THE FOLLOWING:

1 PERCENT BY WEIGHT NITROGEN
2 PERCENT BY WEIGHT PHOSPHATE
1 PERCENT BY WEIGHT POTASH

OR

1 PERCENT BY WEIGHT NITROGEN
3 PERCENT BY WEIGHT PHOSPHATE
1 PERCENT BY WEIGHT POTASH

STANDARD CONTROLLED RELEASE FERTILIZER N-P-K BLENDS OF 10-20-10 OR 10-30-10 SATISFY THIS REQUIREMENT.

2.03 SEED TESTED WITHIN 6 MONTHS OF SOWING, SHALL HAVE THE FOLLOWING CHARACTERISTICS:

A. PERMANENT SEEDING: CONDUCT BETWEEN MARCH 1 AND APRIL 1 OR BETWEEN AUGUST 25 THROUGH SEPTEMBER 15

MANICURED LAWN AREAS:

SPECIES	PERCENTAGES (MINIMUM) WEIGHT	PURITY	GERMINATION
ENVIROSHADE SEED BLEND*	95	98	90
REED CANARYGRASS	5	85	75
ANNUAL RYE (NURSE PLANT)	40 LBS/ACRE		

UNMANICURED AREAS:

SPECIES	PERCENTAGES (MINIMUM) WEIGHT	PURITY	GERMINATION
ENVIROSHADE SEED BLEND*	60	98	90
UNSCARIFIED SERICEA LESPEDEZA	20	85	75
KOBE LESPEDEZA OR CROWNVETCH	20	85	75
ANNUAL RYE (NURSE PLANT)	40 LBS/ACRE		

* OR APPROVED EQUAL CONTAINING A MINIMUM OF THREE DIFFERENT VARIETIES OF FINE BLADED TALL FESCUES COMPRISING 80 PERCENT OF THE SEED MIX, WITH THE REMAINING 20 PERCENT OF THE SEED MIX COMPOSED OF A COOL SEASON RED FESCUE VARIETY.

B. TEMPORARY SEEDING (OMIT LESPEDEZA IN DEVELOPED LOTS/LAWNS)

SEEDING DATE	PERCENTAGES (MIN.) SPECIES	WGT.	PURITY	GERM.	SEEDING RATE POUNDS PER ACRE
FEB 1 – MAY 1	ANNUAL RYE	70	98	85	120
	AND KOBE LESPEDEZA	30	98	85	50
MAY 1 - AUG 15	SMALL STEM SUDANGRASS	100	98	80	50
AUG 15 – NOV 15	ANNUAL RYE	100	96	85	140
NOV 15 – FEB 1	WINTER RYE	100	96	85	140

2.04 LIME SHALL BE GROUND AGRICULTURAL GRADE LIMESTONE CONTAINING NOT LESS THAN 85 PERCENT CALCIUM AND MAGNESIUM CARBONATES. FINENESS SHALL BE SUCH THAT 100 PERCENT WILL PASS A NO. 20 SIEVE AND NOT LESS THAN 50 PERCENT WILL PASS A NO. 100 SIEVE. BURNT LIME, HYDRATED LIME, OR PELLETIZED LIME MAY BE SUBSTITUTED IN EQUIVALENT CARBONATES, IF REQUESTED.

2.05 TYPE I MULCH COMPOSED OF THRESHED STRAW OF CEREAL GRAIN OR WOOD FIBER SHALL BE FREE OF OBJECTIONABLE WEED SEEDS OR OTHER HARMFUL MATERIAL.

2.06 TYPE II MULCH SHALL BE "HOLD/GRO" EROSION CONTROL FABRIC MANUFACTURED BY GULF STATES PAPER CORPORATION OR "CURLEX" BLANKETS MANUFACTURED BY THE AMERICAN EXCELSIOR COMPANY OR C125 MATTING MANUFACTURED BY NORTH AMERICAN GREEN.

2.07 ASPHALT ADHESIVE FOR USE WITH TYPE I MULCH SHALL BE EMULSIFIED ASPHALT MEETING REQUIREMENTS OF ASTM D 977, GRADE SS-1.

2.08 SYNTHETIC MULCH BINDER FOR USE WITH TYPE I MULCH: AEROSPRAY, PETROSET, OR TERRA TACK.

2.09 STAPLES FOR USE WITH MULCH BLANKET SHALL BE THE MORE STRINGENT OF PLAIN IRON WIRE, NO. 8 GAGE OR HEAVIER, BE 6 INCHES OR MORE IN LENGTH, OR MANUFACTURERS PRODUCT RECOMMENDATIONS FOR THE SPECIFIC APPLICATION SHOWN ON THE PLANS.

3. EXECUTION

3.01 TEMPORARY SEEDING

A. USE IN AREAS WHEN FINAL GRADING HAS NOT BEEN COMPLETED OR WHEN PERMANENT SEEDING CANNOT BE DONE DUE TO THE SPECIFIED PERMANENT SEEDING DATES, OR PROJECT SEQUENCING REQUIRES DISTURBING THE AREA IN A SECONDARY PHASE OF WORK.

B. APPLY FERTILIZER AT EQUIVALENT RATE OF 10 POUNDS OF 10-20-10 PER 1,000 SQUARE FEET OR 450 LBS/ACRE. DO NOT APPLY MORE THAN 1 LB OF WATER SOLUBLE NITROGEN PER 1,000 SQUARE FEET WITHIN A 30-DAY PERIOD. FERTILIZER SHALL BE INCORPORATED INTO THE UPPER 4-6 INCHES OF APPLICATION AREA AT THE TIME OF APPLICATION.

C. APPLY LIME AT A RATE OF 90 POUNDS PER 1,000 SQUARE FEET OR TO REACH A SOIL PH BETWEEN 6.25 AND 6.50.

D. FOR LOOSE SOIL, WORK LIME AND FERTILIZER INTO SOIL AND THEN SEED. FOR PACKED OR HARD SOIL, LOOSEN TOP LAYER WHILE WORKING LIME AND FERTILIZER INTO SOIL AND THEN SEED AT THE RATE REQUIRED FOR THE TEMPORARY SEEDING SPECIES.

3.02 PREPARE SOIL FOR PERMANENT SEEDING AND HYDROSEEDING BY RESTORATION OF 6 INCHES OF TOPSOIL AND TILLAGE IN PLACE TO LOOSEN THOROUGHLY AND BREAK UP ALL CLODS TO A DEPTH OF 6 INCHES. HAND RAKE TO REMOVE ALL STUMPS AND ROOTS, COARSE VEGETATION, STONES LARGER THAN 1/2 INCH, AND ALL CONSTRUCTION DEBRIS. SOIL SHALL BE WORKED BY SUITABLE AGRICULTURAL EQUIPMENT TO A DEPTH OF NOT LESS THAN 6 INCHES. RAKE TO A UNIFORM, SMOOTH, AND DRAINABLE SURFACE.

A. APPLY LIME AND FERTILIZER IN ACCORDANCE WITH DCR STANDARDS, MIXING THEM INTO THE UPPER 4 TO 6 INCHES OF THE SEED BED. ADJUST PH OF SOIL TO BETWEEN 6.25 AND 6.50 BY APPLYING LIME UP TO 90 POUNDS PER 1,000 SQUARE FEET. APPLY FERTILIZER AT AN EQUIVALENT RATE OF 12 LBS

OF 10-20-10 FERTILIZER PER 1,000 SQUARE FEET OR 500 LBS/ACRE. RATES SHALL BE ADJUSTED FOR OTHER GRADES OF FERTILIZER. FERTILIZER APPLICATION SHALL BE LIMITED TO NO MORE THAN 1 LB OF WATER SOLUBLE NITROGEN PER 1,000 SQUARE FEET WITHIN A 30-DAY PERIOD.

3.03 SOW PERMANENT GRASS SEED BETWEEN DATES OF MARCH 1 AND APRIL 1 OR SEPTEMBER 1 AND OCTOBER 15.

3.04 SOW SEED BY MECHANICAL SEEDER AS FOLLOWS:

A. MIX SEED THOROUGHLY WITH CLEAN DRY SAWDUST AND BROADCAST AT RATE OF 7 POUNDS OF GRASS SEED PER 1,000 SQUARE FEET IN CROSS DIRECTIONS TO ENSURE UNIFORM DISTRIBUTION. RAKE SURFACE LIGHTLY AND ROLL WITH APPROPRIATE TYPE OF LAWN ROLLER WEIGHING MAXIMUM OF 150 POUNDS PER FOOT OF WIDTH TO IMBED SEED 0.25 INCH IN THE TOPSOIL SURFACE.

B. APPLY EITHER TYPE I OR TYPE II MULCH.

(1) TYPE I MULCH: APPLY UNIFORMLY AT THE FOLLOWING RATES:

STRAW - 70-90 POUNDS PER 1,000 SQUARE FEET

WOOD FIBER - 25-50 POUNDS PER 1,000 SQUARE FEET

(2) ANCHOR MULCH BY THE FOLLOWING METHODS:

APPLY LIGHT TACK COAT OF ASPHALT EMULSION (10 GALLONS PER 1,000 SQUARE FEET).

IN RESIDENTIAL AREAS, APPLY A SYNTHETIC MULCH BINDER AT RATE RECOMMENDED BY MANUFACTURER.

ON SLOPES STEEPER THAN 4 HORIZONTAL TO 1 VERTICAL, SECURE HEAVY JUTE MESH WITH STAPLES OVER TYPE I MULCH.

(3) TYPE II MULCH: APPLY ON SLOPES 3:1 OR STEEPER AND IN AREAS OF CONCENTRATED FLOW IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS AND AS SHOWN ON PROJECT PLANS.

3.05 SOW SEED BY HYDROSEEDING AS FOLLOWS:

A. MIX LIME, SEED, FERTILIZER, AND WOOD CELLULOSE FIBER IN REQUIRED AMOUNT OF WATER TO PRODUCE A HOMOGENEOUS SLURRY. HYDROSEEDING MIX SHALL INCORPORATE A 16-45-7 SEED STARTING FERTILIZER TO PROMOTE GERMINATION AT A RATE OF 35 POUNDS PER ACRE. THE ABOVE INGREDIENTS SHALL BE ADDED AND MIXED IN THE FOLLOWING ORDER: LIME AT 15 POUNDS PER ACRE, SEED AT 260 POUNDS PER ACRE, FERTILIZER AT 35 POUNDS PER ACRE, AND AMPLE WOOD CELLULOSE FIBER TO MAKE A SLURRY. ALL INGREDIENTS ARE TO BE DESIGNED FOR USE IN HYDROSEEDING OPERATIONS. AFTER THOROUGHLY MIXED, APPLY UNIFORMLY AT THE RATE OF 260 POUNDS OF GRASS SEED PER ACRE, DRY WEIGHT.

B. THE ABOVE MIXTURE SHALL BE APPLIED WITHIN 3.0 HOURS FROM THE TIME OF MIXING.

C. ALL MIXTURES SHALL BE CONSTANTLY AGITATED FROM THE TIME THEY ARE MIXED UNTIL THEY ARE APPLIED TO THE SEED BED.

D. IMMEDIATELY FOLLOWING THE APPLICATION OF THE SEED SLURRY MIX, MAKE SEPARATE APPLICATION OF WOOD CELLULOSE MULCH AT THE RATE OF 1,500 POUNDS, DRY WEIGHT, PER ACRE.

3.06 REMOVE ALL SOILING OR STAINING OF FINISHED WALKS, DRIVES, AND PARKING AREAS RESULTING FROM SEEDING WORK. MAINTAIN PAVED AREAS IN CLEAN CONDITION.

3.07 MAINTENANCE OF PERMANENT SEEDING

A. PROVIDE PERIODIC WATERING AS REQUIRED ASSISTING WITH VEGETATION ESTABLISHMENT.

B. RESEED AND MULCH SPOTS LARGER THAN 1 SQUARE FOOT, WHICH DO NOT, EXHIBIT A UNIFORM STAND OF GRASS WITHIN 6 WEEKS, PROVIDE ADDITIONAL TOPSOIL AS REQUIRED.

C. IN THE EVENT THAT GROWTH IS NOT ESTABLISHED BY FINAL PROJECT INSPECTION, CONTINUE THE SPECIFIED ATTENTION UNTIL STAND IS ACCEPTED BY THE ENGINEER.

END OF SECTION

SECTION 03300 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. SUBMITTALS: PRODUCT DATA DESIGNS AND SUBMITTALS REQUIRED BY ACI 301.

B. READY-MIXED CONCRETE PRODUCER QUALIFICATIONS: ASTM C 94/C 94M.

C. COMPLY WITH ACI 301, "SPECIFICATION FOR STRUCTURAL CONCRETE"; ACI 117, "SPECIFICATIONS FOR TOLERANCES FOR CONCRETE CONSTRUCTION AND MATERIALS"; AND CRSI'S "MANUAL OF STANDARD PRACTICE."

PART 2 - PRODUCTS

2.1 MATERIALS

A. REINFORCING BARS: ASTM A 615/A 615M, GRADE 60, DEFORMED.

B. PLAIN STEEL WIRE: ASTM A 82, AS DRAWN.

C. PLAIN-STEEL WELDED WIRE REINFORCEMENT: ASTM A 185, FABRICATED FROM AS-DRAWN STEEL WIRE INTO FLAT SHEETS.

D. DEFORMED-STEEL WELDED WIRE REINFORCEMENT: ASTM A 497, FLAT SHEET.

E. PORTLAND CEMENT: ASTM C 150, TYPE I OR II.

F. FLY ASH: ASTM C 618, TYPE C OR F.

G. AGGREGATES: ASTM C 33, UNIFORMLY GRADED.

H. SYNTHETIC FIBER: ASTM C 1116, TYPE III, POLYPROPYLENE FIBERS, 1/2 TO 1-1/2 INCHES LONG.

I. AIR-ENTRAINING ADMIXTURE: ASTM C 260.

J. CHEMICAL ADMIXTURES: ASTM C 494, HIGH-RANGE WATER REDUCING. DO NOT USE CALCIUM CHLORIDE OR ADMIXTURES CONTAINING CALCIUM CHLORIDE.

K. VAPOR RETARDER: CLEAR 10-MIL- THICK POLYETHYLENE SHEET.

L. JOINT-FILLER STRIPS: ASTM D 1751, ASPHALT-SATURATED CELLULOSIC FIBER, OR ASTM D 1752, CORK OR SELF-EXPANDING CORK.

M. MOISTURE-RETAINING COVER: ASTM C 171, POLYETHYLENE FILM OR WHITE BURLAP-POLYETHYLENE SHEET.

N. CLEAR, WATERBORNE, MEMBRANE-FORMING CURING COMPOUND: ASTM C 309, TYPE 1, CLASS B.

O. CLEAR, SOLVENT-BORNE, MEMBRANE-FORMING CURING AND SEALING COMPOUND: ASTM C 1315, TYPE 1, CLASS A.

P. CLEAR, WATERBORNE, MEMBRANE-FORMING CURING AND SEALING COMPOUND: ASTM C 1315, TYPE 1, CLASS A.

2.2 MIXES

A. COMPLY WITH ACI 301 REQUIREMENTS FOR CONCRETE MIXTURES.

B. NORMAL-WEIGHT CONCRETE: PREPARE DESIGN MIXES, PROPORTIONED ACCORDING TO ACI 301, AS FOLLOWS:

1. MINIMUM COMPRESSIVE STRENGTH: 4000 PSI AT 28 DAYS.
2. MAXIMUM WATER-CEMENTITIOUS MATERIALS RATIO: 0.45.
3. SLUMP LIMIT: 8 INCHES FOR CONCRETE WITH VERIFIED SLUMP OF 2 TO 4 INCHES BEFORE ADDING HIGH-RANGE WATER-REDUCING ADMIXTURE OR PLASTICIZING ADMIXTURE, PLUS OR MINUS 1 INCH.
4. AIR CONTENT: MAINTAIN WITHIN RANGE PERMITTED BY ACI 301. DO NOT ALLOW AIR CONTENT OF FLOOR SLABS TO RECEIVE TROWELED FINISHES TO EXCEED 3 PERCENT.

C. MEASURE, BATCH, MIX, AND DELIVER CONCRETE ACCORDING TO ASTM C 94/C 94M AND ASTM C 1116.

1. WHEN AIR TEMPERATURE IS ABOVE 90 DEG F, REDUCE MIXING AND DELIVERY TIME TO 60 MINUTES.

PART 3 - EXECUTION

3.1 CONCRETING

A. CONSTRUCT FORMWORK ACCORDING TO ACI 301 AND MAINTAIN TOLERANCES AND SURFACE IRREGULARITIES WITHIN ACI 347R LIMITS OF CLASS A, 1/8 INCH FOR CONCRETE EXPOSED TO VIEW AND CLASS C, 1/2 INCH FOR OTHER CONCRETE SURFACES.

B. PLACE VAPOR RETARDER ON PREPARED SUBGRADE, WITH JOINTS LAPPED 6 INCHES AND SEALED.

C. COMPLY WITH CRSI'S "MANUAL OF STANDARD PRACTICE" FOR FABRICATING, PLACING, AND SUPPORTING REINFORCEMENT.

D. INSTALL CONSTRUCTION, ISOLATION, AND CONTRACTION JOINTS WHERE INDICATED. INSTALL FULL-DEPTH JOINT-FILLER STRIPS AT ISOLATION JOINTS.

E. PLACE CONCRETE IN A CONTINUOUS OPERATION AND CONSOLIDATE USING MECHANICAL VIBRATING EQUIPMENT.

F. PROTECT CONCRETE FROM PHYSICAL DAMAGE, PREMATURE DRYING, AND REDUCED STRENGTH DUE TO HOT OR COLD WEATHER DURING MIXING, PLACING, AND CURING.

G. FORMED SURFACE FINISH: SMOOTH-FORMED FINISH FOR CONCRETE EXPOSED TO VIEW, COATED, OR COVERED BY WATERPROOFING OR OTHER DIRECT-APPLIED MATERIAL; ROUGH-FORMED FINISH ELSEWHERE.

H. SLAB FINISHES: COMPLY WITH ACI 302.1R FOR SCREEDING, RESTRAIGHTENING, AND FINISHING OPERATIONS FOR CONCRETE SURFACES. DO NOT WET CONCRETE SURFACES. PROVIDE THE FOLLOWING FINISHES:

1. SCRATCH FINISH FOR SURFACES TO RECEIVE MORTAR SETTING BEDS.
2. FLOAT FINISH FOR INTERIOR STEPS AND RAMPS AND SURFACES TO RECEIVE WATERPROOFING, ROOFING, OR OTHER DIRECT-APPLIED MATERIAL.
3. TROWELED FINISH FOR FLOOR SURFACES AND FLOORS TO RECEIVE FLOOR COVERINGS, PAINT, OR OTHER THIN FILM-FINISH COATINGS.
4. TROWEL AND FINE-BROOM FINISH FOR SURFACES TO RECEIVE THIN-SET TILE.
5. NONSLIP-BROOM FINISH TO EXTERIOR CONCRETE PLATFORMS, STEPS, AND RAMPS.

I. BEGIN CURING CONCRETE SLABS AFTER FINISHING. APPLY MEMBRANE-FORMING CURING AND SEALING COMPOUND TO CONCRETE.

J. OWNER WILL ENGAGE A TESTING AGENCY TO PERFORM FIELD TESTS AND TO SUBMIT TEST REPORTS.

K. PROTECT CONCRETE FROM DAMAGE. REPAIR SURFACE DEFECTS IN FORMED CONCRETE AND SLABS.

END OF SECTION

SECTION 04810 - UNIT MASONRY ASSEMBLIES

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. SEE DIVISION 5 SECTION "METAL FABRICATIONS" FOR FURNISHING STEEL LINTELS FOR UNIT MASONRY.

B. COMPLY WITH ACI 530.1/ASCE 6/TMS 602.

C. PRECONSTRUCTION TESTING SERVICE: OWNER WILL ENGAGE A QUALIFIED INDEPENDENT TESTING AGENCY TO PERFORM PRECONSTRUCTION TESTING REQUIRED BY AUTHORITIES HAVING JURISDICTION.

D. SAMPLE PANELS: CONSTRUCT A SAMPLE WALL PANEL APPROXIMATELY 48 INCHES LONG BY 48 INCHES HIGH TO DEMONSTRATE AESTHETIC EFFECTS AND SET QUALITY STANDARDS FOR MATERIALS AND EXECUTION.

PART 2 - PRODUCTS

2.1 MASONRY UNITS

A. CONCRETE MASONRY UNITS: ASTM C 90; WEIGHT CLASSIFICATION, NORMAL WEIGHT.

1. INTEGRAL WATER REPELLENT: GRACE CONSTRUCTION PRODUCTS, A UNIT OF W. R. GRACE & CO. - CONN.; DRY-BLOCK OR MASTER BUILDERS, INC.; RHEOPEL.
2. SPECIAL SHAPES FOR LINTELS, CORNERS, JAMBS, SASH, CONTROL JOINTS, AND OTHER SPECIAL CONDITIONS.
3. SQUARE-EDGED UNITS FOR OUTSIDE CORNERS, UNLESS OTHERWISE INDICATED.

2.2 MORTAR AND GROUT

A. MORTAR: ASTM C 270, PROPORTION SPECIFICATION.

1. MASONRY CEMENT: DO NOT USE MASONRY CEMENT OR PLASTIC CEMENT.
2. DO NOT USE CALCIUM CHLORIDE IN MORTAR.
3. FOR MASONRY BELOW GRADE OR IN CONTACT WITH EARTH, USE TYPE S.
4. FOR REINFORCED MASONRY, USE TYPE S.
5. FOR EXTERIOR, ABOVE-GRADE, LOAD-BEARING AND NON-LOAD-BEARING WALLS AND PARAPET WALLS; FOR INTERIOR LOAD-BEARING WALLS; FOR INTERIOR NON-LOAD-BEARING PARTITIONS, AND FOR OTHER APPLICATIONS WHERE ANOTHER TYPE IS NOT INDICATED, USE TYPE S.
6. WATER-REPELLENT ADDITIVE: FOR MORTAR USED WITH CONCRETE MASONRY UNITS MADE WITH INTEGRAL WATER REPELLENT, USE PRODUCT RECOMMENDED BY MANUFACTURER OF UNITS.

B. GROUT: ASTM C 476 WITH A SLUMP OF 8 TO 11 INCHES.

2.3 REINFORCEMENT, TIES, AND ANCHORS

A. STEEL REINFORCING BARS: ASTM A 615/A 615M, GRADE 60.

B. JOINT REINFORCEMENT: ASTM A 951.

1. COATING: HOT-DIP GALVANIZED AT BOTH INTERIOR AND EXTERIOR WALLS.
2. WIRE DIAMETER FOR SIDE RODS: W1.7 OR 0.148 INCH.
3. WIRE DIAMETER FOR CROSS RODS: W1.7 OR 0.148 INCH.
4. FOR SINGLE-WYTHE MASONRY, PROVIDE EITHER LADDER DESIGN OR TRUSS DESIGN.

2.4 EMBEDDED FLASHING MATERIALS

A. SHEET METAL FLASHING: STAINLESS STEEL, 0.0156 INCH THICK.

2.5 MISCELLANEOUS MASONRY ACCESSORIES

A. COMPRESSIBLE FILLER: PREMOLDED STRIPS COMPLYING WITH ASTM D 1056, GRADE 2A1.

B. PREFORMED CONTROL-JOINT GASKETS: DESIGNED TO FIT STANDARD SASH BLOCK AND TO MAINTAIN LATERAL STABILITY IN MASONRY WALL; MADE FROM STYRENE-BUTADIENE RUBBER OR PVC.

C. WEEP HOLES: ROUND POLYETHYLENE TUBING, 3/8-INCH OD.

D. LOOSE-GRANULAR PERLITE INSULATION: ASTM C 549, TYPE II OR IV.

E. MOLDED-POLYSTYRENE INSULATION UNITS: ASTM C 578, TYPE I; SPECIALLY SHAPED UNITS DESIGNED FOR INSTALLING IN CORES OF MASONRY UNITS.

F. EXTRUDED-POLYSTYRENE BOARD INSULATION: ASTM C 578, TYPE IV OR X.

G. POLYISOCYANURATE BOARD INSULATION: ASTM C 1289, TYPE I, CLASS 2; ALUMINUM-FOIL FACED.

H. PROPRIETARY ACIDIC MASONRY CLEANER: PRODUCT EXPRESSLY APPROVED FOR INTENDED USE BY CLEANER MANUFACTURER AND MANUFACTURER OF MASONRY UNITS.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. CUT MASONRY UNITS WITH SAW. INSTALL WITH CUT SURFACES AND, WHERE POSSIBLE, CUT EDGES CONCEALED.

B. MIX UNITS FOR EXPOSED UNIT MASONRY FROM SEVERAL PALLETS OR CUBES AS THEY ARE PLACED TO PRODUCE UNIFORM BLEND OF COLORS AND TEXTURES.

C. MATCHING EXISTING MASONRY: MATCH COURSING, BONDING, COLOR, AND TEXTURE OF EXISTING MASONRY.

D. STOPPING AND RESUMING WORK: RACK BACK UNITS; DO NOT TOOTH.

E. FILL CORES IN HOLLOW CONCRETE MASONRY UNITS WITH GROUT 24 INCHES UNDER BEARING PLATES, BEAMS, LINTELS, POSTS, AND SIMILAR ITEMS, UNLESS OTHERWISE INDICATED.

F. BUILD NON-LOAD-BEARING INTERIOR PARTITIONS FULL HEIGHT AND INSTALL COMPRESSIBLE FILLER IN JOINT BETWEEN TOP OF PARTITION AND UNDERSIDE OF STRUCTURE ABOVE.

G. TOOL EXPOSED JOINTS SLIGHTLY CONCAVE WHEN THUMBPRINT HARD, UNLESS OTHERWISE INDICATED.

H. KEEP CAVITIES CLEAN OF MORTAR DROPPINGS AND OTHER MATERIALS DURING CONSTRUCTION.

3.2 LINTELS

A. INSTALL LINTELS WHERE INDICATED.

B. MINIMUM BEARING OF 8 INCHES AT EACH JAMB, UNLESS OTHERWISE INDICATED.

3.3 FLASHING AND WEEP HOLES

A. INSTALL EMBEDDED FLASHING AND WEEP HOLES IN MASONRY AT SHELF ANGLES, LINTELS, LEDGES, OTHER OBSTRUCTIONS TO THE DOWNWARD FLOW OF WATER IN THE WALL, AND WHERE INDICATED.

B. PLACE THROUGH-WALL FLASHING ON SLOPING BED OF MORTAR AND COVER WITH MORTAR. SEAL PENETRATIONS IN FLASHING BEFORE COVERING WITH MORTAR.

1. EXTEND FLASHING 4 INCHES INTO MASONRY AT EACH END AND TURN UP 2 INCHES TO FORM A PAN.

C. TRIM WICKING MATERIAL USED IN WEEP HOLES FLUSH WITH OUTSIDE FACE OF WALL AFTER MORTAR HAS SET.

3.4 PARGING

A. PARGE MASONRY WALLS, WHERE INDICATED, IN TWO UNIFORM COATS WITH A STEEL-TROWEL FINISH. FORM A WASH AT TOP OF PARGING AND A COVE AT BOTTOM. DAMP CURE PARGING FOR AT LEAST 24 HOURS.

3.5 CLEANING

A. CLEAN MASONRY AS WORK PROGRESSES. REMOVE MORTAR FINS AND SMEARS BEFORE TOOLING JOINTS.

B. FINAL CLEANING: AFTER MORTAR IS THOROUGHLY CURED, CLEAN EXPOSED MASONRY.

1. WET WALL SURFACES WITH WATER BEFORE APPLYING ACIDIC CLEANER, THEN REMOVE CLEANER PROMPTLY BY RINSING THOROUGHLY WITH CLEAR WATER.
2. CLEAN MASONRY WITH A PROPRIETARY ACIDIC CLEANER APPLIED ACCORDING TO MANUFACTURER'S WRITTEN INSTRUCTIONS.

END OF SECTION

SECTION 05521 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. DRAWINGS AND GENERAL PROVISIONS OF THE CONTRACT, INCLUDING GENERAL AND SUPPLEMENTARY CONDITIONS AND DIVISION 1 SPECIFICATION SECTIONS, APPLY TO THIS SECTION.

1.2 SUMMARY

A. THIS SECTION INCLUDES THE FOLLOWING:

1. ALUMINUM PIPE AND TUBE RAILINGS.

1.3 PERFORMANCE REQUIREMENTS

A. GENERAL: IN ENGINEERING RAILINGS TO WITHSTAND STRUCTURAL LOADS INDICATED, DETERMINE ALLOWABLE DESIGN WORKING STRESSES OF RAILING MATERIALS BASED ON THE FOLLOWING:

1. ALUMINUM: THE LESSER OF MINIMUM YIELD STRENGTH DIVIDED BY 1.65 OR MINIMUM ULTIMATE TENSILE STRENGTH DIVIDED BY 1.95.

B. STRUCTURAL PERFORMANCE: PROVIDE RAILINGS CAPABLE OF WITHSTANDING THE EFFECTS OF GRAVITY LOADS AND THE FOLLOWING LOADS AND STRESSES WITHIN LIMITS AND UNDER CONDITIONS INDICATED:

1. HANDRAILS:

a. UNIFORM LOAD OF 50 LBF/ FT. APPLIED IN ANY DIRECTION.
b. CONCENTRATED LOAD OF 200 LBF APPLIED IN ANY DIRECTION.
c. UNIFORM AND CONCENTRATED LOADS NEED NOT BE ASSUMED TO ACT CONCURRENTLY.

2. TOP RAILS OF GUARDS:

a. UNIFORM LOAD OF 50 LBF/ FT. APPLIED IN ANY DIRECTION.
b. CONCENTRATED LOAD OF 200 LBF APPLIED IN ANY DIRECTION.
c. UNIFORM AND CONCENTRATED LOADS NEED NOT BE ASSUMED TO ACT CONCURRENTLY.

3. INFILL OF GUARDS:

a. CONCENTRATED LOAD OF 200 LBF APPLIED HORIZONTALLY ON AN AREA OF 1 SQ. FT.
b. UNIFORM LOAD OF 25 LBF/SQ. FT. APPLIED HORIZONTALLY.
c. INFILL LOAD AND OTHER LOADS NEED NOT BE ASSUMED TO ACT CONCURRENTLY.

C. THERMAL MOVEMENTS: PROVIDE EXTERIOR RAILINGS THAT ALLOW FOR THERMAL MOVEMENTS RESULTING FROM THE FOLLOWING MAXIMUM CHANGE (RANGE) IN AMBIENT AND SURFACE TEMPERATURES BY PREVENTING BUCKLING, OPENING OF JOINTS, OVERSTRESSING OF COMPONENTS, FAILURE OF CONNECTIONS, AND OTHER DETRIMENTAL EFFECTS. BASE ENGINEERING CALCULATION ON SURFACE TEMPERATURES OF MATERIALS DUE TO BOTH SOLAR HEAT GAIN AND NIGHTTIME-SKY HEAT LOSS.

1. TEMPERATURE CHANGE (RANGE): 120 DEG F, AMBIENT; 180 DEG F, MATERIAL SURFACES.

D. CONTROL OF CORROSION: PREVENT GALVANIC ACTION AND OTHER FORMS OF CORROSION BY INSULATING METALS AND OTHER MATERIALS FROM DIRECT CONTACT WITH INCOMPATIBLE MATERIALS.

1.4 SUBMITTALS: PROVIDE SUBMITTALS IN A TIMELY MANNER IN ACCORDANCE WITH THE APPROVED SUBMITTALS SCHEDULE AS SPECIFIED IN DIVISION 1 – GENERAL REQUIREMENTS.

A. SUBMITTAL: PRODUCT DATA - FOR THE FOLLOWING:

1. MANUFACTURER'S PRODUCT LINES OF MECHANICALLY CONNECTED RAILINGS.
2. GROUT, ANCHORING CEMENT, AND PAINT PRODUCTS.

B. SUBMITTAL: SHOP DRAWINGS - INCLUDE PLANS, ELEVATIONS, SECTIONS, DETAILS, AND ATTACHMENTS TO OTHER WORK.

1. FOR INSTALLED PRODUCTS INDICATED TO COMPLY WITH DESIGN LOADS, INCLUDE STRUCTURAL ANALYSIS DATA SIGNED AND SEALED BY THE QUALIFIED PROFESSIONAL ENGINEER RESPONSIBLE FOR THEIR PREPARATION.

C. SUBMITTAL: SAMPLES FOR INITIAL SELECTION - FOR PRODUCTS INVOLVING SELECTION OF COLOR, TEXTURE, OR DESIGN.

D. SUBMITTAL: SAMPLES FOR VERIFICATION - FOR EACH TYPE OF EXPOSED FINISH REQUIRED.

1. SECTIONS OF EACH DISTINCTLY DIFFERENT LINEAR RAILING MEMBER, INCLUDING HANDRAILS, TOP RAILS, POSTS, AND BALUSTERS.
2. FITTINGS AND BRACKETS.
3. ASSEMBLED SAMPLE OF RAILING SYSTEM, MADE FROM FULL-SIZE COMPONENTS, INCLUDING TOP RAIL, POST, HANDRAIL, AND INFILL. SAMPLE NEED NOT BE FULL HEIGHT.

a. SHOW METHOD OF CONNECTING MEMBERS AT INTERSECTIONS.

1.5 QUALITY ASSURANCE

A. SOURCE LIMITATIONS: OBTAIN EACH TYPE OF RAILING THROUGH ONE SOURCE FROM A SINGLE MANUFACTURER.

1.6 PROJECT CONDITIONS

A. FIELD MEASUREMENTS: VERIFY ACTUAL LOCATIONS OF WALLS AND OTHER CONSTRUCTION CONTIGUOUS WITH RAILINGS BY FIELD MEASUREMENTS BEFORE FABRICATION AND INDICATE MEASUREMENTS ON SHOP DRAWINGS.

1. ESTABLISHED DIMENSIONS: WHERE FIELD MEASUREMENTS CANNOT BE MADE WITHOUT DELAYING THE WORK, ESTABLISH DIMENSIONS AND PROCEED WITH FABRICATING RAILINGS WITHOUT FIELD MEASUREMENTS. COORDINATE WALL AND OTHER CONTIGUOUS CONSTRUCTION TO ENSURE THAT ACTUAL DIMENSIONS CORRESPOND TO ESTABLISHED DIMENSIONS.
2. PROVIDE ALLOWANCE FOR TRIMMING AND FITTING AT SITE.

1.7 COORDINATION AND SCHEDULING

A. COORDINATE INSTALLATION OF ANCHORAGES FOR RAILINGS. FURNISH SETTING DRAWINGS, TEMPLATES, AND DIRECTIONS FOR INSTALLING ANCHORAGES, INCLUDING SLEEVES, CONCRETE INSERTS, ANCHOR BOLTS, AND ITEMS WITH INTEGRAL ANCHORS, THAT ARE TO BE EMBEDDED IN CONCRETE OR MASONRY. DELIVER SUCH ITEMS TO PROJECT SITE IN TIME FOR INSTALLATION.

B. SCHEDULE INSTALLATION SO WALL ATTACHMENTS ARE MADE ONLY TO COMPLETED WALLS. DO NOT SUPPORT RAILINGS TEMPORARILY BY ANY MEANS THAT DO NOT SATISFY STRUCTURAL PERFORMANCE REQUIREMENTS.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. AVAILABLE MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, MANUFACTURERS OFFERING PRODUCTS THAT MAY BE INCORPORATED INTO THE WORK INCLUDE, BUT ARE NOT LIMITED TO, THE FOLLOWING:

1. ALUMINUM PIPE AND TUBE RAILINGS:

a. HOLLAENDER MANUFACTURING COMPANY.

2.2 METALS, GENERAL

A. METAL SURFACES, GENERAL: PROVIDE MATERIALS WITH SMOOTH SURFACES, WITHOUT SEAM MARKS, ROLLER MARKS, ROLLED TRADE NAMES, STAINS, DISCOLORATIONS, OR BLEMISHES.

B. BRACKETS, FLANGES, AND ANCHORS: CAST OR FORMED METAL OF SAME TYPE OF MATERIAL AND FINISH AS SUPPORTED RAILS, UNLESS OTHERWISE INDICATED.

2.3 ALUMINUM

A. ALUMINUM, GENERAL: PROVIDE ALLOY AND TEMPER RECOMMENDED BY ALUMINUM PRODUCER AND FINISHER FOR TYPE OF USE AND FINISH INDICATED, AND WITH NOT LESS THAN THE STRENGTH AND DURABILITY PROPERTIES OF ALLOY AND TEMPER DESIGNATED BELOW FOR EACH ALUMINUM FORM REQUIRED.

B. EXTRUDED BARS AND TUBING: ASTM B 221, ALLOY 6063-T5/T52.

2.4 FASTENERS

A. GENERAL: PROVIDE THE FOLLOWING:

1. ALUMINUM RAILINGS: TYPE 304 STAINLESS-STEEL FASTENERS.

B. FASTENERS FOR ANCHORING RAILINGS TO OTHER CONSTRUCTION: SELECT FASTENERS OF TYPE, GRADE, AND CLASS REQUIRED TO PRODUCE CONNECTIONS SUITABLE FOR ANCHORING RAILINGS TO OTHER TYPES OF CONSTRUCTION INDICATED AND CAPABLE OF WITHSTANDING DESIGN LOADS.

C. FASTENERS FOR INTERCONNECTING RAILING COMPONENTS:

1. PROVIDE CONCEALED FASTENERS FOR INTERCONNECTING RAILING COMPONENTS AND FOR ATTACHING THEM TO OTHER WORK, UNLESS OTHERWISE INDICATED.
2. PROVIDE CONCEALED FASTENERS FOR INTERCONNECTING RAILING COMPONENTS AND FOR ATTACHING THEM TO OTHER WORK, UNLESS EXPOSED FASTENERS ARE UNAVOIDABLE OR ARE THE STANDARD FASTENING METHOD FOR RAILINGS INDICATED.
3. PROVIDE TAMPER-RESISTANT FLAT-HEAD MACHINE SCREWS FOR EXPOSED FASTENERS, UNLESS OTHERWISE INDICATED.

D. ANCHORS: PROVIDE CAST-IN-PLACE, CHEMICAL OR TORQUE-CONTROLLED EXPANSION ANCHORS, FABRICATED FROM CORROSION-RESISTANT MATERIALS WITH CAPABILITY TO SUSTAIN, WITHOUT FAILURE, A LOAD EQUAL TO SIX TIMES THE LOAD IMPOSED WHEN INSTALLED IN UNIT MASONRY AND EQUAL TO FOUR TIMES THE LOAD IMPOSED WHEN INSTALLED IN CONCRETE, AS DETERMINED BY TESTING PER ASTM E 488 CONDUCTED BY A QUALIFIED INDEPENDENT TESTING AGENCY.

2.5 MISCELLANEOUS MATERIALS

A. BITUMINOUS PAINT: COLD-APPLIED ASPHALT EMULSION COMPLYING WITH ASTM D 1187.

B. NONSHRINK, NONMETALLIC GROUT: FACTORY-PACKAGED, NONSTAINING, NONCORROSIVE, NONGASEOUS GROUT COMPLYING WITH ASTM C 1107. PROVIDE GROUT SPECIFICALLY RECOMMENDED BY MANUFACTURER FOR INTERIOR AND EXTERIOR APPLICATIONS.

2.6 FABRICATION

A. GENERAL: FABRICATE RAILINGS TO COMPLY WITH REQUIREMENTS INDICATED FOR DESIGN, DIMENSIONS, MEMBER SIZES AND SPACING, DETAILS, FINISH, AND ANCHORAGE, BUT NOT LESS THAN THAT REQUIRED TO SUPPORT STRUCTURAL LOADS.

B. ASSEMBLE RAILINGS IN THE SHOP TO GREATEST EXTENT POSSIBLE TO MINIMIZE FIELD SPLICING AND ASSEMBLY. DISASSEMBLE UNITS ONLY AS NECESSARY FOR SHIPPING AND HANDLING LIMITATIONS. CLEARLY MARK UNITS FOR REASSEMBLY AND COORDINATED INSTALLATION. USE CONNECTIONS THAT MAINTAIN STRUCTURAL VALUE OF JOINED PIECES.

C. CUT, DRILL, AND PUNCH METALS CLEANLY AND ACCURATELY. REMOVE BURRS AND EASE EDGES TO A RADIUS OF APPROXIMATELY 1/32 INCH, UNLESS OTHERWISE INDICATED. REMOVE SHARP OR ROUGH AREAS ON EXPOSED SURFACES.

D. FORM WORK TRUE TO LINE AND LEVEL WITH ACCURATE ANGLES AND SURFACES.

E. FABRICATE CONNECTIONS THAT WILL BE EXPOSED TO WEATHER IN A MANNER TO EXCLUDE WATER. PROVIDE WEEP HOLES WHERE WATER MAY ACCUMULATE.

F. CUT, REINFORCE, DRILL, AND TAP AS INDICATED TO RECEIVE FINISH HARDWARE, SCREWS, AND SIMILAR ITEMS.

G. CONNECTIONS: FABRICATE RAILINGS WITH NONWELDED CONNECTIONS, UNLESS OTHERWISE INDICATED.

H. NONWELDED CONNECTIONS: CONNECT MEMBERS WITH CONCEALED MECHANICAL FASTENERS AND FITTINGS. FABRICATE MEMBERS AND FITTINGS TO PRODUCE FLUSH, SMOOTH, RIGID, HAIRLINE JOINTS.

   1. FABRICATE SPLICE JOINTS FOR FIELD CONNECTION USING AN EPOXY STRUCTURAL ADHESIVE IF THIS IS MANUFACTURER'S STANDARD SPLICING METHOD.

I. FORM CHANGES IN DIRECTION AS FOLLOWS:

   1. BY INSERTING PREFABRICATED FLUSH-ELBOW FITTINGS.

J. FORM SIMPLE AND COMPOUND CURVES BY BENDING MEMBERS IN JIGS TO PRODUCE UNIFORM CURVATURE FOR EACH REPETITIVE CONFIGURATION REQUIRED; MAINTAIN CROSS SECTION OF MEMBER THROUGHOUT ENTIRE BEND WITHOUT BUCKLING, TWISTING, CRACKING, OR OTHERWISE DEFORMING EXPOSED SURFACES OF COMPONENTS.

K. CLOSE EXPOSED ENDS OF RAILING MEMBERS WITH PREFABRICATED END FITTINGS.

L. PROVIDE WALL RETURNS AT ENDS OF WALL-MOUNTED HANDRAILS, UNLESS OTHERWISE INDICATED. CLOSE ENDS OF RETURNS UNLESS CLEARANCE BETWEEN END OF RAIL AND WALL IS 1/4 INCH OR LESS.

M. BRACKETS, FLANGES, FITTINGS, AND ANCHORS: PROVIDE WALL BRACKETS, FLANGES, MISCELLANEOUS FITTINGS, AND ANCHORS TO INTERCONNECT RAILING MEMBERS TO OTHER WORK, UNLESS OTHERWISE INDICATED.

N. PROVIDE INSERTS AND OTHER ANCHORAGE DEVICES FOR CONNECTING RAILINGS TO CONCRETE OR MASONRY WORK. FABRICATE ANCHORAGE DEVICES CAPABLE OF WITHSTANDING LOADS IMPOSED BY RAILINGS. COORDINATE ANCHORAGE DEVICES WITH SUPPORTING STRUCTURE.

O. FOR RAILING POSTS SET IN CONCRETE, PROVIDE STEEL SLEEVES NOT LESS THAN 6 INCHES LONG WITH INSIDE DIMENSIONS NOT LESS THAN 1/2 INCH GREATER THAN OUTSIDE DIMENSIONS OF POST, WITH STEEL PLATE FORMING BOTTOM CLOSURE.

2.7 FINISHES, GENERAL

A. COMPLY WITH NAAMM'S "METAL FINISHES MANUAL FOR ARCHITECTURAL AND METAL PRODUCTS" FOR RECOMMENDATIONS FOR APPLYING AND DESIGNATING FINISHES.

B. PROTECT MECHANICAL FINISHES ON EXPOSED SURFACES FROM DAMAGE BY APPLYING A STRIPPABLE, TEMPORARY PROTECTIVE COVERING BEFORE SHIPPING.

C. PROVIDE EXPOSED FASTENERS WITH FINISH MATCHING APPEARANCE, INCLUDING COLOR AND TEXTURE, OF RAILINGS.

2.8 ALUMINUM FINISHES

A. FINISH DESIGNATIONS PREFIXED BY AA COMPLY WITH THE SYSTEM ESTABLISHED BY THE ALUMINUM ASSOCIATION FOR DESIGNATING ALUMINUM FINISHES.

B. CLASS I, CLEAR ANODIC FINISH: AA-M12C22A41 (MECHANICAL FINISH: NONSPECULAR AS FABRICATED; CHEMICAL FINISH: ETCHED, MEDIUM MATTE; ANODIC COATING: ARCHITECTURAL CLASS I, CLEAR COATING 0.018 MM OR THICKER) COMPLYING WITH AAMA 611.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. FIT EXPOSED CONNECTIONS TOGETHER TO FORM TIGHT, HAIRLINE JOINTS.

B. PERFORM CUTTING, DRILLING, AND FITTING REQUIRED FOR INSTALLING RAILINGS. SET RAILINGS ACCURATELY IN LOCATION, ALIGNMENT, AND ELEVATION; MEASURED FROM ESTABLISHED LINES AND LEVELS AND FREE OF RACK.

1. DO NOT WELD, CUT, OR ABRADE SURFACES OF RAILING COMPONENTS THAT HAVE BEEN COATED OR FINISHED AFTER FABRICATION AND THAT ARE INTENDED FOR FIELD CONNECTION BY MECHANICAL OR OTHER MEANS WITHOUT FURTHER CUTTING OR FITTING.
2. SET POSTS PLUMB WITHIN A TOLERANCE OF 1/16 INCH IN 3 FEET.

3. ALIGN RAILS SO VARIATIONS FROM LEVEL FOR HORIZONTAL MEMBERS AND VARIATIONS FROM PARALLEL WITH RAKE OF STEPS AND RAMPS FOR SLOPING MEMBERS DO NOT EXCEED 1/4 INCH IN 12 FEET.

C. CORROSION PROTECTION: COAT CONCEALED SURFACES OF ALUMINUM THAT WILL BE IN CONTACT WITH GROUT, CONCRETE, MASONRY, WOOD, OR DISSIMILAR METALS, WITH A HEAVY COAT OF BITUMINOUS PAINT.

D. ADJUST RAILINGS BEFORE ANCHORING TO ENSURE MATCHING ALIGNMENT AT ABUTTING JOINTS.

E. FASTENING TO IN-PLACE CONSTRUCTION: USE ANCHORAGE DEVICES AND FASTENERS WHERE NECESSARY FOR SECURING RAILINGS AND FOR PROPERLY TRANSFERRING LOADS TO IN-PLACE CONSTRUCTION.

3.2 RAILING CONNECTIONS

A. NONWELDED CONNECTIONS: USE MECHANICAL OR ADHESIVE JOINTS FOR PERMANENTLY CONNECTING RAILING COMPONENTS. USE WOOD BLOCKS AND PADDING TO PREVENT DAMAGE TO RAILING MEMBERS AND FITTINGS. SEAL RECESSED HOLES OF EXPOSED LOCKING SCREWS USING PLASTIC CEMENT FILLER COLORED TO MATCH FINISH OF RAILINGS.

B. EXPANSION JOINTS: INSTALL EXPANSION JOINTS AT LOCATIONS INDICATED BUT NOT FARTHER APART THAN REQUIRED TO ACCOMMODATE THERMAL MOVEMENT. PROVIDE SLIP-JOINT INTERNAL SLEEVE EXTENDING 2 INCHES BEYOND JOINT ON EITHER SIDE, FASTEN INTERNAL SLEEVE SECURELY TO 1 SIDE, AND LOCATE JOINT WITHIN 6 INCHES OF POST.

3.3 ANCHORING POSTS

A. USE STEEL PIPE SLEEVES PRESET AND ANCHORED INTO CONCRETE FOR INSTALLING POSTS. AFTER POSTS HAVE BEEN INSERTED INTO SLEEVES, FILL ANNULAR SPACE BETWEEN POST AND SLEEVE WITH NONSHRINK, NONMETALLIC GROUT, MIXED AND PLACED TO COMPLY WITH ANCHORING MATERIAL MANUFACTURER'S WRITTEN INSTRUCTIONS.

B. FORM OR CORE-DRILL HOLES NOT LESS THAN 5 INCHES DEEP AND 3/4 INCH LARGER THAN OD OF POST FOR INSTALLING POSTS IN CONCRETE. CLEAN HOLES OF LOOSE MATERIAL, INSERT POSTS, AND FILL ANNULAR SPACE BETWEEN POST AND CONCRETE WITH NONSHRINK, NONMETALLIC GROUT, MIXED AND PLACED TO COMPLY WITH ANCHORING MATERIAL MANUFACTURER'S WRITTEN INSTRUCTIONS.

C. COVER ANCHORAGE JOINT WITH FLANGE OF SAME METAL AS POST, ATTACHED TO POST WITH SET SCREWS.

D. LEAVE ANCHORAGE JOINT EXPOSED; WIPE OFF SURPLUS ANCHORING MATERIAL; AND LEAVE 1/8-INCH BUILDUP, SLOPED AWAY FROM POST.

E. ANCHOR POSTS TO METAL SURFACES WITH OVAL FLANGES, ANGLE TYPE, OR FLOOR TYPE AS REQUIRED BY CONDITIONS, CONNECTED TO POSTS AND TO METAL SUPPORTING MEMBERS AS FOLLOWS:

1. FOR ALUMINUM PIPE RAILINGS, ATTACH POSTS USING FITTINGS DESIGNED AND ENGINEERED FOR THIS PURPOSE.

3.4 ATTACHING HANDRAILS TO WALLS

A. ATTACH HANDRAILS TO WALL WITH WALL BRACKETS. PROVIDE BRACKETS WITH 1-1/2-INCH CLEARANCE FROM INSIDE FACE OF HANDRAIL AND FINISHED WALL SURFACE.

1. USE TYPE OF BRACKET WITH FLANGE TAPPED FOR CONCEALED ANCHORAGE TO THREADED HANGER BOLT.
2. USE TYPE OF BRACKET WITH PREDRILLED HOLE FOR EXPOSED BOLT ANCHORAGE.

B. LOCATE BRACKETS AS INDICATED OR, IF NOT INDICATED, AT SPACING REQUIRED TO SUPPORT STRUCTURAL LOADS.

C. SECURE WALL BRACKETS TO BUILDING CONSTRUCTION AS FOLLOWS:

1. FOR CONCRETE AND SOLID MASONRY ANCHORAGE, USE DRILLED-IN EXPANSION SHIELDS AND HANGER OR LAG BOLTS.

3.5 ADJUSTING AND CLEANING

A. CLEAN ALUMINUM AND STAINLESS STEEL BY WASHING THOROUGHLY WITH CLEAN WATER AND SOAP AND RINSING WITH CLEAN WATER.

3.6 PROTECTION

A. PROTECT FINISHES OF RAILINGS FROM DAMAGE DURING CONSTRUCTION PERIOD WITH TEMPORARY PROTECTIVE COVERINGS APPROVED BY RAILING MANUFACTURER. REMOVE PROTECTIVE COVERINGS AT TIME OF SUBSTANTIAL COMPLETION.

B. RESTORE FINISHES DAMAGED DURING INSTALLATION AND CONSTRUCTION PERIOD SO NO EVIDENCE REMAINS OF CORRECTION WORK. RETURN ITEMS THAT CANNOT BE REFINISHED IN THE FIELD TO THE SHOP; MAKE REQUIRED ALTERATIONS AND REFINISH ENTIRE UNIT, OR PROVIDE NEW UNITS.

END OF SECTION

SECTION 05530 - GRATINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. DRAWINGS AND GENERAL PROVISIONS OF THE CONTRACT, INCLUDING GENERAL AND SUPPLEMENTARY CONDITIONS AND DIVISION 1 SPECIFICATION SECTIONS, APPLY TO THIS SECTION.

1.2 SUMMARY

A. THIS SECTION INCLUDES THE FOLLOWING:

1. GLASS-FIBER-REINFORCED PLASTIC GRATINGS.

B. RELATED SECTIONS INCLUDE THE FOLLOWING:

1. DIVISION 5 SECTION "STRUCTURAL STEEL" FOR STRUCTURAL-STEEL FRAMING SYSTEM COMPONENTS.
2. DIVISION 5 SECTION "PIPE AND TUBE RAILINGS" FOR METAL PIPE AND TUBE HANDRAILS AND RAILINGS.

1.3 SUBMITTALS: PROVIDE SUBMITTALS IN A TIMELY MANNER IN ACCORDANCE WITH THE APPROVED SUBMITTALS SCHEDULE AS SPECIFIED IN DIVISION 1 – GENERAL REQUIREMENTS.

A. SUBMITTAL: PRODUCT DATA - FOR THE FOLLOWING:

1. GLASS-FIBER-REINFORCED PLASTIC GRATINGS.
2. CLIPS AND ANCHORAGE DEVICES FOR GRATINGS.

B. SUBMITTAL: SHOP DRAWINGS - INCLUDE PLANS, ELEVATIONS, SECTIONS, DETAILS, AND ATTACHMENTS TO OTHER WORK.

1.4 PROJECT CONDITIONS

A. FIELD MEASUREMENTS: VERIFY ACTUAL LOCATIONS OF WALLS AND OTHER CONSTRUCTION CONTIGUOUS WITH GRATINGS BY FIELD MEASUREMENTS BEFORE FABRICATION AND INDICATE MEASUREMENTS ON SHOP DRAWINGS.

1. ESTABLISHED DIMENSIONS: WHERE FIELD MEASUREMENTS CANNOT BE MADE WITHOUT DELAYING THE WORK, ESTABLISH DIMENSIONS AND PROCEED WITH FABRICATING GRATINGS WITHOUT FIELD MEASUREMENTS. COORDINATE WALL AND OTHER CONTIGUOUS CONSTRUCTION TO ENSURE THAT ACTUAL DIMENSIONS CORRESPOND TO ESTABLISHED DIMENSIONS.
2. PROVIDE ALLOWANCE FOR TRIMMING AND FITTING AT SITE.

1.5 COORDINATION

A. COORDINATE INSTALLATION OF ANCHORAGES FOR GRATINGS, GRATING FRAMES, AND SUPPORTS. FURNISH SETTING DRAWINGS, TEMPLATES, AND DIRECTIONS FOR INSTALLING ANCHORAGES, INCLUDING SLEEVES, CONCRETE INSERTS, ANCHOR BOLTS, AND ITEMS WITH INTEGRAL ANCHORS, THAT ARE TO BE EMBEDDED IN CONCRETE OR MASONRY. DELIVER SUCH ITEMS TO PROJECT SITE IN TIME FOR INSTALLATION.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. AVAILABLE MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, MANUFACTURERS OFFERING PRODUCTS THAT MAY BE INCORPORATED INTO THE WORK INCLUDE, BUT ARE NOT LIMITED TO, THE FOLLOWING:

1. GLASS-FIBER-REINFORCED PLASTIC GRATINGS:

a. CREATIVE PULTRUSIONS, INC.
b. ENDURO SYSTEMS INC.; COMPOSITE PRODUCTS DIVISION.
c. FIBERGRATE COMPOSITE STRUCTURES INC.
d. FISHER & LUDLOW.
e. IKG INDUSTRIES; A HARSCO COMPANY.
f. SEASAFE, INC.
g. STRONGWELL.

2.2 FASTENERS

A. GENERAL: UNLESS OTHERWISE INDICATED, PROVIDE TYPE 316 STAINLESS-STEEL FASTENERS FOR EXTERIOR USE AND ZINC-PLATED FASTENERS WITH COATING COMPLYING WITH ASTM B 633, CLASS FE/ZN 5, AT EXTERIOR WALLS. PROVIDE STAINLESS-STEEL FASTENERS FOR FASTENING ALUMINUM. SELECT FASTENERS FOR TYPE, GRADE, AND CLASS REQUIRED.

B. STEEL BOLTS AND NUTS: REGULAR HEXAGON-HEAD BOLTS, ASTM A 307, GRADE A; WITH HEX NUTS, ASTM A 563; AND, WHERE INDICATED, FLAT WASHERS.

C. PLAIN WASHERS: ROUND, ASME B18.22.1.

D. LOCK WASHERS: HELICAL, SPRING TYPE, ASME B18.21.1.

E. ANCHORS: PROVIDE CAST-IN-PLACE ANCHORS WITH CAPABILITY TO SUSTAIN, WITHOUT FAILURE, A LOAD EQUAL TO SIX TIMES THE LOAD IMPOSED WHEN INSTALLED IN UNIT MASONRY AND EQUAL TO FOUR TIMES THE LOAD IMPOSED WHEN INSTALLED IN CONCRETE, AS DETERMINED BY TESTING PER ASTM E 488 CONDUCTED BY A QUALIFIED INDEPENDENT TESTING AGENCY.

2.3 FABRICATION

A. SHOP ASSEMBLY: FABRICATE GRATING SECTIONS IN SHOP TO GREATEST EXTENT POSSIBLE TO MINIMIZE FIELD SPLICING AND ASSEMBLY. DISASSEMBLE UNITS ONLY AS NECESSARY FOR SHIPPING AND HANDLING LIMITATIONS. USE CONNECTIONS THAT MAINTAIN STRUCTURAL VALUE OF JOINED PIECES. CLEARLY MARK UNITS FOR REASSEMBLY AND COORDINATED INSTALLATION.

B. CUT, DRILL, AND PUNCH MATERIAL CLEANLY AND ACCURATELY. REMOVE BURRS AND EASE EDGES TO A RADIUS OF APPROXIMATELY 1/32 INCH, UNLESS OTHERWISE INDICATED. REMOVE SHARP OR ROUGH AREAS ON EXPOSED SURFACES.

C. FORM FROM MATERIALS OF SIZE, THICKNESS, AND SHAPES INDICATED, BUT NOT LESS THAN THAT NEEDED TO SUPPORT INDICATED LOADS.

D. FIT EXPOSED CONNECTIONS ACCURATELY TOGETHER TO FORM HAIRLINE JOINTS.

E. PROVIDE FOR ANCHORAGE OF TYPE INDICATED; COORDINATE WITH SUPPORTING STRUCTURE. FABRICATE AND SPACE THE ANCHORING DEVICES TO SECURE GRATINGS, FRAMES, AND SUPPORTS RIGIDLY IN PLACE AND TO SUPPORT INDICATED LOADS.

2.4 GLASS-FIBER-REINFORCED PLASTIC GRATINGS

A. PULTRUDED GLASS-FIBER-REINFORCED GRATINGS: BAR GRATINGS ASSEMBLED FROM COMPONENTS MADE BY SIMULTANEOUSLY PULLING GLASS FIBERS AND EXTRUDING THERMOSETTING PLASTIC RESIN THROUGH A HEATED DIE UNDER PRESSURE TO PRODUCE A PRODUCT WITHOUT VOIDS AND WITH A HIGH GLASS-FIBER CONTENT.

1. CONFIGURATION: I4010; 1-INCH I-BARS SPACED 1 INCH O.C. (40 PERCENT OPEN).
2. RESIN TYPE: VINYLESTER (SVF).
3. COLOR: YELLOW.
4. TRAFFIC SURFACE: APPLIED ABRASIVE FINISH.

B. FABRICATE CUTOUTS IN GRATING SECTIONS FOR PENETRATIONS INDICATED. ARRANGE CUTOUTS TO PERMIT GRATING REMOVAL WITHOUT DISTURBING ITEMS PENETRATING GRATINGS.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. FASTENING TO IN-PLACE CONSTRUCTION: PROVIDE ANCHORAGE DEVICES AND FASTENERS WHERE NECESSARY FOR SECURING GRATINGS TO IN-PLACE CONSTRUCTION. INCLUDE THREADED FASTENERS FOR CONCRETE AND MASONRY INSERTS, THROUGH-BOLTS, LAG BOLTS, AND OTHER CONNECTORS.

B. CUTTING, FITTING, AND PLACEMENT: PERFORM CUTTING, DRILLING, AND FITTING REQUIRED FOR INSTALLING GRATINGS. SET UNITS ACCURATELY IN

LOCATION, ALIGNMENT, AND ELEVATION; MEASURED FROM ESTABLISHED LINES AND LEVELS AND FREE OF RACK.

C. PROVIDE TEMPORARY BRACING OR ANCHORS IN FORMWORK FOR ITEMS THAT ARE TO BE BUILT INTO CONCRETE OR MASONRY.

D. FIT EXPOSED CONNECTIONS ACCURATELY TOGETHER TO FORM HAIRLINE JOINTS.

3.2 INSTALLING GLASS-FIBER-REINFORCED PLASTIC GRATINGS

A. COMPLY WITH MANUFACTURER'S WRITTEN INSTRUCTIONS FOR INSTALLING GRATINGS. USE MANUFACTURER'S STANDARD STAINLESS-STEEL ANCHOR CLIPS AND HOLD-DOWN DEVICES FOR BOLTED CONNECTIONS.

END OF SECTION

SECTION 07841 - THROUGH-PENETRATION FIRESTOP SYSTEMS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. SUBMITTALS: PROVIDE SUBMITTALS IN A TIMELY MANNER IN ACCORDANCE WITH THE APPROVED SUBMITTALS SCHEDULE AS SPECIFIED IN DIVISION 1 – GENERAL REQUIREMENTS. PRODUCT DATA AND PRODUCT CERTIFICATES SIGNED BY MANUFACTURER CERTIFYING THAT PRODUCTS FURNISHED COMPLY WITH REQUIREMENTS.

1. SUBMITTAL: PRODUCT DATA - FOR EACH TYPE OF PRODUCT INDICATED.
2. SUBMITTAL: SHOP DRAWINGS - FOR EACH THROUGH-PENETRATION FIRESTOP SYSTEM, SHOW EACH TYPE OF CONSTRUCTION CONDITION PENETRATED, RELATIONSHIPS TO ADJOINING CONSTRUCTION, AND TYPE OF PENETRATING ITEM. INCLUDE FIRESTOP DESIGN DESIGNATION OF QUALIFIED TESTING AND INSPECTING AGENCY THAT EVIDENCES COMPLIANCE WITH REQUIREMENTS FOR EACH CONDITION INDICATED.

   a. SUBMIT DOCUMENTATION, INCLUDING ILLUSTRATIONS, FROM A QUALIFIED TESTING AND INSPECTING AGENCY THAT IS APPLICABLE TO EACH THROUGH-PENETRATION FIRESTOP SYSTEM CONFIGURATION FOR CONSTRUCTION AND PENETRATING ITEMS.
   b. WHERE PROJECT CONDITIONS REQUIRE MODIFICATION TO A QUALIFIED TESTING AND INSPECTING AGENCY'S ILLUSTRATION FOR A PARTICULAR THROUGH-PENETRATION FIRESTOP CONDITION, SUBMIT ILLUSTRATION, WITH MODIFICATIONS MARKED, APPROVED BY THROUGH-PENETRATION FIRESTOP SYSTEM MANUFACTURER'S FIRE-PROTECTION ENGINEER AS AN ENGINEERING JUDGMENT OR EQUIVALENT FIRE-RESISTANCE-RATED ASSEMBLY.

B. THROUGH-PENETRATION FIRESTOP SYSTEM SCHEDULE: INDICATE LOCATIONS OF EACH THROUGH-PENETRATION FIRESTOP SYSTEM, ALONG WITH THE FOLLOWING INFORMATION:

1. TYPES OF PENETRATING ITEMS.
2. TYPES OF CONSTRUCTIONS PENETRATED, INCLUDING FIRE-RESISTANCE RATINGS AND, WHERE APPLICABLE, THICKNESSES OF CONSTRUCTION PENETRATED.

C. THROUGH-PENETRATION FIRESTOP SYSTEMS FOR EACH LOCATION IDENTIFIED BY FIRESTOP DESIGN DESIGNATION OF QUALIFIED TESTING AND INSPECTING AGENCY.

D. PROVIDE FIRESTOPPING SYSTEMS WITH FIRE-RESISTANCE RATINGS INDICATED BY REFERENCE TO UL DESIGNATIONS AS LISTED IN ITS "FIRE RESISTANCE DIRECTORY," OR TO DESIGNATIONS OF ANOTHER TESTING AGENCY ACCEPTABLE TO AUTHORITIES HAVING JURISDICTION.

E. PROVIDE THROUGH-PENETRATION FIRESTOPPING SYSTEMS WITH F-RATINGS INDICATED, AS DETERMINED ACCORDING TO ASTM E 814, BUT NOT LESS THAN FIRE-RESISTANCE RATING OF CONSTRUCTION PENETRATED.

1. PROVIDE THROUGH-PENETRATION FIRESTOPPING SYSTEMS WITH T-RATINGS AS WELL AS F-RATINGS, AS DETERMINED ACCORDING TO ASTM E 814, WHERE INDICATED.

F. FOR EXPOSED FIRESTOPPING, PROVIDE PRODUCTS WITH FLAME-SPREAD INDEXES OF LESS THAN 25 AND SMOKE-DEVELOPED INDEXES OF LESS THAN 450, AS DETERMINED ACCORDING TO ASTM E 84.

G. INSTALLATION RESPONSIBILITY: ASSIGN INSTALLATION OF THROUGH-PENETRATION FIRESTOP SYSTEMS AND FIRE-RESISTIVE JOINT SYSTEMS IN PROJECT TO A SINGLE QUALIFIED INSTALLER.

H. SOURCE LIMITATIONS: OBTAIN THROUGH-PENETRATION FIRESTOP SYSTEMS, FOR EACH KIND OF PENETRATION AND CONSTRUCTION CONDITION INDICATED, THROUGH ONE SOURCE FROM A SINGLE MANUFACTURER.

PART 2 - PRODUCTS

2.1 FIRESTOP SYSTEMS

A. ANY THROUGH-PENETRATION FIRESTOP SYSTEM THAT IS CLASSIFIED BY UL FOR THE APPLICATION AND WITH F-RATING AND T-RATING INDICATED MAY BE USED.

PART 3 - EXECUTION

3.1 INSTALLATION

A. INSTALL FIRESTOPPING SYSTEMS TO COMPLY WITH REQUIREMENTS LISTED IN TESTING AGENCY'S DIRECTORY FOR INDICATED FIRE-RESISTANCE RATING.

B. IDENTIFICATION: IDENTIFY THROUGH-PENETRATION FIRESTOP SYSTEMS WITH PERMANENT LABELS ATTACHED TO SURFACES ADJACENT TO FIRESTOP SYSTEMS SO THAT LABELS WILL BE VISIBLE TO ANYONE SEEKING TO REMOVE PENETRATING ITEMS OR FIRESTOP SYSTEMS. INCLUDE THE FOLLOWING INFORMATION ON LABELS:

1. THE WORDS "WARNING - THROUGH-PENETRATION FIRESTOP SYSTEM - DO NOT DISTURB."
2. CLASSIFICATION/LISTING DESIGNATION OF APPLICABLE TESTING AND INSPECTING AGENCY.
3. THROUGH-PENETRATION FIRESTOP SYSTEM MANUFACTURER'S NAME AND PRODUCT NAME.

END OF SECTION

SECTION 07842 - FIRE-RESISTIVE JOINT SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. DRAWINGS AND GENERAL PROVISIONS OF THE CONTRACT, INCLUDING GENERAL AND SUPPLEMENTARY CONDITIONS AND DIVISION 1 SPECIFICATION SECTIONS, APPLY TO THIS SECTION.

1.2 SUMMARY

A. THIS SECTION INCLUDES FIRE-RESISTIVE JOINT SYSTEMS FOR THE FOLLOWING:

1. HEAD-OF-WALL JOINTS.
2. WALL-TO-WALL JOINTS.

B. RELATED SECTIONS INCLUDE THE FOLLOWING:

1. DIVISION 7 SECTION "JOINT SEALANTS" FOR NON-FIRE-RESISTIVE JOINT SEALANTS.

1.3 PERFORMANCE REQUIREMENTS

A. GENERAL: PROVIDE FIRE-RESISTIVE JOINT SYSTEMS THAT ARE PRODUCED AND INSTALLED TO RESIST SPREAD OF FIRE ACCORDING TO REQUIREMENTS INDICATED, RESIST PASSAGE OF SMOKE AND OTHER GASES, AND MAINTAIN ORIGINAL FIRE-RESISTANCE RATING OF ASSEMBLY IN WHICH FIRE-RESISTIVE JOINT SYSTEMS ARE INSTALLED.

B. JOINT SYSTEMS IN AND BETWEEN FIRE-RESISTANCE-RATED CONSTRUCTIONS: PROVIDE SYSTEMS WITH ASSEMBLY RATINGS EQUALING OR EXCEEDING THE FIRE-RESISTANCE RATINGS OF CONSTRUCTION THAT THEY JOIN, AND WITH MOVEMENT CAPABILITIES INDICATED AS DETERMINED BY UL 2079.

C. FOR FIRE-RESISTIVE SYSTEMS EXPOSED TO VIEW, PROVIDE PRODUCTS WITH FLAME-SPREAD AND SMOKE-DEVELOPED INDEXES OF LESS THAN 25 AND 450, RESPECTIVELY, AS DETERMINED PER ASTM E 84.

1.4 SUBMITTALS: PROVIDE SUBMITTALS IN A TIMELY MANNER IN ACCORDANCE WITH THE APPROVED SUBMITTALS SCHEDULE AS SPECIFIED IN DIVISION 1 – GENERAL REQUIREMENTS.

A. SUBMITTAL: PRODUCT DATA - FOR EACH TYPE OF PRODUCT INDICATED.

B. SUBMITTAL: SHOP DRAWINGS - FOR EACH FIRE-RESISTIVE JOINT SYSTEM, SHOW EACH KIND OF CONSTRUCTION CONDITION IN WHICH JOINTS ARE INSTALLED; ALSO SHOW RELATIONSHIPS TO ADJOINING CONSTRUCTION. INCLUDE FIRE-RESISTIVE JOINT SYSTEM DESIGN DESIGNATION OF TESTING AND INSPECTING

AGENCY ACCEPTABLE TO AUTHORITIES HAVING JURISDICTION THAT DEMONSTRATES COMPLIANCE WITH REQUIREMENTS FOR EACH CONDITION INDICATED.

1. SUBMIT DOCUMENTATION, INCLUDING ILLUSTRATIONS, FROM A QUALIFIED TESTING AND INSPECTING AGENCY THAT IS APPLICABLE TO EACH FIRE-RESISTIVE JOINT SYSTEM CONFIGURATION FOR CONSTRUCTION AND PENETRATING ITEMS.

C. SUBMITTAL: PRODUCT CERTIFICATES - FOR EACH TYPE OF FIRE-RESISTIVE JOINT SYSTEM, SIGNED BY PRODUCT MANUFACTURER.

D. SUBMITTAL: FIELD QUALITY-CONTROL TEST REPORTS.

E. SUBMITTAL: EVALUATION REPORTS - EVIDENCE OF FIRE-RESISTIVE JOINT SYSTEMS' COMPLIANCE WITH ICBO ES AC30, FROM THE ICBO EVALUATION SERVICE.

1.5 QUALITY ASSURANCE

A. INSTALLER QUALIFICATIONS: A FIRM THAT HAS BEEN APPROVED BY FMG ACCORDING TO FMG 4991, "APPROVAL OF FIRESTOP CONTRACTORS."

B. INSTALLATION RESPONSIBILITY: ASSIGN INSTALLATION OF THROUGH-PENETRATION FIRESTOP SYSTEMS AND FIRE-RESISTIVE JOINT SYSTEMS IN PROJECT TO A SINGLE QUALIFIED INSTALLER.

C. SOURCE LIMITATIONS: OBTAIN FIRE-RESISTIVE JOINT SYSTEMS, FOR EACH KIND OF JOINT AND CONSTRUCTION CONDITION INDICATED, THROUGH ONE SOURCE FROM A SINGLE MANUFACTURER.

D. FIRE-TEST-RESPONSE CHARACTERISTICS: PROVIDE FIRE-RESISTIVE JOINT SYSTEMS THAT COMPLY WITH THE FOLLOWING REQUIREMENTS AND THOSE SPECIFIED IN PART 1 "PERFORMANCE REQUIREMENTS" ARTICLE:

1. FIRE-RESISTANCE TESTS ARE PERFORMED BY A QUALIFIED TESTING AND INSPECTING AGENCY. A QUALIFIED TESTING AND INSPECTING AGENCY IS UL OR ANOTHER AGENCY PERFORMING TESTING AND FOLLOW-UP INSPECTION SERVICES FOR FIRE-RESISTIVE JOINT SYSTEMS ACCEPTABLE TO AUTHORITIES HAVING JURISDICTION.
2. FIRE-RESISTIVE JOINT SYSTEMS ARE IDENTICAL TO THOSE TESTED PER METHODS INDICATED IN PART 1 "PERFORMANCE REQUIREMENTS" ARTICLE AND COMPLY WITH THE FOLLOWING:

   A. FIRE-RESISTIVE JOINT SYSTEM PRODUCTS BEAR CLASSIFICATION MARKING OF QUALIFIED TESTING AND INSPECTING AGENCY.
   B. FIRE-RESISTIVE JOINT SYSTEMS CORRESPOND TO THOSE INDICATED BY REFERENCING SYSTEM DESIGNATIONS OF THE QUALIFIED TESTING AND INSPECTING AGENCY.

1.6 DELIVERY, STORAGE, AND HANDLING

A. DELIVER FIRE-RESISTIVE JOINT SYSTEM PRODUCTS TO PROJECT SITE IN ORIGINAL, UNOPENED CONTAINERS OR PACKAGES WITH QUALIFIED TESTING AND INSPECTING AGENCY'S CLASSIFICATION MARKING APPLICABLE TO PROJECT AND

WITH INTACT AND LEGIBLE MANUFACTURERS' LABELS IDENTIFYING PRODUCT AND MANUFACTURER, DATE OF MANUFACTURE, LOT NUMBER, SHELF LIFE, CURING TIME, AND MIXING INSTRUCTIONS FOR MULTICOMPONENT MATERIALS.

B. STORE AND HANDLE MATERIALS FOR FIRE-RESISTIVE JOINT SYSTEMS TO PREVENT THEIR DETERIORATION OR DAMAGE DUE TO MOISTURE, TEMPERATURE CHANGES, CONTAMINANTS, OR OTHER CAUSES.

1.7 PROJECT CONDITIONS

A. ENVIRONMENTAL LIMITATIONS: DO NOT INSTALL FIRE-RESISTIVE JOINT SYSTEMS WHEN AMBIENT OR SUBSTRATE TEMPERATURES ARE OUTSIDE LIMITS PERMITTED BY FIRE-RESISTIVE JOINT SYSTEM MANUFACTURERS OR WHEN SUBSTRATES ARE WET DUE TO RAIN, FROST, CONDENSATION, OR OTHER CAUSES.

B. VENTILATE FIRE-RESISTIVE JOINT SYSTEMS PER MANUFACTURER'S WRITTEN INSTRUCTIONS BY NATURAL MEANS OR, IF THIS IS INADEQUATE, FORCED-AIR CIRCULATION.

1.8 COORDINATION

A. COORDINATE CONSTRUCTION OF JOINTS TO ENSURE THAT FIRE-RESISTIVE JOINT SYSTEMS ARE INSTALLED ACCORDING TO SPECIFIED REQUIREMENTS.

B. COORDINATE SIZING OF JOINTS TO ACCOMMODATE FIRE-RESISTIVE JOINT SYSTEMS.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. AVAILABLE PRODUCTS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, FIRE-RESISTIVE JOINT SYSTEMS THAT MAY BE INCORPORATED INTO THE WORK INCLUDE, BUT ARE NOT LIMITED TO, THOSE SYSTEMS INDICATED IN THE FIRE-RESISTIVE JOINT SYSTEM SCHEDULE AT THE END OF PART 3.

2.2 FIRE-RESISTIVE JOINT SYSTEMS

A. COMPATIBILITY: PROVIDE FIRE-RESISTIVE JOINT SYSTEMS THAT ARE COMPATIBLE WITH JOINT SUBSTRATES, UNDER CONDITIONS OF SERVICE AND APPLICATION, AS DEMONSTRATED BY FIRE-RESISTIVE JOINT SYSTEM MANUFACTURER BASED ON TESTING AND FIELD EXPERIENCE.

B. ACCESSORIES: PROVIDE COMPONENTS OF FIRE-RESISTIVE JOINT SYSTEMS, INCLUDING PRIMERS AND FORMING MATERIALS, THAT ARE NEEDED TO INSTALL FILL MATERIALS AND TO COMPLY WITH PART 1 "PERFORMANCE REQUIREMENTS" ARTICLE. USE ONLY COMPONENTS SPECIFIED BY FIRE-RESISTIVE JOINT SYSTEM MANUFACTURER AND APPROVED BY THE QUALIFIED TESTING AND INSPECTING AGENCY FOR SYSTEMS INDICATED.

PART 3 - EXECUTION

3.1 EXAMINATION

A. EXAMINE SUBSTRATES AND CONDITIONS, WITH INSTALLER PRESENT, FOR COMPLIANCE WITH REQUIREMENTS FOR JOINT CONFIGURATIONS, SUBSTRATES, AND OTHER CONDITIONS AFFECTING PERFORMANCE OF WORK.

1. PROCEED WITH INSTALLATION ONLY AFTER UNSATISFACTORY CONDITIONS HAVE BEEN CORRECTED.

3.2 PREPARATION

A. SURFACE CLEANING: CLEAN JOINTS IMMEDIATELY BEFORE INSTALLING FIRE-RESISTIVE JOINT SYSTEMS TO COMPLY WITH FIRE-RESISTIVE JOINT SYSTEM MANUFACTURER'S WRITTEN INSTRUCTIONS AND THE FOLLOWING REQUIREMENTS:

1. REMOVE FROM SURFACES OF JOINT SUBSTRATES FOREIGN MATERIALS THAT COULD INTERFERE WITH ADHESION OF FILL MATERIALS.
2. CLEAN JOINT SUBSTRATES TO PRODUCE CLEAN, SOUND SURFACES CAPABLE OF DEVELOPING OPTIMUM BOND WITH FILL MATERIALS. REMOVE LOOSE PARTICLES REMAINING FROM CLEANING OPERATION.
3. REMOVE LAITANCE AND FORM-RELEASE AGENTS FROM CONCRETE.

B. PRIMING: PRIME SUBSTRATES WHERE RECOMMENDED IN WRITING BY FIRE-RESISTIVE JOINT SYSTEM MANUFACTURER USING THAT MANUFACTURER'S RECOMMENDED PRODUCTS AND METHODS. CONFINE PRIMERS TO AREAS OF BOND; DO NOT ALLOW SPILLAGE AND MIGRATION ONTO EXPOSED SURFACES.

C. MASKING TAPE: USE MASKING TAPE TO PREVENT FILL MATERIALS OF FIRE-RESISTIVE JOINT SYSTEM FROM CONTACTING ADJOINING SURFACES THAT WILL REMAIN EXPOSED ON COMPLETION OF WORK AND THAT WOULD OTHERWISE BE PERMANENTLY STAINED OR DAMAGED BY SUCH CONTACT OR BY CLEANING METHODS USED TO REMOVE SMEARS FROM FIRE-RESISTIVE JOINT SYSTEM MATERIALS. REMOVE TAPE AS SOON AS POSSIBLE WITHOUT DISTURBING FIRE-RESISTIVE JOINT SYSTEM'S SEAL WITH SUBSTRATES OR DAMAGING ADJOINING SURFACES.

3.3 INSTALLATION

A. GENERAL: INSTALL FIRE-RESISTIVE JOINT SYSTEMS TO COMPLY WITH PART 1 "PERFORMANCE REQUIREMENTS" ARTICLE AND FIRE-RESISTIVE JOINT SYSTEM MANUFACTURER'S WRITTEN INSTALLATION INSTRUCTIONS FOR PRODUCTS AND APPLICATIONS INDICATED.

B. INSTALL FORMING/PACKING/BACKING MATERIALS AND OTHER ACCESSORIES OF TYPES REQUIRED TO SUPPORT FILL MATERIALS DURING THEIR APPLICATION AND IN POSITION NEEDED TO PRODUCE CROSS-SECTIONAL SHAPES AND DEPTHS REQUIRED TO ACHIEVE FIRE RATINGS INDICATED.

C. INSTALL FILL MATERIALS FOR FIRE-RESISTIVE JOINT SYSTEMS BY PROVEN TECHNIQUES TO PRODUCE THE FOLLOWING RESULTS:

1. FILL VOIDS AND CAVITIES FORMED BY OPENINGS AND FORMING/PACKING/BACKING MATERIALS AS REQUIRED TO ACHIEVE FIRE-RESISTANCE RATINGS INDICATED.
2. APPLY FILL MATERIALS SO THEY CONTACT AND ADHERE TO SUBSTRATES FORMED BY JOINTS.
3. FOR FILL MATERIALS THAT WILL REMAIN EXPOSED AFTER COMPLETING WORK, FINISH TO PRODUCE SMOOTH, UNIFORM SURFACES THAT ARE FLUSH WITH ADJOINING FINISHES.

3.4 FIELD QUALITY CONTROL

A. INSPECTING AGENCY: ENGAGE A QUALIFIED INDEPENDENT INSPECTING AGENCY TO INSPECT FIRE-RESISTIVE JOINT SYSTEMS AND PREPARE INSPECTION REPORTS.

B. TESTING SERVICES: INSPECTING OF COMPLETED INSTALLATIONS OF FIRE-RESISTIVE JOINT SYSTEMS SHALL TAKE PLACE IN SUCCESSIVE STAGES AS INSTALLATION OF FIRE-RESISTIVE JOINT SYSTEMS PROCEEDS. DO NOT PROCEED WITH INSTALLATION OF JOINT SYSTEMS FOR THE NEXT AREA UNTIL INSPECTING AGENCY DETERMINES COMPLETED WORK SHOWS COMPLIANCE WITH REQUIREMENTS.

   1. INSPECTING AGENCY SHALL STATE IN EACH REPORT WHETHER INSPECTED FIRE-RESISTIVE JOINT SYSTEMS COMPLY WITH OR DEVIATE FROM REQUIREMENTS.

C. REMOVE AND REPLACE FIRE-RESISTIVE JOINT SYSTEMS WHERE INSPECTIONS INDICATE THAT THEY DO NOT COMPLY WITH SPECIFIED REQUIREMENTS.

D. ADDITIONAL INSPECTING, AT CONTRACTOR'S EXPENSE, WILL BE PERFORMED TO DETERMINE COMPLIANCE OF REPLACED OR ADDITIONAL WORK WITH SPECIFIED REQUIREMENTS.

E. PROCEED WITH ENCLOSING FIRE-RESISTIVE JOINT SYSTEMS WITH OTHER CONSTRUCTION ONLY AFTER INSPECTION REPORTS ARE ISSUED AND FIRE-RESISTIVE JOINT SYSTEMS COMPLY WITH REQUIREMENTS.

3.5 CLEANING AND PROTECTING

A. CLEAN OFF EXCESS FILL MATERIALS ADJACENT TO JOINTS AS WORK PROGRESSES BY METHODS AND WITH CLEANING MATERIALS THAT ARE APPROVED IN WRITING BY FIRE-RESISTIVE JOINT SYSTEM MANUFACTURERS AND THAT DO NOT DAMAGE MATERIALS IN WHICH OPENINGS OCCUR.

B. PROVIDE FINAL PROTECTION AND MAINTAIN CONDITIONS DURING AND AFTER INSTALLATION THAT ENSURE FIRE-RESISTIVE JOINT SYSTEMS ARE WITHOUT DAMAGE OR DETERIORATION AT TIME OF SUBSTANTIAL COMPLETION. IF DAMAGE OR DETERIORATION OCCURS DESPITE SUCH PROTECTION, CUT OUT AND REMOVE DAMAGED OR DETERIORATED FIRE-RESISTIVE JOINT SYSTEMS IMMEDIATELY AND INSTALL NEW MATERIALS TO PRODUCE FIRE-RESISTIVE JOINT SYSTEMS COMPLYING WITH SPECIFIED REQUIREMENTS.

3.6 FIRE-RESISTIVE JOINT SYSTEM SCHEDULE

A. DESIGNATION SYSTEM FOR JOINTS IN OR BETWEEN FIRE-RESISTANCE-RATED CONSTRUCTIONS: ALPHANUMERIC SYSTEMS LISTED IN UL'S "FIRE RESISTANCE DIRECTORY" UNDER PRODUCT CATEGORY XHBN.

B. HEAD-OF-WALL FIRE-RESISTIVE JOINT SYSTEMS:

1. ASSEMBLY RATING: 2 HOURS.
2. MOVEMENT CAPABILITIES: CLASS I - PERCENT COMPRESSION OR EXTENSION.

C. WALL-TO-WALL FIRE-RESISTIVE JOINT SYSTEMS:

1. ASSEMBLY RATING: 2 HOURS.

END OF SECTION

SECTION 07920 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. SUBMITTALS: PRODUCT DATA AND COLOR SAMPLES.

B. ENVIRONMENTAL LIMITATIONS: DO NOT PROCEED WITH INSTALLATION OF JOINT SEALANTS WHEN AMBIENT AND SUBSTRATE TEMPERATURE CONDITIONS ARE OUTSIDE LIMITS PERMITTED BY JOINT SEALANT MANUFACTURER OR ARE BELOW 40 DEG F.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS

A. COMPATIBILITY: PROVIDE JOINT SEALANTS, JOINT FILLERS, AND OTHER RELATED MATERIALS THAT ARE COMPATIBLE WITH ONE ANOTHER AND WITH JOINT SUBSTRATES UNDER SERVICE AND APPLICATION CONDITIONS.

B. SEALANT FOR USE IN BUILDING EXPANSION JOINTS:

1. SINGLE-COMPONENT, NEUTRAL-CURING SILICONE SEALANT, ASTM C 920, TYPE S; GRADE NS; CLASS 25; USES T, M, AND O, WITH THE ADDITIONAL CAPABILITY TO WITHSTAND 50 PERCENT MOVEMENT IN BOTH EXTENSION AND COMPRESSION FOR A TOTAL OF 100 PERCENT MOVEMENT.

C. SEALANT FOR GENERAL EXTERIOR USE WHERE ANOTHER TYPE IS NOT SPECIFIED, ONE OF THE FOLLOWING:

1. SINGLE-COMPONENT, NONSAG POLYSULFIDE SEALANT, ASTM C 920, TYPE S; GRADE NS; CLASS 12-1/2; USES NT, M, G, A, AND O.
2. SINGLE-COMPONENT, NEUTRAL-CURING SILICONE SEALANT, ASTM C 920, TYPE S; GRADE NS; CLASS 25; USES T, NT, M, G, A, AND O.
3. SINGLE-COMPONENT, NONSAG URETHANE SEALANT, ASTM C 920, TYPE S; GRADE NS; CLASS 25; AND USES NT, M, A, AND O.

D. SEALANT FOR EXTERIOR TRAFFIC-BEARING JOINTS, WHERE SLOPE PRECLUDES USE OF POURABLE SEALANT:

1. SINGLE-COMPONENT, NONSAG URETHANE SEALANT, ASTM C 920, TYPE S; GRADE NS; CLASS 25; USES T, NT, M, G, A, AND O.

E. SEALANT FOR EXTERIOR TRAFFIC-BEARING JOINTS, WHERE SLOPE ALLOWS USE OF POURABLE SEALANT:

1. SINGLE-COMPONENT, POURABLE URETHANE SEALANT, ASTM C 920, TYPE S; GRADE P; CLASS 25; USES T, M, G, A, AND O.

F. SEALANT FOR USE IN INTERIOR JOINTS IN CERAMIC TILE AND OTHER HARD SURFACES IN KITCHENS AND TOILET ROOMS AND AROUND PLUMBING FIXTURES:

1. SINGLE-COMPONENT, MILDEW-RESISTANT SILICONE SEALANT, ASTM C 920, TYPE S; GRADE NS; CLASS 25; USES NT, G, A, AND O; FORMULATED WITH FUNGICIDE.

G. SEALANT FOR INTERIOR USE AT PERIMETERS OF DOOR AND WINDOW FRAMES:

1. LATEX SEALANT, SINGLE-COMPONENT, NONSAG, MILDEW-RESISTANT, PAINTABLE, ACRYLIC-EMULSION SEALANT COMPLYING WITH ASTM C 834.

2.2 JOINT-SEALANT BACKING

A. GENERAL: PROVIDE SEALANT BACKINGS OF MATERIAL AND TYPE THAT ARE NONSTAINING; ARE COMPATIBLE WITH JOINT SUBSTRATES, SEALANTS, PRIMERS, AND OTHER JOINT FILLERS; AND ARE APPROVED FOR APPLICATIONS INDICATED BY SEALANT MANUFACTURER.

B. CYLINDRICAL SEALANT BACKINGS: ASTM C 1330, OF SIZE AND DENSITY TO CONTROL SEALANT DEPTH AND OTHERWISE CONTRIBUTE TO PRODUCING OPTIMUM SEALANT PERFORMANCE.

C. BOND-BREAKER TAPE: POLYETHYLENE TAPE OR OTHER PLASTIC TAPE RECOMMENDED BY SEALANT MANUFACTURER FOR PREVENTING SEALANT FROM ADHERING TO RIGID, INFLEXIBLE JOINT-FILLER MATERIALS OR JOINT SURFACES AT BACK OF JOINT.

PART 3 - EXECUTION

3.1 INSTALLATION

A. COMPLY WITH ASTM C 1193.

END OF SECTION

SECTION 08110 - STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. DRAWINGS AND GENERAL PROVISIONS OF THE CONTRACT, INCLUDING GENERAL AND SUPPLEMENTARY CONDITIONS AND DIVISION 1 SPECIFICATION SECTIONS, APPLY TO THIS SECTION.

1.2 SUMMARY

A. SECTION INCLUDES:

1. STANDARD HOLLOW METAL DOORS AND FRAMES.

B. RELATED SECTIONS:

1. DIVISION 4 SECTION "UNIT MASONRY ASSEMBLIES" FOR EMBEDDING ANCHORS FOR HOLLOW METAL WORK INTO MASONRY CONSTRUCTION.
2. DIVISION 8 SECTION "DOOR HARDWARE" FOR DOOR HARDWARE FOR HOLLOW METAL DOORS.
3. DIVISION 9 PAINTING SECTIONS FOR FIELD PAINTING HOLLOW METAL DOORS AND FRAMES.

1.3 DEFINITIONS

A. MINIMUM THICKNESS: MINIMUM THICKNESS OF BASE METAL WITHOUT COATINGS.

B. STANDARD HOLLOW METAL WORK: HOLLOW METAL WORK FABRICATED ACCORDING TO ANSI/SDI A250.8.

1.4 SUBMITTALS: PROVIDE SUBMITTALS IN A TIMELY MANNER IN ACCORDANCE WITH THE APPROVED SUBMITTALS SCHEDULE AS SPECIFIED IN DIVISION 1 – GENERAL REQUIREMENTS.

A. SUBMITTAL: PRODUCT DATA - FOR EACH TYPE OF PRODUCT INDICATED. INCLUDE CONSTRUCTION DETAILS, MATERIAL DESCRIPTIONS, CORE DESCRIPTIONS, FIRE-RESISTANCE RATING, TEMPERATURE-RISE RATINGS, AND FINISHES.

B. SUBMITTAL: SHOP DRAWINGS - INCLUDE THE FOLLOWING:

1. ELEVATIONS OF EACH DOOR DESIGN.
2. DETAILS OF DOORS, INCLUDING VERTICAL AND HORIZONTAL EDGE DETAILS AND METAL THICKNESSES.
3. FRAME DETAILS FOR EACH FRAME TYPE, INCLUDING DIMENSIONED PROFILES AND METAL THICKNESSES.

4. LOCATIONS OF REINFORCEMENT AND PREPARATIONS FOR HARDWARE.
5. DETAILS OF EACH DIFFERENT WALL OPENING CONDITION.
6. DETAILS OF ANCHORAGES, JOINTS, FIELD SPLICES, AND CONNECTIONS.
7. DETAILS OF ACCESSORIES.
8. DETAILS OF MOLDINGS, REMOVABLE STOPS, AND GLAZING.
9. DETAILS OF CONDUIT AND PREPARATIONS FOR POWER, SIGNAL, AND CONTROL SYSTEMS.

1.5 QUALITY ASSURANCE

A. SOURCE LIMITATIONS: OBTAIN HOLLOW METAL WORK FROM SINGLE SOURCE FROM SINGLE MANUFACTURER.

B. FIRE-RATED DOOR ASSEMBLIES: ASSEMBLIES COMPLYING WITH NFPA 80 THAT ARE LISTED AND LABELED BY A QUALIFIED TESTING AGENCY, FOR FIRE-PROTECTION RATINGS INDICATED, BASED ON TESTING AT POSITIVE PRESSURE AS CLOSE TO NEUTRAL PRESSURE AS POSSIBLE ACCORDING TO NFPA 252 OR UL 10B.

C. FIRE-RATED, BORROWED-LIGHT FRAME ASSEMBLIES: ASSEMBLIES COMPLYING WITH NFPA 80 THAT ARE LISTED AND LABELED, BY A TESTING AND INSPECTING AGENCY ACCEPTABLE TO AUTHORITIES HAVING JURISDICTION, FOR FIRE-PROTECTION RATINGS INDICATED, BASED ON TESTING ACCORDING TO NFPA 257 OR UL 9. LABEL EACH INDIVIDUAL GLAZED LITE.

1.6 DELIVERY, STORAGE, AND HANDLING

A. DELIVER HOLLOW METAL WORK PALLETIZED, WRAPPED, OR CRATED TO PROVIDE PROTECTION DURING TRANSIT AND PROJECT-SITE STORAGE. DO NOT USE NONVENTED PLASTIC.

1. PROVIDE ADDITIONAL PROTECTION TO PREVENT DAMAGE TO FINISH OF FACTORY-FINISHED UNITS.

B. DELIVER WELDED FRAMES WITH TWO REMOVABLE SPREADER BARS ACROSS BOTTOM OF FRAMES, TACK WELDED TO JAMBS AND MULLIONS.

C. STORE HOLLOW METAL WORK UNDER COVER AT PROJECT SITE. PLACE IN STACKS OF FIVE UNITS MAXIMUM IN A VERTICAL POSITION WITH HEADS UP, SPACED BY BLOCKING, ON MINIMUM 4-INCH- HIGH WOOD BLOCKING. DO NOT STORE IN A MANNER THAT TRAPS EXCESS HUMIDITY.

1. PROVIDE MINIMUM 1/4-INCH SPACE BETWEEN EACH STACKED DOOR TO PERMIT AIR CIRCULATION.

1.7 PROJECT CONDITIONS

A. FIELD MEASUREMENTS: VERIFY ACTUAL DIMENSIONS OF OPENINGS BY FIELD MEASUREMENTS BEFORE FABRICATION.

1.8 COORDINATION

A. COORDINATE INSTALLATION OF ANCHORAGES FOR HOLLOW METAL FRAMES. FURNISH SETTING DRAWINGS, TEMPLATES, AND DIRECTIONS FOR INSTALLING ANCHORAGES, INCLUDING SLEEVES, CONCRETE INSERTS, ANCHOR BOLTS, AND ITEMS WITH INTEGRAL ANCHORS. DELIVER SUCH ITEMS TO PROJECT SITE IN TIME FOR INSTALLATION.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, AVAILABLE MANUFACTURERS OFFERING PRODUCTS THAT MAY BE INCORPORATED INTO THE WORK INCLUDE, BUT ARE NOT LIMITED TO, THE FOLLOWING:

1. CECO DOOR PRODUCTS; AN ASSA ABLOY GROUP COMPANY.
2. FLEMING DOOR PRODUCTS LTD.; AN ASSA ABLOY GROUP COMPANY.
3. STEELCRAFT; AN INGERSOLL-RAND COMPANY.
4. WINDSOR REPUBLIC DOORS.

2.2 MATERIALS

A. COLD-ROLLED STEEL SHEET: ASTM A 1008/A 1008M, COMMERCIAL STEEL (CS), TYPE B; SUITABLE FOR EXPOSED APPLICATIONS.

B. HOT-ROLLED STEEL SHEET: ASTM A 1011/A 1011M, COMMERCIAL STEEL (CS), TYPE B; FREE OF SCALE, PITTING, OR SURFACE DEFECTS; PICKLED AND OILED.

C. METALLIC-COATED STEEL SHEET: ASTM A 653/A 653M, COMMERCIAL STEEL (CS), TYPE B; WITH MINIMUM A40 METALLIC COATING.

D. FRAME ANCHORS: ASTM A 591/A 591M, COMMERCIAL STEEL (CS), 40Z COATING DESIGNATION; MILL PHOSPHATIZED.

1. FOR ANCHORS BUILT INTO EXTERIOR WALLS, STEEL SHEET COMPLYING WITH ASTM A 1008/A 1008M OR ASTM A 1011/A 1011M, HOT-DIP GALVANIZED ACCORDING TO ASTM A 153/A 153M, CLASS B.

E. INSERTS, BOLTS, AND FASTENERS: HOT-DIP GALVANIZED ACCORDING TO ASTM A 153/A 153M.

F. POWDER-ACTUATED FASTENERS IN CONCRETE: FASTENER SYSTEM OF TYPE SUITABLE FOR APPLICATION INDICATED, FABRICATED FROM CORROSION-RESISTANT MATERIALS, WITH CLIPS OR OTHER ACCESSORY DEVICES FOR ATTACHING HOLLOW METAL FRAMES OF TYPE INDICATED.

G. GROUT: ASTM C 476, EXCEPT WITH A MAXIMUM SLUMP OF 4 INCHES, AS MEASURED ACCORDING TO ASTM C 143/C 143M.

H. MINERAL-FIBER INSULATION: ASTM C 665, TYPE I (BLANKETS WITHOUT MEMBRANE FACING); CONSISTING OF FIBERS MANUFACTURED FROM SLAG OR ROCK WOOL WITH 6- TO 12-LB/CU. FT. DENSITY; WITH MAXIMUM FLAME-SPREAD AND SMOKE-DEVELOPMENT INDEXES OF 25 AND 50, RESPECTIVELY; PASSING ASTM E 136 FOR COMBUSTION CHARACTERISTICS.

I. BITUMINOUS COATING: COLD-APPLIED ASPHALT MASTIC, SSPC-PAINT 12, COMPOUNDED FOR 15-MIL DRY FILM THICKNESS PER COAT. PROVIDE INERT-TYPE NONCORROSIVE COMPOUND FREE OF ASBESTOS FIBERS, SULFUR COMPONENTS, AND OTHER DELETERIOUS IMPURITIES.

2.3 STANDARD HOLLOW METAL DOORS

A. GENERAL: PROVIDE DOORS OF DESIGN INDICATED, NOT LESS THAN THICKNESS INDICATED; FABRICATED WITH SMOOTH SURFACES, WITHOUT VISIBLE JOINTS OR SEAMS ON EXPOSED FACES UNLESS OTHERWISE INDICATED. COMPLY WITH ANSI/SDI A250.8.

1. DESIGN: FLUSH PANEL.
2. CORE CONSTRUCTION: MANUFACTURER'S STANDARD KRAFT-PAPER HONEYCOMB, POLYSTYRENE, POLYURETHANE, POLYISOCYANURATE, MINERAL-BOARD, OR VERTICAL STEEL-STIFFENER CORE.

   a. FIRE DOOR CORE: AS REQUIRED TO PROVIDE FIRE-PROTECTION RATINGS INDICATED.
3. VERTICAL EDGES FOR SINGLE-ACTING DOORS: BEVELED EDGE.

   a. BEVELED EDGE: 1/8 INCH IN 2 INCHES.

4. VERTICAL EDGES FOR DOUBLE-ACTING DOORS: ROUND VERTICAL EDGES WITH 2-1/8-INCH RADIUS.
5. TOP AND BOTTOM EDGES: CLOSED WITH FLUSH OR INVERTED 0.042-INCH- THICK, END CLOSURES OR CHANNELS OF SAME MATERIAL AS FACE SHEETS.
6. TOLERANCES: COMPLY WITH SDI 117, "MANUFACTURING TOLERANCES FOR STANDARD STEEL DOORS AND FRAMES."

B. INTERIOR DOORS: FACE SHEETS FABRICATED FROM COLD-ROLLED STEEL SHEET UNLESS METALLIC-COATED SHEET IS INDICATED. PROVIDE DOORS COMPLYING WITH REQUIREMENTS INDICATED BELOW BY REFERENCING ANSI/SDI A250.8 FOR LEVEL AND MODEL AND ANSI/SDI A250.4 FOR PHYSICAL PERFORMANCE LEVEL:

1. LEVEL 3 AND PHYSICAL PERFORMANCE LEVEL A (EXTRA HEAVY DUTY), MODEL 2 (SEAMLESS).

C. HARDWARE REINFORCEMENT: FABRICATE ACCORDING TO ANSI/SDI A250.6 WITH REINFORCING PLATES FROM SAME MATERIAL AS DOOR FACE SHEETS.

D. FABRICATE CONCEALED STIFFENERS AND HARDWARE REINFORCEMENT FROM EITHER COLD- OR HOT-ROLLED STEEL SHEET.

2.4 STANDARD HOLLOW METAL FRAMES

A. GENERAL: COMPLY WITH ANSI/SDI A250.8 AND WITH DETAILS INDICATED FOR TYPE AND PROFILE.

B. INTERIOR FRAMES: FABRICATED FROM COLD-ROLLED STEEL SHEET UNLESS METALLIC-COATED SHEET IS INDICATED.

1. FABRICATE FRAMES WITH MITERED OR COPED CORNERS.
2. FABRICATE FRAMES AS FULL PROFILE WELDED UNLESS OTHERWISE INDICATED.
3. FRAMES FOR BORROWED LIGHTS: SAME AS ADJACENT DOOR FRAME.

C. HARDWARE REINFORCEMENT: FABRICATE ACCORDING TO ANSI/SDI A250.6 WITH REINFORCEMENT PLATES FROM SAME MATERIAL AS FRAMES.

2.5 FRAME ANCHORS

A. JAMB ANCHORS:

1. MASONRY TYPE: ADJUSTABLE STRAP-AND-STIRRUP OR T-SHAPED ANCHORS TO SUIT FRAME SIZE, NOT LESS THAN 0.042 INCH THICK, WITH CORRUGATED OR PERFORATED STRAPS NOT LESS THAN 2 INCHES WIDE BY 10 INCHES LONG; OR WIRE ANCHORS NOT LESS THAN 0.177 INCH THICK.
2. POSTINSTALLED EXPANSION TYPE FOR IN-PLACE CONCRETE OR MASONRY: MINIMUM 3/8-INCH- DIAMETER BOLTS WITH EXPANSION SHIELDS OR INSERTS. PROVIDE PIPE SPACER FROM FRAME TO WALL, WITH THROAT REINFORCEMENT PLATE, WELDED TO FRAME AT EACH ANCHOR LOCATION.

B. FLOOR ANCHORS: FORMED FROM SAME MATERIAL AS FRAMES, NOT LESS THAN 0.042 INCH THICK, AND AS FOLLOWS:

1. MONOLITHIC CONCRETE SLABS: CLIP-TYPE ANCHORS, WITH TWO HOLES TO RECEIVE FASTENERS.

2.6 STOPS AND MOLDINGS

A. MOLDINGS FOR GLAZED LITES IN DOORS: MINIMUM 0.032 INCH THICK, FABRICATED FROM SAME MATERIAL AS DOOR FACE SHEET IN WHICH THEY ARE INSTALLED.

B. FIXED FRAME MOLDINGS: FORMED INTEGRAL WITH HOLLOW METAL FRAMES, A MINIMUM OF 5/8 INCH HIGH UNLESS OTHERWISE INDICATED.

C. LOOSE STOPS FOR GLAZED LITES IN FRAMES: MINIMUM 0.032 INCH THICK, FABRICATED FROM SAME MATERIAL AS FRAMES IN WHICH THEY ARE INSTALLED.

2.7 FABRICATION

A. FABRICATE HOLLOW METAL WORK TO BE RIGID AND FREE OF DEFECTS, WARP, OR BUCKLE. ACCURATELY FORM METAL TO REQUIRED SIZES AND PROFILES, WITH MINIMUM RADIUS FOR THICKNESS OF METAL. WHERE

PRACTICAL, FIT AND ASSEMBLE UNITS IN MANUFACTURER'S PLANT. TO ENSURE PROPER ASSEMBLY AT PROJECT SITE, CLEARLY IDENTIFY WORK THAT CANNOT BE PERMANENTLY FACTORY ASSEMBLED BEFORE SHIPMENT.

B. TOLERANCES: FABRICATE HOLLOW METAL WORK TO TOLERANCES INDICATED IN SDI 117.

C. HOLLOW METAL DOORS:

1. GLAZED LITES: FACTORY CUT OPENINGS IN DOORS.

D. HOLLOW METAL FRAMES: WHERE FRAMES ARE FABRICATED IN SECTIONS DUE TO SHIPPING OR HANDLING LIMITATIONS, PROVIDE ALIGNMENT PLATES OR ANGLES AT EACH JOINT, FABRICATED OF SAME THICKNESS METAL AS FRAMES.

1. WELDED FRAMES: WELD FLUSH FACE JOINTS CONTINUOUSLY; GRIND, FILL, DRESS, AND MAKE SMOOTH, FLUSH, AND INVISIBLE.
2. PROVIDE COUNTERSUNK, FLAT- OR OVAL-HEAD EXPOSED SCREWS AND BOLTS FOR EXPOSED FASTENERS UNLESS OTHERWISE INDICATED.
3. FLOOR ANCHORS: WELD ANCHORS TO BOTTOM OF JAMBS AND MULLIONS WITH AT LEAST FOUR SPOT WELDS PER ANCHOR.
4. JAMB ANCHORS: PROVIDE NUMBER AND SPACING OF ANCHORS AS FOLLOWS:

a. MASONRY TYPE: LOCATE ANCHORS NOT MORE THAN 18 INCHES FROM TOP AND BOTTOM OF FRAME. SPACE ANCHORS NOT MORE THAN 32 INCHES O.C. AND AS FOLLOWS:

a) Two anchors per jamb up to 60 INCHES high.
b) Three anchors per jamb from 60 TO 90 INCHES high.
c) Four anchors per jamb from 90 TO 120 INCHES high.
d) Four anchors per jamb plus 1 additional anchor per jamb for each 24 INCHES or fraction thereof above 120 INCHES high.

b. POSTINSTALLED EXPANSION TYPE: LOCATE ANCHORS NOT MORE THAN 6 INCHES FROM TOP AND BOTTOM OF FRAME. SPACE ANCHORS NOT MORE THAN 26 INCHES O.C.

5. DOOR SILENCERS: EXCEPT ON WEATHER-STRIPPED DOORS, DRILL STOPS TO RECEIVE DOOR SILENCERS AS FOLLOWS. KEEP HOLES CLEAR DURING CONSTRUCTION.

a. SINGLE-DOOR FRAMES: DRILL STOP IN STRIKE JAMB TO RECEIVE THREE DOOR SILENCERS.
b. DOUBLE-DOOR FRAMES: DRILL STOP IN HEAD JAMB TO RECEIVE TWO DOOR SILENCERS.

E. FABRICATE CONCEALED STIFFENERS, EDGE CHANNELS, AND HARDWARE REINFORCEMENT FROM EITHER COLD- OR HOT-ROLLED STEEL SHEET.

F. HARDWARE PREPARATION: FACTORY PREPARE HOLLOW METAL WORK TO RECEIVE TEMPLATED MORTISED HARDWARE; INCLUDE CUTOUTS, REINFORCEMENT, MORTISING, DRILLING, AND TAPPING ACCORDING TO THE

DOOR HARDWARE SCHEDULE AND TEMPLATES FURNISHED AS SPECIFIED IN DIVISION 8 SECTION "DOOR HARDWARE."

1. LOCATE HARDWARE AS INDICATED, OR IF NOT INDICATED, ACCORDING TO ANSI/SDI A250.8.
2. REINFORCE DOORS AND FRAMES TO RECEIVE NONTEMPLATED, MORTISED AND SURFACE-MOUNTED DOOR HARDWARE.
3. COMPLY WITH APPLICABLE REQUIREMENTS IN ANSI/SDI A250.6 AND ANSI/DHI A115 SERIES SPECIFICATIONS FOR PREPARATION OF HOLLOW METAL WORK FOR HARDWARE.
4. COORDINATE LOCATIONS OF CONDUIT AND WIRING BOXES FOR ELECTRICAL CONNECTIONS WITH DIVISION 16 SECTIONS.

G. STOPS AND MOLDINGS: PROVIDE STOPS AND MOLDINGS AROUND GLAZED LITES WHERE INDICATED. FORM CORNERS OF STOPS AND MOLDINGS WITH BUTTED OR MITERED HAIRLINE JOINTS.

1. SINGLE GLAZED LITES: PROVIDE FIXED STOPS AND MOLDINGS WELDED ON SECURE SIDE OF HOLLOW METAL WORK.
2. MULTIPLE GLAZED LITES: PROVIDE FIXED AND REMOVABLE STOPS AND MOLDINGS SO THAT EACH GLAZED LITE IS CAPABLE OF BEING REMOVED INDEPENDENTLY.
3. PROVIDE FIXED FRAME MOLDINGS ON OUTSIDE OF EXTERIOR AND ON SECURE SIDE OF INTERIOR DOORS AND FRAMES.
4. PROVIDE LOOSE STOPS AND MOLDINGS ON INSIDE OF HOLLOW METAL WORK.
5. COORDINATE RABBET WIDTH BETWEEN FIXED AND REMOVABLE STOPS WITH TYPE OF GLAZING AND TYPE OF INSTALLATION INDICATED.

2.8 STEEL FINISHES

A. PRIME FINISH: APPLY MANUFACTURER'S STANDARD PRIMER IMMEDIATELY AFTER CLEANING AND PRETREATING.

1. SHOP PRIMER: MANUFACTURER'S STANDARD, FAST-CURING, LEAD- AND CHROMATE-FREE PRIMER COMPLYING WITH ANSI/SDI A250.10 ACCEPTANCE CRITERIA; RECOMMENDED BY PRIMER MANUFACTURER FOR SUBSTRATE; COMPATIBLE WITH SUBSTRATE AND FIELD-APPLIED COATINGS DESPITE PROLONGED EXPOSURE.

PART 3 - EXECUTION

3.1 EXAMINATION

A. EXAMINE SUBSTRATES, AREAS, AND CONDITIONS, WITH INSTALLER PRESENT, FOR COMPLIANCE WITH REQUIREMENTS FOR INSTALLATION TOLERANCES AND OTHER CONDITIONS AFFECTING PERFORMANCE OF THE WORK.

B. EXAMINE ROUGHING-IN FOR EMBEDDED AND BUILT-IN ANCHORS TO VERIFY ACTUAL LOCATIONS BEFORE FRAME INSTALLATION.

C. FOR THE RECORD, PREPARE WRITTEN REPORT, ENDORSED BY INSTALLER, LISTING CONDITIONS DETRIMENTAL TO PERFORMANCE OF THE WORK.

D. PROCEED WITH INSTALLATION ONLY AFTER UNSATISFACTORY CONDITIONS HAVE BEEN CORRECTED.

3.2 PREPARATION

A. REMOVE WELDED-IN SHIPPING SPREADERS INSTALLED AT FACTORY. RESTORE EXPOSED FINISH BY GRINDING, FILLING, AND DRESSING, AS REQUIRED TO MAKE REPAIRED AREA SMOOTH, FLUSH, AND INVISIBLE ON EXPOSED FACES.

B. PRIOR TO INSTALLATION, ADJUST AND SECURELY BRACE WELDED HOLLOW METAL FRAMES FOR SQUARENESS, ALIGNMENT, TWIST, AND PLUMBNESS TO THE FOLLOWING TOLERANCES:

1. SQUARENESS: PLUS OR MINUS 1/16 INCH, MEASURED AT DOOR RABBET ON A LINE 90 DEGREES FROM JAMB PERPENDICULAR TO FRAME HEAD.
2. ALIGNMENT: PLUS OR MINUS 1/16 INCH, MEASURED AT JAMBS ON A HORIZONTAL LINE PARALLEL TO PLANE OF WALL.
3. TWIST: PLUS OR MINUS 1/16 INCH, MEASURED AT OPPOSITE FACE CORNERS OF JAMBS ON PARALLEL LINES, AND PERPENDICULAR TO PLANE OF WALL.
4. PLUMBNESS: PLUS OR MINUS 1/16 INCH, MEASURED AT JAMBS ON A PERPENDICULAR LINE FROM HEAD TO FLOOR.

C. DRILL AND TAP DOORS AND FRAMES TO RECEIVE NONTEMPLATED, MORTISED, AND SURFACE-MOUNTED DOOR HARDWARE.

3.3 INSTALLATION

A. GENERAL: INSTALL HOLLOW METAL WORK PLUMB, RIGID, PROPERLY ALIGNED, AND SECURELY FASTENED IN PLACE; COMPLY WITH DRAWINGS AND MANUFACTURER'S WRITTEN INSTRUCTIONS.

B. HOLLOW METAL FRAMES: INSTALL HOLLOW METAL FRAMES OF SIZE AND PROFILE INDICATED. COMPLY WITH ANSI/SDI A250.11.

1. SET FRAMES ACCURATELY IN POSITION, PLUMBED, ALIGNED, AND BRACED SECURELY UNTIL PERMANENT ANCHORS ARE SET. AFTER WALL CONSTRUCTION IS COMPLETE, REMOVE TEMPORARY BRACES, LEAVING SURFACES SMOOTH AND UNDAMAGED.

    a. AT FIRE-PROTECTION-RATED OPENINGS, INSTALL FRAMES ACCORDING TO NFPA 80.
    b. WHERE FRAMES ARE FABRICATED IN SECTIONS BECAUSE OF SHIPPING OR HANDLING LIMITATIONS, FIELD SPLICE AT APPROVED LOCATIONS BY WELDING FACE JOINT CONTINUOUSLY; GRIND, FILL, DRESS, AND MAKE SPLICE SMOOTH, FLUSH, AND INVISIBLE ON EXPOSED FACES.
    c. INSTALL FRAMES WITH REMOVABLE GLAZING STOPS LOCATED ON SECURE SIDE OF OPENING.
    d. INSTALL DOOR SILENCERS IN FRAMES BEFORE GROUTING.
    e. REMOVE TEMPORARY BRACES NECESSARY FOR INSTALLATION ONLY AFTER FRAMES HAVE BEEN PROPERLY SET AND SECURED.
    f. CHECK PLUMBNESS, SQUARENESS, AND TWIST OF FRAMES AS WALLS ARE CONSTRUCTED. SHIM AS NECESSARY TO COMPLY WITH INSTALLATION TOLERANCES.

g. FIELD APPLY BITUMINOUS COATING TO BACKS OF FRAMES THAT ARE FILLED WITH GROUT CONTAINING ANTIFREEZING AGENTS.

2. FLOOR ANCHORS: PROVIDE FLOOR ANCHORS FOR EACH JAMB AND MULLION THAT EXTENDS TO FLOOR, AND SECURE WITH POSTINSTALLED EXPANSION ANCHORS.

a. FLOOR ANCHORS MAY BE SET WITH POWDER-ACTUATED FASTENERS INSTEAD OF POSTINSTALLED EXPANSION ANCHORS IF SO INDICATED AND APPROVED ON SHOP DRAWINGS.

3. MASONRY WALLS: COORDINATE INSTALLATION OF FRAMES TO ALLOW FOR SOLIDLY FILLING SPACE BETWEEN FRAMES AND MASONRY WITH GROUT.
4. IN-PLACE CONCRETE OR MASONRY CONSTRUCTION: SECURE FRAMES IN PLACE WITH POSTINSTALLED EXPANSION ANCHORS. COUNTERSINK ANCHORS, AND FILL AND MAKE SMOOTH, FLUSH, AND INVISIBLE ON EXPOSED FACES.
5. INSTALLATION TOLERANCES: ADJUST HOLLOW METAL DOOR FRAMES FOR SQUARENESS, ALIGNMENT, TWIST, AND PLUMB TO THE FOLLOWING TOLERANCES:

a. SQUARENESS: PLUS OR MINUS 1/16 INCH, MEASURED AT DOOR RABBET ON A LINE 90 DEGREES FROM JAMB PERPENDICULAR TO FRAME HEAD.
b. ALIGNMENT: PLUS OR MINUS 1/16 INCH, MEASURED AT JAMBS ON A HORIZONTAL LINE PARALLEL TO PLANE OF WALL.
c. TWIST: PLUS OR MINUS 1/16 INCH, MEASURED AT OPPOSITE FACE CORNERS OF JAMBS ON PARALLEL LINES, AND PERPENDICULAR TO PLANE OF WALL.
d. PLUMBNESS: PLUS OR MINUS 1/16 INCH, MEASURED AT JAMBS AT FLOOR.

C. HOLLOW METAL DOORS: FIT HOLLOW METAL DOORS ACCURATELY IN FRAMES, WITHIN CLEARANCES SPECIFIED BELOW. SHIM AS NECESSARY.

1. NON-FIRE-RATED STANDARD STEEL DOORS:

a. JAMBS AND HEAD: 1/8 INCH PLUS OR MINUS 1/16 INCH.
b. BETWEEN EDGES OF PAIRS OF DOORS: 1/8 INCH PLUS OR MINUS 1/16 INCH.
c. BETWEEN BOTTOM OF DOOR AND TOP OF THRESHOLD: MAXIMUM 3/8 INCH.
d. BETWEEN BOTTOM OF DOOR AND TOP OF FINISH FLOOR (NO THRESHOLD): MAXIMUM 3/4 INCH.

2. FIRE-RATED DOORS: INSTALL DOORS WITH CLEARANCES ACCORDING TO NFPA 80.

D. GLAZING: COMPLY WITH INSTALLATION REQUIREMENTS IN DIVISION 8 SECTION "GLAZING" AND WITH HOLLOW METAL MANUFACTURER'S WRITTEN INSTRUCTIONS.

1. SECURE STOPS WITH COUNTERSUNK FLAT- OR OVAL-HEAD MACHINE SCREWS SPACED UNIFORMLY NOT MORE THAN 9 INCHES O.C. AND NOT MORE THAN 2 INCHES O.C. FROM EACH CORNER.

3.4 ADJUSTING AND CLEANING

A. FINAL ADJUSTMENTS: CHECK AND READJUST OPERATING HARDWARE ITEMS IMMEDIATELY BEFORE FINAL INSPECTION. LEAVE WORK IN COMPLETE AND PROPER OPERATING CONDITION. REMOVE AND REPLACE DEFECTIVE WORK, INCLUDING HOLLOW METAL WORK THAT IS WARPED, BOWED, OR OTHERWISE UNACCEPTABLE.

B. REMOVE GROUT AND OTHER BONDING MATERIAL FROM HOLLOW METAL WORK IMMEDIATELY AFTER INSTALLATION.

C. PRIME-COAT TOUCHUP: IMMEDIATELY AFTER ERECTION, SAND SMOOTH RUSTED OR DAMAGED AREAS OF PRIME COAT AND APPLY TOUCHUP OF COMPATIBLE AIR-DRYING, RUST-INHIBITIVE PRIMER.

D. METALLIC-COATED SURFACES: CLEAN ABRADED AREAS AND REPAIR WITH GALVANIZING REPAIR PAINT ACCORDING TO MANUFACTURER'S WRITTEN INSTRUCTIONS.

END OF SECTION

SECTION 08710 - DOOR HARDWARE

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. ALLOWANCES: PROVIDE HARDWARE UNDER HARDWARE ALLOWANCE IN DIVISION 1 SECTION "PRICE AND PAYMENT PROCEDURES."

B. SUBMITTALS: HARDWARE SCHEDULE AND KEYING SCHEDULE.

C. DELIVER KEYS TO OWNER.

D. FIRE-RESISTANCE-RATED ASSEMBLIES: PROVIDE PRODUCTS THAT COMPLY WITH NFPA 80 AND ARE LISTED AND LABELED BY A TESTING AND INSPECTING AGENCY ACCEPTABLE TO AUTHORITIES HAVING JURISDICTION FOR APPLICATIONS INDICATED. ON EXIT DEVICES PROVIDE LABEL INDICATING "FIRE EXIT HARDWARE."

PART 2 - PRODUCTS

2.1 HARDWARE

A. HINGES:

1. STAINLESS-STEEL HINGES WITH STAINLESS-STEEL PINS FOR EXTERIOR.
2. NONREMOVABLE HINGE PINS FOR EXTERIOR AND PUBLIC INTERIOR EXPOSURE.
3. BALL-BEARING HINGES FOR DOORS WITH CLOSERS AND ENTRY DOORS.
4. 3 HINGES FOR 1-3/4-INCH-THICK DOORS 90-INCHES OR LESS IN HEIGHT; 4 HINGES FOR DOORS MORE THAN 90-INCHES IN HEIGHT.
5. 2 HINGES FOR 1-3/4-INCH-THICK DOORS 48-INCHES OR LESS IN HEIGHT.

B. LOCKSETS AND LATCHSETS:

1. BHMA A156.2, SERIES 4000, GRADE 1 FOR BORED LOCKS AND LATCHES.
2. BHMA A156.3, GRADE 1 FOR EXIT DEVICES.
3. BHMA A156.5, GRADE 1 FOR AUXILIARY LOCKS.
4. BHMA A156.12, SERIES 5000, GRADE 1] FOR INTERCONNECTED LOCKS AND LATCHES.
5. BHMA A156.13, SERIES 1000, GRADE 1 FOR MORTISE LOCKS AND LATCHES.
6. LEVER HANDLES ON LOCKSETS AND LATCHSETS.
7. PROVIDE TRIM ON EXIT DEVICES MATCHING LOCKSETS.
8. MANUFACTURERS:

   a. BEST ACCESS SYSTEMS; DIV. OF THE STANLEY WORKS (BAS).

C. KEY LOCKS TO OWNER’S EXISTING MASTER-KEY SYSTEM.

1. CYLINDERS WITH SIX-PIN TUMBLERS AND REMOVABLE CORES.
2. PROVIDE CONSTRUCTION KEYING.

D. CLOSERS:

1. MOUNT CLOSERS ON INTERIOR SIDE (ROOM SIDE) OF DOOR OPENING. PROVIDE REGULAR-ARM, PARALLEL-ARM, OR TOP-JAMB-MOUNTED CLOSERS AS NECESSARY.
2. ADJUSTABLE DELAYED OPENING (ACCESSIBLE TO PEOPLE WITH DISABILITIES) FEATURE ON CLOSERS.

E. PROVIDE WALL STOPS OR FLOOR STOPS FOR DOORS WITHOUT CLOSERS.

F. PROVIDE HARDWARE FINISHES AS FOLLOWS:

1. HINGES: MATCHING FINISH OF LOCKSET/LATCHSET.
2. LOCKSETS, LATCHSETS, AND EXIT DEVICES: SATIN CHROME PLATED.
3. CLOSERS: MATCHING FINISH OF LOCKSET/LATCHSET.
4. OTHER HARDWARE: MATCHING FINISH OF LOCKSET/LATCHSET.

PART 3 - EXECUTION

3.1 INSTALLATION

A. MOUNT HARDWARE IN LOCATIONS RECOMMENDED BY THE DOOR AND HARDWARE INSTITUTE UNLESS OTHERWISE INDICATED.

3.2 HARDWARE SCHEDULE

A. HARDWARE SET NO. 1:

1. HINGES.
2. BORED STORE ROOM OR CLOSET LOCK (F86).
3. PAIR SELF-LATCHING FLUSH BOLTS WITH DUSTPROOF STRIKE.
4. TWO CLOSERS.
5. COORDINATOR.
6. ASTRAGAL.
7. FOUR KICK PLATES.
8. SILENCERS.

B. HARDWARE SET NO. 2

1. HINGES.
2. FIRE EXIT RIM DEVICE.
3. CLOSER.
4. SILENCERS.

C. HARDWARE SET NO. 3:

1. HINGES.
2. BORED STORE ROOM OR CLOSET LOCK (F86).
3. LATCH GUARD.
4. PAIR SELF-LATCHING FLUSH BOLTS WITH DUSTPROOF STRIKE.
5. TWO CLOSERS WITH HOLD OPEN.
6. COORDINATOR.
7. ASTRAGAL.
8. WEATHER STRIPPING.
9. SILENCERS.

END OF SECTION

SECTION 08800 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. DRAWINGS AND GENERAL PROVISIONS OF THE CONTRACT, INCLUDING GENERAL AND SUPPLEMENTARY CONDITIONS AND DIVISION 1 SPECIFICATION SECTIONS, APPLY TO THIS SECTION.

1.2 SUMMARY

A. THIS SECTION INCLUDES GLAZING FOR THE FOLLOWING PRODUCTS AND APPLICATIONS, INCLUDING THOSE SPECIFIED IN OTHER SECTIONS WHERE GLAZING REQUIREMENTS ARE SPECIFIED BY REFERENCE TO THIS SECTION:

1. DOORS.
2. INTERIOR BORROWED LITES.

B. RELATED SECTIONS INCLUDE THE FOLLOWING:

1. DIVISION 8 SECTION "PLASTIC GLAZING" FOR ACRYLIC AND POLYCARBONATE GLAZING IN THE FORM OF MONOLITHIC AND DOUBLE-WALLED STRUCTURED SHEETS.

1.3 DEFINITIONS

A. MANUFACTURERS OF GLASS PRODUCTS: FIRMS THAT PRODUCE PRIMARY GLASS, FABRICATED GLASS, OR BOTH, AS DEFINED IN REFERENCED GLAZING PUBLICATIONS.

B. GLASS THICKNESSES: INDICATED BY THICKNESS DESIGNATIONS IN MILLIMETERS ACCORDING TO ASTM C 1036.

1.4 PERFORMANCE REQUIREMENTS

A. GENERAL: PROVIDE GLAZING SYSTEMS CAPABLE OF WITHSTANDING NORMAL THERMAL MOVEMENT AND WIND AND IMPACT LOADS (WHERE APPLICABLE) WITHOUT FAILURE, INCLUDING LOSS OR GLASS BREAKAGE ATTRIBUTABLE TO THE FOLLOWING: DEFECTIVE MANUFACTURE, FABRICATION, AND INSTALLATION; FAILURE OF SEALANTS OR GASKETS TO REMAIN WATERTIGHT AND AIRTIGHT; DETERIORATION OF GLAZING MATERIALS; OR OTHER DEFECTS IN CONSTRUCTION.

B. GLASS DESIGN: GLASS THICKNESS DESIGNATIONS INDICATED ARE MINIMUMS AND ARE FOR DETAILING ONLY. CONFIRM GLASS THICKNESSES BY ANALYZING PROJECT LOADS AND IN-SERVICE CONDITIONS. PROVIDE GLASS LITES IN THE THICKNESS DESIGNATIONS INDICATED FOR VARIOUS SIZE OPENINGS, BUT NOT LESS THAN THICKNESSES AND IN STRENGTHS (ANNEALED OR HEAT TREATED) REQUIRED TO MEET OR EXCEED THE FOLLOWING CRITERIA:

1. GLASS THICKNESSES: SELECT MINIMUM GLASS THICKNESSES TO COMPLY WITH ASTM E 1300, ACCORDING TO THE FOLLOWING REQUIREMENTS:

   a. SPECIFIED DESIGN WIND LOADS: 90 MPH, BUT NOT LESS THAN WIND LOADS APPLICABLE TO PROJECT AS REQUIRED BY ASCE 7 "MINIMUM DESIGN LOADS FOR BUILDINGS AND OTHER STRUCTURES": SECTION 6.0 "WIND LOADS."
   b. MINIMUM GLASS THICKNESS FOR EXTERIOR LITES: NOT LESS THAN 6.0 MM.

C. THERMAL MOVEMENTS: PROVIDE GLAZING THAT ALLOWS FOR THERMAL MOVEMENTS RESULTING FROM THE FOLLOWING MAXIMUM CHANGE (RANGE) IN AMBIENT AND SURFACE TEMPERATURES ACTING ON GLASS FRAMING MEMBERS AND GLAZING COMPONENTS. BASE ENGINEERING CALCULATION ON SURFACE TEMPERATURES OF MATERIALS DUE TO BOTH SOLAR HEAT GAIN AND NIGHTTIME-SKY HEAT LOSS.

   1. TEMPERATURE CHANGE (RANGE): 120 DEG F, AMBIENT; 180 DEG F, MATERIAL SURFACES.

1.5 SUBMITTALS: PROVIDE SUBMITTALS IN A TIMELY MANNER IN ACCORDANCE WITH THE APPROVED SUBMITTALS SCHEDULE AS SPECIFIED IN DIVISION 1 – GENERAL REQUIREMENTS.

A. SUBMITTAL: PRODUCT DATA - FOR EACH GLASS PRODUCT AND GLAZING MATERIAL INDICATED.

B. SUBMITTAL: SAMPLES - FOR THE FOLLOWING PRODUCTS, IN THE FORM OF 12-INCH- SQUARE SAMPLES FOR GLASS.

   1. FIRE-RESISTIVE GLAZING PRODUCTS.

C. SUBMITTAL: GLAZING SCHEDULE - USE SAME DESIGNATIONS INDICATED ON DRAWINGS FOR GLAZED OPENINGS IN PREPARING A SCHEDULE LISTING GLASS TYPES AND THICKNESSES FOR EACH SIZE OPENING AND LOCATION.

1.6 QUALITY ASSURANCE

A. INSTALLER QUALIFICATIONS: AN EXPERIENCED INSTALLER WHO HAS COMPLETED GLAZING SIMILAR IN MATERIAL, DESIGN, AND EXTENT TO THAT INDICATED FOR THIS PROJECT; WHOSE WORK HAS RESULTED IN GLASS INSTALLATIONS WITH A RECORD OF SUCCESSFUL IN-SERVICE PERFORMANCE; AND WHO EMPLOYS GLASS INSTALLERS FOR THIS PROJECT WHO ARE CERTIFIED UNDER THE NATIONAL GLASS ASSOCIATION'S CERTIFIED GLASS INSTALLER PROGRAM.

B. SOURCE LIMITATIONS FOR GLAZING ACCESSORIES: OBTAIN GLAZING ACCESSORIES THROUGH ONE SOURCE FROM A SINGLE MANUFACTURER FOR EACH PRODUCT AND INSTALLATION METHOD INDICATED.

C. GLAZING FOR FIRE-RATED DOOR ASSEMBLIES: GLAZING FOR ASSEMBLIES THAT COMPLY WITH NFPA 80 AND THAT ARE LISTED AND LABELED BY A TESTING AND INSPECTING AGENCY ACCEPTABLE TO AUTHORITIES HAVING JURISDICTION, FOR FIRE-PROTECTION RATINGS INDICATED, BASED ON TESTING ACCORDING TO NFPA 252.

D. SAFETY GLAZING PRODUCTS: COMPLY WITH TESTING REQUIREMENTS IN 16 CFR 1201.

1. SUBJECT TO COMPLIANCE WITH REQUIREMENTS, OBTAIN SAFETY GLAZING PRODUCTS PERMANENTLY MARKED WITH CERTIFICATION LABEL OF THE SAFETY GLAZING CERTIFICATION COUNCIL OR ANOTHER CERTIFICATION AGENCY OR MANUFACTURER ACCEPTABLE TO AUTHORITIES HAVING JURISDICTION.
2. WHERE GLAZING UNITS, INCLUDING KIND FT GLASS AND LAMINATED GLASS, ARE SPECIFIED IN PART 2 ARTICLES FOR GLAZING LITES MORE THAN 9 SQ. FT. IN EXPOSED SURFACE AREA OF ONE SIDE, PROVIDE GLAZING PRODUCTS THAT COMPLY WITH CATEGORY II MATERIALS, FOR LITES 9 SQ. FT. OR LESS IN EXPOSED SURFACE AREA OF ONE SIDE, PROVIDE GLAZING PRODUCTS THAT COMPLY WITH CATEGORY I OR II MATERIALS, EXCEPT FOR HAZARDOUS LOCATIONS WHERE CATEGORY II MATERIALS ARE REQUIRED BY 16 CFR 1201 AND REGULATIONS OF AUTHORITIES HAVING JURISDICTION.

E. GLAZING PUBLICATIONS: COMPLY WITH PUBLISHED RECOMMENDATIONS OF GLASS PRODUCT MANUFACTURERS AND ORGANIZATIONS BELOW, UNLESS MORE STRINGENT REQUIREMENTS ARE INDICATED. REFER TO THESE PUBLICATIONS FOR GLAZING TERMS NOT OTHERWISE DEFINED IN THIS SECTION OR IN REFERENCED STANDARDS.

1. GANA PUBLICATIONS: GANA'S "GLAZING MANUAL."

1.7 DELIVERY, STORAGE, AND HANDLING

A. PROTECT GLAZING MATERIALS ACCORDING TO MANUFACTURER'S WRITTEN INSTRUCTIONS AND AS NEEDED TO PREVENT DAMAGE TO GLASS AND GLAZING MATERIALS FROM CONDENSATION, TEMPERATURE CHANGES, DIRECT EXPOSURE TO SUN, OR OTHER CAUSES.

1.8 PROJECT CONDITIONS

A. ENVIRONMENTAL LIMITATIONS: DO NOT PROCEED WITH GLAZING WHEN AMBIENT AND SUBSTRATE TEMPERATURE CONDITIONS ARE OUTSIDE LIMITS PERMITTED BY GLAZING MATERIAL MANUFACTURERS AND WHEN GLAZING CHANNEL SUBSTRATES ARE WET FROM RAIN, FROST, CONDENSATION, OR OTHER CAUSES.

1. DO NOT INSTALL LIQUID GLAZING SEALANTS WHEN AMBIENT AND SUBSTRATE TEMPERATURE CONDITIONS ARE OUTSIDE LIMITS PERMITTED BY GLAZING SEALANT MANUFACTURER OR BELOW 40 DEG F.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. IN OTHER PART 2 ARTICLES WHERE TITLES BELOW INTRODUCE LISTS, THE FOLLOWING REQUIREMENTS APPLY TO PRODUCT SELECTION:

1. PRODUCT: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCT SPECIFIED.

2.2 GLASS PRODUCTS

A. ANNEALED FLOAT GLASS: ASTM C 1036, TYPE I (TRANSPARENT FLAT GLASS), QUALITY-Q3; OF CLASS INDICATED.

B. HEAT-TREATED FLOAT GLASS: ASTM C 1048; TYPE I (TRANSPARENT FLAT GLASS); QUALITY-Q3; OF CLASS, KIND, AND CONDITION INDICATED.

1. FABRICATION PROCESS: BY HORIZONTAL (ROLLER-HEARTH) PROCESS WITH ROLL-WAVE DISTORTION PARALLEL TO BOTTOM EDGE OF GLASS AS INSTALLED, UNLESS OTHERWISE INDICATED.
2. FOR UNCOATED GLASS, COMPLY WITH REQUIREMENTS FOR CONDITION A.
3. FOR COATED VISION GLASS, COMPLY WITH REQUIREMENTS FOR CONDITION C (OTHER UNCOATED GLASS).
4. PROVIDE KIND FT (FULLY TEMPERED) FLOAT GLASS IN PLACE OF ANNEALED OR KIND HS (HEAT-STRENGTHENED) FLOAT GLASS WHERE SAFETY GLASS IS INDICATED.

2.3 FIRE-RATED GLAZING PRODUCTS

A. GEL-FILLED, DUAL-GLAZED UNITS: PROPRIETARY CATEGORY II SAFETY GLAZING PRODUCT IN THE FORM OF TWO LITES OF CONDITION A (UNCOATED SURFACES), TYPE I (TRANSPARENT FLAT GLASS), CLASS 1 (CLEAR), KIND FT (FULLY TEMPERED) FLOAT GLASS; WITH A PERIMETER METAL SPACER SEPARATING LITES AND DUAL-EDGE SEAL ENCLOSING A CAVITY COMPLETELY FILLED WITH CLEAR, FULLY TRANSPARENT, HEAT-ABSORBING GEL.

1. FIRE-PROTECTION RATING: 60 MINUTES, AND PERMANENTLY LABELED BY A TESTING AND INSPECTING AGENCY ACCEPTABLE TO AUTHORITIES HAVING JURISDICTION.
2. PRODUCT: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, "SUPERLITE II -60” BY SAFTI; A DIVISION OF O'KEEFFE'S INC.

2.4 GLAZING GASKETS

A. SOFT COMPRESSION GASKETS: EXTRUDED OR MOLDED, CLOSED-CELL, INTEGRAL-SKINNED GASKETS OF MATERIAL INDICATED BELOW; COMPLYING WITH ASTM C 509, TYPE II, BLACK; AND OF PROFILE AND HARDNESS REQUIRED TO MAINTAIN WATERTIGHT SEAL:

1. EPDM.
2. SILICONE.
3. THERMOPLASTIC POLYOLEFIN RUBBER.
4. ANY MATERIAL INDICATED ABOVE.

2.5 MISCELLANEOUS GLAZING MATERIALS

A. GENERAL: PROVIDE PRODUCTS OF MATERIAL, SIZE, AND SHAPE COMPLYING WITH REFERENCED GLAZING STANDARD, REQUIREMENTS OF MANUFACTURERS OF GLASS AND OTHER GLAZING MATERIALS FOR APPLICATION INDICATED, AND WITH A PROVEN RECORD OF COMPATIBILITY WITH SURFACES CONTACTED IN INSTALLATION.

B. CLEANERS, PRIMERS, AND SEALERS: TYPES RECOMMENDED BY SEALANT OR GASKET MANUFACTURER.

C. SETTING BLOCKS: ELASTOMERIC MATERIAL WITH A SHORE, TYPE A DUROMETER HARDNESS OF 85, PLUS OR MINUS 5.

D. SPACERS: ELASTOMERIC BLOCKS OR CONTINUOUS EXTRUSIONS WITH A SHORE, TYPE A DUROMETER HARDNESS REQUIRED BY GLASS MANUFACTURER TO MAINTAIN GLASS LITES IN PLACE FOR INSTALLATION INDICATED.

E. EDGE BLOCKS: ELASTOMERIC MATERIAL OF HARDNESS NEEDED TO LIMIT GLASS LATERAL MOVEMENT (SIDE WALKING).

F. CYLINDRICAL GLAZING SEALANT BACKING: ASTM C 1330, TYPE O (OPEN-CELL MATERIAL), OF SIZE AND DENSITY TO CONTROL GLAZING SEALANT DEPTH AND OTHERWISE PRODUCE OPTIMUM GLAZING SEALANT PERFORMANCE.

G. PERIMETER INSULATION FOR FIRE-RESISTIVE GLAZING: IDENTICAL TO PRODUCT USED IN TEST ASSEMBLY TO OBTAIN FIRE-RESISTANCE RATING.

2.6 FABRICATION OF GLAZING UNITS

A. FABRICATE GLAZING UNITS IN SIZES REQUIRED TO GLAZE OPENINGS INDICATED FOR PROJECT, WITH EDGE AND FACE CLEARANCES, EDGE AND SURFACE CONDITIONS, AND BITE COMPLYING WITH WRITTEN INSTRUCTIONS OF PRODUCT MANUFACTURER AND REFERENCED GLAZING PUBLICATIONS, TO COMPLY WITH SYSTEM PERFORMANCE REQUIREMENTS.

PART 3 - EXECUTION

3.1 EXAMINATION

A. EXAMINE FRAMING GLAZING, WITH INSTALLER PRESENT, FOR COMPLIANCE WITH THE FOLLOWING:

1. MANUFACTURING AND INSTALLATION TOLERANCES, INCLUDING THOSE FOR SIZE, SQUARENESS, AND OFFSETS AT CORNERS.
2. PRESENCE AND FUNCTIONING OF WEEP SYSTEM.
3. MINIMUM REQUIRED FACE OR EDGE CLEARANCES.
4. EFFECTIVE SEALING BETWEEN JOINTS OF GLASS-FRAMING MEMBERS.

B. PROCEED WITH INSTALLATION ONLY AFTER UNSATISFACTORY CONDITIONS HAVE BEEN CORRECTED.

3.2 PREPARATION

A. CLEAN GLAZING CHANNELS AND OTHER FRAMING MEMBERS RECEIVING GLASS IMMEDIATELY BEFORE GLAZING. REMOVE COATINGS NOT FIRMLY BONDED TO SUBSTRATES.

3.3 GLAZING, GENERAL

A. COMPLY WITH COMBINED WRITTEN INSTRUCTIONS OF MANUFACTURERS OF GLASS, SEALANTS, GASKETS, AND OTHER GLAZING MATERIALS, UNLESS MORE STRINGENT REQUIREMENTS ARE INDICATED, INCLUDING THOSE IN REFERENCED GLAZING PUBLICATIONS.

B. GLAZING CHANNEL DIMENSIONS, AS INDICATED ON DRAWINGS, PROVIDE NECESSARY BITE ON GLASS, MINIMUM EDGE AND FACE CLEARANCES, AND ADEQUATE SEALANT THICKNESSES, WITH REASONABLE TOLERANCES. ADJUST AS REQUIRED BY PROJECT CONDITIONS DURING INSTALLATION.

C. PROTECT GLASS EDGES FROM DAMAGE DURING HANDLING AND INSTALLATION. REMOVE DAMAGED GLASS FROM PROJECT SITE AND LEGALLY DISPOSE OF OFF PROJECT SITE. DAMAGED GLASS IS GLASS WITH EDGE DAMAGE OR OTHER IMPERFECTIONS THAT, WHEN INSTALLED, COULD WEAKEN GLASS AND IMPAIR PERFORMANCE AND APPEARANCE.

D. INSTALL SETTING BLOCKS IN SILL RABBETS, SIZED AND LOCATED TO COMPLY WITH REFERENCED GLAZING PUBLICATIONS, UNLESS OTHERWISE REQUIRED BY GLASS MANUFACTURER. SET BLOCKS IN THIN COURSE OF COMPATIBLE SEALANT SUITABLE FOR HEEL BEAD.

E. DO NOT EXCEED EDGE PRESSURES STIPULATED BY GLASS MANUFACTURERS FOR INSTALLING GLASS LITES.

F. PROVIDE SPACERS FOR GLASS LITES WHERE LENGTH PLUS WIDTH IS LARGER THAN 50 INCHES AS FOLLOWS:

1. LOCATE SPACERS DIRECTLY OPPOSITE EACH OTHER ON BOTH INSIDE AND OUTSIDE FACES OF GLASS. INSTALL CORRECT SIZE AND SPACING TO PRESERVE REQUIRED FACE CLEARANCES, UNLESS GASKETS AND GLAZING TAPES ARE USED THAT HAVE DEMONSTRATED ABILITY TO MAINTAIN REQUIRED FACE CLEARANCES AND TO COMPLY WITH SYSTEM PERFORMANCE REQUIREMENTS.
2. PROVIDE 1/8-INCH MINIMUM BITE OF SPACERS ON GLASS AND USE THICKNESS EQUAL TO SEALANT WIDTH. WITH GLAZING TAPE, USE THICKNESS SLIGHTLY LESS THAN FINAL COMPRESSED THICKNESS OF TAPE.

G. PROVIDE EDGE BLOCKING WHERE INDICATED OR NEEDED TO PREVENT GLASS LITES FROM MOVING SIDEWAYS IN GLAZING CHANNEL, AS RECOMMENDED IN WRITING BY GLASS MANUFACTURER AND ACCORDING TO REQUIREMENTS IN REFERENCED GLAZING PUBLICATIONS.

H. SET GLASS LITES IN EACH SERIES WITH UNIFORM PATTERN, DRAW, BOW, AND SIMILAR CHARACTERISTICS.

I. WHERE WEDGE-SHAPED GASKETS ARE DRIVEN INTO ONE SIDE OF CHANNEL TO PRESSURIZE SEALANT OR GASKET ON OPPOSITE SIDE, PROVIDE ADEQUATE ANCHORAGE SO GASKET CANNOT WALK OUT WHEN INSTALLATION IS SUBJECTED TO MOVEMENT.

J. SQUARE CUT WEDGE-SHAPED GASKETS AT CORNERS AND INSTALL GASKETS IN A MANNER RECOMMENDED BY GASKET MANUFACTURER TO PREVENT CORNERS FROM

PULLING AWAY; SEAL CORNER JOINTS AND BUTT JOINTS WITH SEALANT RECOMMENDED BY GASKET MANUFACTURER.

3.4 GASKET GLAZING (DRY)

A. FABRICATE COMPRESSION GASKETS IN LENGTHS RECOMMENDED BY GASKET MANUFACTURER TO FIT OPENINGS EXACTLY, WITH ALLOWANCE FOR STRETCH DURING INSTALLATION.

B. INSERT SOFT COMPRESSION GASKET BETWEEN GLASS AND FRAME OR FIXED STOP SO IT IS SECURELY IN PLACE WITH JOINTS MITER CUT AND BONDED TOGETHER AT CORNERS.

C. INSTALL GASKETS SO THEY PROTRUDE PAST FACE OF GLAZING STOPS.

3.5 CLEANING AND PROTECTION

A. PROTECT EXTERIOR GLASS FROM DAMAGE IMMEDIATELY AFTER INSTALLATION BY ATTACHING CROSSED STREAMERS TO FRAMING HELD AWAY FROM GLASS. DO NOT APPLY MARKERS TO GLASS SURFACE. REMOVE NONPERMANENT LABELS, AND CLEAN SURFACES.

B. PROTECT GLASS FROM CONTACT WITH CONTAMINATING SUBSTANCES RESULTING FROM CONSTRUCTION OPERATIONS, INCLUDING WELD SPLATTER. IF, DESPITE SUCH PROTECTION, CONTAMINATING SUBSTANCES DO COME INTO CONTACT WITH GLASS, REMOVE SUBSTANCES IMMEDIATELY AS RECOMMENDED BY GLASS MANUFACTURER.

C. EXAMINE GLASS SURFACES ADJACENT TO OR BELOW EXTERIOR CONCRETE AND OTHER MASONRY SURFACES AT FREQUENT INTERVALS DURING CONSTRUCTION, BUT NOT LESS THAN ONCE A MONTH, FOR BUILDUP OF DIRT, SCUM, ALKALINE DEPOSITS, OR STAINS; REMOVE AS RECOMMENDED IN WRITING BY GLASS MANUFACTURER.

D. REMOVE AND REPLACE GLASS THAT IS BROKEN, CHIPPED, CRACKED, OR ABRADED OR THAT IS DAMAGED FROM NATURAL CAUSES, ACCIDENTS, AND VANDALISM, DURING CONSTRUCTION PERIOD.

E. WASH GLASS ON BOTH EXPOSED SURFACES IN EACH AREA OF PROJECT NOT MORE THAN FOUR DAYS BEFORE DATE SCHEDULED FOR INSPECTIONS THAT ESTABLISH DATE OF SUBSTANTIAL COMPLETION. WASH GLASS AS RECOMMENDED IN WRITING BY GLASS MANUFACTURER.

END OF SECTION

SECTION 08952 - FIBERGLASS-SANDWICH-PANEL ASSEMBLIES

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.

1.2 SUMMARY

A. THIS SECTION INCLUDES ASSEMBLIES INCORPORATING FIBERGLASS SANDWICH PANELS AND ALUMINUM FRAME SYSTEMS AS FOLLOWS:

1. REMOVABLE WALL ASSEMBLIES.

1.3 PERFORMANCE REQUIREMENTS

A. PROVIDE ASSEMBLIES, INCLUDING ANCHORAGE, CAPABLE OF WITHSTANDING, WITHOUT FAILURE, THE EFFECTS OF THE FOLLOWING:

1. STRUCTURAL LOADS.
2. THERMAL MOVEMENTS.
3. MOVEMENTS OF SUPPORTING STRUCTURE.
4. DIMENSIONAL TOLERANCES OF BUILDING FRAME AND OTHER ADJACENT CONSTRUCTION.
5. LIFTING OF REMOVABLE UNITS.

B. FAILURE INCLUDES THE FOLLOWING:

1. DEFLECTION EXCEEDING SPECIFIED LIMITS.
2. WATER LEAKAGE.
3. THERMAL STRESSES TRANSFERRED TO BUILDING STRUCTURE.
4. NOISE OR VIBRATION CREATED BY WIND AND THERMAL AND STRUCTURAL MOVEMENTS.
5. LOOSENING OR WEAKENING OF FASTENERS, ATTACHMENTS, AND OTHER COMPONENTS.
6. DELAMINATION OF FIBERGLASS-SANDWICH-PANEL FACES FROM PANEL CORES.

C. STRUCTURAL LOADS:

1. WIND LOADS: 90 MPH, EXPOSURE B.
2. SEISMIC LOADS: SS=25.5, S1=9.1.
3. LOAD COMBINATIONS: CALCULATE ACCORDING TO IBC 2003.

D. DEFLECTION OF ASSEMBLIES:

1. VERTICAL ASSEMBLIES: LIMITED TO 1/60 OF CLEAR SPAN FOR EACH ASSEMBLY COMPONENT.

E. THERMAL MOVEMENTS: ALLOW FOR THERMAL MOVEMENTS FROM AMBIENT AND SURFACE TEMPERATURE CHANGES. BASE ENGINEERING CALCULATION ON SURFACE TEMPERATURES OF MATERIALS DUE TO BOTH SOLAR HEAT GAIN AND NIGHTTIME-SKY HEAT LOSS.

1. TEMPERATURE CHANGE (RANGE): 120 DEG F, AMBIENT; 180 DEG F, MATERIAL SURFACES.

1.4 PERFORMANCE TESTING

A. PROVIDE ASSEMBLIES THAT COMPLY WITH TEST-PERFORMANCE REQUIREMENTS INDICATED, AS EVIDENCED BY REPORTS OF TESTS PERFORMED ON MANUFACTURER'S STANDARD ASSEMBLIES BY A QUALIFIED INDEPENDENT TESTING AGENCY.

B. STRUCTURAL-PERFORMANCE TEST: ASTM E 330.

1. PERFORMANCE AT DESIGN LOAD: WHEN TESTED AT POSITIVE AND NEGATIVE WIND-LOAD DESIGN PRESSURES, ASSEMBLIES DO NOT EVIDENCE DEFLECTION EXCEEDING SPECIFIED LIMITS.
2. PERFORMANCE AT MAXIMUM TEST LOAD: WHEN TESTED AT 150 PERCENT OF POSITIVE AND NEGATIVE WIND-LOAD DESIGN PRESSURES, ASSEMBLIES, INCLUDING ANCHORAGE, DO NOT EVIDENCE MATERIAL FAILURES, STRUCTURAL DISTRESS, AND PERMANENT DEFORMATION OF MAIN SUPPORTING MEMBERS EXCEEDING 0.2 PERCENT OF SPAN.
3. TEST DURATIONS: AS REQUIRED BY DESIGN WIND VELOCITY BUT NOT LESS THAN 10 SECONDS.

C. AIR-INFILTRATION TEST: ASTM E 283.

1. MINIMUM STATIC-AIR-PRESSURE DIFFERENCE: 1.57 LBF/SQ. FT.
2. MAXIMUM AIR LEAKAGE: 0.06 CFM/SQ. FT.

D. TEST FOR WATER PENETRATION UNDER STATIC PRESSURE: ASTM E 331.

1. MINIMUM STATIC-AIR-PRESSURE DIFFERENCE: 20 PERCENT OF POSITIVE WIND-LOAD DESIGN PRESSURE, BUT NOT LESS THAN 10 LBF/SQ. FT.
2. WATER LEAKAGE: NONE.

E. WATER-PENETRATION, WIND-DRIVEN-RAIN TEST: WIND-DRIVEN-RAIN TEST IN ICBO ES AC07, "SPECIAL ROOFING SYSTEMS."

1. WATER LEAKAGE: NONE.

1.5 SUBMITTALS

A. PRODUCT DATA: INCLUDE CONSTRUCTION DETAILS, MATERIAL DESCRIPTIONS, DIMENSIONS OF INDIVIDUAL COMPONENTS AND PROFILES, AND FINISHES FOR ASSEMBLIES.

B. SHOP DRAWINGS: FOR ASSEMBLIES. INCLUDE PLANS, ELEVATIONS, SECTIONS, DETAILS, AND ATTACHMENTS TO OTHER WORK.

1. INCLUDE STRUCTURAL ANALYSIS DATA SIGNED AND SEALED BY THE QUALIFIED PROFESSIONAL ENGINEER RESPONSIBLE FOR THEIR PREPARATION.

C. SAMPLES FOR VERIFICATION: FOR EACH TYPE OF EXPOSED FINISH REQUIRED, IN MANUFACTURER'S STANDARD SIZES.

D. MAINTENANCE DATA: FOR ASSEMBLIES TO INCLUDE IN MAINTENANCE MANUALS.

E. WARRANTIES: SPECIAL WARRANTIES SPECIFIED IN THIS SECTION.

1.6 QUALITY ASSURANCE

A. INSTALLER QUALIFICATIONS: ENTITY CAPABLE OF ASSUMING ENGINEERING RESPONSIBILITY, INCLUDING PREPARATION OF SHOP DRAWINGS, AND PERFORMING WORK OF THIS SECTION AND WHO IS ACCEPTABLE TO MANUFACTURER.

B. MANUFACTURER QUALIFICATIONS: FOR FIBERGLASS SANDWICH PANELS, A QUALIFIED MANUFACTURER WHOSE FACILITIES, PROCESSES, AND PRODUCTS ARE MONITORED BY AN INDEPENDENT, ACCREDITED QUALITY-CONTROL AGENCY FOR COMPLIANCE WITH APPLICABLE REQUIREMENTS IN ICBO ES AC04, "SANDWICH PANELS."

C. PRODUCT OPTIONS: INFORMATION ON DRAWINGS AND IN SPECIFICATIONS ESTABLISHES REQUIREMENTS FOR ASSEMBLIES' AESTHETIC EFFECTS AND PERFORMANCE CHARACTERISTICS. AESTHETIC EFFECTS ARE INDICATED BY DIMENSIONS, ARRANGEMENTS, ALIGNMENT, AND PROFILES OF COMPONENTS AND ASSEMBLIES AS THEY RELATE TO SIGHTLINES, TO ONE ANOTHER, AND TO ADJOINING CONSTRUCTION. PERFORMANCE CHARACTERISTICS ARE INDICATED BY CRITERIA SUBJECT TO VERIFICATION BY ONE OR MORE METHODS INCLUDING TESTING CONDUCTED BY AN INDEPENDENT TESTING AGENCY AND IN-SERVICE PERFORMANCE.

1. DO NOT MODIFY INTENDED AESTHETIC EFFECTS, AS JUDGED SOLELY BY ARCHITECT, EXCEPT WITH ARCHITECT'S APPROVAL. IF MODIFICATIONS ARE PROPOSED, SUBMIT COMPREHENSIVE EXPLANATORY DATA TO ARCHITECT FOR REVIEW.

D. FIRE-TEST-RESPONSE CHARACTERISTICS: WHERE FIRE-TEST-RESPONSE CHARACTERISTICS ARE INDICATED FOR ASSEMBLIES AND COMPONENTS,

PROVIDE PRODUCTS IDENTICAL TO THOSE TESTED PER TEST METHOD INDICATED BY AN INDEPENDENT TESTING AND INSPECTING AGENCY ACCEPTABLE TO AUTHORITIES HAVING JURISDICTION.

E. WELDING: QUALIFY PROCEDURES AND PERSONNEL ACCORDING TO AWS D1.2, "STRUCTURAL WELDING CODE - ALUMINUM."

F. NFRC CERTIFICATION: PROVIDE FIBERGLASS SANDWICH PANELS THAT ARE CERTIFIED FOR U-FACTORS INDICATED ACCORDING TO NFRC 100 AND LISTED IN ITS "NATIONAL FENESTRATION COUNCIL INCORPORATED - CERTIFIED PRODUCTS DIRECTORY."

1.7 PROJECT CONDITIONS

A. FIELD MEASUREMENTS: INDICATE MEASUREMENTS ON SHOP DRAWINGS.

1.8 WARRANTY

A. SPECIAL ASSEMBLY WARRANTY: MANUFACTURER'S STANDARD FORM IN WHICH MANUFACTURER AND INSTALLER AGREE TO REPAIR OR REPLACE COMPONENTS OF ASSEMBLIES THAT FAIL IN MATERIALS OR WORKMANSHIP WITHIN SPECIFIED WARRANTY PERIOD.

1. FAILURES INCLUDE, BUT ARE NOT LIMITED TO, THE FOLLOWING:

a. STRUCTURAL FAILURES INCLUDING, BUT NOT LIMITED TO, EXCESSIVE DEFLECTION.
b. DETERIORATION OF METALS, METAL FINISHES, AND OTHER MATERIALS BEYOND NORMAL WEATHERING.
c. WATER LEAKAGE.

2. WARRANTY PERIOD: 5 YEARS FROM DATE OF SUBSTANTIAL COMPLETION.

B. SPECIAL FIBERGLASS-SANDWICH-PANEL WARRANTY: MANUFACTURER'S STANDARD FORM IN WHICH MANUFACTURER AGREES TO REPLACE PANELS THAT EXHIBIT DEFECTS IN MATERIALS OR WORKMANSHIP.

1. DEFECTS INCLUDE, BUT ARE NOT LIMITED TO, THE FOLLOWING:

a. FIBERBLOOM.
b. DELAMINATION OF COATING, IF ANY, FROM EXTERIOR FACE SHEET.
c. DISCOLORATION OF EXTERIOR FACE SHEET OF MORE THAN 8.0 UNITS DELTA E WHEN MEASURED ACCORDING ASTM D 2244.
d. DELAMINATION OF PANEL FACE SHEETS FROM PANEL CORES.

2. WARRANTY PERIOD: 10 YEARS FROM DATE OF SUBSTANTIAL COMPLETION.

C. SPECIAL ALUMINUM-FINISH WARRANTY: MANUFACTURER'S STANDARD FORM IN WHICH MANUFACTURER AGREES TO REPAIR OR REPLACE COMPONENTS ON

WHICH FINISHES FAIL WITHIN SPECIFIED WARRANTY PERIOD. WARRANTY DOES NOT INCLUDE NORMAL WEATHERING.

1. FAILURES INCLUDE, BUT ARE NOT LIMITED TO, CHECKING, CRAZING, PEELING, CHALKING, AND FADING OF FINISHES.
2. WARRANTY PERIOD: 5 YEARS FROM DATE OF SUBSTANTIAL COMPLETION.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. AVAILABLE MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, MANUFACTURERS OFFERING PRODUCTS THAT MAY BE INCORPORATED INTO THE WORK INCLUDE, BUT ARE NOT LIMITED TO, THE FOLLOWING:

1. KALWALL CORPORATION.
2. MAJOR INDUSTRIES, INC.
3. SKYWALL TRANSLUCENT SYSTEMS; VISTAWALL GROUP (THE).

2.2 ALUMINUM FRAME SYSTEMS

A. ALUMINUM: ALLOY AND TEMPER RECOMMENDED IN WRITING BY MANUFACTURER FOR TYPE OF USE AND FINISH INDICATED.

1. SHEET AND PLATE: ASTM B 209.
2. EXTRUDED BARS, RODS, PROFILES, AND TUBES: ASTM B 221.
3. EXTRUDED STRUCTURAL PIPE AND TUBES: ASTM B 429.

B. COMPONENTS: MANUFACTURER'S STANDARD EXTRUDED-ALUMINUM MEMBERS OF THICKNESS REQUIRED AND REINFORCED AS REQUIRED TO SUPPORT IMPOSED LOADS.

1. CONSTRUCTION: THERMALLY BROKEN; FRAMING MEMBERS ARE COMPOSITE ASSEMBLIES OF TWO SEPARATE EXTRUDED-ALUMINUM COMPONENTS PERMANENTLY BONDED BY A MATERIAL OF LOW THERMAL CONDUCTANCE.

C. EXPOSED FLASHING AND CLOSURES: MANUFACTURER'S STANDARD ALUMINUM COMPONENTS NOT LESS THAN 0.060 INCH THICK.

D. FRAME-SYSTEM GASKETS: MANUFACTURER'S STANDARD.

E. FRAME-SYSTEM SEALANTS: AS RECOMMENDED IN WRITING BY MANUFACTURER.

F. ANCHORS, FASTENERS, AND ACCESSORIES: MANUFACTURER'S STANDARD, CORROSION-RESISTANT, NONSTAINING, AND NONBLEEDING; COMPATIBLE WITH ADJACENT MATERIALS.

1. AT CLOSURES, RETAINING CAPS, OR BATTENS, USE ASTM A 193/A 193M, 300 SERIES STAINLESS-STEEL SCREWS.
2. WHERE FASTENERS ARE SUBJECT TO LOOSENING OR TURNING OUT FROM THERMAL AND STRUCTURAL MOVEMENTS, WIND LOADS, OR VIBRATION, USE SELF-LOCKING DEVICES.
3. AT MOVEMENT JOINTS, USE SLIP-JOINT LININGS, SPACERS, AND SLEEVES OF MATERIAL AND TYPE RECOMMENDED IN WRITING BY MANUFACTURER.

G. CONCRETE AND MASONRY INSERTS: HOT-DIP GALVANIZED CAST-IRON, MALLEABLE-IRON, OR STEEL INSERTS COMPLYING WITH ASTM A 123/A 123M OR ASTM A 153/A 153M REQUIREMENTS.

H. ANCHOR BOLTS: ASTM A 307, GRADE A, HOT-DIP ZINC COATING, ASTM A 153/A 153M, CLASS C.

I. FRAME SYSTEM FABRICATION:

1. FABRICATE COMPONENTS BEFORE FINISHING.
2. FABRICATE COMPONENTS THAT, WHEN ASSEMBLED, HAVE THE FOLLOWING CHARACTERISTICS:

a. PROFILES THAT ARE SHARP, STRAIGHT, AND FREE OF DEFECTS OR DEFORMATIONS.
b. ACCURATELY FITTED JOINTS WITH ENDS COPED OR MITERED.
c. INTERNAL GUTTERING SYSTEMS OR OTHER MEANS TO DRAIN WATER PASSING JOINTS, CONDENSATION OCCURRING WITHIN COMPONENTS, AND MOISTURE MIGRATING WITHIN THE ASSEMBLY TO EXTERIOR.

3. FABRICATE SILL CLOSURES WITH WEEP HOLES AND FOR INSTALLATION AS CONTINUOUS COMPONENT.

4. REINFORCE COMPONENTS AS REQUIRED TO RECEIVE FASTENER THREADS.

5. WELD COMPONENTS IN CONCEALED LOCATIONS TO GREATEST EXTENT POSSIBLE TO MINIMIZE DISTORTION OR DISCOLORATION OF FINISH. REMOVE WELD SPATTER AND WELDING OXIDES FROM EXPOSED SURFACES BY DESCALING OR GRINDING.

2.3 FIBERGLASS SANDWICH PANELS

A. PANEL CONSTRUCTION: ASSEMBLY OF UNIFORMLY COLORED, TRANSLUCENT, THERMOSET, FIBERGLASS-REINFORCED-POLYMER FACE SHEETS BONDED TO BOTH SIDES OF A GRID CORE AND COMPLYING WITH REQUIREMENTS APPLICABLE TO PANEL MATERIALS IN ICBO ES AC04, "SANDWICH PANELS."

1. FACE-SHEET, SELF-IGNITION TEMPERATURE: 650 DEG F OR MORE PER ASTM D 1929.
2. FACE-SHEET BURNING EXTENT: 1 INCH OR LESS PER ASTM D 635.
3. FACE-SHEET, SMOKE-DEVELOPED INDEX: 450 OR LESS PER ASTM E 84.

4. INTERIOR FACE-SHEET, FLAME-SPREAD INDEX: NOT MORE THAN 25 PER ASTM E 84.

B. PANEL THICKNESS: 2-3/4 INCHES.

C. PANEL U-FACTOR: NOT MORE THAN 0.24, MEASURED IN BTU/SQ. FT. X H X DEG F ACCORDING TO NFRC 100 OR ASTM C 1363 USING PROCEDURES DESCRIBED IN ASTM C 1199 AND ASTM E 1423.

D. PANEL STRENGTH CHARACTERISTICS:

1. MAXIMUM PANEL DEFLECTION: 3-1/2 INCHES WHEN A 4-BY-12-FOOT PANEL IS TESTED ACCORDING TO ASTM E 72 AT 34 LBF/ SQ. FT., WITH A MAXIMUM 0.090-INCH SET DEFLECTION AFTER 5 MINUTES.
2. PANEL SUPPORT STRENGTH: CAPABLE OF SUPPORTING, WITHOUT FAILURE, A 300-LBF CONCENTRATED LOAD WHEN APPLIED TO A 3-INCH- DIAMETER DISK ACCORDING TO ASTM E 661.

E. GRID CORE: MECHANICALLY INTERLOCKED EXTRUDED-ALUMINUM I-BEAMS, WITH A MINIMUM FLANGE WIDTH OF 7/16 INCH.

1. EXTRUDED ALUMINUM: ASTM B 221, IN ALLOY AND TEMPER RECOMMENDED IN WRITING BY MANUFACTURER.
2. I-BEAM CONSTRUCTION: THERMALLY BROKEN; TWO SEPARATE EXTRUDED-ALUMINUM COMPONENTS PERMANENTLY BONDED BY A MATERIAL OF LOW THERMAL CONDUCTANCE.
3. GRID PATTERN: INLINE RECTANGLE, NOMINAL 12 BY 24 INCHES.

F. EXTERIOR FACE SHEET:

1. THICKNESS: 0.070 INCHES.
2. COLOR: AS SELECTED BY ARCHITECT FROM MANUFACTURER'S FULL RANGE.
3. COLOR STABILITY: NOT MORE THAN 7.0 UNITS DELTA E WHEN MEASURED ACCORDING TO ASTM D 2244 AFTER OUTDOOR WEATHERING IN SOUTHERN FLORIDA ACCORDING TO PROCEDURES IN ASTM D 1435 WITH PANELS MOUNTED FACING SOUTH AND AS FOLLOWS:

   a. PANEL MOUNTING ANGLE: NOT MORE THAN 45 DEGREES FROM HORIZONTAL.
   b. EXPOSURE PERIOD: 60 MONTHS.

4. EROSION PROTECTION: MANUFACTURER'S STANDARD.

G. INTERIOR FACE SHEET:

1. THICKNESS: 0.045 INCH.
2. COLOR: AS SELECTED BY ARCHITECT FROM MANUFACTURER'S FULL RANGE.

H. FIBERGLASS-SANDWICH-PANEL ADHESIVE: ASTM D 2559.

1. COMPATIBLE WITH FACING AND CORE MATERIALS.

2. TENSILE AND SHEAR BOND STRENGTH OF AGED ADHESIVE ENSURES PERMANENT ADHESION OF FACINGS TO CORES, AS EVIDENCED BY TESTING ACCORDING TO ASTM C 297 AND ASTM D 1002 AFTER ACCELERATED AGING PROCEDURES THAT COMPLY WITH AGING REQUIREMENTS FOR ADHESIVES WITH HIGH RESISTANCE TO MOISTURE IN ICBO ES AC05, "SANDWICH PANEL ADHESIVES."

I. PANEL FABRICATION: FACTORY ASSEMBLE AND SEAL PANELS.

1. LAMINATE FACE SHEETS TO GRID CORE UNDER A CONTROLLED PROCESS USING HEAT AND PRESSURE TO PRODUCE STRAIGHT ADHESIVE BONDING LINES THAT COVER WIDTH OF CORE MEMBERS AND THAT HAVE SHARP EDGES.

a. WHITE SPOTS INDICATING LACK OF BOND AT INTERSECTIONS OF GRID-CORE MEMBERS ARE LIMITED IN NUMBER TO 4 FOR EVERY 40-SQUARE FEET OF PANEL AND LIMITED IN DIAMETER TO 3/64 INCH.

2. FABRICATE WITH GRID PATTERN THAT IS SYMMETRICAL ABOUT CENTERLINES OF EACH PANEL.
3. FABRICATE PANEL TO ALLOW CONDENSATION WITHIN PANEL TO ESCAPE.
4. REINFORCE PANEL CORNERS.

2.4 ACCESSORY MATERIALS

A. INSULATING MATERIALS: SPECIFIED IN DIVISION 7 SECTION "BUILDING INSULATION."

B. BITUMINOUS PAINT: COLD-APPLIED ASPHALT-MASTIC PAINT COMPLYING WITH SSPC-PAINT 12 REQUIREMENTS EXCEPT CONTAINING NO ASBESTOS, FORMULATED FOR 30-MIL THICKNESS PER COAT.

2.5 ALUMINUM FINISHES

A. GENERAL: COMPLY WITH NAAMM'S "METAL FINISHES MANUAL FOR ARCHITECTURAL AND METAL PRODUCTS" FOR RECOMMENDATIONS FOR APPLYING AND DESIGNATING FINISHES.

B. FINISH DESIGNATIONS PREFIXED BY AA COMPLY WITH THE SYSTEM ESTABLISHED BY THE ALUMINUM ASSOCIATION FOR DESIGNATING ALUMINUM FINISHES.

C. CLASS I, CLEAR ANODIC FINISH: AA-M12C22A41 (MECHANICAL FINISH: NONSPECULAR AS FABRICATED; CHEMICAL FINISH: ETCHED, MEDIUM MATTE; ANODIC COATING: ARCHITECTURAL CLASS I, CLEAR COATING 0.018 MM OR THICKER) COMPLYING WITH AAMA 611.

PART 3 - EXECUTION

3.1 EXAMINATION

A. EXAMINE AREAS, WITH INSTALLER PRESENT, FOR COMPLIANCE WITH REQUIREMENTS FOR INSTALLATION TOLERANCES AND OTHER CONDITIONS AFFECTING PERFORMANCE OF WORK.

1. PROCEED WITH INSTALLATION ONLY AFTER UNSATISFACTORY CONDITIONS HAVE BEEN CORRECTED.

3.2 INSTALLATION

A. GENERAL:

1. COMPLY WITH MANUFACTURER'S WRITTEN INSTRUCTIONS.
2. DO NOT INSTALL DAMAGED COMPONENTS.
3. FIT JOINTS BETWEEN ALUMINUM COMPONENTS TO PRODUCE HAIRLINE JOINTS FREE OF BURRS AND DISTORTION.
4. RIGIDLY SECURE NONMOVEMENT JOINTS.
5. INSTALL ANCHORS WITH SEPARATORS AND ISOLATORS TO PREVENT METAL CORROSION AND ELECTROLYTIC DETERIORATION AND TO PREVENT IMPEDING MOVEMENT OF MOVING JOINTS.
6. WELD ALUMINUM COMPONENTS IN CONCEALED LOCATIONS TO MINIMIZE DISTORTION OR DISCOLORATION OF FINISH. PROTECT GLAZING SURFACES FROM WELDING.
7. SEAL JOINTS WATERTIGHT, UNLESS OTHERWISE INDICATED.

B. METAL PROTECTION: WHERE ALUMINUM COMPONENTS WILL CONTACT DISSIMILAR MATERIALS, PROTECT AGAINST GALVANIC ACTION BY PAINTING CONTACT SURFACES WITH BITUMINOUS PAINT OR BY INSTALLING NONCONDUCTIVE SPACERS AS RECOMMENDED IN WRITING BY MANUFACTURER FOR THIS PURPOSE.

C. INSTALL CONTINUOUS ALUMINUM SILL CLOSURE WITH WEATHERPROOF EXPANSION JOINTS AND LOCKED AND SEALED OR WELDED CORNERS. LOCATE WEEP HOLES AT RAFTERS.

D. INSTALL COMPONENTS TO DRAIN WATER PASSING JOINTS, CONDENSATION OCCURRING WITHIN ALUMINUM MEMBERS AND PANELS, AND MOISTURE MIGRATING WITHIN ASSEMBLY TO EXTERIOR.

E. INSTALL COMPONENTS PLUMB AND TRUE IN ALIGNMENT WITH ESTABLISHED LINES AND ELEVATIONS.

F. INSTALL INSULATION MATERIALS AS SPECIFIED IN DIVISION 7 SECTION "BUILDING INSULATION."

G. ERECTION TOLERANCES: INSTALL ASSEMBLIES TO COMPLY WITH THE FOLLOWING MAXIMUM TOLERANCES:

1. ALIGNMENT: LIMIT OFFSET FROM TRUE ALIGNMENT TO 1/32 INCH WHERE SURFACES ABUT IN LINE, EDGE TO EDGE, AT CORNERS, OR WHERE A REVEAL OR PROTRUDING ELEMENT SEPARATES ALIGNED SURFACES BY LESS THAN 3 INCHES; OTHERWISE, LIMIT OFFSET TO 1/8 INCH.

2. LOCATION AND PLANE: LIMIT VARIATION FROM TRUE LOCATION AND PLANE TO 1/8 INCH IN 12 FEET; 1/2 INCH OVER TOTAL LENGTH.

END OF SECTION

SECTION 09960 - HIGH-PERFORMANCE COATINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. DRAWINGS AND GENERAL PROVISIONS OF THE CONTRACT, INCLUDING GENERAL AND SUPPLEMENTARY CONDITIONS AND DIVISION 1 SPECIFICATION SECTIONS, APPLY TO THIS SECTION.

1.2 SUMMARY

A. THIS SECTION INCLUDES SURFACE PREPARATION AND APPLICATION OF HIGH-PERFORMANCE COATING SYSTEMS ON THE FOLLOWING SUBSTRATES:

1. INTERIOR SUBSTRATES:

a. CONCRETE, HORIZONTAL SURFACES.
b. CLAY MASONRY.
c. CONCRETE MASONRY UNITS (CMU).
d. STEEL.
e. GALVANIZED METAL.

B. RELATED SECTIONS INCLUDE THE FOLLOWING:

1. DIVISION 5 SECTIONS FOR SHOP PRIMING OF METAL SUBSTRATES WITH PRIMERS SPECIFIED IN THIS SECTION.
2. DIVISION 9 PAINTING SECTIONS FOR SPECIAL-USE COATINGS AND GENERAL FIELD PAINTING.

1.3 SUBMITTALS: PROVIDE SUBMITTALS IN A TIMELY MANNER IN ACCORDANCE WITH THE APPROVED SUBMITTALS SCHEDULE AS SPECIFIED IN DIVISION 1 – GENERAL REQUIREMENTS.

A. SUBMITTAL: PRODUCT DATA - FOR EACH TYPE OF PRODUCT INDICATED.

B. SUBMITTAL: SAMPLES FOR INITIAL SELECTION - FOR EACH TYPE OF FINISH-COAT PRODUCT INDICATED.

C. SUBMITTAL: SAMPLES FOR VERIFICATION - FOR EACH TYPE OF COATING SYSTEM AND IN EACH COLOR AND GLOSS OF FINISH COAT INDICATED.

1. SUBMIT SAMPLES ON RIGID BACKING, 8 INCHES SQUARE.
2. STEP COATS ON SAMPLES TO SHOW EACH COAT REQUIRED FOR SYSTEM.
3. LABEL EACH COAT OF EACH SAMPLE.
4. LABEL EACH SAMPLE FOR LOCATION AND APPLICATION AREA.

D. SUBMITTAL: PRODUCT LIST - FOR EACH PRODUCT INDICATED. CROSS-REFERENCE PRODUCTS TO COATING SYSTEM AND LOCATIONS OF APPLICATION AREAS. USE SAME DESIGNATIONS INDICATED ON DRAWINGS AND IN SCHEDULES.

1.4 QUALITY ASSURANCE

A. MASTER PAINTERS INSTITUTE (MPI) STANDARDS:

1. PRODUCTS: COMPLYING WITH MPI STANDARDS INDICATED AND LISTED IN "MPI APPROVED PRODUCTS LIST."
2. PREPARATION AND WORKMANSHIP: COMPLY WITH REQUIREMENTS IN "MPI ARCHITECTURAL PAINTING SPECIFICATION MANUAL" FOR PRODUCTS AND COATING SYSTEMS INDICATED.

B. MOCKUPS: PROVIDE BENCHMARK SAMPLES OF SLIP-RESITANT COATING SYSTEM INDICATED TO VERIFY PRELIMINARY SELECTIONS MADE UNDER SAMPLE SUBMITTALS AND TO DEMONSTRATE AESTHETIC EFFECTS AND SET QUALITY STANDARDS FOR MATERIALS AND EXECUTION.

1. IF PRELIMINARY COLOR OR FINISH SELECTIONS ARE NOT APPROVED, APPLY ADDITIONAL BENCHMARK SAMPLES OF ADDITIONAL COLORS SELECTED BY ARCHITECT AT NO ADDED COST TO OWNER.

1.5 DELIVERY, STORAGE, AND HANDLING

A. STORE MATERIALS NOT IN USE IN TIGHTLY COVERED CONTAINERS IN WELL-VENTILATED AREAS WITH AMBIENT TEMPERATURES CONTINUOUSLY MAINTAINED AT NOT LESS THAN 45 DEG F.

1. MAINTAIN CONTAINERS IN CLEAN CONDITION, FREE OF FOREIGN MATERIALS AND RESIDUE.
2. REMOVE RAGS AND WASTE FROM STORAGE AREAS DAILY.

1.6 PROJECT CONDITIONS

A. APPLY COATINGS ONLY WHEN TEMPERATURE OF SURFACES TO BE COATED AND SURROUNDING AIR TEMPERATURES ARE BETWEEN 50 AND 95 DEG F.

B. DO NOT APPLY COATINGS IN SNOW, RAIN, FOG, OR MIST; WHEN RELATIVE HUMIDITY EXCEEDS 85 PERCENT; AT TEMPERATURES LESS THAN 5 DEG F ABOVE THE DEW POINT; OR TO DAMP OR WET SURFACES.

1.7 EXTRA MATERIALS

A. FURNISH EXTRA MATERIALS DESCRIBED BELOW THAT ARE FROM SAME PRODUCTION RUN (BATCH MIX) AS MATERIALS APPLIED AND THAT ARE PACKAGED FOR STORAGE AND IDENTIFIED WITH LABELS DESCRIBING CONTENTS.

1. QUANTITY: FURNISH AN ADDITIONAL 5 PERCENT, BUT NOT LESS THAN 1 GAL. OF EACH MATERIAL AND COLOR APPLIED.

PART 2 - PRODUCTS

2.1 HIGH-PERFORMANCE COATINGS, GENERAL

A. MATERIAL COMPATIBILITY:

1. PROVIDE MATERIALS FOR USE WITHIN EACH COATING SYSTEM THAT ARE COMPATIBLE WITH ONE ANOTHER AND SUBSTRATES INDICATED, UNDER CONDITIONS OF SERVICE AND APPLICATION AS DEMONSTRATED BY MANUFACTURER, BASED ON TESTING AND FIELD EXPERIENCE.
2. PROVIDE PRODUCTS OF SAME MANUFACTURER FOR EACH COAT IN A COATING SYSTEM.

B. COLORS: AS SELECTED BY ARCHITECT FROM MANUFACTURER'S FULL RANGE.

2.2 BLOCK FILLERS

A. INTERIOR/EXTERIOR LATEX BLOCK FILLER: MPI#4.

1. AVAILABLE PRODUCTS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PRODUCTS THAT MAY BE INCORPORATED INTO THE WORK INCLUDE, BUT ARE NOT LIMITED TO, THE FOLLOWING:

a. BENJAMIN MOORE & CO.; MOORCRAFT, SUPER CRAFT LATEX BLOCK FILLER, 285-01.
b. CLOVERDALE PAINT; LATEX BLOCK FILLER, 5700.
c. COLUMBIA PAINT & COATINGS; HIGH PERFORMANCE, INT/EXT ACRYLIC LATEX BLOCK FILLER, 05-055-PP.
d. CORONADO PAINT; SUPER KOTE 5000, COMMERCIAL LATEX BLOCK FILLER, 946-11.
e. ICI PAINTS; DEVOE COATINGS, BLOXFIL ACRYLIC BLOCK FILLER, 4000.
f. PPG ARCHITECTURAL FINISHES, INC.; INTERIOR/EXTERIOR LATEX BLOCK FILLER, 6-12.
g. SHERWIN-WILLIAMS COMPANY (THE); PREPRITE, INT/EXT BLOCK FILLER, B25W25.

2.3 METAL PRIMERS

A. COLD-CURING EPOXY PRIMER: MPI #101.

1. AVAILABLE PRODUCTS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PRODUCTS THAT MAY BE INCORPORATED INTO THE WORK INCLUDE, BUT ARE NOT LIMITED TO, THE FOLLOWING:

a. CORONADO PAINT; POLYAMIDE EPOXY PRIMER, 1201-147.
b. ICI PAINTS; DEVOE/FULLER, SURFACE TOLERANT EPOXY, DP32U-XX.
c. SHERWIN-WILLIAMS COMPANY (THE); INDUSTRIAL & MARINE, DURAPLATE 235 MULTI-PURPOSE EPOXY, B67W235.

B. WATERBORNE GALVANIZED-METAL PRIMER: MPI #134.

1. AVAILABLE PRODUCTS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PRODUCTS THAT MAY BE INCORPORATED INTO THE WORK INCLUDE, BUT ARE NOT LIMITED TO, THE FOLLOWING:

a. BENJAMIN MOORE & CO.; ACRYLIC METAL PRIMER, M04.

b. CLOVERDALE PAINT; ECOLOGIC RUSTEX PRIMER, 700 SERIES.
c. COLUMBIA PAINT & COATINGS; HI-PERFORMANCE, WATERBORNE ACRYLIC BONDING PRIMER, 05-174-PP.
d. CORONADO PAINT; H. P. ACRYLIC RUST INHIBITING PRIMER, 180-11/147.
e. DUNN-EDWARDS CORPORATION; M-P PRIME, W713.
f. ICI PAINTS; DEVOE COATINGS, DEVFLEX WB DTM PRIMER FINISH, 4020.
g. PPG ARCHITECTURAL FINISHES, INC.; PITT-TECH, DTM HIGH PERFORMANCE PRIMER/FINISH, 90-712.
h. SHERWIN-WILLIAMS COMPANY (THE); INDUSTRIAL & MARINE, DTM ACRYLIC PRIMER/FINISH, B66W1.

2.4 WATER-BASED, LIGHT-INDUSTRIAL COATINGS

A. SEMIGLOSS, WATER-BASED, LIGHT-INDUSTRIAL COATING: MPI #110-G5.

1. AVAILABLE PRODUCTS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PRODUCTS THAT MAY BE INCORPORATED INTO THE WORK INCLUDE, BUT ARE NOT LIMITED TO, THE FOLLOWING:

a. BENJAMIN MOORE & CO.; (CANADA), LATEX, M28-08.
b. CLOVERDALE PAINT; ECOLOGIC W.B. ARCHITECTURAL FINISH, 70623.
c. COLUMBIA PAINT & COATINGS; HIGH PERFORMANCE, ACRY-SHIELD SEMI-GLOSS ENAMEL, 05-262.
d. CORONADO PAINT; DTM ACRYLIC COATINGS, 182 LINE.
e. DUNN-EDWARDS CORPORATION; PERMASHEEN, INT./EXT.100% ACRYLIC SEMI-GLOSS, W 901.
f. ICI PAINTS; DEVOE COATINGS, DEVFLEX WB ACRYLIC SG ENAMEL, 4206-0100.
g. SHERWIN-WILLIAMS COMPANY (THE); INDUSTRIAL & MARINE, SHER-CRYL HPA SEMI-GLOSS, B66W351.

2.5 EPOXY COATINGS

A. EPOXY, COLD-CURED, GLOSS: MPI #77.

1. AVAILABLE PRODUCTS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PRODUCTS THAT MAY BE INCORPORATED INTO THE WORK INCLUDE, BUT ARE NOT LIMITED TO, THE FOLLOWING:

a. BENJAMIN MOORE & CO.; POLYAMIDE EPOXY COATING, M36/M37.
b. CLOVERDALE PAINT; CLOVACOAT 300, 833.
c. COLUMBIA PAINT & COATINGS; INSL-X, INSL-TILE II, EP-5300.
d. CORONADO PAINT; POLYAMIDE EPOXY COATING, 101 LINE.
e. ICI PAINTS; DEVOE/FULLER, GUARDCOTE, DP34UXX.
f. PPG ARCHITECTURAL FINISHES, INC.; AQUAPON, EPOXY COLD CURED GLOSS, 95-1.

B. WATER-BASED EPOXY (INTERIOR AND EXTERIOR): MPI #115.

1. AVAILABLE PRODUCTS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PRODUCTS THAT MAY BE INCORPORATED INTO THE WORK INCLUDE, BUT ARE NOT LIMITED TO, THE FOLLOWING:

   a. BENJAMIN MOORE & CO.; ACRYLIC EPOXY GLOSS "A", HARDENER "B", M43/M44.
   b. CLOVERDALE PAINT; ECOLOGIC WATER-BORNE EPOXY, 705 SERIES.
   c. COLUMBIA PAINT & COATINGS; DUPONT, CORLAR WATERBORNE ACRYLIC EPOXY, 76P.
   d. CORONADO PAINT; WATER-BASED AMINE ADDUCT EPOXY, 142 LINE.
   e. DUNN-EDWARDS CORPORATION; INTERGARD 735, 73510.
   f. ICI PAINTS; DEVOE/FULLER, GARDCOTE-WB, DP25U9XX.
   g. PPG ARCHITECTURAL FINISHES, INC.; AQUAPON, WATERBORNE EPOXY, 98-1/98-98.
   h. SHERWIN-WILLIAMS COMPANY (THE); INDUSTRIAL & MARINE, WATER BASED CATALYZED EPOXY, B70W SERIES.

C. CONTAINMENT LINER

1. PRODUCTS: SIKAGARD 62, AS MANUFACTURED BY SIKA CORPORATION, 1682 MARION WILLIAMSPORT ROAD, MARION, OHIO, 43302.

   a. CHEMICAL RESITANCE:

      1) ALUM 8.5%
      2) CAUSTIC (SODIUM HYDROXIDE) < 50%.
      3) SODIUM HYPOCHLORITE 15%.

D. MASONRY (CLAY AND CMU) AND CONCRETE LEVELING MORTAR

1. PRODUCTS: SIKATOP 121 PLUS, AS MANUFACTURED BY SIKA CORPORATION, 1682 MARION WILLIAMSPORT ROAD, MARION, OHIO, 43302.

E. SLIP-RESISTANT AGGREGATE

1. PRODUCTS: OVEN DRIED QUARTZ SAND AS RECOMENDED BY THE CONTAINMENT MANUFACTUR.

PART 3 - EXECUTION

3.1 EXAMINATION

A. EXAMINE SUBSTRATES AND CONDITIONS, WITH APPLICATOR PRESENT, FOR COMPLIANCE WITH REQUIREMENTS FOR MAXIMUM MOISTURE CONTENT AND OTHER CONDITIONS AFFECTING PERFORMANCE OF WORK.

1. MAXIMUM MOISTURE CONTENT OF SUBSTRATES: WHEN MEASURED WITH AN ELECTRONIC MOISTURE METER AS FOLLOWS:

   a. CONCRETE: 12 PERCENT.
   b. MASONRY (CLAY AND CMU): 12 PERCENT.

2. VERIFY COMPATIBILITY WITH AND SUITABILITY OF SUBSTRATES, INCLUDING COMPATIBILITY WITH EXISTING FINISHES OR PRIMERS.
3. BEGIN COATING APPLICATION ONLY AFTER UNSATISFACTORY CONDITIONS HAVE BEEN CORRECTED AND SURFACES ARE DRY.
4. COATING APPLICATION INDICATES ACCEPTANCE OF SURFACES AND CONDITIONS.

3.2 PREPARATION

A. COMPLY WITH MANUFACTURER'S WRITTEN INSTRUCTIONS AND RECOMMENDATIONS IN "MPI ARCHITECTURAL PAINTING SPECIFICATION MANUAL" APPLICABLE TO SUBSTRATES INDICATED.

B. REMOVE PLATES, MACHINED SURFACES, AND SIMILAR ITEMS ALREADY IN PLACE THAT ARE NOT TO BE COATED. IF REMOVAL IS IMPRACTICAL OR IMPOSSIBLE BECAUSE OF SIZE OR WEIGHT OF ITEM, PROVIDE SURFACE-APPLIED PROTECTION BEFORE SURFACE PREPARATION AND COATING.

1. AFTER COMPLETING COATING OPERATIONS, REINSTALL ITEMS THAT WERE REMOVED; USE WORKERS SKILLED IN THE TRADES INVOLVED.

C. CLEAN SUBSTRATES OF SUBSTANCES THAT COULD IMPAIR BOND OF COATINGS, INCLUDING DIRT, OIL, GREASE, AND INCOMPATIBLE PAINTS AND ENCAPSULANTS.

1. REMOVE INCOMPATIBLE PRIMERS AND REPRIME SUBSTRATE WITH COMPATIBLE PRIMERS AS REQUIRED TO PRODUCE COATING SYSTEMS INDICATED.

D. CONCRETE SUBSTRATES: REMOVE RELEASE AGENTS, CURING COMPOUNDS, EFFLORESCENCE, AND CHALK. DO NOT COAT SURFACES IF MOISTURE CONTENT OR ALKALINITY OF SURFACES TO BE COATED EXCEEDS THAT PERMITTED IN MANUFACTURER'S WRITTEN INSTRUCTIONS.

1. CLEAN SURFACES WITH PRESSURIZED WATER. USE PRESSURE RANGE OF 1500 TO 4000 PSI AT 6 TO 12 INCHES.
2. ABRASIVE BLAST CLEAN SURFACES TO COMPLY WITH SSPC-SP 7/NACE NO. 4, "BRUSH-OFF BLAST CLEANING."

E. CLAY MASONRY SUBSTRATES: REMOVE EFFLORESCENCE AND CHALK. DO NOT COAT SURFACES IF MOISTURE CONTENT OR ALKALINITY OF SURFACES TO BE COATED EXCEEDS THAT PERMITTED IN MANUFACTURER'S WRITTEN INSTRUCTIONS.

1. CLEAN SURFACES WITH PRESSURIZED WATER. USE PRESSURE RANGE OF 100 TO 600 PSI AT 6 TO 12 INCHES.

F. CMU SUBSTRATES: REMOVE EFFLORESCENCE AND CHALK. DO NOT COAT SURFACES IF MOISTURE CONTENT OR ALKALINITY OF SURFACES TO BE COATED EXCEEDS THAT PERMITTED IN MANUFACTURER'S WRITTEN INSTRUCTIONS.

G. STEEL SUBSTRATES: REMOVE RUST AND LOOSE MILL SCALE.

1. CLEAN USING METHODS RECOMMENDED IN WRITING BY COATING MANUFACTURER.
2. BLAST CLEAN ACCORDING TO SSPC-SP 10/NACE NO. 2, "NEAR-WHITE BLAST CLEANING."

H. GALVANIZED-METAL SUBSTRATES: REMOVE GREASE AND OIL RESIDUE FROM GALVANIZED SHEET METAL FABRICATED FROM COIL STOCK BY MECHANICAL METHODS TO PRODUCE CLEAN, LIGHTLY ETCHED SURFACES THAT PROMOTE ADHESION OF SUBSEQUENTLY APPLIED COATINGS.

I. PREPARE ALL CONTAINMENT AREA SURFACES TO BE SEALED BY ROUTING OUT ALL CRACKS TO A MINIMUM OF 1/4" DEEP TO DEVELOP A SQUARE EDGE AND SOUND BASE FOR CRACK SEALANT APPLICATION. FILL ALL VOIDS, HONEYCOMB, TIE WIRE HOLES, CAVITIES, AND LOCAL DEPRESSIONS WITH FILLER COMPOUND LISTED BY SEALANT MANUFACTURER AS COMPATIBLE WITH FINAL SURFACE COATING TO PRESENT A UNIFORM, CONSISTENT PROFILE PRIOR TO APPLICATION OF FINAL SEALANT COATING. SEALANT FOR FLOOR SURFACE OF INTERIOR AND EXTERIOR CONTAINMENT AREAS SHALL BE SLIP-RESISTANT FINISH. THERE SHALL BE NO DEPRESSIONS OR VOIDS VISIBLE IN THE CONCRETE/MASONRY SURFACE PRIOR TO APPLICATION OF SEALANT, AND VOIDS OR DEPRESSIONS EVIDENT AFTER COMPLETION OF SEALANT APPLICATION SHALL BE CORRECTED AT CONTRACTOR EXPENSE.

3.3 APPLICATION

A. APPLY HIGH-PERFORMANCE COATINGS ACCORDING TO MANUFACTURER'S WRITTEN INSTRUCTIONS.

1. USE APPLICATORS AND TECHNIQUES SUITED FOR COATING AND SUBSTRATE INDICATED.
2. COAT SURFACES BEHIND MOVABLE EQUIPMENT AND FURNITURE SAME AS SIMILAR EXPOSED SURFACES. BEFORE FINAL INSTALLATION, COAT SURFACES BEHIND PERMANENTLY FIXED EQUIPMENT OR FURNITURE WITH PRIME COAT ONLY.
3. COAT BACK SIDES OF ACCESS PANELS, REMOVABLE OR HINGED COVERS, AND SIMILAR HINGED ITEMS TO MATCH EXPOSED SURFACES.

B. TINT EACH UNDERCOAT A LIGHTER SHADE TO FACILITATE IDENTIFICATION OF EACH COAT IF MULTIPLE COATS OF THE SAME MATERIAL ARE TO BE APPLIED. TINT UNDERCOATS TO MATCH COLOR OF FINISH COAT, BUT PROVIDE SUFFICIENT DIFFERENCE IN SHADE OF UNDERCOATS TO DISTINGUISH EACH SEPARATE COAT.

C. IF UNDERCOATS OR OTHER CONDITIONS SHOW THROUGH FINAL COAT, APPLY ADDITIONAL COATS UNTIL CURED FILM HAS A UNIFORM COATING FINISH, COLOR, AND APPEARANCE.

D. APPLY COATINGS TO PRODUCE SURFACE FILMS WITHOUT CLOUDINESS, SPOTTING, HOLIDAYS, LAPS, BRUSH MARKS, RUNS, SAGS, ROPINESS, OR OTHER SURFACE IMPERFECTIONS. PRODUCE SHARP GLASS LINES AND COLOR BREAKS.

3.4 CLEANING AND PROTECTION

A. AT END OF EACH WORKDAY, REMOVE RUBBISH, EMPTY CANS, RAGS, AND OTHER DISCARDED MATERIALS FROM PROJECT SITE.

B. AFTER COMPLETING COATING APPLICATION, CLEAN SPATTERED SURFACES. REMOVE SPATTERED COATINGS BY WASHING, SCRAPING, OR OTHER METHODS. DO NOT SCRATCH OR DAMAGE ADJACENT FINISHED SURFACES.

C. PROTECT WORK OF OTHER TRADES AGAINST DAMAGE FROM COATING OPERATION. CORRECT DAMAGE BY CLEANING, REPAIRING, REPLACING, AND RECOATING, AS APPROVED BY ARCHITECT, AND LEAVE IN AN UNDAMAGED CONDITION.

D. AT COMPLETION OF CONSTRUCTION ACTIVITIES OF OTHER TRADES, TOUCH UP AND RESTORE DAMAGED OR DEFACED COATED SURFACES.

3.5 HIGH-PERFORMANCE COATING SCHEDULE

A. CONCRETE AND MASONRY SUBSTRATES.

1. EPOXY COATING SYSTEM:

a. PRIME COAT: EPOXY, COLD-CURED, GLOSS, MPI #77.
b. INTERMEDIATE COAT: EPOXY, COLD-CURED, GLOSS, MPI #77.
c. TOPCOAT: EPOXY, COLD-CURED, GLOSS, MPI #77.

B. CLAY-MASONRY SUBSTRATES:

1. EPOXY COATING SYSTEM:

a. PRIME COAT: EPOXY, COLD-CURED, GLOSS, MPI #77.
b. INTERMEDIATE COAT: EPOXY, COLD-CURED, GLOSS, MPI #77.
c. TOPCOAT: EPOXY, COLD-CURED, GLOSS, MPI #77.

C. CMU SUBSTRATES:

1. WATER-BASED EPOXY COATING SYSTEM:

a. PRIME COAT: INTERIOR/EXTERIOR LATEX BLOCK FILLER, MPI #4.
b. INTERMEDIATE COAT: WATER-BASED EPOXY (INTERIOR AND EXTERIOR), MPI #115.
c. TOPCOAT: WATER-BASED EPOXY (INTERIOR AND EXTERIOR), MPI #115.

D. CONTAINMENT LINER

1. HIGH-BUILD, PROTECTIVE, SOLVENT-FREE, COLORED EPOXY COATING, 30 MIL SYSTEM

a. PRIME COAT: MASONRY (CLAY AND CMU) AND CONCRETE LEVELING MORTAR
b. FIRST COAT:CONTAINMENT LINER
c. INTERMEDIATE COAT: CONTAINMENT LINER, PROVIDE BROADCAST SLIP-RESITANT AGGERGATE ON HORIZONTAL SURFACES.
d. TOPCOAT: CONTAINMENT LINER

E. STEEL SUBSTRATES:

1. WATER-BASED, LIGHT-INDUSTRIAL COATING SYSTEM:

a. PRIME COAT: COLD-CURING EPOXY PRIMER, MPI #101.
b. INTERMEDIATE COAT: WATER-BASED, LIGHT-INDUSTRIAL COATING, MPI #110, GLOSS MATCHING TOPCOAT.
c. TOPCOAT: WATER-BASED, LIGHT-INDUSTRIAL COATING, MPI #110-G5, SEMIGLOSS.

F. GALVANIZED-METAL SUBSTRATES:

1. WATER-BASED, LIGHT-INDUSTRIAL COATING SYSTEM:

a. PRIME COAT: WATERBORNE GALVANIZED-METAL PRIMER, MPI #134.
b. TOPCOAT: WATER-BASED, LIGHT-INDUSTRIAL COATING, MPI #110-G5, SEMIGLOSS.

END OF SECTION

SECTION 09981 - CEMENTITIOUS COATINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. DRAWINGS AND GENERAL PROVISIONS OF THE CONTRACT, INCLUDING GENERAL AND SUPPLEMENTARY CONDITIONS AND DIVISION 1 SPECIFICATION SECTIONS, APPLY TO THIS SECTION.

1.2 SUMMARY

A. THIS SECTION INCLUDES SURFACE PREPARATION, INCLUDING CRACK REPAIR, AND APPLICATION OF CEMENTITIOUS COATING SYSTEMS TO SCHEDULED SURFACES.

1.3 PERFORMANCE REQUIREMENTS

A. PROVIDE CEMENTITIOUS COATING SYSTEMS WITH THE FOLLOWING PROPERTIES AS DETERMINED BY TEST METHODS INDICATED:

1. COMPRESSIVE STRENGTH: NOT LESS THAN 400 PSI AT 28 DAYS ACCORDING TO ASTM C 496.
2. FLEXURAL STRENGTH: NOT LESS THAN 700 PSI AT 28 DAYS ACCORDING TO ASTM C 348.
3. PERMEANCE: NOT LESS THAN 9.50 PERMS ACCORDING TO ASTM E 96.
4. ACCELERATED WEATHERING: NO FAILURE AFTER 5000 HOURS ACCORDING TO ASTM G 155.

1.4 SUBMITTALS: PROVIDE SUBMITTALS IN A TIMELY MANNER IN ACCORDANCE WITH THE APPROVED SUBMITTALS SCHEDULE AS SPECIFIED IN DIVISION 1 – GENERAL REQUIREMENTS.

A. SUBMITTAL: PRODUCT DATA - FOR EACH CEMENTITIOUS COATING SYSTEM INDICATED.

1. MATERIAL LIST: AN INCLUSIVE LIST OF EACH REQUIRED COATING MATERIAL. INDICATE EACH MATERIAL AND CROSS-REFERENCE THE SPECIFIC COATING, FINISH SYSTEM, AND APPLICATION. IDENTIFY EACH MATERIAL BY MANUFACTURER'S CATALOG NUMBER AND GENERAL CLASSIFICATION.
2. MANUFACTURER'S INFORMATION: MANUFACTURER'S TECHNICAL INFORMATION INCLUDING BASIC MATERIAL ANALYSIS AND INSTRUCTIONS FOR HANDLING, STORING, AND APPLYING EACH COATING MATERIAL.

B. SUBMITTAL: SAMPLES FOR INITIAL SELECTION - FOR EACH TYPE OF FINISH-COAT MATERIAL INDICATED.

1. AFTER COLOR SELECTION, ARCHITECT WILL RETURN COLOR CHIPS INDICATING COLORS SELECTED FOR SURFACES TO BE COATED.

C. SUBMITTAL: SAMPLES FOR VERIFICATION - FOR EACH COLOR TO BE APPLIED, WITH TEXTURE TO SIMULATE ACTUAL CONDITIONS, ON REPRESENTATIVE SAMPLES OF THE ACTUAL SUBSTRATE.

1. PROVIDE STEPPED SAMPLES, DEFINING EACH SEPARATE COAT, INCLUDING BLOCK FILLERS AND PRIMERS. USE REPRESENTATIVE COLORS WHEN PREPARING SAMPLES FOR REVIEW. RESUBMIT UNTIL REQUIRED COLOR AND TEXTURE ARE ACHIEVED.
2. PROVIDE A LIST OF MATERIALS AND APPLICATIONS FOR EACH COAT OF EACH SAMPLE. LABEL EACH SAMPLE FOR LOCATION AND APPLICATION.
3. SUBMIT 4 SAMPLES ON THE FOLLOWING SUBSTRATES FOR ARCHITECT'S REVIEW OF COLOR AND TEXTURE ONLY:

   a. CONCRETE AND MASONRY: 4-BY-6-INCH SAMPLES OF ACTUAL SUBSTRATE MATERIAL FOR EACH COLOR AND TEXTURE.
   b. CONCRETE MASONRY: 6-BY-10-INCH RECTANGULAR SAMPLES OF CONCRETE MASONRY, WITH MORTAR JOINT IN CENTER, FOR EACH COLOR AND TEXTURE.
4. RESUBMIT SAMPLES, AS REQUESTED, UNTIL REQUIRED COLOR AND TEXTURE ARE ACHIEVED.

1.5 QUALITY ASSURANCE

A. APPLICATOR QUALIFICATIONS: A FIRM OR INDIVIDUAL EXPERIENCED IN APPLYING CEMENTITIOUS COATING SYSTEMS SIMILAR IN MATERIAL AND EXTENT TO THOSE INDICATED FOR THIS PROJECT, WHOSE WORK HAS RESULTED IN APPLICATIONS AND WITH A RECORD OF SUCCESSFUL IN-SERVICE PERFORMANCE.

B. SOURCE LIMITATIONS: OBTAIN CEMENTITIOUS COATING MATERIALS THROUGH ONE SOURCE FROM A SINGLE MANUFACTURER.

1.6 DELIVERY, STORAGE, AND HANDLING

A. DELIVER MATERIALS TO PROJECT SITE IN MANUFACTURER'S ORIGINAL, NEW, UNOPENED PACKAGES AND CONTAINERS BEARING MANUFACTURER'S NAME AND LABEL, AND THE FOLLOWING INFORMATION:

1. PRODUCT NAME OR TITLE OF MATERIAL.
2. MANUFACTURER'S STOCK NUMBER AND DATE OF MANUFACTURE.
3. CONTENTS BY VOLUME, FOR PIGMENT AND VEHICLE CONSTITUENTS.
4. APPLICATION INSTRUCTIONS.
5. COLOR NAME AND NUMBER.
6. HANDLING INSTRUCTIONS AND PRECAUTIONS.

B. STORE MATERIALS NOT IN USE IN TIGHTLY COVERED CONTAINERS IN A WELL-VENTILATED AREA AT A MINIMUM AMBIENT TEMPERATURE OF 45 DEG F. MAINTAIN CONTAINERS USED IN STORAGE OF COATINGS IN A CLEAN CONDITION, FREE OF FOREIGN MATERIALS AND RESIDUE.

1. PROTECT CEMENTITIOUS COATING MATERIALS FROM FREEZING. KEEP MATERIALS DRY AND STORAGE AREA NEAT AND ORDERLY. REMOVE WASTE DAILY. TAKE NECESSARY MEASURES TO ENSURE THAT WORKERS AND WORK AREAS ARE PROTECTED FROM HEALTH HAZARDS RESULTING FROM HANDLING, MIXING, AND APPLYING THE COATING.

1.7 PROJECT CONDITIONS

A. TEMPERATURE CONDITIONS: APPLY COATINGS ONLY WHEN TEMPERATURE OF SURFACES TO BE COATED AND SURROUNDING AIR TEMPERATURES ARE BETWEEN 50 AND 90 DEG F, UNLESS OTHERWISE PERMITTED BY MANUFACTURER'S WRITTEN INSTRUCTIONS. DO NOT APPLY COATINGS IF AMBIENT OR SURFACE TEMPERATURES ARE EXPECTED TO FALL BELOW 45 DEG F WITHIN 12 HOURS.

B. WEATHER CONDITIONS: DO NOT APPLY CEMENTITIOUS COATINGS IN SNOW, RAIN, FOG, OR MIST; WHEN RELATIVE HUMIDITY EXCEEDS 85 PERCENT; OR AT TEMPERATURES LESS THAN 5 DEG F ABOVE DEW POINT. ALLOW SURFACES TO ATTAIN TEMPERATURE AND CONDITIONS SPECIFIED BEFORE PROCEEDING WITH OR CONTINUING COATING OPERATION.

PART 2 - PRODUCTS

2.1 CEMENTITIOUS COATING MATERIALS, GENERAL

A. MATERIAL COMPATIBILITY: PROVIDE CRACK FILLERS, BLOCK FILLERS, CEMENTITIOUS FINISH-COAT MATERIALS, AND RELATED 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.

B. MATERIAL QUALITY: PROVIDE MANUFACTURER'S BEST-QUALITY, POLYMER-MODIFIED CEMENTITIOUS COATING MATERIAL. MATERIAL CONTAINERS NOT DISPLAYING MANUFACTURER'S PRODUCT IDENTIFICATION WILL NOT BE ACCEPTABLE.

C. COLORS AND TEXTURES: SEE THE COATING SCHEDULE AT THE END OF PART 3 FOR COLOR SELECTIONS.

D. COLORS AND TEXTURES: AS SELECTED BY ARCHITECT FROM MANUFACTURER'S FULL RANGE.

2.2 POLYMER-MODIFIED CEMENTITIOUS COATING MATERIALS

A. AVAILABLE PRODUCTS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PRODUCTS THAT MAY BE INCORPORATED INTO THE WORK INCLUDE, BUT ARE NOT LIMITED TO, ONE OF THE FOLLOWING:

1. W. R. BONSAL COMPANY; SURECOAT.
2. CHEMREX, INC.; MASTERSEAL 510.
3. GEMITE PRODUCTS, INC.; CHEM-KOTE ST.
4. TAMMS INDUSTRIES CO.; TAMOSEAL.
5. SIKA, CORPORATION; SIKAPROOF SEAL.

PART 3 - EXECUTION

3.1 EXAMINATION

A. EXAMINE SUBSTRATES AND CONDITIONS, WITH APPLICATOR PRESENT, FOR COMPLIANCE WITH REQUIREMENTS FOR COATING APPLICATION.

1. PROCEED WITH COATING APPLICATION ONLY AFTER UNSATISFACTORY CONDITIONS HAVE BEEN CORRECTED AND SURFACES ARE THOROUGHLY DRY.
2. START OF COATING APPLICATION WILL BE CONSTRUED AS APPLICATOR'S ACCEPTANCE OF SURFACE CONDITIONS.

3.2 PREPARATION

A. GENERAL: REMOVE HARDWARE AND HARDWARE ACCESSORIES, PLATES, MACHINED SURFACES, LIGHT FIXTURES, AND SIMILAR ITEMS ALREADY INSTALLED THAT ARE NOT TO BE COATED. IF REMOVAL IS IMPRACTICAL OR IMPOSSIBLE BECAUSE OF SIZE OR WEIGHT OF ITEM, PROVIDE SURFACE-APPLIED PROTECTION BEFORE SURFACE PREPARATION AND COATING.

1. AFTER COMPLETING COATING OPERATIONS IN EACH AREA, REINSTALL REMOVED ITEMS USING WORKERS SKILLED IN TRADES INVOLVED.

B. CLEANING: BEFORE APPLYING COATINGS OR OTHER SURFACE TREATMENTS, CLEAN SUBSTRATES OF SUBSTANCES THAT COULD IMPAIR BOND OF COATING SYSTEMS. REMOVE OIL AND GREASE BEFORE CLEANING.

1. SCHEDULE CLEANING AND COATING APPLICATION SO DUST AND OTHER CONTAMINANTS FROM CLEANING OPERATIONS WILL NOT FALL ON WET, NEWLY COATED SURFACES.

C. SURFACE PREPARATION: CLEAN AND PREPARE SURFACES TO BE COATED ACCORDING TO MANUFACTURER'S WRITTEN INSTRUCTIONS FOR THE PARTICULAR SUBSTRATE CONDITIONS AND AS SPECIFIED.

1. CEMENTITIOUS SURFACES: PREPARE CONCRETE, CONCRETE MASONRY UNITS, AND SIMILAR SURFACES TO BE COATED. REMOVE EFFLORESCENCE, CHALK, DUST, DIRT, RELEASE AGENTS, GREASE,

OIL, AND SIMILAR SUBSTANCES BY ABRASIVE OR WATER BLASTING, FOLLOWED BY A CLEAR-WATER RINSE.

a. REMOVE MILDEW AND NEUTRALIZE SURFACES ACCORDING TO MANUFACTURER'S WRITTEN INSTRUCTIONS BEFORE PATCHING MATERIALS ARE APPLIED.
b. ROUGHEN TO REMOVE GLAZE. USE ABRASIVE BLAST-CLEANING METHODS IF RECOMMENDED BY COATING MANUFACTURER.
c. IF HARDENERS OR SEALERS HAVE BEEN USED TO IMPROVE CURING, USE MECHANICAL METHODS OF SURFACE PREPARATION.
d. DETERMINE ALKALINITY AND MOISTURE CONTENT OF SURFACES TO BE COATED BY PERFORMING APPROPRIATE TESTS. DO NOT APPLY COATINGS OVER SURFACES WHERE MOISTURE CONTENT EXCEEDS THAT PERMITTED IN MANUFACTURER'S WRITTEN INSTRUCTIONS.
e. REMOVE EXISTING PAINT RESIDUE FROM SUBSTRATES THAT HAVE BEEN PREVIOUSLY PAINTED.

2. CRACK REPAIR: FILL CRACKS ACCORDING TO MANUFACTURER'S WRITTEN INSTRUCTIONS BEFORE COATING SURFACES.

a. CRACKS LARGER THAN 1/32 INCH: CUT OUT STATIC CRACKS, VOIDS, OR HONEYCOMBING LARGER THAN 1/32 INCH AND PATCH WITH MATERIALS RECOMMENDED IN WRITING BY COATING MANUFACTURER. IDENTIFY DYNAMIC CRACKS AND TREAT ACCORDING TO MANUFACTURER'S WRITTEN INSTRUCTIONS BEFORE BEGINNING APPLICATION.

D. MATERIAL PREPARATION: CAREFULLY MIX AND PREPARE MATERIALS ACCORDING TO COATING MANUFACTURER'S WRITTEN INSTRUCTIONS.

1. MIX THE TWO COMPONENTS IN A CLEAN CONTAINER BY HAND OR WITH A HEAVY-DUTY, SLOW-SPEED DRILL WITH A MIXING PADDLE TO ACHIEVE A SMOOTH, HEAVY-BATTER CONSISTENCY.
2. AFTER MIXING, ALLOW COATING MATERIAL TO SIT FOR APPROXIMATELY 10 MINUTES. REMIX BEFORE BEGINNING APPLICATION.
3. APPLY MATERIAL WITHIN 40 TO 60 MINUTES OF MIXING.

3.3 APPLICATION

A. GENERAL: APPLY CEMENTITIOUS COATINGS TO EXPOSED SURFACES INDICATED. COATING COLORS, SURFACE TREATMENTS, AND FINISHES ARE INDICATED IN SCHEDULES IN THE CONTRACT DOCUMENTS.

1. COLORS: WHERE AN ITEM OR SURFACE IS NOT SPECIFICALLY MENTIONED IN SCHEDULES, COAT WITH SAME COLOR AS SIMILAR ADJACENT MATERIALS OR SURFACES. IF A COLOR IS NOT DESIGNATED, ARCHITECT WILL SELECT A COLOR FROM STANDARDS AVAILABLE.

B. APPLICATION PROCEDURES: APPLY CEMENTITIOUS COATINGS BY BRUSH OR SPRAY ACCORDING TO MANUFACTURER'S WRITTEN INSTRUCTIONS.

1. DAMPEN SUBSTRATE OF SURFACES TO RECEIVE CEMENTITIOUS COATINGS ONE HOUR BEFORE BEGINNING APPLICATION TO PREVENT SURFACE DRAG. IMMEDIATELY BEFORE APPLYING COATINGS, REDAMPEN SUBSTRATE. SUBSTRATES SHALL BE SATURATED SURFACE DRY AT TIME OF APPLICATION.
2. BRUSHES: USE TAMPICO OR MASONRY BRUSHES BEST SUITED FOR MATERIAL BEING APPLIED.
3. SPRAY EQUIPMENT: USE SPRAY EQUIPMENT RECOMMENDED IN WRITING BY MANUFACTURER FOR MATERIAL AND TEXTURE REQUIRED.

C. MINIMUM COATING THICKNESS: APPLY EACH MATERIAL AT NOT LESS THAN MANUFACTURER'S RECOMMENDED SPREADING RATE. PROVIDE TOTAL CURED MATERIAL THICKNESS INDICATED OR AS RECOMMENDED IN WRITING BY MANUFACTURER.

1. NUMBER OF COATS AND FILM THICKNESS REQUIRED ARE SAME REGARDLESS OF APPLICATION METHOD. DO NOT APPLY SUCCEEDING COATS UNTIL PREVIOUS COAT HAS CURED AS RECOMMENDED IN WRITING BY MANUFACTURER.

D. BRUSH APPLICATION: BRUSH-OUT AND WORK BRUSH COATS INTO SURFACES IN AN EVEN FILM, FILLING ALL PORES AND VOIDS AT RATE RECOMMENDED IN WRITING BY MANUFACTURER TO ACHIEVE CURED MATERIAL THICKNESS INDICATED. FINISH COAT WITH SMOOTH, HORIZONTAL STROKES.

E. SPRAY APPLICATION: WHERE SPRAY APPLICATION IS USED, APPLY EACH COAT ACCORDING TO MANUFACTURER'S WRITTEN INSTRUCTIONS TO PROVIDE THE EQUIVALENT HIDING OF BRUSH-APPLIED COATS. FOLLOW SPRAY APPLICATION WITH A GENERAL LIGHT BROOMING OF COATED SURFACE TO IMPART A SLIGHT TEXTURE.

F. COMPLETED WORK: MATCH APPROVED SAMPLES FOR COLOR, TEXTURE, AND COVERAGE. REMOVE, REFINISH, OR RECOAT WORK NOT COMPLYING WITH SPECIFIED REQUIREMENTS.

3.4 FIELD QUALITY CONTROL

A. OWNER RESERVES THE RIGHT TO INVOKE THE FOLLOWING TEST PROCEDURE AT ANY TIME AND AS OFTEN AS OWNER DEEMS NECESSARY DURING THE PERIOD WHEN COATING OPERATIONS ARE BEING CONDUCTED:

1. OWNER WILL ENGAGE THE SERVICES OF A QUALIFIED INDEPENDENT TESTING AGENCY TO SAMPLE COATING USED. SAMPLES OF MATERIAL DELIVERED TO PROJECT SITE WILL BE TAKEN, IDENTIFIED AND SEALED, AND CERTIFIED IN PRESENCE OF CONTRACTOR.
2. TESTING AGENCY WILL PERFORM APPROPRIATE TESTS FOR THE FOLLOWING CHARACTERISTICS, AS REQUIRED BY OWNER:

   a. QUANTITATIVE MATERIAL ANALYSIS.
   b. COMPRESSIVE strength.
   c. FLEXURAL STRENGTH.
   d. WATER-VAPOR TRANSMISSION.

e. ACCELERATED WEATHERING.

3. OWNER MAY DIRECT CONTRACTOR TO STOP COATING APPLICATION IF TEST RESULTS SHOW MATERIALS BEING USED DO NOT COMPLY WITH REQUIREMENTS. CONTRACTOR SHALL REMOVE NONCOMPLYING MATERIALS FROM PROJECT SITE, PAY FOR TESTING, AND RECOAT SURFACES COATED WITH REJECTED MATERIALS. IF NECESSARY, CONTRACTOR MAY BE REQUIRED TO REMOVE REJECTED MATERIALS FROM PREVIOUSLY COATED SURFACES IF, ON RECOATING WITH SPECIFIED MATERIALS, THE TWO COATINGS ARE NOT COMPATIBLE.

3.5 CLEANING

A. CLEANUP: CLEAN SPILLED OR SPATTERED MATERIALS FROM ADJACENT SURFACES NOT TO BE COATED, IMMEDIATELY BEFORE COATING HAS ACHIEVED AN INITIAL SET. DO NOT SCRATCH OR DAMAGE ADJACENT FINISHED SURFACES.

1. AT THE END OF EACH WORKDAY, REMOVE RUBBISH, EMPTY CANS, RAGS, AND OTHER DISCARDED MATERIALS FROM PROJECT SITE.
2. CLEAN TOOLS, BRUSHES, AND CONTAINERS AT THE END OF EACH WORKDAY.

3.6 PROTECTION

A. PROTECT THE WORK OF OTHER TRADES FROM DAMAGE, WHETHER BEING COATED OR NOT. CORRECT DAMAGE BY CLEANING, REPAIRING, REPLACING, AND RECOATING AS APPROVED BY ARCHITECT. LEAVE THE WORK IN AN UNDAMAGED CONDITION.

B. PROVIDE "WET PAINT" SIGNS TO PROTECT NEWLY COATED FINISHES. REMOVE TEMPORARY PROTECTIVE WRAPPINGS PROVIDED BY OTHERS TO PROTECT THEIR WORK AFTER COMPLETING COATING OPERATIONS.

1. AT COMPLETION OF CONSTRUCTION ACTIVITIES OF OTHER TRADES, TOUCH UP AND RESTORE DAMAGED OR DEFACED COATED SURFACES.

3.7 COATING SCHEDULE

A. PROVIDE THE FOLLOWING CEMENTITIOUS COATING SYSTEMS FOR SUBSTRATES INDICATED:

1. APPLY ADDITIONAL COATS WHEN UNDERCOATS OR OTHER CONDITIONS SHOW THROUGH FINAL COAT UNTIL CURED FILM IS OF UNIFORM COATING FINISH, COLOR, AND APPEARANCE.

B. ABOVE-GRADE CONCRETE AND MASONRY: TWO FINISH COATS WITH TOTAL CURED THICKNESS NOT LESS THAN 40 MILS.

1. FIRST COAT: APPLY POLYMER-MODIFIED CEMENTITIOUS COATING MATERIAL AT THE RATE OF 2 LB/SQ. YD. TO ACHIEVE A TOTAL CURED THICKNESS OF 25 MILS.
2. SECOND COAT: APPLY POLYMER-MODIFIED CEMENTITIOUS COATING MATERIAL AT THE RATE OF 1 LB/SQ. YD. TO ACHIEVE A TOTAL CURED THICKNESS OF 15 MILS.

C. PREVIOUSLY COATED SURFACES: ONE FINISH COAT WITH A TOTAL CURED THICKNESS OF NOT LESS THAN 15 MILS.

1. APPLY POLYMER-MODIFIED CEMENTITIOUS COATING MATERIAL AT THE RATE OF 1 LB/SQ. YD. TO ACHIEVE A TOTAL CURED THICKNESS OF 15 MILS.

END OF SECTION

SECTION 10200 - LOUVERS AND VENTS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. SUBMITTALS: PRODUCT DATA, SHOP DRAWINGS.

PART 2 - PRODUCTS

2.1 MATERIALS

A. ALUMINUM: ASTM B 221 (ASTM B 221M), ALLOY 6063-T5 OR T-52 FOR EXTRUSIONS; ASTM B 209 (ASTM B 209M), ALLOY 3003 OR 5005 FOR SHEET.

B. GALVANIZED STEEL SHEET: ASTM A 653/A 653M, G90 (Z275) ZINC COATING.

C. STAINLESS-STEEL SHEET: ASTM A 240/A 240M, TYPE 304.

D. FASTENERS: OF SAME BASIC METAL AND ALLOY AS FASTENED METAL OR 300 SERIES STAINLESS STEEL.

2.2 LOUVERS

A. HORIZONTAL, EXTRUDED-ALUMINUM, NONDRAINABLE-BLADE LOUVERS:

1. ALUMINUM THICKNESS: 0.080 INCH (2.0 MM) FOR BLADES AND FRAMES.
2. FREE AREA: NOT LESS THAN 4.0 SQ. FT. (0.37 SQ. M) FOR 24-INCH- (0.6-M-) WIDE BY 48-INCH- (1.2-M-) HIGH LOUVER.
3. POINT OF BEGINNING WATER PENETRATION: NOT LESS THAN 850 FPM (4.3 M/S).
4. AIR PERFORMANCE: NOT MORE THAN 0.10-INCH WG (25-PA) STATIC PRESSURE DROP AT 700-FPM (3.6-M/S) FREE-AREA VELOCITY.

2.3 LOUVER SCREENS

A. PROVIDE SCREEN AT INTERIOR FACE OF EACH EXTERIOR LOUVER. FABRICATE SCREEN FRAMES FROM SAME KIND AND FORM OF METAL AS INDICATED FOR LOUVER TO WHICH SCREENS ARE ATTACHED.

1. SCREENING: ALUMINUM, 18-BY-16 (1.4-BY-1.6-MM) MESH, 0.012-INCH (0.30-MM) WIRE.

2.4 FINISHES

A. ALUMINUM LOUVERS: HIGH-PERFORMANCE ORGANIC COATING FINISH, AA-C12C42R1X. USE MANUFACTURER'S STANDARD 3-COAT FLUOROPOLYMER SYSTEM COMPLYING WITH AAMA 2605, WITH FINISH COATS CONTAINING AT LEAST 70 PERCENT POLYVINYLIDENE FLUORIDE RESIN BY WEIGHT.

PART 3 - EXECUTION

3.1 INSTALLATION

A. INSTALL LOUVERS LEVEL, PLUMB, AND AT INDICATED ALIGNMENT WITH ADJACENT WORK.

B. USE CONCEALED ANCHORAGES WHERE POSSIBLE.

C. PROTECT METAL SURFACES FROM CORROSION OR GALVANIC ACTION BY APPLYING A HEAVY COATING OF BITUMINOUS PAINT ON SURFACES THAT WILL BE IN CONTACT WITH CONCRETE, MASONRY, OR DISSIMILAR METALS.

END OF SECTION 10200

SECTION 11160 - LOADING DOCK EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. DRAWINGS AND GENERAL PROVISIONS OF THE CONTRACT, INCLUDING GENERAL AND SUPPLEMENTARY CONDITIONS AND DIVISION 1 SPECIFICATION SECTIONS, APPLY TO THIS SECTION.

1.2 SUMMARY

A. SECTION INCLUDES:

1. DOCK BUMPERS.

B. RELATED SECTIONS:

1. DIVISION 3 SECTION "CAST-IN-PLACE CONCRETE” FOR CONCRETE WORK FOR RECESSED LOADING DOCK EQUIPMENT.
2. DIVISION 5 SECTION "METAL FABRICATIONS" FOR LOADING DOCK PLATFORM EDGE CHANNELS.

1.3 DEFINITIONS

A. OPERATING RANGE: MAXIMUM AMOUNT OF TRAVEL ABOVE AND BELOW THE LOADING DOCK LEVEL.

B. WORKING RANGE: RECOMMENDED AMOUNT OF TRAVEL ABOVE AND BELOW THE LOADING DOCK LEVEL FOR WHICH LOADING AND UNLOADING OPERATIONS CAN TAKE PLACE.

1.4 SUBMITTALS: PROVIDE SUBMITTALS IN A TIMELY MANNER IN ACCORDANCE WITH THE APPROVED SUBMITTALS SCHEDULE AS SPECIFIED IN DIVISION 1 – GENERAL REQUIREMENTS.

A. SUBMITTAL: PRODUCT DATA - FOR EACH TYPE OF PRODUCT INDICATED. INCLUDE CONSTRUCTION DETAILS, MATERIAL DESCRIPTIONS, DIMENSIONS OF INDIVIDUAL COMPONENTS AND PROFILES, AND FINISHES FOR LOADING DOCK EQUIPMENT. INCLUDE RATED CAPACITIES, OPERATING CHARACTERISTICS, AND FURNISHED SPECIALTIES AND ACCESSORIES.

B. SUBMITTAL: SHOP DRAWINGS - FOR LOADING DOCK EQUIPMENT. INCLUDE PLANS, ELEVATIONS, SECTIONS, DETAILS, AND ATTACHMENTS TO OTHER WORK.

1. DETAIL EQUIPMENT ASSEMBLIES AND INDICATE DIMENSIONS, WEIGHTS, LOADS, REQUIRED CLEARANCES, METHOD OF FIELD ASSEMBLY, COMPONENTS, AND LOCATION AND SIZE OF EACH FIELD CONNECTION.

1.5 PROJECT CONDITIONS

A. FIELD MEASUREMENTS: VERIFY ACTUAL DIMENSIONS OF CONSTRUCTION CONTIGUOUS WITH LOADING DOCK EQUIPMENT.

1.6 WARRANTY

A. SPECIAL WARRANTY FOR DOCK COMPONENTS: MANUFACTURER'S STANDARD FORM IN WHICH MANUFACTURER AGREES TO REPAIR OR REPLACE DOCK COMPONENTS THAT FAIL IN MATERIALS OR WORKMANSHIP WITHIN SPECIFIED WARRANTY PERIOD.

1. FAILURES INCLUDE, BUT ARE NOT LIMITED TO, THE FOLLOWING:

a. STRUCTURAL FAILURES INCLUDING CRACKED OR BROKEN STRUCTURAL SUPPORT MEMBERS, LOAD-BEARING WELDS.

2. WARRANTY PERIOD FOR STRUCTURAL ASSEMBLY: 5 YEARS FROM DATE OF SUBSTANTIAL COMPLETION.

PART 2 - PRODUCTS

2.1 MATERIALS

A. STEEL PLATES, SHAPES, AND BARS: ASTM 36/A 36M.

B. STEEL TUBING: ASTM A 500, COLD FORMED.

C. WELDING RODS AND BARE ELECTRODES: SELECT ACCORDING TO AWS SPECIFICATIONS FOR METAL ALLOY WELDED.

D. WOOD: DOC PS 20 DIMENSION LUMBER, SELECT STRUCTURAL GRADE, KILN DRIED.

E. PRESSURE-TREATED WOOD: DOC PS 20 DIMENSION LUMBER, SELECT STRUCTURAL GRADE, KILN DRIED, AND PRESSURE TREATED WITH WATERBORNE PRESERVATIVES TO COMPLY WITH AWPA C2.

2.2 DOCK BUMPERS

A. MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, AVAILABLE MANUFACTURERS OFFERING PRODUCTS THAT MAY BE INCORPORATED INTO THE WORK INCLUDE, BUT ARE NOT LIMITED TO, THE FOLLOWING:

1. AMERICAN FLOOR PRODUCTS COMPANY, INC.
2. BEACON INDUSTRIES, INC.
3. CHALFANT DOCK EQUIPMENT.
4. DURABLE CORPORATION.
5. ELLIS INDUSTRIES, INC.
6. FLEXON, INC.
7. HUGGER DOCK EQUIPMENT COMPANY; DIVISION OF COLUMBUS FOAM PRODUCTS, INC.
8. PAWLING CORPORATION; ARCHITECTURAL PRODUCTS DIVISION.

9. PENTALIFT EQUIPMENT CORPORATION.
10. PIONEER LOADING DOCK EQUIPMENT.
11. RITE-HITE CORPORATION.
12. ROL-LIFT CORPORATION.
13. SPX DOCK PRODUCTS - KELLEY.
14. SPX DOCK PRODUCTS - SERCO.
15. SUPER SEAL MFG. LTD.
16. TENNESSEE MAT COMPANY, INC.
17. VESTIL MANUFACTURING COMPANY.

B. LAMINATED-TREAD DOCK BUMPER: FABRICATED FROM MULTIPLE, UNIFORMLY THICK PLIES CUT FROM FABRIC-REINFORCED RUBBER TIRES. LAMINATE PLIES UNDER PRESSURE ON NOT LESS THAN TWO 3/4-INCH- DIAMETER, STEEL SUPPORTING RODS THAT ARE WELDED AT ONE END TO 1/4-INCH- THICK, STRUCTURAL-STEEL END ANGLE AND SECURED WITH A NUT AND ANGLE AT THE OTHER END. FABRICATE ANGLES WITH PREDRILLED ANCHOR HOLES AND SIZED TO PROVIDE NOT LESS THAN 1 INCH OF TREAD PLIES EXTENDING BEYOND THE FACE OF CLOSURE ANGLES.

1. THICKNESS: 6 INCHES.
2. HORIZONTAL STYLE: 12 INCHES HIGH BY LENGTH INDICATED ON DRAWINGS.

C. ANCHORAGE DEVICES: HOT-DIP GALVANIZED-STEEL ANCHOR BOLTS, NUTS, WASHERS, BOLTS, SLEEVES, CAST-IN-PLACE PLATES, AND OTHER ANCHORAGE DEVICES AS REQUIRED TO FASTEN BUMPERS SECURELY IN PLACE AND TO SUIT INSTALLATION TYPE INDICATED.

2.3 GENERAL FINISH REQUIREMENTS

A. FINISH LOADING DOCK EQUIPMENT AFTER ASSEMBLY AND TESTING.

2.4 STEEL FINISHES

A. GALVANIZING: HOT-DIP GALVANIZE COMPONENTS AS INDICATED TO COMPLY WITH THE FOLLOWING:

1. ASTM A 123/A 123M FOR IRON AND STEEL LOADING DOCK EQUIPMENT.
2. ASTM A 153/A 153M OR ASTM F 2329 FOR IRON AND STEEL HARDWARE FOR LOADING DOCK EQUIPMENT.

B. GALVANIZED-STEEL FINISH: IMMEDIATELY AFTER CLEANING AND PRETREATING, APPLY MANUFACTURER'S STANDARD TWO-COAT, BAKED-ON FINISH CONSISTING OF PRIME COAT AND THERMOSETTING TOPCOAT IN MANUFACTURER'S STANDARD COLOR.

PART 3 - EXECUTION

3.1 EXAMINATION

A. EXAMINE AREAS AND CONDITIONS, WITH INSTALLER PRESENT, FOR COMPLIANCE WITH REQUIREMENTS FOR INSTALLATION TOLERANCES AND OTHER CONDITIONS AFFECTING PERFORMANCE OF LOADING DOCK EQUIPMENT.

B. PROCEED WITH INSTALLATION ONLY AFTER UNSATISFACTORY CONDITIONS HAVE BEEN CORRECTED.

3.2 PREPARATION

A. COORDINATE SIZE AND LOCATION OF LOADING DOCK EQUIPMENT INDICATED TO BE ATTACHED TO OR RECESSED INTO CONCRETE OR MASONRY, AND FURNISH ANCHORING DEVICES WITH TEMPLATES, DIAGRAMS, AND INSTRUCTIONS FOR THEIR INSTALLATION.

3.3 INSTALLATION

A. GENERAL: INSTALL LOADING DOCK EQUIPMENT, INCLUDING ACCESSORIES AS REQUIRED FOR A COMPLETE INSTALLATION.

B. DOCK BUMPERS: ATTACH DOCK BUMPERS TO FACE OF LOADING DOCK IN A MANNER THAT COMPLIES WITH REQUIREMENTS INDICATED FOR SPACING, ARRANGEMENT, AND POSITION RELATIVE TO TOP OF PLATFORM AND ANCHORAGE.

1. WELDED ATTACHMENT: PLUG-WELD ANCHOR HOLES IN CONTACT WITH STEEL INSERTS AND FILLET WELD AT OTHER LOCATIONS.
2. BOLTED ATTACHMENT: ATTACH DOCK BUMPERS TO PRESET ANCHOR BOLTS EMBEDDED IN CONCRETE OR TO CAST-IN-PLACE INSERTS OR THREADED STUDS WELDED TO EMBEDDED-STEEL PLATES OR ANGLES. IF PRESET ANCHOR BOLTS, CAST-IN-PLACE INSERTS, OR THREADED STUDS WELDED TO EMBEDDED-STEEL PLATES OR ANGLES ARE NOT PROVIDED, ATTACH DOCK BUMPERS BY DRILLING AND ANCHORING WITH EXPANSION ANCHORS AND BOLTS.
3. SCREW ATTACHMENT: ATTACH DOCK BUMPERS TO WOOD CONSTRUCTION WITH LAG BOLTS AS INDICATED.

3.4 ADJUSTING

A. AFTER COMPLETING INSTALLATION OF EXPOSED, FACTORY-FINISHED LOADING DOCK EQUIPMENT, INSPECT EXPOSED FINISHES AND REPAIR DAMAGED FINISHES.

END OF SECTION

SECTION 11232 – DIAPHRAGM METERING CHEMICAL FEED PUMPS

1. GENERAL

1.1 SPECIAL CONDITIONS

A. THIS SPECIFICATION COVERS THE FURNISHING OF U.S. FILTER/WALLACE & TIERNAN DIAPHRAGM METERING PUMPS AS BASE BID. THE EQUIPMENT AND MATERIAL SPECIFIED IS DEEMED MOST SUITABLE FOR THE PROPOSED WATER TREATMENT SYSTEM. THE CONTRACTOR SHALL PREPARE HIS BID ON THE BASIS OF THE MATERIALS AND EQUIPMENT LISTED HEREIN.

B. THE BASE BID EQUIPMENT SHALL BE U.S. FILTER/WALLACE & TIERNAN PRODUCTS ENCORE 100 SERIES SIMPLEX DIAPHRAGM PUMPS WITH VARIABLE SPEED DC DRIVE MOTORS WITH MANUAL POTENTIOMETER AND REMOTE 4-20MA INTERFACE CONTROLS LOCATED IN THE UPSTAIRS OPERATIONS CONTROL ROOM.

1.2 WORK INCLUDES

A. THE CONTRACTOR SHALL PROVIDE ALL LABOR, MATERIALS, EQUIPMENT, AND INCIDENTALS AS SHOWN, SPECIFIED, AND REQUIRED TO FURNISH, INSTALL, AND TEST THE DIAPHRAGM METERING CHEMICAL FEED PUMPS COMPLETE WITH PIPING, VALVES, TANKS, MIXERS, CONTROLS, AND APPURTENANCES. REFER TO SECTION 11242 FOR FURTHER REQUIREMENT ON APPURTENANCES RELATED TO THESE METERING PUMP SYSTEMS.

B. IN ORDER TO ASSURE THE HIGHEST QUALITY CONTROL, THE EQUIPMENT SUPPLIER AND MANUFACTURER SHALL BE ONE IN THE SAME.

1.3 PRODUCT DELIVERY, STORAGE, AND HANDLING:

A. FABRICATED PARTS, WHEN DELIVERED TO THE SITE, SHALL BE STORED OFF THE GROUND AND PROTECTED FROM WEATHER AND DAMAGE. CONTROL AND ELECTRICAL DEVICES SHALL BE STORED INDOORS.

B. HANDLE SO AS TO PREVENT DAMAGE TO EQUIPMENT DURING HANDLING AND TRANSPORTATION.

1.4 SUBMITTALS: PROVIDE THE FOLLOWING IN A TIMELY MANNER IN ACCORDANCE WITH THE APPROVED SUBMITTALS SCHEDULE AS SPECIFIED IN DIVISION 1 - GENERAL REQUIREMENTS.

A. SUBMITTAL: SHOP DRAWINGS SHOWING DIMENSIONS, CONSTRUCTION AND INSTALLATION DETAILS, MATERIALS USED, AND SHIPPING AND OPERATING WEIGHTS. THIS SHALL INCLUDE A DETAILED ISOMETRIC LAYOUT OF THE PROPOSED PERMANENT AND TEMPORARY METERING PUMP CONFIGURATIONS.

B. SUBMITTAL: MANUFACTURER'S LITERATURE AND CATALOG CUTS OF PURCHASED ITEMS.

C. SUBMITTAL: INSTALLATION, OPERATION & MAINTENANCE MANUALS COMPLETE FROM THE MANUFACTURER:

(1) COMPLETE MANUFACTURER'S INSTALLATION INSTRUCTIONS WITH DETAILED INSTALLATION DRAWINGS.

(2) COMPLETE MANUFACTURER'S OPERATIONAL INSTRUCTIONS.

(3) COMPLETE MANUFACTURER'S MAINTENANCE INSTRUCTIONS WITH COMPLETE CATALOG INFORMATION, PARTS LIST, RECOMMENDED SPARE PARTS LIST, INSTRUCTIONS FOR PERIODIC MAINTENANCE OF THE CHEMICAL FEED SYSTEM EQUIPMENT AND A SINGLE COMPLETE PM KIT FOR ONE PUMP.

1.5 GENERAL REQUIREMENTS

A. PUMPS SHALL BE SUPPLIED COMPLETE BY A SINGLE MANUFACTURER, INCLUDING DRIVE ARRANGEMENT, LOCAL CONTROLS, REMOTE CONTROL STATION, VALVES, PULSATION DAMPENERS, AIR AND GAS RELIEF, STRAINERS, ANTI-SIPHON VALVES, AND MOUNTING HARDWARE. ASSEMBLY BY THE INSTALLER OF COMPONENTS SUPPLIED BY VARIOUS MANUFACTURERS WILL NOT BE ACCEPTABLE. REMOTE CONTROL STATION SHALL BE LOCATED IN MAIN OPERATIONS CONTROL ROOM ON THE SECOND FLOOR OF THE BUILDING, REMOTE STATION SHALL INCLUDE READOUTS OF PUMP OUTPUT, SPEED, AND STROKE.

2. PRODUCTS

2.1 DIAPHRAGM METERING CHEMICAL FEED PUMPS SHALL BE VARIABLE SPEED, DC MOTOR OPERATED POSITIVE DISPLACEMENT PUMPS.

A. PUMP CAPACITIES SHALL BE AS SHOWN IN THE PUMP SCHEDULE. PUMP CAPACITY SHALL BE ADJUSTABLE FROM 0 TO 100 PERCENT BY VARYING THE PLUNGER'S EFFECTIVE STROKE LENGTH OR FREQUENCY AND THE PUMP SPEED. THE PUMPS SHALL BE CONTINUOUSLY ADJUSTABLE WHILE PUMP IS RUNNING IN MANUAL OR AUTOMATIC CONTROL. THE PUMP SHALL BE CAPABLE OF TRACKING A 4-20 MA ANALOG INPUT FROM AN INTEGRATED REMOTE OPERATING TERMINAL TO BE LOCATED IN THE SECOND FLOOR OPERATIONS CONTROL ROOM.

B. PUMP SCHEDULE:

PUMP NO.	SERVICE DESCRIPTION	CAPACITY (GPH)
CP-1	SODIUM HYPOCHLORITE, 12.5-15%	0 TO 30
CP-2	SODIUM HYPOCHLORITE, 12.5-15%	0 TO 30
CP-3	SODIUM HYPOCHLORITE, 12.5-15%	0 TO 30
CP-4	SODIUM HYPOCHLORITE, 12.5-15%	0 TO 30

C. PUMP AND FITTING MATERIALS SHALL BE COMPATIBLE WITH FULL STRENGTH SODIUM HYPOCHLORITE.

D. PUMP OUTPUT SHALL BE CONTINUOUSLY RATED AT OPERATING TEMPERATURE AND ADJUSTABLE WHILE PUMPS ARE IN OPERATION. PROVIDE AN INLINE FLOWMETER OF THE IN-LINE FLOW TUBE, NON-WETTED TRANSDUCER DESIGN. FLOWMETER SHALL BE MICROPROCESSOR BASED ON TRANSIT TIME FLOW MONITORING TECHNIQUE. FLOW TUBE SHALL HAVE A KYNAR BODY WITH 3/8-INCH END CONNECTIONS. FLOW METER SHALL HAVE AN LCD INDICATOR FOR LOCAL REPORTING AND A 4-20 MA FLOW SIGNAL OUTPUT TO REMOTE PUMP OPERATING STATION. SYSTEM SHALL BE DESIGNED FOR A FLOW RANGE OF 0-30 GALLONS PER HOUR AND SHALL BE A CONTROLOTRON MODEL 1010 FTN.

E. POSITIVE FLOW SHALL BE ENSURED BY THE USE OF A MINIMUM OF FOUR DIAPHRAGM TYPE CHECK VALVES AND A FIVE FUNCTION VALVE FOR PRESSURE RELIEF, BACKPRESSURE, ANTI-SIPHON, DEGAS, AND DRAIN.

F. THE PUMP SHALL BE WATER RESISTANT FOR OUTDOOR INSTALLATION, AND INTERNALLY DAMPENED FOR NOISE REDUCTION.

G. OPERATOR STATION

(1) PROVIDE AN OPERATOR STATION THAT WILL ALLOW LOCAL OR REMOTE VARIABLE SPEED CONTROL. LOCAL CONTROL SHALL ENABLE MANUAL ADJUSTMENT OF PUMP STROKE AND FREQUENCY. REMOTE CONTROL OPERATION SHALL BE CAPABLE OF RECEIVING A 4-20 MA SIGNAL AND VARYING THE PUMP OUTPUT SPEED TO MATCH THE SIGNAL WITH REMOTE VISUAL SPEED INDICATOR AND FLOWRATE DISPLAY. THIS CONTROL UNIT SHALL BE LOCATED IN THE SECOND FLOOR OPERATOR CONTROL ROOM.

(2) CONTROL PANEL SHALL BE LOCATED OPPOSITE THE LIQUID END.

(3) CAPACITY ADJUSTMENT SHALL BE PROVIDED BY A DIAL KNOB FOR STROKE LENGTH AND A SIX BUTTON KEYPAD FOR STROKE FREQUENCY AND FUNCTION SELECTION.

(4) CONTROL PANEL SHALL HAVE A 16 CHARACTER DOT MATRIX, BACKLIT LCD DISPLAY TO VIEW CONTROL OPTIONS, OPERATING CONDITIONS, AND ALARMS.

H. ELECTRONIC DRIVE

(1) DRIVE SHALL HAVE AUTOMATIC RESET THERMAL OVERLOAD PROTECTION.

(2) PUMP SHALL AUTOMATICALLY STOP PULSING WHEN DISCHARGE PRESSURE EXCEEDS PUMP PRESSURE RATING BY NOT MORE THAN 35 PERCENT WHEN THE PUMP IS AT MAXIMUM STROKE RATE.

(3) ELECTRONIC CIRCUITRY SHALL BE EMI RESISTANT AND SHALL EMPLOY A METAL OXIDE VARISTOR FOR SURGE PROTECTION.

(4) CIRCUIT OVERLOAD PROTECTION SHALL BE PROVIDED BY A RESETTABLE CIRCUIT BREAKER MOUNTED ON THE PUMP CONTROL PANEL AND ACCESSIBLE FROM OUTSIDE THE PUMP.

I. ENCLOSURE

(1) PUMP GEAR BOX SHALL BE EPOXY COATED CAST IRON, WITH SCH 80 GRAY PVC DRIVE ENDS

(2) ELECTRONIC CIRCUITRY SHALL BE MOUNTED AT THE REAR OF THE PUMP FOR MAXIMUM PROTECTION AGAINST CHEMICAL INTRUSION.

J. PROVIDE TITANIUM METERING PUMP WALL MOUNT BRACKETS; ONE FOR EACH PUMP.

3. EXECUTION

3.1 INSTALLATION

A. INSTALL CHEMICAL FEED PUMPS IN THE LOCATIONS SHOWN ON THE DRAWINGS AND IN ACCORDANCE WITH MANUFACTURER’S RECOMMENDATIONS. THIS WILL INCLUDE INSTALLATION AND COMMISSIONING OF A TEMPORARY FEED SYSTEM, INSTALLATION AND COMMISSIONING OF A PERMANENT FEED SYSTEM AND DECOMMISSIONING AND INTEGRATION OF TEMPORARY FEED SYSTEM INTO THE PERMANENT FEED SYSTEM.

3.2 FIELD TESTING

A. UPON COMPLETION OF INSTALLATION OF THE CHEMICAL FEED PUMPS, TEST FOR CONFORMANCE WITH PERFORMANCE REQUIREMENTS AND THE DESIGN CALCULATIONS.

B. PRIOR TO STARTUP, INSPECT ALL EQUIPMENT FOR PROPER ALIGNMENT AND CONNECTION.

C. FIELD TESTING SHALL INCLUDE MEASUREMENT OF AT LEAST THE FOLLOWING:

(1) MINIMUM AND MAXIMUM PUMP RATE FOR EACH FEED PUMP.

3.3 START-UP SERVICES

A. THE CONTRACTOR SHALL FURNISH THE SERVICES OF A MANUFACTURER'S FACTORY SERVICE PERSON FOR FINAL INSPECTION AND START-UP OF ALL CHEMICAL FEED PUMPS AND TO INSTRUCT OWNER AND CONTRACTOR'S PERSONNEL IN PROPER OPERATION AND MAINTENANCE PROCEDURES. A MINIMUM OF ONE TRIP FOR A TOTAL OF ONE 8-HOUR WORKDAY SHALL BE REQUIRED.

3.4 TRAINING OF PERSONNEL

A. PROVIDE FOR TRAINING OF DESIGNATED PERSONNEL IN THE OPERATION AND MAINTENANCE OF THE CHEMICAL FEED PUMPS INCLUDING ALL COMPONENTS SPECIFIED IN THIS SECTION. TRAINING SHALL BE CONDUCTED AT TIMES

AND LOCATIONS ACCEPTABLE TO THE OWNER. CONTRACTOR SHALL DESIGNATE A PERSON RESPONSIBLE FOR SCHEDULING AND COORDINATING ALL TRAINING.

B. PROVIDE DETAILED SYSTEM TRAINING INCLUDING AS A MINIMUM THE FOLLOWING:

(1) SYSTEM OPERATIONS PHILOSOPHY

(2) OPERATOR INTERFACE/SYSTEM SET POINTS

(3) COMPONENT PERFORMANCE REQUIREMENTS

(4) COMPONENT FUNCTIONS

(5) COMPONENT MAINTENANCE

(6) COMPONENT TROUBLESHOOTING

END OF SECTION

SECTION 11236 - CHEMICAL TANKS

1. GENERAL

1.01 THIS SECTION SPECIFIES THE CHEMICAL STORAGE TANKS AND ACCESSORIES.

1.02 SUBMITTALS: PROVIDE THE FOLLOWING IN A TIMELY MANNER IN ACCORDANCE WITH THE APPROVED SUBMITTALS SCHEDULE AS SPECIFIED IN DIVISION 1 - GENERAL REQUIREMENTS.

A. SUBMITTAL: SHOP DRAWINGS FOR EACH TANK INCLUDING:

(1) CRITICAL DIMENSIONS

(2) FITTING LOCATIONS

(3) CONSTRUCTION MATERIALS

(4) APPROVED CHEMICAL STORAGE

(5) TANK HEAT TRACING SYSTEM AND CONNECTION POINT LOCATION

(6) TANK INSULATION AND EXTERIOR COATING

(7) MAGNETICALLY COUPLED LEVEL INDICATOR

B. SUBMITTAL: MANUFACTURER'S CATALOG DATA.

C. SUBMITTAL: MANUFACTURER'S INSTALLATION INSTRUCTIONS.

1.03 CHEMICAL TANKS SHALL BE PLAS-TANKS INDUSTRIES, INC.; MFG JUSTIN TANKS, INC.; OR AUGUSTA FIBERGLASS, INC.

1.04 FUEL OIL TANKS SHALL BE CONVAULT AS MANUFACTURED BY CORE ENGINEERING SOLUTIONS OR APPROVED EQUAL.

2. PRODUCTS

2.01 FIBERGLASS REINFORCED PLASTIC TANKS

A. CHEMICAL TANKS SHALL BE FIBERGLASS REINFORCED PLASTIC (FRP). TANKS SHALL BE FABRICATED IN ACCORDANCE WITH ASTM D 4097, ASTM D 3299, AND ASTM C 582. FIRE RETARDANT PROPERTIES SHALL PROVIDE A FLAME SPREAD RATING OF 25 OR LESS IN ACCORDANCE WITH ASTM E 84 CLASS 1. TANK LIFTING LUGS, HOLD-DOWNS AND PIPE BRACKET ATTACHMENT LUGS SHALL BE PROVIDED AS REQUIRED TO ENSURE PROPER HANDLING AND INSTALLATION FOR PERMANENT AND TEMPORARY CONFIGURATIONS. ALL HARDWARE SHALL BE TYPE 316 STAINLESS STEEL UNLESS OTHERWISE NOTED. GASKETS OF CHEMICALLY COMPATIBLE MATERIAL SHALL BE PROVIDED FOR ALL FLANGED CONNECTIONS.

(1) ALL TANKS SHALL HAVE A CERTIFICATION LABEL APPLIED TO THE FINAL EXTERIOR SURFACE OF THE TANK SO IT WILL BE PERMANENTLY VISIBLE STATING:

CORROSION RESISTANT LINER RESIN FOR THE CHEMICAL STORED

TYPE OF LINER REINFORCEMENT

CHEMICAL TO BE STORED INCLUDING:

CHEMICAL NAME, PURITY, AND CONCENTRATION

SPECIFIC GRAVITY

MAXIMUM TEMPERATURE

PRECAUTIONS IN HANDLING

EXTERIOR RESIN

TANK CAPACITY

DATE OF MANUFACTURE

ITEM LABELED "SUPPLIER NAME AND ADDRESS" WITH ADEQUATE BLANK AREA FOR FUTURE COMPLETION.

(2) ALL TANKS SHALL HAVE AN INTERIOR LAYER OF CORROSION BARRIER OF HETRON 922, DERAKANE 411, OR APPROVED EQUAL. THE LAYER SHALL BE A MINIMUM OF 150 MILS THICK. TANKS SHALL PASS CHEMICAL RESISTANCE TEST AS CALLED FOR IN ASTM C 581. THIS COATING IS REQUIRED SO THAT EACH TANK CAN BE USED TO STORE SODIUM HYPOCHLORITE AS NEEDED.

(3) ALL TANKS (INCLUDING TEMPORARY INSTALLATION) SHALL BE INSTALLED WITH A 1/2-INCH PAD OF CLOSED CELL FOAM NEOPRENE RUBBER BETWEEN THE BOTTOM OF THE TANK AND THE TOP OF THE CONCRETE FOUNDATION. ALL TANK FITTINGS SHALL BE PROVIDED WITH GASKETED BLIND FLANGE PLATES OVER ALL OPENINGS SUITABLE FOR PERMANENT USE. TANKS SHALL BE CLEAN AND SUITABLE FOR POTABLE WATER CHEMICAL STORAGE UPON DELIVERY AND WHEN PLACED IN SERVICE.

(4) TANKS (T1, T2, AND T3) SHALL BE INSTALLED WITH TWO OUTLET PORTS LOCATED TO PROVIDE FULL DRAINAGE OF THE TANK, ONE FOR ROUTINE CHEMICAL SUPPLY AND ONE FOR MAINTENANCE DRAINING OF THE TANK.

(5) TANK T-5 SHALL BE HEAT TRACED AND INSULATED WITH 2 INCHES OF RESIN IMPREGNATED FIBERGLASS INSULATION. HEAT TRACING AND INSULATION SYSTEM SHALL BE AS SPECIFIED FOR ASSOCIATED CAUSTIC SODA PIPING. TANK HEAT TRACING WIRE SHALL BE INDEPENDENT OF PIPING SYSTEM, BUT HEAT TRACING SHALL BE TIED TO COMMON REMOTE MONITORING AND CONTROL UNIT USED FOR PIPING SYSTEM AND EXISTING CAUSTIC TANK. ALL HEAT TRACING SHALL HAVE AN AUDIBLE ALARM INSIDE THE PLANT BUILDING TO INDICATE OUT OF RANGE (HIGH & LOW) TEMPERATURE OPERATION OR FAILURE OF THE HEAT TRACING SYSTEM.

(6) ALL TANKS SHALL BE PROVIDED WITH A MAGNETICALLY COUPLED LEVEL INDICATOR CONSTRUCTED OF SCHEDULE 80 CPVC. BODY OF GAUGE ON CAUSTIC TANK SHALL BE HEAT TRACED AND INSULATED AS PART OF PERMANENT INSTALLATION. LEVEL INDICATOR SHALL BE A SHUTTLE OR FLIPPER TYPE INDICATOR HOUSED IN A HERMETICALLY SEALED POLYCARBONATE TUBE WITH FLOURESCENT INDICATOR VISIBLE FROM A MINIMUM OF 50 FEET AWAY.

B. TANK DESIGN

(1) SODIUM HYPOCHLORITE TANKS, (T1, T2, T3):

CONSTRUCTION:	FRP
INSIDE DIAMETER	9 FEET – 0 INCH

TANK HEIGHT:	12 FEET – 0 INCH
NOMINAL CAPACITY:	5,700 GALLONS
TOP:	FLAT
CHEMICAL:	15% SODIUM HYPOCHLORITE
SPECIFIC GRAVITY:	APPROXIMATELY 1.21
TEMPERATURE:	AMBIENT
PRESSURE:	ATMOSPHERIC
FITTINGS: (T-1)	30-INCH FLANGED MANWAY WITH COVER AT 45 DEGREES AND CENTER 3 FEET OFF BOTTOM
	2-INCH FLANGED TOP NOZZLE FOR PRESSURE RELIEF AND SITE GAUGE AT 75 DEGREES AND 4 FOOT RADIUS
	2-INCH FLANGED SUCTION NOZZLE AT 75 DEGREES AND 1 INCH OFF BOTTOM FOR SITE GAUGE
	6-INCH FLANGED TOP NOZZLE, 6 INCHES HIGH FOR LEVEL SENSOR AT 90 DEGREES AND 3-FOOT 9-INCH RADIUS
	1-INCH FLANGED SUCTION NOZZLE AT 135 DEGREES AND 1 INCH OFF BOTTOM
	2-INCH FULL DRAIN NOZZLE AT 225 DEGREES
	2-INCH FLANGED TOP FILL NOZZLE AT 315 DEGREES AND 4-FOOT RADIUS WITH INTERIOR DIP TUBE OF SCHEDULE 80 CPVC EXTENDING TO WITHIN 12 INCHES OF TANK FLOOR, PROVIDE 3/4-INCH THICK 12-INCH SQUARE ANTI-EROSION PLATE OF BUILT UP RESIN AT BASE OF DIP TUBE INLET. TIE DIP TUBE INTO TANK WALL FOR STRUCTURAL SUPPORT. PROVIDE A 1-INCH HOLE IN THE TOP OF THE INTERIOR DIP TUBE 1 INCH BELOW TANK TOP TO SERVE AS A FILL PORT VACUUM BREAK
	6-INCH FLANGED NOZZLE, 6 INCHES HIGH FOR VENT AT 0 DEGREES AND 0 FOOT RADIUS
	PROVIDE A MINIMUM OF SIX BOTTOM LUGS SUITABLE FOR BOLTING THE TANK TO THE CONCRETE BASE. TANK WILL BE USED IN AN INTERIOR APPLICATION.

FITTINGS: (T-2, T-3)	30-INCH FLANGED MANWAY WITH COVER AT 45 DEGREES AND CENTER 3 FEET OFF BOTTOM
	2-INCH FLANGED TOP NOZZLE FOR PRESSURE RELIEF AND SITE GAUGE AT 75 DEGREES AND 4 FOOT RADIUS
	2-INCH FLANGED SUCTION NOZZLE AT 75 DEGREES AND 1 INCH OFF BOTTOM FOR SITE GAUGE
	1-INCH FLANGED SUCTION NOZZLE AT 90 DEGREES AND 1 INCH OFF BOTTOM
	6-INCH FLANGED NOZZLE, 6 INCHES HIGH FOR LEVEL SENSOR AT 90 DEGREES AND 3-FOOT 9-INCH RADIUS
	2-INCH FULL DRAIN NOZZLE AT 225 DEGREES
	2-INCH FLANGED TOP FILL NOZZLE AT 315 DEGREES AND 4-FOOT RADIUS WITH INTERIOR DIP TUBE OF SCHEDULE 80 CPVC EXTENDING TO WITHIN 12 INCHES OF TANK FLOOR, PROVIDE 3/4-INCH THICK 12-INCH SQUARE ANTI-EROSION PLATE OF BUILT UP RESIN AT BASE OF DIP TUBE INLET. TIE DIP TUBE INTO TANK WALL FOR STRUCTURAL SUPPORT. PROVIDE A 1-INCH HOLE IN THE TOP OF THE INTERIOR DIP TUBE 1 INCH BELOW TANK TOP TO SERVE AS A FILL PORT VACUUM BREAK
	6-INCH FLANGED NOZZLE, 6 INCHES HIGH FOR VENT AT 0 DEGREES AND 0 FOOT RADIUS
	PROVIDE A MINIMUM OF SIX BOTTOM LUGS SUITABLE FOR BOLTING THE TANK TO THE CONCRETE BASE. TANK WILL BE USED IN AN INTERIOR APPLICATION.

(2) ALUMINIUM SULFATE (ALUM) TANK (T-4):
(NOTE TEMP USE WITH SODIUM HYPOCHLORITE DURING CONSTRUCTION T-5)
(TANK ONE OF ADDITIVE BID OPTION A – CONFIRM CONNECTION LOCATIONS PRIOR TO ORDERING)

CONSTRUCTION:	FRP
INSIDE DIAMETER	9 FEET – 0 INCH
TANK HEIGHT:	15 FEET – 0 INCH
NOMINAL CAPACITY:	7,100 GALLONS
TOP:	DOMED
CHEMICAL:	50% SOLUTION ALUMINUM SULFATE

SPECIFIC GRAVITY:	APPROXIMATELY 1.34
TEMPERATURE:	AMBIENT
PRESSURE:	ATMOSPHERIC
FITTINGS: (T-5)	30-INCH FLANGED MANWAY WITH COVER AT 45 DEGREES AND CENTER 3 FEET OFF BOTTOM
	6-INCH FLANGED TOP NOZZLE, 6 INCHES WITH SCREENED MUSHROOM VENT AT 45 DEGREES AND 4-FOOT RADIUS
	2-INCH FLANGED TOP NOZZLE FOR SITE GAUGE AT 75 DEGREES AND 4 FOOT RADIUS
	2-INCH FLANGED NOZZLE AT 75 DEGREES AND 1 INCH OFF BOTTOM FOR SITE GAUGE
	2-INCH FLANGED SUCTION NOZZLE AT 90 DEGREES AND 12 INCHES OFF BOTTOM
	2-INCH FLANGED SUCTION NOZZLE AT 90 DEGREES AND 24 INCHES OFF BOTTOM (SPARE)
	2-INCH FULL DRAIN NOZZLE AT 315 DEGREES
	2-INCH FLANGED TOP FILL NOZZLE AT 270 DEGREES AND 4 FOOT RADIUS, PROVIDE EXTERIOR PIPE CLAMP LUGS AT 4 FEET ON CENTER DOWN SIDE OF TANK AT 270 DEGREES TO WITHIN 1 FOOT OF BOTTOM. PROVIDE INTERIOR DIP TUBE OF SCHEDULE 80 CPVC EXTENDING TO WITHIN 12 INCHES OF TANK FLOOR, PROVIDE 3/4-INCH THICK 12-INCH SQUARE ANTI-EROSION PLATE OF BUILT UP RESIN AT BASE OF DIP TUBE INLET. TIE DIP TUBE INTO TANK WALL FOR STRUCTURAL SUPPORT. PROVIDE A 1-INCH HOLE IN THE TOP OF THE INTERIOR DIP TUBE 1 INCH BELOW TANK TOP TO SERVE AS A FILL PORT VACUUM BREAK
	PROVIDE A MINIMUM OF FOUR EXTERIOR TIE DOWN LUGS AROUND THE TOP PORTION OF THE TANK TO ENABLE IT TO BE TIED DOWN FOR TEMPORARY SERVICE PRIOR TO PERMANENT INSTALLATION.
	PROVIDE A MINIMUM OF SIX BOTTOM LUGS SUITABLE FOR BOLTING THE TANK TO THE CONCRETE BASE. TANK WILL BE

USED IN AN EXTERIOR APPLICATION SUBJECT TO WINDS OF 100 MPH.

(3) CAUSTIC SODA TANK (T-5):
(NOTE TEMP USE WITH SODIUM HYPOCHLORITE DURING CONSTRUCTION T-5)
(TANK TWO OF ADDITIVE BID OPTION A – CONFIRM CONNECTION LOCATIONS PRIOR TO ORDERING)

CONSTRUCTION:	FRP
INSIDE DIAMETER	9 FEET – 0 INCH
TANK HEIGHT:	15 FEET – 0 INCH
NOMINAL CAPACITY:	7,100 GALLONS
TOP:	DOMED
CHEMICAL:	25-50% CAUSTIC SODA
SPECIFIC GRAVITY:	APPROXIMATELY 1.53
TEMPERATURE:	AMBIENT
PRESSURE:	ATMOSPHERIC
FITTINGS: (T-4)	30-INCH FLANGED MANWAY WITH COVER AT 45 DEGREES AND CENTER 3 FEET OFF BOTTOM
	6-INCH FLANGED TOP NOZZLE, 6 INCHES WITH SCREENED MUSHROOM VENT AT 45 DEGREES AND 4-FOOT RADIUS
	HEAT TRACING TERMINAL WIRING BOX SHALL BE LOCATED AT 60 DEGREES AND 5 FEET OFF THE BOTTOM OF THE TANK.
	2-INCH FLANGED TOP NOZZLE FOR SITE GAUGE AT 75 DEGREES AND 4 FOOT RADIUS
	2-INCH FLANGED NOZZLE AT 75 DEGREES AND 12 INCHES OFF BOTTOM FOR SITE GAUGE
	2-INCH FLANGED SUCTION NOZZLE AT 90 DEGREES AND 12 INCHES OFF BOTTOM
	2-INCH FLANGED SUCTION NOZZLE AT 90 DEGREES AND 24 INCHES OFF BOTTOM (SPARE)
	1-INCH FLANGED TEMPERATURE MONITORING NOZZLE AT 90 DEGREES AND 48 INCHES OFF BOTTOM
	2-INCH FULL DRAIN NOZZLE AT 315 DEGREES

2-INCH FLANGED TOP FILL NOZZLE AT 270 DEGREES AND 4 FOOT RADIUS, PROVIDE EXTERIOR PIPE CLAMP LUGS AT 4 FEET ON CENTER DOWN SIDE OF TANK AT 270 DEGREES TO WITHIN 1 FOOT OF BOTTOM, LUGS TO EXTEND A MIN OF 3 INCHES BEYOND TANK INSULATION FOR CONNECTION OF FILL PIPING. PROVIDE INTERIOR DIP TUBE OF SCHEDULE 80 CPVC EXTENDING TO WITHIN 12 INCHES OF TANK FLOOR, PROVIDE 3/4-INCH THICK 12-INCH SQUARE ANTI-EROSION PLATE OF BUILT UP RESIN AT BASE OF DIP TUBE INLET. TIE DIP TUBE INTO TANK WALL FOR STRUCTURAL SUPPORT. PROVIDE A 1-INCH HOLE IN THE TOP OF THE INTERIOR DIP TUBE 1 INCH BELOW TANK TOP TO SERVE AS A FILL PORT VACUUM BREAK

TANK TO BE HEAT TRACED WITH POLYOLEFIN WRAPPED, SELF REGULATING HEAT TRACING WIRE PER SPECIFICATIONS AND INSULATED WITH 2-INCHES OF POLYURETHANE FOAM AND A TOP COAT OF WHITE ELASTOMERIC PAINT SUITABLE FOR EXTERIOR EXPOSURE (MIN. 20 MIL DRY FILM THICKNESS). PROVIDE FOIL TAPE UNDER HEAT TRACING TO PROTECT TANK FROM LOCALIZED OVERHEATING.

PROVIDE A MINIMUM OF FOUR EXTERIOR TIE DOWN LUGS AROUND THE TOP PORTION OF THE TANK TO ENABLE IT TO BE TIED DOWN FOR TEMPORARY SERVICE PRIOR TO PERMANENT INSTALLATION.

PROVIDE A MINIMUM OF SIX BOTTOM LUGS SUITABLE FOR BOLTING THE TANK TO THE CONCRETE BASE. TANK WILL BE USED IN AN EXTERIOR APPLICATION. TANK WILL BE USED IN AN EXTERIOR APPLICATION SUBJECT TO WINDS OF 100 MPH.

2.02 INTEGRALLY CONTAINED CONCRETE VAULTED TANK

A. DIESEL FUEL STORAGE TANK SHALL BE A 1,000 GALLON CONVAULT TANK OR APPROVED EQUAL WITH A 20-YEAR SERVICE GUARANTEE. TANK SHALL HAVE INTEGRAL FILL AND OVERFLOW PORT CONTAINMENT, INTEGRAL LOCAL LEVEL ALARM AND INDICATOR, AND MEET UL STANDARD 2085 FOR INSULATED SECONDARY CONTAINED ABOVEGROUND STORAGE TANKS. TANK SHALL BE CONSTRUCTED WITH A SEAMLESS EXTERNAL CONCRETE VAULT, MINIMUM OF 6-INCHES THICK. STEEL PRIMARY TANK SHALL BE ENCASED IN A 30-MIL POLYETHYLENE PRIMARY LINER. ALL EXTERNAL FITTINGS SHALL BE POWDER COATED WITH 316 STAINLESS STEEL HARDWARE. CONCRETE VAULT SHALL BE FINISHED IN WHITE EPOXY PAINT. ALL FINISHES SHALL BE FACTORY APPLIED. ANY BLEMISHES OR DEFECTS EXHIBITED DURING CONSTRUCTION SHALL BE REPAIRED TO OWNER’S SATISFACTION AND COMPLY WITH MANUFACTURER’S WARRANTEE REQUIREMENTS.

3. EXECUTION

3.01 INSTALLATION

A. UPON DELIVERY, CHECK TANKS CLOSELY FOR DAMAGE. INSURE TANK IS HANDLED WITH CARE TO PREVENT INADVERTENT DAMAGE DURING INSTALLATION.

B. INSTALL TANK IN ACCORDANCE WITH MANUFACTURER'S WRITTEN INSTALLATION INSTRUCTIONS, INCLUDING TEMPORARY AND PERMANENT INSTALLATION AS SHOWN ON THE PLANS. ALUM AND CAUSTIC TANKS USED FOR TEMPORARY STORAGE OF SODIUM HYPOCHLORITE SHALL BE PURGED AND RINSED PRIOR TO PLACING THEM IN PERMANENT SERVICE FOR ALUM AND CAUSTIC USE.

C. AFTER PLACING NEW ALUM AND CAUSTIC TANKS IN SERVICE FOR A SATISFACTORY TEST PERIOD DETERMINED BY OWNER, REMOVE EXISTING SODIUM HYDROXIDE AND ALUM TANKS FROM SERVICE FOR RETROFIT OF NEW TOP FILL PIPING AND CORRECTION OF CONTAINMENT SLAB DEFECTS. THIS WILL REQUIRE CLEANING AND PURGING OF THE TANKS, REMOVAL OF TANKS FROM EXISTING LOCATIONS, REPAIR OF CONCRETE UNDER THE TANK ACCORDING TO CONCRETE REPAIR SPECIFICATIONS, AND REINSTALLATION OF TANKS WITH A NEW NEOPRENE BASE PAD TO MATCH NEW TANKS. WHILE THESE TANKS ARE OUT OF SERVICE THE CONTRACTOR SHALL INSTALL NEW 2-INCH FLANGED TOP FILL PORTS ON THESE TWO TANKS PER TANK MANUFACTURER’S RECOMMENDATIONS AND TO MATCH NEW PERMANENT FILL POINT LOCATIONS. THIS RETROFIT WILL INCLUDE PROVIDING AN INTERIOR DIP TUBE EXTENDING TO WITHIN 12 INCHES OF THE BASE OF EACH TANK WITH A 1-INCH ANTI-SIPHON HOLE IN THE UPPER 6-INCHES OF THE DIP TUBE. THE CONTRACTOR SHALL ALSO REPLACE ALL EXTERIOR FITTING GASKETS ON THESE TANKS AS PART OF RETROFIT OPERATIONS. UPON RETROFIT, THE TANKS SHALL THEN BE REINSTALLED WITH NEW STAINLESS STEEL ANCHORING HARDWARE, HYDROSTATICALLY TESTED, AND PLACED IN SERVICE. IF ADDITIVE OPTION BID ITEM IS SELECTED, RETROFIT WORK WILL BE LIMITED TO REPAIR OF THE EXISTING CONCRETE SLAB, CLEANING OF EXISTING TANKS SUITABLE FOR DISPOSAL REQUIREMENTS AND INSTALLATION OF NEW TANKS WITH NEOPRENE BASES AND STAINLESS STEEL HARDWARE.

D. CONNECT DIESEL TANK TO EXISTING GENERATOR SET SUPPLY AND RETURN LINES WITH TYPE K COPPER USING FLARED OR COMPRESSION FITTINGS SUITABLE FOR IMMERSION IN DIESEL FUEL. CONNECT ELECTRIC SENSORS AND ALARMS TO EXISTING SERVICE CONNECTIONS. FILL AND TEST ALL TANK APPURTENANCES.

E. ALL TANK AND PIPE ASSEMBLIES SHALL BE LEAK TESTED PRIOR TO PLACING IN SERVICE. LEAK TESTING OF PIPE SHALL BE PER SPECIFICATION SECTION 11242. ALL TANKS SHALL BE HYDROSTATICALLY TESTED ON SITE FOR A MINIMUM OF 24 HOURS WITH ZERO LEAKAGE EVIDENT UPON COMPLETION OF THE 24-HOUR TEST, WATER FOR THIS TESTING WILL BE PROVIDED ON SITE. ALL LEAKS IDENTIFIED SHALL BE REPAIRED ACCORDING TO MANUFACTURER RECOMMENDATIONS AND THE TEST REPEATED UNTIL IT IS SUCCESSFULLY COMPLETED.

END OF SECTION

SECTION 11242 – CHEMICAL PIPING SYSTEMS

1. GENERAL

1.01 DESCRIPTION

A. CHEMICAL FEED SYSTEMS SHALL CONSIST OF, BUT NOT BE LIMITED TO, ALL PIPING, TUBING, VALVES, FITTINGS, AND OTHER APPURTENANCES REQUIRED FOR COMPLETE AND OPERABLE FEED SYSTEMS FOR THE FOLLOWING CHEMICAL SERVICES:

(1) SODIUM HYPOCHLORITE, 12.5 PERCENT

(2) ALUMINIUM SULFATE, 8.5 PERCENT

(3) SODIUM HYDROXIDE, 25 PERCENT

B. THE CONTRACTOR SHALL PROVIDE ALL LABOR, MATERIALS, EQUIPMENT, AND INCIDENTALS REQUIRED TO INSTALL, TEST, AND PLACE IN SATISFACTORY SERVICE ALL CHEMICAL FEED SYSTEMS AS INDICATED ON THE DRAWINGS AND AS SPECIFIED HEREIN.

C. RELATED SECTIONS:

(1) SECTION 11232 - DIAPHRAGM METERING CHEMICAL FEED PUMP

1.02 SUBMITTALS: PROVIDE THE FOLLOWING IN A TIMELY MANNER IN ACCORDANCE WITH THE APPROVED SUBMITTALS SCHEDULE AS SPECIFIED IN DIVISION 1 - GENERAL REQUIREMENTS.

A. SUBMITTAL: CATALOG CUTS, PERFORMANCE DATA, SHOP DRAWINGS, REPLACEABLE PARTS LISTS, AND CERTIFICATES OF COMPATIBILITY WITH INTENDED CHEMICAL SERVICE FOR THE FOLLOWING:

(1) PIPING, FITTINGS, AND PIPE APPURTENANCES

(2) CHEMICAL TUBING

(3) DIMENSIONED PIPING LAYOUT FOR CHEMICAL PIPING SYSTEMS

(4) VALVES

(5) PRESSURE GAUGES

(6) FLOWMETER

(7) PIPE HEAT TRACING AND INSULATION SYSTEMS

(8) TANK AND PIPE TEMPERATURE MONITORING EQUIPMENT

B. SUBMITTAL: PROVIDE WIRING SCHEMATIC WITH INTERCONNECTION DIAGRAM AND A COMPLETE DESCRIPTION OF OPERATION FOR EACH LEG OF THE CAUSTIC SODA HEAT TRACING SYSTEM. THIS SHALL INCLUDE PROVISIONS FOR PROTECTING FILL AND SUPPLY LINES AND STORAGE TANKS. THE HEAT

TRACING SYSTEM SHALL INCORPORATE AN AUDIBLE ANNUNCIATOR INSIDE THE BUILDING TO ALERT OPERATORS OF OUT OF RANGE TEMPERATURE OPERATION.

1.03 QUALITY ASSURANCE

A. THE MANUFACTURERS SHALL PROVIDE ALL PIPING, VALVES, EQUIPMENT, AND APPURTENANCES REQUIRED FOR COMPLETE AND OPERABLE CHEMICAL FEED SYSTEMS.

B. EACH EQUIPMENT SUPPLIER SHALL HAVE UNIT RESPONSIBILITY FOR ITS EQUIPMENT STARTUP.

1.04 PROJECT CONDITIONS

A. EQUIPMENT FURNISHED IN ACCORDANCE WITH THIS SECTION SHALL BE INSTALLED AT THE LOCATION AND IN THE SPACE ALLOCATED ON THE CONTRACT DRAWINGS.

B. STRUCTURAL, PIPING, ELECTRICAL REQUIREMENTS, WIRING, INSTRUMENTATION AND CONTROLS, DRAWINGS, OR OTHER MODIFICATIONS REQUIRED TO ACCOMMODATE EQUIPMENT OFFERED OTHER THAN THAT SPECIFIED AS THE DESIGN STANDARD AND AS SHOWN ON THE DRAWINGS SHALL BE DONE AT NO ADDITIONAL COST TO THE OWNER.

1.05 WARRANTY: IN ADDITION TO THE MANUFACTURER’S STANDARDS GUARANTEE, THE CONTRACTOR SHALL INCLUDE THE SERVICES OF A FACTORY-TRAINED SERVICEMAN TO PROVIDE REPAIR SERVICES FOR THE EQUIPMENT FOR THE PERIOD OF 1 YEAR COMMENCING WITH THE TIME THE EQUIPMENT IS PLACED IN CONTINUOUS PERMANENT OPERATION. THIS SERVICE SHALL INCLUDE THE COST OF ALL REPLACEMENT PARTS REQUIRED DURING THE INTERVAL.

2. PRODUCTS

2.01 MATERIALS

A. ALL CHEMICAL FEED EQUIPMENT SHALL HAVE MANUFACTURER’S NAME, MODEL NUMBER, WORKING PRESSURE, IF PERTINENT, AND OTHER TECHNICAL INFORMATION, AS REQUIRED, CAST IN RAISED LETTERS ON BODY OF EQUIPMENT.

B. ALL FLANGED CONNECTIONS WHERE REQUIRED, UNLESS OTHERWISE SPECIFIED, SHALL HAVE ANSI 150-POUND FLANGES.

C. ALL BOLTS, NUTS, STUDS, ETC., ON OR REQUIRED TO CONNECT CHEMICAL FEED EQUIPMENT TO BASES, SUPPORTS, WALLS, AND OTHER SURFACES SHALL BE COMPATIBLE WITH THE CHEMICAL BEING HANDLED AND AS RECOMMENDED BY THE MANUFACTURER.

D. BOLTS AND NUTS SHALL HAVE HEXAGON HEADS AND NUTS.

E. GASKET MATERIALS AND INSTALLATION SHALL CONFORM TO MANUFACTURER’S RECOMMENDATIONS.

F. FUEL OIL PIPING SHALL BE FLANGED AND FLARED TYPE K SOFT COPPER

2.02 PIPING APPLICATION

A. SODIUM HYPOCHLORITE FILL, SUPPLY, AND RETURN PIPING FROM TANKS TO METERING PUMPS SHALL BE SCHEDULE 80 POLYVINYL CHLORIDE (PVC). TEMPORARY PIPING SHALL BE AS SHOWN ON PLANS. PIPING FROM METERING PUMPS TO FEED POINTS SHALL BE TYGON TUBING RUN WITHIN CONDUIT AS SPECIFIED BELOW.

B. CAUSTIC AND ALUM CHEMICAL PIPING SHALL BE SCHEDULE 80 CPVC MEETING ASTM D1785 SPECIFICATIONS, MANUFACTURED WITH RESIN MEETING REQUIREMENTS OF ASTM D-1784, CLASS 12454-B. JOINTS SHALL BE SOCKET TYPE, WITH FITTINGS MEETING REQUIREMENTS OF ASTM D-2467 FOR SCHEDULE 80 SOCKET TYPE FITTINGS. FLANGED CONNECTIONS SHALL BE MADE WITH SOCKET WELD FLANGES AND ELASTOMERIC GASKETS. ALL CONNECTIONS SHALL BE RATED FOR 150 PSI WORKING PRESSURE. PRIMERS AND SOLVENTS SHALL MEET REQUIREMENTS OF ASTM F 656 AND ASTM D-2564 – PVC CEMENT SHALL BE WELD-ON, CPVC 724 BY IPS CORPORATION FOR ALL CHEMICAL APPLICATIONS. THE CONTRACTOR SHALL CONFIRM PIPE JOINT FABRICATION AND CEMENT TYPES WITH VENDORS TO ENSURE THEY ARE COMPATIBLE WITH CHEMICAL APPLICATION INTENDED. STRICT ADHERENCE TO PIPE MANUFACTURERS JOINT FITTING CRAFTSMANSHIP IS ALSO HIGHLIGHTED IN THESE SPECIFICATIONS DUE TO THE AGGRESSIVE NATURE OF THE CHEMICALS TO BE CARRIED WITHIN THESE PIPING SYSTEMS.

C. CHEMICAL FEED CONDUIT

(1) CONDUIT: NEMA TC-2, SOLVENT WELDED SCHEDULE 40 POLYVINYL CHLORIDE ELECTRICAL CONDUIT (EPC-40-PVC) – 3” MINIMUM SIZE.

(2) FITTINGS: NEMA TC-3, SOLVENT WELDED SCHEDULE 40 POLYVINYL CHLORIDE, LIQUID TIGHT FLEXIBLE PVC CONDUIT MAY BE USED FOR BENDS AND COMPLEX CORNERS, PROVIDED IT IS ADEQUATELY SUPPORTED.

(3) SOLVENT CEMENT: ASTM D 2564.

D. HYPOCHLORITE TUBING: TUBING SHALL BE TYGON CHEMFLUOR FEP TUBING, AS MANUFACTURED BY NORTON PERFORMANCE PLASTICS CORPORATION OR APPROVED EQUAL. INSIDE DIAMETER SHALL BE AS INDICATED ON DRAWINGS. MINIMUM WALL THICKNESS SHALL BE 1/8 INCH. TUBING SHALL BE RATED FOR A MAXIMUM WORKING PRESSURE OF 150 PSIG IN ACCORDANCE WITH ASTM D 1599. INSTALL ONE SPARE FEED TUBE FROM THE PUMP CONNECTION POINT TO EACH FEED POINT WITHIN EACH CONTAINMENT RUN, LEAVING SUFFICIENT EXCESS TO PERMIT CONNECTION TO THE PUMP AND FEED POINT IN THE FUTURE.

E. PIPE SUPPORTS FOR CHEMICAL PIPING: PIPE SUPPORTS SHALL BE IN ACCORDANCE WITH SECTION 15140 – PIPE SUPPORTS, ANCHORS, AND SEALS.

F. ACCESSORIES: PROVIDE CHEMICALLY RESISTANT FLANGES, QUICK DISCONNECTS, CONNECTING PIECES, TRANSITION GLANDS, TRANSITION SLEEVES, AND OTHER ADAPTERS AS REQUIRED FOR COMPLETE AND OPERABLE PIPING SYSTEMS FOR SERVICE INDICATED.

G. PROVIDE CHEMICAL FEED PIPING SUPPORTS AND WALL MOUNTING BRACKETS AS REQUIRED. SUPPORTS AND WALL MOUNTING BRACKETS SHALL BE CHEMICALLY RESISTANT AND SHALL BE CONSTRUCTED OF MATERIALS

COMPATIBLE WITH THE CHEMICALS BEING CONVEYED THROUGH PIPING TO BE SUPPORTED.

2.03 CHEMICAL VALVES: DIAPHRAGM VALVES SHALL BE USED FOR ALL CHEMICAL SYSTEM APPLICATIONS UNLESS OTHERWISE NOTED.

A. DIAGPHRAGM VALVES SHALL BE THE WEIR TYPE DIAPHRAGM VALVE WITH TRUE UNION ENDS, EXCEPT CAUSTIC SODA VALVES WHICH SHALL HAVE SPIGOT ENDS. ALL VALVES SHALL BE RATED FOR A WORKING PRESSURE OF 150 PSI AT A TEMPERATURE OF 160 DEGREES F. ALL VALVES SHALL BE EQUIPPED WITH A HANDWHEEL OPERATOR AND INDICATING BONNET. ALL VALVES SHALL HAVE VITON ETF DIAPHRAGMS, OR APPROVED EQUAL SUITABLE FOR CHEMICAL SERVICE. DIAPHRAGM VALVES SHALL BE MANUFACTURED BY ITT, GEORGE FISCHER, OR STEARNS.

BALL VALVES: BALL VALVES SHALL BE CONSTRUCTED OF ASTM D 1784 PVC BODY, BALL, CARRIER, AND STEM WITH TFE BALL SEAT AND VITON O-RINGS AND GASKETS. SOCKET WELDED CONSTRUCTION SHALL BE PVC FULL PORT, TRUE UNION (DOUBLE UNION/DOUBLE BLOCK THROUGH 3-INCH DIAMETER) DESIGN. FLANGED CONSTRUCTION SHALL BE PVC FLANGES CONFORMING TO 150-POUND DRILLING. VALVES SHALL BE SUITABLE FOR 150-PSI NONSHOCK COLD WATER SERVICE AT 70 DEGREES F. VALVES SHALL BE NIBCO/CHEMTROL, ASAHI/AMERICA, OR HAYWARD.

B. BALL CHECK VALVES: BALL CHECK VALVES SHALL BE CONSTRUCTED OF ASTM D 1784 PVC BODY, BALL, CARRIER WITH VITON BALL SEAL AND SEAL CARRIER O-RING. SOCKET WELDED END CONSTRUCTION SHALL BE PVC TRUE UNION DESIGN AND SHALL INSURE FULL BALL MOVEMENT. FLANGED CONSTRUCTION SHALL BE PVC FLANGES CONFORMING TO 150-POUND DRILLING. VALVES SHALL BE SUITABLE FOR 150-PSI NONSHOCK COLD WATER SERVICE AT 70 DEGREES F. VALVES SHALL BE NIBCO/CHEMTROL, ASAHI/AMERICA, OR HAYWARD.

2.04 HYPOCHLORITE METERING PUMP ACCESSORIES

A. PRESSURE RELIEF VALVES SHALL BE PVC WITH VITON ETF DIAPHRAGM AND NPT ENDS SUITABLE FOR 150-PSI NONSHOCK COLD WATER WORKING PRESSURE AT 70 DEGREES F. RELIEF SET POINT SHALL BE FIELD ADJUSTABLE BETWEEN 40 TO 80 PSI. VALVES SHALL BE PROVIDED BY PUMP MANUFACTURER.

B. BACK PRESSURE VALVES SHALL BE PVC WITH VITON ETF DIAPHRAGM SUITABLE FOR 150-PSI NONSHOCK COLD WATER SERVICE AT 150 DEGREES F. VALVES SHALL BE PROVIDED BY PUMP MANUFACTURER. VALVES SHALL BE PROVIDED WITH INTEGRAL PRESSURE GAUGES (0-100 PSIG RANGE), AND ADJUSTABLE FROM 15 TO 60-PSIG SURGE RANGE.

C. PULSATION DAMPER SHALL BE PROVIDED BY PUMP MANUFACTURER. MAXIMUM OSCILLATION OF FLOW SHALL BE 2 PERCENT OF MEAN. BOTTOM PRODUCT CHAMBER SHALL BE PVC; TOP AIR CHAMBER SHALL BE 316 STAINLESS STEEL AND THE DIAPHRAGM SHALL BE VITON ETF.

D. PRESSURE GAUGES: PRESSURE GAUGES SHALL BE 0 – 100 PSIG, WITH VITON ETF DIAPHRAGM SEALS AND GAUGE GUARDS. GAUGES SHALL BE COMPLETE WITH DIAPHRAGM SEAL AND WETTED PARTS COMPATIBLE WITH SODIUM HYPOCHLORITE BEING HANDLED.

E. Y-STRAINERS: Y-STRAINERS SHALL HAVE SOCKET END CONNECTIONS WITH VITON O-RING SEALS AND 1/32-INCH PERFORATED STRAINING SCREEN. Y-STRAINERS SHALL HAVE A COLD WATER NONSHOCK PRESSURE RATING OF 150 PSIG AT 70 DEGREES F. ALL STRAINER CLEANOUT CAPS SHALL HAVE AN INTEGRALLY MOLDED HEX NUT FOR EASY REMOVAL. BODY AND SCREEN CONSTRUCTION SHALL BE SCHEDULE 80 PVC. PLASTIC Y-STRAINERS SHALL BE AS MANUFACTURED BY HAYWARD INDUSTRIAL PRODUCTS, INC. OR APPROVED EQUAL.

F. VACUUM BREAKERS: SHALL HAVE KYNAR OR SCHEDULE 80 CPVC BODIES WITH VITON ETF DIAPHRAGM SUITABLE FOR 100-PSI NONSHOCK COLD WATER SERVICE AT 150 DEGREES F. OPERATING SPRINGS SHALL BE NON-CONTACT TYPE CONSTRUCTED OF STAINLESS STEEL. VALVES SHALL BE PROVIDED BY PUMP MANUFACTURER.

2.05 CHEMICAL FEED SYSTEM SUPPORT SHELVES

(1) THE CHEMICAL FEED SUPPORT SHELVES SHALL BE CONSTRUCTED OF 1 INCH THICK FIBERGLASS GRATING WITH 3/4-INCH SQURE GRID PATTERN. ALL MOUNTING HARDWARE SHALL BE 316 STAINLESS STEEL.

(2) THE SHELVES SHALL BE SIZED TO ADEQUATELY ACCOMMODATE THE CHEMICAL FEED PUMPS, PIPING, AND ALL OTHER APPURTENANCES SUPPORTED BY THE SHELVES.

(3) THE SHELVES SHALL BE PROVIDED BY THE CHEMICAL FEED PUMP MANUFACTURER AND SHALL BE SUITABLE FOR WITHSTANDING ALL STATIC AND DYNAMIC LOADS IMPARTED BY THE CHEMICAL FEED PUMPS AND THEIR APPURTENANCES WITHOUT VIBRATION.

2.06 HEAT TRACING SYSTEM

(1) PROVIDE SELF REGULATING HEAT TRACING FOR ALL CAUSTIC SODA PIPING AND THE CAUSTIC TANK. HEAT TRACING SHALL BE SUITABLE FOR APPLICATION TO CPVC PIPING SYSTEMS AND SHALL INCLUDE A METAL FOIL SUBSTRATE TO PROTECT THE CPVC PIPE FROM LOCALIZED HOT SPOTS AT CONTACT POINTS. SYSTEM SHALL BE DESIGNED WITH OVERTEMPERATURE CONTROL SUCH THAT TEMPERATURE OF HEAT TRACING WILL NOT EXCEED 130 DEGREES F. HEAT TRACING SHALL BE DESIGNED TO MAINTAIN TEMPERATURE OF PIPE AND TANK AT A CONSTANT TEMPERATURE OF 75 DEGREES F BASED ON APPLICATION OF A MAXIMUM OF 5 WATTS PER FOOT TO CABLE AND SHALL BE CONTROLLED WITH A REMOTE TERMINAL UNIT THAT WILL INDICATE WALL TEMPERATURE, SYSTEM STATUS, GROUND FAULTS, AND PROVIDE OPERATOR CONTROL OF SETPOINTS AND ALARM FUNCTION FOR OUT OF RANGE PERFORMANCE. CABLE SHALL BE COPPER BRAID WITH POLYOLEFIN JACKET, CHROMALOX SRL5-1CR OR APPROVED EQUAL. REMOTE MONITORING AND CONTROL UNIT SHALL BE INTEGRAL PACKAGE WITH HEAT TRACING WIRE MANUFACTURER. TIE HEAT TRACING ON EXISTING CAUSTIC TANK INTO NEW REMOTE MONITORING AND CONTROL UNIT. PROVIDE DIRECT READ ANALOG TEMPERATURE GAUGE ON CAUSTIC TANK SUITABLE FOR IMMERSION SERVICE WITH 50 PERCENT CAUSTIC SOLUTION.

2.07 CAUSTIC SODA PIPING INSULATION

(1) INSULATION FOR CAUSTIC SODA PIPING SHALL FIBERGLASS FIBERS BONDED WITH RESIN, INTEGRALLY JACKETED WITH A REINFORCED VAPOR RETARDER FACING AND FACTORY APPLIED LONGITUDINAL ACRYLIC CLOSURE SYSTEM DESIGNED FOR A MINIMUM APPLICATION TEMPERATURE RANGE FROM 0-150 DEGREES F. INSULATION SHALL BE JOHN MANVILLE MICRO-LOK™ OR APPROVED EQUAL WITH A THICKNESS OF 3 INCHES AND A K VALUE OF AT LEAST 0.23 BTU-IN/(HR-FT2-F) AT 75 DEGREES F. INSULATION SHALL BE SUITABLE FOR USE WITH SELF REGULATING HEAT TRACING SYSTEMS AND CPVC PIPES. SECTION JOINTS SHALL BE SEALED WITH BUTT STRIPS FROM THE FACTORY WHICH SELF SEAL THE ENDS AND LAP OVER THE JOINT BY A MINIMUM OF 2 INCHES. EXPANSION JOINTS SHALL BE PROVIDED TO PERMIT EXPANSION WITHIN THE TEMPERATURE RANGE SPECIFIED BASED ON THERMAL EXPANSION OF CPVC CARRIER PIPE. INSULATION SYSTEM SHALL BE SUITABLE FOR EXTERIOR USE AND SHALL BE PROTECTED WITH A SPECIALTY RUBBERIZED BITUMEN WATERPROOFING MEMBRANE DESIGNED FOR EXTERIOR USE. MEMBRANE SHALL BE SELF HEALING/SELF STICK IF PUNCTURED AND PROVIDE EXPANSION CHARACTERISTICS TO PERMIT INSULATION MOVEMENT.

3. EXECUTION

3.01 INSTALLATION: INSTALL EQUIPMENT AS SHOWN ON THE DRAWINGS AND ACCORDING TO THE WRITTEN INSTRUCTIONS OF THE MANUFACTURER. PROVIDE ALL NECESSARY INTERCONNECTIONS, SERVICES, AND ADJUSTMENTS REQUIRED FOR COMPLETE OPERATING CHEMICAL FEED SYSTEMS.

3.02 INSTALL TEMPORARY FEED SYSTEM USING SPECIFIED COMPONENTS OF THE PERMANENT SYSTEM. TEMPORARY FEED PIPING SHALL NOT BE REUSED; METERING PUMPS USED IN THE TEMPORARY SYSTEM SHALL BE REUSED IN THE PERMANENT INSTALLATION. UPON DECOMMISSIONING OF THE TEMPORARY SYSTEM, SERVICEABLE VALVES, FITTINGS AND PIPING INCLUDING PROTECTIVE CASING PIPE SHALL BE CLEANED AND TURNED INTO THE CITY FOR FUTURE USE.

3.03 UNDIMENSIONED DRAWINGS ARE INTENDED TO INDICATE THE GENERAL ARRANGEMENT OF PIPING SYSTEMS AND ARE NOT INTENDED TO CONVEY PRECISE LOCATION INFORMATION. UNLESS OTHERWISE INDICATED, RUN HORIZONTAL PIPING LEVEL AND PARALLEL TO THE WALLS AND RUN VERTICAL PIPING STRAIGHT AND PLUMB.

3.04 INSTALL UNIONS ON EACH SIDE OF REGULATORS AND SIMILAR ITEMS, AND AT EACH PIECE OF EQUIPMENT SUCH THAT EQUIPMENT MAY BE READILY REMOVED FOR SERVICING. UNIONS SHALL NOT BE PLACED IN A LOCATION WHICH WILL BE INACCESSIBLE AFTER COMPLETION OF CONSTRUCTION.

3.05 TEST ALL PIPING IN THE PRESENCE OF THE OWNER’S REPRESENTATIVE. SUPPLY NECESSARY FITTINGS AND EQUIPMENT TO CONDUCT TESTS. ALL PIPE SHALL BE PURGED AND HYDROSTATICALLY TESTED TO 100 PSI FOR 1 HOUR. IF PRESSURE CANNOT BE MAINTAINED, DETERMINE CAUSE, REPAIR, AND RETEST UNTIL TEST IS COMPLETED SATISFACTORILY. NO LEAKAGE WILL BE ALLOWED.

END OF SECTION

SECTION 13700 - BASIC INSTRUMENTATION AND CONTROL SYSTEMS REQUIREMENTS

1. GENERAL

1.01 DESCRIPTION: THE 13700 SERIES OF SPECIFICATION SECTIONS PROVIDE A GUIDE TO THE CONTRACTOR FOR THE PURCHASE OF EQUIPMENT AND ARE NOT INTENDED TO COVER ALL THE NORMAL APPURTENANCES. THE CONTRACTOR SHALL PROVIDE WORKING SYSTEMS COMPLETE WITH ALL APPURTENANCES TO MAKE THE SYSTEMS FULLY OPERABLE.

1.02 REFERENCES

A. UL508A OUTLINE OF INVESTIGATION FOR INDUSTRIAL CONTROL PANELS

B. UL 913 INTRINSICALLY SAFE APPARATUS AND ASSOCIATED APPARATUS FOR USE IN CLASS I, II, AND III DIVISION 1, HAZARDOUS LOCATIONS

1.03 RELATED WORK SPECIFIED ELSEWHERE INCLUDES THE FOLLOWING:

A. SECTION 16110 - METALLIC RACEWAYS.

B. SECTION 16120 - WIRE, CABLE, AND WIRING (600 VOLT MAXIMUM).

C. SECTION 16133 - PULL AND JUNCTION BOXES.

D. SECTION 16190 - SUPPORTING DEVICES.

E. SECTION 16752 – ELECTRICAL PILOT DEVICES.

1.04 PROVIDE THE SERVICES OF A SINGLE CONTROLS AND INSTRUMENTATION (C AND I) CONTRACTOR TO FURNISH, INSTALL, TEST, AND PLACE THE SYSTEM IN OPERATION. THE C AND I CONTRACTOR SHALL HAVE THE FULL IN-HOUSE CAPABILITIES AND PERSONNEL TO DESIGN, FABRICATE, PROGRAM, INSTALL, CALIBRATE, START UP, AND TROUBLESHOOT ALL CONTROL AND INSTRUMENTATION EQUIPMENT WITHOUT SUBCONTRACTING OR OTHERWISE INVOLVING ANY TEMPORARY OR NON-STAFF PERSONNEL. HOWEVER, THE CONTRACTOR MAY INSTALL CONDUIT, ASSOCIATED PULL BOXES, AND WIRE EXCLUDING WIRE TERMINATIONS. THE C AND I CONTRACTOR SHALL BE SELECTED FROM THE FOLLOWING LISTING ONLY. DETAILED QUALIFICATIONS MAY BE REQUIRED TO BE FURNISHED FOR THE CONTRACTOR PROPOSED. ANY C AND I CONTRACTOR DETERMINED NOT TO MEET THE REQUIREMENTS STATED IN THIS SECTION SHALL BE REPLACED BY ANOTHER LISTED CONTRACTOR AT NO INCREASE IN CONTRACT PRICE.

A. SYNCHRONY INC.
6410 COMMONWEALTH DRIVE
ROANOKE, VIRGINIA 24018

ATTN: VICTOR IANNELLO, PRESIDENT
(540) 989-1541

B. AMR, INC.
P.O. BOX 234
ROCKY GAP, VIRGINIA 24336

ATTN: BOB FOSTER
(540)961-6467

C. M.C. DEAN – CIM AUTOMATION
P.O. BOX 211
18 NEW LIFE DRIVE
RUCKERSVILLE, VIRGINIA 22968

ATTN: BOB LINK
(434)985-8945

1.05 BEFORE INSTALLATION, VERIFY THAT CONTROLS ARE APPROPRIATE FOR THE FURNISHED EQUIPMENT.

A. MAKE CHANGES REQUIRED DUE TO DIFFERENT EQUIPMENT, MORE UP-TO-DATE CONTROLS, OR SAFETY DEVICES SO THAT THE EQUIPMENT OPERATES AS REQUIRED.

B. WHEN EQUIPMENT IS SUPPLIED WITH REQUIREMENTS OTHER THAN THOSE SPECIFIED OR SHOWN ON DRAWINGS, ASSOCIATED MODIFICATIONS SHALL BE PROVIDED.

1.06 CONTROL VOLTAGE SHALL NOT EXCEED 120 VOLTS UNLESS INDICATED OTHERWISE ON THE DRAWINGS.

1.07 MATERIAL, EQUIPMENT, AND INSTALLATION SHALL MEET REQUIREMENTS OF APPLICABLE CODES AND STANDARDS. ELECTRICAL MATERIAL AND EQUIPMENT SHALL BEAR THE UL LABEL EXCEPT WHERE UL DOES NOT LABEL SUCH TYPES OF MATERIAL AND EQUIPMENT. GENERAL USE CONTROL PANELS IN NON HAZARDOUS AREAS SHALL MEET THE REQUIREMENTS OF UL 508A.

1.08 THE C&I CONTRACTOR SHALL PROVIDE 40 HOURS OF ON-SITE PROGRAMMING TIME AFTER THE COMPLETION OF STATION STARTUP FOR THE PURPOSE OF MODIFICATION, REFINEMENT, AND CUSTOMIZATION OF THE STATION PROGRAM.

1.09 ALL SOFTWARE APPLICATIONS USED BY THE C&I CONTRACTOR TO DEVELOP SITE SPECIFIC PROGRAMS AND NOT ALREADY OWNED BY OWNER SHALL BECOME THE PROPERTY OF THE OWNER AND SHALL BE TURNED OVER TO THEM AT THE END OF THE PROJECT.

1.10 DATE SENSITIVE COMPUTERS, COMPUTER CONTROLS, MICROPROCESSORS AND PROGRAMS SHALL ACCOMMODATE ALL CALENDAR DATES INCLUDING LEAP YEARS WITHOUT CAUSING PROBLEMS.

2. PRODUCTS: NOT USED

3. EXECUTION: NOT USED

END OF SECTION

SECTION 13701 - DATA SUBMITTALS

1. GENERAL

1.01 SUBMITTALS: PROVIDE THE FOLLOWING IN A TIMELY MANNER IN ACCORDANCE WITH THE APPROVED SUBMITTALS SCHEDULE AS SPECIFIED IN DIVISION 1 - GENERAL REQUIREMENTS.

A. SUBMITTAL: MANUFACTURER'S DATA - WITHIN 30 DAYS AFTER AWARD OF CONTRACT, SUBMIT MANUFACTURER'S DATA IN ONE COORDINATED PACKAGE FOR APPROVAL BY WILEY & WILSON.

(1) SUBMIT DATA ON EACH DEVICE TO BE INSTALLED. DATA SUBMITTED SHALL BE MANUFACTURER'S ORIGINAL CATALOG SHEETS. XEROX OR SIMILAR COPIES WILL NOT BE ACCEPTED.

(2) ARRANGE THE SUBMITTALS IN THE SAME SEQUENCE AS THESE SPECIFICATIONS AND REFERENCE AT THE UPPER RIGHT-HAND CORNER THE PARTICULAR SPECIFICATION SECTION AND PARAGRAPH NUMBER FOR WHICH EACH SUBMITTAL IS INTENDED. PLACE TAB SHEETS BETWEEN THE DEVICES SPECIFIED IN DIFFERENT SPECIFICATION SECTIONS. SUBMITTALS FOR EACH MANUFACTURED ITEM SHALL BE MANUFACTURER'S DESCRIPTIVE LITERATURE (EQUIPMENT SPECIFICATION), EQUIPMENT DRAWINGS, DIAGRAMS, PERFORMANCE AND CHARACTERISTIC CURVES, AND CATALOG CUTS AND SHALL INCLUDE THE MANUFACTURER'S NAME, TRADE NAME, CATALOG MODEL OR NUMBER, NAMEPLATE DATA, SIZE, LAYOUT DIMENSIONS, CAPACITY, SPECIFICATION REFERENCE, AND ALL OTHER INFORMATION NECESSARY TO ESTABLISH CONTRACT COMPLIANCE. BIND IN LOOSE-LEAF BINDER.

B. SUBMITTAL: TEST DOCUMENTS

(1) TEST PLAN: WITHIN 45 DAYS OF AWARD OF CONTRACT, SUBMIT TEST PLAN TO WILEY & WILSON FOR APPROVAL. THE TEST PLAN SHALL DEFINE THE SCOPE OF TESTS REQUIRED TO ENSURE THAT THE SYSTEM MEETS ALL APPLICABLE SPECIFICATIONS.

(2) TEST RESULTS: WITHIN 10 DAYS OF COMPLETION OF TESTING, SUBMIT TEST REPORTS TO WILEY & WILSON FOR APPROVAL.

C. SUBMITTAL: OPERATION AND MAINTENANCE MANUAL - 30 DAYS PRIOR TO PROJECT CLOSEOUT, SUBMIT FIVE COPIES OF THE MANUAL BOUND IN LOOSE-LEAF BINDERS FOR REVIEW BY WILEY & WILSON.

(1) THE MANUAL'S IDENTIFICATION SHALL BE INSCRIBED ON THE COVER.

(2) THE MANUALS SHALL INCLUDE THE NAMES, ADDRESSES, AND TELEPHONE NUMBERS OF EACH SUBCONTRACTOR INSTALLING EQUIPMENT AND SYSTEMS AND OF THE LOCAL REPRESENTATIVES FOR EACH ITEM OF EQUIPMENT AND EACH SYSTEM.

(3) THE MANUALS SHALL HAVE A TABLE OF CONTENTS AND BE ASSEMBLED TO CONFORM TO THE PROJECT MANUAL TABLE OF CONTENTS WITH THE TAB SHEETS PLACED BEFORE INSTRUCTIONS COVERING THE SUBJECT. ADDITIONALLY, EACH MANUAL SHALL CONTAIN A COMPREHENSIVE INDEX OF ALL MANUALS SUBMITTED IN ACCORDANCE WITH THIS PARAGRAPH.

(4) MANUALS AND SPECIFICATIONS SHALL BE FURNISHED WHICH PROVIDE FULL AND COMPLETE COVERAGE OF THE FOLLOWING SUBJECTS:

OPERATIONAL REQUIREMENT: THIS DOCUMENT SHALL DESCRIBE, IN CONCISE TERMS, ALL THE FUNCTIONAL AND OPERATIONAL REQUIREMENTS FOR THE SYSTEM.

MAINTENANCE: DOCUMENTATION OF ALL USER-PERFORMED MAINTENANCE ON ALL SYSTEM COMPONENTS INCLUDING INSPECTION, PERIODIC PREVENTIVE MAINTENANCE, FAULT DIAGNOSIS, AND REPAIR OR REPLACEMENT OF DEFECTIVE UNITS. THIS SHALL INCLUDE CALIBRATION, MAINTENANCE, AND REPAIR OF ALL SENSORS AND CONTROLS, PLUS DIAGNOSIS AND REPAIR OR REPLACEMENT OF ALL SYSTEM HARDWARE.

D. SUBMITTAL: SPARE PARTS - 30 DAYS PRIOR TO PROJECT CLOSEOUT, SUBMIT A RECOMMENDED LIST OF SPARE PARTS.

1.02 INSTALLATION DRAWINGS SHALL BE IN ACCORDANCE WITH SECTION 13702.

2. PRODUCTS

2.01 LOOSE-LEAF BINDER SHALL BE WILSON JONES CATALOG NUMBER 364-49NHB.

2.02 TAB SHEETS SHALL BE AICO STOCK NUMBER L-213-31.

3. EXECUTION: NOT USED

END OF SECTION

SECTION 13702 - INSTALLATION DRAWINGS

1. GENERAL

1.01 REFERENCES

A. INSTRUMENT SOCIETY OF AMERICA (ISA) PUBLICATIONS

(1) S5.1 INSTRUMENTATION SYMBOLS AND IDENTIFICATION

(2) S5.4 INSTRUMENT LOOP DIAGRAMS

(3) S51.1 STANDARD PROCESS INSTRUMENTATION TERMINOLOGY

B. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

(1) NFPA 79 ELECTRICAL STANDARD FOR INDUSTRIAL MACHINERY

1.02 DESIGN CRITERIA

A. THE CONTRACT DOCUMENTS INCLUDE P&I DIAGRAMS AND LADDER DIAGRAMS, BUT NOT DETAILED INSTALLATION DRAWINGS OF THE SYSTEM. ITEMS SUCH AS LADDER DIAGRAMS, CABINET LAYOUT, TUBING RUNS, WIRING, AND CONDUIT RUNS HAVE BEEN LEFT FOR DESIGN BY CONTRACTOR.

B. PROVIDE INSTALLATION DRAWINGS TO COMPLETELY DOCUMENT THE CONTROLS AND INSTRUMENTATION INSTALLATION.

1.03 SUBMITTAL: PROVIDE SUBMITTALS IN A TIMELY MANNER IN ACCORDANCE WITH THE APPROVED SUBMITTALS SCHEDULE AS SPECIFIED IN DIVISION 1 – GENERAL REQUIREMENTS.

A. SUBMITTAL: REVIEW DRAWINGS

1.04 DRAWING REQUIREMENTS

A. DRAWINGS SHALL CONSIST OF THE FOLLOWING:

(1) ELEVATIONS, CONTROL PANELS, ACCESSORIES, PERMANENT NAMEPLATE IDENTIFICATION, AND ANY OTHER ITEMS THAT MUST BE SHOWN TO ASSURE A COORDINATED INSTALLATION. DRAWINGS SHALL INDICATE REQUIRED CLEARANCE FOR OPERATION, MAINTENANCE, AND REPLACEMENT OF OPERATING EQUIPMENT DEVICES.

(2) ELECTRICAL CONTROL WIRING DIAGRAMS OF THE LADDER TYPE SIMILAR TO THOSE IN THE CONTRACT DOCUMENTS ANNOTATED TO CONFORM TO NFPA 79, ANNEX D. DUE TO VARIATIONS AMONG MANUFACTURERS, GENERALIZED DIAGRAMS OF THIS TYPE HAVE BEEN INCLUDED IN THE CONTRACT DOCUMENTS. THE INSTALLATION DRAWINGS SHALL CONTAIN LADDER DIAGRAMS FOR EACH MOTOR AND THE LIKE SHOWING EQUIPMENT EXACTLY AS IT SHALL BE INSTALLED. DIAGRAMS SHALL CLEARLY INDICATE LOCATION OF EACH DEVICE. FIELD WIRING SHALL BE SHOWN DOTTED, PANEL WIRING SOLID. EACH WIRE SHALL HAVE A UNIQUE IDENTIFICATION NUMBER. IF THE SYSTEMS HOUSE DOES NOT HAVE AN ESTABLISHED SYSTEM RESULTING IN UNIQUELY NUMBERED WIRES, THE FOLLOWING SYSTEM SHALL BE USED. EACH WIRE NUMBER SHALL CONSIST OF FIVE DIGITS. THE FIRST TWO DIGITS SHALL BE THE LAST TWO DIGITS OF THE DRAWING NUMBER ON WHICH THE WIRE IS SHOWN OR ORIGINATES. THE SECOND TWO DIGITS SHALL BE THE LADDER RUNG NUMBER WHERE THE WIRE IS SHOWN OR ORIGINATES. THE FIFTH DIGIT

SHALL BE THE NUMBER OF THE WIRE ON A GIVEN RUNG NUMBERED IN A LEFT TO RIGHT SEQUENCE. NUMBER EACH DEVICE TERMINAL WITH MANUFACTURER'S TERMINAL NUMBER.

(3) INSTRUMENTATION LOOP DIAGRAMS SHOWING INTERCONNECTING WIRING BETWEEN PRIMARY ELEMENTS, TRANSMITTERS, CONTROLLERS, RECORDERS, INDICATORS, COMPUTATIONAL DEVICES, DECISION DEVICES, VALVES, AND THE LIKE. DIAGRAMS SHALL CONFORM TO ISA STANDARD S5.4. DUE TO VARIATIONS AMONG MANUFACTURERS, GENERALIZED DIAGRAMS OF THIS TYPE HAVE BEEN INCLUDED IN THE CONTRACT DOCUMENTS. INSTALLATION DRAWINGS SHALL CONTAIN A LOOP DIAGRAM FOR EACH LOOP SHOWING EQUIPMENT EXACTLY AS IT SHALL BE INSTALLED. FIELD WIRING SHALL BE SHOWN DOTTED, PANEL WIRING SOLID. NUMBER EACH DEVICE TERMINAL WITH MANUFACTURER'S TERMINAL NUMBER. NUMBER WIRES USING A SYSTEM SIMILAR TO THAT USED FOR LADDER DIAGRAMS.

(4) PANEL INTERIOR AND EXTERIOR ELEVATIONS AND SECTIONS, CONFORMING TO NFPA 79, ANNEX D.

(5) PROGRAMMABLE CONTROLLER LOGIC DIAGRAMS OF THE LADDER TYPE CONFORMING TO NFPA 79, ANNEX D. FURTHER ANNOTATE LOGIC DIAGRAMS BY IDENTIFYING INPUT CONTACTS WITH THEIR P&ID TAG NUMBERS AS WELL AS THEIR PROGRAMMABLE CONTROLLER INPUT ADDRESS NUMBER. ALSO IDENTIFY OUTPUTS BY THE P&ID TAG NUMBER OF THE FINAL ELEMENT CONTROLLED AS WELL AS THEIR PROGRAMMABLE CONTROLLER OUTPUT ADDRESS NUMBER. IN ADDITION, PROVIDE A NARRATIVE OF THE LOGIC IN ENGLISH-LANGUAGE TEXT FORMAT.

B. PREPARATION OF DRAWINGS

(1) DRAWINGS SHALL BE PREPARED ON A CAD (COMPUTER-AIDED-DRAFTING) SYSTEM. SYSTEM DISKS AND/OR TAPES SHALL BECOME THE PROPERTY OF THE OWNER AT PROJECT CLOSEOUT. A COPY OF THE DISKS OR TAPES MAY BE RETAINED BY THE SYSTEMS HOUSE.

(2) ALL AVAILABLE INFORMATION WHICH WILL DEFINE THE SCOPE OF THE WORK SHALL BE INCLUDED ON THE DRAWINGS. A COMPLETE LEGEND OF ABBREVIATIONS AND SYMBOLS AND EQUIPMENT SCHEDULES SHALL ALSO BE INCLUDED ON THE DRAWINGS. DRAWINGS SHALL BE FINAL AND COMPLETE, WITH ALL ELEMENTS THOROUGHLY CHECKED AND COORDINATED WITH EACH OTHER AND WITH THE SPECIFICATIONS.

(3) EQUIPMENT TAG NUMBERS SHALL BE THE SAME AS THOSE INDICATED ON THE CONTRACT DRAWINGS.

(4) DRAWING FORMAT: THE DRAWING FORMAT, STYLE, AND LETTERING SHALL BE THE SAME AS THE CONTRACT DRAWINGS. EVERY EFFORT SHALL BE MADE TO AVOID UNNECESSARY DETAIL, POOR SPACING, CARELESS LETTERING, WEAK LINES, AND CROWDED DRAWINGS.

(5) DRAFTING MEDIA: CERTIFIED FOR CONSTRUCTION AND AS-BUILT DRAWING. SUBMITTALS SHALL BE IN INK ON PAPER.

(6) SIZES OF DRAWINGS: THE DRAWINGS SHALL BE 11 BY 17 INCHES. LOOP DIAGRAMS AND PROGRAMMABLE CONTROLLER LOGIC DIAGRAMS SHALL BE 8-1/2 BY 11 INCHES OR 11 BY 17 INCHES AS REQUIRED.

(7) SCALES: LOCATED DIRECTLY UNDER THE TITLE OF EACH PLAN, ELEVATION, SECTION, DETAIL, ETC., SHALL BE AN INDICATION OF THE SCALE OF THE OBJECT DRAWN. INCLUDE A GRAPHIC SCALE ON DRAWINGS WHICH MAY BE SUBJECT TO HALF-SIZE REPRODUCTION.

(8) ARRANGEMENT OF DRAWINGS: DRAWINGS SHALL BE ARRANGED IN THE FOLLOWING ORDER:

INDEX

P&I DIAGRAMS

LADDER DIAGRAMS

PROGRAMMABLE, CONTROLLER LOGIC DIAGRAMS

LOOP DIAGRAMS

PANEL INTERIOR AND EXTERIOR ELEVATIONS AND SECTIONS

(9) LOOP DIAGRAMS AND PROGRAMMABLE CONTROLLER LOGIC DIAGRAMS SHALL BE SEPARATELY BOUND IN LOOSELEAF BINDERS. IF A SIGNIFICANT PORTION OF THE DIAGRAMS ARE 11 BY 17 INCHES, USE BINDERS SIZED FOR 11 BY 17 INCH DRAWINGS.

(10) LETTERING: THE MINIMUM SIZE LETTERING, WHICH INCLUDES ALL ALPHANUMERIC SYMBOLS USED ON ALL PROJECT DRAWINGS SHALL BE NOT LESS THAN 0.10 INCH.

C. WORK SHALL NOT BE STARTED UNTIL THE "CERTIFIED FOR CONSTRUCTION" DRAWINGS HAVE BEEN ISSUED BY THE CONTRACTOR.

2. PRODUCTS: NOT USED

3. EXECUTION: NOT USED

END OF SECTION

SECTION 13703 - INSTALLATION AND STARTUP

1. GENERAL

1.01 CALIBRATION INSTRUMENTATION SHALL HAVE BEEN CERTIFIED WITHIN 6 MONTHS OF THE DATE OF USE TO HAVE AN ACCURACY 50 PERCENT GREATER THAN THE DEVICE BEING CALIBRATED. CERTIFICATION SHEETS SHALL BE AVAILABLE UPON REQUEST.

1.02 SUBMITTAL: PROVIDE SUBMITTALS IN A TIMELY MANNER IN ACCORDANCE WITH THE APPROVED SUBMITTALS SCHEDULE AS SPECIFIED IN DIVISION 1 – GENERAL REQUIREMENTS.

A. SUBMITTAL: NAMEPLATES

B. SUBMITTAL: BRASS TAGS

C. SUBMITTAL: CABLE TIES

2. PRODUCTS

2.01 NAMEPLATES SHALL HAVE THE FOLLOWING FEATURES:

A. CONSTRUCTED FROM BLACK LAMINATED PHENOLIC WITH A WHITE CENTER CORE SANDWICHED BETWEEN TWO BLACK STRATA.

B. ENGRAVED TO FORM WHITE LETTERS 3/8 INCH HIGH.

C. MOUNTING HOLES AT EACH END TO ACCEPT SCREW FASTENER.

2.02 BRASS TAGS SHALL HAVE THE FOLLOWING FEATURES:

A. MINIMUM GAGE: 16

B. MINIMUM DIMENSIONS: 0.75 INCH BY 1.5 INCHES

C. STAMPED TO FORM PERMANENT LETTERS MINIMUM 0.10 INCH HIGH

D. HOLE TO RECEIVE CABLE TIE

2.03 CABLE TIES SHALL HAVE THE FOLLOWING FEATURES:

A. STEEL STRAPPING COATED WITH NYLON

B. ONE WAY DETENT HEAD

C. ACCEPTABLE MANUFACTURER AND TYPE: THOMAS & BETTS, TY-WRAPS

3. EXECUTION

3.01 INSTALLATION

A. ALL INSTALLATION SHALL BE MADE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS AND WITH THE CONTROL INDUSTRY'S STANDARD ACCEPTED PRACTICES.

B. COORDINATION FOR INSTALLATION OF INSTRUMENTATION AND CONTROLS

(1) COORDINATE INSTRUMENTATION AND CONTROLS WORK WITH THE EQUIPMENT SUPPLIERS REGARDING RECOMMENDATIONS FOR PROPER INSTALLATION OF

ULTRASONIC LEVEL SENSORS. SIZE AND SELECT ALL SENSORS AND PRIMARY SIGNALING DEVICES. PROVIDE INSTRUCTIONS FOR THE PROPER INSTALLATION OF EQUIPMENT. SIZE AND SELECT ALL FINAL CONTROL ELEMENTS.

(2) WHERE INSTRUMENTATION OR CONTROLS OR BOTH ARE CALLED FOR ON ONE DRAWING, BUT ARE NOT SHOWN ON ANOTHER, THEY SHALL BE PROVIDED. WHERE A DEVICE IS SPECIFIED BUT NOT SHOWN ON A DRAWING, IT SHALL BE PROVIDED.

C. ELECTRICAL AND ELECTRONIC

(1) FIELD DEVICES, WIRING, AND CONDUIT HAVE NOT BEEN SHOWN IN THE CONTRACT DOCUMENTS IN PLAN VIEW. DEVICE LOCATION SHALL BE DETERMINED FROM THE P&I DIAGRAMS AND THE MECHANICAL AND ELECTRICAL DRAWINGS.

(2) FIELD WIRING REQUIREMENTS SHALL BE DETERMINED FROM THE INSTALLATION DRAWINGS. PROVIDE ALL REQUIRED FIELD WIRING.

(3) SHIELDED CABLES: IDENTIFY EACH CABLE AT EACH SPLICE AND TERMINATION USING THE WIRE NUMBERS ASSIGNED ON THE INSTALLATION DRAWINGS.

THE SHIELD SHALL BE GROUNDED AT A SINGLE LOCATION. THAT LOCATION SHALL BE WITHIN THE CONTROL CABINET UNLESS THE MANUFACTURER RECOMMENDS OTHERWISE.

THE SHIELD SHALL BE MADE ELECTRICALLY CONTINUOUS OVER THE ENTIRE RUN OF SHIELDED CABLE.

UNLESS OTHERWISE NOTED ON THE DRAWINGS, SPLICES SHALL BE ALLOWED ONLY AT TERMINATION POINTS ON EQUIPMENT IN THE LOOP AND AT TERMINAL STRIPS INSIDE CONTROL PANELS. LENGTH OF SPLICE POINTS AND TERMINATIONS WHERE THE SHIELD IS NOT PHYSICALLY AROUND THE CONDUCTORS SHALL BE KEPT AS SHORT AS POSSIBLE.

AT THE CABLE ENDS WHERE THE SHIELD IS NOT CONNECTED, TRIM BACK THE SHIELD AND COVER WITH HEAT SHRINK INSULATION TO PREVENT ACCIDENTAL GROUNDING.

THE USE OF NON-SHIELDED CONDUCTORS TO CARRY AN ANALOG SIGNAL IS NOT ALLOWED.

ANALOG SHIELDED CABLE SHALL NOT BE INSTALLED IN CONDUIT WITH POWER CABLE.

(4) NONSHIELDED WIRES: IDENTIFY EACH WIRE AT EACH TERMINATION USING THE WIRE NUMBERS ASSIGNED ON THE INSTALLATION DRAWINGS. WIRING FROM EACH TERMINAL AT EACH FIELD MOUNTED DEVICE SHALL BE RUN FROM THE DEVICE BACK TO ITS ASSOCIATED PANEL AND ALL INTERCONNECTING SPLICING SHALL BE DONE IN THE PANEL.

(5) UNLESS OTHERWISE NOTED:

ALL CONTROL VOLTAGES SHALL BE 120 VAC MAXIMUM.

ALL CONTROL VOLTAGES FOR MOTOR CONTROL CIRCUITS SHALL BE 120 VAC MAXIMUM, DERIVED FROM THE MOTOR POWER CIRCUIT USING A CONTROL VOLTAGE TRANSFORMER AS NECESSARY.

(6) THE USE OF CONTROL DEVICES WITH NON-ISOLATED ELECTRICAL CONNECTIONS (POWER OR SIGNAL) SHALL BE ALLOWED ONLY WHEN ALL NON-ISOLATED CONNECTIONS ARE COMPATIBLE AND DERIVED FROM THE SAME POWER SOURCE. DEVICES INCLUDE, BUT ARE NOT LIMITED TO ANALOG AND DISCRETE PLC I/O CARDS, SIGNAL CONDITIONING MODULES, COMPUTATIONAL MODULES (SUCH AS ADDER/SUBTRACTOR), LOOP ISOLATORS, TRANSMITTERS, CONTROLLERS, AND RECORDERS.

3.02 CALIBRATION

A. CALIBRATION FORMS SHALL BE USED FOR EACH INSTRUMENT TO DOCUMENT CALIBRATION OF THE INSTRUMENT.

B. UNLESS OTHERWISE SPECIFIED, ALL DISPLAY INDICATORS OF ANALOG SIGNALS SHALL BE IN ENGINEERING UNITS.

C. LEVEL INSTRUMENTS

(1) CALIBRATE SONIC/ULTRASONIC LEVEL TRANSMITTERS BY ARTIFICIALLY PROVIDING VARIOUS LEVELS OF LIQUID IN THE MEASURED VESSEL.

(2) ALL LEVEL INSTRUMENTS NOT LISTED ABOVE SHALL BE CALIBRATED USING THE MANUFACTURER'S RECOMMENDED PROCEDURE.

D. RECEIVER INSTRUMENTS (INDICATORS AND CONTROLLERS)

(1) CONNECT PENS TO A CALIBRATION SOURCE. CHECK CALIBRATION AT FIVE POINTS; 10, 25, 50, 75, AND 100 PERCENT SPAN.

(2) CHECK FULL SPAN OF EACH CONTROLLER MANUAL OUTPUT SIGNAL.

(3) VERIFY THE OUTPUT ACTION OF EACH CONTROLLER IS CORRECT.

(4) CALIBRATE COMPUTATIONAL DEVICES AT FIVE POINTS. USE THE MANUFACTURER'S INSTRUCTION MANUAL AS A GUIDE FOR SELECTING CALIBRATION POINTS.

(5) CALIBRATE DECISION DEVICES USING THE MANUFACTURER'S INSTRUCTION MANUAL AS A GUIDE.

3.03 TESTS

A. FURNISH CALIBRATED TESTING EQUIPMENT AND COMPETENT, EXPERIENCED TESTING ENGINEERS WHO SHALL CONDUCT OPERATING AND PERFORMANCE TESTS FOR EACH SYSTEM SPECIFIED.

B. TEST INSTRUMENTS SHALL BE CALIBRATED PRIOR TO TESTS.

C. COORDINATE TESTS WITH REQUIREMENTS OF OTHER SECTIONS OF THE SPECIFICATIONS.

D. PRIOR TO CONDUCTING FORMAL TESTS, OPERATE SYSTEMS AND EQUIPMENT FOR AT LEAST 7 DAYS.

E. CONDUCT FORMAL TESTS IN PRESENCE OF WILEY & WILSON'S REPRESENTATIVE TO DEMONSTRATE THAT ALL CONTRACT REQUIREMENTS ARE MET. THESE TESTS SHALL INCLUDE PERFORMANCE TESTS FOR ALL EQUIPMENT AND OPERATING TESTS FOR SYSTEMS.

(1) MALFUNCTION IN ANY TESTED SYSTEM OR PIECE OF EQUIPMENT OR COMPONENT PART THEREOF THAT OCCURS BEFORE, DURING, OR AS A RESULT OF TESTS SHALL BE CORRECTED, REPAIRED, AND/OR REPLACED AT NO ADDITIONAL COST AND THE TESTS REPEATED IN THE PRESENCE OF WILEY & WILSON'S REPRESENTATIVE.

(2) FURTHER MALFUNCTIONS SHALL BE SIMILARLY REPAIRED AND TEST SHALL BE REPEATED IN THE PRESENCE OF WILEY & WILSON'S REPRESENTATIVE.

F. IF COMPLETION OF AN ENVIRONMENTAL CONTROL SYSTEM OCCURS DURING A SEASON WHEN FINAL CONTROL SETTINGS AND ADJUSTMENTS CANNOT BE PROPERLY MADE TO MAKE A PERFORMANCE TEST, THEN SUCH FINAL CONTROL SETTINGS AND ADJUSTMENTS SHALL BE MADE DURING FIRST ACTUAL SEASON OF USE.

3.04 NAMEPLATES

A. INSTALL A NAMEPLATE ON FRONT OF PANEL, BENEATH EACH FRONT OF PANEL MOUNTED DEVICE UNLESS DEVICE HAS AN INTEGRAL NAMEPLATE. ENGRAVING SHALL BE DEVICE NAME ON TOP LINE(S) FOLLOWED BY P&ID TAG NUMBER ON LAST LINE.

B. INSTALL A NAMEPLATE ON BACK OF PANEL FRONT, BENEATH EACH FRONT OF PANEL MOUNTED DEVICE. ENGRAVING SHALL BE P&ID TAG NUMBER.

C. INSTALL A NAMEPLATE ON INTERIOR SUBPANEL, BENEATH EACH INSIDE OF PANEL MOUNTED DEVICE. ENGRAVING SHALL BE P&ID TAG NUMBER.

D. FASTEN NAMEPLATES WITH SCREWS OR A NONADHESIVE TYPE FASTENER.

3.05 BRASS TAGS

A. INSTALL A BRASS TAG ON EACH FIELD MOUNTED DEVICE.

B. STAMPING SHALL BE DEVICE NAME ON TOP LINE(S) FOLLOWED BY P&ID TAG NUMBER ON LAST LINE.

C. ATTACH BRASS TAGS TO ASSOCIATED DEVICES USING CABLE TIES.

END OF SECTION

SECTION 13737 - ELECTRONIC DIGITAL INDICATORS

1. GENERAL

1.01 REFERENCES

A. INSTRUMENT SOCIETY OF AMERICA (ISA) PUBLICATIONS

(1) S5.1 INSTRUMENTATION SYMBOLS AND IDENTIFICATION

(2) S5.4 INSTRUMENT LOOP DIAGRAMS

(3) RP12.1 RECOMMENDED PRACTICE FOR ELECTRICAL INSTRUMENTS IN HAZARDOUS ATMOSPHERES

(4) RP12.6 INSTALLATION OF INTRINSICALLY SAFE INSTRUMENT SYSTEMS IN CLASS I HAZARDOUS LOCATIONS

(5) S51.1 STANDARD PROCESS INSTRUMENTATION TERMINOLOGY

B. NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA) 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

1.02 INSTRUMENTATION LOOP SHALL BE 4-20 MA. LOOP LOADS SHALL BE WITHIN THE CURRENT SOURCE LOAD CAPACITY.

1.03 ALL INDICATORS SHALL BE CALIBRATED IN PROCESS ENGINEERING UNITS. SCALE MULTIPLIERS, IF REQUIRED, SHALL BE LIMITED TO POWERS OF TEN; I.E., 10, 100, 1,000, AND THE LIKE.

1.04 SUBMITTAL: PROVIDE SUBMITTALS IN A TIMELY MANNER IN ACCORDANCE WITH THE APPROVED SUBMITTALS SCHEDULE AS SPECIFIED IN DIVISION 1 – GENERAL REQUIREMENTS.

A. SUBMITTAL: PANEL MOUNTED DIGITAL INDICATOR DATA

2. PRODUCTS

2.01 DIGITAL INDICATOR, PANEL MOUNTED SHALL HAVE THE FOLLOWING FEATURES:

A. TYPE: 3.5-DIGIT, LED DISPLAY MINIMUM 0.5-INCH HIGH DIGITS

B. INPUT: 4 TO 20 MA CURRENT LOOP

C. ACCURACY: PLUS OR MINUS 0.1 PERCENT OF SPAN PLUS ONE DIGIT

D. REPEATABILITY: PLUS OR MINUS ONE DIGIT

E. AMBIENT OPERATING RANGE

(1) TEMPERATURE: 32 TO 122 DEGREES F

(2) HUMIDITY: 0 TO 90 PERCENT NONCONDENSING

F. THE DECIMAL POINT LOCATION SHALL BE FIELD MOVABLE TO ANY LOCATION

G. OVERRANGE INDICATION

H. STABILITY WITH TIME: NO MEASURABLE DRIFT

I. NORMAL MODE REJECTION: MINIMUM 60 DB AT 60 HERTZ

J. COMMON MODE REJECTION: MINIMUM 100 DB AT 60 HERTZ

K. POWER: 120 VOLTS AC

L. MANUFACTURER AND TYPE

(1) ACTION INSTRUMENTS, INC.

(2) NEWPORT ELECTRONICS, INC.

(3) PRECISION DIGITAL CORPORATION

(4) RED LION CONTROLS

3. EXECUTION: NOT USED

END OF SECTION

SECTION 13738.09 - ELECTRONIC FLOW INSTRUMENTATION, ULTRASONIC

1. GENERAL

1.01 REFERENCES

A. AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME) PUBLICATION

(1) FLUID METERS, 6TH EDITION

B. INSTRUMENT SOCIETY OF AMERICA (ISA) PUBLICATIONS

(1) S5.1 INSTRUMENTATION SYMBOLS AND IDENTIFICATION

(2) S5.4 INSTRUMENT LOOP DIAGRAMS

(3) RP12.1 RECOMMENDED PRACTICE FOR ELECTRICAL INSTRUMENTS IN HAZARDOUS ATMOSPHERES

(4) RP12.6 INSTALLATION OF INTRINSICALLY SAFE INSTRUMENT SYSTEMS IN CLASS I HAZARDOUS LOCATIONS

(5) S51.1 STANDARD PROCESS INSTRUMENTATION TERMINOLOGY

C. NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA) 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

1.02 INSTRUMENTATION LOOP SHALL BE 4-20 MA. LOOP LOADS SHALL BE WITHIN THE CURRENT SOURCE LOAD CAPACITY.

1.03 ENCLOSURES SHALL BE AS FOLLOWS:

A. HAZARDOUS AREAS

(1) IF EQUIPMENT IS INTRINSICALLY SAFE: CAST, NEMA 4X CORROSION RESISTANT.

1.04 SUBMITTALS: PROVIDE THE FOLLOWING IN A TIMELY MANNER IN ACCORDANCE WITH THE APPROVED SUBMITTALS SCHEDULE AS SPECIFIED IN DIVISION 1 - GENERAL REQUIREMENTS.

A. SUBMITTAL: ULTRASONIC FLOWMETER DATA

2. PRODUCTS

2.01 ULTRASONIC FLOWMETERS SHALL BE PROVIDED WITH THE FEATURES LISTED BELOW:

A. PERFORMANCE SPECIFICATIONS

(1) ACCURACY: 0.5 PERCENT OF ACTUAL FLOW

(2) FLOW RANGE: MINUS 40 FEET/SECOND TO PLUS 40 FEET/SECOND INCLUDING ZERO FLOW

(3) FLOW SENSITIVITY: 0.001 FOOT/SECOND FOR PIPES FROM 0.5 TO 156

INCHES OUTSIDE DIAMETER

(4) LINEARITY: 0.01 FOOT/SECOND

(5) REPRODUCIBILITY: 0.01 FOOT/SECOND

(6) ZERO DRIFT: 0.01 FOOT/SECOND

B. TRANSDUCER

(1) NONINTRUSIVE

(2) CLAMP-ON

(3) SUBMERSIBLE

(4) MEASURES FLOW WITHOUT CONTACT WITH LIQUID NOR PIPE OBSTRUCTION

(5) INTRINSICALLY SAFE, NEMA 4

(6) PROCESS TEMPERATURE RANGE: MINUS 40 TO PLUS 225 DEGREES F

(7) PROCESS TEMPERATURE RANGE: MINUS 80 TO PLUS 500 DEGREES F

(8) PROCESS FLUID: SODIUM HYPOCYLORITE

C. TRANSMITTER

(1) RATE-OF-FLOW DISPLAY: FOUR-DIGITS WITH ENGINEERING UNITS OF GPM AND MOVABLE DECIMAL POINT

(2) TOTALIZER DISPLAY: SIX-DIGIT

(3) ALL MODULES PLUG-IN TYPE

(4) SELF-TEST BUTTON TO INITIATE VERIFICATION OF ALL DATA OUTPUT FUNCTIONS, DISPLAYS, AND ALARM INDICATORS

(5) TEST CONNECTOR ENABLING INSPECTION OF IMPORTANT CIRCUIT POINTS AND TRANSDUCER WAVE SHAPES

(6) OPERABLE WITH TRANSDUCERS OFF THE PIPE IN FACE-TO-FACE CONTACT

(7) ADJUSTABLE SLEW RATE RATIO OF 10 TO 1

(8) CAPABLE OF AUTOMATICALLY SELECTING BETWEEN THE DIFFERENTIAL AND DOPPLER DETECTION BASED ON LIQUID SONIC CONDUCTIVITY

(9) ANALOG AND DIGITAL CALIBRATION SETTLEABLE WITHOUT ACTUAL FLOW

(10) AMBIENT TEMPERATURE RANGE: MINUS 20 TO PLUS 115 DEGREES F

(11) AMBIENT TEMPERATURE RANGE: MINUS 30 TO PLUS 135 DEGREES F

(12) SIGNAL OUTPUTS

4 TO 20 MADC PROPORTIONAL TO FLOW RATE

PULSES PROPORTIONAL TO FLOW

(13) ALARM OUTPUTS

EMPTY PIPE

FAULT WARNING

FAULT ALARM

MEMORY OPERATION

LOW RANGE INDICATOR

OVERFLOW

(14) POWER REQUIREMENTS

VOLTAGE: 120 VOLTS AC

POWER CONSUMPTION: 50 WATTS MAXIMUM

D. ACCEPTABLE MANUFACTURER: CONTROLOTRON CORPORATION

3. EXECUTION

3.01 INSTALL FLOW ELEMENTS WITH UPSTREAM AND DOWNSTREAM STRAIGHT, UNOBSTRUCTED RUNS IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. WHERE THERE IS INSUFFICIENT STRAIGHT RUN, INSTALL STRAIGHTENING VANES.

END OF SECTION

SECTION 13741 - ELECTRONIC LEVEL INSTRUMENTATION

1. GENERAL

1.01 REFERENCES

A. INSTRUMENT SOCIETY OF AMERICA (ISA) PUBLICATIONS

(1) S5.1 INSTRUMENTATION SYMBOLS AND IDENTIFICATION

(2) S5.4 INSTRUMENT LOOP DIAGRAMS

(3) S51.1 STANDARD PROCESS INSTRUMENTATION TERMINOLOGY

B. NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA) 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

1.02 INSTRUMENTATION LOOP SHALL BE 4-20 MA. LOOP LOADS SHALL BE WITHIN THE CURRENT SOURCE LOAD CAPACITY.

1.03 SUBMITTAL: PROVIDE SUBMITTALS IN A TIMELY MANNER IN ACCORDANCE WITH THE APPROVED SUBMITTALS SCHEDULE AS SPECIFIED IN DIVISION 1 – GENERAL REQUIREMENTS.

A. SUBMITTAL: REMOTE ELECTRONICS ULTRASONIC TYPE LEVEL INSTRUMENTATION DATA

2. PRODUCTS

2.01 LEVEL INSTRUMENTATION SHALL BE PROVIDED WITH THE FEATURES LISTED IN THE FOLLOWING ARTICLES.

2.02 ULTRASONIC TYPE WITH REMOTE ELECTRONICS

A. DESCRIPTION

(1) THE SYSTEM SHALL CONSIST OF TWO COMPONENTS, A TRANSDUCER AND AN INDICATOR/CONTROLLER/TRANSMITTER.

(2) THE PRINCIPLE OF OPERATION SHALL RELY ON TOUCH-FREE MEASUREMENT OF THE LIQUID LEVEL IN A VESSEL AND THE CONVERSION OF THAT MEASURED VARIABLE INTO A SIGNAL DIRECTLY PROPORTIONAL TO LEVEL (IN ENGINEERING UNITS OF INCHES OR FEET) FOR INDICATION, TRANSMISSION, AND/OR CONTROL.

(3) LEVEL MEASUREMENT SHALL BE ACCOMPLISHED BY PROPAGATION OF ULTRASONIC PULSES BY THE TRANSDUCER, AND TEMPERATURE COMPENSATED MEASUREMENT OF TRAVEL TIME OF THE PULSES FROM THE TRANSDUCER TO THE LIQUID SURFACE AND BACK TO THE TRANSDUCER.

B. TRANSDUCER

(1) KYNAR, TEFZEL, OR PVC ENCAPSULATED, SUBMERSIBLE

(2) SUITABLE FOR USE IN CLASS I, DIVISION 1 HAZARDOUS LOCATIONS

C. INDICATOR/CONTROLLER/TRANSMITTER

(1) ENCLOSURE: NEMA 4X OUTDOORS; NEMA 4X UNITS SHALL HAVE READOUT VIEWING WINDOW AND INTERNAL SPACE HEATERS.

(2) SOLID STATE PLUG-IN ELECTRONIC MODULES

(3) READOUTS

PANEL METER, FOUR-DIGIT LIQUID CRYSTAL DISPLAY

(4) OUTPUT: 4-20 MA SIGNAL PROPORTIONAL TO LEVEL

SPDT CONTACT CLOSURES FOR THE LEVELS INDICATED ON THE PLANS

D. ACCURACY: PLUS OR MINUS 0.25 PERCENT OF SPAN OVER A TEMPERATURE RANGE OF MINUS 4 DEGREES F TO PLUS 140 DEGREES F

E. TEMPERATURE OPERATING RANGE: MINUS 4 TO PLUS 140 DEGREES F

F. ZERO AND SPAN ADJUSTMENT

G. PREASSEMBLED MULTI-CONDUCTOR CABLING FOR CONNECTION OF TRANSDUCER TO THE INDICATOR/CONTROLLER/TRANSMITTER. CABLING SHALL BE MOLDED INTO TRANSDUCER.

H. MANUFACTURER AND TYPE

(1) ENDRESS & HAUSER, FMU 86X SERIES TRANSMITTER AND FDU 8X SENSOR

(2) MILTRONICS, RANGER SERIES

(3) POLYSONICS, ERS-91L

3. EXECUTION

3.01 PROVIDE MOUNTING BRACKET FOR TRANSDUCER. COORDINATE TRANSDUCER WITH TANK OPENING AS PROVIDED FOR LEVEL MEASUREMENT.

END OF SECTION

SECTION 13755 - ELECTRICAL RELAYS

1. GENERAL

1.01 REFERENCES

A. INSTRUMENT SOCIETY OF AMERICA (ISA) PUBLICATIONS

(1) S5.1 INSTRUMENTATION SYMBOLS AND IDENTIFICATION

(2) RP12.1 RECOMMENDED PRACTICE FOR ELECTRICAL INSTRUMENTS IN HAZARDOUS ATMOSPHERES

(3) S51.1 STANDARD PROCESS INSTRUMENTATION TERMINOLOGY

B. NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA) 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

1.02 SUBMITTAL: PROVIDE SUBMITTALS IN A TIMELY MANNER IN ACCORDANCE WITH THE APPROVED SUBMITTALS SCHEDULE AS SPECIFIED IN DIVISION 1 – GENERAL REQUIREMENTS.

A. SUBMITTAL: GENERAL PURPOSE CONTROL RELAY DATA

2. PRODUCTS

2.01 GENERAL PURPOSE CONTROL RELAYS SHALL HAVE THE FOLLOWING FEATURES:

A. MANUFACTURER AND TYPE

(1) ALLEN-BRADLEY BULLETIN 700, TYPE P

(2) CUTLER-HAMMER TYPE M

(3) GENERAL ELECTRIC CR120A OR CR120B, AS APPLICABLE

(4) SQUARE D CLASS 8501, TYPE X

3. EXECUTION

3.01 INSTALL RELAYS IN CONTROL PANELS AS REQUIRED TO PROVIDE INTERLOCKING REQUIRED BY P&I AND LADDER DIAGRAMS.

END OF SECTION

SECTION 15140 - PIPE SUPPORTS, ANCHORS, AND SEALS

1. GENERAL

1.01 PIPING SYSTEMS SHALL BE SUPPORTED IN ACCORDANCE WITH ANSI B31.1 "POWER PIPING" SO AS TO MAINTAIN REQUIRED PITCH OF LINES, PREVENT VIBRATION, AND PROVIDE FOR EXPANSION AND CONTRACTION MOVEMENT.

1.02 ACCEPTABLE MANUFACTURER: GRINNELL, ELCEN METAL PRODUCTS, F&S CENTRAL, OR MICHIGAN HANGER COMPANY (GRINNELL FIGURE NUMBERS ESTABLISH THE STANDARD OF QUALITY.)

2. PRODUCTS

2.01 RIGID SUPPORTS OR HANGERS, ALL EXTERIOR SUPPORTS AND COMPONENTS TO BE HOT DIP GALVANIZED OR 304 STAINLESS STEEL.

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 FIGURE 104.

B. ADJUSTABLE CLEVIS TYPE HANGER SHALL BE BLACK CARBON STEEL AND BE APPROVED BY FACTORY MUTUAL AND BE UL LISTED. HANGER SHALL BE GRINNELL FIGURE 260.

C. PIPE ROLL HANGERS SHALL CONSIST OF A CAST IRON ROLL AND STEEL ROLL ROD. HANGER SHALL BE GRINNELL FIGURE 171.

2.02 PROTECTION SADDLE FOR INSULATION SHALL BE FABRICATED FROM CURVED 3/16-INCH THICK 304 STAINLESS STEEL TO MATCH INSULATION RADIUS. SADDLES SHALL BE 12 INCHES LONG AND SHALL BE DESIGNED FOR THE INSULATION THICKNESS USED.

2.03 HANGER RODS SHALL BE ASTM A 575 OR A 576 HOT ROLLED CARBON STEEL AND MEET MECHANICAL PROPERTY REQUIREMENTS OF ASTM A 663.

2.04 BEAM CLAMPS SHALL BE FABRICATED SPECIFICALLY FOR THE STRUCTURE TO WHICH THE HANGER ROD IS ATTACHED.

2.05 SEALS

A. SEALS AT FIRE RATED CEILINGS AND WALLS: PIPE OR CONDUIT PENETRATION SEALANT SHALL BE RTV SILICONE FOAM AS MANUFACTURED BY DOW CORNING, THERMOFIBER SAFING INSULATION AS MANUFACTURED BY U.S. GYPSUM, OR FIRE BARRIER FS-195 AS MANUFACTURED BY 3M COMPANY. SEALING METHOD SHALL BE LISTED AS A THROUGH-PENETRATION FIRESTOP SYSTEM IN THE UL BUILDING MATERIALS DIRECTORY. PROVIDE A FIRESTOP SYSTEM AS RECOMMENDED FOR THE TYPE OF PIPE, THE TYPE OF PARTITION, AND THE FIRE RESISTANCE RATING OF THE PENETRATED PARTITION.

B. SEALS AT WATERPROOFED WALL AND WATERPROOFED FLOOR PENETRATIONS: PIPE PENETRATION CLOSURES SHALL BE "LINK-SEAL" AS MANUFACTURED BY THUNDERLINE CORPORATION. SEALS SHALL BE MODULAR MECHANICAL TYPE,

CONSISTING OF INTERLOCKING SYNTHETIC RUBBER LINKS SHAPED TO CONTINUOUSLY FILL THE ANNULAR SPACE BETWEEN THE PIPE AND SLEEVE.

3. EXECUTION

3.01 INSTALL RIGID PIPE HANGERS AS FOLLOWS:

A. UNINSULATED PIPE 2-INCH AND SMALLER - GRINNELL FIGURE 104
B. INSULATED PIPE 2-INCH AND SMALLER - GRINNELL FIGURE 260
C. ALL PIPING 2-1/2 INCH AND LARGER - GRINNELL FIGURE 260

3.02 WHERE NECESSARY DUE TO SPACE LIMITATIONS, PROVIDE PIPE ROLL HANGER EQUAL TO GRINNELL FIGURE 171 FOR PIPING 2-1/2 INCHES AND LARGER.

3.03 PROVIDE PROTECTION SADDLE FOR INSULATED PIPING. PROTECTION SADDLE SHALL BE EQUAL TO GRINNELL 160 SERIES OF THE SIZE TO FIT THE PIPE AND INSULATION THICKNESS TO BE APPLIED. ADJUST THE SADDLE INTO PLACE ON THE PIPE UNDERSIDE SO THAT THE PIPE IS SUPPORTED AT THE CORRECT ELEVATION BY THE ROLLER. PROVIDE ROLLER SIZE TO MATCH PROTECTION SADDLE.

A. IN PLACE OF THE PROTECTION SADDLE, GRINNELL FIGURE 167 INSULATION PROTECTION SHIELDS MAY BE USED BETWEEN THE HANGER AND THE INSULATION ON THE LOWER HALF OF THE PIPE. THE INSULATION BETWEEN THE SHIELD AND THE PIPE SHALL BE CALCIUM SILICATE HAVING A MINIMUM DENSITY OF 13 POUNDS PER CUBIC FOOT AND A MINIMUM COMPRESSIVE STRENGTH OF 100 PSI.

3.04 PROTECT PIPE INSULATION WHICH IS TO RECEIVE A VAPOR BARRIER FROM PIPE HANGERS BY USING GRINNELL FIGURE 167 INSULATION PROTECTION SHIELDS BETWEEN THE HANGER AND THE INSULATION. THE CALCIUM SILICATE INSULATION SHALL BE COVERED WITH A VAPOR BARRIER.

3.05 HORIZONTAL CPVC PIPING SHALL BE CONTINUOUSLY SUPPORTED BY A BENT PLATE STEEL CHANNEL, A MINIMUM OF 18 GAGE THICKNESS. CONTINUOUS SUPPORT SHALL MAKE ALLOWANCE FOR ALL FORMS OF COUPLERS HAVING A DIAMETER LARGER THAN THAT OF THE PIPE.

3.06 SPACE SUPPORTS OR HANGERS FOR HORIZONTAL PIPING AT MAXIMUM OF 4-FEET ON CENTER. THIS SPACING DOES NOT APPLY WHERE THERE ARE CONCENTRATED LOADS BETWEEN SUPPORTS SUCH AS VALVES OR SPECIALTIES.

A. HANGERS FOR PIPING SERVICES NOT INCLUDED IN THE PRECEDING SCHEDULE, SUCH AS GASES, WASTES, VENTS, AND ROOF DRAINS SHALL BE SPACED IN ACCORDANCE WITH THE APPLICABLE CODE.

B. PROVIDE PIPE HANGER OR SUPPORT WITHIN 18 INCHES OF EVERY CHANGE IN DIRECTION FOR PIPING 1-1/2 INCHES AND SMALLER AND WITHIN 3 FEET OF EVERY CHANGE IN DIRECTION FOR PIPING 2 INCHES AND LARGER. HORIZONTAL "NO-HUB" PIPING SHALL BE SUPPORTED AT EACH JOINT.

C. PROVIDE SUPPORTS OR GUIDES AS REQUIRED TO RESTRICT EXCESSIVE HORIZONTAL MOTION IN VERTICAL PIPING.

3.07 PROVIDE PIPE ALIGNMENT GUIDES AS DETAILED ON THE DRAWINGS.

3.08 SUPPORT HANGERS FOR PIPE BY USING MALLEABLE IRON OR GALVANIZED STEEL CONCRETE INSERTS, CONCRETE ANCHOR BOLTS, BEAM CLAMPS WITH LOCK NUTS OR RETAINING STRAPS, OR OTHER SPECIAL FASTENING DEVICES, AS REQUIRED, FOR THE SUPPORT OF HANGERS. AS AN OPTION WHERE DIRECT ATTACHMENT TO FRAME MEMBERS IS NOT POSSIBLE, AUXILIARY FRAME MEMBERS MAY BE PROVIDED WHICH SHALL SPAN AT LEAST TWO STRUCTURAL FRAME MEMBERS. DO NOT ATTACH HANGERS TO ROOF DECK OR FLOOR DECK.

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.

3.09 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 AND THROUGH 3-1/2 INCH - 1/2-INCH DIAMETER

C. FOR 4-INCH AND 5-INCH PIPE - 5/8-INCH DIAMETER

3.10 PROVIDE CONCRETE ANCHOR BLOCKS FOR UNDERGROUND, MECHANICALLY JOINED, DOMESTIC WATER, AND FIRE PROTECTION SERVICES. INSTALL ANCHOR BLOCKS AT ALL PIPE BENDS REQUIRING FITTINGS. CONCRETE SHALL BE AS SPECIFIED UNDER SECTION 03300 - CAST-IN-PLACE CONCRETE.

3.11 USE ANCHORS AND EXPANSION BENDS IN THE INSTALLATION WHERE SHOWN ON DRAWINGS, AS REQUIRED OR A MINIMUM OF ONE JOINT IN EACH HORIZONTAL RUN OVER TWENTY FEET IN LENGTH TO ACCOMMODATE EXPANSION AND CONTRACTION MOVEMENTS AND PREVENT UNDUE STRESSING OF PIPE.

3.12 HORIZONTAL PIPELINES, PASSING THROUGH INTERIOR WALLS AND PARTITIONS, AND VERTICAL PIPELINES, PASSING THROUGH FLOORS, SHALL BE PROVIDED WITH SCHEDULE 40 BLACK STEEL PIPE SLEEVES. SLEEVE DIAMETERS SHALL BE SUFFICIENT TO ACCOMMODATE INSULATED PIPE.

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 NONWATERTIGHT FLOORS, SHALL BE SUFFICIENT TO GIVE A 1/2-INCH PROJECTION ABOVE FINISHED FLOOR ELEVATIONS.

3.13 PIPES PASSING THROUGH EXTERIOR WALLS, OTHER WATERPROOFED WALLS, OR WATERPROOFED FLOORS SHALL BE PROVIDED WITH CAST-IN-PLACE INSERTS OF SCHEDULE 40 BLACK STEEL PIPE SLEEVES AND 1/2-INCH STEEL LEAK PLATE. INSTALL ADJUSTABLE MECHANICAL SEALS IN THE ANNULAR SPACE BETWEEN PIPE AND SLEEVE AND ADJUST UNTIL WATERTIGHT.

3.14 FLASH NONPRESSURE, VENT PIPES THROUGH WALL WITH SLEEVES OF 16-OUNCE SOFT SHEET COPPER ENCLOSING THE PIPE ON ALL SIDES. FLASHING SHALL EXTEND HORIZONTALLY NOT LESS THAN 9 INCHES FROM PIPE.

END OF SECTION

SECTION 16010 - BASIC ELECTRICAL REQUIREMENTS

1. GENERAL

1.01 DESCRIPTION

A. PROVIDE NECESSARY ITEMS FOR A COMPLETE INSTALLATION OF ELECTRICALLY OPERATED EQUIPMENT SPECIFIED IN THIS PROJECT MANUAL OR SHOWN ON CONTRACT DRAWINGS.

B. 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.

C. THE CONTRACTOR SHALL PROVIDE INSTRUMENTATION AND RELATED CONTROL WORK AS A PART OF THE ELECTRICAL WORK. THE CONTRACTOR SHALL PROVIDE THE EXPERTISE NECESSARY TO PROPERLY INSTALL, WIRE, CALIBRATE, AND START UP ALL REQUIRED INSTRUMENTATION AND CONTROLS PROVISIONS.

1.02 QUALITY ASSURANCE

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.

(1) AMERICAN CONCRETE INSTITUTE ..... ACI

(2) AMERICAN NATIONAL STANDARDS INSTITUTE ..... ANSI

(3) AMERICAN SOCIETY FOR TESTING AND MATERIALS ..... ASTM

(4) ASSOCIATION OF EDISON ILLUMINATING COMPANIES ..... AEIC

(5) CERTIFIED BALLASTS MFG ..... CBM

(6) ELECTRICAL TESTING LAB ..... ETL

(7) ELECTRONIC INDUSTRIES ASSOCIATION ..... EIA

(8) INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS ..... IEEE

(9) INSTRUMENTATION, SYSTEMS, AND AUTOMATION SOCIETY .....ISA

(10) INSULATED POWER CABLE ENGINEERS ASSOCIATION ..... IPCEA

(11) INTERNATIONAL BUILDING CODE ..... IBC

(12) NATIONAL ELECTRICAL CODE (NFPA NO. 70) ..... NEC

(13) NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION ..... NEMA

(14) NATIONAL ELECTRICAL SAFETY CODE ..... NESC

(15) NATIONAL FIRE PROTECTION ASSOCIATION ..... NFPA

(16) TELECOMMUNICATIONS INDUSTRY ASSOCIATION .....TIA

(17) UNDERWRITERS LABORATORIES, INC. ..... UL

B. WHEN EQUIPMENT IS SUPPLIED WITH ELECTRICAL REQUIREMENTS DIFFERENT FROM THOSE SPECIFIED OR SHOWN ON THE DRAWINGS, ASSOCIATED ELECTRICAL FACILITIES OF THE CORRECT SIZE, TYPE, AND RATING SHALL BE PROVIDED.

1.03 SUBMITTALS: PROVIDE THE FOLLOWING IN A TIMELY MANNER IN ACCORDANCE WITH THE APPROVED SUBMITTALS SCHEDULE AS SPECIFIED IN DIVISION 1 - GENERAL REQUIREMENTS.

A. SUBMITTAL: NAMEPLATE

B. SUBMITTAL: TEST RESULTS ELECTRICAL SYSTEMS AND EQUIPMENT

1.04 DELIVERY, STORAGE, AND HANDLING: PRIOR TO INSTALLATION, STORE EQUIPMENT IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS TO AVOID DAMAGE.

1.05 PROJECT SCHEDULING: COORDINATE ELECTRICAL OUTAGES TO FACILITATE THE WORK OF THIS PROJECT WITH THE OWNER.

2. PRODUCTS

2.01 NAMEPLATES

A. MATERIAL: NAMEPLATES SHALL BE CONSTRUCTED OF LAMINATED PHENOLIC WITH A WHITE CENTER CORE SANDWICHED BETWEEN BLACK LAYERS.

B. INSCRIPTION: LETTERS SHALL BE ENGRAVED IN THE PHENOLIC TO FORM LETTERS 3/8 INCHES HIGH, UNLESS INDICATED OTHERWISE ON DRAWINGS.

C. FASTENERS SHALL BE NONADHESIVE TYPE SUCH AS SCREWS.

2.02 SUPPORTING MATERIAL SHALL BE IN ACCORDANCE WITH SECTION 16190.

3. EXECUTION

3.01 ALL ELECTRICAL WORK SHALL BE PERFORMED BY OR UNDER THE DIRECT SUPERVISION OF AN ELECTRICIAN LICENSED TO WORK IN THE PROJECT LOCATION.

3.02 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.

3.03 EQUIPMENT CONNECTIONS FOR EQUIPMENT FURNISHED BY THE OWNER OR UNDER SEPARATE CONTRACT SHALL BE COMPLETE AS SPECIFIED IN PARAGRAPH ABOVE.

3.04 MOUNT A NAMEPLATE ON EACH PANELBOARD, STARTER, SAFETY SWITCH, REMOTE CONTROL PUSH-BUTTON STATION, AND ALL SIMILAR CONTROLS.

3.05 INSTALL CONTROL AND ALARM WIRING FOR ALL EQUIPMENT, MECHANICAL AND ELECTRICAL, IN ACCORDANCE WITH DIVISION 16 SPECIFICATION SECTIONS. BEFORE INSTALLING CONTROL CIRCUITS, ENSURE THAT CONTROLS AND WIRING DIAGRAMS ARE IN ACCORDANCE WITH THOSE FURNISHED WITH THE EQUIPMENT. MAKE ANY CHANGES REQUIRED DUE TO DIFFERENT EQUIPMENT, MORE UP-TO-DATE CONTROLS OR SAFETY DEVICES, SO THAT THE EQUIPMENT OPERATES AS REQUIRED. CONTROL DIAGRAMS ON MECHANICAL DRAWINGS SHALL BE CHECKED AND

COORDINATED WITH OTHER CONTROL DIAGRAMS. CONTROL VOLTAGE SHALL NOT EXCEED 120 VOLTS UNLESS INDICATED OTHERWISE ON THE DRAWINGS.

END OF SECTION

SECTION 16030 - REWORKING EXISTING SYSTEM

1. GENERAL

1.01 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.

2. PRODUCTS

2.01 PRODUCTS SHALL BE NEW AND AS SPECIFIED IN THIS DIVISION UNLESS REUSE OF EXISTING FACILITIES IS SPECIFICALLY INDICATED ON THE DRAWINGS.

3. EXECUTION

3.01 COORDINATE ELECTRICAL OUTAGES TO FACILITATE REWORKING OF EXISTING SYSTEM WITH THE OWNER.

3.02 DISPOSE OF REMOVED EQUIPMENT AND MATERIAL.

3.03 INSTALL A GROUNDING CONDUCTOR IN EACH FEEDER AND BRANCH CIRCUIT TO BE REWORKED.

3.04 REPLACE ALL NONGROUNDING TYPE RECEPTACLES IN AREAS TO BE REWORKED WITH GROUNDING TYPE RECEPTACLES.

3.05 THOROUGHLY INSPECT ELECTRICAL SYSTEMS IN REWORKED AREAS AND BRING TO THE ATTENTION OF WILEY & WILSON ALL DEFECTIVE OR UNSERVICEABLE MATERIAL NOT SCHEDULED FOR REMOVAL OR REPLACEMENT.

3.06 REMOVE ABANDONED WIRING AND ABANDONED EXPOSED CONDUIT.

3.07 CUT BACK EXPOSED PORTIONS OF ABANDONED, CONCEALED CONDUIT TO FACILITATE PATCHING.

END OF SECTION

SECTION 16090 - MOTORS

1. GENERAL

1.01 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

1.02 QUALITY ASSURANCE: 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 SOURCES OF MOTOR DAMAGE.

2. PRODUCTS

2.01 UNLESS OTHERWISE SPECIFIED OR INDICATED ON THE DRAWINGS, THE FOLLOWING FEATURES AND RATINGS APPLY.

A. MOTOR WINDING INSULATION TEMPERATURE RISE SHALL BE NEMA MG 1 CLASS "B." THE INSULATION SHALL BE CLASS "B" OR CLASS "F."

B. MOTOR FREQUENCY SHALL BE 60 HERTZ.

2.02 MOTOR ENCLOSURES, TYPES, AND FEATURES SPECIFICALLY INDICATED ON DRAWINGS OR IN OTHER PORTIONS OF SPECIFICATIONS SHALL BE PROVIDED.

2.03 MOTORS SHALL BE SUITABLE FOR STARTING BY TYPE OF STARTERS INDICATED.

2.04 PHASE AND VOLTAGE RATINGS SHALL BE NEMA STANDARD RATINGS INDICATED ON ELECTRICAL DRAWINGS.

2.05 SINGLE-SPEED POLYPHASE SQUIRREL-CAGE INTEGRAL-HORSEPOWER MOTORS IN THE RANGE 1 THROUGH 200 HORSEPOWER SHALL BE HIGH EFFICIENCY TYPE AND SHALL HAVE THEIR EFFICIENCIES INDICATED BY A NEMA NOMINAL EFFICIENCY RATING ON THE NAMEPLATE. THE NOMINAL EFFICIENCY SHALL BE AT LEAST THAT SPECIFIED IN NEMA MG 1, SECTION 12 OR ENERGY POLICY ACT OF 1992 (EPACT '92), WHICHEVER IS GREATER.

2.06 SINGLE PHASE MOTORS SHALL BE EQUIPPED WITH INTEGRAL, THERMAL OVERLOADS.

3. EXECUTION

3.01 DURING INSTALLATION, INSPECT FOR DAMAGE, MOISTURE, ALIGNMENT, PROPER LUBRICATION, OIL LEAKS, PHASE IDENTIFICATION, AND CLEANLINESS. TEST FOR PROPER ROTATION. CHECK AND RECORD MOTOR SPEED.

3.02 PERFORM A MEGGER TEST ON ALL MOTORS 1 HORSEPOWER AND LARGER.

3.03 PERFORM THE MEGGER TEST WITH THE WINDINGS AT AMBIENT TEMPERATURE. DRY AND RETEST ANY MACHINE NOT PASSING THIS TEST UNTIL IT EITHER PASSES OR IS FOUND UNSATISFACTORY.

3.04 TEST PROCEDURE

A. FOR THREE-PHASE MOTORS AND GENERATORS, APPLY MEGGER TESTS BETWEEN ALL PHASES TIED TOGETHER AND GROUND. THE TEST VOLTAGE SHALL BE

1,000 VOLTS DC AND MEASURED RESISTANCE SHALL NOT BE LESS THAN 20 MEGOHMS.

B. MAINTAIN MEGGER TESTS FOR 1 MINUTE OR UNTIL THE READING MAINTAINS A CONSTANT VALUE FOR 15 SECONDS.

C. RECORD ALL MEGGER READINGS AND AMBIENT TEMPERATURE AT THE TIME OF TEST.

END OF SECTION

SECTION 16110 - METALLIC RACEWAYS

1. GENERAL

1.01 REFERENCES:

A. ANSI PUBLICATIONS

(1) C80.1 RIGID STEEL CONDUIT, ZINC COATED

(2) C80.2 RIGID STEEL CONDUIT, ENAMELED

2. PRODUCTS

2.01 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.

2.02 FLEXIBLE METAL CONDUIT: GALVANIZED, SINGLE STRIP

2.03 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.

2.04 EXPANSION JOINT FITTINGS: O-Z/GEDNEY TYPE AX OR APPLETON TYPE XJB, WATERTIGHT, PERMITTING TWO-WAY MOVEMENT UP TO 4 INCHES, EQUIPPED WITH BONDING JUMPERS AROUND OR THROUGH EACH FITTING

2.05 THRUWALL SEALING FITTINGS: TYPE CSMI FOR EXISTING WALLS AND TYPE WSK FOR NEW WALLS BY O-Z/GEDNEY ELECTRICAL MANUFACTURING COMPANY

2.06 FIRE-SEAL FITTINGS: TYPE CFSI BY O-Z/GEDNEY COMPANY

2.07 CONDUIT SEALING BUSHING FOR CONDUIT ENTRIES ABOVE OR BELOW GROUND: O-Z/GEDNEY SERIES CSB (FOR SCHEDULE 40 CONDUIT) OR CSM (FOR PIPE, CONDUIT, OR TUBING) OR APPROVED EQUAL.

2.08 CONDUIT BUSHINGS

A. INSULATING BUSHINGS FOR RIGID CONDUIT SHALL BE TYPE B BY O-Z/GEDNEY OR BU500 BY STEEL CITY.

B. GROUNDING BUSHING: O-Z/GEDNEY TYPE BLG

C. CABLE SEALING BUSHING FOR CONDUITS ENTERING ENCLOSURES: O-Z/GEDNEY TYPE GRK

2.09 PULLING IN WIRE: PROVIDE NO. 14 GALVANIZED IRON OR 5/32 INCH POLYETHYLENE ROPE

2.10 THREAD LUBRICANT/SEALANT SHALL BE CROUSE-HINDS TYPE STL EXCEPT WHEN REQUIRED ON JOINTS FOR HEAT PRODUCING ELEMENTS SUCH AS LIGHTING FIXTURES, IT SHALL BE CROUSE-HINDS TYPE HTL.

2.11 CLAMP BACK AND NEST BACK SPACERS: TYPE G AND NG, RESPECTIVELY, BY O-Z/GEDNEY COMPANY.

3. EXECUTION

3.01 APPLICATION

A. INSTALL RIGID STEEL CONDUIT.

B. INSTALL FLEXIBLE METAL CONDUIT FOR CONNECTIONS TO MOTORS AND OTHER EQUIPMENT SUBJECT TO VIBRATION, AND FOR CONNECTIONS TO RECESSED OR SEMIRECESSED LIGHTING FIXTURES.

C. INSTALL LIQUID TIGHT FLEXIBLE METAL CONDUIT FOR CONNECTIONS TO MOTORS AND OTHER EQUIPMENT SUBJECT TO VIBRATION, AND FOR CONNECTIONS TO RECESSED OR SEMIRECESSED LIGHTING FIXTURES IN WET AREAS.

D. INSTALL EXPANSION JOINT FITTINGS WHERE CONDUITS PASS THROUGH BUILDING EXPANSION JOINTS.

E. INSTALL THRUWALL SEALING FITTINGS WHERE CONDUITS ENTER BUILDINGS OR VAULTS BELOW FINISHED GRADE.

F. INSTALL WIREWAY AS INDICATED ON DRAWINGS.

G. INSTALL FIRE-SEAL FITTINGS WHERE CONDUITS PENETRATE CONCRETE FLOOR SLABS OR MASONRY WALLS REQUIRED TO BE FIRE RATED.

3.02 INSTALL CONDUIT CONCEALED WHERE INDICATED ON THE DRAWINGS. MAINTAIN MINIMUM DISTANCE OF 6 INCHES FROM PARALLEL RUNS OF FLUES, STEAM, OR HOT WATER PIPES.

3.03 SPACE GROUPS OF CONDUITS UNIFORMLY. FOR BENDS AND OFFSETS, USE AN APPROVED HICKEY OR BENDING MACHINE.

3.04 CUT ALL CONDUIT WITH HACKSAW OR APPROVED CUTTING MACHINE AND REAM AFTER THREADING TO REMOVE ALL BURRS.

3.05 FASTEN CONDUIT SECURELY TO OUTLETS, JUNCTIONS, AND PULL BOXES TO ENSURE FIRM ELECTRICAL CONTACT. JOIN CONDUIT WITH APPROVED COUPLINGS. NO RUNNING THREADS WILL BE ALLOWED.

3.06 CONNECTION OF CONDUIT TO SHEET METAL BOXES AND ENCLOSURES:

A. CONNECTION TO NEMA 1 TYPE BOXES AND ENCLOSURES:

(1) RIGID CONDUIT: INSTALL INSULATED BUSHINGS AND DOUBLE LOCKNUTS.

B. CONNECTION TO NEMA 3R, 4, 4X, AND 12 TYPE BOXES: INSTALL INSULATED BUSHINGS AND SEALING LOCKNUTS OR HUBS.

C. INSTALL CONDUIT SEALING BUSHINGS WITHIN ALL CONDUITS WHICH HAVE ENTERED A BUILDING FROM OUTSIDE, WHETHER FROM ABOVE OR BELOW GRADE.

3.07 AVOID CONDENSATION POCKETS IN INSTALLATIONS. KEEP CONDUIT, FITTINGS, AND BOXES FREE FROM FOREIGN MATTER, BEFORE, DURING, AND AFTER INSTALLATION.

3.08 NOT MORE THAN ONE EXPOSED CONDUIT SHALL BE RUN DOWN TO AN EXPOSED WALL SWITCH OR OUTLET BOX.

3.09 CONDUITS LESS THAN 1 INCH MAY BE INSTALLED IN CONCRETE BUT SHALL NOT CROSS EACH OTHER. INSTALLATION OF LARGER CONDUITS IN CONCRETE MUST BE APPROVED BY WILEY & WILSON.

3.10 SUPPORT RUNS OF METALLIC CONDUIT AT LEAST EVERY 8 FEET.

3.11 INSTALL RUNS OF CONDUIT PARALLEL OR PERPENDICULAR TO WALLS, STRUCTURAL MEMBERS, OR INTERSECTIONS OF VERTICAL PLANES AND CEILINGS.

A. PROVIDE RIGHT ANGLE TURNS CONSISTING OF FITTINGS OR SYMMETRICAL BENDS.

3.12 SUPPORT CONDUITS WITHIN 1 FOOT OF ALL CHANGES IN DIRECTION. SUPPORTS SHALL INCLUDE WALL BRACKETS, TRAPEZE HANGERS, STRAP HANGERS, OR PIPE STRAPS SECURED TO HOLLOW MASONRY WITH TOGGLE BOLTS, TO BRICK AND CONCRETE WITH EXPANSION BOLTS, TO METAL SURFACES WITH MACHINE SCREWS, AND TO WOOD WITH WOOD SCREWS.

3.13 EXPLOSIVE DRIVE EQUIPMENT MAY BE USED TO MAKE CONNECTIONS SUBJECT TO COMPLIANCE WITH SAFETY REGULATIONS.

3.14 WOODEN PLUGS INSERTED IN MASONRY, AND THE USE OF NAILS AS FASTENING MEDIA, ARE PROHIBITED.

3.15 SUPPORT CONDUIT RISERS EXPOSED IN WIRE SHAFTS AT EACH FLOOR LEVEL WITH U-CLAMP HANGERS.

3.16 INSTALL EMPTY CONDUIT FOR FUTURE USE AS INDICATED ON THE DRAWINGS. CONDUIT SHALL BE COMPLETE WITH PULL WIRE OR ROPE, JUNCTION AND OUTLET BOXES.

3.17 CONDUIT SHALL NOT BE SUPPORTED FROM METAL ROOF DECK.

3.18 PROVIDE PITCH POCKET WHERE CONDUIT PENETRATES A BUILT-UP OR METAL ROOF.

3.19 PROVIDE PREMOLDED PIPE SEAL WHERE CONDUIT PENETRATES SINGLE PLY MEMBRANE ROOF.

3.20 CONDUIT SHALL NOT PENETRATE CONCRETE BASES DESIGNED FOR VIBRATION ISOLATION.

3.21 APPLY THREAD LUBRICANT/SEALANT TO JOINTS OF ALL CONDUIT BURIED IN EARTH, ENCASED IN CONCRETE, OR INSTALLED OUTDOORS.

3.22 PAINT WITH TWO COATS OF BLACK ASPHALTUM ALL RSC CONDUITS BURIED IN EARTH.

3.23 CONDUITS BURIED IN EARTH OUTSIDE BUILDINGS SHALL HAVE 30-INCH COVER.

END OF SECTION

SECTION 16120 - WIRE, CABLE, AND WIRING (600 VOLT MAXIMUM)

1. GENERAL

1.01 REFERENCES

A. NEMA PUBLICATIONS

(1) WC 55 INSTRUMENTATION CABLES AND THERMOCOUPLE WIRE

(2) WC 57 STANDARD FOR CONTROL CABLES

(3) WC 70 NONSHIELDED POWER CABLES RATED 2000 VOLTS OR LESS FOR THE DISTRIBUTION OF ELECTRICAL ENERGY

B. UNDERWRITERS LABORATORIES (UL) STANDARDS

(1) UL STANDARD 83 – THERMOPLASTIC INSULATED WIRES AND CABLES

(2) UL STANDARD 1063 – MACHINE TOOL WIRES AND CABLES

(3) UL STANDARD 1569 – METAL CLAD CABLES

1.02 CONDUCTOR CODING

A. COLOR CODE CONDUCTORS IN ACCORDANCE WITH NATIONAL ELECTRICAL CODE.

(1) GROUNDED CONDUCTORS NO. 6 AWG AND SMALLER SHALL HAVE A CONTINUOUS WHITE OR GRAY OUTER FINISH OR THREE CONTINUOUS WHITE STRIPES ON OTHER THAN GREEN INSULATION FOR THE ENTIRE CONDUCTOR LENGTH.

(2) GROUNDED CONDUCTORS LARGER THAN NO. 6 AWG SHALL BE IDENTIFIED BY EITHER A CONTINUOUS WHITE OR GRAY OUTER FINISH OR BY THREE CONTINUOUS WHITE STRIPES ON OTHER THAN GREEN INSULATION FOR THE ENTIRE CONDUCTOR LENGTH OR AT THE TIME OF INSTALLATION BY A DISTINCTIVE WHITE MARKING AT THE TERMINATION. THE MAKING SHALL ENCIRCLE THE ENTIRE CONDUCTOR OR INSULATION.

(3) UNGROUNDED CIRCUIT CONDUCTORS SHALL BE CLEARLY DISTINGUISHABLE FROM OTHER PHASE CONDUCTORS, GROUNDED CONDUCTORS OR EQUIPMENT GROUNDING CONDUCTORS EITHER BY CONTINUOUS INSULATION COLOR OR BY TWO LAPS OF COLORED TAPE ON EACH CONDUCTOR AT ALL POINTS OF ACCESS.

B. NUMBER CODE ALL CONTROL AND INSTRUMENTATION WIRING AT ALL POINTS OF ACCESS.

1.03 CONDUCTOR SIZES ARE BASED ON COPPER UNLESS OTHERWISE INDICATED ON DRAWINGS AND SHALL NOT BE REDUCED IN SIZE OR QUANTITY REGARDLESS OF INSULATION TYPE.

2. PRODUCTS

2.01 POWER AND CONTROL CONDUCTORS

A. GENERAL

(1) CONDUCTORS SHALL BE SOFT ANNEALED COPPER UNLESS SPECIFICALLY INDICATED OTHERWISE.

(2) POWER CONDUCTORS SHALL BE NO. 12 CONDUCTORS, UNLESS OTHERWISE INDICATED. CONTROL CONDUCTORS SHALL BE NO. 14 MINIMUM FOR NEC CLASS I AND NO. 16 MINIMUM FOR NEC CLASS II CONTROL CIRCUITS.

(3) CONDUCTORS SHALL BE STRANDED EXCEPT POWER AND LIGHTING BRANCH CIRCUITS THROUGH NUMBER 10 AWG MAY BE SOLID.

(4) CONDUCTORS SHALL HAVE INSULATION RATED FOR 600 VOLTS UNLESS OTHERWISE INDICATED.

(5) MULTICONDUCTOR CABLES SHALL HAVE AN OVERALL PVC JACKET.

B. CONDUCTORS INSIDE BUILDINGS

(1) INSULATION SHALL BE TYPE "THWN" UNLESS OTHERWISE INDICATED.

C. UNDERGROUND OUTDOOR CONDUCTORS SHALL BE TYPE, "USE," (UNDERGROUND SERVICE ENTRANCE) INSULATED AND RATED FOR 600 VOLTS UNLESS OTHERWISE INDICATED. DIRECT BURIAL CABLE SHALL BE JACKETED.

2.02 LOW SIGNAL LEVEL INSTRUMENTATION CABLES SHALL HAVE THE FOLLOWING FEATURES:

A. CONDUCTOR

(1) GAGE: 16 AWG

(2) TYPE: STRANDED, COPPER-TINNED

(3) INSULATION: CHEMICALLY CROSS-LINKED POLYETHYLENE OR FLAME RETARDANT ETHYLENE PROPYLENE, 90 DEGREES C, 600 VOLTS

(4) ARRANGEMENT: TWISTED PAIR, 1-1/2 INCH MINIMUM LAY

B. SHIELDING: 100 PERCENT COVERAGE ALUMINUM POLYESTER TAPE WITH 18 GAGE BARE, TINNED, COPPER DRAIN WIRE IN CONTINUOUS CONTACT WITH TAPE

C. OVERALL JACKET: POLYVINYL CHLORIDE OR CHLORINATED POLYETHYLENE

D. SUITABLE FOR INSTALLATION IN CABLE TRAY

E. SUITABLE FOR INSTALLATION IN CLASS I, DIVISION 2 HAZARDOUS AREAS, GAS-BLOCKED

2.03 TERMINAL STRIPS SHALL BE BARRIER-TYPE, RATED 600 VOLTS. STRIPS SHALL HAVE A MARKING STRIP SUITABLE FOR MARKING USING PERMANENT, WATERPROOF INK PENS.

2.04 PULLING COMPOUND SHALL BE UL LISTED.

2.05 WIRE MARKERS SHALL BE WRAP-AROUND TAGS, SHRINKABLE PVC SLEEVING WITH HOT-STAMPED BLOCKS OR SLIP-ON BEADS.

2.06 MOTOR CONNECTIONS

A. CONNECTION LUGS SHALL BE TWO HOLE, COMPRESSION TYPE, THOMAS AND BETTS CATALOG NUMBER SERIES 54200.

B. INSULATION SHALL BE MOTOR STUB SPLICE INSULATORS, THOMAS AND BETTS CATALOG NUMBERS MSC8, 2, 20, 250, 500 AS APPLICABLE OR RAYCHEM MCK.

3. EXECUTION

3.01 INSTALL WIRING IN CONDUIT UNLESS OTHERWISE SHOWN.

3.02 PULL CONDUCTORS USING RECOGNIZED METHODS AND EQUIPMENT LEAVING AMPLE LENGTHS OF WIRE AT JUNCTIONS FOR CONNECTIONS.

A. COMPLETE AND CLEAN OUT CONDUIT SYSTEM BEFORE PULLING WIRE.

B. USE COMPOUND AS REQUIRED TO FACILITATE PULLING.

3.03 LONG BRANCH CIRCUITS

A. UNDER THE FOLLOWING CONDITIONS BRANCH CIRCUIT CONDUCTORS ROUTED FROM THE PANELBOARD TO THE FIRST OUTLET, FIXTURE, ETC. SHALL BE INCREASED FROM THE SPECIFIED SIZE TO THE NEXT LARGER SIZE.

(1) 120 VOLT CIRCUITS EXCEEDING 50 FEET.

(2) 277 VOLT CIRCUITS EXCEEDING 100 FEET.

3.04 SPLICING

A. INSTALL SPLICE-FREE CONDUCTORS WITHIN DUCTS, CONDUITS, OR EARTH.

B. INSTRUMENTATION CONDUCTORS SHALL BE SPLICE-FREE FROM TRANSMITTER TO RECEIVER.

C. CONNECT NO. 10 AND SMALLER WIRES WITH CONSTANT PRESSURE EXPANDABLE SPRING TYPE CONNECTORS, "SCOTCHLOK" BY 3M OR B-CAP BY BUCHANAN.

D. CONNECT NO. 8 AND LARGER WIRES WITH COMPRESSION CONNECTORS OR SPLICES AS MANUFACTURED BY BURNDY OR T&B.

E. INSULATE SPLICING CONNECTORS TO AT LEAST 200 PERCENT OF WIRE INSULATION. USE PRESTRETCHED TUBING CONNECTOR INSULATORS, 3/M PST FOR NO. 2 AND LARGER CONDUCTORS.

3.05 TERMINATION

A. USE TERMINAL STRIPS TO TERMINATE AND SPLICE CONTROL, INSTRUMENTATION, AND COMMUNICATION CABLES. MARK WIRE NUMBERS ON MARKING STRIP.

B. SHIELD GROUNDING

(1) GROUND ALL SHIELDS ONLY AT TERMINATION POINT CLOSEST TO TRANSMITTER POWER SUPPLY, EXCEPT GROUND THERMOCOUPLE EXTENSION WIRE SHIELD ONLY AT THERMOCOUPLE.

(2) AT END WHERE SHIELD IS NOT TO BE GROUNDED, PULL SHIELD BACK OVER CABLE JACKET AND COVER ENTIRELY WITH CLEAR HEAT SHRINK TUBING TO PREVENT ACCIDENTAL GROUNDING.

3.06 USE SPLIT WEDGE TYPE CABLE SUPPORTS WHICH CLAMP EACH CONDUCTOR INDIVIDUALLY IN VERTICAL FEEDERS WHERE REQUIRED.

3.07 FORM AND TIE ALL WIRING IN PANELBOARDS, CONTROL CENTERS, CONTROL PANELS, AND THE LIKE.

A. BUNDLE WIRING AND TIE AT 6-INCH INTERVALS.

B. 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 NONASSOCIATED WIRING.

3.08 IDENTIFY EACH WIRE USING WIRE MARKERS AT ALL POINTS OF ACCESS.

A. IDENTIFY LIGHTING AND RECEPTACLE BRANCH CIRCUIT WIRING BY PANELBOARD NAME AND CIRCUIT NUMBER.

B. IDENTIFY MOTOR BRANCH CIRCUIT WIRING BY MCC NAME, CIRCUIT NUMBER, AND PHASE.

C. IDENTIFY FEEDERS BY NAME OF EQUIPMENT FROM WHICH THEY ORIGINATE, CIRCUIT NUMBER, AND PHASE.

D. IDENTIFY CONTROL AND INSTRUMENTATION WIRING USING A CONTRACTOR SELECTED NUMBERING SYSTEM ALLOWING A UNIQUE NUMBER FOR EACH WIRE.

3.09 MOTOR CONNECTIONS: MAKE MOTOR CONNECTIONS USING CONNECTION LUGS WITH MOTOR STUB SPLICE INSULATORS.

3.10 INSTALL CABLE CONNECTORS ON ALL FLEXIBLE CABLES ENTERING ENCLOSURES.

3.11 TEST THE INSULATION RESISTANCE OF EACH CONDUCTOR PHASE TO PHASE AND PHASE TO GROUND FOR 1/2 MINUTE. THE TEST VOLTAGE SHALL BE 1,000 VOLTS DC AND THE INSULATION RESISTANCE SHALL NOT BE LESS THAN 1,000,000 OHMS FOR NO. 14 AND 12 AWG AND 250,000 OHMS FOR LARGER CONDUCTORS.

3.12 A MAXIMUM OF 24 CURRENT CARRYING CONDUCTORS WILL BE PERMITTED IN A SINGLE RACEWAY UNLESS SPECIFICALLY INDICATED OTHERWISE ON THE DRAWINGS. DERATE IN ACCORDANCE WITH NEC.

3.13 TWO OR THREE SINGLE PHASE CIRCUITS MAY BE INSTALLED IN ONE CONDUIT USING CONDUCTORS OF DIFFERENT PHASES AND A COMMON NEUTRAL, EXCEPT WHERE GROUND FAULT OR ARC-FAULT BREAKERS ARE APPLIED FOR CIRCUIT PROTECTION OR UNLESS OTHERWISE NOTED ON THE DRAWINGS.

3.14 LOW VOLTAGE INSTRUMENTATION CABLE SHALL NOT BE INSTALLED IN CONDUIT WITH POWER OR CONTROL CIRCUITS.

END OF SECTION

SECTION 16133 - PULL AND JUNCTION BOXES

1. GENERAL

1.01 DESCRIPTION: THIS SECTION SPECIFIES BOXES INSTALLED WITHIN BUILDINGS AND OUTSIDE ABOVE GRADE.

2. PRODUCTS

2.01 NEMA 1 BOXES SHALL HAVE THE FOLLOWING FEATURES:

A. CONSTRUCTED OF CODE GAGE, HOT-ROLLED SHEET STEEL

B. REMOVABLE COVERS SUITABLE FOR SURFACE OR FLUSH MOUNTING AS APPLICABLE

C. HOT-DIPPED GALVANIZED FINISH ON ALL SHEET STEEL

D. CADMIUM PLATED HARDWARE

E. MANUFACTURER

(1) BOXES 4 BY 4 BY 4 INCHES AND LARGER: HOFFMAN ENGINEERING COMPANY

(2) BOXES SMALLER THAN 4 BY 4 BY 4 INCHES: STEEL CITY 52141, 52151, AND 52171 SERIES, WITH 52-C SERIES COVERS

2.02 NEMA 4 BOXES SHALL HAVE THE FOLLOWING FEATURES:

A. ACCEPTABLE MATERIALS

(1) NEMA 4 BOXES: TYPE 5052 ALUMINUM, MINIMUM 0.080 INCH THICK

(2) NEMA 4X BOXES: TYPE 304 STAINLESS STEEL, MINIMUM 14 GAGE

B. CONTINUOUSLY WELDED SEAMS

C. NO KNOCKOUTS

D. ROLLED LIP AROUND DOOR

E. NEOPRENE GASKETED COVERS

F. STAINLESS STEEL HARDWARE

G. MANUFACTURER: HOFFMAN ENGINEERING COMPANY

2.03 CONDUIT BODIES

A. WHERE OF SUFFICIENT SIZE TO CARRY THE SAME FILL CAPACITY AS THE LARGEST CONNECTED CONDUIT, CONDUIT BODIES MAY BE USED INSTEAD OF

PULL AND JUNCTION BOXES PROVIDED THEY MEET THE REQUIREMENTS OF THE APPLICABLE NEMA STANDARDS.

B. MATERIAL: CAST FERROUS ALLOY WITH GALVANIZED FINISH

C. PROVIDE COVERS AND GASKETS WITH CONDUIT BODIES OF A DESIGN SUITABLE FOR THE APPLICATION. PROVIDE WATERTIGHT CONDUIT BODIES IN DAMP AND WET LOCATIONS.

D. HARDWARE: STAINLESS STEEL

E. MANUFACTURER: APPLETON, CROUSE-HINDS, OR KILLARK

3. EXECUTION

3.01 APPLICATION

A. INSTALL NEMA 1 BOXES IN DRY, NONHAZARDOUS, NONCORROSIVE AREAS INDOORS.

B. INSTALL NEMA 4 BOXES OUTDOORS AND IN WET, NONHAZARDOUS, NONCORROSIVE AREAS INDOORS.

C. INSTALL NEMA 4X BOXES IN CORROSIVE AREAS OUTDOORS AND INDOORS.

3.02 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.

3.03 SIZE BOXES IN ACCORDANCE WITH NEC UNLESS LARGER BOXES ARE INDICATED.

3.04 IDENTIFY EACH PULL AND JUNCTION BOX USING AN INDELIBLE MARKER ON COVERS. MARKINGS SHALL IDENTIFY SOURCE AND CIRCUIT NUMBERS.

END OF SECTION

SECTION 16135 - LIGHTING FIXTURE OUTLET BOXES

1. GENERAL: NOT USED.

2. PRODUCTS

2.01 CAST BOXES SHALL HAVE THE FOLLOWING FEATURES:

A. MATERIALS AND FINISH: IRON ALLOY, CADMIUM ZINC ELECTROPLATING WITH OVERALL ALUMINUM CELLULOSE LACQUER FINISH

B. MANUFACTURER: APPLETON, CROUSE-HINDS, OR KILLARK

2.02 FIXTURE OUTLETS IN CEILINGS SHALL BE A MINIMUM OF 4 INCHES OCTAGONAL (4-11/16 INCHES BY 2-1/2 INCHES DEEP WHERE REQUIRED TO ACCOMMODATE LARGER CONDUIT OR LARGER NUMBER OF WIRES).

2.03 LIGHTING FIXTURE OUTLET BOXES SHALL BE PROVIDED WITH SUITABLE STUDS AND SUPPORTS FOR CARRYING THE WEIGHT OF THE FIXTURE, WHERE FIXTURES ARE TO BE MOUNTED ON THE BOX. INCREASE BOX DEPTH, AS REQUIRED, FOR ADDITIONAL WIRES AND CONDUITS.

2.04 PROVIDE COVER PLATES FOR OUTLET BOXES AS REQUIRED.

3. EXECUTION

3.01 APPLICATION

A. INSTALL CAST BOXES

3.02 FOR BOXES FLUSH MOUNTED IN FINISHED WALLS OR CEILINGS

A. INSTALL PLASTER RINGS OR RAISED COVERS AS REQUIRED SO THAT COVER PLATES FIT AGAINST BOXES OR RINGS.

B. 3/16 INCH MAXIMUM GAPS ALLOWED FOR NONCOMBUSTIBLE WALLS.

C. ADJUST LOCATION OF OUTLETS IN MASONRY OR TILE CONSTRUCTION TO OCCUR IN THE NEAREST JOINT TO THE HEIGHT SPECIFIED.

3.03 SUPPORT ALL SURFACE MOUNTED BOXES AND SUSPENDED BOXES TO MAINTAIN ALIGNMENT AND RIGIDITY.

3.04 SUPPORT OUTLET BOXES FROM BUILDING STRUCTURE.

3.05 CLEAN BOXES OF ALL FOREIGN MATTER PRIOR TO INSTALLATION OF WIRING OR DEVICES.

END OF SECTION

SECTION 16140 - WIRING DEVICES

1. GENERAL

1.01 REFERENCES

A. NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA) PUBLICATIONS

(1) WD 1 GENERAL COLOR REQUIREMENTS FOR WIRING DEVICES

(2) WD 6 WIRING DEVICES – DIMENSIONAL SPECIFICATIONS

B. UNDERWRITERS LABORATORIES (UL) PUBLICATIONS

(1) UL 20 GENERAL-USE SNAP SWITCHES

(2) UL 943 GROUND-FAULT CIRCUIT INTERRUPTERS

1.02 WIRING DEVICE COLOR SHALL BE IVORY, EXCEPT WHERE OTHERWISE INDICATED.

2. PRODUCTS

2.01 AC GENERAL-USE SNAP SWITCHES

A. PROVIDE TOTALLY ENCLOSED, 20 AMPERE, 120/277 VOLT, QUIET AC GENERAL-USE SNAP SWITCHES.

B. SWITCHES SHALL BE SINGLE POLE.

C. SWITCHES SHALL BE SPECIFICATION GRADE. BRYANT 4900 SERIES, HUBBELL HBL1220 SERIES, PASS & SEYMOUR LEGRAND PS20AC SERIES, COOPER INDUSTRIES 2221 SERIES OR ARROW HART 1990.

2.02 DUPLEX CONVENIENCE RECEPTACLES

A. PROVIDE NEMA CONFIGURATION 5-20 DUPLEX 125 VOLT GROUNDING TYPE RECEPTACLES RATED FOR 20 AMPERES UNLESS OTHERWISE INDICATED ON THE DRAWINGS.

B. RECEPTACLES SHALL BE SPECIFICATION GRADE. BRYANT 5362, HUBBELL HBL5362, PASS & SEYMOUR LEGRAND 5362, COOPER INDUSTRIES 5362 SLATER 5362, OR ARROW HART 5362.

2.03 OTHER RECEPTACLES

A. RECEPTACLES REQUIRING CURRENT, VOLTAGE, OR CONFIGURATION DIFFERENT FROM DUPLEX CONVENIENCE RECEPTACLES SHALL BE AS INDICATED ON THE DRAWINGS.

B. PROVIDE OTHER RECEPTACLES WITH QUALITY, MATERIAL, AND WORKMANSHIP AT LEAST EQUAL TO THAT SPECIFIED FOR DUPLEX CONVENIENCE RECEPTACLES.

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: 5 PLUS OR MINUS 1 MILLIAMPERE

(4) TRIP SPEED: 0.025 SECOND MAXIMUM

(5) FRONT-ACCESSIBLE TEST AND RESET PUSH BUTTONS

(6) MANUFACTURER AND TYPE

BRYANT GFR53FT

HUBBELL GF5362

PASS & SEYMOUR LEGRAND 2091

COOPER INDUSTRIES GF20V

ARROW HART GF5242

3. EXECUTION

3.01 INSTALL AC 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 INSURE SWITCHES ARE INSTALLED ON STRIKE SIDE OF DOOR.

A. LOCATE CENTER LINE OF SWITCH NO HIGHER THAN 4 FEET 0 INCHES ABOVE FINISHED FLOOR ELEVATION (A.D.A. REQUIREMENT) UNLESS OTHERWISE INDICATED.

B. LONG DIMENSION OF SWITCHES SHALL BE VERTICAL UNLESS OTHERWISE INDICATED OR REQUIRED.

3.02 INSTALL RECEPTACLES AS INDICATED ON THE DRAWINGS.

A. LOCATE CENTER LINE OF RECEPTACLE APPROXIMATELY 1 FOOT 6 INCHES ABOVE FINISHED FLOOR ELEVATION UNLESS OTHERWISE INDICATED.

B. LONG DIMENSION OF RECEPTACLES SHALL BE VERTICAL UNLESS OTHERWISE INDICATED OR REQUIRED.

END OF SECTION

SECTION 16190 - SUPPORTING DEVICES

1. GENERAL

1.01 SUPPORTING MATERIAL SHALL BE COMPLETE WITH HANGERS, CONNECTORS, BOLTS, CLAMPS, AND NECESSARY ACCESSORIES TO MAKE A COMPLETE INSTALLATION.

1.02 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.

2. PRODUCTS

2.01 INDOORS IN DRY AREAS: MATERIALS SHALL BE GALVANIZED OR CADMIUM PLATED STEEL.

2.02 INDOORS IN WET, DAMP, OR CORROSIVE AREAS: THREADED MATERIALS SHALL BE STAINLESS STEEL. ALL OTHER MATERIALS SHALL BE ALUMINUM AND/OR STAINLESS STEEL.

2.03 OUTDOORS: THREADED MATERIALS SHALL BE STAINLESS STEEL. ALL OTHER MATERIALS SHALL BE ALUMINUM, STAINLESS STEEL, OR BOTH.

2.04 ACCEPTABLE MANUFACTURERS:

A. B-LINE SYSTEMS, INC.

B. MIDLAND-ROSS CORPORATION, ELECTRICAL PRODUCTS DIVISION (KINDORF)

C. UNISTRUT

D. CADDY FASTENERS BY ERICO PRODUCTS, INC.

3. EXECUTION

3.01 SUPPORT ALL EQUIPMENT WHICH IS NOT INHERENTLY SELF-SUPPORTING IN SUCH A MANNER AS TO EFFECT A RIGID AND PERMANENT INSTALLATION. USE FACTORY-FABRICATED CHANNEL, SUPPORT SYSTEMS, AND AS APPROPRIATE, OTHER STRUCTURAL SHAPES SUCH AS ANGLES, "C" CHANNELS, PIPE, AND THE LIKE.

END OF SECTION

SECTION 16440 - SAFETY SWITCHES

1. GENERAL

1.01 REFERENCES: NEMA PUBLICATION

A. KS 1 ENCLOSED AND MISCELLANEOUS DISTRIBUTION EQUIPMENT SWITCHES (600 VOLTS MAXIMUM)

1.02 SWITCHES REFERRED TO AS DISCONNECT SWITCHES OR MOTOR CIRCUIT SWITCHES ON THE DRAWINGS SHALL BE SAFETY SWITCHES.

1.03 PROVISIONS OF THIS SECTION SHALL GOVERN SWITCHES AND FUSED SWITCHES PROVIDED AS PART OF PANELBOARDS OR OTHER EQUIPMENT.

1.04 SUBMITTALS: PROVIDE SUBMITTALS IN A TIMELY MANNER IN ACCORDANCE WITH THE APPROVED SUBMITTALS SCHEDULE AS SPECIFIED IN DIVISION 1 - GENERAL REQUIREMENTS.

A. SUBMITTAL: SAFETY SWITCH DATA

2. PRODUCTS

2.01 SAFETY SWITCHES SHALL BE THE ENCLOSED HEAVY DUTY TYPE (TYPE HD) WITH QUICK-MAKE, QUICK-BREAK MECHANISM AND EXTERNAL PADLOCKABLE OPERATING HANDLE.

2.02 SAFETY SWITCHES SHALL BE RATED FOR 240 OR 600 VOLTS AS APPLICABLE. THEY SHALL BE HORSEPOWER RATED WHEN USED IN MOTOR CIRCUITS.

2.03 SAFETY SWITCHES SHALL BE FUSIBLE OR NONFUSIBLE, TWO, THREE, OR FOUR POLE AS INDICATED ON DRAWINGS.

2.04 SAFETY SWITCHES SHALL BE SINGLE THROW UNLESS OTHERWISE INDICATED ON THE DRAWINGS.

2.05 SAFETY SWITCHES SHALL HAVE FAULT CURRENT WITHSTAND RATINGS EQUAL TO OR GREATER THAN THE SHORT CIRCUIT CURRENT RATING OF NEAREST UPSTREAM OVERCURRENT DEVICE. SEE THE DRAWINGS FOR SPECIFIC RATINGS.

2.06 ENCLOSURES SHALL BE NEMA 1 INDOORS AND NEMA 4X OUTDOORS UNLESS OTHERWISE INDICATED ON DRAWINGS.

2.07 NONAUTOMATIC CIRCUIT BREAKERS MAY BE USED AS SAFETY SWITCHES PROVIDED THEY HAVE REQUIRED RATINGS.

2.08 MANUFACTURER SHALL BE GENERAL ELECTRIC, SQUARE D, SIEMENS, OR CUTLER-HAMMER.

3. EXECUTION

3.01 MOUNT SAFETY SWITCHES SECURELY BETWEEN 3 AND 6 FOOT LEVELS ABOVE FLOOR UNLESS OTHERWISE INDICATED ON THE DRAWINGS.

3.02 PROVIDE SAFETY SWITCHES WHERE INDICATED ON THE DRAWINGS OR REQUIRED BY NEC.

3.03 PROVIDE SAFETY SWITCHES WITHIN SIGHT FROM AND READILY ACCESSIBLE FROM AIR-CONDITIONING OR REFRIGERATING EQUIPMENT WHEN SWITCHES ARE NOT PROVIDED INTEGRAL WITH EQUIPMENT.

END OF SECTION

SECTION 16450 - GROUNDING

1. GENERAL

1.01 QUALITY ASSURANCE:

A. GROUNDING SHALL BE IN ACCORDANCE WITH NEC AS A MINIMUM. ADDITIONAL GROUNDING REQUIREMENTS SHALL BE AS SPECIFIED OR INDICATED ON DRAWINGS.

B. ALL GROUNDING AND BONDING CONNECTORS SHALL BE LISTED BY A NATIONALLY RECOGNIZED TESTING LABORATORY.

1.02 REFERENCES:

A. ANSI/TIA/EIA JOINT STANDARD J-STD-606 ADMINISTRATION STANDARD FOR COMMERCIAL BUILDINGS.

B. ANSI/TIA/EIA JOINT STANDARD J-STD-607-A COMMERCIAL BUILDING GROUNDING (EARTHING) AND BONDING REQUIREMENTS FOR TELECOMMUNICATIONS.

C. ASTM B 3 STANDARD SPECIFICATION FOR SOFT OR ANNEALED COPPER WIRE.

D. ASTM B 8 STANDARD SPECIFICATION FOR CONCENTRIC-LAY-STRANDED COPPER CONDUCTORS, HARD, MEDIUM-HARD, OR SOFT.

E. ASTM B 33 STANDARD SPECIFICATION FOR TINNED SOFT OR ANNEALED COPPER WIRE FOR ELECTRICAL PURPOSES.

F. IEEE C2 NATIONAL ELECTRICAL SAFETY CODE.

G. NEMA WC 5 THERMOPLASTIC-INSULATED WIRE AND CABLE FOR THE TRANSMISSION AND DISTRIBUTION OF ELECTRICAL ENERGY.

H. NEMA WC 7 CROSS-LINKED-THERMOSETTING-POLYETHYLENE-INSULATED WIRE AND CABLE FOR THE TRANSMISSION AND DISTRIBUTION OF ELECTRICAL ENERGY.

I. NFPA 70 NATIONAL ELECTRICAL CODE.

J. UL 467 STANDARD FOR GROUNDING AND BONDING EQUIPMENT.

2. PRODUCTS

2.01 GROUND RODS SHALL BE COPPER CLAD STEEL, 10 FEET IN LENGTH AND 3/4 INCH IN DIAMETER.

2.02 GROUNDING ELECTRODE CONDUCTORS SHALL BE BARE TINNED-COPPER SIZED IN ACCORDANCE WITH NATIONAL ELECTRICAL CODE, MINIMUM SIZE 1/0 AWG.

2.03 EQUIPMENT GROUNDING CONDUCTORS IN RACEWAYS SHALL BE GREEN INSULATED COPPER SIZED IN ACCORDANCE WITH NATIONAL ELECTRICAL CODE.

2.04 DIRECT BURIED GROUND CONNECTIONS SHALL BE EXOTHERMIC TYPE CADWELD OR THERMOWELD OR THE HYGROUND™ IRREVERSIBLE COMPRESSION TYPE BY BURNDY.

2.05 CABLE-TO-PIPE (WATER OR PROCESS) CONNECTORS SHALL BE AS FOLLOWS:

A. GENERAL: BOLTS ("U" AND STRAIGHT), NUTS, AND LOCK WASHERS SHALL BE STAINLESS STEEL.

B. FOR CONNECTIONS TO 1/2 TO 1-1/2 INCH (IPS) PIPE: O-Z/GEDNEY COMPANY TYPE ABG OR BURNDY TYPE GAR.

C. FOR CONNECTIONS TO 2 TO 8 INCH (IPS) PIPE: O-Z/GEDNEY COMPANY TYPE CG OR BURNDY TYPE GAR.

D. FOR CONNECTIONS TO PIPES LARGER THAN 8 INCH (IPS): O-Z/GEDNEY COMPANY TYPE WG-2 WITH STAINLESS STEEL STRAP AND BODY OR BURNDY TYPE GAR.

3. EXECUTION

3.01 APPLICATIONS

A. PROVIDE EQUIPMENT GROUNDING CONDUCTORS IN ALL RACEWAYS CONTAINING CONDUCTORS HAVING 100 VOLTS OR MORE TO GROUND.

B. CONDUCTORS: PROVIDE SOLID COPPER CONDUCTORS FOR NO. 10 AWG AND SMALLER, AND STRANDED COPPER CONDUCTORS FOR NO. 8 AWG AND LARGER, UNLESS OTHERWISE INDICATED.

3.02 INSTALLATION

A. GROUNDING CONDUCTORS: ROUTE ALONG SHORTEST AND STRAIGHTEST PATHS PRACTICABLE, UNLESS OTHERWISE INDICATED OR REQUIRED BY CODE. AVOID OBSTRUCTING ACCESS OR PLACING CONDUCTORS WHERE THEY MAY BE SUBJECT TO STRAIN, IMPACT, OR DAMAGE.

B. BONDING STRAPS AND JUMPERS: INSTALL IN LOCATIONS ACCESSIBLE FOR INSPECTION AND MAINTENANCE, EXCEPT WHERE ROUTED THROUGH SHORT LENGTHS OF CONDUIT.

(1) BONDING TO STRUCTURE: BOND STRAPS TO BASIC STRUCTURE, TAKING CARE NOT TO PENETRATE ANY ADJACENT PARTS.

(2) BONDING TO EQUIPMENT MOUNTED ON VIBRATION ISOLATION HANGERS AND SUPPORTS: INSTALL SO VIBRATION IS NOT TRANSMITTED TO RIGIDLY MOUNTED EQUIPMENT.

(3) USE EXOTHERMIC-WELDED OR IRREVERSIBLE COMPRESSION-TYPE CONNECTORS FOR OUTDOOR LOCATIONS, BUT IF A DISCONNECT-TYPE CONNECTION IS REQUIRED, USE A BOLTED CLAMP.

C. GROUNDING AND BONDING FOR PIPING:

(1) METAL WATER SERVICE PIPE: PROVIDE INSULATED COPPER GROUNDING CONDUCTORS, IN CONDUIT, FROM BUILDING'S MAIN ELECTRICAL SERVICE EQUIPMENT, OR GROUNDING BUS, TO MAIN METAL WATER SERVICE ENTRANCES TO BUILDING. CONNECT GROUNDING CONDUCTORS TO MAIN METAL WATER SERVICE PIPES, USING SPECIFIED CONNECTORS. WHERE A DIELECTRIC MAIN WATER FITTING IS INSTALLED, CONNECT GROUNDING CONDUCTOR ON STREET SIDE OF FITTING. BOND METAL GROUNDING CONDUCTOR CONDUIT OR SLEEVE TO CONDUCTOR AT EACH END.

(2) WATER METER PIPING: USE BRAIDED-TYPE BONDING JUMPERS TO ELECTRICALLY BYPASS WATER METERS. CONNECT TO PIPE WITH A BOLTED CONNECTOR.

3.03 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.

3.04 GROUND EACH OUTSIDE LIGHTING STANDARD WITH ONE GROUND ROD.

3.05 GROUND ALL SWITCH ENCLOSURES.

3.06 IRREVERSIBLE COMPRESSION TYPE GROUNDING CONNECTIONS SHALL BE INSTALLED ONLY WITH TOOLS APPROVED BY THE MANUFACTURER FOR THIS PURPOSE.

END OF SECTION

SECTION 16752 - ELECTRICAL PILOT DEVICES

1. GENERAL

1.01 REFERENCES

A. INSTRUMENTATION, SYSTEMS, AND AUTOMATION SOCIETY (ISA) PUBLICATIONS

(1) S5.1 INSTRUMENTATION SYMBOLS AND IDENTIFICATION

(2) RP12.1 RECOMMENDED PRACTICE FOR ELECTRICAL INSTRUMENTS IN HAZARDOUS ATMOSPHERES

(3) S51.1 PROCESS INSTRUMENTATION TERMINOLOGY

B. NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA) PUBLICATIONS

(1) ICS 1 INDUSTRIAL CONTROL AND SYSTEMS: GENERAL REQUIREMENTS

(2) ICS 2 INDUSTRIAL CONTROL AND SYSTEMS: CONTROLLERS, CONTACTORS, AND OVERLOAD RELAYS RATED 600 VOLTS DEVICES, CONTROLLERS, AND ASSEMBLIES

(3) ICS 6 INDUSTRIAL CONTROL AND SYSTEMS: ENCLOSURES

1.02 SUBMITTALS: PROVIDE THE FOLLOWING IN A TIMELY MANNER IN ACCORDANCE WITH THE APPROVED SUBMITTALS SCHEDULE AS SPECIFIED IN DIVISION 1 - GENERAL REQUIREMENTS.

A. SUBMITTAL: MANUFACTURERS LITERATURE FOR ELECTRICAL PILOT DEVICES

B. SUBMITTAL: PILOT DEVICE DATA

2. PRODUCTS

2.01 GENERAL: PILOT DEVICES SHALL BE CORROSION RESISTANT (NEMA 4, 4X, AND 13) HEAVY-DUTY TYPE, RATED 600 VOLTS.

2.02 SWITCHES

A. SWITCHES LISTED BELOW SHALL BE TWO POSITION ROTARY TYPE:

(1) ON/OFF

(2) OFF/AUTOMATIC

B. SELECTOR SWITCHES SHALL BE SINGLE OR MULTIPLE BLOCK, ROTARY TYPE.

C. PUSH BUTTON SWITCHES SHALL BE MULTIPLE CONTACT, SINGLE OR MULTIPLE (AS REQUIRED) BLOCK, SPRING RETURN TYPE WITH EACH BLOCK HAVING ONE NORMALLY OPEN AND ONE NORMALLY CLOSED CONTACT.

2.03 INDICATING LIGHTS SHALL BE THE TRANSFORMER TYPE, 120 VOLT PRIMARY, 6 VOLT SECONDARY.

2.04 ENCLOSURES FOR FIELD MOUNTED DEVICES SHALL BE AS FOLLOWS:

A. NEMA 12: INDOORS, NONHAZARDOUS, NONCORROSIVE AREA

B. NEMA 4X

(1) INDOORS IN WET OR CORROSIVE AREA

(2) OUTDOORS

3. EXECUTION

3.01 INSTALL DEVICES IN MAIN CONTROL CENTERS, INDIVIDUAL MOTOR STARTERS, AND FIELD MOUNTED ADJACENT TO UNIT CONTROLLED AS REQUIRED BY THE P & I DIAGRAMS.

A. INSTALL FIELD MOUNTED DEVICES APPROXIMATELY 4 FEET - 6 INCHES ABOVE FINISHED FLOOR OR GRADE, AS APPLICABLE.

B. INSTALL FRONT-OF-PANEL MOUNTED DEVICES IN LOCAL CONTROL PANELS BETWEEN 3 FEET - 2 INCHES AND 5 FEET - 6 INCHES ABOVE FINISHED FLOOR.

END OF SECTION