



architects + engineers

CONTRACT AND SPECIFICATIONS

**TOWN OF RIVERHEAD
RIVERHEAD SEWER DISTRICT
SUFFOLK COUNTY, NEW YORK**

CLASS A BIOSOLIDS IMPROVEMENTS

CONTRACT G – GENERAL CONSTRUCTION

H2M Project No.: RDSD 2202

Supervisor

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Town Board

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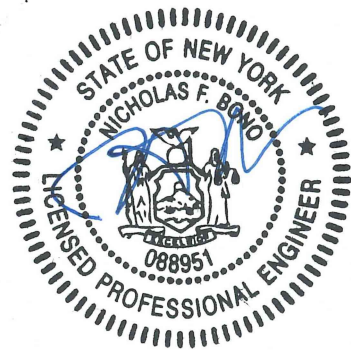
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January 2024

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**TOWN OF RIVERHEAD SEWER DISTRICT
CONTRACT AND SPECIFICATIONS
FOR
CLASS A BIOSOLIDS IMPROVEMENTS
CONTRACT G – GENERAL CONSTRUCTION
H2M PROJECT NO.: RDSD 2202**

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NOTICE TO BIDDERS

The Town Board of Riverhead will receive bids for the following contract:

CLASS A BIOSOLIDS IMPROVEMENTS

CONTRACT E – ELECTRICAL CONSTRUCTION

CONTRACT G – GENERAL CONSTRUCTION

CONTRACT P – PLUMBING CONSTRUCTION

H2M PROJECT NO.: RDSD 2202

for the Riverhead Sewer District at the Town Clerk's office, Town Hall, 4 West 2nd Street, Riverhead, New York 11901 at 11:00 AM prevailing time, on **Thursday, February 22, 2024**, at which time and place the bids will be publicly opened and read.

Plans and specifications may be examined on, or after, **Thursday, January 18, 2024**, by visiting the Town of Riverhead website: townofriverheadny.gov and click on "Online Services -> Bids". Specifications are available in electronic format only and can only be downloaded from the aforementioned website, where vendors must register. Vendors submitting bids without registration on said site, shall be disqualified. Updates or notices regarding this project will only be distributed via the website.

Each proposal must be accompanied by a bid bond in the amount of five percent (5%) of the total bid, or a certified check made payable to the TOWN OF RIVERHEAD as assurance that the bid is made in good faith.

The right is reserved to reject any or all bids, to waive any informalities, and to accept the lowest responsible bid.

BY ORDER OF THE TOWN BOARD
TOWN OF RIVERHEAD
SUFFOLK COUNTY, NEW YORK

ACTING AS THE GOVERNING BODY
OF THE RIVERHEAD SEWER DISTRICT

JAMES M. WOOTEN, TOWN CLERK

NOTICE TO BIDDERS

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INSTRUCTIONS TO BIDDERS

1. **RECEIPT AND OPENING OF BIDS**

Pursuant to Town Board Resolution, the Town of Riverhead invites bids on the forms herein provided for the CLASS A BIOSOLIDS IMPROVEMENTS, CONTRACT E – ELECTRICAL CONSTRUCTION, CONTRACT No. RDSD 2202, CONTRACT G – GENERAL CONSTRUCTION, CONTRACT No. RDSD 2202, & CONTRACT P – PLUMBING CONSTRUCTION; 4 West 2nd Street, Riverhead, New York, time, date and place indicated in the Notice to Bidders.

2. **PLAN DEPOSITS**

Plan deposits are not required. No hard copies of the bid plans will be issued. All bid documents shall be obtained from the Town of Riverhead website in electronic PDF format.

3. **PLANS AND SPECIFICATIONS**

Complete sets of Plans and Specifications for the inspection of prospective bidders will be found on file with the Riverhead Sewer District, 2 River Avenue, Riverhead, NY, and at the office of H2M architects + engineers, 538 Broad Hollow Road, 4th Floor East, Melville, New York.

All contractors must input their names, telephone numbers, fax numbers, and correct mailing addresses to access the Plans and Specifications from the Town website, and/or to view the plans and specs and either of the above two (2) locations.

4. **VERBAL ANSWERS**

The Town Board, its agents, servants or employees, or the Engineer, will not be responsible in any manner for verbal answers to any inquiries regarding the meaning of the Contract Drawings or Specifications given prior to the awarding of the contract.

5. **EXAMINATION OF SITE**

Bidders must satisfy themselves by personal examination of the location of the proposed work and of the actual conditions and requirements of the work and shall not, at any time after the submission of a proposal, dispute or complain of such estimate or assert that there was any misunderstanding in regard to the depth and character of excavation and extent of dewatering to be made or the nature of the work to be done.

6. **FORM, PREPARATION AND PRESENTATION OF PROPOSAL**

In submitting the bid, the bid sheets furnished are to be filled in but not detached from the Contract Form. In no case is the Contract Form to be filled in or signed by the bidder. All proposals and either the certified check or bid bond must be placed in a sealed opaque envelope bearing the Bidder's firm name and address and separately marked for each contract a bid is submitted for:

"CLASS A BIOSOLIDS IMPROVEMENTS, CONTRACT E – ELECTRICAL CONSTRUCTION, CONTRACT No. RDSD 2202"

"CLASS A BIOSOLIDS IMPROVEMENTS, CONTRACT G – GENERAL CONSTRUCTION, CONTRACT No. RDSD 2202"

INSTRUCTIONS TO BIDDERS

"CLASS A BIOSOLIDS IMPROVEMENTS, CONTRACT P – PLUMBING CONSTRUCTION, CONTRACT No. RDSD 2202"

but otherwise unmarked. All blank spaces for bid prices must be filled in, in ink, in both words and figures, with the total or gross sum for which the bid is made. Bids that contain any omission, erasure, alteration, addition or items not called for in the itemized bid form or that contract irregularities of any kind may be rejected. In case of discrepancy between the unit price and total amount bid for any item, the unit price, as expressed in words, shall govern.

The Proposal contained herein shall be used in making out bids. Any proposal not in accordance with these instructions or containing bids not asked for may be rejected. While separate prices are required for various items under this contract, it is understood that the contract will be awarded as a whole.

As the estimates of quantities of items stated in the Proposal are approximate only, bidders are required to submit their proposal upon and in the following express conditions, which shall apply and become part of every proposal received.

Bids will be compared by total amounts; said total amount being the sum of the products of the quantities multiplied by the unit prices bid for the various unit price items, with due consideration being given to the lump sum prices bid and stipulated amounts for any contingent or optional items. Unbalanced bids will not be accepted.

Each bidder shall fill out in ink, in both words and figures, in the spaces provided, its unit or lump sum bid, as the case may be, for each item in said Proposal for which it is submitting a bid. If there is any discrepancy between the prices in words and figures, the prices in words shall govern as unit and lump sum prices.

A bid may not be considered valid which does not include bids for all items in the Proposal.

Each bidder must state, in its proposal, its full name and business address, and the full name of every person, firm or corporation, interested in same, and the address of every person or firm, or president and secretary of every corporation, interested with it.

If the contract is not awarded by the Town Board within ninety (90) days after the receipt of bids, the obligation of the bidder under this Proposal may terminate at its option and it shall thereupon be entitled to a refund of its certified check or release of its bid bond furnished by it as security with its proposal.

7. BID SECURITY

- (A) The bid must be accompanied by a certified check on the solvent bank or trust company with its principal place of business in New York State, or an acceptable bid bond, in an amount equal to not less than five percent (5%) of the total bid, made payable to the Town of Riverhead (herein identified as the Town), as assurance that the bid is made in good faith. The certified checks or bid bonds will be returned after execution of the contract between the Town and the successful bidder; the certified check or bid bond of the successful bidder will be retained until filing and approval of the Performance Bond and until the completion of ten percent (10%) of the work under the contract.
- (B) The successful bidder, upon his failure or refusal to execute and deliver the contract insurance and bonds required within fourteen (14) days after the date of notice of the

INSTRUCTIONS TO BIDDERS

acceptance of his bid, shall forfeit to the Town, as liquidated damages for such failure or refusal, the security deposited with his bid.

- (C) Each proposal must also be accompanied by a Letter of Intent from a surety company acceptable to the Town, which letter shall assure the Town that the bidder, if awarded the Contract, will be able to secure from the surety the required bonds in the required amounts.

8. QUALIFICATIONS OF BIDDERS

- (A) Forms or qualifications of bidders, giving evidence of sufficient facilities, equipment, experience and financial ability to insure completion of the work will be provided, and the three lowest bidders shall be prepared to file at the option of the Town said form, properly filled in and sworn to in the Office of the Town Clerk within seven (7) days after the opening of bids.
- (B) Information contained in any statement of financial ability shall be not more than thirty (30) days old at the time of submission. If a financial statement is already on file with the Town Clerk, a new one need not be submitted provided the information contained therein is not more than thirty (30) days old at the time of the opening of bids and provided the contractor has not materially changed since submission of said statement.

9. REJECTION OF BIDS

- (A) The Town Board reserves the right to waive any informalities in or reject any bid if the evidence submitted in the qualifications statement or an investigation of such bidder fails to satisfy the Town Board that such bidder is reputable, reliable and responsible, and that they possess the necessary qualifications (financial, labor, equipment and otherwise properly qualified to carry out the obligations of the contract and to complete the work contemplated therein. The Board reserves the right to reject any and all bids which do not conform to the Proposal. Conditional bids will not be accepted.
- (B) The Town Board shall be the sole judge of the qualifications of the bidders and of the merits thereof and reserves the right to reject any bid if the record of the bidder in the performance of contracts, payment of bills and meeting of obligations to subcontractors, material men or employees is not satisfactory to the Town Board, or if the evidence submitted by, or the investigation of, such bidders fails to satisfy the Town Board that it is properly qualified to carry out the obligations of the contract and to complete the work contemplated therein.
- (C) The Town Board reserves the right to reject any and all bids, in whole or in part, to waive any information in any or all bids, and to accept the bid or part thereof which it deems most favorable to the Town after all bids have been examined and/or checked. No bid shall be withdrawn for a period of forty-five (45) days after being publicly opened and read.
- (D) The Town Board reserves the right to reject any bids, in whole by a low bidder in which the owner of the low bidder has violated Prevailing Wage and Supplemental Payment Requirements of the Labor Law, and any other labor provisions, including but not limited to child labor violations, failure to pay wages, or unemployment insurance tax delinquencies within the past five (5) years. An owner is defined in this paragraph as an individual who owns more than 50% of a past or present company.

INSTRUCTIONS TO BIDDERS

10. WITHDRAWAL OF BID

- (A) Any bid may be withdrawn prior to the Bid Opening Date and Time specified above or authorized postponement.
- (B) Bids may not be withdrawn before forty-five (45) days after the Bid Opening Date and Time, unless a clerical mistake or error is claimed by the Bidder.
- (C) If a Bidder claims to have made a clerical mistake or error in his Bid, he shall notify the Owner within the time limitations set forth in General Municipal Law Section 103 (11) (a) together with all documentary evidence in support of the Bidder's claim of a bid mistake or error.

11. BIDDER'S RESPONSIBILITY

- (A) The Bidder shall include the complete cost of furnishing all materials, labor, and equipment necessary to complete the work in accordance with the plans and specifications, including all other expenses incidental thereto.
- (B) Bidders must examine the plans and specifications and exercise their own judgment as to the nature and amount of the whole of the work to be done, and for the bid prices, must assume all risks of variance by whomever made in computation or statement of amounts or quantities necessary to fully complete the work in strict compliance with the contract documents.
- (C) The contractor shall assume all risks and responsibility and shall complete the work in whatever material and under whatever conditions he may encounter or create, without extra cost to the Town.
- (D) Attention is hereby particularly directed to the provisions of the contract whereby the Contractor will be responsible for any loss or damage that may happen to the work or any part thereof during its progress; and also whereby the Contractor shall make good any defects or faults that may occur during the progress of the work or within twelve (12) months after date of the Engineer's approval of the final payment request.
- (E) No plea of ignorance or misunderstanding of conditions that exist or that may hereafter exist, or of conditions or difficulties that may be encountered in the execution of the work under this contract, as a result of failure to make the necessary examinations and investigations, will be to fulfill in every detail all of the requirements of the contract documents, or will be accepted as a basis for any claims whatsoever for extra compensation or for extension of time.

12. SIGNATURE OF CONTRACTOR

The bidder to whom a contract may be awarded shall appear at the office of the Town Board, with the surety documents offered by it, within seven (7) days, Saturdays and Sundays excepted, after date of notification of the acceptance of its proposal, and there sign the contract in quadripartite for the work and furnish approved security for its performance.

In case of failure to do so, the bidder shall be considered as having abandoned the same, and the check accompanying its proposal shall be forfeited to the Town Board, or the penalty of the bid bond shall be invoked.

INSTRUCTIONS TO BIDDERS

13. CONSTRUCTION TERMS AND CONDITIONS

The successful bidder is warned that the work specified in the Conditions of Contract, together with the Information to Bidders, Form of Bid, Plans and Specifications and Instruction of the Town Engineer, or his duly authorized representative, will be strictly enforced.

14. SECURITY FOR FAITHFUL PERFORMANCE AND MAINTENANCE

The successful bidder shall be required to furnish at the execution of the contract an executed bond of a surety company authorized to do business in the State of New York and approved by the Town Board, in an amount equal to 100% of the total amount of the contract, guaranteeing to the Board the faithful performance of the contract and payment of all claims for materials, labor and wages in connection therewith. Prior to the release of the Performance Bond, the Contractor shall deliver to the Town a Maintenance Bond equal to 100% of the total contract price, including all extras which shall remain in effect for a period of one (1) year from the date of the Engineer's approval of the final payment request as a Guarantee Bond.

15. FOREIGN CONTRACTORS

Foreign contractors must comply with the provisions of Articles 9A and 16 of the Tax Law, as amended, prior to submission of a bid for the performance of this work. The certificate of the New York State Tax Commission to the effect that all taxes have been paid by the foreign contractor shall be conclusive proof of the payment of taxes. The term "foreign contractor" as used in this subdivision means in the case of an individual, a person who is a legal resident of another state or foreign country; and in the case of a foreign corporation, one organized under the laws of a state other than the State of New York.

16. LIEN LAW

Attention of all persons submitting bids is specifically called to the provisions of Section 25, Subdivision 5, Section 25A and 25B of the Lien Law, as amended, in relation to funds being received by a contractor for a public improvement declared to constitute trust funds in the hands of such contractor to be applied first to the payment of certain claims. Pursuant to Section 220-a of the Labor Law all contractors and subcontractors and subcontractors to subcontractors shall file an affidavit attesting to the payment to employees.

17. SUBCONTRACTORS AND SUPPLIERS

Within five days after receipt from the Town Engineer, or his representative, of notice to begin work, the contractor will furnish written notice of names of all subcontractors to be employed on the project and the general items of work to be done by them. Simultaneously, the contractor shall furnish written notice of the names and suppliers of materials to be used on the project. The town may disapprove, for good cause, any subcontractor or material supplier selected by the contractor by giving written notice of its disapproval within five (5) days after receiving the names of subcontractors and material suppliers, to the contractor who shall thereupon promptly notify the town of the names of the subcontractor or material supplier selected in replacement which shall again be subject to approval by the town.

18. PENAL LAW

Attention is called to Section 1918 of the Penal Law as follows:

INSTRUCTIONS TO BIDDERS

Construction or blasting near pipe conveying combustible gas

No person shall discharge explosives in the ground, nor shall any person other than a state or county employee regularly engaged in the maintenance and repair thereof excavate in any then existing street, highway, or public place, unless notice thereof in writing shall have been given at least seventy-two (72) hours in advance to the person, corporation or municipality engaged in the distribution of gas in such territory. The person having direction or control of such work shall give such notice, and further he shall ascertain whether there is within one hundred (100) feet in such street, highway or public place, or in the case of a proposed discharge of explosives within a radius of two hundred (200) feet of such discharge, any pipe of any other person, corporation or municipality conveying combustible gas, and if thereby any such pipe, he shall also give such notice to any other such person, corporation or municipality. Provided, however, that in any emergency involving danger to life, health, or property it shall be lawful to excavate without using explosives if the notices prescribed herein are given as soon as reasonably possible, and to discharge explosives to protect a person or persons from an immediate and substantial danger of death or serious personal injury if such notices are given before any such discharge is undertaken. Any such work shall be performed in such manner as to avoid danger to any pipe conveying combustible gas. Any violation of the provisions of this section shall be a misdemeanor.

19. REFUSAL TO WAIVE IMMUNITY

Pursuant to the provisions of Section 103-A of the General Municipal Law, in the event that the bidder or any members, partner, director or officer of the bidder, should refuse when called before a grand jury to testify concerning any transaction or contract had with the State, any political subdivision thereof, a public authority or with any public department, agency or official of the State, of any political subdivision thereof or of an authority, to sign a waiver of immunity against subsequent criminal prosecution or to answer any relevant questions concerning such transaction or contract, such person, and any firm, partnership or corporation of which he is a member, partner, firm director or officer shall be disqualified from thereafter selling to or submitting bids to or receiving awards from or entering into any contracts with any municipal corporation or any public department, agency, or official thereof, for goods, work or services, for a period of five (5) years after such refusal, and any and all contracts made with any municipal corporation or any public department, agency or official thereof on or after the first day of July, 1959, by, such person and any firm, partnership or corporation of which he is a member, partner, director or officer may be canceled or terminated by the municipal corporation without incurring any penalty or damages on account of such cancellation or termination, but any monies owing by the municipal corporation for goods delivered or work done prior to the cancellation or termination shall be paid.

20. ADDENDA AND INTERPRETATIONS

Every request for information or interpretation of the Contract Documents or Drawings must be addressed in writing to Nicholas Bono, P.E., Deputy Director of Wastewater Engineering, H2M architects + engineers, 538 Broad Hollow Road, 4th Floor East, Melville, New York, 11747 and to be given any consideration, must be received at least seven (7) days prior to the date fixed for the opening of bids. Request for information or interpretation of the Contract Documents or Drawings will only be evaluated and considered if made by registered plan holders as recorded on the Town's website. Any such interpretations or supplemental instructions will be in the form of written addenda and will be posted on the Town's website for access by all prospective bidders/registered plan holders. The failure of any bidder to receive any such addenda will not relieve the bidders of any obligations under his bid as submitted. Any addenda so issued shall become part of the Contract Documents.

21. LIQUIDATED DAMAGES

Liquidated damages in the amount of One Thousand Dollars and 00 Cents (\$1,000.00) will be assessed for each consecutive calendar day of delay not excusable as provided in the Contract Documents.

22. EXEMPTION FROM SALES AND USE TAXES

In accordance with Chapter 513 of the laws of 1974 adopted by the New York State Legislature, amending Section 1115(a) of the tax law, specifically paragraphs 15 and 16, political subdivisions, as described in subdivision (a) paragraph (L) of Section 1116 of the tax laws, of the State of New York are exempt from the payment of sales and use taxes imposed on tangible personal property within the limitations specified in tax law 115 (a) (15) and (16).

- (15) Tangible personal property sold to a contractor, subcontractor or repairman for use in erecting structure or building of an organization described in subdivision (a) of Section 116, or adding to, altering or improving real property, property or land of such an organization, as the terms real property, property and land are defined in the real property tax law; provided, however, no exemption shall exist under this paragraph unless such tangible personal property is to become an integral component part of such structure, building or real property.
- (16) Tangible personal property sold to a contractor or repairman for use in maintaining, servicing or repairing real property, or land of an organization described in subdivision (a) of Section 116, as the terms real property, property or land are defined in the real property tax law; provided, however, no exemption shall exist under this paragraph unless such tangible personal property is to become an integral component part of such structure, building or real property.

Contractors entering into contract with the Town of Riverhead shall be exempt from payment of sales and use tax described above. Procedures and forms are available to the contractor direct from the Instructions and Interpretations Unit, State of New York, Department of Taxation and Finance, State Campus, Albany, New York 12227.

23. METHOD OF AWARD

All bids will be compared based on the lowest bid price(s) submitted for the work to be done in addition to the qualifications of the bidder. Bidder may be requested to submit additional information such as references.

24. TIME FOR COMMENCEMENT OF WORK

The bidder, when submitting his bid, must be prepared to commence work not later than Twenty Eight (28) days after receiving a Notice to Proceed.

Work shall commence as stipulated in the construction schedule provided by the Town of Riverhead or alternate schedule provided by the Contractor which alternate schedule is acceptable to the Town and shall meet the stipulations of this contract. The entire work must be satisfactorily completed and the project improvements available for use within the completion time stipulated. For additional information see Conditions of Contract, Section 5, Time of Completion.

INSTRUCTIONS TO BIDDERS

25. PAYMENT

Upon completion of the work under this contract, the contractor shall notify the Town Engineer of his completion. The Town Engineer will then make a final inspection and submit to the contractor a "punch list" if required. Upon final acceptance of the work by the Town Engineer, the contractor shall be paid one lump sum payment equal to the amount bid herein minus previous payments and plus or minus other contract approved charge orders. Contractor shall submit a Receipt on company letterhead in the amount billed, a signed Town of Riverhead Voucher, Certified Payroll Records, Wage Disclaimer and the No Lien Affidavit attesting to the payment of employees. Payment shall not be processed until all necessary paperwork is received.

26. NYS LABOR LAW

The contractor and each and every subcontractor performing work at the site of the project to which this contract relates shall comply with the applicable provisions of the Labor Law, as amended, of the State of New York.

27. NYS WAGE RATES

The rates of wages determined by the New York State Industrial Commissioner pursuant to the Labor Law, which are to be paid on this project, are set forth herein immediately following:

PREVAILING WAGE RATES

CURRENT PREVAILING WAGE RATES SCHEDULE PRESENTED ON THE PAGES DIRECTLY FOLLOWING THIS INSTRUCTION TO BIDDERS SECTION

28. FEDERAL LABOR LAW

If this project is being assisted by funding from the Federal Government of the United States of America under one or more current federal funding programs, and as such, the performance of all work contemplated under the terms and conditions of this set of plans, specifications and related documents must conform to certain basic and specific standards and requirements of both Federal and New York State governments.

29. FEDERAL WAGE RATES

The rates of wages determined by the Federal Government of the United State of America pursuant to the Labor Law, which are to be paid on this project, are set forth herein immediately following:

30. INSURANCE REQUIRED BY THE TOWN OF RIVERHEAD

The Contractor shall not commence any work until it has obtained and had approved by the Town all of the insurance specified and required by the Contract.

The successful bidder will be required to procure and pay for the following types of insurance, in accordance with the provisions of the Conditions of Contract:

- (A) Workers' Compensation Insurance.
- (B) Public Liability and Property Damage.
- (C) Contractor's Liability and Contractor's Property Damage.

INSTRUCTIONS TO BIDDERS

(D) Owner's Protective Public Liability and Property Damage.

Insurance documents meeting the requirements of Conditions of Contract, Section 38, Contractor's Insurance, shall be submitted within 14 calendar days from the date of award. Failure to provide acceptable insurance certificate(s) within this time frame shall result in the termination of Primary Contractor status.

The Contractor shall not permit any subcontractor to commence any operation on the site until satisfactory proof of carriage of the above required insurance has been posted with, and approved by, the Town Board.

31. TERM OF CONTRACT

The term of this contract shall be until the completion date set by the Notice to Proceed and the length of contract time (calendar days) as stipulated in the Proposal Form. The Town of Riverhead shall have the option of extending this contract upon good cause shown by the Contractor.

32. CERTIFIED PAYROLL RECORDS

State of New York Department of Labor

On September 10, 1997, Governor Pataki signed into law Assembly Bill 6394-B amending Article 8, Section 220, of the NYS labor Law to include the following language:

Every contractor and sub-contractor shall submit to the department of jurisdiction within thirty (30) days after issuance of its first payroll, and every thirty (30) days thereafter, a transcript of the original payroll record, as provided by this article, subscribed and affirmed as true under penalties of perjury. The DEPARTMENT OF JURISDICTION shall be required to receive and maintain such payroll records.

The original payrolls or transcripts shall be preserved for three years from the completion of the work on the awarded project.

This law took effect on November 9, 1997.

Form WH-347 Inst. is included in this package for contractor's convenience and must be completed, for the current payment request period, including all payroll information for all employees and subcontractor employees including but not limited to laborers, mechanics, foremen, supervisors, etc.

INSTRUCTIONS TO BIDDERS

PERSONAL PERFORMANCE FORM
STATEMENT TO BE SUBMITTED
WHEN WORK IS PERFORMED PERSONALLY
(SECTION 10001, TITLE 18, US CODE)

I, _____, hereby certify that I am the

_____ of _____
Title Name of Firm Submitting Statement

_____ for _____
Prime Contractor or Subcontractor Nature of Work

at _____, located in _____
Name of Building work being done City and State

under contract number _____
Government Contract No. (See No. 3 Below)

that _____
State All Work or List the Specific Classes of Work

was done personally by _____
Names of Person(s) Performing Work & Their Connection
w/ Firm

that no wages were received for the labor performed; that no mechanics or laborers were employed in the prosecution thereof; and that the work was done during the following periods: ____
_____ to _____
Beginning Date Ending Date

Last date on which work was performed at the site was _____.

Signature

Title

Section 100001 of Title 18 of the United State Code (Criminal Code and Criminal Procedures) shall apply to such statements – 72 Stat 887, 18 U.S.C., among other things, provides that whoever knowingly and willfully makes or uses a document or writing containing any false, fictitious or fraudulent statement or entry, in any matter within the jurisdiction of any department or agency of the United State, shall be fined not more than \$10,000 or imprisoned not more than five years, or both).

Instructions for Submission of Statements of Work Performed Personally

- 1. Prime contractors or subcontractors who perform the work are required to submit in lieu of weekly statements of compliance and payrolls with respect to the payment of wages pursuant to the Copeland Anti-kickbacks regulations, a certified statement clearly showing (1) their contractual relationship,; (2) the scope and dates of work performed (3) that they received no wages; and (4) that no mechanics or laborers were employed in the prosecution of the work. The aforementioned sample form sets forth the wording described for such certified statements.**
- 2. Prime contractors are responsible for the submission of the certified statements of subcontractors. Subcontractors' statement should be forwarded to the prime contractor for transmission to the Government contracting officer or his designated representative.**
Statements of prime contractors and subcontractors should be submitted as soon as possible after the last date on which work was performed at the site.
- 3. To facilitate identification of the project involved, prime contractors should provide their subcontractors with the Government contract number (if exists) or project name as called for on statement form.**
- 4. Prime contractors should furnish their subcontractors with copies of the sample statement form so as to facilitate submission of the necessary information.**

INSTRUCTIONS TO BIDDERS

33. NO LIEN AFFIDAVIT & WAGE DISCLAIMER

State of New York Department of Labor

Pursuant to Section 220-a of the New York State Labor Law all contractors, subcontractors and subcontractors to subcontractors must file an affidavit pertaining to the payment of all laborers and mechanics, exclusive of supervisory employees.

Affidavit Form 220 and Town of Riverhead Wage Disclaimer Form is included in this package for contractor's convenience. Unless given at later date, leave project number blank.

NOTE: Bidders are advised that this is not a contract authorizing any work. It is the option of the Town to authorize work at any time of the year. Any Town department or agency can use this contract.

INSTRUCTIONS TO BIDDERS

MUNICIPAL CORPORATION

CLASS A BIOSOLIDS
IMPROVEMENTS
2 RIVER AVENUE
RIVERHEAD, NY 11901

CONTRACT NAME: _____ PROJECT No.: _____

AFFIDAVIT

Pursuant to Section 220-a of the Labor Law and Town of Riverhead Requirements
Note: All contractors, subcontractors, and subcontractors of subcontractors must file this statement for each payment period requested.

I, _____, _____
Name Title

of _____ Contractor
Name of Firm Subcontractor

Project No.: _____ With: _____
Contractor Name

for _____
Indicate Nature of Work

at _____ hereby certify that all laborers have been paid in full for
period ended _____, 20 _____. and that there is now due and owing from
it/me to any and all laborers (laborers include all laborers, mechanics, foremen and supervisory
employees) for daily or weekly wages or supplements on account of labor performed upon the
work under said contract, the following amounts to the persons whose names are set forth below
opposite such amounts. (If none, so state.)

\$ _____ due and owing to _____
\$ _____ due and owing to _____
\$ _____ due and owing to _____
\$ _____ due and owing to _____

Use additional sheet if necessary.

I further certify that I have contracted with the firms listed below as subcontractors, for labor to be
performed upon the work under said contract for the current pay period requested. (If none, so
state.)

Names and Address of Subcontractors	Type of Work
_____	_____
_____	_____
_____	_____

Use additional sheet if necessary

Signature

INSTRUCTIONS TO BIDDERS

STATE OF NEW YORK

SS:

COUNTY OF: _____

On this _____ day of _____ 20____, personally appeared before me _____
to me known and known to me who being by me duly sworn said that he is _____
(Officer)

of _____ the _____
(Contractor or Subcontractor) (Corporation or Partnership)

for which he executed the foregoing statement, for and in behalf of the said _____
contractor; that he has read the said statement so signed by him and known to be the seal
thereof and that the same is true and to his own knowledge.

Notary Public

Dated: _____

Section 220-c Labor Law. Any Contractor or subcontractor who shall upon his oath verify any statement required to be filed under this act which is known by him to be false, shall be guilty of perjury and punishable as provided by Section One Thousand Six Hundred and Thirty Three of the Penal Law.

INSTRUCTIONS TO BIDDERS

TOWN OF RIVERHEAD WAGE DISCLAIMER

Note: All contractors, subcontractors, and subcontractor of subcontractors must file this statement for each payment period request.

DATE: _____

TO: TOWN OF RIVERHEAD

FROM: _____
(Contractor)

PROJECT: _____

To our knowledge, the laborers listed on the attached certified payrolls have been paid the prevailing wage rates as established by the Department of Labor.

Signature

Title

Date



Kathy Hochul, Governor

Roberta Reardon, Commissioner

Town of Riverhead

John Beatty, Engineer
360 Bloomfield Avenue
Suite 301
Windsor CT 06095

Schedule Year 2023 through 2024
Date Requested 09/06/2023
PRC# 2023010670

Location Riverhead WRRF
Project ID# RDSD 2202
Project Type Work will consist of constructing a new sludge handling and treatment process to achieve Class A Biosolids.

PREVAILING WAGE SCHEDULE FOR ARTICLE 8 PUBLIC WORK PROJECT

Attached is the current schedule(s) of the prevailing wage rates and prevailing hourly supplements for the project referenced above. A unique Prevailing Wage Case Number (PRC#) has been assigned to the schedule(s) for your project.

The schedule is effective from July 2023 through June 2024. All updates, corrections, posted on the 1st business day of each month, and future copies of the annual determination are available on the Department's website www.labor.ny.gov. Updated PDF copies of your schedule can be accessed by entering your assigned PRC# at the proper location on the website.

It is the responsibility of the contracting agency or its agent to annex and make part, the attached schedule, to the specifications for this project, when it is advertised for bids and /or to forward said schedules to the successful bidder(s), immediately upon receipt, in order to insure the proper payment of wages.

Please refer to the "General Provisions of Laws Covering Workers on Public Work Contracts" provided with this schedule, for the specific details relating to other responsibilities of the Department of Jurisdiction.

Upon completion or cancellation of this project, enter the required information and mail **OR** fax this form to the office shown at the bottom of this notice, **OR** fill out the electronic version via the NYSDOL website.

NOTICE OF COMPLETION / CANCELLATION OF PROJECT

Date Completed: _____ Date Cancelled: _____

Name & Title of Representative: _____

Phone: (518) 457-5589 Fax: (518) 485-1870
W. Averell Harriman State Office Campus, Bldg. 12, Room 130, Albany, NY 12226

General Provisions of Laws Covering Workers on Article 8 Public Work Contracts

Introduction

The Labor Law requires public work contractors and subcontractors to pay laborers, workers, or mechanics employed in the performance of a public work contract not less than the prevailing rate of wage and supplements (fringe benefits) in the locality where the work is performed.

Responsibilities of the Department of Jurisdiction

A Department of Jurisdiction (Contracting Agency) includes a state department, agency, board or commission; a county, city, town or village; a school district, board of education or board of cooperative educational services; a sewer, water, fire, improvement and other district corporation; a public benefit corporation; and a public authority awarding a public work contract.

The Department of Jurisdiction (Contracting Agency) awarding a public work contract MUST obtain a Prevailing Rate Schedule listing the hourly rates of wages and supplements due the workers to be employed on a public work project. This schedule may be obtained by completing and forwarding a "Request for wage and Supplement Information" form (PW 39) to the Bureau of Public Work. The Prevailing Rate Schedule MUST be included in the specifications for the contract to be awarded and is deemed part of the public work contract.

Upon the awarding of the contract, the law requires that the Department of Jurisdiction (Contracting Agency) furnish the following information to the Bureau: the name and address of the contractor, the date the contract was let and the approximate dollar value of the contract. To facilitate compliance with this provision of the Labor Law, a copy of the Department's "Notice of Contract Award" form (PW 16) is provided with the original Prevailing Rate Schedule.

The Department of Jurisdiction (Contracting Agency) is required to notify the Bureau of the completion or cancellation of any public work project. The Department's PW 200 form is provided for that purpose.

Both the PW 16 and PW 200 forms are available for completion [online](#).

Hours

No laborer, worker, or mechanic in the employ of a contractor or subcontractor engaged in the performance of any public work project shall be permitted to work more than eight hours in any day or more than five days in any week, except in cases of extraordinary emergency. The contractor and the Department of Jurisdiction (Contracting Agency) may apply to the Bureau of Public Work for a dispensation permitting workers to work additional hours or days per week on a particular public work project.

Wages and Supplements

The wages and supplements to be paid and/or provided to laborers, workers, and mechanics employed on a public work project shall be not less than those listed in the current Prevailing Rate Schedule for the locality where the work is performed. If a prime contractor on a public work project has not been provided with a Prevailing Rate Schedule, the contractor must notify the Department of Jurisdiction (Contracting Agency) who in turn must request an original Prevailing Rate Schedule from the Bureau of Public Work. Requests may be submitted by: mail to NYSDOL, Bureau of Public Work, State Office Bldg. Campus, Bldg. 12, Rm. 130, Albany, NY 12226; Fax to Bureau of Public Work (518) 485-1870; or electronically at the NYSDOL website www.labor.ny.gov.

Upon receiving the original schedule, the Department of Jurisdiction (Contracting Agency) is REQUIRED to provide complete copies to all prime contractors who in turn MUST, by law, provide copies of all applicable county schedules to each subcontractor and obtain from each subcontractor, an affidavit certifying such schedules were received. If the original schedule expired, the contractor may obtain a copy of the new annual determination from the NYSDOL website www.labor.ny.gov.

The Commissioner of Labor makes an annual determination of the prevailing rates. This determination is in effect from July 1st through June 30th of the following year. The annual determination is available on the NYSDOL website www.labor.ny.gov.

Payrolls and Payroll Records

Every contractor and subcontractor MUST keep original payrolls or transcripts subscribed and affirmed as true under penalty of perjury. As per Article 6 of the Labor law, contractors and subcontractors are required to establish, maintain, and preserve for not less than six (6) years, contemporaneous, true, and accurate payroll records. At a minimum, payrolls must show the following information for each person employed on a public work project: Name, Address, Last 4 Digits of Social Security Number, Classification(s) in which the worker was employed, Hourly wage rate(s) paid, Supplements paid or provided, and Daily and weekly number of hours worked in each classification.

The filing of payrolls to the Department of Jurisdiction is a condition of payment. Every contractor and subcontractor shall submit to the Department of Jurisdiction (Contracting Agency), within thirty (30) days after issuance of its first payroll and every thirty (30) days thereafter, a transcript of the original payrolls, subscribed and affirmed as true under penalty of perjury. The Department of Jurisdiction (Contracting Agency) shall collect, review for facial validity, and maintain such payrolls.

In addition, the Commissioner of Labor may require contractors to furnish, with ten (10) days of a request, payroll records sworn to as their validity and accuracy for public work and private work. Payroll records include, but are not limited to time cards, work description sheets, proof that supplements were provided, cancelled payroll checks and payrolls. Failure to provide the requested information within the allotted ten (10) days will result in the withholding of up to 25% of the contract, not to exceed \$100,000.00. If the contractor or subcontractor does not maintain a place of business in New York State and the amount of the contract exceeds \$25,000.00, payroll records and certifications must be kept on the project worksite.

The prime contractor is responsible for any underpayments of prevailing wages or supplements by any subcontractor.

All contractors or their subcontractors shall provide to their subcontractors a copy of the Prevailing Rate Schedule specified in the public work contract as well as any subsequently issued schedules. A failure to provide these schedules by a contractor or subcontractor is a violation of Article 8, Section 220-a of the Labor Law.

All subcontractors engaged by a public work project contractor or its subcontractor, upon receipt of the original schedule and any subsequently issued schedules, shall provide to such contractor a verified statement attesting that the subcontractor has received the Prevailing Rate Schedule and will pay or provide the applicable rates of wages and supplements specified therein. (See NYS Labor Laws, Article 8 . Section 220-a).

Determination of Prevailing Wage and Supplement Rate Updates Applicable to All Counties

The wages and supplements contained in the annual determination become effective July 1st whether or not the new determination has been received by a given contractor. Care should be taken to review the rates for obvious errors. Any corrections should be brought to the Department's attention immediately. It is the responsibility of the public work contractor to use the proper rates. If there is a question on the proper classification to be used, please call the district office located nearest the project. Any errors in the annual determination will be corrected and posted to the NYSDOL website on the first business day of each month. Contractors are responsible for paying these updated rates as well, retroactive to July 1st.

When you review the schedule for a particular occupation, your attention should be directed to the dates above the column of rates. These are the dates for which a given set of rates is effective. To the extent possible, the Department posts rates in its possession that cover periods of time beyond the July 1st to June 30th time frame covered by a particular annual determination. Rates that extend beyond that instant time period are informational ONLY and may be updated in future annual determinations that actually cover the then appropriate July 1st to June 30th time period.

Withholding of Payments

When a complaint is filed with the Commissioner of Labor alleging the failure of a contractor or subcontractor to pay or provide the prevailing wages or supplements, or when the Commissioner of Labor believes that unpaid wages or supplements may be due, payments on the public work contract shall be withheld from the prime contractor in a sufficient amount to satisfy the alleged unpaid wages and supplements, including interest and civil penalty, pending a final determination.

When the Bureau of Public Work finds that a contractor or subcontractor on a public work project failed to pay or provide the requisite prevailing wages or supplements, the Bureau is authorized by Sections 220-b and 235.2 of the Labor Law to so notify the financial officer of the Department of Jurisdiction (Contracting Agency) that awarded the public work contract. Such officer MUST then withhold or cause to be withheld from any payment due the prime contractor on account of such contract the amount indicated by the Bureau as sufficient to satisfy the unpaid wages and supplements, including interest and any civil penalty that may be assessed by the Commissioner of Labor. The withholding continues until there is a final determination of the underpayment by the Commissioner of Labor or by the court in the event a legal proceeding is instituted for review of the determination of the Commissioner of Labor.

The Department of Jurisdiction (Contracting Agency) shall comply with this order of the Commissioner of Labor or of the court with respect to the release of the funds so withheld.

Summary of Notice Posting Requirements

The current Prevailing Rate Schedule must be posted in a prominent and accessible place on the site of the public work project. The prevailing wage schedule must be encased in, or constructed of, materials capable of withstanding adverse weather conditions and be titled "PREVAILING RATE OF WAGES" in letters no smaller than two (2) inches by two (2) inches.

The "[Public Work Project](#)" notice must be posted at the beginning of the performance of every public work contract, on each job site.

Every employer providing workers. compensation insurance and disability benefits must post notices of such coverage in the format prescribed by the Workers. Compensation Board in a conspicuous place on the jobsite.

Every employer subject to the NYS Human Rights Law must conspicuously post at its offices, places of employment, or employment training centers, notices furnished by the State Division of Human Rights.

Employers liable for contributions under the Unemployment Insurance Law must conspicuously post on the jobsite notices furnished by the NYS Department of Labor.

Apprentices

Employees cannot be paid apprentice rates unless they are individually registered in a program registered with the NYS Commissioner of Labor. The allowable ratio of apprentices to journeyworkers in any craft classification can be no greater than the statewide building trade ratios promulgated by the Department of Labor and included with the Prevailing Rate Schedule. An employee listed on a payroll as an apprentice who is not registered as above or is performing work outside the classification of work for which the apprentice is indentured, must be paid the prevailing journeyworker's wage rate for the classification of work the employee is actually performing.

NYSDOL Labor Law, Article 8, Section 220-3, require that only apprentices individually registered with the NYS Department of Labor may be paid apprenticeship rates on a public work project. No other Federal or State Agency of office registers apprentices in New York State.

Persons wishing to verify the apprentice registration of any person must do so in writing by mail, to the NYSDOL Office of Employability Development / Apprenticeship Training, State Office Bldg. Campus, Bldg. 12, Albany, NY 12226 or by Fax to NYSDOL Apprenticeship Training (518) 457-7154. All requests for verification must include the name and social security number of the person for whom the information is requested.

The only conclusive proof of individual apprentice registration is written verification from the NYSDOL Apprenticeship Training Albany Central office. Neither Federal nor State Apprenticeship Training offices outside of Albany can provide conclusive registration information.

It should be noted that the existence of a registered apprenticeship program is not conclusive proof that any person is registered in that program. Furthermore, the existence or possession of wallet cards, identification cards, or copies of state forms is not conclusive proof of the registration of any person as an apprentice.

Interest and Penalties

In the event that an underpayment of wages and/or supplements is found:

- Interest shall be assessed at the rate then in effect as prescribed by the Superintendent of Banks pursuant to section 14-a of the Banking Law, per annum from the date of underpayment to the date restitution is made.
- A Civil Penalty may also be assessed, not to exceed 25% of the total of wages, supplements, and interest due.

Debarment

Any contractor or subcontractor and/or its successor shall be ineligible to submit a bid on or be awarded any public work contract or subcontract with any state, municipal corporation or public body for a period of five (5) years when:

- Two (2) willful determinations have been rendered against that contractor or subcontractor and/or its successor within any consecutive six (6) year period.
- There is any willful determination that involves the falsification of payroll records or the kickback of wages or supplements.

Criminal Sanctions

Willful violations of the Prevailing Wage Law (Article 8 of the Labor Law) may be a felony punishable by fine or imprisonment of up to 15 years, or both.

Discrimination

No employee or applicant for employment may be discriminated against on account of age, race, creed, color, national origin, sex, disability or marital status.

No contractor, subcontractor nor any person acting on its behalf, shall by reason of race, creed, color, disability, sex or national origin discriminate against any citizen of the State of New York who is qualified and available to perform the work to which the employment relates (NYS Labor Law, Article 8, Section 220-e(a)).

No contractor, subcontractor, nor any person acting on its behalf, shall in any manner, discriminate against or intimidate any employee on account of race, creed, color, disability, sex, or national origin (NYS Labor Law, Article 8, Section 220-e(b)).

The Human Rights Law also prohibits discrimination in employment because of age, marital status, or religion.

There may be deducted from the amount payable to the contractor under the contract a penalty of \$50.00 for each calendar day during which such person was discriminated against or intimidated in violation of the provision of the contract (NYS Labor Law, Article 8, Section 220-e(c)).

The contract may be cancelled or terminated by the State or municipality. All monies due or to become due thereunder may be forfeited for a second or any subsequent violation of the terms or conditions of the anti-discrimination sections of the contract (NYS Labor Law, Article 8, Section 220-e(d)).

Every employer subject to the New York State Human Rights Law must conspicuously post at its offices, places of employment, or employment training centers notices furnished by the State Division of Human Rights.

Workers' Compensation

In accordance with Section 142 of the State Finance Law, the contractor shall maintain coverage during the life of the contract for the benefit of such employees as required by the provisions of the New York State Workers' Compensation Law.

A contractor who is awarded a public work contract must provide proof of workers' compensation coverage prior to being allowed to begin work.

The insurance policy must be issued by a company authorized to provide workers' compensation coverage in New York State. Proof of coverage must be on form C-105.2 (Certificate of Workers' Compensation Insurance) and must name this agency as a certificate holder.

If New York State coverage is added to an existing out-of-state policy, it can only be added to a policy from a company authorized to write workers' compensation coverage in this state. The coverage must be listed under item 3A of the information page.

The contractor must maintain proof that subcontractors doing work covered under this contract secured and maintained a workers' compensation policy for all employees working in New York State.

Every employer providing worker's compensation insurance and disability benefits must post notices of such coverage in the format prescribed by the Workers' Compensation Board in a conspicuous place on the jobsite.

Unemployment Insurance

Employers liable for contributions under the Unemployment Insurance Law must conspicuously post on the jobsite notices furnished by the New York State Department of Labor.



Kathy Hochul, Governor

Roberta Reardon, Commissioner

Town of Riverhead

John Beatty, Engineer
360 Bloomfield Avenue
Suite 301
Windsor CT 06095

Schedule Year 2023 through 2024
Date Requested 09/06/2023
PRC# 2023010670

Location Riverhead WRRF
Project ID# RDSD 2202
Project Type Work will consist of constructing a new sludge handling and treatment process to achieve Class A Biosolids.

Notice of Contract Award

New York State Labor Law, Article 8, Section 220.3a requires that certain information regarding the awarding of public work contracts, be furnished to the Commissioner of Labor. One "Notice of Contract Award" (PW 16, which may be photocopied), **MUST** be completed for **EACH** prime contractor on the above referenced project.

Upon notifying the successful bidder(s) of this contract, enter the required information and mail **OR** fax this form to the office shown at the bottom of this notice, **OR** fill out the electronic version via the NYSDOL website.

Contractor Information

All information must be supplied

Federal Employer Identification Number: _____		
Name: _____		
Address: _____ _____		
City: _____	State: _____	Zip: _____
Amount of Contract: \$ _____	Contract Type:	
Approximate Starting Date: ____/____/____	☐ (01) General Construction	
Approximate Completion Date: ____/____/____	☐ (02) Heating/Ventilation	
	☐ (03) Electrical	
	☐ (04) Plumbing	
	☐ (05) Other : _____	

Phone: (518) 457-5589 Fax: (518) 485-1870
W. Averell Harriman State Office Campus, Bldg. 12, Room 130, Albany, NY 12226

Social Security Numbers on Certified Payrolls:

The Department of Labor is cognizant of the concerns of the potential for misuse or inadvertent disclosure of social security numbers. Identity theft is a growing problem and we are sympathetic to contractors' concern regarding inclusion of this information on payrolls if another identifier will suffice.

For these reasons, the substitution of the use of the last four digits of the social security number on certified payrolls submitted to contracting agencies on public work projects is now acceptable to the Department of Labor. This change does not affect the Department's ability to request and receive the entire social security number from employers during its public work/ prevailing wage investigations.

Construction Industry Fair Play Act: Required Posting for Labor Law Article 25-B § 861-d

Construction industry employers must post the "Construction Industry Fair Play Act" notice in a prominent and accessible place on the job site. Failure to post the notice can result in penalties of up to \$1,500 for a first offense and up to \$5,000 for a second offense. The posting is included as part of this wage schedule. Additional copies may be obtained from the NYS DOL website, <https://dol.ny.gov/public-work-and-prevailing-wage>

If you have any questions concerning the Fair Play Act, please call the State Labor Department toll-free at 1-866-435-1499 or email us at: dol.misclassified@labor.ny.gov.

Worker Notification: (Labor Law §220, paragraph a of subdivision 3-a)

Effective June 23, 2020

This provision is an addition to the existing wage rate law, Labor Law §220, paragraph a of subdivision 3-a. It requires contractors and subcontractors to provide written notice to all laborers, workers or mechanics of the *prevailing wage and supplement rate* for their particular job classification *on each pay stub**. It also requires contractors and subcontractors to *post a notice* at the beginning of the performance of every public work contract *on each job site* that includes the telephone number and address for the Department of Labor and a statement informing laborers, workers or mechanics of their right to contact the Department of Labor if he/she is not receiving the proper prevailing rate of wages and/or supplements for his/her job classification. The required notification will be provided with each wage schedule, may be downloaded from our website www.labor.ny.gov or be made available upon request by contacting the Bureau of Public Work at 518-457-5589. *In the event the required information will not fit on the pay stub, an accompanying sheet or attachment of the information will suffice.

**To all State Departments, Agency Heads and Public Benefit Corporations
IMPORTANT NOTICE REGARDING PUBLIC WORK ENFORCEMENT FUND**

Budget Policy & Reporting Manual

B-610

Public Work Enforcement Fund

effective date December 7, 2005

1. Purpose and Scope:

This Item describes the Public Work Enforcement Fund (the Fund, PWEF) and its relevance to State agencies and public benefit corporations engaged in construction or reconstruction contracts, maintenance and repair, and announces the recently-enacted increase to the percentage of the dollar value of such contracts that must be deposited into the Fund. This item also describes the roles of the following entities with respect to the Fund:

- New York State Department of Labor (DOL),
- The Office of the State of Comptroller (OSC), and
- State agencies and public benefit corporations.

2. Background and Statutory References:

DOL uses the Fund to enforce the State's Labor Law as it relates to contracts for construction or reconstruction, maintenance and repair, as defined in subdivision two of Section 220 of the Labor Law. State agencies and public benefit corporations participating in such contracts are required to make payments to the Fund.

Chapter 511 of the Laws of 1995 (as amended by Chapter 513 of the Laws of 1997, Chapter 655 of the Laws of 1999, Chapter 376 of the Laws of 2003 and Chapter 407 of the Laws of 2005) established the Fund.

3. Procedures and Agency Responsibilities:

The Fund is supported by transfers and deposits based on the value of contracts for construction and reconstruction, maintenance and repair, as defined in subdivision two of Section 220 of the Labor Law, into which all State agencies and public benefit corporations enter.

Chapter 407 of the Laws of 2005 increased the amount required to be provided to this fund to .10 of one-percent of the total cost of each such contract, to be calculated at the time agencies or public benefit corporations enter into a new contract or if a contract is amended. The provisions of this bill became effective August 2, 2005.

To all State Departments, Agency Heads and Public Benefit Corporations
IMPORTANT NOTICE REGARDING PUBLIC WORK ENFORCEMENT FUND

OSC will report to DOL on all construction-related ("D") contracts approved during the month, including contract amendments, and then DOL will bill agencies the appropriate assessment monthly. An agency may then make a determination if any of the billed contracts are exempt and so note on the bill submitted back to DOL. For any instance where an agency is unsure if a contract is or is not exempt, they can call the Bureau of Public Work at the number noted below for a determination. Payment by check or journal voucher is due to DOL within thirty days from the date of the billing. DOL will verify the amounts and forward them to OSC for processing.

For those contracts which are not approved or administered by the Comptroller, monthly reports and payments for deposit into the Public Work Enforcement Fund must be provided to the Administrative Finance Bureau at the DOL within 30 days of the end of each month or on a payment schedule mutually agreed upon with DOL.

Reports should contain the following information:

- Name and billing address of State agency or public benefit corporation;
- State agency or public benefit corporation contact and phone number;
- Name and address of contractor receiving the award;
- Contract number and effective dates;
- Contract amount and PWEF assessment charge (if contract amount has been amended, reflect increase or decrease to original contract and the adjustment in the PWEF charge); and
- Brief description of the work to be performed under each contract.

Checks and Journal Vouchers, payable to the "New York State Department of Labor" should be sent to:

Department of Labor
Administrative Finance Bureau-PWEF Unit
Building 12, Room 464
State Office Campus
Albany, NY 12226

Any questions regarding billing should be directed to NYSDOL's Administrative Finance Bureau-PWEF Unit at (518) 457-3624 and any questions regarding Public Work Contracts should be directed to the Bureau of Public Work at (518) 457-5589.



Required Notice under Article 25-B of the Labor Law

Attention All Employees, Contractors and Subcontractors: You are Covered by the Construction Industry Fair Play Act

The law says that you are an employee unless:

- You are free from direction and control in performing your job, **and**
- You perform work that is not part of the usual work done by the business that hired you, **and**
- You have an independently established business.

Your employer cannot consider you to be an independent contractor unless all three of these facts apply to your work.

It is against the law for an employer to misclassify employees as independent contractors or pay employees off the books.

Employee Rights: If you are an employee, you are entitled to state and federal worker protections. These include:

- Unemployment Insurance benefits, if you are unemployed through no fault of your own, able to work, and otherwise qualified,
- Workers' compensation benefits for on-the-job injuries,
- Payment for wages earned, minimum wage, and overtime (under certain conditions),
- Prevailing wages on public work projects,
- The provisions of the National Labor Relations Act, and
- A safe work environment.

It is a violation of this law for employers to retaliate against anyone who asserts their rights under the law. Retaliation subjects an employer to civil penalties, a private lawsuit or both.

Independent Contractors: If you are an independent contractor, **you must pay all taxes and Unemployment Insurance contributions required by New York State and Federal Law.**

Penalties for paying workers off the books or improperly treating employees as independent contractors:

- **Civil Penalty**
 - First offense: Up to \$2,500 per employee
 - Subsequent offense(s): Up to \$5,000 per employee
- **Criminal Penalty**
 - First offense: Misdemeanor - up to 30 days in jail, up to a \$25,000 fine and debarment from performing public work for up to one year.
 - Subsequent offense(s): Misdemeanor - up to 60 days in jail or up to a \$50,000 fine and debarment from performing public work for up to 5 years.

If you have questions about your employment status or believe that your employer may have violated your rights and you want to file a complaint, call the Department of Labor at (866) 435-1499 or send an email to dol.misclassified@labor.ny.gov. All complaints of fraud and violations are taken seriously. You can remain anonymous.

Employer Name:

IA 999 (09/16)



Attention Employees

THIS IS A: **PUBLIC WORK PROJECT**

If you are employed on this project as a **worker, laborer, or mechanic** you are entitled to receive the **prevailing wage and supplements rate** for the classification at which you are working.

Your pay stub and wage notice received upon hire must clearly state your wage rate and supplement rate.

Chapter 629 of
the Labor Laws
of 2007:

These wages are set by law and must be posted at the work site. They can also be found at:
<https://dol.ny.gov/bureau-public-work>



If you feel that you have not received proper wages or benefits, please call our nearest office.*

Albany	(518) 457-2744	Patchogue	(631) 687-4882
Binghamton	(607) 721-8005	Rochester	(585) 258-4505
Buffalo	(716) 847-7159	Syracuse	(315) 428-4056
Garden City	(516) 228-3915	Utica	(315) 793-2314
New York City	(212) 932-2419	White Plains	(914) 997-9507
Newburgh	(845) 568-5287		

* For New York City government agency construction projects, please contact the Office of the NYC Comptroller at (212) 669-4443, or www.comptroller.nyc.gov – click on Bureau of Labor Law.

Contractor Name: _____

Project Location: _____

Requirements for OSHA 10 Compliance

Article 8 §220-h requires that when the advertised specifications, for every contract for public work, is \$250,000.00 or more the contract must contain a provision requiring that every worker employed in the performance of a public work contract shall be certified as having completed an OSHA 10 safety training course. The clear intent of this provision is to require that all employees of public work contractors, required to be paid prevailing rates, receive such training "prior to the performing any work on the project."

The Bureau will enforce the statute as follows:

All contractors and sub contractors must attach a copy of proof of completion of the OSHA 10 course to the first certified payroll submitted to the contracting agency and on each succeeding payroll where any new or additional employee is first listed.

Proof of completion may include but is not limited to:

- Copies of bona fide course completion card (*Note: Completion cards do not have an expiration date.*)
- Training roster, attendance record or other documentation from the certified trainer pending the issuance of the card.
- Other valid proof

**A certification by the employer attesting that all employees have completed such a course is not sufficient proof that the course has been completed.

Any questions regarding this statute may be directed to the New York State Department of Labor, Bureau of Public Work at 518-457-5589.

WICKS

Public work projects are subject to the Wicks Law requiring separate specifications and bidding for the plumbing, heating and electrical work, when the total project's threshold is \$3 million in Bronx, Kings, New York, Queens and, Richmond counties; \$1.5 million in Nassau, Suffolk and Westchester counties; and \$500,000 in all other counties.

For projects below the monetary threshold, bidders must submit a sealed list naming each subcontractor for the plumbing, HVAC and electrical and the amount to be paid to each. The list may not be changed unless the public owner finds a legitimate construction need, including a change in specifications or costs or the use of a Project Labor Agreement (PLA), and must be open to public inspection.

Allows the state and local agencies and authorities to waive the Wicks Law and use a PLA if it will provide the best work at the lowest possible price. If a PLA is used, all contractors shall participate in apprentice training programs in the trades of work it employs that have been approved by the Department of Labor (DOL) for not less than three years. They shall also have at least one graduate in the last three years and use affirmative efforts to retain minority apprentices. PLA's would be exempt from Wicks, but deemed to be public work subject to prevailing wage enforcement.

The Commissioner of Labor shall have the power to enforce separate specification requirements on projects, and may issue stop-bid orders against public owners for non-compliance.

Other new monetary thresholds, and similar sealed bidding for non-Wicks projects, would apply to certain public authorities including municipal housing authorities, NYC Construction Fund, Yonkers Educational Construction Fund, NYC Municipal Water Finance Authority, Buffalo Municipal Water Finance Authority, Westchester County Health Care Association, Nassau County Health Care Corp., Clifton-Fine Health Care Corp., Erie County Medical Center Corp., NYC Solid Waste Management Facilities, and the Dormitory Authority.

Contractors must pay subcontractors within a 7 days period.

(07.19)

Introduction to the Prevailing Rate Schedule

Information About Prevailing Rate Schedule

This information is provided to assist you in the interpretation of particular requirements for each classification of worker contained in the attached Schedule of Prevailing Rates.

Classification

It is the duty of the Commissioner of Labor to make the proper classification of workers taking into account whether the work is heavy and highway, building, sewer and water, tunnel work, or residential, and to make a determination of wages and supplements to be paid or provided. It is the responsibility of the public work contractor to use the proper rate. If there is a question on the proper classification to be used, please call the district office located nearest the project. District office locations and phone numbers are listed below.

Prevailing Wage Schedules are issued separately for "General Construction Projects" and "Residential Construction Projects" on a county-by-county basis.

General Construction Rates apply to projects such as: Buildings, Heavy & Highway, and Tunnel and Water & Sewer rates.

Residential Construction Rates generally apply to construction, reconstruction, repair, alteration, or demolition of one family, two family, row housing, or rental type units intended for residential use.

Some rates listed in the Residential Construction Rate Schedule have a very limited applicability listed along with the rate. Rates for occupations or locations not shown on the residential schedule must be obtained from the General Construction Rate Schedule. Please contact the local Bureau of Public Work office before using Residential Rate Schedules, to ensure that the project meets the required criteria.

Payrolls and Payroll Records

Contractors and subcontractors are required to establish, maintain, and preserve for not less than six (6) years, contemporaneous, true, and accurate payroll records.

Every contractor and subcontractor shall submit to the Department of Jurisdiction (Contracting Agency), within thirty (30) days after issuance of its first payroll and every thirty (30) days thereafter, a transcript of the original payrolls, subscribed and affirmed as true under penalty of perjury.

Paid Holidays

Paid Holidays are days for which an eligible employee receives a regular day's pay, but is not required to perform work. If an employee works on a day listed as a paid holiday, this remuneration is in addition to payment of the required prevailing rate for the work actually performed.

Overtime

At a minimum, all work performed on a public work project in excess of eight hours in any one day or more than five days in any workweek is overtime. However, the specific overtime requirements for each trade or occupation on a public work project may differ. Specific overtime requirements for each trade or occupation are contained in the prevailing rate schedules.

Overtime holiday pay is the premium pay that is required for work performed on specified holidays. It is only required where the employee actually performs work on such holidays.

The applicable holidays are listed under HOLIDAYS: OVERTIME. The required rate of pay for these covered holidays can be found in the OVERTIME PAY section listings for each classification.

Supplemental Benefits

Particular attention should be given to the supplemental benefit requirements. Although in most cases the payment or provision of supplements is straight time for all hours worked, some classifications require the payment or provision of supplements, or a portion of the supplements, to be paid or provided at a premium rate for premium hours worked. Supplements may also be required to be paid or provided on paid holidays, regardless of whether the day is worked. The Overtime Codes and Notes listed on the particular wage classification will indicate these conditions as required.

Effective Dates

When you review the schedule for a particular occupation, your attention should be directed to the dates above the column of rates. These are the dates for which a given set of rates is effective. The rate listed is valid until the next effective rate change or until the new annual determination which takes effect on July 1 of each year. All contractors and subcontractors are required to pay the current prevailing rates of wages and supplements. If you have any questions please contact the Bureau of Public Work or visit the New York State Department of Labor website (www.labor.ny.gov) for current wage rate information.

Apprentice Training Ratios

The following are the allowable ratios of registered Apprentices to Journey-workers.

For example, the ratio 1:1,1:3 indicates the allowable initial ratio is one Apprentice to one Journeyworker. The Journeyworker must be in place on the project before an Apprentice is allowed. Then three additional Journeyworkers are needed before a second Apprentice is allowed. The last ratio repeats indefinitely. Therefore, three more Journeyworkers must be present before a third Apprentice can be hired, and so on.

Please call Apprentice Training Central Office at (518) 457-6820 if you have any questions.

Title (Trade)	Ratio
Boilermaker (Construction)	1:1,1:4
Boilermaker (Shop)	1:1,1:3
Carpenter (Bldg.,H&H, Pile Driver/Dockbuilder)	1:1,1:4
Carpenter (Residential)	1:1,1:3
Electrical (Outside) Lineman	1:1,1:2
Electrician (Inside)	1:1,1:3
Elevator/Escalator Construction & Modernizer	1:1,1:2
Glazier	1:1,1:3
Insulation & Asbestos Worker	1:1,1:3
Iron Worker	1:1,1:4
Laborer	1:1,1:3
Mason	1:1,1:4
Millwright	1:1,1:4
Op Engineer	1:1,1:5
Painter	1:1,1:3
Plumber & Steamfitter	1:1,1:3
Roofer	1:1,1:2
Sheet Metal Worker	1:1,1:3
Sprinkler Fitter	1:1,1:2

If you have any questions concerning the attached schedule or would like additional information, please contact the nearest BUREAU of PUBLIC WORK District Office or write to:

New York State Department of Labor
Bureau of Public Work
State Office Campus, Bldg. 12
Albany, NY 12226

District Office Locations:	Telephone #	FAX #
Bureau of Public Work - Albany	518-457-2744	518-485-0240
Bureau of Public Work - Binghamton	607-721-8005	607-721-8004
Bureau of Public Work - Buffalo	716-847-7159	716-847-7650
Bureau of Public Work - Garden City	516-228-3915	516-794-3518
Bureau of Public Work - Newburgh	845-568-5287	845-568-5332
Bureau of Public Work - New York City	212-932-2419	212-775-3579
Bureau of Public Work - Patchogue	631-687-4882	631-687-4902
Bureau of Public Work - Rochester	585-258-4505	585-258-4708
Bureau of Public Work - Syracuse	315-428-4056	315-428-4671
Bureau of Public Work - Utica	315-793-2314	315-793-2514
Bureau of Public Work - White Plains	914-997-9507	914-997-9523
Bureau of Public Work - Central Office	518-457-5589	518-485-1870

Suffolk County General Construction

Asbestos Worker	10/01/2023

JOB DESCRIPTION Asbestos Worker

DISTRICT 4

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk

WAGES

Per Hour: 07/01/2023

Asbestos Worker \$ 46.75
Removal & Abatement Only*

NOTE: *On Mechanical Systems that are NOT to be SCRAPPED.

SUPPLEMENTAL BENEFITS

Per Hour:

Asbestos Worker \$ 12.65
Removal & Abatement Only

OVERTIME PAY

See (B, B2, *E, J) on OVERTIME PAGE

*Hours worked on Saturdays are paid at time and one half only if forty hours have been worked during the week.

HOLIDAY

Paid: See (1) on HOLIDAY PAGE

Overtime: See (5, 6, 8) on HOLIDAY PAGE

REGISTERED APPRENTICES

Apprentice Removal & Abatement Only:

1000 hour terms at the following percentage of Journeyman's rates.

1st	2nd	3rd	4th
78%	80%	83%	89%

SUPPLEMENTAL BENEFIT

Per Hour:

Apprentice
Removal & Abatement \$ 12.65

4-12a - Removal Only

Boilermaker	10/01/2023

JOB DESCRIPTION Boilermaker

DISTRICT 4

ENTIRE COUNTIES

Bronx, Dutchess, Kings, Nassau, New York, Orange, Putnam, Queens, Richmond, Rockland, Suffolk, Sullivan, Ulster, Westchester

WAGES

Per Hour: 07/01/2023 01/01/2024

Boilermaker	\$ 65.88	\$ 67.38
Repairs & Renovations	65.88	67.38

Repairs & Renovation: Includes Repairing, Renovating replacement of parts to an existing unit(s).

SUPPLEMENTAL BENEFITS

Per Hour:

Boilermaker	33.5% of hourly	33.5% of Hourly
Repair \$ Renovations	Wage Paid	Wage Paid
	+ \$ 26.49	+ \$26.85

NOTE: "Hourly Wage Paid" shall include any and all premium(s) pay.

Repairs & Renovation Includes replacement of parts and repairs & renovation of existing unit.

OVERTIME PAY

See (*B, O, **U) on OVERTIME PAGE

Note:* Includes 9th & 10th hours, double for 11th or more.

** Labor Day ONLY, if worked.

Repairs & Renovation see (B,E,Q) on OT Page

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 12, 15, 25, 26, 29) on HOLIDAY PAGE

REGISTERED APPRENTICES

Wage per hour:
(1/2) Year Terms at the following percentage of Boilermaker's Wage

1st	2nd	3rd	4th	5th	6th	7th
65%	70%	75%	80%	85%	90%	95%

Supplemental Benefits Per Hour:

Apprentice(s)	33.5% of Hourly Wage Paid Plus Amount Below	33.5% of Hourly Wage Paid Plus Amount Below
1st Term	\$ 20.12	\$ 20.36
2nd Term	21.03	21.28
3rd Term	21.95	22.22
4th Term	22.83	23.12
5th Term	23.76	24.07
6th Term	24.67	25.00
7th Term	25.58	25.93

NOTE: "Hourly Wage Paid" shall include any and all premium(s)

4-5

Broadband 10/01/2023

JOB DESCRIPTION Broadband

DISTRICT 4

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk

WAGES

Per Hour:	7/01/2023	06/30/2024 Additional
Field Tech Install/Repair	\$ 50.87	3% *

(*)To be allocated at a later date.

For outside work (excluding installation on building construction/alteration/renovation projects), stopping at first point of attachment (demarcation), installing/maintaining/repairing broadband internet service.

SUPPLEMENTAL BENEFITS

Per Hour:
\$ 23.24

OVERTIME PAY

See (B, K, *R) on OVERTIME PAGE

Note: *Two and one half times the hourly rate after the 8th hour

HOLIDAY

Paid: See (5, 6, 7, 11, 12) on HOLIDAY PAGE

4-CWA-Dist1

Carpenter 10/01/2023

JOB DESCRIPTION Carpenter

DISTRICT 8

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Putnam, Queens, Richmond, Rockland, Suffolk, Westchester

WAGES

Per hour:	07/01/2023
Piledriver	\$ 59.16 + 9.79*

Dockbuilder \$ 59.16
+ 9.79*

*This portion is not subject to overtime premiums

SUPPLEMENTAL BENEFITS

Per hour:

Journeyworker \$ 45.34

OVERTIME PAY

See (B, E2, O) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE.

Paid: for 1st & 2nd yr.

Apprentices See (5,6,11,13,25)

Overtime: See (5,6,11,13,25) on HOLIDAY PAGE.

REGISTERED APPRENTICES

Wages per hour

(1)year terms:

1st	2nd	3rd	4th
\$25.60	\$31.20	\$39.58	\$47.97
+ 5.30*	+ 5.30*	+ 5.30*	+ 5.30*

*This portion is not subject to overtime premiums

Supplemental benefits per hour:

All Terms: \$ 31.83

8-1556 Db

Carpenter

10/01/2023

JOB DESCRIPTION Carpenter

DISTRICT 8

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Rockland, Suffolk, Westchester

WAGES

Per hour: 07/01/2023

Carpet/Resilient

Floor Coverer \$ 55.05
+ 8.25*

*This portion is not subject to overtime premiums

INCLUDES HANDLING & INSTALLATION OF ARTIFICIAL TURF AND SIMILAR TURF INDOORS/OUTDOORS.

SUPPLEMENTAL BENEFITS

Per hour:

\$ 39.45

OVERTIME PAY

See (B, E, Q) on OVERTIME PAGE

HOLIDAY

Paid: See (18, 19) on HOLIDAY PAGE.

Paid for 1st & 2nd yr.

Apprentices See (5,6,11,13,16,18,19,25)

Overtime: See (5,6,11,13,16,18,19,25) on HOLIDAY PAGE.

REGISTERED APPRENTICES

Wage per hour - (1) year terms:

1st	2nd	3rd	4th
\$ 25.20	\$ 28.20	\$ 32.45	\$ 40.33
+ 1.85*	+ 2.35*	+ 2.85*	+ 3.85*

*This portion is not subject to overtime premiums

Supplemental benefits per hour:

1st	2nd	3rd	4th
\$ 15.22	\$ 16.22	\$ 19.32	\$ 20.32

8-2287

Carpenter**10/01/2023**

JOB DESCRIPTION Carpenter

DISTRICT 8

ENTIRE COUNTIES

Bronx, Dutchess, Kings, Nassau, New York, Orange, Putnam, Queens, Richmond, Rockland, Suffolk, Westchester

WAGES

Per Hour: 07/01/2023

Marine Construction:

Marine Diver \$ 74.03
+ 9.79*

Marine Tender \$ 53.57
+ 9.79*

*This portion is not subject to overtime premiums

SUPPLEMENTAL BENEFITS

Per Hour:

Journeyworker \$ 45.34

OVERTIME PAY

See (B, E, E2, Q) on OVERTIME PAGE

HOLIDAY

Paid: See (18, 19) on HOLIDAY PAGE

Overtime: See (5, 6, 10, 11, 13, 16, 18, 19) on HOLIDAY PAGE

REGISTERED APPRENTICES

Wages per hour:

One (1) year terms.

1st year	\$ 25.60 + 5.30*
2nd year	31.20 + 5.30*
3rd year	39.58 + 5.30*
4th year	47.97 + 5.05*

*This portion is not subject to overtime premiums

Supplemental Benefits

Per Hour:

All terms \$ 31.83

8-1456MC

Carpenter**10/01/2023**

JOB DESCRIPTION Carpenter

DISTRICT 8

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Putnam, Queens, Richmond, Rockland, Suffolk, Westchester

WAGES

Per hour: 07/01/2023

Building \$ 58.70
Millwright + 12.62*

*This portion is not subject to overtime premiums

SUPPLEMENTAL BENEFITS

Per hour:

Millwright \$ 44.31

OVERTIME PAY

See (B, E, Q) on OVERTIME PAGE

HOLIDAY

Paid: See (18,19) on HOLIDAY PAGE.

Overtime See (5,6,8,11,13,18,19,25) on HOLIDAY PAGE.

REGISTERED APPRENTICES

Wages per hour:

One (1) year terms:

1st.	2nd.	3rd.	4th.
\$31.74	\$37.19	\$42.64	\$53.54
+ 6.75*	+ 7.92*	+ 9.09*	+ 11.43*

*This portion is not subject to overtime premiums

Supplemental benefits per hour:

One (1) year terms:

1st.	2nd.	3rd.	4th.
\$29.81	\$32.34	\$35.52	\$39.94

8-740.1

Carpenter

10/01/2023

JOB DESCRIPTION Carpenter

DISTRICT 8

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES

Per Hour:

07/01/2023

Timberman \$ 54.05
+ 10.26*

*This portion not subject to overtime premiums

SUPPLEMENTAL BENEFITS

Per Hour:

07/01/2023

\$ 44.55

OVERTIME PAY

See (B, E, E2, Q) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE.

Paid: for 1st & 2nd yr.

Apprentices See (5,6,11,13,25)

Overtime: See (5,6,11,13,25) on HOLIDAY PAGE.

REGISTERED APPRENTICES

Wages per hour:

One (1) year terms:

1st	2nd	3rd	4th
\$23.42	\$28.53	\$36.18	\$43.84
+ 5.55*	+ 5.55*	+ 5.55*	+ 5.55*

*This portion is not subject to overtime premiums

Supplemental benefits per hour:
All terms \$ 31.54

8-1556 Tm

Carpenter**10/01/2023**

JOB DESCRIPTION Carpenter**DISTRICT** 8**ENTIRE COUNTIES**

Bronx, Kings, Nassau, New York, Queens, Richmond, Rockland, Westchester

PARTIAL COUNTIES

Orange: South of but including the following, Waterloo Mills, Slate Hill, New Hampton, Goshen, Blooming Grove, Mountainville, east to the Hudson River.

Putnam: South of but including the following, Cold Spring, Tompkins Corner, Mahopac, Croton Falls, east to Connecticut border.

Suffolk: West of Port Jefferson and Patchogue Road to Route 112 to the Atlantic Ocean.

WAGES

Per hour: 07/01/2023

Core Drilling:

Driller \$ 43.88
+ 2.50*

Driller Helper \$ 34.47
+ 2.50*

Note: Hazardous Waste Pay Differential:

For Level C, an additional 15% above wage rate per hour

For Level B, an additional 15% above wage rate per hour

For Level A, an additional 15% above wage rate per hour

Note: When required to work on water: an additional \$ 3.00 per hour.

*This portion is not subject to overtime premiums

SUPPLEMENTAL BENEFITS

Per hour:

Driller and Helper \$ 28.85

OVERTIME PAY

See (B, G, P) on OVERTIME PAGE

HOLIDAY

Paid: See (5, 6) on HOLIDAY PAGE

Overtime: See (5, 6) on HOLIDAY PAGE

8-1536-CoreDriller

Carpenter - Building / Heavy&Highway**10/01/2023**

JOB DESCRIPTION Carpenter - Building / Heavy&Highway**DISTRICT** 4**ENTIRE COUNTIES**

Nassau, Suffolk

WAGES

Per Hour:	07/01/2023	05/01/2024
Carpenter		Additional
(Building)	\$ 51.13	\$0.75/hr*
Carpenter		
(Heavy Highway)	51.13	

(*)To be allocated at a later date.

"NOTE" ADD 15% to straight time hourly wage for NEW YORK STATE D.O.T. and other GOVERNMENTAL MANDATED Off-Shift Work.

NOTE - The 'Employer Registration' (30.1) use of a '4 Day/10 Hour Work schedules' will no longer be accepted or processed. All registered projects prior to June 30,2023 will expire within the granted time frame.

For Pre-Registered Projects Four (4), Ten (10) hour days may be worked at straight time during a week, Monday thru Thursday. Friday may be used as a make-up day. Tuesday thru Friday may be worked with no make-up day. For further clarification contact your local Bureau Office.

SUPPLEMENTAL BENEFITS

Per Hour:

Both Carpenter
Categories \$ 34.11

OVERTIME PAY

See (B, E, Q) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES

One(1) Year Terms at the following :

Per Hour:

	1st	2nd	3rd	4th	5th
07/01/2023	\$ 25.16	\$ 29.58	\$ 31.78	\$ 33.98	\$ 38.41

05/01/2024	\$ TBD	\$ TBD	\$ TBD	\$ TBD	\$ TBD

Supplemental Benefits
Per Hour:

All Terms: \$ 21.02

4-Reg.Council Nass/Suff

Electrician

10/01/2023

JOB DESCRIPTION Electrician

DISTRICT 4

ENTIRE COUNTIES

Nassau, Suffolk

WAGES

Per Hour: 07/01/2023

Electrician
Electrical Maintenance \$ 46.79

Traffic Signal 47.75

"PLEASE NOTE"

Applicable to "EXISTING ELECTRICAL SYSTEMS" including, but not limited to TRAFFIC SIGNALS & STREET LIGHTING. Not used for addons.

NOTE - The 'Employer Registration' (30.1) use of a '4 Day/10 Hour Work schedules' will no longer be accepted or processed. All registered projects prior to June 30,2023 will expire within the granted time frame.

For Pre-Registered Projects Four (4), Ten (10) hour days may be worked at straight time during a week, Monday thru Thursday. Friday may be used as a make-up day. Tuesday thru Friday may be worked with no make-up day. For further clarification contact your local Bureau Office.

SUPPLEMENTAL BENEFITS

Per Hour:

Electrician 14% of Hourly
Wage Paid + \$22.73

NOTE: "Hourly Wage Paid" shall include any and all premium(s) pay

OVERTIME PAY

See (B, E2, K, P) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 15, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES

Term(s) at the following Percentage
of Journeyman(s) Wage:

	07/01/2023
1st 6mns	40%
2nd 6mns	50%

2nd year	60%
3rd year	70%
4th year	80%
5th year	90%

Supplemental Benefits:

1st 6mns	5% + \$4.83
2nd 6mns	10% + \$5.64
2nd year	11% + \$6.99
3rd year	12% + \$9.21
4th year	13% + \$13.02
5th year	14% + \$16.56

NOTE: Percentages are on "Hourly Wage Paid"

NOTE: "Hourly Wage Paid" shall include any and all premium(s) pay

4-25m

Electrician	10/01/2023

JOB DESCRIPTION Electrician

DISTRICT 4

ENTIRE COUNTIES

Nassau, Suffolk

WAGES

Per Hour: 07/01/2023

Tree Trimmer/Remover

Line Clearance Specialist \$ 40.38

Groundman* \$24.22

These rates apply to all tree trimming/removal contracts including but not limited to "Electrical Line Clearance"/"Long Island Railroad Right of Ways".

For Building Construction or Road/Highway Construction Contracts, Heavy & Highway Laborer and Operating Engineer classifications Apply.

* Note: Groundman Classification not to exceed 20% of the company(s) workforce on Project. Please contact local office for clarification.

SUPPLEMENTAL BENEFITS

Per Hour: 07/01/2023

Tree Trimmer 5% of Hourly
Line Clearance Specialist Wage Paid +
and Groundman \$19.29

NOTE: "Hourly Wage Paid" shall include any and all premium(s) paid

OVERTIME PAY

See (B, E, P, S) on OVERTIME PAGE

HOLIDAY

Paid: See (5, 6, 8, 16, 23, 24, 25, 26) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 16, 23, 24, 25, 26) on HOLIDAY PAGE

4-1049/Tree

Electrician	10/01/2023

JOB DESCRIPTION Electrician

DISTRICT 4

ENTIRE COUNTIES

Nassau, Suffolk

WAGES

Per Hour: 07/01/2023 04/27/2024

Electrician/Wireman \$ 59.50 \$ 61.75
Inside/Outside

SUPPLEMENTAL BENEFITS

Per Hour
Electrician/Wireman 17% of Hourly 18% of Hourly

(all categories)	Wage Paid + \$ 33.23	Wage Paid + \$ 34.36

NOTE: "Hourly Wage Paid" shall include any and all premium[s]

OVERTIME PAY

See (B, E, E2, Q, V) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE

Overtime: See (5, 6, 15, 16, 25, 26) on HOLIDAY PAGE

REGISTERED APPRENTICES

Terms at the following Percentage of Journeyman(s) Wage:

Indentured Before 4/25/2020:

1st 6mth	35%
2nd 6mth	35%
2nd year	40%
3rd year	45%
4th year	60%
5th year	75%

Indentured After 4/25/2020 (6 month terms):

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
35%	35%	37.5%	40%	42.5%	45%	50%	55%	65%	75%

Supplemental Benefits Per Hour:

07/01/2023

04/27/2024

Indentured Before 04/25/2020:

1st 6 Months	4% + \$ 5.44	5% + \$5.57
2nd 6 Months	9% + \$ 6.90	10% + \$6.90
3rd Year	10% + \$7.94	11% + \$8.14
4rd Year	11% + \$ 9.31	12% + \$9.57
5th Year	14% + \$ 11.70	15% + \$12.02
6th Year	15% + \$ 18.46	16% + \$19.04

Indentured After 04/25/2020 (6 month terms):

1st	4% + \$ 5.44	5% + \$ 5.57
2nd	9% + \$ 6.70	10% + \$ 6.90
3rd	10% + \$7.95	11% + \$ 8.17
4th	11% + \$9.31	12% + \$ 9.57
5th	11% + \$9.33	12% + \$ 9.60
6th	11% + \$ 9.34	12% + \$ 9.61
7th	14% + \$ 11.72	15% + \$ 12.06
8th	14% + \$ 11.75	15% + \$ 12.08
9th	15% + \$ 18.46	16% + \$ 19.04
10th	16% + \$ 19.10	16% + \$ 19.10

NOTE: Percentages are on "Hourly Wage Paid"

NOTE: "Hourly Wage Paid" shall include any and all premium(s).

4-25

Electrician

10/01/2023

JOB DESCRIPTION Electrician

DISTRICT 4

ENTIRE COUNTIES

Nassau, Suffolk

WAGES

Per Hour: 07/01/2023

Electrician

Pump & Tank \$ 45.65

SUPPLEMENTAL BENEFITS

Per Hour:

Electrician

Pump & Tank 18% of *Wage
paid + \$24.85

*Wage Paid includes any and all Premiums

OVERTIME PAY

See (B, E, Q) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE

Overtime: See (5, 6, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES

1 Year Terms at the Following:

Per Hour:

1st	2nd	3rd	4th
\$17.85	\$18.85	\$19.85	\$20.85

SUPPLEMENTAL BENEFITS

Per Hour:

1st	5% of *Wage paid + \$6.71
2nd	8% of *Wage paid + \$7.21
3rd	8% of *Wage paid + \$7.81
4th	8% of *Wage paid + \$7.81

*Wage Paid includes any and all Premiums

4-25 Pump & Tank

Electrician

10/01/2023

JOB DESCRIPTION Electrician

DISTRICT 4

ENTIRE COUNTIES

Nassau, Suffolk

WAGES

Per Hour: 07/01/2023

Telephone and

Integrated Tele-Data

System Electrician \$ 40.43

This rate classification applies to ALL Voice, Data & Video work.: Excluding Fire Alarm Systems and Energy Management Systems (HVAC Controls), in those cases the regular Electrician rate applies. To ensure proper use of this rate please call Nassau Offices at (516)228-3912 or Suffolk Offices at (631)687-4882.

SUPPLEMENTAL BENEFITS

Per Hour:

Tele-Data

Electrician 18% of
Hourly Wage
Paid + \$ 22.36

NOTE: "Hourly Wage Paid" shall include any and all premium(s) pay

OVERTIME PAY

See (B, E, E2, Q) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE

Overtime: See (5, 6, 15, 16, 25) on HOLIDAY PAGE

4-25tela

Electrician Lineman

10/01/2023

JOB DESCRIPTION Electrician Lineman

DISTRICT 4

ENTIRE COUNTIES

Nassau, Queens, Suffolk

WAGES

For Utility Distribution & Transmission Line Construction:

Per Hour: 07/01/2023

Lineman/Splicer	\$65.25
Material Man	56.77
Heavy Equip. Operator	52.20

Groundman	39.15
Flagman	29.36

For Natural Gasline Construction	06/04/2024
Per Hour:	
Journeyman U.G.Mech	55.68 \$ 57.63

NOTE - The 'Employer Registration' (30.1) use of a '4 Day/10 Hour Work schedules' will no longer be accepted or processed. All registered projects prior to June 30,2023 will expire within the granted time frame.

For Pre-Registered Projects Four (4), Ten (10) hour days may be worked at straight time during a week, Monday thru Thursday. Friday may be used as a make-up day. Tuesday thru Friday may be worked with no make-up day. For further clarification contact your local Bureau Office.

SUPPLEMENTAL BENEFITS

Per Hour:
Utility Distribution & Transmission Line Construction:

All Classifications	07/01/2023
	32.75% of Hourly Wage Paid + \$15.04

NOTE: "Hourly Wage Paid" shall include any and all premium(s) pay

Natural Gasline Construction	07/01/2023	06/04/2024
Per Hour:		
Journeyman U.G.Mech.	32.08	33.12

OVERTIME PAY

See (B, E, Q) on OVERTIME PAGE
OVERTIME for Natural Gas Mechanic:(B,G,P)

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 16, 23, 25, 26) on HOLIDAY PAGE
Same as Above for Natural Gas Mechanic.

REGISTERED APPRENTICES

1000 hour Terms at the following Percentage of Journeyman's Wage.
(Lineman Only)

1st	2nd	3rd	4th	5th	6th	7th
60%	65%	70%	75%	80%	85%	90%

SUPPLEMENTAL BENEFIT:

	07/01/2023
All Terms	31.75% of Hourly Wage Paid + \$ 15.04

4-1049 Line/Gas

Elevator Constructor

10/01/2023

JOB DESCRIPTION Elevator Constructor

DISTRICT 4

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk

PARTIAL COUNTIES

Rockland: Entire County except for the Township of Stony Point

Westchester: Entire County except for the Townships of Bedford, Lewisboro, Cortland, Mt. Kisco, North Salem, Pound Ridge, Somers and Yorktown.

WAGES

Per hour:
07/01/2023

Elevator Constructor \$ 77.49

Modernization &
Service/Repair \$ 60.89

NOTE - The 'Employer Registration' (30.1) use of a '4 Day/10 Hour Work schedules' will no longer be accepted or processed. All registered projects prior to June 30,2023 will expire within the granted time frame.

For Pre-Registered Projects Four (4), Ten (10) hour days may be worked at straight time during a week, Monday thru Thursday. Friday may be used as a make-up day. Tuesday thru Friday may be worked with no make-up day. For further clarification contact your local Bureau Office.

SUPPLEMENTAL BENEFITS

Per Hour:

Elevator Constructor \$ 45.574

Modernization &
Service/Repairs 44.412

OVERTIME PAY

Constructor See (D, M, T) on OVERTIME PAGE.

Modern/Service See (B, F, S) on OVERTIME PAGE.

HOLIDAY

Paid: See (5, 6, 8, 11, 15, 16, 25) on HOLIDAY PAGE

Overtime: See (5, 6, 8, 11, 15, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES

WAGES PER HOUR:

*Note:1st, 2nd, 3rd Terms are based on Average wage of Constructor & Modernization.

Terms 4 thru 9 Based on Journeyman's wage of classification Working in.

6 MONTH TERMS:

1st Term*	2nd & 3rd Term*	4th & 5th Term	6th & 7th Term	8th & 9th Term
50%	50%	55%	65%	75%

SUPPLEMENTAL BENEFITS

Elevator Constructor

1st Term	\$ 0.00
2nd & 3rd Term	36.024
4th & 5th Term	36.943
6th & 7th Term	38.448
8th & 9th Term	39.953

Modernization &
Service/Repair

1st Term	\$ 0.00
2nd & 3rd Term	35.694
4th & 5th Term	36.525
6th & 7th Term	37.948
8th & 9th Term	39.38

4-1

Glazier

10/01/2023

JOB DESCRIPTION Glazier

DISTRICT 8

ENTIRE COUNTIES

Bronx, Dutchess, Kings, Nassau, New York, Orange, Putnam, Queens, Richmond, Rockland, Suffolk, Sullivan, Ulster, Westchester

WAGES

Per hour: 7/01/2023

Glazier & Glass Tinting \$ 61.64

*Scaffolding 65.64

Window Film

**Repair & Maintenance 30.76

*Scaffolding includes swing scaffold, mechanical equipment, scissor jacks, man lifts, booms & buckets 30' or more, but not pipe scaffolding.

**Repair & Maintenance- All repair & maintenance work on a particular building whenever performed, where the total cumulative Repair & Maintenance contract value is under \$184,000.

SUPPLEMENTAL BENEFITS

Per hour: 7/01/2023

Glazier & Glass Tinting \$ 40.20

Window Film
Repair & Maintenance 23.19

OVERTIME PAY

See (B, E, Q, V) on OVERTIME PAGE

For 'Repair & Maintenance' see (B, B2, I, S) on overtime page.

HOLIDAY

Paid: See (1) on HOLIDAY PAGE

Overtime: See (4, 6, 16, 25) on HOLIDAY PAGE

For 'Repair & Maintenance'

Paid: See(5, 6, 16, 25)

Overtime: See(5, 6, 16, 25)

REGISTERED APPRENTICES

Wage per hour:

(1) year terms at the following wage rates:

7/01/2023

1st term \$ 21.93
2nd term 30.05
3rd term 39.95
4th term 48.97

Supplemental Benefits:

(Per hour)

1st term \$ 18.25
2nd term 25.97
3rd term 31.27
4th term 34.32

8-1087 (DC9 NYC)

Insulator - Heat & Frost

10/01/2023

JOB DESCRIPTION Insulator - Heat & Frost

DISTRICT 4

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk

WAGES

Per Hour: 07/01/2023

Insulators
Heat & Frost \$ 70.51

SUPPLEMENTAL BENEFITS

Per Hour:

Insulators \$ 35.76
Heat & Frost

OVERTIME PAY

See (B, E, *Q, V) on OVERTIME PAGE

* Triple time for Labor Day (If worked)

HOLIDAY

Paid: See (1) on HOLIDAY PAGE

Overtime: See (5, 6, 11, 15, 16, 25, 26) on HOLIDAY PAGE

REGISTERED APPRENTICES

Wages:

1 year terms.

Wages Per Hour:

1st	2nd	3rd	4th
\$ 28.20	\$ 35.26	\$ 42.31	\$ 49.36

Supplemental Benefits:

\$ 14.30	\$ 17.88	\$ 21.46	\$ 25.03

4-12

Ironworker

10/01/2023

JOB DESCRIPTION Ironworker

DISTRICT 9

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES

Per Hour:	07/01/2023	01/01/2024 Additional
Stone Derrickmen Rigger	\$ 72.90	+ \$ 1.64
Stone Handset Derrickman	70.47	+ \$ 1.11

SUPPLEMENTAL BENEFITS

Per hour:

Stone Derrickmen Rigger	\$ 43.10
Stone Handset Derrickman	42.84

OVERTIME PAY

See (B, D1, *E, Q, **V) on OVERTIME PAGE

*Time and one-half shall be paid for all work on Saturday up to eight (8) hours and double time shall be paid for all work thereafter.

** Benefits same premium as wages on Holidays only

HOLIDAY

Paid: See (18) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 25) on HOLIDAY PAGE
Work stops at schedule lunch break with full day's pay.

REGISTERED APPRENTICES

Wage per hour:

Stone Derrickmen Rigger:	1st	2nd	3rd	4th
07/01/2023	\$ 35.90	\$ 51.53	\$ 57.32	\$ 63.11

Supplemental Benefits:

Per hour:				
07/01/2023	22.11	32.58	32.58	32.58

Stone Handset:

1/2 year terms at the following hourly wage rate:

	1st	2nd	3rd	4th
07/01/2023	34.56	49.75	55.33	60.90

Supplemental Benefits:

Per hour:				
07/01/2023	22.10	32.46	32.46	32.46

9-197D/R

Ironworker

10/01/2023

JOB DESCRIPTION Ironworker

DISTRICT 4

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES

Per Hour:	07/01/2023

Ornamental	\$ 46.90
Chain Link Fence	46.90
Guide Rail	46.90

SUPPLEMENTAL BENEFITS

Per hour:	
Journeyworker:	\$ 63.04

OVERTIME PAY

See (B, B1, Q, V) on OVERTIME PAGE

HOLIDAY

Paid:	See (1) on HOLIDAY PAGE
Overtime:	See (5, 6, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES

Apprentices Hired after 9/1/18:

1 year terms	07/01/2023
1st Term	\$ 21.13
2nd Term	24.77
3rd Term	28.40
4th Term	32.06

Supplemental Benefits per hour:	
1st Term	\$ 17.90
2nd Term	19.15
3rd Term	20.41
4th Term	21.67

4-580-Or

Ironworker

10/01/2023

JOB DESCRIPTION Ironworker

DISTRICT 4

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES

PER HOUR:	07/01/2023	01/01/2024	07/01/2024
Ironworker:		Additional	Additional
Structural	\$ 57.20	\$ 1.75/Hr.*	\$ 1.75/Hr.*
Bridges			
Machinery			

(*)To be allocated at a later date.

SUPPLEMENTAL BENEFITS

PER HOUR PAID:

Journeyman	\$ 87.35

OVERTIME PAY

See (B, B1, Q, *V) on OVERTIME PAGE

*NOTE: Benefits are calculated for every hour paid

HOLIDAY

Paid:	See (1) on HOLIDAY PAGE
Overtime:	See (5, 6, 18, 19) on HOLIDAY PAGE

REGISTERED APPRENTICES

WAGES PER HOUR:

6 month terms at the following rate:

1st	\$ 29.73
2nd	30.33
3rd - 6th	30.94

Supplemental Benefits

PER HOUR PAID:

All Terms	\$ 60.69

Ironworker

10/01/2023

JOB DESCRIPTION Ironworker

DISTRICT 4

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

PARTIAL COUNTIES

Rockland: Southern section - south of Convent Road and east of Blue Hills Road.

WAGES

Per hour: 07/01/2023

Reinforcing &
Metal Lathing \$ 56.95

"Base" Wage \$ 55.20
plus \$ 1.75

"Base" Wage is used to calculate overtime hours only.

SUPPLEMENTAL BENEFITS

Per hour:
Reinforcing & \$ 42.72
Metal Lathing

OVERTIME PAY

See (B, E, Q, *X) on OVERTIME PAGE

*Only \$23.50 per Hour for non worked hours

Supplemental Benefit Premiums for Overtime Hours worked:

Time & One Half \$ 49.47
Double Time \$ 56.22

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 13, *18, **19, 25) on HOLIDAY PAGE

*Note: Work performed after first 4 Hours.

REGISTERED APPRENTICES

(1) year terms at the following wage rates:

1st term	2nd term	3rd term	4th Term
Wage Per Hour: \$ 22.55	\$ 28.38	\$ 34.68	\$ 37.18
"Base" Wage \$ 21.00	\$ 26.80	\$ 33.10	\$ 35.60
plus \$1.55	plus \$1.58	plus \$1.58	plus \$1.58

"Base" Wage is used to calculate overtime hours ONLY.

SUPPLEMENTAL BENIFITS

Per Hour:

1st term	2nd term	3rd term	4th Term
\$ 18.17	\$ 21.34	\$ 22.00	\$ 22.50

4-46Reinf

Laborer - Building

10/01/2023

JOB DESCRIPTION Laborer - Building

DISTRICT 4

ENTIRE COUNTIES

Nassau, Suffolk

WAGES

Per Hour:	07/01/2023	07/01/2024
Building Laborer	\$ 43.30	Additional \$ 1.35/Hr.*

(*)To be allocated at a later date.

SUPPLEMENTAL BENEFITS

Per Hour:

Building Laborer \$ 31.71

OVERTIME PAY

See (B, E, Q) on OVERTIME PAGE

See also(H)for Fire Watch on OVERTIME PAGE

Asbestos Worker See (B, H)

HOLIDAY

Paid: See (1) on HOLIDAY PAGE

Overtime: See (5, 6, 25) on HOLIDAY PAGE

Asbestos Worker see (5,6,8 & 28)

REGISTERED APPRENTICES

Regular Hours Work Terms

Term #1 1 hr to 1000hrs

Term #2 1001hrs to 2000hrs

Term #3 2001hrs to 3000hrs

Term #4 3001hrs to 4000hrs

Wages per hour:

1st Term \$ 18.15

2nd Term 23.06

3rd Term 28.48

4th Term 33.36

Benefits per hour

1st Term \$ 22.19

2nd Term 23.75

3rd Term 23.75

4th Term 23.75

4-66

Laborer - Building

10/01/2023

JOB DESCRIPTION Laborer - Building

DISTRICT 4

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk

WAGES

Per Hour:	07/01/2023	01/02/2024
Asbestos, Lead and Hazardous	\$ 39.50*	Additional \$ 1.50/Hr. to be allocated

Material Abatement

Laborer

(Re-Roofing Removal See Roofer)

NOTE: Asbestos removed from Mechanical Systems not to be scrapped

See Asbestos Worker

SUPPLEMENTAL BENEFITS

Per Hour:

Laborer \$ 19.65

OVERTIME PAY

See (B, B2, I) on OVERTIME PAGE

*Calculate at \$39.50 per hour then add \$0.95

HOLIDAY

Paid: See (1) on HOLIDAY PAGE

Overtime: See (5, 6, 8, 28) on HOLIDAY PAGE

REGISTERED APPRENTICES

1000 hour terms at the following;

Per Hour:

1st term	\$ 20.50*
2nd Term	21.50**
3rd Term	24.50***
4th Term	26.50****

SUPPLEMENTAL BENEFIT
Per Hour:

All Terms	\$ 14.25

OVERTIME PAY:

*Calculate at \$20.00 per hour then add \$0.50

**Calculate at \$21.00 per hour then add \$0.50

***Calculate at \$24.00 per hour then add \$0.50

****Calculate at \$26.00 per hour then add \$0.50

4-NYDC(78)

Laborer - Heavy&Highway	10/01/2023

JOB DESCRIPTION Laborer - Heavy&Highway

DISTRICT 4

ENTIRE COUNTIES

Nassau, Suffolk

WAGES

Laborer (Heavy/Highway):

GROUP # 1: Asphalt Rakers, Concrete Curb Formsetters.

GROUP # 2: Asphalt Shovelers, Roller Boys and Tampers.

GROUP # 3: Basic Laborer, Power Tool(Jackhammer), Landscape Construction(Non-Building), Traffic Control Personnel(flaggers)

WAGES PER HOUR:

	07/01/2023	06/01/2024
GROUP # 1		
Total Wage Paid	\$ 60.28	Additional
"Base Wage"	51.43	\$ 2.55/Hr.*
GROUP # 2		
Total Wage Paid	58.81	
"Base Wage"	49.96	
GROUP # 3		
Total Wage Paid	54.34	
"Base Wage"	45.49	

(*)To be allocated at a later date.

NOTE: "Base Wage" for Premium/Overtime calculation Only. \$8.85 is difference between "Base" and "Total".

Additional 30% to "Base Wage" for all hours worked on New York State D.O.T. and/or other Government Mandated Off-Shift Work.

Hazardous Material Work add an Additional 10% of base wage.

SUPPLEMENTAL BENEFITS

Per Hour:

ALL GROUPS	\$ 35.63

After Forty (40)paid hours in a work week

OVERTIME PAY	26.78

OVERTIME PAY

See (B, E2, F) on OVERTIME PAGE

NOTES: Premium/Overtime Pay to be calculated on "Base Wage" ONLY

Example Group# 3: \$45.49 X Time and One Half = \$68.23 + \$8.85 = \$77.08

HOLIDAY

Paid: See (1) on HOLIDAY PAGE

Overtime: See (1) on HOLIDAY PAGE

REGISTERED APPRENTICES

1000 hour(s) Terms at the following Percentage of the "Base Wage" except

4th Term calculate at Total Wage Paid.

1st 0-1000/Hrs.	60%
2nd 1001-2000/Hrs.	70%
3rd 2001-3000/Hrs.	80%
4th 3001-4000/Hrs.	90%

Supplemental Benefits per hour:

All APPRENTICES	\$ 35.63
After Forty(40) paid hours in a work Week	26.78

4-1298

Mason**10/01/2023**

JOB DESCRIPTION Mason

DISTRICT 4

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk

WAGES

Per Hour: 07/01/2023

Brick/Block Layer \$ 65.39

Base Wage for OT Calculation 55.24

SUPPLEMENTAL BENEFITS

Per Hour:

Brick/Block Layer \$ 32.60

OVERTIME PAY

See (A, E, E2, Q) on OVERTIME PAGE

Note: OT Calculated on Base Wage plus \$ 10.15/hr.

HOLIDAY

Paid: See (1) on HOLIDAY PAGE

Overtime: See (5, 6, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES

(800 hour) Terms at the following Percentage of Journey workers "Base Wage" plus \$ 5.40/hr.:

1st	2nd	3rd	4th	5th
50%	60%	70%	80%	90%

Supplemental Benefits per hour:

All Apprentices \$ 23.60

4-1Brk

Mason - Building**10/01/2023**

JOB DESCRIPTION Mason - Building

DISTRICT 9

ENTIRE COUNTIES

Nassau, Rockland, Suffolk, Westchester

WAGES

Per hour:	07/01/2023	12/04/2023	06/05/2024
		Additional	Additional
Tile Setters	\$ 62.98	\$ 0.72	\$ 0.72

SUPPLEMENTAL BENEFITS

Per Hour:

\$ 25.61*

+ \$10.04

* This portion of benefits subject to same premium rate as shown for overtime wages.

OVERTIME PAY

See (B, E, Q, V) on OVERTIME PAGE

Work beyond 10 hours on Saturday shall be paid at double the hourly wage rate.

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 15, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES

Wage per hour:

(750 hour) term at the following wage rate:

Term:

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
1-750	751-1500	1501-2250	2251-3000	3001-3750	3751-4500	4501-5250	5251-6000	6001-6750	6501-7000
07/01/2023									
\$21.70	\$26.66	\$33.75	\$38.69	\$42.25	\$45.70	\$49.29	\$54.23	\$57.09	\$61.25

Supplemental Benefits per hour:

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
07/01/2023									
\$12.55*	\$12.55*	\$15.36*	\$15.36*	\$16.36*	\$17.86*	\$18.86*	\$18.86*	\$16.86*	\$22.11*
+\$0.73	+\$0.78	+\$0.88	+\$0.88	+\$1.37	+\$1.42	+\$1.83	+\$1.88	+\$6.03	+\$6.61

* This portion of benefits subject to same premium rate as shown for overtime wages.

9-7/52A

Mason - Building

10/01/2023

JOB DESCRIPTION Mason - Building

DISTRICT 9

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES

Building

Wages per hour:

	07/01/2023	01/01/2024 Additional

Mosaic & Terrazzo Mechanic	\$ 60.65	\$1.06

Mosaic & Terrazzo Finisher	59.04	

SUPPLEMENTAL BENEFITS

Per hour:

Mosaic & Terrazzo Mechanic	\$ 30.26* + \$9.16

Mosaic & Terrazzo Finisher	\$ 30.26* + \$9.15

*This portion of benefits subject to same premium rate as shown for overtime wages.

OVERTIME PAY

See (A, E, Q) on OVERTIME PAGE

07/01/2023- Deduct \$7.25 from hourly wages before calculating overtime.

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 11, 15, 16, 25) on HOLIDAY PAGE

Easter Sunday is an observed holiday. Holidays falling on a Saturday will be observed on that Saturday. Holidays falling on a Sunday will be celebrated on the Monday.

REGISTERED APPRENTICES

Wages Per hour:

1st	2nd	3rd	4th	5th	6th
0-1500	1501-3000	3001-3750	3751-4500	4501-5250	5251-6000
\$ 25.82	\$ 33.19	\$ 36.39	\$ 40.38	\$ 48.52	\$ 54.59

Supplemental Benefits per hour:

\$6.00*	\$7.72*	\$18.16*	\$23.27*	\$24.21*	\$27.24*
+\$3.21	+\$4.12	+\$5.50	+\$6.41	+\$7.33	+\$8.29

*This portion of benefits subject to same premium rate as shown for overtime wages.

9-7/3

Mason - Building	10/01/2023

JOB DESCRIPTION Mason - Building

DISTRICT 9

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES

Per hour: 07/01/2023 07/03/2023

Building-Marble Restoration: Marble, Stone &	\$ 47.22	\$ 47.44

Terrazzo Polisher

SUPPLEMENTAL BENEFITS

Per Hour:
Journeyworker:

Building-Marble Restoration: Marble, Stone & Polisher	\$ 30.29	\$ 30.64

OVERTIME PAY

See (B, *E, Q, V) on OVERTIME PAGE

*ON SATURDAYS, 8TH HOUR AND SUCCESSIVE HOURS PAID AT DOUBLE HOURLY RATE.

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 11, 15, 25) on HOLIDAY PAGE
1ST TERM APPRENTICE GETS PAID FOR ALL OBSERVED HOLIDAYS.

REGISTERED APPRENTICES

WAGES per hour:

900 hour term at the following wage:

1st 1- 900	2nd 901- 1800	3rd 1801- 2700	4th 2701
\$ 33.04	\$ 37.78	\$ 42.49	\$ 47.22

Supplemental Benefits Per Hour: 27.65	28.52	29.41	30.29

07/03/2023

900 hour term at the following wage:

1st 1- 900	2nd 901- 1800	3rd 1801- 2700	4th 2701
\$ 33.19	\$ 37.95	\$ 42.69	\$ 47.44

Supplemental Benefits Per Hour: 27.99	28.86	29.76	30.64

9-7/24-MP

Mason - Building	10/01/2023

JOB DESCRIPTION Mason - Building

DISTRICT 9

ENTIRE COUNTIES

Bronx, Dutchess, Kings, Nassau, New York, Orange, Putnam, Queens, Richmond, Rockland, Suffolk, Sullivan, Ulster, Westchester

WAGES

Per Hour:

07/01/2023 7/03/2023

Marble Cutters & Setters

\$ 62.82 \$ 63.12

SUPPLEMENTAL BENEFITS

Per Hour:

Journeyworker

\$ 39.03 \$ 39.34

OVERTIME PAY

See (B, E, Q, V) on OVERTIME PAGE

HOLIDAY

Paid:

See (1) on HOLIDAY PAGE

Overtime:

See (5, 6, 8, 11, 15, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES

Wage Per Hour:

07/01/2023

750 hour terms at the following wage

1st	2nd	3rd	4th	5th	6th	7th	8th
0- 3000	3001- 3750	3751- 4500	4501- 5250	5251- 6000	6001- 6750	6751- 7500	7500+
\$ 26.42	\$ 39.62	\$ 42.91	\$ 46.22	\$ 49.52	\$ 53.38	\$ 59.67	\$ 62.82

Supplemental Benefits per hour:

07/01/2023

1st	2nd	3rd	4th	5th	6th	7th	8th
\$ 25.38	\$ 28.86	\$ 29.74	\$ 30.60	\$ 31.48	\$ 36.44	\$ 38.17	\$ 39.03

07/03/2023

Wage Per Hour:

750 hour terms at the following wage.

1st	2nd	3rd	4th	5th	6th	7th	8th
0- 3000	3001- 3750	3751- 4500	4501- 5250	5251- 6000	6001- 6750	6751- 7500	7500+
\$ 26.60	\$ 39.82	\$ 43.13	\$ 46.45	\$ 49.78	\$ 53.64	\$ 59.95	\$ 63.12

Supplemental Benefits Per Hour:

1st	2nd	3rd	4th	5th	6th	7th	8th
\$ 25.54	\$ 29.09	\$ 29.97	\$ 30.84	\$ 31.72	\$ 36.73	\$ 38.48	\$ 39.34

9-7/4

Mason - Building

10/01/2023

JOB DESCRIPTION Mason - Building

DISTRICT 9

ENTIRE COUNTIES

Nassau, Rockland, Suffolk, Westchester

WAGES

Per hour:

07/01/2023 12/04/2023 06/03/2024

Tile Finisher

\$ 48.36 Additional \$ 0.59 Additional \$ 0.59

SUPPLEMENTAL BENEFITS

Per Hour:

\$ 22.56*

+ \$9.86

*This portion of benefits subject to same premium rate as shown for overtime wages

OVERTIME PAY

See (B, E, Q, *V) on OVERTIME PAGE

*Work beyond 10 hours on a Saturday shall be paid at double the hourly wage rate.

HOLIDAY

Paid: See (1) on HOLIDAY PAGE

Overtime: See (5, 6, 11, 15, 16, 25) on HOLIDAY PAGE

9-7/88A-tf

Mason - Building

10/01/2023

JOB DESCRIPTION Mason - Building

DISTRICT 9

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES

Per hour:	07/01/2023	07/03/2023
Marble, Stone,		
Maintenance Finishers:	\$ 27.26	\$ 27.44

Note 1: An additional \$2.00 per hour
for time spent grinding floor using
"60 grit" and below.

Note 2: Flaming equipment operator
shall be paid an additional \$25.00 per day.

SUPPLEMENTAL BENEFITS

Per Hour:

Marble, Stone		
Maintenance Finishers:	\$ 14.97	\$ 15.20

OVERTIME PAY

See (B, *E, Q, V) on OVERTIME PAGE

*Double hourly rate after 8 hours on Saturday

HOLIDAY

Paid: See (5, 6, 8, 11, 15, 25) on HOLIDAY PAGE

Overtime: See (5, 6, 8, 11, 15, 25) on HOLIDAY PAGE

1st term apprentice gets paid for all observed holidays.

REGISTERED APPRENTICES

WAGES per hour:	07/01/2023	07/03/2023
0-750	\$ 21.89	\$ 22.04
751-1500	22.60	\$ 22.75
1501-2250	23.32	\$ 23.48
2251-3000	24.04	\$ 24.20
3001-3750	25.11	\$ 25.27
3751-4500	26.54	\$ 26.72
4501+	27.26	\$ 27.44

Supplemental Benefits:
Per hour:

0-750	12.03	\$ 12.24
751-1500	12.43	\$ 12.64
1501-2250	12.82	\$ 13.03
2251-3000	13.21	\$ 13.42
3001-3750	13.80	\$ 14.02
3751-4500	14.58	\$ 14.80
4501+	14.97	\$ 15.20

9-7/24M-MF

Mason - Building / Heavy&Highway

10/01/2023

JOB DESCRIPTION Mason - Building / Heavy&Highway

DISTRICT 9

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES

Per hour:	07/01/2023	07/03/2023	01/01/2024 Additional
Marble-Finisher	\$ 49.32	\$ 49.65	\$ 0.53

SUPPLEMENTAL BENEFITS

Journeyworker:
Per hour

Marble- Finisher	\$ 36.62	\$ 36.67

OVERTIME PAY

See (B, E, Q, V) on OVERTIME PAGE

Work beyond 8 hours on a Saturday shall be paid at double the rate.

HOLIDAY

Overtime: See (5, 6, 8, 11, 15, 16, 25) on HOLIDAY PAGE

When an observed holiday falls on a Sunday, it will be observed the next day.

9-7/20-MF

Mason - Building / Heavy&Highway

10/01/2023

JOB DESCRIPTION Mason - Building / Heavy&Highway

DISTRICT 4

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk

WAGES

Per Hour:	07/01/2023
Cement Mason	\$ 53.77

SUPPLEMENTAL BENEFITS

Per Hour:

Cement Mason	\$ 34.16
1.5 X overtime rate	\$ 61.70
2 X overtime rate	\$ 68.32

OVERTIME PAY

See (B1, Q) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE

Overtime: See (5, 6, 8, 11, 13, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES

(1) year terms at the following Percentage of Journeyworkers Wage.

1st Term	\$ 19.92
2nd Term	\$ 24.82
3rd Term	\$ 30.22

Supplement Benefits per hour paid:

		1.5X OT	2X OT
1st Term	\$ 14.36	\$ 21.55	\$ 28.72
2nd Term	\$ 14.66	\$ 22.00	\$ 29.32
3rd Term	\$ 14.77	\$ 22.16	\$ 29.54

4-780

Mason - Building / Heavy&Highway

10/01/2023

JOB DESCRIPTION Mason - Building / Heavy&Highway

DISTRICT 4

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk

WAGES

NOTE: Shall include but not limited to Precast concrete slabs (London Walks) Marble and Granite pavers 2'x 2' or larger.

Per Hour:

	07/01/2023	05/01/2024 Additional
Stone Setter	\$ 68.45	\$ 3.32*

Base Rate	52.76
Stone Tender	51.82
Base Rate	44.54

(*)To be allocated at a later date.

SUPPLEMENTAL BENEFITS

Per Hour:

Stone Setter \$ 40.78

Stone Tender 23.15

OVERTIME PAY

See (*C, **E, Q) on OVERTIME PAGE

Base Rates are use to Calculate Overtime Premiums then adding in:

\$15.69/Hr. for Stone Setter and \$7.28/Hr. for Stone Tender

* On weekdays the eighth (8th) and ninth (9th) hours are time and one-half all work thereafter is paid at double the hourly rate.

** The first nine (9) hours on Saturday is paid at time and one-half all work thereafter is paid at double the hourly rate.

HOLIDAY

Paid: See (*18) on HOLIDAY PAGE

Overtime: See (5, 6, 10) on HOLIDAY PAGE

Paid: *Must work first 1/2 of day

REGISTERED APPRENTICES

Per Hour:

Stone Setter(800 hour) terms at the following Percentage of Stone Setters Base wage rate per hour plus \$7.33:

1st	2nd	3rd	4th	5th	6th
50%	60%	70%	80%	90%	100%

Supplemental Benefits:

All Apprentices \$ 25.50

4-1Stn

Mason - Heavy&Highway

10/01/2023

JOB DESCRIPTION Mason - Heavy&Highway

DISTRICT 4

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk

WAGES

Per Hour: 07/01/2023

Pointer, Caulkers &
Cleaners \$ 62.19

SUPPLEMENTAL BENEFITS

Per Hour:

Pointer, Cleaners &
Caulkers \$ 30.65

OVERTIME PAY

See (B, E2, H) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE

Overtime: See (5, 6, 25, 26) on HOLIDAY PAGE

REGISTERED APPRENTICES

Wages per hour:

One (1) year terms at the following wage rates.

1st	2nd	3rd	4th
\$ 31.48	\$ 35.54	\$ 41.14	\$ 49.50

Apprentices Supplemental Benefits:

(per hour paid)

\$ 15.30	\$ 20.00	\$ 23.75	\$ 24.75

Operating Engineer - Building

10/01/2023

JOB DESCRIPTION Operating Engineer - Building

DISTRICT 4

ENTIRE COUNTIES

Nassau, Suffolk

WAGES

BUILDING CATEGORIES:

CLASS "AA "CRANES:

ABI Machine (150,000lbs and over or 149,999lbs and under when driving steel sheet piles),Crane, Truck Crane, Hydraulic Crane(Over 75 tons), Derrick, Dragline, Dredge, Crawler Crane, Tower Crane & Pile Driver, Vertical Drill Rig (115,000lbs and over and 114,999lbs and under).

CLASS "A":

ABI Machine (149,999 and under used for augering and drilling), Asphalt Spreader, Backhoe Crawler(360 swing), Barrier Machine, CAP (ice machine), Cherrypicker CAP (over 70 tons), CMI or Maxim Spreader, Concrete Pump, Directional Boring, GradAll, Grader, Hydraulic Cherrypicker/Crane (2seats), Hoist (3drum or multi platform), Laser Screed, Loading Machine (Bucket/CAP 10yds or more), Milling Machine (Large), Pipeline Welder, Plant Engineer, Power Winch (stone setting/structural steel), Powerhouse, Scoop Carry-All Scraper (in tandem), Sideboom Tractor (includes tank work), Track Alignment Machine, Stone Spreader (self propelled), Striping Machine (long line/truck mounted), Tree Grapple, Zamboni.

CLASS "B":

Backhoe (other than 360), Belt Screte, Boom Truck, Bulldozer, Boring Machine/Auger, Cherry Picker(under 70 Tons), Hydraulic Crane(under 75 Tons), Conveyor-Multi, Curb Machine (asphalt or concrete), Dinky Locomotive, Drill Rig (dowels)Fork Lift, Hoist (2 Drum), Loading Machine & Front End Loader, Mechanical Compactors (machine drawn), Mulch Machine(Machine Fed), Post Hole/Auger, Power Wincher (Not Included in Class "A"), Asphalt Roller, Hydraulic Pump with Boring Machine, Scoop, Carryall/Scaper, Skid Loader/Skid Steer/Bobcat, Trenching Machine, Vermeer Cutter, Work Boat, Inspection/Safety Boat.

CLASS "C":

Concrete Finish/Saw/Spreader, Dirt Roller, Hoist (1 drum, Clam Shell), Interior Hoist, Milling Machine (small), Oiler Truck Crane (pile work), Power Broom, Vactor Truck, VacAll.

CLASS "D":

Boiler (thermoplastic), Concrete Breaker, Conveyer, Curing Machine, Fork Lift or Walk Behind (power operated), Generator, Hydra Hammer, Compactors (mechanical or hand operated), Maintenance Engineer (small equipment/well point/welding & burning), Mechanic (field man), Micro-Trap with Compressor, Oiler (Truck Crane Boom 100ft or more) Power Winch Truck Mounted (Stone Setter/Struct. Steel), Pin Puller, Portable Heaters, Power Buggies, Pump (double action diaphragm), Pump (4 inch or over), Pump (hydraulic/submersible) Jet Pump, Pulvi-Mixer, Ridge Cutter, Shot Blaster.

CLASS "E":

Batching Plant, Compressor (structural steel/2 or more battery), Generator (small), Grinder, Ground Heater, Power Grinder, Mixer with Skip, Mulching Machine (hand fed), Oiler, Pipeline Welder Helper, Power Washer, Pumps (up to 3 inch/single action 1 to 3 inches), Pump (gypsum), Root Cutter, Stump Chipper, Track Tamper, Tractor (caterpillar or wheel), Trenching Machine (hand), Welding Machine (pile work/structural steel), Deckhand on Work/Inspection/Safety Boat.

07/01/2023

Class "AA"	\$ 90.26
Cranes:	
Boom length over 100 feet add	\$ 1.00
Boom length over 150 feet add	\$ 1.50
Boom length over 250 feet add	\$ 2.50
Boom length over 350 feet add	\$ 3.00

Class "A"	75.40
Add \$3.50 for Hazardous Waste Work	

Class "B"	71.63
Add \$2.50 for Hazardous Waste Work	

Class "C"	69.13
Add \$1.50 for Hazardous Waste Work	

Class "D"	52.83
Add \$1.00 for Hazardous Waste Work	

Class "E" 50.62

SUPPLEMENTAL BENEFITS

Per Hour:

All Classes \$ 40.65
Overtime Rate 36.10

OVERTIME PAY

See (D, O) on OVERTIME PAGE

HOLIDAY

Paid: See (5, 6, 15, 16, 25) on HOLIDAY PAGE
Overtime: See (5, 6, 15, 16, 25) on HOLIDAY PAGE

"NOTE" Employee must be Employed day before
and day after Holiday to receive Holiday Pay.

REGISTERED APPRENTICES

One(1) Year Terms at the following Rate:

1st Term \$ 28.00
2nd Term 29.00
3rd Term 30.00

Supplemental Benefits per hour:

All Apprentices \$ 15.64
Overtime Rate 5.60

4-138

Operating Engineer - Building / Heavy&Highway

10/01/2023

JOB DESCRIPTION Operating Engineer - Building / Heavy&Highway

DISTRICT 4

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk

WAGES

Per Hour: 07/01/2023 08/01/2023

Well Driller \$ 40.63 \$ 41.85

Well Driller
Helper 34.17 \$ 36.26

Hazardous Waste Differential
Added to Hourly Wage:

Level A \$ 3.00
Level B 2.00
Level C 1.00

Monitoring Well Work

Add to Hourly Wage:

Level A \$ 3.00
Level B 2.00

SUPPLEMENTAL BENEFITS

Per Hour:

Well Driller 10% of straight
& Helper time rate plus \$ 13.50

Additional \$ 4.25/Hr. for Premium Time Hours Worked

OVERTIME PAY

See (B2, P, S) on OVERTIME PAGE

HOLIDAY

Paid: See (5, 6, 16, 23) on HOLIDAY PAGE
Overtime: See (5, 6, 16, 23) on HOLIDAY PAGE

REGISTERED APPRENTICES

Apprentices at 12 Month Terms

Wages Per Hour:

1st Term	\$ 28.00
2nd Term	29.00
3rd Term	30.00

SUPPLEMENTAL BENEFITS

Per Hour:

All Terms 10% of Wage + \$ 13.50

Additional \$4.25/Hr. for premium time hours worked.

4-138well

Operating Engineer - Heavy&Highway

10/01/2023

JOB DESCRIPTION Operating Engineer - Heavy&Highway

DISTRICT 4

ENTIRE COUNTIES

Nassau, Suffolk

WAGES

HEAVY and HIGHWAY CATEGORIES:

CLASS "AA" CRANES:

ABI Machine (150,000lbs and over), ABI Machine (149,000lbs and under driving steel sheets), Crane, Truck Crane, Derrick, Dragline, Dredge, Crawler Crane, Tower Crane, Pile Driver, Hydraulic Crane (75 Tons & Over).

CLASS "A":

ABI Machine (149,000lbs and under for Augering or Drilling), Asphalt Spreader, Backhoe Crawler (360 Swing & over 150,000lbs), Backhoe Crawler (360 Swing & under 149,000lbs), Barrier Machine, Cherrypicker Cap (over 70 tons), CMI or Maxim Spreader, Concrete Pump, Directional Boring, Grader, Gradall, Hoist (3 drum or multi-platform), Hydraulic Cherrypicker/crane (2 seats), Loading Machine (bucket 10 yds. or more), Laser Screed, Milling Machine (Large), Pipeline Welder, Plant Engineer. Power Winch-Stone Setting/Structural Steel or Truck Mounted, Powerhouse, Scoop-Carryall-Scaper in Tandem, Side Boom Tractor, Side Boom Tractor (Tank Work), Stone Spreader(self propelled), Striping Machine (long line/truck mounted), Tree Grapple, Tank Work, Track Alignment Machine.

CLASS "B":

Backhoe (other than 360), Belt Screte, Boom Truck, Bulldozer, Boring Machine/Auger, Hydraulic Crane(75 Tons & Under), Cherry Picker (under 70 tons), Conveter-Multi, Curb Machine Asphalt/Concrete, Dinky Locomotive, Drill Rig for Dowels, Field Mechanic, Fork Lift, Hoist (2 Drum), Loading Machine, Loading Machine (Front End), Mechanical Compactors (Machine Drawn), Mulching Machine (Machine Fed), Post Hole/Auger, Power Winch (other than structural steel), Pump Hydraulic (with boring machine), Asphalt Roller, Scoop (carry-all, scraper), Skid Loader/Steer, Vermeer Cutter, Work Boat, Inspection & Safety Boat.

CLASS "C":

Concrete Finish/Saw/Spreader Machines, Dirt Roller, Hoist (1 drum, clam shell), Interior Hoist, Oiler Truck Crane(Pile work), Power Broom(Sweeper), Small Milling Machine, Vactor Truck/Vac-All Truck, Tack Oil Truck.

CLASS "D":

Boiler (Thermoplastic), Concrete Breaker, Conveyor, Curing Machine, Fireman, Fork lift (walk behind), Generator, Hydra Hammer, Maintenance Engineer (small equipment/Well Point/Welding & Burning), Compactors (hand operated), Pin Puller, Portable Heaters, Power Buggies, Pulvi Mixer, Pumps (double action/4 inch and over/Hydraulic/Submersible & Jet), Ridge Cutter, Robotic Unit Operator(Trenchless Pipe Rehab-Cleaning & Television of Sewers/CCTV Inspection), Shotblaster.

CLASS "E":

Batching Plant (On Job Site), Compressor (structural steel/2 or more in battery), Generator(small), Grinder, Ground Heater(boilers), Power Grinder, Mixer (with skip), Mulching Machine (hand feed), Oiler, Pipeline Welder Helper, Power Washer, Pump(up to 3 inches/Gypsum/Single action 1 to 3 inches), Root Cutter, Stump Grinder, Track Tamper, Tractor (caterpillar or wheel), Trenching Machine (hand), Welding Machine (Pile Work/Structural Steel), Deckhand (on Work/Inspection/Safety Boat).

07/01/2023

Class "AA"	\$ 89.45
Cranes:	Boom Length over 100 feet add \$ 1.00 per hour
	Boom Length over 150 feet add \$ 1.50 per hour
	Boom Length over 250 feet add \$ 2.00 per hour
	Boom Length over 350 feet add \$ 3.00 per hour

Class "A" 79.43
Add \$3.50 for Hazardous Waste Work.

Class "B" 74.36

Add \$2.50 for Hazardous Waste Work.

Class "C" 71.78
Add \$1.50 for Hazardous Waste Work

Class "D" 55.08
Add \$1.00 for Hazardous Waste Work

Class "E" 52.82

"NOTE": ADD 30% to straight time hourly wage for NEW YORK STATE
D.O.T. and other GOVERNMENTAL MANDATED off-shift work.

SUPPLEMENTAL BENEFITS

Per Hour:

ALL CLASSES \$ 40.90

Note: OVERTIME AMOUNT 36.10

OVERTIME PAY

See (D, O) on OVERTIME PAGE

HOLIDAY

Paid: See (5, 8, 15, 20, 22, 25, 26) on HOLIDAY PAGE

Overtime: See (5, 8, 15, 20, 22, 25, 26) on HOLIDAY PAGE

"Note" Employee must be employed day before and day after
a holiday to receive holiday pay.

REGISTERED APPRENTICES

Wage per hour:

REGISTERED APPRENTICES

One(1) Year Terms at the following Rate:

1st Term \$ 28.00
2nd Term 29.00
3rd Term 30.00

SUPPLEMENTAL BENEFITS:

APPRENTICES 15.64
Note: Overtime Amount 5.60

4-138

Operating Engineer - Heavy&Highway

10/01/2023

JOB DESCRIPTION Operating Engineer - Heavy&Highway

DISTRICT 4

ENTIRE COUNTIES

Nassau, Suffolk

WAGES

Party Chief - One who directs a survey party

Instrument Man - One who runs the instrument and assists Party Chief

Rodman - One who holds the rod and in general, assists the survey party

Categories cover GPS & Under Ground Surveying

Per Hour: 07/01/2023
Heavy Highway/Building

Party Chief \$ 75.03
Instrument Man 56.11
Rodman 47.45

SUPPLEMENTAL BENEFITS

Per Hour:

Heavy Highway/Building \$ 41.60

Premium*:
Heavy Highway/Building 50.68

Premium**:
Heavy Highway/Building 60.51

* Applies to instances where 1-1/2 regular rate are paid

**Applies to instances where 2 times the rate are paid.

OVERTIME PAY

See (B, *E, Q) on OVERTIME PAGE

* Doubletime paid on the 9th hour on Saturday.

HOLIDAY

Paid: See (5, 6, 7, 11, 16) on HOLIDAY PAGE

Overtime: See (5, 6, 7, 11, 16) on HOLIDAY PAGE

4-15D-N/S co.

Operating Engineer - Marine Dredging

10/01/2023

JOB DESCRIPTION Operating Engineer - Marine Dredging

DISTRICT 4

ENTIRE COUNTIES

Albany, Bronx, Cayuga, Clinton, Columbia, Dutchess, Essex, Franklin, Greene, Jefferson, Kings, Monroe, Nassau, New York, Orange, Oswego, Putnam, Queens, Rensselaer, Richmond, Rockland, St. Lawrence, Suffolk, Ulster, Washington, Wayne, Westchester

WAGES

These wages do not apply to Operating Engineers on land based construction projects. For those projects, please see the Operating Engineer Heavy/Highway Rates. The wage rates below for all equipment and operators are only for marine dredging work in navigable waters found in the counties listed above.

Per Hour:	07/01/2023	10/01/2023
CLASS A1 Deck Captain, Leverman Mechanical Dredge Operator Licensed Tug Operator 1000HP or more.	\$ 43.94	\$ 45.26
CLASS A2 Crane Operator (360 swing)	39.16	40.33
CLASS B Dozer, Front Loader Operator on Land	To conform to Operating Engineer Prevailing Wage in locality where work is being performed including benefits.	
CLASS B1 Derrick Operator (180 swing) Spider/Spill Barge Operator Operator II, Fill Placer, Engineer, Chief Mate, Electrician, Chief Welder, Maintenance Engineer Licensed Boat, Crew Boat Operator	38.00	39.14
CLASS B2 Certified Welder	35.77	36.84
CLASS C1 Drag Barge Operator, Steward, Mate, Assistant Fill Placer	34.79	35.83
CLASS C2 Boat Operator	33.67	34.68
CLASS D Shoreman, Deckhand, Oiler, Rodman, Scowman, Cook, Messman, Porter/Janitor	27.97	28.81

SUPPLEMENTAL BENEFITS

Per Hour:

THE FOLLOWING SUPPLEMENTAL BENEFITS APPLY TO ALL CATEGORIES

All Classes A & B	\$ 11.85 plus 6% of straight time wage, Overtime hours add \$ 0.63	\$ 12.00 plus 6% of straight time wage, Overtime hours add \$ 0.63
All Class C	\$ 11.60 plus 6% of straight time wage, Overtime hours add \$ 0.50	\$ 11.75 plus 6% of straight time wage, Overtime hours add \$ 0.50
All Class D	\$ 11.35 plus 6% of straight time wage, Overtime hours add \$ 0.38	\$ 11.60 plus 6% of straight time wage, Overtime hours add \$ 0.50

OVERTIME PAY

See (B2, F, R) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 15, 26) on HOLIDAY PAGE

4-25a-MarDredge

Operating Engineer - Survey Crew - Consulting Engineer

10/01/2023

JOB DESCRIPTION Operating Engineer - Survey Crew - Consulting Engineer

DISTRICT 9

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Putnam, Queens, Richmond, Suffolk, Westchester

PARTIAL COUNTIES

Dutchess: That part in Dutchess County lying South of the North City line of Poughkeepsie.

WAGES

Feasibility and preliminary design surveying, any line and grade surveying for inspection or supervision of construction.

Per hour: 07/01/2023

Survey Classifications

Party Chief	\$ 47.15
Instrument Man	39.30
Rodman	34.35

SUPPLEMENTAL BENEFITS

Per Hour:

All Crew Members: \$ 23.15

OVERTIME PAY

OVERTIME:.... See (B, E*, Q, V) ON OVERTIME PAGE.

*Double-time paid on the 9th hour on Saturday.

HOLIDAY

Paid: See (5, 6, 7, 11, 16) on HOLIDAY PAGE
Overtime: See (5, 6, 7, 11, 16) on HOLIDAY PAGE

9-15dconsult

Operating Engineer - Trenchless Pipe Rehab

10/01/2023

JOB DESCRIPTION Operating Engineer - Trenchless Pipe Rehab

DISTRICT 4

ENTIRE COUNTIES

Nassau, Suffolk

WAGES

IMPORTANT NOTE: This Category & Classifications are now located in
Operating Engineers/Heavy Highway & Laborers/ Heavy Highway.

Per Hour:	07/01/2023 (SEE)
Robotic Unit Operator	Operator(class D)
Technician/Boiler, Generator	Operator(class D)
AM Liner/Hydra Seal	Laborer(Grp#3)
Hobas Pipe, Polyethylene Pipe or Pull and Inflate Liner	Laborer(Grp#3)

OVERTIME PAY

HOLIDAY

4-138TrchPREh

Painter	10/01/2023

JOB DESCRIPTION Painter

DISTRICT 8

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Putnam, Queens, Richmond, Suffolk, Westchester

WAGES

Per hour:	07/01/2023
Brush	\$ 51.70*
Abatement/Removal of lead based or lead containing paint on materials to be repainted.	51.70*
Spray & Scaffold	\$ 54.70*
Fire Escape	54.70*
Decorator	54.70*
Paperhanger/Wall Coverer	54.48*

*Subtract \$ 0.10 to calculate premium rate.

SUPPLEMENTAL BENEFITS

Per hour:	
Paperhanger	\$ 34.60
All others	32.73
Premium	36.70**

**Applies only to "All others" category, not paperhanger journeyworker.

OVERTIME PAY

See (A, H) on OVERTIME PAGE

HOLIDAY

Paid:	See (1) on HOLIDAY PAGE
Overtime:	See (5, 6, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES

One (1) year terms at the following wage rate.

Per hour:	07/01/2023
Appr 1st term...	\$ 19.95*
Appr 2nd term...	25.56*
Appr 3rd term...	31.05*
Appr 4th term...	41.62*

*Subtract \$ 0.10 to calculate premium rate.

Supplemental benefits:

Per Hour:	
Appr 1st term...	\$ 16.06

Appr 2nd term...	19.95
Appr 3rd term...	23.02
Appr 4th term...	29.16

8-NYDC9-B/S

Painter	10/01/2023

JOB DESCRIPTION Painter

DISTRICT 8

ENTIRE COUNTIES

Putnam, Suffolk, Westchester

PARTIAL COUNTIES

Nassau: All of Nassau except the areas described below: Atlantic Beach, Ceaderhurst, East Rockaway, Gibson, Hewlett, Hewlett Bay, Hewlett Neck, Hewlett Park, Inwood, Lawrence, Lido Beach, Long Beach, parts of Lynbrook, parts of Oceanside, parts of Valley Stream, and Woodmere. Starting on the South side of Sunrise Hwy in Valley Stream running east to Windsor and Rockaway Ave., Rockville Centre is the boundary line up to Lawson Blvd. turn right going west all the above territory. Starting at Union Turnpike and Lakeville Rd. going north to Northern Blvd. the west side of Lakeville road to Northern blvd. At Northern blvd. going east the district north of Northern blvd. to Port Washington Blvd. West of Port Washington blvd. to St. Francis Hospital then north of first traffic light to Port Washington and Sands Point, Manor HAVen, Harbour Acres.

WAGES

Per hour:	07/01/2023
Drywall Taper	\$ 51.45*

*Subtract \$ 0.10 to calculate premium rate.

SUPPLEMENTAL BENEFITS

Per hour:	
Journeyman	\$ 30.88

OVERTIME PAY

See (A, H) on OVERTIME PAGE

HOLIDAY

Paid:	See (1) on HOLIDAY PAGE
Overtime:	See (5, 6, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES

Wages - Per Hour:

1500 hour terms at the following wage rate:

1st term	\$ 19.95*
2nd term	25.56*
3rd term	31.00*
4th term	41.52*

*Subtract \$ 0.10 to calculate premium rate.

Supplemental Benefits - Per hour:

One year term (1500 hours) at the following dollar amount.

1st year	\$ 15.22
2nd year	18.90
3rd year	21.81
4th year	27.58

8-NYDCT9-DWT

Painter - Bridge & Structural Steel	10/01/2023

JOB DESCRIPTION Painter - Bridge & Structural Steel

DISTRICT 8

ENTIRE COUNTIES

Albany, Bronx, Clinton, Columbia, Dutchess, Essex, Franklin, Fulton, Greene, Hamilton, Kings, Montgomery, Nassau, New York, Orange, Putnam, Queens, Rensselaer, Richmond, Rockland, Saratoga, Schenectady, Schoharie, Suffolk, Sullivan, Ulster, Warren, Washington, Westchester

WAGES

Per Hour:		
STEEL:		
Bridge Painting:	07/01/2023	10/01/2023
	\$ 54.50	\$ 56.00
	+ 10.10*	+ 10.35*

ADDITIONAL \$6.50 per hour for POWER TOOL/SPRAY, whether straight time or overtime.

NOTE: All premium wages are to be calculated on base rate per hour only.

* For the period of May 1st to November 15th, this amount is payable up to 40 hours. For the period of Nov 16th to April 30th, this amount is payable up to 50 hours. EXCEPTION: First and last week of employment, and for the weeks of Memorial Day, Independence Day and Labor Day, where the amount is paid for the actual number of hours worked (no cap).

NOTE: Generally, for Bridge Painting Contracts, ALL WORKERS on and off the bridge (including Flagmen) are to be paid Painter's Rate; the contract must be ONLY for Bridge Painting.

SHIFT WORK:

When directly specified in public agency or authority contract documents for an employer to work a second shift and works the second shift with employees other than from the first shift, all employees who work the second shift will be paid 10% of the base wage shift differential in lieu of overtime for the first eight (8) hours worked after which the employees shall be paid at time and one half of the regular wage rate. When a single irregular work shift is mandated in the job specifications or by the contracting agency, wages shall be paid at time and one half for single shifts between the hours of 3pm-11pm or 11pm-7am.

SUPPLEMENTAL BENEFITS

Per Hour:

Journeyworker:

\$ 11.78	\$ 12.43
+ 30.85*	+ 31.55*

* For the period of May 1st to November 15th, this amount is payable up to 40 hours. For the period of Nov 16th to April 30th, this amount is payable up to 50 hours. EXCEPTION: First and last week of employment, and for the weeks of Memorial Day, Independence Day and Labor Day, where the amount is paid for the actual number of hours worked (no cap).

OVERTIME PAY

See (B, F, R) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
Overtime: See (4, 6) on HOLIDAY PAGE

REGISTERED APPRENTICES

Wage - Per hour:

Apprentices: (1) year terms.

1st year	\$ 21.80 + 4.04	\$ 22.40 + 4.14
2nd year	\$ 32.70 + 6.06	\$ 33.60 + 6.21
3rd year	\$ 43.60 + 8.08	\$ 44.80 + 8.28
Supplemental Benefits - Per hour:		
1st year	\$.90 + 12.34	\$ 1.16 + 12.62
2nd year	\$ 7.07 + 18.51	\$ 7.46 + 18.93
3rd year	\$ 9.42 + 24.68	\$ 9.94 + 25.24

NOTE: All premium wages are to be calculated on base rate per hour only.

8-DC-9/806/155-BrSS

Painter - Line Striping

10/01/2023

JOB DESCRIPTION Painter - Line Striping

DISTRICT 8

ENTIRE COUNTIES

Albany, Clinton, Columbia, Dutchess, Essex, Franklin, Fulton, Greene, Hamilton, Montgomery, Nassau, Orange, Putnam, Rensselaer, Rockland, Saratoga, Schenectady, Schoharie, Suffolk, Sullivan, Ulster, Warren, Washington, Westchester

WAGES

Per hour:

Painter (Striping-Highway):	07/01/2023	01/01/2024	07/01/2024
Striping-Machine Operator*	\$ 31.53	\$ 31.53	\$ 34.12
Linerman Thermoplastic	38.34	38.34	41.12

Note: * Includes but is not limited to: Positioning of cones and directing of traffic using hand held devices. Excludes the Driver/Operator of equipment used in the maintenance and protection of traffic safety.

NOTE - The "Employer Registration" (30.1) use of a '4 Day/10 Hour Work schedules' will no longer be accepted or processed. All registered projects prior to June 30,2023 will expire within the granted time frame.

For Pre-Registered Projects Four (4), Ten (10) hour days may be worked at straight time during a week, Monday thru Thursday. Friday may be used as a make-up day. Tuesday thru Friday may be worked with no make-up day. For further clarification contact your local Bureau Office.

SUPPLEMENTAL BENEFITS

Per hour paid:

Journeyworker:

Striping Machine Operator:	\$ 10.03	\$ 22.24	\$ 23.65
Linerman Thermoplastic:	10.03	22.24	23.65

OVERTIME PAY

See (B, B2, E2, F, S) on OVERTIME PAGE

HOLIDAY

Paid: See (5, 20) on HOLIDAY PAGE

Overtime: See (5, 20) on HOLIDAY PAGE

REGISTERED APPRENTICES

One (1) year terms at the following wage rates:

1st Term:	\$ 15.00	\$ 15.00	\$ 15.00
2nd Term:	18.92	18.92	20.47
3rd Term:	25.22	25.22	27.30

Supplemental Benefits per hour:

1st term:	\$ 9.16	\$ 22.24	\$ 23.65
2nd Term:	10.03	22.24	23.65
3rd Term:	10.03	22.24	23.65

8-1456-LS

Painter - Metal Polisher

10/01/2023

JOB DESCRIPTION Painter - Metal Polisher

DISTRICT 8

ENTIRE COUNTIES

Albany, Allegany, Bronx, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Clinton, Columbia, Cortland, Delaware, Dutchess, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Herkimer, Jefferson, Kings, Lewis, Livingston, Madison, Monroe, Montgomery, Nassau, New York, Niagara, Oneida, Onondaga, Ontario, Orange, Orleans, Oswego, Otsego, Putnam, Queens, Rensselaer, Richmond, Rockland, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Suffolk, Sullivan, Tioga, Tompkins, Ulster, Warren, Washington, Wayne, Westchester, Wyoming, Yates

WAGES

	07/01/2023
Metal Polisher	\$ 38.18
Metal Polisher*	39.28
Metal Polisher**	42.18

*Note: Applies on New Construction & complete renovation

** Note: Applies when working on scaffolds over 34 feet.

SUPPLEMENTAL BENEFITS

Per Hour: 07/01/2023

Journeyworker:

All classification \$ 12.34

OVERTIME PAY

See (B, E, P, T) on OVERTIME PAGE

HOLIDAY

Paid: See (5, 6, 11, 15, 16, 25, 26) on HOLIDAY PAGE
Overtime: See (5, 6, 9, 11, 15, 16, 25, 26) on HOLIDAY PAGE

REGISTERED APPRENTICES

Wages per hour:

One (1) year term at the following wage rates:

07/01/2023

1st year	\$ 16.00
2nd year	17.00
3rd year	18.00

1st year*	\$ 16.39
2nd year*	17.44
3rd year*	18.54

1st year**	\$ 18.50
2nd year**	19.50
3rd year**	20.50

*Note: Applies on New Construction & complete renovation

** Note: Applies when working on scaffolds over 34 feet.

Supplemental benefits:

Per hour:

1st year	\$ 8.69
2nd year	8.69
3rd year	8.69

8-8A/28A-MP

Plasterer

10/01/2023

JOB DESCRIPTION Plasterer

DISTRICT 9

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk

WAGES

Per hour:

	07/01/2023	08/01/2023
Building:		
Plasterer/Traditional &	\$ 46.00	\$ 47.72
Spraying Fireproofing	+ \$5.00*	+ \$5.00*

SUPPLEMENTAL BENEFITS

Per hour:

Journeyworker	\$ 23.15	\$ 25.35

OVERTIME PAY

See (B, E, Q) on OVERTIME PAGE

*This portion is not subjected to OT premiums.

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES

	07/01/2023	08/01/2023
Wages:		
(per hour)		
800 hours term:		
1st term	\$ 25.44 + 2.75*	\$ 19.30+ 0.68*
2nd term	27.49 + 2.51*	\$ 22.53+ 0.81*
3rd term	32.38 + 3.50*	\$ 25.79+ 0.95*
4th term	34.68 + 3.75*	

*This portion is not subjected to OT premiums.

Supplemental Benefits:

(per hour):
(800) hours term:

1st term	\$ 14.70	\$ 11.59
2nd term	15.60	\$ 12.02
3rd term	17.43	\$ 12.52
4th term	18.35	

9-262

Plumber**10/01/2023**

JOB DESCRIPTION Plumber**DISTRICT 4****ENTIRE COUNTIES**

Nassau, Suffolk

WAGES

Per Hour: 07/01/2023

Plumber/

PUMP & TANK \$ 46.99

SUPPLEMENTAL BENEFITS

Per Hour:

Plumber \$ 35.39

OVERTIME PAY

See (B, B2, E2, Q, *V) on OVERTIME PAGE

(V) For Sundays & Holidays if Worked Only

HOLIDAY

Paid: See (1) on HOLIDAY PAGE

Overtime: See (5, 6, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES

One(1) Year Terms at the Following

Percentage of Journeyman's wage:

1st Term	30%
2nd Term	40%
3rd Term	50%
4th Term	60%
5th Term	70%

Supplemental Benefits Per Hour:

1st Term	\$ 23.47
2nd Term	24.11
3rd Term	24.93
4th Term	25.31
5th Term	28.54

4-200 Pump & Tank

Plumber**10/01/2023**

JOB DESCRIPTION Plumber**DISTRICT 4****ENTIRE COUNTIES**

Nassau, Suffolk

WAGES

Per Hour: 07/01/2023 11/01/2023 05/01/2024

Plumber \$ 57.23 \$ 57.98 \$ 58.98

SUPPLEMENTAL BENEFITS

Per Hour:

Plumber \$ 49.65 \$ 50.20 \$ 50.75

OVERTIME PAY

See (A, E, Q, *V) on OVERTIME PAGE

CODE "V" is only for SUNDAYS and HOLIDAYS THAT ARE WORKED

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 15, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES

One(1) Year Terms at the following percentage of Plumbers Rate:

1st	2nd	3rd	4th	5th
30%	40%	50%	60%	70%

Supplemental Benefits per hour:

	07/01/2023	11/01/2023	05/01/2024
1st Term	\$ 35.02	\$ 35.52	\$ 36.02
2nd Term	37.51	37.86	38.51
3rd Term	39.03	39.53	40.03
4th Term	40.68	41.18	41.68
5th Term	42.41	42.91	43.41

4-200

Plumber

10/01/2023

JOB DESCRIPTION Plumber

DISTRICT 4

ENTIRE COUNTIES

Nassau, Suffolk

WAGES

Per Hour:

	07/01/2023	11/01/2023	05/01/2024
Plumber			
MAINTENANCE ONLY	\$ 34.55	\$ 35.05	\$35.05

Maintenance: Correction of problem(s)with the existing fixture or group of fixtures, preventive repairs or servicing of said fixtures

SUPPLEMENTAL BENEFITS

Per Hour:

	07/01/2023	11/01/2023	05/01/2024
Plumber			
Maintenance	\$ 20.93	\$ 21.43	\$ 22.43

OVERTIME PAY

See (B, B2, J) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 15, 16) on HOLIDAY PAGE

4-200 Maintance

Roofer

10/01/2023

JOB DESCRIPTION Roofer

DISTRICT 4

ENTIRE COUNTIES

Nassau, Suffolk

WAGES

	07/01/2023
Per Hour	
ROOFER/Waterproofofer	

Total Wage \$ 55.75
to be Paid

"Base" Wage 49.25**

SUPPLEMENTAL BENEFITS

Per Hour:

ROOFER/Waterproofofer	\$ 36.36

OVERTIME PAY

Per Hour:

NEW ROOF SEE (B,E,Q)
RE-ROOF SEE (B,E,E2,Q)

** Overtime Pay to be calculated on "BASE" Wage then add \$6.50.
(Example: \$49.25 x time and one half = \$73.88 + \$6.50 = \$80.38)

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 13, *16, **25) on HOLIDAY PAGE
Note: Time and One Half the Hourly Base Rate + \$6.50 if worked.

REGISTERED APPRENTICES

(1) Year terms at the following Percentage of Roofers/Waterproofers Base Wage.

1st	2nd	3rd	4th
40%	50%	70%	80% + \$ 5.20/Hr.

Supplemental Benefits per hour:

1st Term	\$ 10.34
2nd Term	12.77
3rd Term	25.99
4th Term	29.22

4-154

Sheetmetal Worker	10/01/2023

JOB DESCRIPTION Sheetmetal Worker

DISTRICT 4

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Rockland, Suffolk, Westchester

WAGES

Per Hour: 07/01/2023

Sign Erector \$ 56.00

NOTE: Structurally Supported Overhead Highway Signs(See STRUCTURAL IRON WORKER CLASS)

SUPPLEMENTAL BENEFITS

Per Hour: 07/01/2023

Sign Erector \$ 55.66

OVERTIME PAY

See (A, F, S) on OVERTIME PAGE

HOLIDAY

Paid: See (5, 6, 10, 11, 12, 16, 25) on HOLIDAY PAGE
Overtime: See (5, 6, 10, 11, 12, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES

Per Hour:

6 month Terms at the following percentage of Sign Erectors wage rate:

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
35%	40%	45%	50%	55%	60%	65%	70%	75%	80%

SUPPLEMENTAL BENEFITS

Per Hour:

07/01/2023

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
\$ 14.95	\$ 16.95	\$ 18.93	\$ 20.93	\$ 28.56	\$ 31.05	\$ 33.57	\$ 36.05	\$ 38.56	\$ 41.05

4-137-SE

Sheetmetal Worker	10/01/2023

JOB DESCRIPTION Sheetmetal Worker

DISTRICT 4

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk

WAGES

Per Hour: 7/01/2023 11/01/2023
Additional
Sheetmetal Worker \$ 59.94 \$ 3.00/Hr.*

Maintenance of Fans \$ 47.95
Temporary Operation

(*)To be allocated at a later date.

SUPPLEMENTAL BENEFITS

Per Hour:

Sheetmetal Worker \$ 51.16

Maintenance Worker \$ 51.16

OVERTIME PAY

See (B, E, E2, Q, V) on OVERTIME PAGE

For Maintenance See Codes B,E, Q & V

HOLIDAY

Paid: See (1) on HOLIDAY PAGE

Overtime: See (5, 6, 11, 15, 16, 25, 26) on HOLIDAY PAGE

REGISTERED APPRENTICES

Per Hour:Wages

Six(6) Month Terms As Follows:

1st & 2nd Term	\$ 20.85
3rd & 4th Term	26.87
5th & 6th Term	32.89
7th & 8th Term	41.94
9th Term	47.53

Per Hour: Supplemental Benefits

1st & 2nd Term	\$ 19.02
3rd & 4th Term	25.90
5th & 6th Term	30.55
7th & 8th Term	37.49
9th Term	42.14

4-28

Steamfitter

10/01/2023

JOB DESCRIPTION Steamfitter

DISTRICT 4

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk

WAGES

Per Hour:	07/01/2023	01/01/2024 Additional	07/01/2024 Additional

AC Service/Heat Service & Refrigeration	\$ 44.85	\$1.25/Hr.*	\$1.25/Hr.*

(*)To be allocated at a later date.

Refrigeration, A/C, Oil Burner and Stoker Service and Repair.

NOTE: Refrigeration Compressor installation. (Not to exceed 5 Hp combined on any one project).

NOTE: Air Condition / Heating Compressor installation.(Not to exceed 15 tons combined on any one project).

SUPPLEMENTAL BENEFITS

Per Hour Worked:

AC Service/Heat Service	\$ 20.71
Per Hour Paid:	17.65

OVERTIME PAY

See (B, E, Q) on OVERTIME PAGE

HOLIDAY

Paid: See (5, 6, 11, 15, 25, 26) on HOLIDAY PAGE

REGISTERED APPRENTICES

1 year terms
Wages per hour:

1st Term	\$ 21.71
2nd Term	26.21
3rd Term	30.53
4th Term	36.87

Benefits per hour Worked:

Per Hour Paid:		Per Hour Paid:
1st Term	\$ 14.20	\$ 11.14
2nd Term	14.57	12.48
3rd Term	15.91	13.38
4th Term	17.72	15.77

4-638B-StmFtrRef

Steamfitter	10/01/2023

JOB DESCRIPTION Steamfitter

DISTRICT 4

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk

WAGES

Per Hour: 07/01/2023

Sprinkler/Steam \$ 69.11
AC/Heat Fitter

Temporary 52.54
Heat & AC
Fitter

Note: Add 15% to Hourly Wage for "Contracting Agency" Mandated Off Shift Work.

SUPPLEMENTAL BENEFITS

Per Hour:

Sprinkler/Steam \$ 53.24
Fitter

Temporary 43.67
Heat & AC
Fitter

Note: Add 15% to Hourly Benefit for "Contracting Agency" Mandated Off Shift Work.

OVERTIME PAY

Note: The posted overtime rates are applicable after 8 hours plus Saturday, Sunday and Holidays on Fire Protection/Sprinkler contracts under \$3,000,000.00 and HVAC/Mechanical contracts under \$30,000,000.00:

Sprinkler/Steam	Wages \$ 138.22	Benefit \$ 106.48
Temp Heat/AC	Wages \$ 105.08	Benefit \$ 87.34

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES

1 year Terms at the Following:

WAGES per hour:

1st Term	2nd Term	3rd Term	4th Term	5th Term
\$ 27.68	\$ 34.59	\$ 41.49	\$ 48.40	\$ 55.30

SUPPLEMENTAL BENEFIT per hour:

1st Term	2nd Term	3rd Term	4th Term	5th Term
\$ 21.80	\$ 27.05	\$ 32.28	\$ 37.53	\$ 42.76

Premium Time Amounts:

43.60	54.10	64.56	75.06	85.52

4-638A-StmSpFtr

Teamster - Asphalt Delivery**10/01/2023**

JOB DESCRIPTION Teamster - Asphalt Delivery**DISTRICT** 4**ENTIRE COUNTIES**

Nassau, Suffolk

WAGES

Per Hour:

Heavy Construction Work:

Shall include the supply of Asphalt for construction, improvement and modification of all or any part of Streets, Highways, Bridges, Tunnels, Railroads, Canals, Dams, Airports, Schools, Power Generation Plants, where distance between project and asphalt plant is not more than 50 miles.

TRUCK DRIVER

07/01/2023

Asphalt Delivery

\$ 41.255

Light Construction Work:

Shall include the supply of Asphalt for construction of Single & Multi Family Homes, Town Houses, Apartment Buildings, including Driveways, Streets and Curbs within those projects. Parking Lots, Office Buildings, where distance between project and asphalt plant is not more than 50 miles.

TRUCK DRIVER

Asphalt Delivery

\$ 35.99

SUPPLEMENTAL BENEFITS

Per Hour:

Heavy Construction Work

TRUCK DRIVER

Asphalt Delivery

\$ 50.3125

Light Construction Work

TRUCK DRIVER

Asphalt Delivery

\$ 13.05

OVERTIME PAY

See (B, *B2, E, **I, P, R, T, ***U) on OVERTIME PAGE

(NOTE) PREMIUM PAY of 25% on straight time hours for New York State D.O.T. and or other GOVERNMENTAL MANDATED off shift work.

Note: (B,E,P,T&*U) Apply to Heavy Construction.

Note: (B2,I,T&*U) Apply to Light Construction.

Note: (*U) Only applies after 8 hours worked on holiday.

HOLIDAY

Paid: See (1) on HOLIDAY PAGE

Overtime: See (5, 6, *16, **25) on HOLIDAY PAGE

NOTE: (*16) Paid at Double if Worked; (**25) Paid at Double if Worked.

4-282

Teamster - Building**10/01/2023**

JOB DESCRIPTION Teamster - Building**DISTRICT** 4**ENTIRE COUNTIES**

Nassau, Suffolk

WAGES

Per Hour:

Truck Driver (Building Demolition & Debris, Cesspool & Leachate Pumping)

07/01/2023

Trailers

\$ 35.77

Straight Jobs

\$ 35.47

SUPPLEMENTAL BENEFITS

Per Hour:

All Classifications

\$ 38.85

OVERTIME PAY

See (B, E, S1) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE

Overtime: See (5, 6, 8, 11, 12, 15, 25, 26) on HOLIDAY PAGE

4-282

Teamster - Delivery of Concrete

10/01/2023

JOB DESCRIPTION Teamster - Delivery of Concrete

DISTRICT 4

ENTIRE COUNTIES

Nassau, Suffolk

WAGES

Per Hour:

Heavy Construction Work:

Shall Include the supply of Ready-Mix Concrete for construction, improvement and modification of all or any part of Streets, Highways, Bridges, Tunnels, Railroads, Canals, Dams, Airports, Schools & Power Generation Plants, where distance between project and asphalt plant is not more than 50 miles.

TRUCK DRIVER

07/01/2023

Concrete Delivery

\$ 40.005

Light Construction Work:

Shall include the supply of Ready-Mix Concrete for construction of Single & Multi Family Homes, Town Houses, Apartment Buildings, including Driveways, Streets and Curbs within those projects. Parking Lots and Office Buildings, where distance between project and asphalt plant is not more than 50 miles.

TRUCK DRIVER

Concrete Delivery

36.815

SUPPLEMENTAL BENEFITS

Per Hour:

Heavy Construction Work

Concrete Delivery

\$ 45.475

Light Construction Work

Concrete Delivery

15.355

OVERTIME PAY

NOTE: Heavy Construction:B2,I

Light Construction:B,E,P

HOLIDAY

Paid: See (1) on HOLIDAY PAGE

Overtime: See (5, 6, *16, **25) on HOLIDAY PAGE

NOTE:(*16) Paid at Double if Worked. (**25) Paid at Double if Worked.

4-282ns

Teamster - Heavy&Highway

10/01/2023

JOB DESCRIPTION Teamster - Heavy&Highway

DISTRICT 4

ENTIRE COUNTIES

Nassau, Suffolk

WAGES

Per Hour:

Heavy Construction Work:

Shall include the construction, improvement or modification of all or any part of Streets, Highways, Bridges, Tunnels, Railroads, Canals, Dams, Airports, Schools, Power Generation Plants.

07/01/2023

Site Excavating
 (Chauffeurs) \$ 41.255

Light Construction Work:

Shall include the construction, improvement and modification of Single & Multi Family Homes, Town Houses, Apartment Buildings, including Driveways, Streets and Curbs within those projects. Parking Lots and Office Buildings.

Site Excavating
 (Chauffeurs) \$ 35.99

SUPPLEMENTAL BENEFITS

Per Hour:

Heavy Construction Work
 Chauffeurs \$ 50.3125

Light Construction Work
 Chauffeurs \$ 13.05

OVERTIME PAY

See (B, *B2, E, **I, P, ***R, ****U) on OVERTIME PAGE

(NOTE) PREMIUM PAY of 25% on straight time hours for NEW YORK STATE D.O.T. and or other GOVERNMENTAL MANDATED off shift work.

Note: (B,E,P,T & *U) Apply to Heavy Construction.

Note: (B2,I,T & *U) Apply to Light Construction.

Note: (*U) Only applies after 8 hours work on holiday

HOLIDAY

Paid: See (1) on HOLIDAY PAGE

Overtime: See (5, 6, *16, **25) on HOLIDAY PAGE

NOTE:(*16) Paid at Double if Worked. (**25) Paid at Double if Worked.

4-282

Welder	10/01/2023

JOB DESCRIPTION Welder

DISTRICT 1

ENTIRE COUNTIES

Albany, Allegany, Bronx, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Clinton, Columbia, Cortland, Delaware, Dutchess, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Herkimer, Jefferson, Kings, Lewis, Livingston, Madison, Monroe, Montgomery, Nassau, New York, Niagara, Oneida, Onondaga, Ontario, Orange, Orleans, Oswego, Otsego, Putnam, Queens, Rensselaer, Richmond, Rockland, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Suffolk, Sullivan, Tioga, Tompkins, Ulster, Warren, Washington, Wayne, Westchester, Wyoming, Yates

WAGES

Per hour 07/01/2023

Welder: To be paid the same rate of the mechanic performing the work.*

*EXCEPTION: If a specific welder certification is required, then the 'Certified Welder' rate in that trade tag will be paid.

OVERTIME PAY

HOLIDAY

1-As Per Trade

Overtime Codes

Following is an explanation of the code(s) listed in the OVERTIME section of each classification contained in the attached schedule. Additional requirements may also be listed in the HOLIDAY section.

NOTE: Supplemental Benefits are 'Per hour worked' (for each hour worked) unless otherwise noted

- (AA) Time and one half of the hourly rate after 7 and one half hours per day
- (A) Time and one half of the hourly rate after 7 hours per day
- (B) Time and one half of the hourly rate after 8 hours per day
- (B1) Time and one half of the hourly rate for the 9th & 10th hours week days and the 1st 8 hours on Saturday.
Double the hourly rate for all additional hours
- (B2) Time and one half of the hourly rate after 40 hours per week
- (C) Double the hourly rate after 7 hours per day
- (C1) Double the hourly rate after 7 and one half hours per day
- (D) Double the hourly rate after 8 hours per day
- (D1) Double the hourly rate after 9 hours per day
- (E) Time and one half of the hourly rate on Saturday
- (E1) Time and one half 1st 4 hours on Saturday; Double the hourly rate all additional Saturday hours
- (E2) Saturday may be used as a make-up day at straight time when a day is lost during that week due to inclement weather
- (E3) Between November 1st and March 3rd Saturday may be used as a make-up day at straight time when a day is lost during that week due to inclement weather, provided a given employee has worked between 16 and 32 hours that week
- (E4) Saturday and Sunday may be used as a make-up day at straight time when a day is lost during that week due to inclement weather
- (E5) Double time after 8 hours on Saturdays
- (F) Time and one half of the hourly rate on Saturday and Sunday
- (G) Time and one half of the hourly rate on Saturday and Holidays
- (H) Time and one half of the hourly rate on Saturday, Sunday, and Holidays
- (I) Time and one half of the hourly rate on Sunday
- (J) Time and one half of the hourly rate on Sunday and Holidays
- (K) Time and one half of the hourly rate on Holidays
- (L) Double the hourly rate on Saturday
- (M) Double the hourly rate on Saturday and Sunday
- (N) Double the hourly rate on Saturday and Holidays
- (O) Double the hourly rate on Saturday, Sunday, and Holidays
- (P) Double the hourly rate on Sunday
- (Q) Double the hourly rate on Sunday and Holidays
- (R) Double the hourly rate on Holidays
- (S) Two and one half times the hourly rate for Holidays

- (S1) Two and one half times the hourly rate the first 8 hours on Sunday or Holidays One and one half times the hourly rate all additional hours.
- (T) Triple the hourly rate for Holidays
- (U) Four times the hourly rate for Holidays
- (V) Including benefits at SAME PREMIUM as shown for overtime
- (W) Time and one half for benefits on all overtime hours.
- (X) Benefits payable on Paid Holiday at straight time. If worked, additional benefit amount will be required for worked hours. (Refer to other codes listed.)

Holiday Codes

PAID Holidays:

Paid Holidays are days for which an eligible employee receives a regular day's pay, but is not required to perform work. If an employee works on a day listed as a paid holiday, this remuneration is in addition to payment of the required prevailing rate for the work actually performed.

OVERTIME Holiday Pay:

Overtime holiday pay is the premium pay that is required for work performed on specified holidays. It is only required where the employee actually performs work on such holidays. The applicable holidays are listed under HOLIDAYS: OVERTIME. The required rate of pay for these covered holidays can be found in the OVERTIME PAY section listings for each classification.

Following is an explanation of the code(s) listed in the HOLIDAY section of each classification contained in the attached schedule. The Holidays as listed below are to be paid at the wage rates at which the employee is normally classified.

- (1) None
- (2) Labor Day
- (3) Memorial Day and Labor Day
- (4) Memorial Day and July 4th
- (5) Memorial Day, July 4th, and Labor Day
- (6) New Year's, Thanksgiving, and Christmas
- (7) Lincoln's Birthday, Washington's Birthday, and Veterans Day
- (8) Good Friday
- (9) Lincoln's Birthday
- (10) Washington's Birthday
- (11) Columbus Day
- (12) Election Day
- (13) Presidential Election Day
- (14) 1/2 Day on Presidential Election Day
- (15) Veterans Day
- (16) Day after Thanksgiving
- (17) July 4th
- (18) 1/2 Day before Christmas
- (19) 1/2 Day before New Years
- (20) Thanksgiving
- (21) New Year's Day
- (22) Christmas
- (23) Day before Christmas
- (24) Day before New Year's
- (25) Presidents' Day
- (26) Martin Luther King, Jr. Day
- (27) Memorial Day
- (28) Easter Sunday

(29) Juneteenth

New York State Department of Labor - Bureau of Public Work
State Office Building Campus
Building 12 - Room 130
Albany, New York 12226

REQUEST FOR WAGE AND SUPPLEMENT INFORMATION

As Required by Articles 8 and 9 of the NYS Labor Law

Fax (518) 485-1870 or mail this form for new schedules or for determination for additional occupations.

This Form Must Be Typed

Submitted By:

(Check Only One)

☐

Contracting Agency

☐

Architect or Engineering Firm

☐

Public Work District Office

Date:

A. Public Work Contract to be let by: (Enter Data Pertaining to Contracting/Public Agency)

1. Name and complete address ☐ (Check if new or change)

Telephone

Fax

E-Mail:

2. NY State Units (see Item 5).

☐ 01 DOT

☐ 02 OGS

☐ 03 Dormitory Authority

☐ 04 State University
Construction Fund

☐ 05 Mental Hygiene
Facilities Corp.

☐ 06 OTHER N.Y. STATE UNIT

☐ 07 City

☐ 08 Local School District

☐ 09 Special Local District, i.e.,
Fire, Sewer, Water District

☐ 10 Village

☐ 11 Town

☐ 12 County

☐ 13 Other Non-N.Y. State
(Describe)

3. SEND REPLY TO ☐ (check if new or change)
Name and complete address:

Telephone

Fax

E-Mail:

4. SERVICE REQUIRED. Check appropriate box and provide project information.

☐ New Schedule of Wages and Supplements.

APPROXIMATE BID DATE :

☐ Additional Occupation and/or Redetermination

PRC NUMBER ISSUED PREVIOUSLY FOR
THIS PROJECT :

OFFICE USE ONLY

B. PROJECT PARTICULARS

5. Project Title _____

Description of Work _____

Contract Identification Number _____

Note: For NYS units, the OSC Contract No. _____

6. Location of Project:
Location on Site _____

Route No/Street Address _____

Village or City _____

Town _____

County _____

7. Nature of Project - Check One:

☐

1. New Building

☐

2. Addition to Existing Structure

☐

3. Heavy and Highway Construction (New and Repair)

☐

4. New Sewer or Waterline

☐

5. Other New Construction (Explain)

☐

6. Other Reconstruction, Maintenance, Repair or Alteration

☐

7. Demolition

☐

8. Building Service Contract

8. OCCUPATION FOR PROJECT :

☐ Construction (Building, Heavy
Highway/Sewer/Water)

☐ Tunnel

☐ Residential

☐ Landscape Maintenance

☐ Elevator maintenance

☐ Exterminators, Fumigators

☐ Fire Safety Director, NYC Only

☐ Fuel Delivery

☐ Guards, Watchmen

☐ Janitors, Porters, Cleaners,
Elevator Operators

☐ Moving furniture and
equipment

☐ Trash and refuse removal

☐ Window cleaners

☐ Other (Describe)

9. Does this project comply with the Wicks Law involving separate bidding? YES ☐ NO ☐

10. Name and Title of Requester

Signature



NEW YORK STATE DEPARTMENT OF LABOR
Bureau of Public Work - Debarment List

**LIST OF EMPLOYERS INELIGIBLE TO BID ON OR BE
AWARDED ANY PUBLIC WORK CONTRACT**

Under Article 8 and Article 9 of the NYS Labor Law, a contractor, sub-contractor and/or its successor shall be debarred and ineligible to submit a bid on or be awarded any public work or public building service contract/sub-contract with the state, any municipal corporation or public body for a period of five (5) years from the date of debarment when:

- Two (2) final determinations have been rendered within any consecutive six-year (6) period determining that such contractor, sub-contractor and/or its successor has WILLFULLY failed to pay the prevailing wage and/or supplements;
- One (1) final determination involves falsification of payroll records or the kickback of wages and/or supplements.

The agency issuing the determination and providing the information, is denoted under the heading 'Fiscal Officer'. DOL = New York State Department of Labor; NYC = New York City Comptroller's Office; AG = New York State Attorney General's Office; DA = County District Attorney's Office.

Debarment Database: To search for contractors, sub-contractors and/or their successors debarred from bidding or being awarded any public work contract or subcontract under NYS Labor Law Articles 8 and 9, or under NYS Workers' Compensation Law Section 141-b, access the database at this link: <https://apps.labor.ny.gov/EDList/searchPage.do>

For inquiries where WCB is listed as the "Agency", please call 1-866-546-9322

NYSDOL Bureau of Public Work Debarment List 10/17/2023

Article 8

AGENCY	Fiscal Officer	FEIN	EMPLOYER NAME	EMPLOYER DBA NAME	ADDRESS	DEBARMENT START DATE	DEBARMENT END DATE
DOL	DOL	*****5754	0369 CONTRACTORS, LLC		515 WEST AVE UNIT PH 13NORWALK CT 06850	05/12/2021	05/12/2026
DOL	DOL	*****4018	ADIRONDACK BUILDING RESTORATION INC.		4156 WILSON ROAD EAST TABERG NY 13471	03/26/2019	03/26/2024
DOL	AG	*****1812	ADVANCED BUILDERS & LAND DEVELOPMENT, INC.		400 OSER AVE #2300HAUPPAUGE NY 11788	09/11/2019	09/11/2024
DOL	DOL	*****1687	ADVANCED SAFETY SPRINKLER INC		261 MILL ROAD P.O BOX 296EAST AURORA NY 14052	05/29/2019	05/29/2024
DOL	NYC		ALL COUNTY SEWER & DRAIN, INC.		7 GREENFIELD DR WARWICK NY 10990	03/25/2022	03/25/2027
DOL	NYC		AMJED PARVEZ		401 HANOVER AVENUE STATEN ISLAND NY 10304	01/11/2021	01/11/2026
DOL	DOL		ANGELO F COKER		2610 SOUTH SALINA STREET SUITE 14SYRACUSE NY 13205	09/17/2020	09/17/2025
DOL	DOL		ANGELO F COKER		2610 SOUTH SALINA STREET SUITE 14SYRACUSE NY 13205	12/04/2018	12/04/2023
DOL	DOL		ANGELO GARCIA		515 WEST AVE UNIT PH 13NORWALK CT 06850	05/12/2021	05/12/2026
DOL	DOL		ANGELO TONDO		449 WEST MOMBSHA ROAD MONROE NY 10950	06/06/2022	06/06/2027
DOL	DOL		ANITA SALERNO		158 SOLAR ST SYRACUSE NY 13204	01/07/2019	01/07/2024
DOL	DOL	*****4231	ANKER'S ELECTRIC SERVICE, INC.		10 SOUTH 5TH ST LOCUST VALLEY NY 11560	09/26/2022	09/26/2027
DOL	NYC		ARADCO CONSTRUCTION CORP		115-46 132RD ST SOUTH OZONE PARK NY 11420	09/17/2020	09/17/2025
DOL	DOL		ARNOLD A. PAOLINI		1250 BROADWAY ST BUFFALO NY 14212	02/03/2020	02/03/2025
DOL	NYC		ARSHAD MEHMOOD		168-42 88TH AVENUE JAMAICA NY 11432	11/20/2019	11/20/2024
DOL	NYC	*****2591	AVI 212 INC.		260 CROPEY AVENUE APT 11GBROOKLYN NY 11214	10/30/2018	10/30/2023
DOL	NYC		AVM CONSTRUCTION CORP		117-72 123RD ST SOUTH OZONE PARK NY 11420	09/17/2020	09/17/2025
DOL	NYC		AZIDABEGUM		524 MCDONALD AVENUE BROOKLYN NY 11218	09/17/2020	09/17/2025
DOL	DOL	*****8421	B & B DRYWALL, INC		206 WARREN AVE APT 1WHITE PLAINS NY 10603	12/14/2021	12/14/2026
DOL	NYC		BALWINDER SINGH		421 HUDSON ST SUITE C5NEW YORK NY 10014	02/20/2019	02/20/2024
DOL	NYC	*****8416	BEAM CONSTRUCTION, INC.		50 MAIN ST WHITE PLAINS NY 10606	01/04/2019	01/04/2024
DOL	DOL		BERNARD BEGLEY		38 LONG RIDGE ROAD BEDFORD NY 10506	12/18/2019	12/18/2024
DOL	NYC	*****2113	BHW CONTRACTING, INC.		401 HANOVER AVENUE STATEN ISLAND NY 10304	01/11/2021	01/11/2026
DOL	DOL	*****3627	BJB CONSTRUCTION CORP.		38 LONG RIDGE ROAD BEDFORD NY 10506	12/18/2019	12/18/2024
DOL	DOL	*****4512	BOB BRUNO EXCAVATING, INC		5 MORNINGSIDE DR AUBURN NY 13021	05/28/2019	05/28/2024
DOL	DOL		BOGDAN MARKOVSKI		370 W. PLEASANTVIEW AVE SUITE 2.329HACKENSACK NJ 07601	02/11/2019	02/11/2024
DOL	DOL		BRADLEY J SCHUKA		4 BROTHERS ROAD WAPPINGERS FALLS NY 12590	10/20/2020	10/20/2025
DOL	DOL	*****9383	C.C. PAVING AND EXCAVATING, INC.		2610 SOUTH SALINA ST SUITE 12SYRACUSE NY 13205	09/17/2020	09/17/2025
DOL	DOL	*****9383	C.C. PAVING AND EXCAVATING, INC.		2610 SOUTH SALINA ST SUITE 12SYRACUSE NY 13205	12/04/2018	12/04/2023
DOL	DOL	*****4083	C.P.D. ENTERPRISES, INC		P.O BOX 281 WALDEN NY 12586	03/03/2020	03/03/2025
DOL	DOL	*****5161	CALADRI DEVELOPMENT CORP.		1223 PARK ST. PEEKSKILL NY 10566	05/17/2021	05/17/2026
DOL	DOL	*****3391	CALI ENTERPRISES, INC.		1223 PARK STREET PEEKSKILL NY 10566	05/17/2021	05/17/2026
DOL	NYC		CALVIN WALTERS		465 EAST THIRD ST MT. VERNON NY 10550	09/09/2019	09/09/2024
DOL	AG	*****7247	CENTURY CONCRETE CORP		2375 RAYNOR ST RONKONKOMA NY 11779	08/04/2021	08/04/2026

NYSDOL Bureau of Public Work Debarment List 10/17/2023

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DOL	DOL	*****0026	CHANTICLEER CONSTRUCTION LLC		4 BROTHERS ROAD WAPPINGERS FALLS NY 12590	10/20/2020	10/20/2025
DOL	NYC		CHARLES ZAHRADKA		863 WASHINGTON STREET FRANKLIN SQUARE NY 11010	03/10/2020	03/10/2025
DOL	DOL		CHRISTOPHER GRECO		26 NORTH MYRTLE AVENUE SPRING VALLEY NY 10956	02/18/2021	02/18/2026
DOL	DOL		CHRISTOPHER PAPASTEFANOU A/K/A CHRIS PAPASTEFANOU		1445 COMMERCE AVE BRONX NY 10461	05/30/2019	05/30/2024
DOL	DOL		CRAIG JOHANSEN		10 SOUTH 5TH ST LOCUST VALLEY NY 11560	09/26/2022	09/26/2027
DOL	DOL	*****3228	CROSS-COUNTY LANDSCAPING AND TREE SERVICE, INC.	ROCKLAND TREE SERVICE	26 NORTH MYRTLE AVENUE SPRING VALLEY NY 10956	02/18/2021	02/18/2026
DOL	DOL	*****2524	CSI ELECTRICAL & MECHANICAL INC		42-32 235TH ST DOUGLSTON NY 11363	01/14/2019	01/14/2024
DOL	DOL	*****7619	DANCO CONSTRUCTION UNLIMITED INC.		485 RAFT AVENUE HOLBROOK NY 11741	10/19/2021	10/19/2026
DOL	DOL		DANIEL ROBERT MCNALLY		7 GREENFIELD DRIVE WARWICK NY 10990	03/25/2022	03/25/2027
DOL	DOL		DARIAN L COKER		2610 SOUTH SALINA ST SUITE 2CSYRACUSE NY 13205	09/17/2020	09/17/2025
DOL	DOL		DARIAN L COKER		2610 SOUTH SALINA ST SUITE 2CSYRACUSE NY 13205	12/04/2018	12/04/2023
DOL	NYC		DAVID WEINER		14 NEW DROP LANE 2ND FLOORSTATEN ISLAND NY 10306	11/14/2019	11/14/2024
DOL	DOL		DELPHI PAINTING & DECORATING CO INC		1445 COMMERCE AVE BRONX NY 10461	05/30/2019	05/30/2024
DOL	DOL	*****5175	EAGLE MECHANICAL AND GENERAL CONSTRUCTION LLC		11371 RIDGE RD WOLCOTT NY 14590	02/03/2020	02/03/2025
DOL	AG		EDWIN HUTZLER		23 NORTH HOWELLS RD BELLPORT NY 11713	08/04/2021	08/04/2026
DOL	DA		EDWIN HUTZLER		2375 RAYNOR STREET RONKONKOMA NY 11779	08/04/2021	08/04/2026
DOL	DOL	*****0780	EMES HEATING & PLUMBING CONTR		5 EMES LANE MONSEY NY 10952	01/20/2002	01/20/3002
DOL	NYC	*****5917	EPOCH ELECTRICAL, INC		97-18 50TH AVE CORONA NY 11368	04/19/2018	04/19/2024
DOL	DOL		FAIGY LOWINGER		11 MOUNTAIN RD 28 VAN BUREN DRMONROE NY 10950	03/20/2019	03/20/2024
DOL	DA		FREDERICK HUTZLER		2375 RAYNOR STREET RONKONKOMA NY 11779	08/04/2021	08/04/2026
DOL	NYC	*****6616	G & G MECHANICAL ENTERPRISES, LLC.		1936 HEMPSTEAD TURNPIKE EAST MEDOW NY 11554	11/29/2019	11/29/2024
DOL	DOL		GABRIEL FRASSETTI			04/10/2019	04/10/2024
DOL	NYC		GAYATRI MANGRU		21 DAREWOOD LANE VALLEY STREAM NY 11581	09/17/2020	09/17/2025
DOL	DOL		GEOFF CORLETT		415 FLAGGER AVE #302STUART FL 34994	10/31/2018	10/31/2023
DOL	DA		GEORGE LUCEY		150 KINGS STREET BROOKLYN NY 11231	01/19/1998	01/19/2998
DOL	DOL		GIGI SCHNECKENBURGER		261 MILL RD EAST AURORA NY 14052	05/29/2019	05/29/2024
DOL	DA		GIOVANNA TRAVALJA		3735 9TH ST LONG ISLAND CITY NY 11101	01/05/2023	01/05/2028
DOL	DOL		HANS RATH		24 ELDOR AVENUE NEW CITY NY 10956	02/03/2020	02/03/2025
DOL	DOL		HERBERT CLEMEN		42 FOWLER AVENUE CORTLAND MANOR NY 10567	01/24/2023	01/24/2028
DOL	DOL		HERBERT CLEMEN		42 FOWLER AVENUE CORTLAND MANOR NY 10567	10/25/2022	10/25/2027
DOL	DOL		IRENE KASELIS		32 PENNINGTON AVE WALDWICK NJ 07463	05/30/2019	05/30/2024
DOL	DOL	*****9211	J. WASE CONSTRUCTION CORP.		8545 RT 9W ATHENS NY 12015	03/09/2021	03/09/2026
DOL	DOL		J.M.J CONSTRUCTION		151 OSTRANDER AVENUE SYRACUSE NY 13205	11/21/2022	11/21/2027
DOL	DOL		J.R. NELSON CONSTRUCTION		531 THIRD STREET ALBANY NY 12206	12/22/2022	12/22/2027
DOL	DOL		J.R. NELSON CONSTRUCTION		531 THIRD STREET ALBANY NY 12206	10/25/2022	10/25/2027

NYSDOL Bureau of Public Work Debarment List 10/17/2023

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DOL	DOL		J.R. NELSON, LLC		531 THIRD STREET ALBANY NY 12206	12/22/2022	12/22/2027
DOL	DOL		J.R. NELSON, LLC		531 THIRD STREET ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL		J.R.N COMPANIES, LLC		531 THIRD STREET ALBANY NY 12206	12/12/2022	12/12/2027
DOL	DOL		J.R.N COMPANIES, LLC		531 THIRD STREET ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL	*****1147	J.R.N. CONSTRUCTION, LLC		531 THIRD ST ALBANY NY 12206	12/22/2022	12/22/2027
DOL	DOL	*****1147	J.R.N. CONSTRUCTION, LLC		531 THIRD ST ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL		JAMES J. BAKER		7901 GEE ROAD CANASTOTA NY 13032	08/17/2021	08/17/2026
DOL	DOL		JASON P. RACE		3469 STATE RT. 69 PERISH NY 13131	09/29/2021	09/29/2026
DOL	DOL		JASON P. RACE		3469 STATE RT. 69 PERISH NY 13131	02/09/2022	02/09/2027
DOL	DOL		JASON P. RACE		3469 STATE RT. 69 PERISH NY 13131	11/15/2022	11/15/2027
DOL	DOL		JASON P. RACE		3469 STATE RT. 69 PERISH NY 13131	03/01/2022	03/01/2027
DOL	DOL	*****7993	JBS DIRT, INC.		7901 GEE ROAD CANASTOTA NY 13032	08/17/2021	08/17/2026
DOL	DOL	*****2435	JEFFEL D. JOHNSON	JMJ7 AND SON	5553 CAIRNSTRAIL CLAY NY 13041	11/21/2022	11/21/2027
DOL	DOL		JEFFEL JOHNSON ELITE CARPENTER REMODEL AND CONSTRUCTION		C2 EVERGREEN CIRCLE LIVERPOOL NY 13090	11/21/2022	11/21/2027
DOL	DOL	*****2435	JEFFREY M. JOHNSON	JMJ7 AND SON	5553 CAIRNS TRAIL CLAY NY 13041	11/21/2022	11/21/2027
DOL	NYC		JENNIFER GUERRERO		1936 HEMPSTEAD TURNPIKE EAST MEADOW NY 11554	11/29/2019	11/29/2024
DOL	DOL		JIM PLAUGHER		17613 SANTE FE LINE ROAD WAYNEFIELD OH 45896	07/16/2021	07/16/2026
DOL	DOL		JMJ7 & SON CONSTRUCTION, LLC		5553 CAIRNS TRAIL LIVERPOOL NY 13041	11/21/2022	11/21/2027
DOL	DOL		JMJ7 AND SONS CONTRACTORS		5553 CAIRNS TRAIL CLAY NY 13041	11/21/2022	11/21/2027
DOL	DOL		JMJ7 CONTRACTORS		7014 13TH AVENUE BROOKLYN NY 11228	11/21/2022	11/21/2027
DOL	DOL		JMJ7 CONTRACTORS AND SONS		5553 CAIRNS TRAIL CLAY NY 13041	11/21/2022	11/21/2027
DOL	DOL		JMJ7 CONTRACTORS, LLC		5553 CAIRNS TRAIL CLAY NY 13041	11/21/2022	11/21/2027
DOL	DOL		JOHN GOCEK		14B COMMERCIAL AVE ALBANY NY 12065	11/14/2019	11/14/2024
DOL	DOL		JOHN MARKOVIC		47 MANDON TERRACE HAWTHORN NJ 07506	03/29/2021	03/29/2026
DOL	DOL		JOHN WASE		8545 RT 9W ATHENS NY 12015	03/09/2021	03/09/2026
DOL	DOL		JON E DEYOUNG		261 MILL RD P.O BOX 296EAST AURORA NY 14052	05/29/2019	05/29/2024
DOL	DOL		JORGE RAMOS		8970 MIKE GARCIA DR MANASSAS VA 20109	07/16/2021	07/16/2026
DOL	DOL		JORI PEDERSEN		415 FLAGER AVE #302STUART FL 34994	10/31/2018	10/31/2023
DOL	DOL		JOSEPH K. SALERNO		1010 TILDEN AVE UTICA NY 13501	07/24/2023	07/24/2028
DOL	DOL		JOSEPH K. SALERNO II		1010 TILDEN AVE UTICA NY 13501	07/24/2023	07/24/2028
DOL	DOL	*****5116	JP RACE PAINTING, INC. T/A RACE PAINTING		3469 STATE RT. 69 PERISH NY 13131	02/09/2022	02/09/2027
DOL	DOL	*****5116	JP RACE PAINTING, INC. T/A RACE PAINTING		3469 STATE RT. 69 PERISH NY 13131	11/15/2022	11/15/2027
DOL	DOL	*****5116	JP RACE PAINTING, INC. T/A RACE PAINTING		3469 STATE RT. 69 PERISH NY 13131	09/29/2021	09/29/2026
DOL	DOL	*****5116	JP RACE PAINTING, INC. T/A RACE PAINTING		3469 STATE RT. 69 PERISH NY 13131	03/01/2022	03/01/2027
DOL	DOL	*****5116	JP RACE PAINTING, INC. T/A RACE PAINTING		3469 STATE RT. 69 PERISH NY 13131	03/01/2022	03/01/2027
DOL	DOL	*****1147	JRN CONSTRUCTION, LLC		531 THIRD STREET ALBANY NY 12206	10/25/2022	10/25/2027

NYSDOL Bureau of Public Work Debarment List 10/17/2023

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DOL	DOL	****1147	JRN CONSTRUCTION, LLC		531 THIRD STREET ALBANY NY 12206	12/22/2022	12/22/2027
DOL	DOL		JRN PAVING, LLC		531 THIRD STREET ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL		JRN PAVING, LLC		531 THIRD STREET ALBANY NY 12206	12/22/2022	12/22/2027
DOL	DOL		JULIUS AND GITA BEHREND		5 EMES LANE MONSEY NY 10952	11/20/2002	11/20/3002
DOL	DOL		KARIN MANGIN		796 PHELPS ROAD FRANKLIN LAKES NJ 07417	12/01/2020	12/01/2025
DOL	DOL		KATE E. CONNOR		7088 INTERSTATE ISLAND RD SYRACUSE NY 13209	03/31/2021	03/31/2026
DOL	DOL	****2959	KELC DEVELOPMENT, INC		7088 INTERSTATE ISLAND RD SYRACUSE NY 13209	03/31/2021	03/31/2026
DOL	DOL		KIMBERLY F. BAKER		7901 GEE ROAD CANASTOTA NY 13032	08/17/2021	08/17/2026
DOL	DA	****8816	LAKE CONSTRUCTION AND DEVELOPMENT CORPORATION		150 KINGS STREET BROOKLYN NY 11231	08/19/1998	08/19/2998
DOL	DOL		LEROY E. NELSON JR		531 THIRD ST ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL		LEROY E. NELSON JR		531 THIRD ST ALBANY NY 12206	12/22/2022	12/22/2027
DOL	AG	****3291	LINTECH ELECTRIC, INC.		3006 TILDEN AVE BROOKLYN NY 11226	02/16/2022	02/16/2027
DOL	DOL		LOUIS A. CALICCHIA		1223 PARK ST. PEEKSKILL NY 10566	05/17/2021	05/17/2026
DOL	NYC		LUBOMIR PETER SVOBODA		27 HOUSMAN AVE STATEN ISLAND NY 10303	12/26/2019	12/26/2024
DOL	NYC		M & L STEEL & ORNAMENTAL IRON CORP.		27 HOUSMAN AVE STATEN ISLAND NY 10303	12/26/2019	12/26/2024
DOL	DOL	****2196	MAINSTREAM SPECIALTIES, INC.		11 OLD TOWN RD SELKIRK NY 12158	02/02/2021	02/02/2026
DOL	DA		MANUEL P TOBIO		150 KINGS STREET BROOKLYN NY 14444	08/19/1998	08/19/2998
DOL	DA		MANUEL TOBIO		150 KINGS STREET BROOKLYN NY 11231	08/19/1998	08/19/2998
DOL	NYC		MAREK FABIJANOWSKI		50 MAIN ST WHITE PLAINS NY 10606	01/04/2019	01/04/2024
DOL	NYC		MARIA NUBILE		84-22 GRAND AVENUE ELMHURST NY 11373	03/10/2020	03/10/2025
DOL	DOL		MATTHEW P. KILGORE		4156 WILSON ROAD EAST TABERG NY 13471	03/26/2019	03/26/2024
DOL	DOL	****4829	MILESTONE ENVIRONMENTAL CORPORATION		704 GINESI DRIVE SUITE 29MORGANVILLE NJ 07751	04/10/2019	04/10/2024
DOL	NYC	****9926	MILLENNIUM FIRE PROTECTION, LLC		325 W. 38TH STREET SUITE 204NEW YORK NY 10018	11/14/2019	11/14/2024
DOL	NYC	****0627	MILLENNIUM FIRE SERVICES, LLC		14 NEW DROP LNE 2ND FLOORSTATEN ISLAND NY 10306	11/14/2019	11/14/2024
DOL	DOL	****1320	MJC MASON CONTRACTING, INC.		42 FOWLER AVENUE CORTLAND MANOR NY 10567	10/25/2022	10/25/2027
DOL	DOL	****1320	MJC MASON CONTRACTING, INC.		42 FOWLER AVENUE CORTLAND MANOR NY 10567	01/24/2023	01/24/2028
DOL	NYC		MUHAMMED A. HASHEM		524 MCDONALD AVENUE BROOKLYN NY 11218	09/17/2020	09/17/2025
DOL	NYC		NAMOW, INC.		84-22 GRAND AVENUE ELMHURST NY 11373	03/10/2020	03/10/2025
DOL	DOL	****7790	NATIONAL BUILDING & RESTORATION CORP		1010 TILDEN AVE UTICA NY 13501	07/24/2023	07/24/2028
DOL	DOL	****1797	NATIONAL CONSTRUCTION SERVICES, INC		1010 TILDEN AVE UTICA NY 13501	07/24/2023	07/24/2028
DOL	DA	****9786	NATIONAL INSULATION & GC CORP		180 MILLER PLACE HICKSVILLE NY 11801	12/12/2018	12/12/2023
DOL	NYC		NAVIT SINGH		402 JERICHO TURNPIKE NEW HYDE PARK NY 11040	08/10/2022	08/10/2027
DOL	DOL		NICHOLE E. FRASER A/K/A NICHOLE RACE		3469 STATE RT. 69 PERISH NY 13131	03/01/2022	03/01/2027
DOL	DOL		NICHOLE E. FRASER A/K/A NICHOLE RACE		3469 STATE RT. 69 PERISH NY 13131	11/15/2022	11/15/2027
DOL	DOL		NICHOLE E. FRASER A/K/A NICHOLE RACE		3469 STATE RT. 69 PERISH NY 13131	09/29/2021	09/29/2026

NYSDOL Bureau of Public Work Debarment List 10/17/2023

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DOL	DOL		NICHOLE E. FRASER A/K/A NICHOLE RACE		3469 STATE RT. 69 PERISH NY 13131	02/09/2022	02/09/2027
DOL	DOL	*****7429	NICOLAE I. BARBIR	BESTUCCO CONSTRUCTI ON, INC.	444 SCHANTZ ROAD ALLEN TOWN PA 18104	09/17/2020	09/17/2025
DOL	NYC	*****5643	NYC LINE CONTRACTORS, INC.		402 JERICHO TURNPIKE NEW HYDE PARK NY 11040	08/10/2022	08/10/2027
DOL	DOL		PAULINE CHAHALES		935 S LAKE BLVD MAHOPAC NY 10541	03/02/2021	03/02/2026
DOL	DOL		PETER STEVENS		11 OLD TOWN ROAD SELKIRK NY 12158	02/02/2021	02/02/2026
DOL	DOL		PETER STEVENS		8269 21ST ST BELLEROSE NY 11426	12/22/2022	12/22/2027
DOL	DOL	*****0466	PRECISION BUILT FENCES, INC.		1617 MAIN ST PEEKSKILL NY 10566	03/03/2020	03/03/2025
DOL	NYC		RASHEL CONSTRUCTION CORP		524 MCDONALD AVENUE BROOKLYN NY 11218	09/17/2020	09/17/2025
DOL	DOL	*****1068	RATH MECHANICAL CONTRACTORS, INC.		24 ELDOR AVENUE NEW CITY NY 10956	02/03/2020	02/03/2025
DOL	DOL	*****2633	RAW POWER ELECTRIC CORP.		3 PARK CIRCLE MIDDLETOWN NY 10940	07/11/2022	07/11/2027
DOL	DA	*****7559	REGAL CONTRACTING INC.		24 WOODBINE AVE NORTHPORT NY 11768	10/01/2020	10/01/2025
DOL	DOL	*****9148	RICH T CONSTRUCTION		107 WILLOW WOOD LANE CAMILLUS NY 13031	11/13/2018	11/13/2023
DOL	DOL		RICHARD REGGIO		1617 MAIN ST PEEKSKILL NY 10566	03/03/2020	03/03/2025
DOL	DOL		RICHARD TIMIAN JR.		108 LAMONT AVE SYRACUSE NY 13209	11/13/2018	11/13/2023
DOL	DOL		ROBBYE BISSESAR		89-51 SPRINGFIELD BLVD QUEENS VILLAGE NY 11427	01/11/2003	01/11/3003
DOL	DOL		ROBERT A. VALERINO		3841 LANYARD COURT NEW PORT RICHEY FL 34652	07/09/2019	07/09/2024
DOL	DOL		ROBERT BRUNO		5 MORNINGSIDE DRIVE AUBURN NY 13021	05/28/2019	05/28/2024
DOL	DOL		ROMEO WARREN		161 ROBYN RD MONROE NY 10950	07/11/2022	07/11/2027
DOL	DOL		RONALD MESSEN		14B COMMERCIAL AVE ALBANY NY 12065	11/14/2019	11/14/2024
DOL	DOL	*****7172	RZ & AL INC.		198 RIDGE AVENUE VALLEY STREAM NY 11581	06/06/2022	06/06/2027
DOL	DOL	*****1365	S & L PAINTING, INC.		11 MOUNTAIN ROAD P.O BOX 408MONROE NY 10950	03/20/2019	03/20/2024
DOL	DOL		SAL FRESINA MASONRY CONTRACTORS, INC.		1935 TEALL AVENUE SYRACUSE NY 13206	07/16/2021	07/16/2026
DOL	DOL		SAL MASONRY CONTRACTORS, INC.		(SEE COMMENTS) SYRACUSE NY 13202	07/16/2021	07/16/2026
DOL	DOL	*****9874	SALFREE ENTERPRISES INC		P.O BOX 14 2821 GARDNER RDPOMPEI NY 13138	07/16/2021	07/16/2026
DOL	DOL		SALVATORE A FRESINA A/K/A SAM FRESINA		107 FACTORY AVE P.O BOX 11070SYRACUSE NY 13218	07/16/2021	07/16/2026
DOL	DOL		SAM FRESINA		107 FACTORY AVE P.O BOX 11070SYRACUSE NY 13218	07/16/2021	07/16/2026
DOL	NYC	*****0349	SAM WATERPROOFING INC		168-42 88TH AVENUE APT.1 AJAMAICA NY 11432	11/20/2019	11/20/2024
DOL	DA	*****0476	SAMCO ELECTRIC CORP.		3735 9TH ST LONG ISLAND CITY NY 11101	01/05/2023	01/05/2028
DOL	NYC	*****1130	SCANA CONSTRUCTION CORP.		863 WASHINGTON STREET FRANKLIN SQUARE NY 11010	03/10/2020	03/10/2025
DOL	DOL	*****2045	SCOTT DUFFIE	DUFFIE'S ELECTRIC, INC.	P.O BOX 111 CORNWALL NY 12518	03/03/2020	03/03/2025
DOL	DOL		SCOTT DUFFIE		P.O BOX 111 CORNWALL NY 12518	03/03/2020	03/03/2025
DOL	NYC	*****6597	SHAIRA CONSTRUCTION CORP.		421 HUDSON STREET SUITE C5NEW YORK NY 10014	02/20/2019	02/20/2024
DOL	DOL		SHULEM LOWINGER		11 MOUNTAIN ROAD 28 VAN BUREN DRMONROE NY 10950	03/20/2019	03/20/2024
DOL	DA		SILVANO TRAVAJA		3735 9TH ST LONG ISLAND CITY NY 11101	01/05/2023	01/05/2028

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DOL	DOL	****0440	SOLAR GUYS INC.		8970 MIKE GARCIA DR MANASSAS VA 20109	07/16/2021	07/16/2026
DOL	NYC		SOMATIE RAMSUNAHAI		115-46 132ND ST SOUTH OZONE PARK NY 11420	09/17/2020	09/17/2025
DOL	DOL	****2221	SOUTH BUFFALO ELECTRIC, INC.		1250 BROADWAY ST BUFFALO NY 14212	02/03/2020	02/03/2025
DOL	NYC	****3661	SPANIER BUILDING MAINTENANCE CORP		200 OAK DRIVE SYOSSET NY 11791	03/14/2022	03/14/2027
DOL	DOL		STANADOS KALOGELAS		485 RAFT AVENUE HOLBROOK NY 11741	10/19/2021	10/19/2026
DOL	DOL	****3496	STAR INTERNATIONAL INC		89-51 SPRINGFIELD BLVD QUEENS VILLAGE NY 11427	08/11/2003	08/11/3003
DOL	DOL	****6844	STEAM PLANT AND CHX SYSTEMS INC.		14B COMMERCIAL AVENUE ALBANY NY 12065	11/14/2019	11/14/2024
DOL	DOL	****9933	STEED GENERAL CONTRACTORS, INC.		1445 COMMERCE AVE BRONX NY 10461	05/30/2019	05/30/2024
DOL	DOL	****9528	STEEL-IT, LLC.		17613 SANTE FE LINE ROAD WAYNESFIELD OH 45896	07/16/2021	07/16/2026
DOL	DOL		STEFANOS PAPASTEFANOU, JR. A/K/A STEVE PAPASTEFANOU, JR.		256 WEST SADDLE RIVER RD UPPER SADDLE RIVER NJ 07458	05/30/2019	05/30/2024
DOL	DOL		STEVE TATE		415 FLAGER AVE #302STUART FL 34994	10/31/2018	10/31/2023
DOL	DOL	****3800	SUBURBAN RESTORATION CO. INC.		5-10 BANTA PLACE FAIR LAWN PLACE NJ 07410	03/29/2021	03/29/2026
DOL	DOL	****1060	SUNN ENTERPRISES GROUP, LLC		370 W. PLEASANTVIEW AVE SUITE 2.329HACKENSACK NJ 07601	02/11/2019	02/11/2024
DOL	DOL	****9150	SURGE INC.		8269 21ST STREET BELLEROSE NY 11426	12/22/2022	12/22/2027
DOL	DOL		SYED RAZA		198 RIDGE AVENUE NY 11581	06/06/2022	06/06/2027
DOL	DOL	****8209	SYRACUSE SCALES, INC.		158 SOLAR ST SYRACUSE NY 13204	01/07/2019	01/07/2024
DOL	DOL		TERRY THOMPSON		11371 RIDGE RD WOLCOTT NY 14590	02/03/2020	02/03/2025
DOL	DOL	****9733	TERSAL CONSTRUCTION SERVICES INC		107 FACTORY AVE P.O BOX 11070SYRACUSE NY 13208	07/16/2021	07/16/2026
DOL	DOL		TERSAL CONTRACTORS, INC.		221 GARDNER RD P.O BOX 14POMPEI NY 13138	07/16/2021	07/16/2026
DOL	DOL		TERSAL DEVELOPMENT CORP.		1935 TEALL AVENUE SYRACUSE NY 13206	07/16/2021	07/16/2026
DOL	DOL		TEST		P.O BOX 123 ALBANY NY 12204	05/20/2020	05/20/2025
DOL	DOL	****6789	TEST1000		P.O BOX 123 ALBANY NY 12044	03/01/2021	03/01/2026
DOL	DOL	****5766	THE COKER CORPORATION	COKER CORPORATIO N	2610 SOUTH SALINA ST SUITE 14SYRACUSE NY 13205	12/04/2018	12/04/2023
DOL	DOL	****5766	THE COKER CORPORATION	COKER CORPORATIO N	2610 SOUTH SALINA ST SUITE 14SYRACUSE NY 13205	09/17/2020	09/17/2025
DOL	DA	****1050	TRI STATE CONSTRUCTION OF NY CORP.		50-39 175TH PLACE FRESH MEADOWS NY 11365	03/28/2022	03/28/2027
DOL	DA	****4106	TRIPLE H CONCRETE CORP		2375 RAYNOR STREET RONKONKOMA NY 11779	08/04/2021	08/04/2026
DOL	DOL	****8210	UPSTATE CONCRETE & MASONRY CONTRACTING CO INC		449 WEST MOMBSHA ROAD MONROE NY 10950	06/06/2022	06/06/2027
DOL	DOL	****6418	VALHALLA CONSTRUCTION, LLC.		796 PHLEPS ROAD FRANKLIN LAKES NJ 07417	12/01/2020	12/01/2025
DOL	NYC	****2426	VICKRAM MANGRU	VICK CONSTRUCTI ON	21 DAREWOOD LANE VALLEY STREAM NY 11581	09/17/2020	09/17/2025
DOL	NYC		VICKRAM MANGRU		21 DAREWOOD LANE VALLEY STREAM NY 11581	09/17/2020	09/17/2025
DOL	DOL		VICTOR ALICANTI		42-32 235TH ST DOUGLASTON NY 11363	01/14/2019	01/14/2024
DOL	NYC		VIKTAR PATONICH		2630 CROPSEY AVE BROOKLYN NY 11214	10/30/2018	10/30/2023
DOL	DOL		VIKTORIA RATH		24 ELDOR AVENUE NEW CITY NY 10956	02/03/2020	02/03/2025
DOL	NYC	****3673	WALTERS AND WALTERS, INC.		465 EAST AND THIRD ST MT. VERNON NY 10550	09/09/2019	09/09/2024

NYSDOL Bureau of Public Work Debarment List 10/17/2023

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DOL	DOL	****3296	WESTERN NEW YORK CONTRACTORS, INC.		3841 LAYNARD COURT NEW PORT RICHEY FL 34652	07/09/2019	07/09/2024
DOL	DOL	****8266	WILLIAM CHRIS MCCLENDON	MCCLENDON ASPHALT PAVING	1646 FALLS STREET NIAGARA FALLS NY 14303	05/01/2023	05/01/2028
DOL	DOL		WILLIAM CHRIS MCCLENDON		1646 FALLS STREET NIAGARA FALLS NY 14303	05/01/2023	05/01/2028
DOL	DOL		WILLIAM G. PROERFRIEDT		85 SPRUCEWOOD ROAD WEST BABYLON NY 11704	01/19/2021	01/19/2026
DOL	DOL	****5924	WILLIAM G. PROPHY, LLC	WGP CONTRACTING, INC.	54 PENTAQUIT AVE BAYSHORE NY 11706	01/19/2021	01/19/2026
DOL	DOL	****4730	XGD SYSTEMS, LLC	TDI GOLF	415 GLAGE AVE #302STUART FL 34994	10/31/2018	10/31/2023

PAYROLL
(For Contractor's Optional Use; See Instructions at www.dol.gov/whd/forms/wh347instr.htm)



Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number.

Rev. Dec. 2008

OMB No.:1235-0008
Expires: 07/31/2024

NAME OF CONTRACTOR ☐				OR SUBCONTRACTOR ☐				ADDRESS												
PAYROLL NO.				FOR WEEK ENDING				PROJECT AND LOCATION				PROJECT OR CONTRACT NO.								
(1)	(2)	(3)	(4)	(4) DAY AND DATE				(5)	(6)	(7)	(8) DEDUCTIONS				(9)					
NAME AND INDIVIDUAL IDENTIFYING NUMBER (e.g., LAST FOUR DIGITS OF SOCIAL SECURITY NUMBER) OF WORKER	NO. OF WITHHOLDING EXEMPTIONS	WORK CLASSIFICATION	OT OR ST								TOTAL HOURS	RATE OF PAY	GROSS AMOUNT EARNED	FICA	WITH- HOLDING TAX			OTHER	TOTAL DEDUCTIONS	NET WAGES PAID FOR WEEK
				HOURS WORKED EACH DAY																
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While completion of Form WH-347 is optional, it is mandatory for covered contractors and subcontractors performing work on Federally financed or assisted construction contracts to respond to the information collection contained in 29 C.F.R. §§ 3.3, 5.5(a). The Copeland Act (40 U.S.C. § 3145) contractors and subcontractors performing work on Federally financed or assisted construction contracts to "furnish weekly a statement with respect to the wages paid each employee during the preceding week." U.S. Department of Labor (DOL) regulations at 29 C.F.R. § 5.5(a)(3)(ii) require contractors to submit weekly a copy of all payrolls to the Federal agency contracting for or financing the construction project, accompanied by a signed "Statement of Compliance" indicating that the payrolls are correct and complete and that each laborer or mechanic has been paid not less than the proper Davis-Bacon prevailing wage rate for the work performed. DOL and federal contracting agencies receiving this information review the information to determine that employees have received legally required wages and fringe benefits.

Public Burden Statement

We estimate that it will take an average of 55 minutes to complete this collection, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. If you have any comments regarding these estimates or any other aspect of this collection, including suggestions for reducing this burden, send them to the Administrator, Wage and Hour Division, U.S. Department of Labor, Room S3502, 200 Constitution Avenue, N.W. Washington, D.C. 20210

Date _____

I, _____
(Name of Signatory Party) (Title)

do hereby state:

(1) That I pay or supervise the payment of the persons employed by _____ on the _____
(Contractor or Subcontractor)
_____ ; that during the payroll period commencing on the _____
(Building or Work)
_____ day of _____, _____, and ending the _____ day of _____, _____,
all persons employed on said project have been paid the full weekly wages earned, that no rebates have
been or will be made either directly or indirectly to or on behalf of said
_____ from the full
(Contractor or Subcontractor)

weekly wages earned by any person and that no deductions have been made either directly or indirectly
from the full wages earned by any person, other than permissible deductions as defined in Regulations, Part
3 (29 C.F.R. Subtitle A), issued by the Secretary of Labor under the Copeland Act, as amended (48 Stat. 948,
63 Stat. 108, 72 Stat. 967; 76 Stat. 357; 40 U.S.C. § 3145), and described below:

(2) That any payrolls otherwise under this contract required to be submitted for the above period are
correct and complete; that the wage rates for laborers or mechanics contained therein are not less than the
applicable wage rates contained in any wage determination incorporated into the contract; that the classifications
set forth therein for each laborer or mechanic conform with the work he performed.

(3) That any apprentices employed in the above period are duly registered in a bona fide apprenticeship
program registered with a State apprenticeship agency recognized by the Bureau of Apprenticeship and
Training, United States Department of Labor, or if no such recognized agency exists in a State, are registered
with the Bureau of Apprenticeship and Training, United States Department of Labor.

(4) That:
(a) WHERE FRINGE BENEFITS ARE PAID TO APPROVED PLANS, FUNDS, OR PROGRAMS

☐ — in addition to the basic hourly wage rates paid to each laborer or mechanic listed in
the above referenced payroll, payments of fringe benefits as listed in the contract
have been or will be made to appropriate programs for the benefit of such employees,
except as noted in section 4(c) below.

(b) WHERE FRINGE BENEFITS ARE PAID IN CASH

☐ — Each laborer or mechanic listed in the above referenced payroll has been paid,
as indicated on the payroll, an amount not less than the sum of the applicable
basic hourly wage rate plus the amount of the required fringe benefits as listed
in the contract, except as noted in section 4(c) below.

(c) EXCEPTIONS

EXCEPTION (CRAFT)	EXPLANATION

REMARKS:

NAME AND TITLE	SIGNATURE

THE WILLFUL FALSIFICATION OF ANY OF THE ABOVE STATEMENTS MAY SUBJECT THE CONTRACTOR OR
SUBCONTRACTOR TO CIVIL OR CRIMINAL PROSECUTION. SEE SECTION 1001 OF TITLE 18 AND SECTION 3729 OF
TITLE 31 OF THE UNITED STATES CODE.

PROPOSAL FORM A

TO THE TOWN BOARD, TOWN OF RIVERHEAD, 4 WEST 2ND STREET, SUFFOLK COUNTY, NEW YORK, ACTING FOR AND ON BEHALF OF THE RIVERHEAD SEWER DISTRICT:

For all work included under the following contract:

CLASS A BIOSOLIDS IMPROVEMENTS
CONTRACT G – GENERAL CONSTRUCTION
CONTRACT NO. RDSD 2202

Made this ____ day of _____, 202_, by

(BIDDER'S NAME)

BIDDER'S DECLARATION: The undersigned, as Bidder, declares that the only person or persons interested in this bid or proposal as principal or principals is or are named herein; and that no other person than herein named has any interest in this proposal or in the contract proposed to be taken; that this bid or proposal is made without any connections with any other person or persons making a bid or proposal for the same purpose; that the bid or proposal is in all respects fair and without collusion or fraud; that it has examined the site of the work, the Contract and Specifications and the Drawings referred to; and has read the Notice to Bidders, Information for Bidders and General Conditions hereto attached and fully understands all the same; and it proposes and agrees, if this proposal is accepted, it will contract with the TOWN BOARD of the TOWN OF RIVERHEAD in the Contract accompanying this bid to perform all the work required in accordance with the Plans and as mentioned in said foregoing Information for Bidders, General Conditions, Notice to Bidders, Contract and Specifications; and it will accept in full payment therefor the following sums to wit:

NOTE: THIS FORM MUST BE COMPLETED BY BIDDER

+ + NO TEXT ON THIS PAGE + +

PROPOSAL FORM B

TOWN OF RIVERHEAD SEWER DISTRICT
 CLASS A BIOSOLIDS IMPROVEMENTS
 CONTRACT No. RDSD 2202
 CONTRACT G – GENERAL CONSTRUCTION

Gentlemen:

The undersigned hereby offers to furnish all labor, equipment, materials, and appurtenances for the **Class A Biosolids Improvements, Contract G – GENERAL CONSTRUCTION** all in accordance with the plans and specifications prepared by H2M architects + engineers.

CONTRACT G – PROPOSAL TABLE

ITEM NO.	APPROX. QTY.	ITEMS BID WITH AMOUNT BID WRITTEN IN WORDS	UNIT PRICE BID		AMOUNT BID PRICE	
			DOLLARS	CENTS	DOLLARS	CENTS
1	Lump Sum	Base Bid for furnishing all Labor, Materials and Equipment required for all Construction work ready for operation, exclusive of work covered under Bid Item Nos. 2, 3, 4, 5, 6, 7, 8,9 & 10. _____ DOLLARS CENTS	N/A	N/A		
2	Lump Sum	For furnishing all Labor, Materials and Equipment required for installation of Scavenger Sludge Thickener (Section 467113) _____ DOLLARS CENTS	N/A	N/A		
3	Lump Sum	For furnishing all Labor, Materials and Equipment required for installation of Rotary Drum Screen (Section 462113) _____ DOLLARS CENTS	N/A	N/A		
4	1,000 Linear Feet	For concrete crack repair (Section 030130) _____ DOLLARS CENTS				
5	500 Square Feet	For concrete spall repair (Section 030130) _____ DOLLARS CENTS				

PROPOSAL FORM B

6	Allowance	For overtime hours worked by Owner's operations staff associated with project required after hour tie-in and tank bypass work as specified in Section 011400 (Overtime Salary).	N/A	N/A	\$10,000	00
		Ten Thousand <u>Zero</u> DOLLARS CENTS				
7	Allowance	For invoiced charges of the testing laboratory, including toning companies where called for, incurred for field laboratory tests, as specified only in Section 014500 – Quality Control (Testing).	N/A	N/A	\$20,000	00
		Twenty Thousand <u>Zero</u> DOLLARS CENTS				
8	Allowance	For furnishing all labor, materials, equipment, and incidentals for unforeseen conditions and associated additional work as directed by Owner and Engineer (Contingency).	N/A	N/A	\$50,000	00
		Fifty Thousand <u>Zero</u> DOLLARS CENTS				

TOTAL BASE BID:

For all work shown, specified and described in the Contract Documents, for the **Class A Biosolids Improvements, Contract G – GENERAL CONSTRUCTION**, Contract No. RDSD 2202, General Construction for the Town of Riverhead, on behalf of the Riverhead Sewer District, complete and ready for operation as summarized in the CONTRACT G – PROPOSAL TABLE above, including the total of the allowances of Eighty Thousand Dollars and Zero Cents (\$80,000.00), as specified in Section 012100 – Allowances (Contract G), for the Total Base of:

_____ Dollars and _____ Cents.
(IN WORDS)

(_____)

PROPOSAL FORM B

The Bidder shall list the name of the one proposed manufacturer for each of the following major equipment/material items that was used to prepare the bid and that will be furnished and installed for this project if the Bidder is awarded the project. **It is expressly understood that the furnishing of this information will not relieve the Bidder of any requirements of the Contract Documents and failure to fill out properly is grounds for rejection:**

1. Scavenger Sludge Thickener (Section 467113): _____
2. Rotary Drum Screen (Section 462113): _____
3. Fabric Structures (Section 133100): _____

NOTE: THIS FORM MUST BE COMPLETED BY BIDDER

ALL WORK SHOWN AND SPECIFIED IN THE CONTRACT DOCUMENTS & INCLUDED IN THE BASE BID SHALL BE COMPLETED WITHIN FIVE HUNDRED FORTY-EIGHT (548) CONSECUTIVE CALENDAR DAYS (SATURDAYS, SUNDAYS AND HOLIDAYS INCLUDED) STARTING TEN DAYS AFTER THE DATE THE OWNER EXECUTED THE CONTRACT. THE COMPLETION DATE WILL BE SET IN THE NOTICE TO PROCEED.

A NOTICE TO PROCEED WILL BE ISSUED AFTER THE CONTRACT HAS BEEN EXECUTED BY THE OWNER.

FAILURE OF THE CONTRACTOR TO COMPLETE ALL WORK SHOWN AND SPECIFIED IN THE CONTRACT DOCUMENTS, BY THE ABOVE SPECIFIED TIME, SHALL SUBJECT HIM/HER TO LIQUIDATED DAMAGES, AS SET FORTH IN ARTICLE 7 OF THE CONTRACT, IN THE SUM OF ONE THOUSAND DOLLARS AND ZERO CENTS (\$1,000.00) PER CALENDAR DAY.

THE TOWN BOARD RESERVES THE RIGHT TO AWARD THIS CONTRACT OR TO REJECT ANY AND ALL BIDS.

EXCESS COSTS FOR ENGINEERING & INSPECTION

SPECIFIC DAMAGES WILL BE ASSESSED AND DEDUCTED FROM AMOUNTS OTHERWISE DUE THE CONTRACTOR FOR ADDITIONAL INSPECTION AND CONTRACT MANAGEMENT TIME REQUIRED BEYOND THE CONTRACT COMPLETION PERIOD SPECIFIED ABOVE. SUCH DEDUCTION SHALL BE NO LESS THAN SIXTY FIVE DOLLARS (\$65.00) PER HOUR AND NO MORE THAN TWO HUNDRED DOLLARS (\$200.00) PER HOUR IN ACCORDANCE WITH THE ENGINEER'S STANDARD BILLING RATE SCHEDULE IN EFFECT WITH THE OWNER AT THE TIME BASED ON CLASSIFICATION OF STAFF.

IN ADDITION, THE OWNER WILL CHARGE TO THE CONTRACTOR, AND WILL DEDUCT FROM THE PARTIAL AND FINAL PAYMENTS DUE THE CONTRACTOR, ALL EXCESS ENGINEERING, INSPECTION, LEGAL AND TESTING CHARGES AND EXPENSES INCURRED BY THE DISTRICT AS STIPULATED BELOW:

1. SERVICES AND OTHER SIMILAR CHARGES AS A RESULT OF THE CONTRACTOR'S AND SUBCONTRACTOR'S ERRORS, OMISSIONS OR FAILURE TO CONFORM TO THE REQUIREMENTS OF THE CONTRACT DOCUMENTS.

2. SERVICES AND OTHER SIMILAR CHARGES REQUIRED TO EXAMINE AND EVALUATE ANY CHANGES OR ALTERNATES PROPOSED BY THE CONTRACTOR AND WHICH MAY VARY FROM THE CONTRACT DOCUMENTS.
3. SERVICES AND OTHER SIMILAR CHARGES AS A RESULT OF THE CONTRACTOR'S PROPOSED SUBSTITUTION OF MATERIALS, EQUIPMENT OR PRODUCTS WHICH REQUIRE A REDESIGN OF ANY PORTION OF THE PROJECT, AS CONTAINED IN THE CONTRACT DOCUMENTS AT THE TIME OF BID.
4. SERVICES AND OTHER SIMILAR CHARGES AS A RESULT OF THE CONTRACTOR'S PROPOSED SUBSTITUTION OF PRODUCTS WHICH REQUIRE AN ENGINEERING EVALUATION TO DETERMINE IF THE SUBSTITUTED PRODUCT IS EQUAL TO THAT SPECIFIED.
5. SERVICES AND OTHER SIMILAR CHARGES AS A RESULT OF CHANGES BY THE CONTRACTOR TO DIMENSIONS, WEIGHTS, SIZES, VOLTAGES, PHASE, HORSEPOWERS, MATERIALS OF CONSTRUCTION, AND SIMILAR PHYSICAL OR OPERATING CHARACTERISTICS OF THE PRODUCT FURNISHED WHICH REQUIRE REDESIGN OF THE PROJECT IN ANY WAY.
6. SERVICES AND OTHER SIMILAR CHARGES FOR THE REVIEW OF RESUBMISSIONS OF SHOP DRAWINGS THAT HAVE BEEN MARKED AS "NO EXCEPTIONS TAKEN" OR "MAKE CORRECTIONS NOTED".
7. SERVICES AND OTHER SIMILAR CHARGES FOR THE REVIEW OF SHOP DRAWINGS SUBMITTED MORE THAN THREE (3) TIMES FOR THE SAME PRODUCT OR PORTION OF THE WORK.
8. SERVICES AND OTHER SIMILAR CHARGES IN CONNECTION WITH ANY WORK PERFORMED PAST THE SPECIFIED WORKING HOURS WHICH WILL BE INVOICED TO THE OWNER AT 1.15 TIMES THE ENGINEER'S STANDARD HOURLY BILLING RATE.
9. ENGINEERING AND LEGAL SERVICES, AND SIMILAR CHARGES AS A RESULT OF THE CONTRACTOR NOT COMPLETING ALL THE WORK WITHIN THE SPECIFIED COMPLETION TIME WHICH SHALL NOT BE CONSIDERED AS PART OF THE LIQUIDATED DAMAGES SPECIFIED ABOVE.

INSPECTION AND CONTRACT MANAGEMENT TIME REQUIRED BEYOND THE CONTRACT COMPLETION PERIOD SPECIFIED ABOVE. SUCH DEDUCTION SHALL BE NO LESS THAN SIXTY FIVE DOLLARS (\$65.00) PER HOUR AND NO MORE THAN TWO HUNDRED DOLLARS (\$200.00) PER HOUR IN ACCORDANCE WITH THE ENGINEER'S STANDARD BILLING RATE SCHEDULE IN EFFECT WITH THE OWNER AT THE TIME BASED ON CLASSIFICATION OF STAFF.

PROPOSAL FORM B

BIDDER'S PRINTED NAME & SIGNATURE:

(Print Name)

(Signature)

NOTE: THIS FORM MUST BE COMPLETED BY BIDDER

PROPOSAL FORM B

THE UNDERSIGNED HEREBY ACKNOWLEDGES RECEIPT OF THE FOLLOWING ADDENDA (IF ANY):

<u>Addendum No.</u>	<u>Dated</u>
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Signature of person, firm or corporation making this proposal:

(Contractor)

(Title)

Mail Address: _____

Telephone No.: _____ Dated: _____

The full names and address of all persons interested in the Proposal or principals are as follows:

<u>Name</u>	<u>Address</u>
_____	_____
_____	_____
_____	_____

NOTE: THIS FORM MUST BE COMPLETED BY BIDDER (IF NONE WERE RECEIVED THEN WRITE THE WORD "NONE").

PROPOSAL FORM B

The Town Board reserves the right to award this contract to the lowest qualified bidder and to reject and declare invalid any or all bids deemed not in the best interest of the Town. In awarding this contract, the Town is not bound by the quantities stated in the Bid Form. It is emphasized that the quantities are approximations only. No guarantee is made for any quantities stated nor is a guarantee made as to the total bid. Such total bid is for the purpose of guidance in awarding the contract only. Payment shall be on the basis of actual work done at the bid prices quoted.

On acceptance of this bid, the undersigned binds himself or themselves to enter into a written contract with the Town not later than fourteen (14) days after the date of notice of the acceptance of his bid and to furnish the required security for faithful performance of the terms of said contract and the insurance as required by the Conditions of contract, and to process the work diligently so as to complete all the work required under this contract within the time frame as dictated by the Town Board or their representative.

PROPOSAL CERTIFICATION

THIS BID IS HEREBY SUBMITTED BY:

DATED: _____

NAME OF BIDDER: _____

BIDDER'S ADDRESS: _____

SIGNED BY: _____

PRINTED NAME & TITLE: _____

BIDDER'S TELEPHONE NO.: (DAY): _____

(NIGHT): _____

FAX: _____

FEDERAL ID NO. OR SOCIAL SECURITY No.: _____

NOTE: THIS FORM MUST BE COMPLETED BY BIDDER

+ + NO TEXT ON THIS PAGE + +

PROPOSAL FORM C

Enclose certified check or bid bond for five percent (5%) of the bid total as stipulated in the foregoing Information for Bidders.

The Bidder hereby agrees to enter into a Contract within fourteen (14) days (Saturdays and Sundays excepted) after due notice from the Town Board, Town of Riverhead, that the Contract has been awarded to it and is ready for signature; such notice to be given in writing within ninety (90) days of opening of the bids and, on the signing of such Contract by the Bidder, to furnish the indemnifying bonds as provided in the Contract.

The Bidder hereby further agrees that in the event of its failure or refusal to enter into a contract in accordance with this bid within fourteen (14) days after due notice from the Town Board that the Contract has been awarded to it and is ready for signature, as given in accordance with the Information for Bidders and/or its failure to execute and deliver the bond for the full amount of the Contract price, as provided in said Information for Bidders, the Bidder's check or bid bond which is herewith deposited with the Town Board shall (at the option of said Board) become due and payable as ascertained and liquidated damages for such default; otherwise, said check or bid bond will be returned to the undersigned.

The full names and residences of all persons and parties interested in the foregoing bid as principals are as follows:

<u>NAME</u>	<u>ADDRESS</u>
_____	_____
_____	_____
_____	_____

NAME OF BIDDER:

BUSINESS ADDRESS OF BIDDER:

DATED AT: _____ THE _____ DAY OF _____, 201_____

NOTE: THIS FORM MUST BE COMPLETED BY BIDDER

FORM OF BID BOND, PAYMENT BONDS AND PERFORMANCE BONDS

The Form of Bid Bond shall be AIA Document A310.

The Form of Labor and Material Payment Bond shall be AIA Document A311.

The Form of Performance Bond and Payment Bond shall be AIA Document A312.

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NON-COLLUSIVE BIDDING CERTIFICATE

As per Chapter 751 of the Laws of 1965, an amendment to the General Municipal Law sponsored by the New York State Department of Law, all bids, proposals and contracts awarded or accepted by a municipality must contain a statement of non-collusion. By submission of this bid or proposal, the bidder certifies that:

- (A) This bid or proposal has been independently arrived at without collusion with any other bidder or with any competitor or potential competitor;
- (B) This bid or proposal has not been knowingly disclosed and will not be knowingly disclosed prior to the opening of bids or proposals for this project to any other bidder, competitor or potential competitor;
- (C) No attempt has been or will be made to induce any other person, partnership or corporation to submit or not to submit a bid or proposal;
- (D) The person signing this bid or proposal certifies that he has fully informed himself regarding the accuracy of the statements contained in this certification and under the penalties of perjury, affirms the truth thereof such penalties being applicable to the bidder as well as to the person signing in its behalf;
- (E) That attached hereto (if corporation bidder) is a certified copy of resolution authorizing the execution of this certificate by the signature of this bid or proposal in behalf of the corporate bidder.

Resolved that _____ be authorized
(Name of Corporation)

to sign and submit the bid or proposal of this corporation for the following project:

(Describe Project)

and to submit in such bid or proposal the certificate as to non-collusion required by Section One Hundred Three D (103-D) of the General Municipal Law as the act and deed of such corporation and for any inaccuracies or misstatements in such certificates, this corporate bidder shall be liable under the penalties of perjury.

The following is a true and correct copy of the resolution adopted by:

Corporation at a meeting of its Board of Directors on the _____ day of _____, 202 ____.

(Seal of Corporation)

Secretary

Legal name of person, firm or corporation making this Bid:

PROPOSAL FORM D

Dated: _____

(Bidder's Seal)

NOTES:

- (1) Where a bidder is a firm, the bid must be signed in the name of the firm by a member of the firm who must sign his own name immediately thereunder as _____, Partner.
- (2) Where a bidder is a corporation, the bid must be signed in the name of the corporation by a duly authorized officer or agent thereof having knowledge of the matters stated in the bid and such officer or agent shall also subscribe his own name, the office he holds, and the seal of the corporation must be affixed.
- (3) The bid must be sworn to by the person signing it, using one of the appropriate forms of acknowledgement that follow.
- (4) The bidders shall date the Form of Affidavit, fill in all blank spaces and complete the "Questionnaire" which follows as part of the bid.
- (5) In case of any discrepancy in the bidder's extensions or total, the Town Engineer's computation of extensions and totals will govern.

FORM OF AFFIDAVIT WHERE BIDDER IS AN INDIVIDUAL

STATE OF _____)

) ss.:

COUNTY OF _____)

_____, being duly sworn, deposes and says: I am the person described in and who executed the foregoing bid and the several matters therein state are in all respects true.

(Signature of person who signed bid)

Subscribed and sworn to before me this
_____ day of _____, 202____.

(Notary Public)

FORM OF AFFIDAVIT WHERE BIDDER IS A FIRM

STATE OF _____)

) ss.:

COUNTY OF _____)

_____ being duly sworn, deposes and says: I am a member of _____, the firm described in and which executed the foregoing bid. I subscribed the name of the firm thereto on behalf of said firm, and the several matters therein stated in all respects are true.

(Signature of person who signed bid)

Subscribed and sworn to before me:

this _____ day of _____, 202__.

(Notary Public)

FORM OF AFFIDAVIT WHERE BIDDER IS A CORPORATION

STATE OF _____)

_____) ss.:
COUNTY OF _____)

_____ being duly sworn, deposes and says: I am the
_____ of _____ the above named
corporation, whose name is subscribed to and which executed the foregoing bid. I reside at
_____, State of
_____. I have knowledge of the several matters therein stated and they are
in all respects true.

(Signature of person who signed bid)

Subscribed and sworn to before me this _____

day of _____, 202____.

(Notary Public)

BIDDER MUST SIGN THIS FORM BEFORE A NOTARY PUBLIC

Bid or Contract Number _____

STATE OF _____)

) ss.:

COUNTY OF _____)

That in connection with the above bid or contract of _____ I _____ the *(applicable herein), (an officer or agent of the corporate applicant, namely its _____), swears or affirms under the penalties of perjury, that no other person will have any direct or indirect interest in this proposal except _____ (in case of a corporation, all officers of the corporation and stockholders owning more than 5% of the corporation and stock must be listed. Use separate sheet in necessary.)

That *(none of the officers or stockholders are) related to any officer or employee of the Town of Riverhead except _____.

That there is not any state or local officer or employee or a member of a board of commissioners of a local public authority or other public corporation within the county (exclusive of a volunteer fireman or civil defense volunteer) interested in such application.

(Signature)

Sworn to before me this _____
day of _____, 202____.

(Notary Public)

*Cross out phrase not appropriate.

NOTE: It is not forbidden that individuals working for the Town of Riverhead or other municipality bid on contracts but only that such interest be revealed when they do bid.

NOTE: THIS FORM MUST BE COMPLETED BY BIDDER

QUALIFICATIONS OF BIDDERS

RIVERHEAD SEWER DISTRICT

TOWN OF RIVERHEAD

NEW YORK

The District may make such investigations as the District deems necessary to determine the responsibility of any Bidder or to determine the ability of any Bidder to perform the Work. Bidders shall furnish to the District all information and data required by the District, including complete financial data, within the time and in the form and manner required by the District. The District reserves the right to reject any bid if the evidence required by the District is not submitted as required or if the evidence submitted by or the investigation of any Bidder fails to satisfy the District that the Bidder is responsible, or is able or qualified to carry out the obligations of the Contract or to complete the Work as contemplated.

At the discretion of the District, the Bidder may be required to complete and submit the enclosed New York State Uniform Contracting Questionnaire to assist in determining the Bidder's qualifications. If requested, it shall be submitted within five (5) working days from notice.

The bidder shall complete the following list. The list shall include projects of similar size and nature (i.e. construction and equipment installations type, prime contract dollar amount) and type (i.e. municipal wastewater pump stations and active facilities that must be maintained during construction). The list of projects shall demonstrate the Bidder's experience with construction methods, and construction procedures. The list shall only include projects which have been completed by the Bidder as the prime contractor, and which have been in operation for a period of not less than one year. A minimum of five such projects shall be provided. At least one (1) of the listed projects shall demonstrate the Bidder's experience with maintenance and protection of existing water or wastewater treatment facilities. List this project as project no.1 and describe the sequence used to phase the project.

Project No. 1 (This project must show experience with existing water or wastewater treatment facilities.)

Project Title: _____

Owner: _____

Owner Contact Name and Phone Number: _____

Location: _____

Engineer's Name and Telephone Number: _____

General Description: _____

Contract Amount: _____

QUALIFICATIONS OF BIDDERS

Project No. 2

Project Title: _____

Owner: _____

Owner Contact Name and Phone Number: _____

Location: _____

Engineer's Name and Telephone Number: _____

General Description: _____

Contract Amount: _____

Project No. 3

Project Title: _____

Owner: _____

Owner Contact Name and Phone Number: _____

Location: _____

Engineer's Name and Telephone Number: _____

General Description: _____

Contract Amount: _____

Project No. 4

Project Title: _____

Owner: _____

Owner Contact Name and Phone Number: _____

Location: _____

Engineer's Name and Telephone Number: _____

General Description: _____

Contract Amount: _____

QUALIFICATIONS OF BIDDERS

Project No. 5

Project Title: _____

Owner: _____

Owner Contact Name and Phone Number: _____

Location: _____

Engineer's Name and Telephone Number: _____

General Description: _____

Contract Amount: _____

The Owner reserves the right to reject any and all bids which do not include a completed qualifications section and/or do not meet the necessary qualifications criteria, for both prime contractor and subcontractors, as described within this qualifications section, for construction work to be performed and completed as required by the Contract Documents.

BIDDER

BIDDER NAME: _____

PREPARED BY: _____

SIGNED BY: _____

TITLE: _____

NOTE: THIS FORM MUST BE COMPLETED BY BIDDER

QUALIFICATIONS OF BIDDERS

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Instructions for New York State Vendor Responsibility Questionnaires

The New York State Vendor Responsibility Questionnaire Is intended to elicit information based on vendor type (For-Profit or Not-for-Profit) and activity (Construction or Non-Construction). The For-Profit Construction (CCA-2) questionnaire follows this page.

Business Entities may print the PDF version of a questionnaire form and complete it annually or may obtain the MS Word version from New York State and complete the questionnaire on a computer. Completing the questionnaire in MS Word allows the questionnaire to be saved on the user's computer and updated in the event that the vendor's information changes.

The person(s) completing the vendor responsibility questionnaire must be knowledgeable about the vendor's business and operations. The certification at the end of each questionnaire must be completed by an owner or officer of the Business Entity and must be notarized to be complete.

Business Entities must answer every question contained in the selected questionnaire. Most questions require "Yes" or "No" answers and request additional information where necessary. For paper submissions, responses that require additional information must include an attachment containing this information. A Business Entity must provide all relevant information which can be obtained within the limits of the law. The Business Entity is not required to provide information regarding a determination or finding made in error which was subsequently corrected.

If the submitting Business Entity is a Joint Venture, one questionnaire must be submitted for the Joint Venture plus each Business Entity comprising the Joint Venture must also submit separate questionnaires.

If the Business Entity uses a Social Security Number (SSN) as its identification number, providing the SSN on the questionnaire is optional. Individuals and Sole Proprietors may use an SSN but are encouraged to obtain and use an Employer Identification Number.

NEW YORK STATE VENDOR RESPONSIBILITY QUESTIONNAIRE FOR-PROFIT CONSTRUCTION (CCA-2)

You have selected the For-Profit Construction questionnaire, commonly known as the "CCA-2," which may be printed and completed in this format or, **for your convenience, may be completed online using the [New York State VendRep System](#).**

COMPLETION & CERTIFICATION

The person(s) completing the questionnaire must be knowledgeable about the vendor's business and operations. An owner or official must certify the questionnaire and the signature must be notarized.

NEW YORK STATE VENDOR IDENTIFICATION NUMBER (VENDOR ID)

The Vendor ID is a ten-digit identifier issued by New York State when the vendor is registered on the Statewide Vendor File. This number must now be included on the questionnaire. If the business entity has not obtained a Vendor ID, contact the IT Service Desk at ITServiceDesk@osc.state.ny.us or call 866-370-4672.

DEFINITIONS

All underlined terms are defined in the "New York State Vendor Responsibility Definitions List," found at <http://www.osc.state.ny.us/vendrep/documents/questionnaire/definitions.pdf>. These terms may not have their ordinary, common or traditional meanings. Each vendor is strongly encouraged to read the respective definitions for any and all underlined terms. By submitting this questionnaire, the vendor agrees to be bound by the terms as defined in the "New York State Vendor Responsibility Definitions List" existing at the time of certification.

RESPONSES

Every question must be answered. Each response must provide all relevant information which can be obtained within the limits of the law. However, information regarding a determination or finding made in error which was subsequently corrected or overturned, and/or was withdrawn by the issuing government entity, is not required. Individuals and Sole Proprietors may use a Social Security Number but are encouraged to obtain and use a federal Employer Identification Number (EIN).

NEW YORK STATE VENDOR RESPONSIBILITY QUESTIONNAIRE FOR-PROFIT CONSTRUCTION (CCA-2)

BUSINESS ENTITY INFORMATION

<u>Legal Business Name</u>		<u>EIN</u> _____		
Address of the <u>Principal Place of Business</u> (street, city, state, zip code)		<u>New York State Vendor Identification Number</u>		
		Telephone ext.	Fax	
		Website		
Authorized Contact for this Questionnaire				
Name		Telephone ext.	Fax	
Title		Email		
Additional <u>Business Entity</u> Identities: If applicable, list any other <u>DBA</u> , <u>Trade Name</u> , <u>Former Name</u> , Other Identity, or <u>EIN</u> used in the last five (5) years, the state or county where filed and the status (active or inactive).				
Type	Name	EIN	State or County where filed	Status

I. BUSINESS CHARACTERISTICS

1.0 <u>Business Entity</u> Type – Check appropriate box and provide additional information:			
a) ☐ <u>Corporation</u> (including <u>PC</u>)	Date of Incorporation		
b) ☐ <u>Limited Liability Company</u> (<u>LLC</u> or <u>PLLC</u>)	Date Organized		
c) ☐ <u>Limited Liability Partnership</u>	Date of Registration		
d) ☐ <u>Limited Partnership</u>	Date Established		
e) ☐ <u>General Partnership</u>	Date Established	County (if formed in NYS)	
f) ☐ <u>Sole Proprietor</u>	How many years in business?		
g) ☐ Other	Date Established		
If Other, explain:			
1.1 Was the <u>Business Entity</u> formed in New York State?			☐ Yes ☐ No
If “No,” indicate jurisdiction where the <u>Business Entity</u> was formed:			
☐ United States	State		
☐ Other	Country		

NEW YORK STATE VENDOR RESPONSIBILITY QUESTIONNAIRE FOR-PROFIT CONSTRUCTION (CCA-2)

I. BUSINESS CHARACTERISTICS			
1.2 Is the <u>Legal Business Entity</u> publicly traded?			☐ Yes ☐ No
If "Yes," provide the <u>CIK code</u> or Ticker Symbol:			
1.3 Is the <u>Business Entity</u> currently <u>registered to do business in New York State</u> ?			☐ Yes ☐ No
<i>Note: Select "Not Required" if the Business Entity is a Sole Proprietor or General Partnership</i>			☐ Not Required
If "No," explain why the <u>Business Entity</u> is not required to be <u>registered to do business in New York State</u> :			
1.4 Is the responding <u>Business Entity</u> a <u>Joint Venture</u> ? Note: If the submitting <u>Business Entity</u> is a <u>Joint Venture</u> , also submit a separate questionnaire for each <u>Business Entity</u> comprising the <u>Joint Venture</u> .			☐ Yes ☐ No
1.5 If the <u>Business Entity's Principal Place of Business</u> is not in New York State, does the <u>Business Entity</u> maintain an office in New York State?			☐ Yes ☐ No
<i>(Select "N/A" if <u>Principal Place of Business</u> is in New York State.)</i>			☐ N/A
If "Yes," provide the address and telephone number for one office located in New York State.			
1.6 Is the Business Entity a New York State certified <u>Minority-Owned Business Enterprise</u> , or <u>Women-Owned Business Enterprise</u> , or <u>New York State Small Business</u> , or federally certified <u>Disadvantaged Business Enterprise</u> ?			☐ Yes ☐ No
If "Yes," check all that apply: ☐ New York State certified <u>Minority-Owned Business Enterprise</u> (MBE) ☐ New York State certified <u>Women-Owned Business Enterprise</u> (WBE) ☐ <u>New York State Small Business</u> ☐ Federally certified <u>Disadvantaged Business Enterprise</u> (DBE)			
1.7 Identify each person or business entity that is, or has been within the past five (5) years, <u>Principal Owner</u> of 5.0% or more of the firm's shares; a Business Entity Official; or one of the five largest shareholders, if applicable. <i>(Attach additional pages if necessary.)</i> <u>Joint Ventures</u> : Provide information for all firms involved.			
Name <i>(For each person, include middle initial)</i>	Title	Percentage of ownership (Enter 0%, if not applicable)	Employment status with the firm
			☐ Current ☐ Former
			☐ Current ☐ Former
			☐ Current ☐ Former
			☐ Current ☐ Former

NEW YORK STATE VENDOR RESPONSIBILITY QUESTIONNAIRE FOR-PROFIT CONSTRUCTION (CCA-2)

II. AFFILIATE and JOINT VENTURE RELATIONSHIPS

2.0 Are there any other construction-related firms in which, now or in the past five years, the submitting Business Entity or any of the individuals or business entities listed in question 1.7 either owned or owns 5.0% or more of the shares of, or was or is one of the five largest shareholders or a director, officer, partner or proprietor of said other firm? *(Attach additional pages if necessary.)* ☐ Yes ☐ No

Firm/Company Name	Firm/Company EIN (If available)	Firm/Company's Primary Business Activity

Firm/Company Address

Explain relationship with the firm and indicate percent of ownership, if applicable (enter N/A, if not applicable):

Are there any shareholders, directors, officers, owners, partners or proprietors that the submitting Business Entity has in common with this firm? ☐ Yes ☐ No

Individual's Name <i>(Include middle initial)</i>	Position/Title with Firm/Company

2.1 Does the Business Entity have any construction-related affiliates not identified in the response to question 2.0 above? *(Attach additional pages if necessary.)* ☐ Yes ☐ No

Affiliate Name	Affiliate EIN (If available)	Affiliate's Primary Business Activity

Affiliate Address

Explain relationship with the affiliate and indicate percent of ownership, if applicable *(enter N/A, if not applicable)*:

Are there any shareholders, directors, officers, owners, partners or proprietors that the submitting Business Entity has in common with this affiliate? ☐ Yes ☐ No

Individual's Name <i>(Include middle initial)</i>	Position/Title with Firm/Company

2.2 Has the Business Entity participated in any construction-related Joint Ventures within the past three (3) years? *(Attach additional pages if necessary.)* ☐ Yes ☐ No

Joint Venture Name	Joint Venture EIN (If available)	Identify parties to the Joint Venture

NEW YORK STATE VENDOR RESPONSIBILITY QUESTIONNAIRE FOR-PROFIT CONSTRUCTION (CCA-2)

III. CONTRACT HISTORY

3.0 Has the Business Entity completed any construction contracts? ☐ Yes ☐ No

If "Yes," list the ten most recent construction contracts the Business Entity has completed using Attachment A – Completed Construction Contracts, found at www.osc.state.ny.us/vendrep/documents/questionnaire/ac3294s.doc.

If less than ten, include most recent subcontracts on projects up to that number.

3.1 Does the Business Entity currently have uncompleted construction contracts? ☐ Yes ☐ No

If "Yes," list all current uncompleted construction contracts by using Attachment B – Uncompleted Construction Contracts, found at www.osc.state.ny.us/vendrep/documents/questionnaire/ac3295s.doc.

Note: Ongoing projects must be included.

IV. INTEGRITY – CONTRACT BIDDING

Within the past five (5) years, has the Business Entity, an affiliate, or any predecessor company or entity:

4.0 Been suspended or debarred from any government contracting process or been disqualified on any government procurement? ☐ Yes ☐ No

4.1 Been subject to a denial or revocation of a government prequalification? ☐ Yes ☐ No

4.2 Had any bid rejected by a government entity for lack of qualifications, responsibility or because of the submission of an informal, non-responsive or incomplete bid? ☐ Yes ☐ No

4.3 Had a proposed subcontract rejected by a government entity for lack of qualifications, responsibility or because of the submission of an informal, non-responsive or incomplete bid? ☐ Yes ☐ No

4.4 Had a low bid rejected on a government contract for failure to make good faith efforts on any Minority-Owned Business Enterprise, Women-Owned Business Enterprise or Disadvantaged Business Enterprise goal or statutory affirmative action requirements on a previously held contract? ☐ Yes ☐ No

4.5 Agreed to a voluntary exclusion from bidding/contracting with a government entity? ☐ Yes ☐ No

4.6 Initiated a request to withdraw a bid submitted to a government entity or made any claim of an error on a bid submitted to a government entity? ☐ Yes ☐ No

For each "Yes," provide an explanation of the issue(s), the Business Entity involved, the relationship to the submitting Business Entity, the government entity involved, project(s), relevant dates, any remedial or corrective action(s) taken and the current status of the issue(s). Provide answer(s) below or attach additional sheets with numbered responses.

V. INTEGRITY – CONTRACT AWARD

Within the past five (5) years, has the Business Entity, an affiliate, or any predecessor company or entity:

5.0 Defaulted on or been suspended, cancelled or terminated for cause on any contract? ☐ Yes ☐ No

5.1 Been subject to an administrative proceeding or civil action seeking specific performance or restitution (except any disputed work proceeding) in connection with any government contract? ☐ Yes ☐ No

5.2 Entered into a formal monitoring agreement, consent decree or stipulation settlement as specified by, or agreed to with, any government entity? ☐ Yes ☐ No

5.3 Had its surety called upon to complete any contract whether government or private sector? ☐ Yes ☐ No

5.4 Forfeited all or part of a standby letter of credit in connection with any government contract? ☐ Yes ☐ No

NEW YORK STATE VENDOR RESPONSIBILITY QUESTIONNAIRE FOR-PROFIT CONSTRUCTION (CCA-2)

V. INTEGRITY – CONTRACT AWARD

Within the past five (5) years, has the Business Entity, an affiliate, or any predecessor company or entity:

For each “Yes,” provide an explanation of the issue(s), the Business Entity involved, the relationship to the submitting Business Entity, the government entity/owners involved, project(s), contract number(s), relevant dates, any remedial or corrective action(s) taken and the current status of the issue(s). Provide answer(s) below or attach additional sheets with numbered responses.

VI. CERTIFICATIONS/LICENSES

Within the past five (5) years, has the Business Entity, an affiliate, or any predecessor company or entity:

6.0 Had a revocation or <u>suspension</u> of any business or professional permit and/or license?	☐ Yes ☐ No

6.1 Had a denial, decertification, revocation or forfeiture of New York State certification of <u>Minority-Owned Business Enterprise</u> , <u>Women-Owned Business Enterprise</u> or a federal certification of <u>Disadvantaged Business Enterprise</u> status, for other than a change of ownership?	☐ Yes ☐ No

For each “Yes,” provide an explanation of the issue(s), the Business Entity involved, the relationship to the submitting Business Entity, the government entity involved, relevant dates, any remedial or corrective action(s) taken and the current status of the issue(s). Provide answer(s) below or attach additional sheets with numbered responses.

VII. LEGAL PROCEEDINGS/GOVERNMENT INVESTIGATIONS

Within the past five (5) years, has the Business Entity, an affiliate, or any predecessor company or entity:

7.0 Been the subject of a criminal <u>investigation</u> , whether open or closed, or an indictment for any business-related conduct constituting a crime under local, state or <u>federal</u> law?	☐ Yes ☐ No

7.1 Been the subject of:	
(i.) An indictment, grant of immunity, <u>judgment</u> or conviction (including entering into a plea bargain) for conduct constituting a crime; or	☐ Yes ☐ No
(ii.) Any criminal <u>investigation</u> , felony indictment or conviction concerning the formation of, or any business association with, an allegedly false or fraudulent <u>Minority-Owned Business Enterprise</u> , <u>Women-Owned Business Enterprise</u> , or a <u>Disadvantaged Business Enterprise</u> ?	☐ Yes ☐ No

7.2 Received any <u>OSHA</u> citation, which resulted in a final determination classified as <u>serious</u> or <u>willful</u> ?	☐ Yes ☐ No

7.3 Had a <u>government entity</u> find a willful prevailing wage or supplemental payment violation?	☐ Yes ☐ No

7.4 Had a New York State Labor Law violation deemed willful?	☐ Yes ☐ No

7.5 Entered into a consent order with the New York State Department of Environmental Conservation, or a <u>federal</u> , state or local government enforcement determination involving a violation of <u>federal</u> , state or local environmental laws?	☐ Yes ☐ No

NEW YORK STATE VENDOR RESPONSIBILITY QUESTIONNAIRE FOR-PROFIT CONSTRUCTION (CCA-2)

VII. LEGAL PROCEEDINGS/GOVERNMENT INVESTIGATIONS

Within the past five (5) years, has the Business Entity, an affiliate, or any predecessor company or entity:

7.6 Other than previously disclosed, been the subject of any <u>citations</u>, notices or violation orders; a pending administrative hearing, proceeding or determination of a violation of: • <u>Federal</u>, state or local health laws, rules or regulations; • <u>Federal</u>, state or local environmental laws, rules or regulations; • Unemployment insurance or workers compensation coverage or <u>claim</u> requirements; • Any labor law or regulation, which was deemed willful; • Employee Retirement Income Security Act (ERISA); • <u>Federal</u>, state or local human rights laws; • <u>Federal</u>, state or local security laws?	☐ Yes ☐ No

For each "Yes," provide an explanation of the issue(s), the Business Entity involved, the relationship to the submitting Business Entity, the government entity involved, relevant dates, any remedial or corrective action(s) taken and the current status of the issue(s). Provide answer(s) below or attach additional sheets with numbered responses.

Note: Information regarding a determination or finding made in error, which was subsequently corrected or overturned, and/or was withdrawn by the issuing government entity, is not required.

VIII. LEADERSHIP INTEGRITY

If the Business Entity is a Joint Venture Entity, answer "N/A - Not Applicable" to questions in this section.

Within the past five (5) years has any individual previously identified or any individual currently or formerly having the authority to sign, execute or approve bids, proposals, contracts or supporting documentation on behalf of the Business Entity with any government entity been:

8.0 <u>Sanctioned</u> relative to any business or professional permit and/or license?	☐ Yes ☐ No ☐ N/A
8.1 <u>Suspended</u>, <u>debarred</u> or <u>disqualified</u> from any <u>government contracting process</u>?	☐ Yes ☐ No ☐ N/A
8.2 The subject of a criminal <u>investigation</u>, whether open or closed, or an indictment for any business-related conduct constituting a crime under local, state or <u>federal</u> law?	☐ Yes ☐ No ☐ N/A
8.3 Charged with a misdemeanor or felony, indicted, granted immunity, convicted of a crime or subject to a judgment for: (i.) Any business-related activity, including but not limited to fraud, coercion, extortion, bribe or bribe-receiving, giving or accepting unlawful gratuities, immigration or tax fraud, racketeering, mail fraud, wire fraud, price-fixing or collusive bidding; or (ii.) Any crime, whether or not business-related, the underlying conduct of which related to truthfulness, including but not limited to the filing of false documents or false sworn statements, perjury or larceny	☐ Yes ☐ No ☐ N/A

For each "Yes," provide an explanation of the issue(s), the individual involved, the relationship to the submitting Business Entity, the government entity involved, relevant dates, any remedial or corrective action(s) taken and the current status of the issue(s). Provide answer(s) below or attach additional sheets with numbered responses.

NEW YORK STATE VENDOR RESPONSIBILITY QUESTIONNAIRE FOR-PROFIT CONSTRUCTION (CCA-2)

IX. FINANCIAL AND ORGANIZATIONAL CAPACITY

9.0 Within the past five (5) years, has the Business Entity or any affiliate received any formal unsatisfactory performance assessment(s) from any government entity on any contract? ☐ Yes ☐ No

If "Yes," provide an explanation of the issue(s), the Business Entity involved, the relationship to the submitting Business Entity, the government entity involved, relevant dates, any remedial or corrective action(s) taken and the current status of the issue(s). Provide answer below or attach additional sheets with numbered responses.

9.1 Within the past five (5) years, has the Business Entity or any affiliate had any liquidated damages assessed over \$25,000? ☐ Yes ☐ No

If "Yes," provide an explanation of the issue(s), the Business Entity involved, the relationship to the submitting Business Entity, relevant dates, the contracting party involved, the amount assessed and the current status of the issue(s). Provide answer below or attach additional sheets with numbered responses.

9.2 Within the past five (5) years, has the Business Entity or any affiliate had any liens, claims or judgments over \$25,000 filed against the Business Entity which remain undischarged or were unsatisfied for more than 90 days? (Note: Including but not limited to tax warrants or liens. Do not include UCC filings.) ☐ Yes ☐ No

If "Yes," provide an explanation of the issue(s), the Business Entity involved, the relationship to the submitting Business Entity, relevant dates, the Lien holder or Claimants' name(s), the amount of the lien(s) and the current status of the issue(s). Provide answer below or attach additional sheets with numbered responses.

9.3 In the last seven (7) years, has the Business Entity or any affiliate initiated or been the subject of any bankruptcy proceedings, whether or not closed, or is any bankruptcy proceeding pending? ☐ Yes ☐ No

If "Yes," provide the Business Entity involved, the relationship to the submitting Business Entity, the bankruptcy chapter number, the court name and the docket number. Indicate the current status of the proceedings as "Initiated," "Pending" or "Closed." Provide answer below or attach additional sheets with numbered responses.

9.4 What is the Business Entity's Bonding Capacity?

a. Single Project

b. Aggregate (All Projects)

9.5 List Business Entity's Gross Sales for the previous three (3) Fiscal Years:

1st Year (Indicate year)
Gross Sales

2nd Year (Indicate year)
Gross Sales

3rd Year (Indicate year)
Gross Sales

9.6 List Business Entity's Average Backlog for the previous three (3) fiscal years:
(Estimated total value of uncompleted work on outstanding contracts)

1st Year (Indicate year)
Amount

2nd Year (Indicate year)
Amount

3rd Year (Indicate year)
Amount

9.7 Attach Business Entity's most recent annual financial statement and accompanying notes or complete Attachment C – Financial Information, found at www.osc.state.ny.us/vendrep/documents/questionnaire/ac3296s.xls.
(This information must be attached.)

**NEW YORK STATE VENDOR RESPONSIBILITY QUESTIONNAIRE
FOR-PROFIT CONSTRUCTION (CCA-2)**

X. FREEDOM OF INFORMATION LAW (FOIL)

10.0 Indicate whether any information provided herein is believed to be exempt from disclosure under the Freedom of Information Law (FOIL).

☐ Yes ☐ No

Note: A determination of whether such information is exempt from FOIL will be made at the time of any request for disclosure under FOIL. Attach additional pages if necessary.

If "Yes," indicate the question number(s) and explain the basis for the claim.

NEW YORK STATE VENDOR RESPONSIBILITY QUESTIONNAIRE FOR-PROFIT CONSTRUCTION (CCA-2)

Certification

The undersigned: (1) recognizes that this questionnaire is submitted for the express purpose of assisting New York State government entities (including the Office of the State Comptroller (OSC)) in making responsibility determinations regarding award or approval of a contract or subcontract and that such government entities will rely on information disclosed in the questionnaire in making responsibility determinations; (2) acknowledges that the New York State government entities and OSC may, in their discretion, by means which they may choose, verify the truth and accuracy of all statements made herein; and (3) acknowledges that intentional submission of false or misleading information may result in criminal penalties under State and/or Federal Law, as well as a finding of non-responsibility, contract suspension or contract termination.

The undersigned certifies that he/she:

- is knowledgeable about the submitting Business Entity's business and operations;
- has read and understands all of the questions contained in the questionnaire;
- has not altered the content of the questionnaire in any manner;
- has reviewed and/or supplied full and complete responses to each question;
- to the best of his/her knowledge, information and belief, confirms that the Business Entity's responses are true, accurate and complete, including all attachments, if applicable;
- understands that New York State government entities will rely on the information disclosed in the questionnaire when entering into a contract with the Business Entity; and
- is under an obligation to update the information provided herein to include any material changes to the Business Entity's responses at the time of bid/proposal submission through the contract award notification, and may be required to update the information at the request of the New York State government entities or OSC prior to the award and/or approval of a contract, or during the term of the contract.

Signature of Owner/Official _____

Printed Name of Signatory _____

Title _____

Name of Business _____

Address _____

City, State, Zip _____

Sworn to before me this _____ day of _____, 20____;

_____ Notary Public

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LIST OF SUBCONTRACTORS

RIVERHEAD SEWER DISTRICT

TOWN OF RIVERHEAD

NEW YORK

The Bidder shall list the subcontractors, if any, to be used for this project. Provide the required information for each proposed subcontractor. Make appropriate copies of this form should the Bidder propose more than five (5) subcontractors. List at least five projects for each subcontractor that demonstrates the subcontractor's qualifications to perform the work of the project. The projects shall be similar in size and complexity and have been completed within the last five (5) years by the subcontractor.

Subcontractor Name: _____

Type of Work: _____

<u>Owner</u>	<u>Contact Name</u>	<u>Phone Number</u>	<u>Location</u>	<u>Contract Amount</u>
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

LIST OF SUBCONTRACTORS

Subcontractor Name: _____

Type of Work: _____

<u>Owner</u>	<u>Contact Name</u>	<u>Phone Number</u>	<u>Location</u>	<u>Contract Amount</u>

_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

Subcontractor Name: _____

Type of Work: _____

<u>Owner</u>	<u>Contact Name</u>	<u>Phone Number</u>	<u>Location</u>	<u>Contract Amount</u>

_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

LIST OF SUBCONTRACTORS

Subcontractor Name: _____

Type of Work: _____

<u>Owner</u>	<u>Contact Name</u>	<u>Phone Number</u>	<u>Location</u>	<u>Contract Amount</u>

Subcontractor Name: _____

Type of Work: _____

<u>Owner</u>	<u>Contact Name</u>	<u>Phone Number</u>	<u>Location</u>	<u>Contract Amount</u>

NOTE: THIS FORM MUST BE COMPLETED BY BIDDER

LIST OF SUBCONTRACTORS

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CONDITIONS OF CONTRACT

1. **CONTRACT DOCUMENTS AND DEFINITIONS**

The Notice to Bidders, Instructions to Bidders, Proposal Form, Form of Bond, Conditions of Contract, General Conditions, Specifications, Form of Contract, Construction Drawings, together with any Addenda, shall form part of this Contract, and the provisions thereof shall be as binding upon the parties hereto, as if they were herein fully set forth. The table of contents, titles, heading, headlines, and marginal notes contained herein are solely to facilitate reference to various provisions of the Contract Documents and in no way affect, limit or cast light upon the interpretation of the provisions to which they refer. Whenever the term "Contract Documents" is used, it shall mean and include the Notice to Bidders, Instructions to Bidders, Proposal Form, Form of Bond, Conditions of Contract, General Conditions, Plans & Specifications, Form of Contract and any Addenda. In case of any conflict or inconsistency between the provisions of the contract and those of the Specifications, the provisions of this contract shall govern.

Extra Work: The term "extra work" as used herein, refers to and includes all work required by the Town, which in the judgment of the Town Engineer involves changes in or additions to work required by the Specifications and any Addenda in their present form and which is not covered by the price in the Form of Bid.

Subcontractor: The term "subcontractor" shall mean any person, firm, or corporation supplying labor and material for work at the site of the project but not including the parties to this contract.

Notice: The term "notice" as used herein, shall mean and include written notice. Written notice shall be deemed to have been duly served when delivered to, or at last known business address of, the person, firm or corporation for who intended, or his, their, or its duly authorized agents, representatives, or officer, or when enclosed in a postage prepaid wrapper or envelope addressed to such person, firm or corporation at his, their or its last known business address and deposited in a United States mailbox.

Directed, Required, Approved, Acceptable: Whenever the Contract Documents refer to the work or its performance, "directed", "required", "permitted", imply the direction, requirement, permission, order, designation or prescription of the Town Engineer, or his representative, and "approved", "satisfied", or "satisfactory", "in the judgment of", and words of like import, shall mean approved, or acceptable to, or satisfactory to, or in the judgment of the Town Engineer, or his representative.

2. **SCOPE OF SERVICES**

The contractor will furnish all labor, materials, suppliers, equipment and other facilities necessary or proper for, or incidental to, the work contemplated by this contract as required by, and in strict accordance with the applicable Plans and Specifications and Addenda prepared by the Town Engineer and/or required by, and in strict accordance with, such changes as are ordered and approved pursuant to this contract, and will perform all other obligations imposed on him by this contract. It is specifically understood that this contract does not guarantee any minimum or maximum quantities of work. Quantities will be as ordered by the Town from time to time, and unit bid prices will govern. The quantities in the proposal are for bidding purposes only.

3. **COMPENSATION TO BE PAID TO THE CONTRACTOR**

(A) **Agreed Prices:** It is understood and agreed that the contractor will accept as payment in full the summation of the products of the actual quantities in place upon the completion of the work, as determined by the Town Engineer's measurements, by the unit prices bid, no allowances being made for anticipated profit or for reasons of variations from the estimated quantities set forth in the Form of Bid.

CONDITIONS OF CONTRACT

(B) Extra Work: The town may, at any time, by a written order and without notice to the sureties, require the performance of such extra work or changes in the work as it may find necessary or desirable. The amount of compensation to be paid to the contract for any extra work, as so ordered, shall be determined as follows:

1. By such applicable unit prices, if any, as set forth in the contract; or
2. If no such unit prices are set forth, then by unit price or by a lump sum mutually agreed upon by the town and the contractor; and
3. If no such unit prices are set forth and if the parties cannot agree upon unit prices or a lump sum; then by actual net cost in money to the contractor of the materials, permits, wages of applied labor, premiums for Worker's Compensation Insurance, payroll taxes required by law, rental for plant and equipment used (excluding small tools) to which total cost will be added twenty (20) percent as full compensation for all other items of profit costs and expenses, including administration, overhead, superintendency, insurance, insurance other than Workers' Compensation Insurance, materials used in temporary structures, allowances made by the contractor to subcontractors, additional premiums upon the performance bond of the contractor and the use of small tools.

4. TIME OF ESSENCE

Inasmuch as the provisions of the contract relating to the time of performance and completion of the work are for the purpose of enabling the town to proceed with the construction of a public improvement in accordance with a predetermined program, such provisions are of the essence of this contract.

5. TIME OF COMPLETION

The town shall assign a construction schedule indicating a start date and a completion date. The contractor shall have a minimum of fourteen (14) days from the date of receipt of construction schedule to the earliest start date on the assigned construction schedule. If said schedule is not acceptable to the contractor, the contractor shall notify the town in writing, postmarked within three (3) working days from date of receipt of construction schedule. This notification shall include an alternative construction schedule. The alternative construction schedule completion date shall not exceed twenty-eight (28) calendar days from the original completion date assigned by the town. Failure to comply with time of completion shall constitute liquidated damages and termination of primary contractor.

6. LIQUIDATED DAMAGES

The time limit being essential to and of the essence of this contract, the primary contractor hereby agrees that the Town shall be and is hereby authorized to deduct and retain out of the money which may be due or may become due to said contractor under this agreement, the sum of the cost of completing the work by the secondary contractor, including overhead charges, services, inspector's wages, and interest on the money invested that the Town will suffer by reason of such default. The Town shall have the right to extend the time for the completion of said work.

7. TERMINATION OF PRIMARY CONTRACTOR

Termination of primary contractor shall include all work in progress and pending. All existing and pending purchase orders pertaining to work issued through the Town-wide Construction Contract shall be hereby considered void. All items previously awarded to terminated contractor shall be hereby awarded to corresponding secondary contractors. Termination of primary contractor shall extend the duration of the contract. At the discretion of the Town of Riverhead, termination of contractor shall warrant disqualification from awarding specific items or all items in succeeding Town-wide construction contracts Capital Improvement Projects, etc.

CONDITIONS OF CONTRACT

8. EXTENSIONS OF TIME. NO WAIVER.

If the contractor shall be delayed in the completion of his work by reason or by reasons of unforeseeable causes beyond his control and without his fault or negligence, including but not restricted to; acts of God, the public enemy, fires, floods, epidemics, quarantine restrictions, strikes, riots, civil commotion or freight embargoes, the period herein specified for completion of his work shall be extended by such time as shall be fixed by the Town.

No such extension of time shall be considered a waiver by the Town of its right to terminate the contract for abandonment or delay by the contractor as hereinafter provided, or relive the contractor from full responsibility for performance of his obligations hereunder.

9. WEATHER

During unsuitable weather, all work must stop when such work would be subject to injury and the contractor shall transfer his men and materials to those parts of the work where weather conditions will not have any effect on the workmanship to any damages on account of such damages or suspension, and he must protect any work that might be injured by the elements and make good any work that is injured.

10. CONTRACT SECURITY

The contractor shall furnish, at the request of the Town, a Performance Bond equal to 100% of the estimated value of individual projects completed under this contract at the discretion of the Town Engineer. Each individual project to be completed under the contract will be evaluated by the Town Engineer or his representative to determine the need for bonding. If bonding is deemed necessary, the contractor will be required to submit documentation confirming the actual cost of such bonding to the Town Engineer for approval. Upon approval, the Town will reimburse the contractor for 100% of the cost of any required bonding. The contractor is advised not to include the cost of bonding in bid submittals.

Additional or Substitute Bond: If at any time the Town shall be or become dissatisfied with any surety or sureties then upon the Performance Bond, or if for any other reason such bond shall cease to be adequate security to the Town, the contractor shall within five (5) days after notice from the Town to do so, substitute an acceptable bond in such form and sum and signed by such other surety as may be satisfactory to the Town. The premiums on such bonds shall be made until the new surety shall have been qualified.

11. LAWS AND ORDINANCES

In the execution of the contract, the contractor will be required to observe and obey all federal, state, county and local laws, ordinances, codes and regulations relating to the performance of the contract including but not limiting labor employed thereon, materials supplied, obstructing streets and highways, maintaining signals, storing, handling and use of explosives and all other general ordinances and state statutes affecting him or his employees of his work hereunder in his relations with the municipality or any other persons, and also all laws, codes, ordinances controlling or limiting the contractor while engaged in executing the work under the contract.

As a condition of the contract, the contractor shall and does hereby agree to comply with all requirements of the Labor Laws of the State of New York.

The contractor shall comply with the provisions of Sections 291-299 of the Executive Law and Civil Rights Law, shall furnish all information and reports deemed necessary by the State Commission for Human

CONDITIONS OF CONTRACT

Rights, the Attorney General and the Industrial Commissioner for purposes of investigation to ascertain compliance with such sections of the Executive Law and Civil Rights Law.

The contract may be forthwith canceled, terminated or suspended, in whole or in part, by the contracting agency upon the basis of a finding made by the State Commissioner for Human Rights that the contractor has not complied with these laws.

The contract hereby expressly agrees to comply with all the provisions of the Labor Law and any and all amendments thereto, insofar as the same are applicable to the contract. The Labor Law, as amended, provides that no laborer, worker or mechanic in the employ of the contractor, subcontractor or other person doing or contracting to do the whole or a part of the work contemplated by this contract, shall be permitted or required to work more than eight (8) hours in any one (1) calendar day, except in cases of extraordinary emergency caused by fire, flood or danger to life or property; that no such person shall be employed more than eight (8) hours in any day or more than five (5) days in any week except in such emergency; that the wages to be paid for a legal day's work as herein before defined, to laborers, workmen or mechanics upon the work called for under this contract or upon any materials used upon, or in connection therewith, shall not be less than the prevailing rate for a day's work in the same trade or occupation in the locality within the State where such work is to be done and each laborer, worker or mechanic employed by the contractor, subcontractor or other person about or upon the work shall be paid the wages herein provided; that employees engaged in the construction maintenance, and repair of highways and in water works construction outside the limits of cities and villages are no longer exempt from the provisions of the labor Law which require that payment of the prevailing rate of wages and the eight (8) hour day.

Section 222 of the Labor Law, as amended by Chapters 556 and 557 of the Laws of 1933, provides that preference in employment shall be given to citizens of the State of New York who have been residents of Suffolk County for at least six (6) consecutive months immediately prior to the commencement of their employment. Each person so employed shall furnish satisfactory proof of residence in accordance with rules adopted by the Industrial Commissioner. Person other than citizens of the State of New York shall be employed only when such citizens are not available. Section 222 further provides that upon the demand of the State Industrial Commissioners, the contractor shall furnish a list of names and addresses of all his subcontractors and further provides that a violation of this section shall constitute a misdemeanor and shall be punishable by a fine of not less than Fifty Dollars (\$50.00) nor more than Five Hundred Dollars (\$500.00) or by imprisonment for not less than thirty nor more than ninety days, or both fine and imprisonment.

Section 220-A of the Labor Law, as amended by Chapter 472 of the Laws of 1932, provides that before payment is made by or on behalf of the State or any city, county, town or village or other civil division of the state of any sums due on account of a contract for a public improvement, it is the duty of the comptroller or the financial officer of the municipal corporation to require the contractor and each and every subcontractor to file a certified statement in writing, in satisfactory form, certifying to the amount then due and owing to any and all laborers for daily or weekly wages on account of labor performed upon the work of the contractor, setting forth herein the names of the persons whose wages are unpaid and the amount due each respectively.

Section 220-B of the Labor Law, as so amended, provides that any interested person who shall have previously filed a protest in writing objecting to the amounts due or to become due to him for daily or weekly wages for labor performed on the public improvement for which the contract was entered into, or if for any reason, it may be deemed advisable, the comptroller of the state or financial officer of the municipal corporation may deduct from the whole amount of any payment on account thereof of the sums or sum admitted by any contractor or subcontractor in such statement or statements so filed to be due and owing by him on account of labor performed and may withhold the amount so deducted for the

CONDITIONS OF CONTRACT

benefit of the laborers for daily work, weekly wages, whose wages are unpaid as shown by the verified statements filed by any contractor or subcontractor and may pay directly to any person the amount or amounts so shown to be due for such wages.

Section 220-C of the Labor Law, as so amended, provides the penalty for making of a false oath or verification.

Section 220-D of the Labor Law provides that the advertised specifications for every contract for the construction, reconstruction, maintenance and/or repair of highways to which the state, county, town and/or village is a party shall contain a provision stating the minimum rate of hourly wage that can be paid, as shall be designated by the Industrial Commissioner, to the laborers employed in the performance of the contract whether by the contractor, subcontractor or other person doing or contracting to do the whole or part of the work completed by the laborers shall be paid not less than such hourly minimum rate of wage. Any person or corporation that willfully pays, after entering into such contract, less than such stipulated minimum hourly wage scale shall be guilty of a misdemeanor and upon conviction, shall be punished for a first offense by a fine of Five Hundred Dollars (\$500.00) or by imprisonment; for a second offense by a fine of One Thousand Dollars (\$1,000.00) and in addition thereto, the contract on which the violation has occurred shall be forfeited, and no such person or corporation shall be entitled to receive any sum nor shall any officer, agent or employee of the state pay the same or authorize its payment from the funds under his charge or control to any person or corporation for work done upon any contract, on which the contractor has been convicted or a second offense in violation of the provisions of this section.

The minimum wage rates established by the Industrial Commissioner, State of New York, for this contract are set forth herein above as part of "Instructions to Bidders, Section 21 "NYS Wage Rates"

12. QUALIFICATIONS FOR EMPLOYMENT

No person under the age of sixteen (16) years and no person currently serving sentence in a penal or correctional institution shall be employed to perform any work on the project under this contract. No person whose age or physical condition is such as to make his employment dangerous to his health or safety or to the health or safety of others, shall be employed to perform any work on this project; provided, however, that such restrictions shall not operate against the employment of physically handicapped persons, otherwise employable, where each person may be safely assigned to work which they can ably perform.

13. NONDISCRIMINATION

There shall be no discrimination because of race, creed, or color in the employment of persons for work under this contract, whether performed by the contractor or any subcontractor. Neither shall the contractor or subcontractor or any person acting on behalf of the contractor or subcontractor discriminate in any manner against or intimidate any employee hired for the performance of work under this contract on account of race, creed, or color.

14. PAYMENTS OF EMPLOYEES

The contractor and each of his subcontractors shall pay each of his employees engaged in work on the project under this contract in full (less deductions made mandatory by law) not less often than once each week. Certified payrolls shall be submitted to the Town Engineer before payment to the contractor is processed. Affidavit attesting to payment or amount owed to employees shall be submitted before payment to contractor is processed.

15. ESTIMATES AND PAYMENTS

CONDITIONS OF CONTRACT

Upon successful completion of all work, the contractor shall submit an invoice to the Town Engineer for approval. Upon approval by the Town Engineer, payment will be made to the contractor within thirty (30) calendar days provided the payment request is correct and complete.

- (A) Monthly: At the end of each calendar month during the progress of the work, the Town Engineer shall make an approximate estimate of the work satisfactorily completed, based upon the prices set forth in the Form of Bid. In consideration of the work completed, the Town will pay or cause to be paid to the contractor the amount estimated by the Town Engineer as due him less five (5%) percent.

The making of any such estimate or payment made thereon shall not be taken or construed as an acceptance by the Town of any work so estimated and paid for. The five (5%) percent of the amount of the monthly estimate remaining unpaid will be retained by the Town as a guarantee that the contractor will faithfully and completely fulfill all obligations imposed by the contract and specifications, and against any damages caused the Town by reason of any failure on the part of the contractor to fulfill all conditions and obligations herein contained.

- (B) Final Estimate: One month after the completion and acceptance of the work specified and contracted for, the Town Engineer will make a final estimate of all the work done. Thereafter, the Town will pay the full amount, less prior payments, less any amounts retained to complete the work according to the provisions of the specifications, less any money paid by the Town by reasons of said contractor having failed to carry out faithfully and completely all the obligations and requirements herein contained. Upon final settlement, according to the conditions herein specified and not until such settlement shall have been made, will the contractor be relieved from the obligations assumed in the contract.
- (C) Measurement for Payment: The Town Engineer shall make due measurement of work completed during the progress of the work and his estimate shall be final and conclusive evidence of the amounts of work performed by the contractor under and by virtue of this agreement and shall be taken as full measure of compensation to be received by the contractor.
- (D) No payments will be made for materials delivered to the site which have not been incorporated into the work.

16. ACCEPTANCE OF FINAL PAYMENT CONSTITUTES RELEASE

The acceptance by the contractor of final payment shall be, and shall operate as a release to the Town from all claims and all liabilities to the contractor for all the things done or furnished in connection with this work and for every act and neglect of the Town and others relating to or arising out of, this work, excepting to the contractor's claims for interest upon the final payment, if this payment be improperly delayed. No payment, however, final or otherwise, shall operate to release the contractor or his sureties from any obligations under this contract or the performance bond or maintenance bond.

17. CONSTRUCTION REPORTS

The contractor shall submit to the Town Engineer prior to commencing any work under this contract, a detailed schedule and plan of operations indicating the manner in which the contractor proposes to prosecute the work and a time schedule therefor. Such schedules are not intended to bind the contractor to a predetermined plan or procedure, but rather to enable the Town Engineer to coordinate the work of the contractor with work required of and to be performed by others. The detailed schedule shall include a list of the subcontractors and material suppliers he proposes to use on the work.

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18. INSPECTION AND TESTS

All material and workmanship shall be subject to inspection, examination and test by the Town Engineer, or his representative, at any time during the construction and at any and all places where manufacturing of materials used and/or construction is carried on.

If at any time before final acceptance of the entire work, the Town Engineer, or his representative, considers necessary or advisable an examination of any portion of the work already completed, by removing the same, the contractor shall upon request, furnish promptly all necessary facilities, labor and materials for such examination. If such work is found to be defective in any material respect, due to the fault of the contractor or any subcontractor, contractor shall be liable for the expense for such examination and of satisfactory reconstruction.

If, however, such approval and consent shall have been given and such work is found to meet the requirements of this contract, the contractor shall be recompensed for the expense of such examination and reconstruction in the manner herein provided for the payment of cost of extra work.

The selection of laboratories and/or agencies for the inspection and tests of supplies, materials or equipment shall be subject to the approval of or designated by the Town. Satisfactory documentary evidence that the material has passed the required inspection and tests must be furnished to the Town Engineer prior to the incorporation of the material in the work.

Any rejected work will be removed from the site of the project completely at the expense of the contractor.

19. PLANS AND SPECIFICATIONS: INTERPRETATIONS

The contractor shall keep at the site of the work one copy of the plans and specifications. Bidding of this contract shall be based on the information and data contained herein. Materials of construction and component installation shall conform to the general requirements of the specifications and details contained at the end of the specifications. The Town Engineer will provide plans and directions for specific drainage projects as projects arise. System configurations, arrangements, elevations, materials and methods are to be as directed by the Town Engineer on a specific project basis.

20. SUPERINTENDENCY BY CONTRACTOR

At the site of the work, the contractor shall give his constant, personal attention to the work or employee a construction superintendent or foreman who shall have full authority to act for the contractor. It is understood that such representative shall be acceptable to the town Engineer, or his representative, and shall be one who can be contained in that capacity for the particular job involved unless he ceases to be on the contractor's payroll. The contractor's superintendent and foreman must be able to read and speak the English language.

21. CONTRACTOR'S TITLE TO MATERIALS

No materials or supplies for the work shall be purchased by the contractor or any subcontractor subject to a 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.

22. PROTECTION OF WORK, PERSONS AND PROPERTY

Precaution shall be exercised at all times for the proper protection of all persons, property and work the contractor shall give notice to the owners of utilities which may serve the area and request their

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assistance in predetermining the location and depth of various pipes, conduits, manholes, and other underground facilities. The safety provisions of applicable laws and building and construction codes shall be observed. 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. The contractor shall furnish entirely at his own expense any and all additional safety measures deemed necessary by the Town to adequately safeguard the traveling public.

23. REPRESENTATIONS OF CONTRACTOR

The contractor represents and warrants:

- (A) That he is financially solvent and that he is experienced in, and competent to, perform the type of work involved under this contract and able to furnish the plant, materials, supplies and/or equipment to be furnished for the work; and
- (B) That he is familiar with all federal, state and municipal law, ordinances and regulations which may in any way affect the work of those employed thereunder, including but not limited to any special acts relating to the work; and
- (C) That such work required by these contract documents as is to be done by him can be satisfactorily constructed and used for the purpose for which is intended and that such construction will not injure any person or damage any property; and
- (D) That he has carefully examined the specifications and project site and that from his own investigations he has satisfied himself as to the nature of the work, the character of equipment and other facilities needed for the performance of the work, and the general local conditions which may in any way affect the work or its performance.

24. AUTHORITY OF THE ENGINEER

In the performance of the work, the contractor shall abide by all orders and directions and requirements of the Town Engineer, or his representative, and shall perform work to the satisfaction of the Town Engineer, or his representative, at such time and places, by such methods, and in such manner and sequence as he may require. The Town Engineer, or his representative, shall determine the amount, quality, acceptability, and fitness of all parts of the work, shall interpret the plans, specifications, contract documents and any extra work orders and shall decide all other questions in connection with the work. Upon request, the Town Engineer, or his representative, shall confirm in writing any oral orders, directions, requirements or determinations. The enumeration herein or elsewhere in the contract documents of particular instance in which the opinion, judgment, discretion or determination of the Town Engineer, or his representative, shall control or in which work shall be performed to his satisfaction or subject to his approval or inspection, shall not imply that only matters similar to those enumerated shall be so governed and performed, but without exception all the work shall be governed and so performed.

25. CHANGES AND ALTERATIONS

The Town Engineer reserves the right to make alterations in locations, line, grade, plan, form or dimensions of the work, or any part thereof, either before or after the commencement of construction. If such alteration diminishes the amount of work to be done, no claim for damages or anticipated profits will be warranted on the work which may be dispensed with. If such alterations increase the amount of work, such increases shall be paid for according to the quantity of work actually done and at the prices for such work as contained in the schedule of prices.

CONDITIONS OF CONTRACT

26. CORRECTION OF WORK

All work and all materials whether incorporated into the work or not, all processes of manufacture and all methods of construction shall be at all times and places subject to the inspection of the Town Engineer, or his representative, who shall be the final judge of quality, materials, processes of manufacture and methods of construction suitable for the purpose for which they are used. Should they fail to meet his approval, they shall be forthwith reconstructed, made good and replaced and/or corrected as the case may be, by the contractor, at his own expense.

If, in the opinion of the Town Engineer, or his representative, it is not desirable to replace any defective or damaged materials or to reconstruct or correct any portion of the work injured or not performed in accordance with the contract documents, the compensation to be paid to the contractor thereunder shall be reduced by such amount as in the judgment of the Town Engineer, or his representative, shall be equitable. The contractor expressly warrants that his work shall be free from any defects in materials or workmanship and agrees to correct any defects which may appear within one year following the final completion of the work. Neither the acceptance of the completed work nor payment therefor shall operate to release the contractor or his sureties from any obligations under or upon this contract or the performance bond.

27. WEATHER CONDITIONS

In the event of temporary suspension of work or during inclement weather or whenever the Town Engineer, or his representative, shall direct, the contractor will, and will cause his subcontractor to sufficiently protect his and their work and materials against damage or injury from the weather. If, in the opinion of the Town Engineer, or his representative, any work or material shall have been damaged or injured by reason of failure on the part of the contractor or any of his subcontractors to protect his or their work, such work and materials shall be removed and replaced at the expense of the contractor.

28. THE TOWN'S RIGHT TO WITHHOLD PAYMENTS

The Town may withhold from the contractor so much of any approved payments due him as may, in the judgment of the Town be necessary:

- (A) To assure the payment of just claims then due and unpaid of any persons supplying labor or materials for the work;
- (B) To protect the Town from loss due to defective work not remedied; or
- (C) To protect the Town from loss due to injury to persons or damage to the work or property of other contractors or subcontractors or others, caused by the act or neglect of the contractor or any of his subcontractors. The Town shall have the right, as agent for the contractor, to apply such amounts so withheld in such manner as the town may deem proper to satisfy such claims or to secure such protection. Such applications of such money shall be deemed payments for the account of the contractor.

29. THE TOWN'S RIGHT TO TERMINATE CONTRACT

The Town of Riverhead may terminate this contract if:

- (A) the contractor shall be adjudged bankrupt or make an assignment for the benefit of creditors; or

CONDITIONS OF CONTRACT

- (B) a receiver or liquidator shall be appointed for the contractor for any of his property and shall not be dismissed within 20 days after such appointment, or the proceedings in connection therewith shall not be stayed on appeal within the said 20 days; or
- (C) the contractor shall refuse or fail, after notice or warning from the Town Engineer, or his representative, to supply enough properly skilled workmen or proper materials to the job; or
- (D) the contractor shall refuse or fail to prosecute the work or any part thereof with such diligence as will insure its completion within the period herein specified (or any duly authorized extension thereof) or shall fail to complete the work within said period; or
- (E) the contractor shall fail to make prompt payments to persons supplying labor or materials for the work; or
- (F) the contractor shall fail or refuse to regard laws, ordinances or the instruction of the Town Engineer, or his representative or otherwise be guilty of a substantial violation of any provisions of this contract.

Upon the determination by the Town of Riverhead to terminate this contract, and in any such event, the Town, without prejudice to any other rights or remedy it may have, may give seven (7) days notice to the contractor, terminate the employment of the contractor and his rights to proceed with as to the entire work or (or at the option of the Town) as to any portion thereof as to which delay shall have occurred, and may take possession of the work and complete the work by contract, secondary contractor or otherwise, as the Town may deem appropriate. In such case, the contractor will not be entitled to receive any further payment until the work is finished. If the unpaid balance of the compensation to be paid to the contractor thereunder shall exceed the expense of so completing the work (including compensation for additional managerial, administrative and inspection services and any damages for delay), such excess shall be paid to the contractor. If such expense shall exceed such unpaid balance, the contractor and his sureties shall be liable to the Town for such excess. If the right of the contractor to proceed with the work is so terminated, the Town may take possession of and utilize in completing the work, such materials, appliances, supplies, plant and equipment as may be on the site of the work and necessary thereof.

30. CONTRACTOR'S RIGHT TO STOP WORK OR TERMINATE CONTRACT

If the work shall be stopped by order of the court or other public authority for a period of three (3) months without act or fault of the contractor or any of his agents, servants, employees or subcontractors, the contractor may, upon ten (10) days notice to the town, discontinue his performance of the work and/or terminate the contract; in which event, the liability of the Town immediately preceding (Paragraph 31), the contractor shall not be obligated to pay to the Town any excess of the expense of completing the work over the unpaid balance of the compensation to be paid to the contractor thereunder.

31. RESPONSIBILITY FOR WORK

The contractor agrees to be responsible for the entire work embraced in this contract until its completion and final acceptance by the Town of Riverhead. The contractor further agrees that any imperfect and/or damaged work that may be discovered at any time before the completion and acceptance of work shall be removed and/or replaced in conformity with the requirements of this contract without charge to the Town. Such removal and replacement will be performed as soon as practicable following receipt of written notice from the Town Engineer that the work is imperfect and/or damaged. The contractor further agrees that the inspection of the work by the Town Engineer or his or her designee shall not relieve him of any obligation to do sound and reliable work. Furthermore, such inspection and/or partial payment for work shall not preclude the Town Engineer from requiring removal and/or replacement at a later time. Neither shall such inspection or partial payment be deemed to be acceptance of any work.

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32. USE OF PREMISES AND REMOVAL OF DEBRIS

The contractor expressly undertakes at his own expense:

- (A) To 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 his work or the work of any of his subcontractors;
- (B) To frequently clean up all refuse, rubbish, scrap materials and debris caused by the operations to the end that at all times, the site of the work shall present a neat, orderly and workmanlike appearance;
- (C) Before final payment hereunder to remove all surplus material, temporary structures, plants of any descriptions and debris of every nature resulting from his operations.

33. SUITS OF LAW

The contractor shall indemnify and save harmless the Town and its employees from and against all suits, claims, demands or actions for any injury sustained or alleged to be sustained by any party or parties in connection with the construction of the work or any part thereof, or any commission or omission of the contractor, his employees or agents of any subcontractor, and in case of any such action shall be brought against the Town, the contractor shall immediately take charge of and defend the same at his own cost and expense.

34. POWER OF THE CONTRACTOR TO ACT IN AN EMERGENCY

In case of an emergency which threatens loss or injury to property and/or safety of life, the contractor will be permitted to act as he sees fit without previous instructions from the Town Engineer, or his representative. He shall notify the Town Engineer, or his representative thereof immediately and any compensation claimed by the contractor due to extra work made necessary because of his acts in such emergency shall be submitted to the town Engineer, or his representative, for approval.

Where the contractor has not taken action but has notified the Town Engineer, or his representative, of an emergency indicating injury to persons or damage to adjoining property or to the work being accomplished under this contract, then upon authorization from the Town Engineer, or his representative to prevent such threatened injury or damage, he shall act as instructed by the Town Engineer, or his representative. The amount of reimbursement claimed by the contractor on account of any such action shall be determined in the manner provided herein for the payment of extra work.

35. PROVISION 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 read and be 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 be forthwith physically amended to make such insertion.

36. SUBLETTING – SUCCESSOR AND ASSIGNS

The contractor shall not sublet any part of the work under this contract nor assign any money due him hereunder without first obtaining the written consent of the town. This contract shall insure the benefit of and shall be binding upon the parties hereunder and upon their respective successors and assigns, but neither party shall assign or transfer his interest herein in whole or in part without consent of the other.

37. GENERAL MUNICIPAL LAW CLAUSE

Pursuant to the provisions of Section 103-a of the General Municipal Law, in the event that the bidder or any member, partner, director or officer of the bidder, should refuse, when called before a grand jury to testify concerning any transaction or contract had with the state, any political subdivision thereof, a public authority or any public department, agency or official of the state or of any political subdivision thereof or of a public authority, to sign a waiver of immunity against subsequent criminal prosecution or to answer any relevant question concerning such transaction or contract, such person, and any firm, partnership, or corporation of which he is a member, partner, director or officer shall be disqualified from thereafter selling to or submitting bids to or receiving awards from or entering into any contracts with any municipal corporation or any public department, agency or official thereof for goods, work or services for a period of five (5) years after such refusal, and any and all contracts made with any municipal corporation or any public department, agency or official thereof on or after the first day of July, 1959, by such person, and by any firm, partnership or corporation of which he is a member, partner, director or officer may be canceled or terminated by the municipal corporation without incurring any penalty or damages on account of such corporation for goods delivered or work done prior to the cancellation or termination shall be paid.

38. CONTRACTOR'S INSURANCE

The contractor shall not commence any work until he has obtained, and had approved by the Town, all the insurance required under this contract as enumerated herein:

Workers' Compensation Insurance

Public Liability and Property Damage Insurance

Contractor's Protective Liability and Property Damage Insurance

Owner's Protective Public Liability and Property Damage Insurance

Automobile Public Liability and Property Damage Insurance

The contractor shall not permit any subcontractor to commence any operation on the site until satisfactory proof of carriage of the above-required insurance has been posted with and approved by the Town.

(A) Workers' Compensation Insurance: The contractor shall take out and maintain, during the life of this contract, Workers' Compensation Insurance for all his employees employed at the site of the project, and in case of any of the work being sublet, the contractor shall require all subcontractors similarly to provide Workers' Compensation Insurance for all the latter's employees unless such employees are covered by the protection afforded by the contractor. Limits: statutory for Workers' Compensation, One Million Dollars (\$1,000,000) Employers Liability.

(B) Public Liability and Property Damage Insurance: The contractor shall take out and maintain during the life of this contract such Public Liability and Property Damage Insurance as shall protect him or any subcontractor performing work covered by this contract from claims for damages for personal injury including accidental death as well as from claims for property damage which may arise from operations under this contract, whether such operations be completed by the contractor or by any subcontractor, or by anyone directly or indirectly employed by either of them, and the amounts of such insurance shall be as follows:

Public Liability Insurance in an amount not less than One Million Dollars (\$1,000,000) combined single limit for bodily injuries, including wrongful death, and property damage. The Town of Riverhead must be named as an additional insured.

(C) Liability and Property Damage Insurance: the above policies for Public Liability and Property Damage Insurance must be so written as to include Contractor's Protective Liability and Property

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Damage Insurance to protect the contractor against claims arising from the operations of any subcontractor. The Town of Riverhead shall be named as additional insured.

- (D) Owner's Protective Public Liability and Property Damage Insurance: The contractor shall furnish to the Town, with respect to the operations he or any of his subcontractors perform, a regular Protective Public Liability Insurance policy for, and in behalf of the Town, providing for a limit of not less than One Million Dollars (\$1,000,000) for all damages arising out of bodily injuries to, or death of, one person and subject to that limit for each person, a total limit of One Million Dollars (\$1,000,000) for all damages arising out of bodily injuries to, or death of, two or more persons in any one accident; and regular Protective Property Damage Insurance providing for a limit of not less than One Million Dollars (\$1,000,000) for damages arising out of injury to, or destruction of, property during the liability of the Town. The coverage provided under this policy must not be affected if the Town performs work in connection with the project either for or in cooperation with the contractor or as an aid thereto whether the same be a part of the contract or separate therefrom, by means of its own employees or agents, or if the Town directs or supervises the work to be performed by the contractor.
- (E) Automobile Public Liability and Property Damage Insurance: The contractor shall take out and maintain during the life of the contract such Automobile Public Liability and Property Damage Insurance as shall protect him and any subcontractor performing work covered by this contract from claims for damages for personal injury, including accidental death as well as from claims for property damage which may arise from operations under this contract, whether such operations be by himself or by a subcontractor or by anyone directly or indirectly employed by either of them and the amounts of such insurance shall be as follows:

Automobile Public Liability Insurance in an amount not less than One Million Dollars (\$1,000,000) combined single limit for bodily injuries, including wrongful death, and property damage. The Town of Riverhead must be named as an additional insured.

Automobile Property Damage Insurance in an amount of not less than One Million Dollars (\$1,000,000) for damages on account of any accident and in an amount of not less than One Million Dollars (\$1,000,000) for damages on account of all accidents.

38A. HOLD HARMLESS CLAUSE

To the fullest extent permitted by law, the contractor shall indemnify and hold harmless the Owner and their agents and employees from and against all claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from the performance of the work, provided that any such claim, damage, loss or expense (i) is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the work itself) including the loss of use resulting therefrom and (ii) is caused in whole or in part by any negligent act or omission of the contractor, any subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts they may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or otherwise reduce any other right or obligation of indemnity which would otherwise exist as to any party or person described in the paragraph.

39. CLAIMS AGAINST TOWN OFFICIALS AND EMPLOYEES

The Contractor expressly agrees and represents that the contractor shall make no claim and shall bring no action pursuant to any federal or state laws, including, but not limited to 42 U.S.C. § 1983, against any Town official or employee in his/her individual or personal capacity for any act, omission, or statement made or done relating to, or arising out of, this contract and expressly waives its rights to bring such a claim pursuant to any federal or state laws, including, but not limited to 42 U.S.C. § 1983.

40. PROOF OF CARRIAGE OF INSURANCE

The contractor shall furnish the Town with certificates of each insurer insuring the contractor under this contract except with respect to subdivision "D". In respect to this paragraph, the contractor shall furnish the Town with the original insurance policy.

Both certificates, as furnished, and the insurance policy, as required, shall bear the policy numbers, the expiration date of the policy and the limits of liability thereunder. Both the certificates and the policy shall be endorsed to provide the Town with any notice of cancellation at least five (5) days prior to the actual date of such cancellation.

The insurance company utilized must have a minimum AM Best Rating of "A-VII".

41. TERM OF CONTRACT

The term of this contract shall be until the completion date set by the Notice to Proceed and the length of contract time (calendar days) as stipulated in the Proposal Form. The Town of Riverhead shall have the option of extending this contract in six-month intervals up to a maximum of one additional year when mutually agreed upon by the Town and the contractor.

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GENERAL CONDITIONS

1. DEFINITIONS

The "General Conditions" are hereby made part of these Specifications and are attached herein.

Where any article of the General Conditions is supplemented hereby, the provisions of such article shall remain in effect. All the supplemental provisions shall be considered as added thereto. Where any such article is amended, voided or superseded thereby, the provisions of such article not so specifically amended, voided or superseded shall remain in effect.

Work, materials, plant, labor and other requirements of the General Conditions shall be furnished by the Contractor. No direct payment will be made for these General Conditions, and payment shall be deemed to be included in the Contract price or various items of the entire Contract.

The words "or approved equal", as hereinafter used, shall refer to the use of an equal product that has received prior approval by the Consulting Engineer for the District.

1.1. DEFINITION OF TERMS

Whenever the following words and expressions are used in the Specifications, it is understood that they have the meaning defined below:

Plans: All official drawings or reproductions of drawings pertaining to the work or to any structure connected therewith.

Specifications: The body of directions, requirements, descriptions, etc. contained in this document, together with all documents of any description and agreements made (or to be made) pertaining to the methods or manner of performing the work and/or to the quantities and quality of materials to be furnished and accepted under this contract.

Town: Town Board of the Town of Riverhead.

Engineer: H2M architects + engineers, Consulting Engineer for the District.

Contract: Collectively, the contract executed by the Town and the contract, Notice to Bidders, Instruction to Bidders, Proposal Form, Form of Bond, Conditions of Contract, General Conditions, Specifications, Addenda, Performance Bonds, and all supplemental agreements made or to be made.

Inspector: An authorized representative of the Town assigned to make any and all necessary inspections of the work performed and the materials furnished by the contractor.

Materials: Any approved materials acceptable to the Town and conforming to the requirements of these specifications.

Work: All of the work proposed to be accomplished at the site of the project, and all such other work as is in any manner required to accomplish the complete project. This includes all plant, labor, materials, supplies, equipment and other facilities and acts necessary or proper or incidental to the carrying out and completion of other terms of this contract. The term "work performed" shall be construed to include the materials delivered to and suitably stored at the site of the project.

2. STANDARDS OF WORKMANSHIP

The apparent silence of the specifications as to any detail or and apparent omission from them of a detailed description concerning any work to be done and materials to be furnished shall be regarded as

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meaning that only the best general practice observed in the latest current construction work is to prevail and that only material and workmanship of first quality is to be used in this connection and all interpretations of these specifications shall be made upon this basis.

3. SAMPLES

The contractor shall furnish for approval, all samples as directed. The work shall be in accordance with approved samples. Samples shall be submitted in ample time so as to prevent delay in fabrication or ordering of materials, allowing for a reasonable time for the Town Engineer, or his representative, to consider the samples submitted, and is necessary, to permit a re-submission of samples to the Town, or its representative, until approval is given.

Work and material shall be furnished and executed in accordance with approved samples, in every aspect. Each sample shall be labeled, bearing material, name and quality, contractor's name, date and other pertinent data. Unless otherwise specified, samples shall be in duplicate and of adequate size to show quality, type, color, range and finish and texture of material. Materials shall not be ordered until approval is received in writing from the Town, or its representative.

4. MANUFACTURED MATERIALS

Where several materials are specified by name, the Town, or its representative, shall have the right, before execution of the contract, to require any and all bidders to state the materials upon which they based their bid. Where any materials are specified by name or trade name, or by catalog number of a company or companies, the contractor shall furnish the article mentioned unless approval of the Town, or its representative, is obtained in writing for a substitution. Should the contractor desire to substitute other materials for one or more specified by name, he shall apply in writing for such permission and state credit or extra involved. He shall also provide supporting data and samples for the consideration of the Town.

Unless particularly specified otherwise, all manufactured articles, materials and equipment shall be applied, assembled, installed, connected, erected, used, cleaned and conditioned as directed by the manufacturer and including the necessary preparation to properly install the work. Where reference is made to manufacturer's directions, the contractor shall submit such directions to the Town or its representative as required.

The materials used in construction shall be disposed so as not to endanger the work, and so that full access may at all times be had to partly completed work and structures and they shall be so disposed as to cause no injury to those having access to the work or any of the units.

All labor shall be performed in the best and most workmanlike manner by mechanics skilled in their respective trades. Standards of work required throughout shall be of such grades as will bring first-class results only. The type of labor employed by the contractor shall be such as will insure the uninterrupted continuity of the entire work, without conflict of any kind.

5. LABORATORY

Laboratories shall be approved by the Town, or its representative, for testing the materials to be used under the contract. Where tests are made, two certified copies showing correctly the chemical analysis and physical tests shall be furnished to the Town, or its representative.

6. SHOP DRAWINGS

The contractor shall submit to the Town Engineer, electronic submittals in accordance with Section 013300 – Submittals and two (2) hard copies of all shop drawings and schedules and no work shall be

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fabricated until his approval has been given. All shop drawings submitted to the Town Engineer must bear the contractor's stamp of approval evidencing that the drawings have been checked.

The contractor will make any corrections in the drawings required by the Town or its representative and will file with the Town or its representative an electronic and two (2) corrected hard copies. Approval by the Town Engineer of such drawings or schedules shall not relieve the contractor from responsibility for:

- (a) Errors of any sort in shop or setting drawings or schedules;
- (b) Deviations from Plans and Specifications unless the contractor, at the time of submission of said drawings and schedules, has given notice to the Town or its representative of any such deviations.

7. PERMITS

7.1 Municipal: All work in connection with the installation of pipes or other underground structures of a like nature either within or without the limits of the highway, shall follow all the provisions as contained herein together with the provisions, as they apply, of the Highway Law, Road Openings, Section 149 and Section 198 of Town law, with all subsequent changes, additions or corrections thereto.

7.2 Suffolk County: All permits required for opening country roads and making connections with county drains will be obtained by the Contractor unless otherwise stated in the Contract documents. A copy of the permit must be kept on the job site at all times. The contractor will not be permitted to open any county road or make any connection to any county drain until he has obtained required permits.

7.3 State of New York: The contractor shall obtain all necessary New York State highway permits whenever the contract requires any work to be done within or upon existing state highway right-of-ways. These permits shall be obtained from the District Office in Hauppauge prior to the performance of the work. Upon application for the permit, the contractor will be required to supply the following:

- (1) Three (3) copies of a sketch or print showing description and location of the proposed work. These prints will be supplied to the contractor by the Town or its representative.
- (2) Contingent liability insurance for the state (in addition to his own liability insurance) shall be furnished in amounts and manner as required by the State of New York. The contingent protective liability and complete operations liability insurance policy to cover:

"The people of the State of New York and/or the Highway Superintendent covering liability arising with respect to all operations through highway permits by permitted by anyone acting by, through or for the permitted, including omissions and supervisor acts of the State", in the amount of personal injury (including death) and property damage as required.

7.4 State of New York Department of Conservation: The contractor shall obtain all necessary New York State DEC dewatering permits whenever the contract requires any work to be done requiring continuous dewatering facilities or a discharge quantity requiring said permit from the NYSDEC. These permits shall be obtained from the NYSDEC Regional Office in Stony Brook prior to the performance of the work. Upon application for the permit, the contractor will be required to supply the following:

- (1) Copies of a sketch or print showing description and location of the proposed dewatering system. These prints will be supplied by the contractor to the Town or its representative.

GENERAL CONDITIONS

8. CONTRACT DOCUMENTS

The Contract Documents include, but are not limited to, the General Conditions, General Specifications, Detailed Specifications, Plans, Proposal, Contract and other sections as either cited on the Index page(s) or actually included in the bound documents.

Each section of the Contract Documents is intended to be complementary to the other sections.

It is intended that they include all items of labor and materials and everything required and necessary to complete the work, even though some items of work or materials may not be particularly mentioned in every section or may have been inadvertently omitted from the Drawings or Specifications or both.

The contractor will be furnished with five (5) sets of Plans and Specifications giving all the details and dimensions necessary for carrying out the work. One copy of Plans and Specifications furnished to the contractor must be kept constantly at the site. Anything shown on the Plans and not mentioned in the Specifications or mentioned in the Specifications and not shown on the Plans and all work and materials necessary for the completion of the work according to the intent and meaning of the contract shall be furnished, performed and done as if the same were both mentioned in the Specifications and shown on the Drawings. Any conflict or inconsistency between the figures and scale of Drawings shall be submitted by the contractor to the Town Engineer, or his representative, whose decisions hereon shall be conclusive.

In the event the meaning of any portion of the Specifications or Drawings or any supplementary drawings or instructions of the Town Engineer, or his representative, is doubtful, the same shall be understood to call for the best type of construction, both as to materials and workmanship, which reasonably can be interpreted.

All materials and workmanship must be strictly in accordance with the Plans and Specifications.

Additional copies of Plans and Specifications, when requested will be furnished to the contractor at cost of reproduction.

The contractor shall furnish to each of the subcontractors and materials men such copies of the Contract Documents as may be required for their work.

9. ERRORS, OMISSIONS AND DISCREPANCIES

If any errors, omissions or discrepancies appear in the drawings, specifications or other documents, the contractor shall, within ten (10) days from receiving such drawings, specifications or documents, notify the Town, or its representative, in writing of such errors or omissions. In the event of the contractor's failing to give such notice, he will be held responsible for the results of any such errors or omissions and the cost of rectifying the same.

If, in the opinion of the contractor, any work is shown on drawings, or details, or is specified in such a manner as will make it impossible to produce a first class piece of work, or should discrepancies appear between the drawings and/or specifications, he shall refer the same to the Town, or its representative, for interpretation before proceeding with the work. If the contractor fails to make such references to the Town, or its representative, no excuse will thereafter be entertained for failure to carry out the work in a satisfactory manner as directed.

Should a conflict occur in or between the drawings and specifications and/or existing conditions, the contractor shall be deemed to have estimated on the more expensive way of doing the work, unless he shall have asked for and obtained the decision in writing from the Town Engineer or his representative,

GENERAL CONDITIONS

before the submission of bids, as to which method or materials will produce the results to the best interests of the Town.

10. TEMPORARY TOILET

The contractor shall provide and maintain a sanitary temporary toilet where directed by the Town, or its representative. The temporary toilet shall be enclosed, weatherproof and kept in a sanitary condition at all times. Upon removal of the temporary outside toilet, and all evidence of the toilet shall be removed from the site.

11. CUTTING, PATCHING AND DIGGING

The contractor shall do all cutting, fitting or patching of his work that may be required to make its several parts come together properly and fit it to receive or be received by work of other contractors shown upon or reasonably implied by Drawings and Specifications for the completed structure, and he shall make good after them as the Town, or its representative may direct. Any cost caused by defective or ill-timed work shall be borne by the party responsible therefore.

The contractor shall not endanger any work by cutting, digging or otherwise, and shall not cut or alter the work of any other contractor except with the consent of the Town, or its representative.

12. PROPER METHOD OF WORK AND PROPER MATERIALS

The Town, or its representative, shall have the power in general to direct the order and sequence of the work, which shall be such as to permit the entire work under this contract to be begun and to proceed as rapidly as possible and such as to bring the several parts of the work to a successful completion at about the same time.

If at anytime before the commencement or during the progress of the work the materials and appliances used or to be used appear to the Town Engineer, or his representative, as insufficient or improper for assuring the quality of the work required, or the required rate of progress, he may order the contractor to increase their efficiency or to improve their character, and the failure of the Town, or its representative, to demand any increase of such efficiency or improvement shall not release the contractor from his obligation to secure the quality of work or the rate of progress specified.

During freezing or inclement weather, no work shall be done except such as can be done satisfactorily and in a manner to secure first class construction throughout. All work shall be done in such a manner as will properly protect and support existing permanent structures, pipe lines, etc.

13. INSPECTION

Inspectors shall be authorized to inspect all work done and materials furnished. Such inspections may extend to all parts of the work and to the preparation or manufacture of the materials to be used. In case of any dispute arising between the contractor and the inspector as to materials furnished or the manner of performing the work, the inspector shall have the authority to reject material or suspend the work until the question at issue shall be referred to and decided by the Town, or its representative. The inspector shall not be authorized to revoke, alter, enlarge, relax or release any requirements of these specifications; nor approve or accept any portion of the work; nor issue instruction contrary to the plans and specifications. The inspector shall in no case act as foreman or perform other duties for the contractor or interfere with the management of the work by the latter.

GENERAL CONDITIONS

Any advice which the inspector may give the contractor shall in no way be construed as binding the Town, or its representative, nor the Town in any way, nor releasing the contractor from the fulfillment of the terms of the contract.

The contractor shall be conclusively presumed to be acquainted with all existing conditions and to guarantee that all work and materials shall, upon final completion of the work, be turned over to the Town in a complete and perfect condition and the contractor shall be responsible for the proper care, maintenance and protection of all work and material until his entire contract is completed and all work and materials found in good condition and accepted. The contractor will be held responsible for the entire work until completed and accepted by the Town.

The contractor shall, at all times, provide the Town, and its representative, assistants and inspectors under him with necessary facilities for determining both on the job and at the places of manufacture, that all work being performed and all materials being manufactured are strictly in accordance with the contract.

Until acceptance of work by the Town, the contractor shall be responsible for all damages to the work including action of the elements or any other cause whatsoever. The contractor shall continuously and adequately protect the work against damage from any cause.

14. WAIVER

Neither the inspection by the Town, its representative or any part of their employees, nor any order, measurement or certificate by the Town, or its representative, nor any order by the Town for the payment of any money, nor any payment for or acceptance of, the whole or any part of the work by the Town, its representative, or the Town, nor any extension of time, nor any possession taken by the Town or its employees shall operate as a waiver of any provision of this contract or of any power herein reserved to the Town or any right to damages herein provided; nor shall any waiver of any breach of the contract constitute a waiver of any subsequent breach. Any remedy provided in this contract shall be construed as cumulative in addition to each and every remedy herein provided.

15. WATER AND ELECTRIC POWER

All water and electric power supply for construction purposes must be provided by the contractor. The cost shall be borne by the contractor.

16. MACHINERY AND EQUIPMENT

All machinery, equipment, trucks and vehicles used in the prosecution of the work or in connection therewith, shall at all times be in proper working condition.

The contractor shall be responsible for curtailing noise, smoke, fumes, or any other nuisance resulting from his operations. He shall, upon written notification from the Town, or its representative, make any repairs, replacements, adjustments, and additions and furnish mufflers when necessary to fulfill these requirements.

17. RIGHT TO USE WORK

The Town may enter upon and use the whole or any portion of the work, which may be in condition to use any time previous to its final acceptance by the Town. Such use shall not constitute or be evidence of acceptance by the Town of the whole or any part of the material furnished or work performed under the contract.

GENERAL CONDITIONS

18. NOTICE OF WARNING

If the contractor shall fail to make prompt payment to persons supplying labor or materials for the work, or refuse or fail to supply enough properly skilled workmen or proper materials or refuse or fail to prosecute the work or any part thereof with such diligence as will insure its completion within the period herein specified (or any duly authorized extension thereof) or fail to complete the work within said period or refuse or fail to regard laws, ordinances, codes, instruction of the Town, or its representative, then the Town shall forward by registered mail to the contractor, at the address given in the contract, a Notice of Warning, and in the event the contractor fails to comply with said Notice of Warning within five (5) days from receipt thereof, the Town shall have the right to terminate the contract.

19. WARNING SIGNS

Contractor shall provide and maintain proper luminous warning and detour signs where directed by the Town, or its representative.

Obstruction, such as stored materials, equipment and excavations shall be marked with no less than two (2) lights which shall be no more than four (4) feet apart.

All lights shall be kept burning from one-half hour before sunset until one-half hour after sunrise.

20. ACCIDENT PREVENTION

During the performance of the work, the contractor shall exercise all reasonable precautions for the protection of persons and property. The safety provisions of applicable laws, building and construction codes shall be observed. Machinery, equipment and all other physical hazards shall be guarded 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 inconsistent with federal, state or municipal laws or regulations.

If any operation, practice or condition is deemed by the Town, or its representative, to be unsafe, he shall notify the contractor in writing to take corrective action. Where in the opinion of the Town, or its representative, any operation, practice or condition shall be promptly discontinued and before the affected part of the work is resumed, remedial action taken.

The Town reserves the right to remedy any neglect on the part of the contractor as regards the protection of the work which may come to its attention, after twenty-four (24) hours notice in writing; except that in cases of emergency, it shall have the right to remedy any neglect without notice, and in either case to deduct the cost of such remedy from money due the contractor.

Nothing in the foregoing paragraphs shall be construed as relieving the contractor from full responsibility at all times for safe prosecution of the work.

21. DAMAGES

The contractor shall pay and make good all losses or damages arising out of any cause connected with the contract and shall indemnify and save harmless the Town, and its representatives, from any and all claims and any and all liability or responsibility of every nature against the Town or any of its officers or agents, by reason of, or connected with the work or materials furnished under the contract and shall pay all costs and expenses of every kind, character, and nature whatsoever, occurring upon or arising out of the contract.

GENERAL CONDITIONS

All damages, direct or indirect, of whatever nature either resulting from the performance of or resulting to the work under this Contract during its progress from whatever cause shall be borne and sustained by the Contractor, and all work shall be solely at its risk until the date of the final payment request, as prepared by the Engineer.

22. MAINTENANCE OF TRAFFIC

All work under this contract is to be completed within the time indicated in the Contract Agreement or as extended by the Town. If in the meantime it should become necessary, because of the lateness of the season, or any other reason to stop work, the contractor shall at his own expense, open proper drainage ditches, erect temporary structures where necessary, prepare the roads so there will be minimum interference with traffic, set up and maintain a competent organization as directed by the Town, or its representative, to keep the highways in first class condition for traffic, and take every precaution to prevent any damage or unreasonable deterioration of the work during the time it is closed.

23. PROTECTION OF LAND MARKERS, TREES, SHRUBS, AND PROPERTY:

Wherever in the conduct of the work, a monument making a point of public or private survey is encountered or brought to view by excavation, the fact shall at once be communicated to the Town, or its representative. In no case shall the contractor remove the same until the location for resetting shall have been made by the Town, or its representative. All monuments or land markings exposed to view when the work is first undertaken shall be carefully preserved and the greatest care exercised to prevent injury to or disturbance of position of the monument.

The unit price of all items shall include the cost of restoring to its former condition any sidewalks or curbs, as well as restoring any trees, shrubs or lawns that may be damaged during this construction. No additional payment will be made.

The contractor is required at his own expense to obtain any and all permits for use of private property if he uses such property for storage, transportation or accomplishment of the work under the contract. Private property shall be cleaned up neatly, any damage repaired and premises restored to their original condition.

24. PROTECTION OF UTILITIES

The contractor shall familiarize himself with the existence of structures of municipal and other public service corporations on or adjoining the site of the work, for the area within the scope of the contractors work. The contractor shall be responsible for calling for a mark out given reasonable opportunity to work in cooperation with the owners of these utilities in the work, reconstruction or alteration of these structures. Such reconstruction and alteration shall be so conducted as to delay or interfere as little as practicable with the work of the contractor. Any additional cost of various items or work because of these utilities shall be included in the price bid for these items.

The Town, or its representative, shall direct the public utility corporations to shift or remove those utility structures that may be necessary to permit the contractor to carry out the work in accordance with the plans. The contractor shall not remove or cause to be removed, any structure or part of a structure owned by a public utility corporation without the approval of the Town, or its representative.

The contractor shall cooperate with the public utility corporation whose structures (aerial, surface or subsurface) are within the limits of or along the outside of the right-of-way, to make it possible for them to maintain uninterrupted service. The contractor shall conduct his operations in such a way as not to delay or interfere as little as practicable with the work of the utility corporation.

25. APPROVAL OF SUBCONTRACTORS AND MATERIALS

Prior to commencing any work under this Contract, the Contractor shall submit to the Engineer for approval a list of all the subcontractors and material suppliers it proposes to use for this Contract.

No subcontractor or material supplier will be permitted to deliver materials or perform any work on this Contract until it has been approved by the Engineer.

26. INTERPRETATION OF DRAWINGS, ETC.

In the event of discrepancies between the Drawings and the Specifications, the following order shall be given preference when making interpretations:

- a. Addenda (later dates to take precedence over earlier dates).
- b. Drawings (schedules or notes to take precedence over other data shown on Drawings).
- c. Detailed Specifications
- d. General Specifications

On all Plans, Drawings, etc., the figure dimensions shall govern in the case of discrepancy between the scales and figures.

The Contractor shall take no advantage of any error or omission in the Plans, or of any discrepancy between the Plans and Specifications, and the Engineer shall make such corrections and interpretations as may be deemed necessary for the fulfillment of the intent of the Specifications and of the Plans as construed by him, and his decision shall be final.

All work that may be called for in the Specifications and not shown on the Plans, or work shown on the Plans and not called for in the Specifications, shall be furnished and executed by the Contractor as if designated in both. Should any work or material be required which is not denoted in the Plans and Specifications, either directly or indirectly, but which is necessary for the proper carrying out of the intent thereof, it is understood and agreed that the same is implied and required, and that the Contractor shall perform such work and furnish such materials as if they were completely delineated and described.

27. ADDITIONAL WORK

Additional work, if required to be performed under this Contract, shall be in accordance with the applicable paragraphs of the Contract. The Town will be the sole judge as to whether such work was intended as part of the Contract or is in addition thereto.

28. OCCUPATIONAL SAFETY AND HEALTH ACT

The Contractor shall meet all standards of the Occupational Safety and Health Act of 1970 and subsequent revisions. This shall include, but not be limited to, the following areas:

Sanitation, noise, radiation, gases, vapors, fumes, mists, dust, illumination, ventilation, protective equipment, fire protection, waste disposal, electrical hazards, scaffolds and ladders, floor holes and wall openings, heavy equipment and permit-required confined spaces.

All specific requirements of the Act shall be adhered to.

GENERAL CONDITIONS

29. SAFETY PROVISIONS

The Contractor shall take every precaution and shall provide such equipment and facilities as are necessary or required for the safety of its employees. In case of an accident, first aid shall be administered to any who may be injured in the progress of the work. In addition, the Contractor shall also be prepared for the removal to the hospital for treatment of any employee either seriously injured or ill.

30. SANITARY REGULATIONS

In addition to compliance with the Occupational Safety and Health Act, the Contractor shall erect and maintain necessary sanitary conveniences for the use of employees on the work. Such conveniences shall be properly secluded from observation, and their use shall be strictly enforced. Such sanitary conveniences shall be constructed in compliance with all laws, ordinances or regulations governing these facilities. The contents of same shall be removed with sufficient frequency to prevent nuisance, and disposed of to the satisfaction of the Town, or its representative.

The Contractor shall obey and enforce such other sanitary regulations and orders and shall take such precautions against infectious diseases as may be deemed necessary. In case any infectious diseases occur among its employees, it shall arrange for the immediate removal of the patient from the work and his isolation from all persons connected with the work.

The building of shanties or other structures for housing the workers, tools, machinery or supplies will be permitted only at approved places, and the sanitary condition of the grounds in and at such shanties or other structures must, at all times, be maintained in a satisfactory manner.

31. RESPONSIBILITY OF ENGINEER AND CONTRACTOR DURING CONSTRUCTION

The Engineer is responsible solely for the general and/or detailed inspection of the work being performed. Such inspection will be periodic and strictly to assure conformance of the Contractor with the Plans and Specifications, such that the end product will conform to the Plans and Specifications.

The Contractor is responsible for complete conformance to the Plans and Specifications, proper construction procedures, coordination with subcontractors, other contractors and utilities, and safe working conditions for its employees.

32. LABOR

All contractors and subcontractors employed upon the work shall and will be required to conform to the Labor Laws of the State of New York and the various acts amendatory and supplementary thereto; and to all other laws, ordinances and legal requirements applicable thereto.

All labor shall be performed in the best and most workmanlike manner by mechanics skilled in their respective trades. The standards of the work required throughout shall be of such grade as will bring results of the first class only.

33. CONTRACTOR'S REPRESENTATIVE

The Contractor, in case of his absence from the work, shall have a competent representative or foreman present, who shall follow without delay all instructions of the Engineer or his assistants in the prosecution and completion of the work, in conformity with this Contract, and shall have full authority to supply labor and material immediately. The Contractor shall also have a competent representative available to receive telephone messages and provide a reasonable reply as soon as possible, but not later than 24 hours.

34. SCHEDULE OF VALUES (LUMP SUM CONTRACTS)

Before the first partial payment under this Contract becomes due, the Contractor shall prepare a Schedule of Values which totals the amount of the Contract and submit it to the Engineer for approval. The Contractor shall make such revisions as may be required to make this Schedule conform to the true value of work as jointly agreed upon by the Engineer and the Contractor. The Contractor shall submit the Schedule of Values in accordance with the requirements contained in Section 012973.

35. INCOMPETENT EMPLOYEES

The Contractor shall employ only competent, skilled and faithful workers to do the work. Upon request of the Engineer in writing, the Contractor shall suspend or discharge from the work any disobedient, disorderly or incompetent person or persons employed thereon, and will not again employ any person so suspended or discharged without the consent of the Engineer.

This requirement shall not be made on the basis of any claim for compensation or damages against the District or any of its officers or agents.

36. CLAIMS OR PROTESTS

If the Contractor considers any work required of it to be outside the requirements of the Contract or considers any record or ruling of the Engineers or Inspectors as unfair, it shall ask for written instructions or decisions immediately, and then file a written protest with the District against the same within five (5) days thereafter, or be considered as having accepted the record or ruling.

37. NOTIFICATION, INTERFERENCE AND INJURY TO UTILITIES

The Contractor shall cooperate in every way with the utility companies.

All excavation shall be done in compliance with Article 36 of the General Business Law and notices given as provided by CLS General Business Law, Part 761.

All conduits, water mains and gas mains encountered in the construction shall be properly and safely taken care of by the Contractor, who shall, upon encountering same, notify the public corporation to whom they belong in order that they may be changed in such a manner as not to interfere with the final construction.

In case any damage shall result to any service pipe for water or gas, or any private or public sewer or conduit, by reason of negligence on the part of the Contractor, the Contractor shall, without delay and at its own expense, repair the same to the satisfaction of the Engineer. If such repairs are not made promptly or satisfactorily, the District may have the repairs made by another Contractor or otherwise, and deduct the cost of same from any monies due or to become due the Contractor.

38. INFRINGEMENT OF PATENTS

The Contractor further agrees to hold itself responsible for any claims made against the District for any infringement of patents by the use of patented articles in any one phase of construction of the work and the completion of same, or any process connected with the work agreed to be performed under this Contract or of any materials used upon said work, and to save harmless and indemnify the District from all costs, expenses and damages which the District shall be obliged to pay by reason of any infringement of patents used in the construction and completion of the work.

GENERAL CONDITIONS

39. GUARANTEE/WARRANTY

The Contractor shall guarantee and warrant its work and that of its subcontractors against defects in workmanship and/or materials for a period of one (1) year from the date of the final payment request, as prepared by the Engineer, except as otherwise specified. Upon written notification from the Engineer, the Contractor shall repair, replace or reconstruct such defects to the satisfaction of the Engineer, at no cost to the District.

40. STANDARDIZATION

The Detailed and General Specifications indicate specific manufacturers and/or catalog numbers, etc., for the purpose of standardization within the District in order to minimize stockpiling of replacement parts.

FORM OF CONTRACT

TOWN OF RIVERHEAD SEWER DISTRICT
CLASS A BIOSOLIDS IMPROVEMENTS
CONTRACT No. RDSD 2202
CONTRACT G – GENERAL CONSTRUCTION

CONTRACT DATED _____, 2023 BY AND BETWEEN THE TOWN OF RIVERHEAD (HEREIN
CALLED THE "OWNER") AND _____
(HEREIN CALLED THE "CONTRACTOR")

WITNESSETH, the Town and the Contractor, in consideration of the premises and of the mutual covenants, considerations and agreements contained, agree as follows:

The Notice to Bidders, Instruction to Bidders, Proposal Form, Form of Bond, Conditions of Contract, General Conditions, Specifications, Form of Contract, Construction Drawings, and Plans, together with any Addenda, shall form part of this contract, and the provisions thereof shall be as binding upon the parties hereto as if they were herein fully set forth. The Table of Contents, title, heading, headlines and marginal notes contained herein are solely to facilitate reference to various provisions of the Contract Documents and in no way affect, limit or case light upon the interpretation of the provisions to which they refer. Whenever the term "Contract Documents" is used, it shall mean and include the Notice to Bidders, Instruction to Bidders, Proposal Form, Form of Bond, Conditions of Contract, General Conditions, Specifications, Form of Contract, Construction Drawings, and any Addenda. In case of any conflict or inconsistency between the provisions of the conditions of this contract shall govern.

IN WITNESS THEROF, the parties hereunto set their hands and seals, and such of them as are corporations have caused these presents to be signed by their duly authorized officers.

NOTE: Quantities of any or all items may be increased, decreased or eliminated in their entirety at the option of the Town prior to or after award of the contract.

Total Bid

_____ Dollars _____

(written in words)

(figures)

ATTEST:

TOWN OF RIVERHEAD

SUPERVISOR

CONTRACTOR

TITLE

FORM OF CONTRACT

STATE OF NEW YORK

)

)ss:

COUNTY OF Suffolk)

On this _____ day of _____, 202____ before me personally appeared

_____.

(Town Supervisor)

The duly elected and qualified Supervisor of the Town of Riverhead, the corporation described in and which executed the foregoing instrument, to me known and known to me to be such Supervisor of the Town of Riverhead; and she being by me duly sworn did depose and say; that she is the Supervisor of the Town of Riverhead; that she resided at

_____, Suffolk County, New York; that she knows the corporation seal of said Town of Riverhead; that the seal affixed to said instrument is such corporate seal; and that she executed the same as such Supervisor for the purpose herein mentioned.

Notary Public

FORM OF CONTRACT

Acknowledgement by Contractor if a PARTNERSHIP

STATE OF NEW YORK)

)ss:

COUNTY OF _____)

On this _____ day of _____, 202 ____, before me personally appeared _____ to me known to by the person described in and who executed the foregoing instrument and who acknowledged to me that he executed the same.

Notary Public

Acknowledgement by Contractor if a PARTNERSHIP

STATE OF NEW YORK)

)ss:

COUNTY OF _____)

On this _____ day of _____, 202 ____ before me personally came _____ to be known and known to be to a member of _____ the firm described in and which executed the foregoing instrument and he acknowledged to me that he subscribed the name of said firm thereto on behalf of said firm for the purpose therein mentioned.

Notary Public

FORM OF CONTRACT

Acknowledgement by Contractor if a CORPORATION

STATE OF NEW YORK)

)ss:

COUNTY OF _____)

On this _____ day of _____, 202 ____, before me personally came
_____ to me known, who being by me duly sworn, did depose and say that he resides
at _____ of
_____ in the state of _____ that he is the
_____ of the _____ the corporation described in and which
executed the foregoing instrument; that he knows the seal of said corporation; that the seal affixed to said
instrument is such corporate seal; that it was so affixed by order of the Board of Directors of said Corporation; and
that he signed his name thereto by like order.

Notary Public

INDEMNITY, LIMITATION OF LIABILITY

1.0 - INDEMNITY

The Contractor and all subcontractors performing work in connection with this Contract shall HOLD HARMLESS, INDEMNIFY and DEFEND the Owner and Engineer, their consultants and each of their officers, agents and employees from any liability, claims, losses or damage including reasonable costs of defense arising out of or alleged to arise from the Contractor's or subcontractor's negligence in the performance of the work described in the Contract Documents, but not including liability that may be due to the sole negligence of the Owner, the Engineer or their officers, agents and employees.

2.0 - LIMITATION OF LIABILITY

The Contractor and all subcontractors agree to limit the liability of the Owner and the Engineer due to the Engineer's professional negligent errors or omissions such that the total aggregate liability of the Engineer to those named shall not exceed Fifty Thousand Dollars (\$50,000) or five percent (5%) of the Contract award amount, whichever is greater.

3.0 - NO CLAIM FOR DELAY

The Contractor and all subcontractors agree to HOLD HARMLESS from any and all claims for loss or damages of any nature against the Owner or Engineer for delays in commencement, performance or completion of the Contract, regardless of whether said delays are, or may be, caused by the Owner, Engineer or any governmental agency.

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CONTRACTOR'S RESPONSIBILITY

It is the Contractor's responsibility to inform the Engineer in advance when a situation arises that forces the Contractor to cancel work for a given day. For example, if the Contractor informs the Engineer that he will be on the job on a certain day and then has to cancel the appointment because he cannot obtain certain labor, materials or equipment, it is the Contractor's responsibility to inform the Engineer of these latest developments and to let him know that construction observation services will not be needed for that day.

In the event that the Engineer is not given ample warning of such a cancellation and, as a result, unnecessary time is spent sending field personnel out to the project site to observe the previously scheduled construction, sufficient funds will be deducted from monies due the Contractor to reimburse the Engineer for this wasted time.

Similarly, sufficient funds will be deducted from monies due the Contractor to reimburse the Engineer for any services rendered in the field or in the office regarding work that had to be performed a second time due to substandard work on the part of the Contractor on the original work.

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TECHNICAL SPECIFICATIONS

DIVISION 01 – GENERAL REQUIREMENTS

011200	MULTIPLE CONTRACT SUMMARY (CONTRACTS E, G & P)
011400	WORK RESTRICTIONS (CONTRACTS E, G & P)
011419	SITE UTILIZATION PLAN (CONTRACTS E, G & P)
012000	PRICE AND PAYMENT PROCEDURES (CONTRACTS E, G & P)
012100	ALLOWANCES (CONTRACTS G)
012200	UNIT PRICES (CONTRACT G)
012300	ALTERNATES (CONTRACTS E, G & P)
012500	PRODUCT SUBSTITUTION PROCEDURES (CONTRACTS E, G & P)
012973	SCHEDULE OF VALUES (CONTRACTS E, G & P)
013100	PROJECT MANAGEMENT AND COORDINATION (CONTRACTS E, G & P)
013119	PROGRESS MEETINGS (CONTRACTS E, G & P)
013216	CONSTRUCTION SCHEDULE (CONTRACTS E, G & P)
013223	SURVEYING (CONTRACTS E, G & P)
013233	CONSTRUCTION PHOTOGRAPHS (CONTRACTS E, G & P)
013300	SUBMITTALS (CONTRACTS E, G & P)
014100	REGULATORY REQUIREMENTS (CONTRACTS E, G & P)
014223	SPECIFICATION FORMAT (CONTRACTS E, G & P)
014320	PRE-INSTALLATION MEETINGS (CONTRACTS E, G & P)
014500	QUALITY CONTROL (CONTRACTS E, G & P)
014536	ENVIRONMENTAL QUALITY CONTROL (CONTRACTS E, G & P)
015000	TEMPORARY FACILITIES AND CONTROLS (CONTRACTS E, G & P)
015113	TEMPORARY ELECTRICITY (CONTRACTS E, G & P)
015213	FIELD OFFICES (CONTRACTS E, G & P)
015526	TRAFFIC CONTROL (CONTRACTS E, G & P)
015719	TEMPORARY ENVIRONMENTAL CONTROLS (CONTRACTS E, G & P)
015720	TEMPORARY SANITARY WASTEWATER CONVEYANCE (CONTRACTS E, G & P)
015813	TEMPORARY PROJECT SIGNAGE (CONTRACTS E, G & P)
016100	BASIC PRODUCT REQUIREMENTS (CONTRACTS E, G & P)
016500	PRODUCT DELIVERY, STORAGE AND HANDLING (CONTRACTS E, G & P)
017423	CLEANING (CONTRACTS E, G & P)
017500	STARTING AND ADJUSTING (CONTRACTS E, G & P)
017550	PROCESS PIPE AND TANK TESTING (CONTRACTS E, G & P)
017800	CLOSEOUT SUBMITTALS (CONTRACTS E, G & P)
017823	OPERATING AND MAINTENANCE DATA (CONTRACTS E, G & P)
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017843	SPARE PARTS (CONTRACTS E, G & P)
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028000	ASBESTOS REMOVAL (CONTRACTS E, G & P)
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END OF SECTION

PART 1 - GENERAL

1.01 BRIEF PURPOSE OF PROJECT / GENERAL

- A. The purpose of the project is to upgrade and expand the Riverhead Wastewater Treatment Plant to upgrade the sludge handling and treatment process to achieve Class A Biosolids.
- B. This Section provides an abbreviated summary of the work for the Construction Contracts associated with the Owner's program to construct the project.
- C. Each Contractor has been provided with copies of all relevant construction technical specifications and drawings for all related construction contracts whose work may directly effect and impact the work under this Contract.
 - 1. Each Contractor shall provide a complete and operational project in anticipation of these affects and impacts.
 - 2. It is each Contractor's responsibility to investigate the work that will be performed by others and consider such in the conduct of his/her work.
- D. In the event that any of the provisions in the technical specifications conflicts with the general conditions, the provision more favorable to the owner, as determined by the owner in its sole discretion, shall govern.

1.02 NOMENCLATURE

- A. Where the terms "Engineer/Architect", "Architect/Engineer", "Engineer", or "Architect" are used throughout these Contract Documents, they shall mean the firm of H2M architects + engineers as may be abbreviated by H2M.
- B. The terms "Contractor" and/or "Prime Contractor" where used within the body of a specific Construction Contract, (i.e.; Contract G, Contract E & Contract P), shall refer to the individual or company who has entered into an agreement with the Owner to perform the work contained within those Contract Documents. The lack of word capitalization shall be incidental.
- C. The GENERAL CONSTRUCTION CONTRACTOR may be referred to as the "General Contractor", "Prime General Contractor", "Contract G Contractor" or similar wording. The lack of word capitalization shall be incidental. This Construction Contract shall be known as Contract G.
- D. The ELECTRICAL CONSTRUCTION CONTRACTOR may be referred to as the "Electrical Contractor", "Prime Electrical Contractor", "Contract E Contractor" or similar wording. The lack of word capitalization shall be incidental. This Construction Contract shall be known as Contract E.
- E. The PLUMBING CONSTRUCTION CONTRACTOR may be referred to as the "Plumbing Contractor", "Prime Plumbing Contractor", "Contract P Contractor" or similar wording. The lack of word capitalization shall be incidental. This Construction Contract shall be known as Contract P.

1.03 ABBREVIATED SUMMARY OF CONTRACT G WORK

- A. Furnish all labor, equipment, materials, tools, means, methods, and incidentals necessary to complete the Work as required by the Contract Documents for this Construction Contract. Each contractor shall coordinate, through the Owner/Engineer, the work of their contract with the work by others.

- B. This abbreviated work summary is provided in order to briefly describe the work covered by the Contract Documents for this Construction Contract. It is not all inclusive of the work under the Contract.
- C. The work includes, but is not limited to, the following:
1. Portions of tree removal, site clearing, grubbing, sheeting, bracing, excavation, soil erosion protection, slope protection, earth movement, subgrade preparation, removal of excess and/or unsuitable excavated material, dewatering, and import of suitable material, as necessary to install and construct all the work defined within the Contract Documents, as noted.
 2. Portions of site work for the sewage treatment plant including, but not limited, drainage control, rough and final grading, curbing, paving, and fences, as noted.
 3. Construction of cast-in-place concrete foundations, and slabs.
 4. Demolition and removals as noted and shown on the Drawings.
 5. Furnish and installation of new gravity sludge thickener and scavenger waste sludge screen.
 6. Furnish and installation of new tank covers.
 7. Insulation and painting of exposed piping, as noted.
 8. Stormwater collection system piping, inlets, manholes and drainage basins.
 9. Portions of exposed process piping, valves, fittings and appurtenances, as noted.
 10. Portions of pipe support systems for exposed piping, as noted.
 11. Yard piping, buried valves, and fittings.
 12. Miscellaneous metals including railing, grating, aluminum tank covers and supports.
 13. Erection of structural steel canopies and fabricated platforms, stairways, and ladders.
 14. Erection of new masonry building.
 15. Erections of prefabricated new metal building for onsite Class A Biosolids storage.
 16. Leak testing and startup participation for the various equipment and systems of the project and provide complete service to troubleshoot and assist manufacturer service representatives in obtaining a completely functional installation.
 17. Startup participation for the various equipment and systems of the project and provide complete service to troubleshoot and assist manufacturer service representatives in obtaining a completely functional installation.
 18. Project closeout submittals.
 19. All other work shown and specified within the Contract Documents for Contract G.

1.04 ABBREVIATED SUMMARY OF CONTRACT P WORK

- A. Furnish all labor, equipment, materials, tools, means, methods, and incidentals necessary to complete the Work as required by the Contract Documents for this Construction Contract. Each contractor shall coordinate, through the Owner/Engineer, the work of their contract with the work by others.
- B. This following abbreviated summary is provided in order to briefly describe the work covered by the Contract Documents for this Construction Contract. It is not all inclusive of the work under the Contract.
- C. The work includes, but is not limited to, the following:
1. Portions of tree removal, site clearing, grubbing, sheeting, bracing, excavation, soil erosion protection, slope protection, earth movement, subgrade preparation, removal of excess and/or unsuitable excavated material, dewatering, and import of suitable material, as necessary to install and construct all the work defined within the Contract Documents, as noted.
 2. Demolition and removals as noted and shown on the Drawings.
 3. Buried & exposed piping, valves, fittings and appurtenances.
 4. Furnish and installation of controlled volume vertical reciprocating pumps

5. Furnish and installation of progressing cavity pumps.
6. Furnish and installation of Autothermal Thermophilic Digestion System.
9. Potable water service to the facility to the extent shown on the Drawings.
10. Furnish and install electric water heaters for connection to potable and/or reuse/recycle water piping.
11. Yard piping, buried valves, and fittings.
12. Portions of Manholes, flow control boxes, and associated piping, as noted.
13. Leak testing and startup participation for the various equipment and systems of the project and provide complete service to troubleshoot and assist manufacturer service representatives in obtaining a completely functional installation.
14. Startup participation for the various equipment and systems of the project and provide complete service to troubleshoot and assist manufacturer service representatives in obtaining a completely functional installation.
15. Project closeout submittals.
16. All other work shown and specified within the Contract Documents for Contract P.

1.05 ABBREVIATED SUMMARY OF CONTRACT E WORK

- A. Furnish all labor, equipment, materials, tools, means, methods, and incidentals necessary to complete the Work as required by the Contract Documents for this Construction Contract. Each Contractor shall coordinate, through the Owner/Engineer, the work of their contract with the work by others.
- B. This following abbreviated summary is provided in order to briefly describe the work covered by the Contract Documents for this Construction Contract. It is not all inclusive of the work under the Contract.
- C. The work includes, but is not limited to, the following:
 1. Portions of tree removal, site clearing, grubbing, sheeting, bracing, excavation, soil erosion protection, slope protection, earth movement, subgrade preparation, removal of excess and/or unsuitable excavated material, dewatering, and import of suitable material, as necessary to install and construct all the work defined within the Contract Documents, as noted.
 2. Portions of site work for the sewage treatment plant including, but not limited, drainage control, rough and final grading, curbing, paving, and fences, as noted.
 3. Demolition and removals as noted and shown on the Drawings.
 4. Provide, install, maintain, and repair, if necessary, temporary power and light throughout the site and to the Owner/Engineer's field office. Temporary power shall be provided as needed at location(s) selected by the engineer based on input from the other Contractors.
 5. Provide, install, maintain, and repair, if necessary, temporary power as needed to maintain existing treatment process systems and equipment during conversion and installation of new systems and reconnection of new power systems to existing process systems.
 6. Main secondary feeders, power distribution, and instrumentation control wiring. Provide, mount, and install electrical conduit, wire, fittings, boxes, panels, and electrical accessories.
 7. All clearing, excavation, filling, and backfilling associated with the installation of underground conduit, duct bank, or wiring.
 8. Motor control centers, local control stations, transfer switches, power distribution panels, breakers, lights, and switches, as noted.
 9. Furnish, install and power primary flow elements, transmitters, flow recorders and install interconnecting wiring as noted. Install and power primary flow elements, transmitters, flow recorders, process equipment control panels, and install interconnecting wiring where said devices are to be provided as work of other contracts.

10. Set electrical sleeves and/or embedded conduit in all concrete construction. All conduits for new construction shall be embedded in concrete slabs, decks, or walls.
11. Set electrical sleeves and/or embedded conduit in all new building masonry and partitioning wall construction. All conduit/wires for new construction shall be embedded in new building walls.
12. Electrical connections (final termination) to all equipment, control panels, ventilating equipment and electrical devices.
13. Arranging for and providing controls integration for existing CP-5, CP-10 and central SCADA system.
14. Startup participation for the various equipment and systems of the project and provide complete service to troubleshoot and assist manufacturer service representatives in obtaining a completely functional installation.
15. Project closeout submittals.
16. All other work shown and specified in the Contract Documents for Contract E.

1.06 PARTIAL LISTING OF SPECIFIC CONTRACT REQUIREMENTS

- A. The Contract Documents detail the work included in the Contract. Related requirements and conditions covered by the Contract Documents include, but is not limited to, the following:
 1. Adherence to work restrictions as specified in Section 011400. Such restrictions include, but is not limited to:
 - a. Guidelines and requirements of the "Owner", Town OF Riverhead Sewer District
 - b. Guidelines and requirements of the Suffolk County Department of Health Services (SCDHS)
 - c. Guidelines and requirements of the New York State Department of Environmental Conservation (NYSDEC)
 - d. Local laws and ordinances of the Town of Riverhead
 - e. Each Contractor shall comply with MBE/WBE requirements as contained in the Contract Documents.
 2. The General Contractor shall comply with the requirements of Section 312333– Trenching. The cost associated with test holes and utility mapping shall be as specified therein, and is subject to change based on conditions existing at the time of construction.

1.07 PARTIAL LISTING OF OVERALL CONTRACT REQUIREMENTS

- A. The Contract Documents detail the work included in the Contract. Related requirements and conditions covered by the Contract Documents include, but is not limited to, the following:
 1. Debris removal and daily and final cleaning up.
 2. Coordination with the Owner and other contractors who have been awarded work by the Owner.
 3. Coordination with utility companies necessary to schedule connection of services, and management of the installation.
 4. Site utilization and management so as not to disrupt the Owner's ability to operate the existing facilities in a safe and efficient manner.
 5. Maintain the Owner's ability to operate the facility at all times during the construction period.
 6. Facilities to be used during the contract period that are to be used by the Owner or his representatives and others involved with constructing the project.
 7. Product and equipment storage and handling requirements.
 8. Starting and adjusting of the equipment and systems required under the project.
 9. Site safety in accordance with all applicable federal, state, and local regulations.
 10. Project submittals, meetings, professional photographs, testing services, work plans, schedules, shop drawings, closeout procedures and documents, manuals, as-built drawings, and final commissioning of the work shall be provided as required by the Contract.

11. Provide and maintain, at all times, temporary roadways for site access to all parties involved with the project.
12. Sequence and schedule the construction so that new facilities come on-line before pre-existing facilities are demolished, dismantled or taken offline.
13. Temporary facilities and controls necessary to construct the project and to maintain permit levels of sewage treatment at all time.
14. Site utilization and management so as to allow other prime contractors to perform work in conjunction with this project and to afford them equal opportunity and space to complete their contractual obligations with the Owner as solely defined by the Engineer.
15. To not hinder the Owner's ability to maintain permit levels of sewage treatment at all times.
16. The Owner has or will award other construction contracts associated with this project.
17. It is anticipated that work of all the contracts will coincide with work of this Contract.
18. Each Contractor shall coordinate the work between the various construction contracts, through the Owner/Engineer, as required to complete the contract requirements in accordance with the requirements contained in Section 013100.

1.08 OWNER SUPPLIED PRODUCTS AND UTILITIES

- A. The Owner will not be supplying equipment, labor, or tools for the project.
- B. The Owner will pay for electricity usage. The restrictions on electrical usage shall be as follows:
 1. Power tool usage during specified working hours will only be permitted.
 2. Power for dewatering and trash pumps and portable heaters will not be permitted.
 3. Sump pumps, if less than 1/3 horsepower will be allowed. Only two (2) sump pumps will be permitted to operate at the same time.
 4. Power to the Owner/Engineer's office, if applicable.
 5. Power to help cure concrete or painting systems will not be permitted.
 6. Power to the Contractor's trailer will be permitted if suitable available from existing WWTP power distribution system is located as approved by the Owner. All connection costs shall be borne by the Contractor(s).
 7. The Owner reserves the right to stop paying for electrical usage at any time if, in the opinion of the Owner/Engineer, the Contractor causes excessive electrical charges or does not conserve electricity to the maximum extent possible in the opinion of the Engineer. All Contractors shall conserve electricity during the course of construction.

1.09 EXISTING CONDITIONS

- A. The Drawings show certain information that has been obtained by the Owner regarding various pipelines, utilities, and structures that exist at the location of the project both below and at grade.
- B. The Owner and the Engineer expressly disclaims all responsibility for the accuracy or completeness of the information given on the Drawings with regard to existing facilities.
- C. In the case where the Contractor discovers an obstruction not indicated on the Drawings or not described via specification reference, then the Contractor shall immediately notify the Engineer of the obstructions' existence.
- D. The Engineer will determine if the obstruction is to be relocated or removed.
- E. Compensation for this extra work will be paid for in accordance with the provisions in the Contract for "Extra Work".

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 NOT USED

END OF SECTION 011200

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Site access and control of areas outside of site.
- B. Contractor use of the premises.
- C. Contractor storage, parking and deliveries.
- D. Work hours, employee conduct and miscellaneous employee requirements.
- E. Contract requirements related to maintaining Owner's current operations and excess inspection required.
- F. Suggested construction sequence.

1.02 SITE ACCESS AND CONTROL

- A. The Contractor shall use the designated entrance to the site as shown on the drawings. If no site entrance is designated, the Contractor shall use an entrance designated by the Owner's Construction Representative.
 - 1. The Owner may permit, solely at the Owner's discretion, the temporary use of another entrance for site access.
 - 2. The Owner will only review requests made by the Contractor for an exception to the designated site entrance if made in writing at least 72 hours in advance of each of the times desired for use.
- B. All contractors to maintain the entrance area clear of materials, vehicles and any other obstacle or debris. Failure to do so will result in a minimum back charge of \$750 per occurrence.
- C. The area around the site is a residential neighborhood. The Owner intends to be a good neighbor. The Contractor shall not close any road for any period in time. The Contractor shall take whatever measures are necessary to not cause any inconvenience to the area's residents.
- D. The Contractor is responsible to employ methods to prevent construction materials and/or debris from leaving the site. The Contractor is responsible to routinely monitor the areas surrounding the site during the day as well as at the end of the work-day and to immediately clean up any area to its previous condition.
- E. The Contractor shall employ methods to prevent the transmission of dirt from vehicles driving on exposed areas of the site from reaching the surrounding roadways. The Contractor will be responsible to immediately clean the roadway, should the measures being taken by the Contractor be found to not satisfactorily control the transmission of any dirt to the roadway.
- F. Any damages to areas outside the site, spills of soil, liquid, or any other material shall immediately be repaired, cleaned and restored to its previous condition.
- G. The Contractor shall comply with all state and local requirements for allowable weight limits of vehicles on all roads.
- H. The Owner reserves the right to back charge the Contractor for all costs associated with maintaining the grounds as well as maintaining areas outside the site, which may be disturbed by the Contractor should the Contractor fail to maintain or repair the aforementioned in a condition acceptable to the Owner.

1.03 CONTRACTOR USE OF THE PREMISES

- A. Premises, for the purpose of this Contract, shall mean the site, buildings and other structures located within the property line or in any temporary or permanent construction easements identified on the plans.
- B. The Contractor shall use and manage the premises and the associated construction activities as follows:
 - 1. To not hinder the Owner's ability to operate their facilities,
 - 2. To allow other Prime Contractors to install their work and complete their contractual obligations in the time period specified,
 - 3. To allow for stockpiling of construction material and debris without any significant hardship, as defined by the Owner's Construction Representative, on the Owner or other contractors,
 - 4. To allow for the stockpiling of excavated soil and imported fill, when called for, without any significant hardship, as defined by the Owner's Construction Representative, on the Owner or other contractors,
 - 5. To allow utility companies to install their work,
 - 6. To allow for the delivery of equipment and materials by independent trucking companies by leaving enough space for backing in and out of areas,
 - 7. To allow for the safe, unimpeded travel way of the Owners vehicles, Owner's Construction Representative's vehicles, Architect's and Engineer's vehicles, construction vehicles and heavy construction equipment about the entire site.
- C. Contractors shall maintain the premises in a safe condition throughout the construction period. Compliance with OSHA regulations and site safety shall be the responsibility of the Contractor as it relates to work of the Contract. The posting of all applicable OSHA safety signs shall be the responsibility of the Contractor.
- D. Contractors shall provide temporary handrails, as required, for their work or for work put in place by their Contract that will require temporary handrails. Construction of temporary handrails shall be as specified in Section 015000.
- E. Contractor(s) shall be responsible for protecting Owners property. All existing buildings, structures, shrubs, trees, lawn fixtures, sculptures and misc. equipment shall be protected at all times. Any removals or relocation of said objects, if allowed shall be as directed by Owner's Construction Representative.
- F. Contractor shall protect all of the physical structures, property and improvements upon the site from damage by their Work and shall immediately repair or replace damage caused by construction operations, employees or equipment employed by the Contractor. All labor, materials and equipment and outside contractors that are employed by the Owner to repair damage caused by the Contractor shall be billed to the Contractor directly or withheld from money due the Contractor for work already completed.
- G. Limit use of the site to the area(s) shown on the Contract Drawings and the adopted Site Utilization Plan. Confine operations to permit others working on the site easy access to all areas of Work.
- H. Keep all existing operations areas, driveways, roads, and parking areas free and clear of materials and equipment. Do not unreasonably encumber the site with materials and equipment. Confine stockpiling of excess excavated material, materials and equipment to areas selected under the Site Utilization Plan or as designated by the Owner's construction representative. Locate storage sheds and trailers to areas designated in the plan or by the Owner's Construction Representative.

- I. Immediately remove excess excavated material or relocate to areas on the site requiring placement of fill. Do not stockpile excess material on the site.
- J. The construction site space is limited and it shall be the General Contractor's responsibility to manage the site during the entire construction period with input from all concerned parties as to meeting their needs. Equal consideration of the needs of others with that of the Contractor's shall be provided as judged by the Owner.
- K. The General Contractor shall be required to mechanically sweep the River Avenue access drive between the intersection of Riverside Drive and River Avenue north onto the treatment facility property, terminating at the southern limits of the UV Reuse building/Trickling Filter work area. The General Contractor shall perform this mechanical sweeping work at a minimum frequency of once per week and a maximum frequency of once per day, or as directed by the Owner's Construction Representative. This sweeping service is not to be considered an extra cost by the General Contractor and must be an anticipated expense that shall be considered at the time of bid.
- L. Due to the limited site area available for construction, staging areas shall be relocated several times during the various stages of construction. Additional compensation for relocating staging areas, equipment and material storage, and trailers are not to be considered an extra cost to the Contractor as this is an anticipated expense that shall be considered at the time of the bid.
- M. Contractors are responsible for cleaning up their own materials and debris. Failure to maintain a clean work site daily, will result in other performing the work and contractor(s) being back charged for the cleaning cost plus construction administration fees.
- N. Use of the existing building facilities during construction is prohibited including but not limited to: toilet rooms, telephone and water fountains. Contractor(s) shall be fined \$250 per occurrence if their employee (or subcontractor's employee) is observed disregarding these rules.
- O. Should it become necessary to access the existing building during construction hours for measurements or other non-disruptive work, the contractor shall be escorted by an Owner's Construction Representative.
- P. Refer to Section 015000 - Temporary Facilities and Controls for minimum rubbish removal requirements.
- Q. Do not discard or dispose of any waste on-site.
- R. Open fires will not be permitted on the site.
- S. The General Contractor shall employ erosion control measures to protect wetlands located adjacent to the work where shown on the Drawings and as required by regulatory agencies.
- T. Install erosion control measures as needed. The Contractor shall confine stormwater runoff to the site.
- U. The General Contractor shall be responsible for managing dust as specified in Section 015719.

1.04 CONTRACTOR STORAGE, PARKING AND DELIVERIES

- A. Contractors must provide exterior storage containers when required. Final location of storage container shall be determined by the Owner.

- B. Do not unreasonably encumber the premises with materials and equipment. Do not store material in existing buildings. Store all equipment and materials to allow the Owner's employees to operate and conduct their business safely.
- C. Confine premise storage areas to locations designated by the Owner. Immediately repair or replace damaged facilities to the satisfaction of the Owner and to a condition that existed before the damage occurred as determined by preconstruction photographs, or if photographs are unavailable, to that deemed by the Owner.
- D. No storage materials will be permitted within the buildings at any time during construction.
- E. Storage of chemicals and painting shall be outside the existing or new structures and shall follow manufacturer's guidelines.
- F. Compressed gas containers shall be properly stored and secured per OSHA, to the satisfaction of the Owner. Failure to do so will result in a \$250 back charge, per occurrence.
- G. Contractor shall provide minimum of 48 hours advance written notice on working days to the Owners Construction Representative for deliveries of materials, site visits by inspectors, manufacturers representatives or any other occasion that impacts the use of the site. Contractor shall be responsible for any costs that are incurred by the owner, for failure to meet previously agreed upon appointments or work schedules.
- H. Deliveries sent to the Owner will not be signed for or unloaded by the Owner. They will be directed to the construction site and if no employee is on site, the delivery will be rejected, at the contractor's expense.
- I. Night deliveries of equipment (past the designated quitting time) will not be permitted. Do not schedule trucking companies to deliver equipment or wait for the job site to open. Delivery trucks shall not obstruct the site entrance, shall not sit within the neighborhood causing an obstruction or perceived nuisance, nor be left idling on or off the site for any period of time.
- J. Parking shall be in the designated areas of the site only. All automotive type vehicles are to be locked when parked or unattended to prevent unauthorized use. Do not leave vehicles or equipment unattended with the motor running or the ignition key in place. Any vehicles or trucks in non-designated areas may be towed at contractor's expense.

1.05 WORK HOURS, EMPLOYEE CONDUCT AND MISCELLANEOUS EMPLOYEE REQUIREMENTS

- A. The Contractor will be permitted to schedule working days and hours as specified in the General Terms and Conditions, if no times are specified therein then the work hours shall be Monday –Friday 7:00 am - 3:30 pm.
- B. Employees are to act in a professional manner. Any employee using inappropriate language or who is disruptive to the work environment will be banned from the site.
- C. Proper work attire is required. Shirts are to be worn at all times and no short pants are permitted.
- D. Employees shall not converse with local residents or Owner's employees.
- E. Any employee found under the influence of any drug or alcohol will be banned from the site.

1.06 CONTRACT REQUIREMENTS RELATED TO MAINTAINING OWNER'S CURRENT OPERATIONS AND EXCESS INSPECTION REQUIRED

- A. The Contractor shall schedule working days and hours as specified. The Contractor shall pay all excess costs for inspection services provided by the Owner/Engineer for working beyond the times specified.
- B. The hourly rate paid for inspection services beyond normal working hours shall be at a maximum billing rate of \$200 per hour, which shall be used to compute the overtime hourly charge.
- C. It is the Contractor's responsibility to determine the dollar amount to be included in the bid to pay for the services of one (1) inspector to be present during the entire time work is being performed during low flow periods or beyond a normal 8-hour day. If the Owner elects to have more than one representative present, then the cost of the additional inspector(s) will not be paid for by the Contractor. The maximum hourly billing rate applies for all instances where excess engineering is performed beyond a normal 8-hour work day, not just work to be performed during low flow periods.
- D. The Contractor will be allowed to work early morning hours if a planned tie-in must be performed. Early morning work is required since it is a low flow period. Provide 72 hours advanced notice to the Engineer for all early morning work together with a written plan as to the steps necessary to construct the work. The overtime salary costs for early morning tie-in work associated with having the operations staff of the treatment facility present shall be paid by the Contractor. This cost will be eligible for reimbursement payment as specified in Section 012100 – Allowances.
- E. Maintenance of Treatment:
 - 1. The designated operator of the Treatment Plant is required by law to maintain the discharge limits specified in the SPDES permit. The permit levels of treatment shall be provided at all times during the construction of the facility.
 - 2. The Contractor shall be responsible for all fines resulting from the discharge of inadequately treated sewage if the cause of the violation was due to the direct or indirect construction action of the Contractor or any of his/her employees, subcontractors, vendors or material suppliers.
 - 3. When it becomes necessary to alter the existing plant operations in any way, the Contractor shall provide at least 72 hours working days advance written notice to the Engineer and Owner. The notice shall indicate the reason for altering the process together with measures necessary to maintain treatment.
 - 4. The Contractor shall not open, close, start or stop any valve, piece of equipment or any other component at the existing facility without first providing written notice. Only licensed operators designated by the Owner shall be permitted to alter the operation of the plant.
 - 5. The Contractor shall employ bypass pumping from one tank to another in order to take process tanks off-line, perform required modifications and demolitions and to complete the work. All equipment, labor, materials, and fuel or source of power used for bypass operations shall be furnished and installed by the Contractor.
 - 6. Where existing electrical facilities require modifications or abandonment, then the Owner shall first decommission them.
 - 7. The Contractor shall conduct all physical work necessary to alter plant flows and install whatever measures are required to perform the work safely.

1.07 SUGGESTED CONSTRUCTION SEQUENCE

- A. The following is a suggested general, not all-inclusive, sequence of construction that may be used to complete all work under the Contract within the time specified. Since permit levels of

treatment must be maintained during construction, certain existing process equipment and units cannot be taken offline until new facilities are placed into permanent, fault free operation.

- B. Work restrictions may be noted throughout the suggested sequence provided below. The Contractor shall comply with all noted work restrictions that appear.
- C. The following suggested sequence is provided for information only:
 - 1. Establish site utilization - set up all required field offices and temporary utilities for construction.
 - 2. Construct new/modified sludge processing systems: The listed work must be completed, tested, checked out by equipment manufacturer and acceptable to the Resident Engineer/Owner prior to starting the Autothermal Thermophilic Aerobic Digestion system conversion work at the existing tanks or taking the tanks off line.
 - a. Construct new sludge screen adjacent to existing blended sludge tanks and complete controls integration.
 - b. Replace existing reuse water booster pump with new larger capacity booster pump.
 - c. Replace existing thickened sludge plunger style pumps with new larger capacity-controlled volume vertical reciprocating pumps and complete controls integration.
 - 3. Contract P shall maintain existing thickened sludge storage volume via combination of temporary repurposing of existing tanks and/or mobilization of new temporary tanks for the duration of work. Owner and Engineer will not permit the reduction of thickened sludge storage volume at any point during the construction period.
 - a. Convert existing Scavenger Waste Digester Tank to ATAD Tank and construct new Class A Biosolids Equipment & Control Building. Control Building shall be completed by Contract G.
 - b. Convert existing Thickened Sludge Holding Tank to SNDR Tank.
 - c. Convert existing Scavenger Sludge Holding Tank to Biofilter.
 - h. Complete controls integration for the Autothermal Thermophilic Aerobic Digestion System by Contract E.
 - 4. Test and start up new Autothermal Thermophilic Aerobic Digestion system.
 - 5. The following work can take place at any time throughout the course of the project as coordinated with the Owner and Engineer:
 - a. Construct new sludge storage building.
 - 6. Complete all remaining contract work.

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 NOT USED

END OF SECTION 011400

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Site Utilization Plan requirements

1.02 SITE UTILIZATION PLAN REQUIREMENTS

- A. The General Contractor shall prepare a Site Utilization Plan (SUP) showing staging areas, parking areas, stockpile areas, debris container areas, unloading areas, and trailer areas for review by the Owner's Construction Representative, Architect, Engineer, and other prime contractors. The length and amount of meetings necessary to develop and adopt a SUP shall be as required.
- B. Meeting(s) will be held at the site with all concerned parties to assist the General Contractor in developing the criteria for the plan. During these meeting(s), all parties will present their needs and requirements for site utilization. As a minimum, each Prime Contractor shall be allocated the same amount of staging/parking/material storage area regardless of the dollar amount of their construction contract. Representatives from the local municipality or utility companies may be attending. The requirements of the local municipality and utility companies shall be incorporated into the SUP.
- C. The General Contractor shall then prepare a draft site plan that attempts to incorporate the needs of all concerned parties. Another meeting will then be held at the site to review and present the plan. The plan shall then be revised at that meeting and adopted for use if it is acceptable to all relevant parties. If all parties cannot agree on an acceptable plan, then the Owner's Construction Representative will establish the Site Utilization Plan without any claims from any contractor.
- D. The Contractor, by submitting a bid, understands the importance of a workable Site Utilization Plan and also understands that the Owner's Construction Representative may be required to select a plan for all contractors to adopt that is not ideal to the planned construction activities anticipated before the bid was submitted. There shall be no claims for damages associated with site utilization.
- E. If the General Contractor fails to prepare the Site Utilization Plan as stipulated above, then the Owner reserves the right to back charge the General Contractor for the costs associated with having a Site Utilization Plan developed.
- F. If a Prime Contractor fails to participate or attend the meetings scheduled to develop the Site utilization Plan then the Prime Contractor will forfeit any right to comment on the plan that is developed.

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 NOT USED

END OF SECTION 011419

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work under this Section specifies the procedures used to process partial and final payments. It also includes the procedure for issuance of the Certificate of Substantial Completion and the Final Payment.
- B. If there are any discrepancies between this Section of the Contract Documents and the Contract, General Conditions, then the Contract and General Conditions shall govern.

1.02 RELATED SECTIONS

- A. Section 012973 - Schedule of Values

1.03 TIME FOR COMPLETION

- A. Inasmuch as the provisions of the Contract relating to the time for performance and completion of the Work are for the purposes of enabling the Owner to proceed with the construction of a public improvement in accordance with a predetermined program, and inasmuch as failure to complete the Work within the period herein specified may result in damage or loss to the Owner, time is of the essence of the Contract.
- B. Time for completion of the Work shall be in accordance with that stipulated in the Contract Documents.
- C. The date for completion will be calculated from the date shown in the Notice To Proceed. The Contractor shall prosecute the Work with diligence from day to day, and complete it at the time fixed.
- D. For the purpose of defining completion date, the Project will be considered complete when all work covered by the Contract has been performed and all installations and equipment have been tested and are ready for permanent use. The Contractor shall provide a copy of the final Certificate of Occupancy from the AHJ prior to issuance of the final payment.
- E. Notwithstanding the foregoing, the Engineer will establish the date of substantial completion when the project is accepted and ready for operation, and no large or major items of work are as yet outstanding. At such time, the Engineer will issue a punch list, itemizing the items of work remaining. The punch list will include "minor" items only, as defined solely by the Engineer. Any prior punch lists, which include "major" or significant items, as defined by the Engineer, shall no be a criterion in establishing the date of substantial completion.

1.04 PARTIAL COMPENSATION

- A. At the Owner's discretion, the Contractor may receive compensation for materials, equipment, and products delivered to the site yet not installed provided:
 - 1. A cancelled check or paid bill from the supplier is submitted to the Engineer/Architect indicating that the Contractor has paid the supplier for the material or equipment.
 - 2. A certificate of insurance is provided specifically insuring the piece of equipment for full value in the event of loss, vandalism, fire, and act of God.
 - 3. A bill of material is delivered to the Engineer/Architect at the time of delivery itemizing the subject material or equipment.
 - 4. The Engineer/Architect has agreed to the pre-purchasing of the materials.

- B. Payment will be made for on-site material and/or equipment for 80% of the gross amount of the paid invoice, less the normal contract retainage.
- C. The Contractor will not receive compensation for materials, equipment, and products stored in the Contractor's yard or shop.
- D. The Contractor will not receive compensation for material, equipment, and products stored on site if it has not been stored in accordance with the manufacturer's requirements and the requirements specified elsewhere within these specifications.
- E. Payment(s) made under this paragraph do(es) not relieve the Contractor from his/her responsibilities under the terms of this Contract.

1.05 PAYMENT TO CONTRACTOR

- A. Submit with each and every voucher for payment for work completed under this Contract, a statement as to the amounts due and owing by the Contractor to labor, subcontractors and materialmen and a certificate relative to payments now due.
 - 1. All statements shall be signed by the Contractor's authorized representative and witnessed by a notary public.
 - 2. A Specimen of the required statement is attached and made a part of this Section of the Contract Documents.
- B. Every application for payment shall consist (and be in the order of) the following properly prepared and executed documents:
 - 1. Transmittal letter or memo describing the exact contents of the payment application
 - 2. Signed invoice on company letterhead
 - 3. Owner's voucher executed by the Contractor (if required)
 - 4. Schedule of Values showing derivation of the invoiced amount, consistent with the proposal form(s)
 - 5. AIA Documents as specified in Section 012973
 - 6. Certified payroll records prepared in accordance with standard accounting procedures in a form acceptable to the Owner
 - 7. Payment affidavits (Specimen forms provided herein this Section and as specified above)
 - 8. Invoices and required backup information for payment to be made out of cash allowance(s)
- C. The Engineer/Architect will not process partial payment applications until the required documents are submitted in the prescribed form as may be discussed at the pre-construction conference or as may be required by the Owner.
- D. Payment requests shall not be submitted more than once per month.

1.06 SUBSTANTIAL COMPLETION AND FINAL PAYMENT REQUEST

- A. Substantial Completion:
 - 1. Upon Substantial Completion of the Work as defined herein and acceptance thereof by the Engineer/Architect/Owner, and as soon thereafter as practicable, the Engineer/Architect will prepare a Certificate of Substantial Completion.
 - a. The Engineer/Architect will establish the date of Substantial Completion when the project is accepted and ready for operation for the intended purpose, and no large, major or important items of work are as yet outstanding; thus the Owner has gained Beneficial Use of the project.
 - b. The Certificate of Substantial Completion will indicate the value of work performed, materials and equipment furnished, and otherwise show the exact aggregate amount

- equal to one hundred percent (100%) of the total compensation to which the Contractor is entitled for the performance of the Contract, less the amount of previous payments, less the sum as stipulated below for remaining Punchlist work.
- c. All documents as specified in Sections 017800, 017823, and 017839 shall be submitted and approved prior to Substantial Completion.
 - d. The Certificate of Substantial Completion will be submitted to the Owner and a copy furnished to the Contractor.
 - e. Upon approval of the Certificate of Substantial Completion by the Owner, and as soon as practicable thereafter, the Owner will pay the Contractor.
2. Attached to the Certificate of Substantial Completion will be a Punchlist itemizing the items of work remaining.
 - a. The Punchlist will include "minor" items only, as so defined solely by the Engineer/Architect.
 - b. Any prior punchlists, which include "major" or significant items, as defined by the Engineer/Architect, shall not be criteria in establishing the date of Substantial Completion.
 - c. This Punchlist shall not be considered all-inclusive and any outstanding contract requirements discovered by the Owner or the Engineer/Architect shall be installed, repaired, replaced and corrected prior to the final inspection. The Engineer/Architect will provide written notice of such additional outstanding work items.
 - d. The Engineer/Architect will calculate and itemize, in the Certificate of Substantial Completion, the value of the Punchlist work as being the larger sum of either:
 - 1) Two times the sum of money which, in the Engineer/Architect's opinion, would be necessary to expend if the Owner were to contract with others for the final completion of the work and satisfaction of all Punchlist items, or
 - 2) The sum of money represented in the Contractor's bid schedule or Schedule of Values for the Punchlist items.
 3. The Certificate of Substantial Completion shall fix the time for the Contractor to finish all Punchlist work.
 4. The Contractor shall prepare a Substantial Completion partial payment application as specified in paragraph 1.05 herein, which shall be made a part of the Certificate of Substantial Completion.
 5. The warranties/guarantees for all equipment, products and services required by the Contract Documents shall commence on the date that the Owner accepted/executed the Certificate of Substantial Completion.
 6. The warranties/guarantees for all equipment, products and services represented on the Substantial Completion Punchlist will begin on the date that the Owner accepted the Final Payment Request as hereinafter specified.
 7. Removal of the Contractor's plant and equipment and other inconsequential adjustments which do not prevent Beneficial Use of the Project, will not be a factor in establishing the date of Substantial Completion.
 8. Only the Final Payment Request will be processed after Substantial Completion has been reached.
- B. Final Completion:
1. Upon receipt of written notice that the work of the Contract is ready for final inspection and upon receipt of a Final Payment Request, the Engineer/Architect will make a formal inspection.
 2. An amount of \$1,000.00 (ONE THOUSAND DOLLARS AND ZERO CENTS) will be deducted from the Contractor's Final Payment for each formal inspection where uncompleted work of the Contract was found by the Engineer.
 3. All spare parts shall have been delivered prior to a final inspection.
 4. Upon Final Completion of the Work in accordance with the Contract and acceptance thereof by the Owner, and as soon thereafter as practicable, the Engineer/Architect will process the Contractor's Final Payment Request.

- a. The Final Payment Request will indicate the value of the work performed, materials and equipment furnished, and otherwise the exact aggregate amount of compensation to which the Contractor will become entitled under the terms of the Contract.
 - b. Upon approval of the Final Payment Request by the Owner, and as soon as practicable thereafter, the Owner will pay the Contractor an amount equal to one hundred percent (100%) of the total compensation to which the Contractor is entitled for the performance of the Contract, less the amount of all previous payments.
5. The issuance of the Final Payment Request and payment in full to the Contractor shall be contingent and conditioned upon submission by the Contractor of a Maintenance Bond.
 - a. The Bond shall be in a form approved by the Owner and issued by a surety acceptable to the Owner in its sole and absolute discretion.
 - b. The Bond shall remain in effect as specified elsewhere in the Contract Documents.

1.07 ACCEPTANCE OF FINAL PAYMENT REQUEST

- A. The Contractor shall be conclusively deemed to have accepted the Final Payment Request as a correct statement of the total liability of the Owner and of the compensation paid and to be paid to the Contractor by the Owner unless within seven (7) days after delivery of his copy of the Final Payment Request to him/her, the Contractor shall return such copy to the Owner together with a statement of his/her objections to such payment request and of any claim for damages or compensation in excess of the amounts shown on the Final Payment Request.
- B. The acceptance by the Contractor of the Final Payment Request as approved by the Owner shall constitute a release and shall discharge the Owner and Engineer/Architect from all further claims by the Contractor arising out of or relating to the Contract, including but not limited to a release from all impact costs.

1.08 RELEASE OF RETAINAGE & REINSPECTION OF WORK

- A. Retainage will be released as specified in the Contract Documents.
- B. During the last month of the Maintenance Bond period, the Owner may make, or cause to be made, a reinspection of the Work. If the Work is found satisfactory and in accordance with the Contract Documents, the Owner will approve the termination of the Contract.
- C. In the event the inspection discloses the existence of defects in the materials, equipment or workmanship or other noncompliance with the Contract Documents, the Contractor shall be required to immediately make good and rectify all defects.
 1. Any item of equipment that has failed to maintain the performance or other salient requirements of these specifications, shows undue wear, or other deleterious defects, will be considered defective.
 2. If the Contractor shall fail or neglect to satisfy the requirements of the Owner with respect to making the necessary corrections, then the Owner may proceed to have the work executed by others and the cost and expense thereof will be borne by the Contractor and his Sureties.
 3. Correction of defects and noncompliance and payment for such by the Contractor or his Sureties shall terminate the Contract and release all parties hereunder.

1.09 SCOPE OF PAYMENTS

- A. The Contractor shall receive and accept the compensation as herein provided, in full payment for furnishing all materials, labor, tools, and equipment and for performing all work contemplated and embraced under the Contract, also for all loss or damage arising out of the nature of the Work or from the action of the elements, or from any unforeseen difficulties or obstructions which may arise or be encountered during the prosecution of the Work, and for all

risks of every description connected with the prosecution of the Work, until its final acceptance by the Owner, also for all expenses incurred by, or in consequence of, the suspension or discontinuance of the said prosecution of the Work as herein specified, and for all actual or alleged infringements of patent, trademark, or copyright, and for completing the Work and the whole hereof, in an acceptable manner, according to the Plans, Specifications, and other Contract Documents.

- B. The payment of any partial or final estimate shall in no way or in no degree prejudice or affect the obligation of the Contractor, at his own cost and expense, to renew or replace all defects and imperfections, or damages. The Engineer/Architect shall be the sole judge, and the Contractor shall be liable to the Owner for failure to do so.

1.10 RIGHT TO WITHHOLD PAYMENTS

- A. The Owner may withhold from the Contractor the amount of any payments due him as may in the judgment of the Owner be necessary:
 - 1. To assure the payment of any lien, stop notice or claim filed with the Owner for work, labor or materials, done, performed, or delivered and used in the prosecution of the Work herein provided for (whether in strictly legal form or otherwise); or
 - 2. To protect the Owner from loss due to defective work not remedied or through any improper or defective machinery, implements or appliances used by the Contractor or for failure of the Contractor to fully comply with all requirements of the Contract; or
 - 3. To protect the Owner from loss due to injury to persons or damage to the work or property of other contractors, subcontractors, or others, caused by the act or neglect of the Contractor or any of his subcontractors.
- B. The Owner shall have the right as agent for the Contractor to apply any amounts so withheld in such manner as it may deem proper to satisfy such claims or secure such protection. Such application of such money shall be deemed payments for the account of the Contractor.
- C. Before release to the Contractor of any funds retained under this provision, the Contractor shall furnish satisfactory written evidence to the Owner that the claim or claims have been fully paid or satisfied.

PART 2 - PRODUCTS

2.01 NOT USED.

PART 3 - EXECUTION

3.01 NOT USED

END OF SECTION 012000

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Allowance pricing for the following items:
 - 1. Overtime Salary Account.
 - 2. Testing
 - 3. Contingency Account.
- B. This Section covers the requirements for use of the cash allowances listed above contained in the proposal (Bid Forms, Price Schedule) and included in the Contract Price bid by the Contractor and defines and stipulates the charges that will be paid for out of the stipulated allowances.
- C. The Contractor shall include the cash allowances stipulated in this Section in the amount bid (Base Bid).
- D. Eligible costs described in this Section, and Sections referenced herein, will be the only costs paid for out of the stipulated allowances.
- E. All other costs associated with the project as specified and/or shown, including but not limited to the delivery, installation and all Contractor overhead and/or collateral expenses are to be distributed among the other portions of the work and shall be included in the lump sum base bid.

1.02 SUBMITTALS

- A. Make all submissions under the provisions of Section 013300.
- B. For each type of product/material specified to be furnished under allowance pricing provide documentation of the unit pricing on manufacturer's letterhead certifying pricing of the product/material.
- C. Submit additional backup information to substantiate the invoiced amount(s) as the Engineer/Architect may require for review and approval, prior to order or payment of item.
- D. Provide written breakdowns for extra work as the Owner may require.

1.03 CHANGES TO STIPULATED (CASH) ALLOWANCE

- A. If the actual cost of services differs from the cash allowance, then the Contract Price will be adjusted accordingly.

1.04 PAYMENTS TO BE MADE OUT OF "OVERTIME SALARY" ACCOUNT

- A. Include the cash allowance of \$10,000.00 (TEN THOUSAND DOLLARS AND ZERO CENTS) (ALL CONTRACTS) in the amount bid for use upon the Owner's instructions.
- B. Funds will be drawn from this account to pay for overtime hours worked by Owner's operations staff associated with project required after hour tie-in and tank bypass work as specified in Section 011400.
 - 1. Overtime hours worked by the Contractor's employees are not eligible for payment under this allowance item.
 - 2. Overtime hours worked by the Architect/Engineer's representative(s), as a result of the Contractor's operations, shall be paid for by the contractor as provided under other terms

and conditions contained in the Contract and General Conditions at the Engineer/Architect's billing rate as specified in Section 011400 – Work Restrictions.

- C. Funds remaining at project closeout shall be credited to the Owner.

1.05 PAYMENTS TO BE MADE OUT OF "TESTING" ACCOUNT

- A. Include the cash allowance of \$20,000 (TEN THOUSAND DOLLARS AND ZERO CENTS) (CONTRACT G only) in the amount bid for independent testing laboratory services specified in Section 014500.
- B. The actual invoiced charges of the testing laboratory, including toning companies where called for, incurred for field and laboratory tests, as specified only in Section 014500 - Quality Control, shall be paid for out of the cash allowance.
1. Any other requirement specified herein throughout these specifications for providing the services of an independent testing laboratory, underground utility location company, or similar outside independent service are to be borne by the Contractor.
 2. All costs for quality control services are to be included as part of the Contract Price (as-bid).
- C. One (1) week prior to each partial payment, submit a certified invoice from each company listing and detailing the total costs incurred since the last invoice.
1. The invoice shall be on company letterhead signed by an authorized representative of the company and shall include man-hours, tests conducted, date of tests and associated costs and fees.
 2. Payment for costs will not be made unless the information is provided and certified. Payment for costs will not be made unless the typed test data reports have been received by the Engineer.
 3. In the case of pipe toning, flags must be set to delineate the route of underground pipes and utilities prior to submission of partial payment request.
- D. If in the event test results (provided by the independent testing laboratory) show non-compliance with these specifications, then at the option of the Contractor and only with the approval of the Owner, he may re-test samples to verify the original test results at his/her own expense.
- E. Costs for re-testing failed components of the work, when ordered by the Engineer/Architect, will not be paid for out of the cash allowance and will be directly borne by the Contractor.

1.06 PAYMENTS TO BE MADE OUT OF CONTINGENCY ACCOUNT

- A. Include the cash allowance of \$50,000 (FIFTY THOUSAND DOLLARS AND ZERO CENTS) in the amount bid for use upon the Owner's instructions.
- B. Include the cash allowance amount indicated in the proposal for use upon the Owner's instructions for additional improvements beyond those identified in the contract documents and for unforeseen conditions.
- C. The Owner will draw funds from the contingency account only upon prior approval by the Owner's Construction Field Representative and Architect/Engineer.
- D. Funds remaining at project closeout shall be credited to the Owner.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 012100

PART 1 - GENERAL

1.01 GENERAL

- A. This Section specifies the requirements for measurements and records made for payment purposes and describes the item(s) under which payment(s) will be made for the Work performed under this Contract.
- B. All work shown or specified in the Contract Documents shall be performed.
- C. Items not specified to be measured or paid for (for which no specific pay item exists in the Price Schedule) shall be included in an appropriate unit price item or in a lump-sum item.

1.02 MEASUREMENT REQUIREMENTS

- A. All required measurements will be made by the Contractor with the Engineer and or Owner's construction representative.
- B. Any measurements not witnessed by Engineer and/or Owner's construction representative and which cannot be verified or substantiated by Engineer and/or Owner's construction representative will not be approved and payment under the item(s) requiring such measurements will not be made.
- C. Coordinate measurements monthly, for the preparation of periodic pay estimates.
- D. Where payments will be made for removing existing materials, or materials generated by work, Contractor shall be required to notify Engineer and/or Owner's construction representative so that he/she may witness the measurements.
 - 1. All materials removed without conforming to the above procedures, which Engineer and/or Owner's construction representative cannot verify or substantiate, will not be paid for.
 - 2. Maintain complete, neat, clean, and legible field notes for all measured items.
 - 3. Notes will contain spaces for Contractor's and Engineer's and/or Owner's construction representative's signatures plus additional space for comments.
 - 4. An original and a carbon copy will be made for all notes and one copy will be turned over to Engineer and/or Owner's construction representative daily.
 - 5. The Engineer's and/or Owner's construction representative's signature will not be constituted as an acceptance of the work, or the measurements made, but will mean that he was present when the measurements were made.

1.03 SUBMITTALS

- A. See Section 013300.
- B. Field notes of all measurements for payment purposes delivered to Engineer and/or Owner's construction representative daily.
- C. Monthly Applications for Payment.
- D. Record Drawings showing the locations and quantities of all items measured for payment purposes.

1.04 SCHEDULING

- A. Notify Engineer and/or Owner's construction representative, as far in advance as possible, of the recording of measurements so that Engineer and/or Owner's construction representative may observe existing conditions, work being performed, and measurements being made.
- B. Allow for and afford Engineer and/or Owner's construction representative ample time, space, and equipment to observe measurements and to verify measurements and elevations.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Provide all labor, materials, facilities, levels, measuring devices and all other equipment and items necessary to perform all measurements properly and accurately for payment purposes.
- B. Payment for certain items not specifically listed in the bid forms but otherwise required by the technical specifications will be deemed included as part of the General Conditions and the individual unit price and lump sum bid items provided for in the proposal.

PART 3 - EXECUTION

3.01 GENERAL

- A. Perform all measuring required under this Section.
- B. Record all measurements and calculated quantities on the Record Drawings.
- C. No measurement will be made for work performed within the limits of Lump Sum Items.

ITEM NO.	ITEM DESCRIPTION AND MEASUREMENTS
4	<u>Concrete Crack Repair</u> - Measure the actual linear length of concrete cracks that are repaired as directed by Engineer in the field. Measurement will be made along the entire length of continuous cracks to be repaired.
5	<u>Concrete Spall Repair</u> - Measure the actual square footage of concrete spalls that are repaired as directed by Engineer in the field. Measurement will be made along the entire area of each surface spall that is repaired.

3.02 PAYMENTS

- A. No separate payments will be made for the Work under this Contract except for the pay items stipulated in this Part 3.
- B. All costs in connection with the Work will be included in one or more of the pay items, as appropriated.
- C. Each pay item will be full compensation for all costs in connection with the item including, but not limited to:
 - 1. the furnishing of all materials, labor, equipment, tools, and all incidentals,
 - 2. the installation of all materials, equipment, facilities, accessories, and appurtenant items,
 - 3. proper share of overhead and profit,
 - 4. mobilization/demobilization,
 - 5. submittals,

6. General and Supplemental Conditions,
7. all temporary facilities and controls
8. restoration of surfaces not scheduled to be paid for by bid items
9. all related and incidental work and items necessary or required to complete the Work and to provide completely connected, operational and approved systems capable of performing as required.

D. In addition to those items described above, Paragraph 3.03 lists specific items of work under each pay item to assist Contractor in appropriating the costs to the proper pay item.

3.03 PAY ITEMS

- A. The name of the following pay item is the abbreviated form of the Bid Item as contained on the Price Schedule in the Bid Forms. The name, as shown below or on the Bid Form, will not be construed to represent a complete description of all or the Work included under such time as is provided only as a means of identification and for ease of conversation.

<u>ITEM NO.</u>	<u>PAYMENT</u>
3	<u>Concrete Crack Repair</u> - Payment will be made at the unit price bid per linear foot of crack repaired and accepted. Include costs for routing existing cracks, debris removal and disposal, transmission of water for surface cleaning, repair materials, application of coatings and mortar, and all work incidental thereto and necessary, therefore.
4	<u>Concrete Spall Repair</u> - Payment will be made at the unit price bid per square foot of spalls repaired and accepted. Include costs for debris removal and disposal of loose materials to sound substrate, transmission of water for surface cleaning, repair materials, application of coatings, and all work incidental thereto and necessary, therefore.

END OF SECTION 012200

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. This Section includes the requirements for substitution of specified products during construction.
- B. The Engineer/Architect will consider requests for substitutions only within thirty (30) days from the date of the Notice to Proceed.
- C. Only products not specifically named in the bid are eligible for substitution in accordance with the requirements contained herein these specifications.
- D. Products named by the Bidder, at the time of bid, shall be furnished and installed and substitutions will not be considered by the Owner/Engineer/Architect for those products named in the bid.

1.02 CONTRACTOR'S OPTIONS

- A. For products specified only by reference standard, select any product meeting that standard.
- B. For products specified by naming several products or manufacturers, select any one of the products or manufacturers named which complies with the Specifications.
- C. Where products are not named, then submit products that meet the specifications.

PART 2 - PRODUCTS

2.01 SUBSTITUTIONS

- A. Name - The Drawings and Specifications list acceptable manufacturers, commercial names, trademarks, brands and other product, material and equipment designations. Such names are provided to establish the required type, quality and other salient requirements of procurement.
- B. Equals - An item equal to that named or described on the Drawings or in the Specifications may be provided by Contractor if accepted by the Engineer/Architect.
- C. A request for product substitution constitutes a representation that the Contractor:
 - 1. Has investigated proposed Product and determined that it meets or exceeds the quality level of the specified Product.
 - 2. Shall provide the same warranty for the Substitution as for the specified Product.
 - 3. Shall coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.
 - 4. Waives claims for additional costs or time extension that may subsequently become apparent.
 - 5. Shall reimburse the Owner and the Engineer/Architect for review or redesign services associated with re-approval by authorities.
 - 6. Shall reimburse the Owner for all additional engineering and/or architectural services claimed by the Engineer/Architect for extra services associated with the review of the Contractor's substituted item since it could not have been originally included in the Engineer/Architect's professional services agreement. Reimbursement shall be based on the man-hours expended, at current billing rates.

- D. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.
- E. Substitution Submittal Procedure:
 - 1. The Contractor shall submit three (3) copies of the Request for SUBSTITUTION FORM for consideration including all required information.
 - 2. The Contractor shall use the form included within this Section.
 - 3. All forms shall be type written.
 - 4. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence.
- F. The burden to prove product equivalence rests on the Contractor.
- G. The Engineer/Architect will notify Contractor in writing of decision to accept or reject request and at that time the Contractor can make a formal submittal in accordance with the requirements in Section 013300.
- H. Substitutions may be considered when a product becomes unavailable through no fault of the Contractor.

PART 3 - EXECUTION

3.01 NOT USED

3.02 THIS SPACE LEFT INTENTIONALLY BLANK.

REQUEST FOR SUBSTITUTION FORM

PROJECT:	SUBSTITUTION REQUEST NUMBER:	
CONTRACT OR:		
ADDRES S:		
TO:	DATE:	
H2M PROJECT NUMBER:	OWNE R:	
CONTRACT NAME:	CONTRACT NO.	
SPECIFICATION TITLE:		
SECTION:	PAGE:	ARTICLE/PARAGR APH:
DRAWING NO(S):		
PROPOSED SUBSTITUTION:		
MANUFACTUR ER:	ADDRES S:	
TRADE NAME:	PHONE #: ()	
INSTALLE R:	ADDRES S:	
PHONE #:		

3.03 HISTORY: ☐ NEW PRODUCT ☐ 2-5 YEARS OLD ☐ 5-10 YEARS OLD ☐ MORE THAN 10 YEARS OLD

3.04 DIFFERENCES BETWEEN PROPOSED SUBSTITUTION AND SPECIFIED PRODUCT:

3.05 ☐ POINT-BY-POINT COMPARATIVE DATA ATTACHED

3.06 REASON FOR NOT PROVIDING SPECIFIED ITEM (ATTACH SEPARATE SHEET IF NECESSARY):

3.07 TYPICAL SIMILAR INSTALLATION:

PROJEC
T:

ENGINEER/ARCHIT
ECT:

ADDRES
S:

OWNER:

DATE
INSTALLED:

3.08 SUBMIT COMPLETE INSTALLATION LIST ON SEPARATE SHEETS.

3.09 PROPOSED SUBSTITUTION AFFECTS OTHER PARTS OF WORK: ☐ NO

☐ YES

3.10 EXPLAIN:

3.11 GROSS SAVINGS TO OWNER FOR ACCEPTING SUBSTITUTION: \$ _____

3.12 PROPOSED SUBSTITUTION CHANGES CONTRACT TIME: ☐ NO ☐ YES

3.13 ADD / DEDUCT (CIRCLE): _____ DAYS

3.14 SUPPORTING DATA ATTACHED FOR EVALUATION OF THE PROPOSED SUBSTITUTION:

3.15 ☐ PRODUCT DATA ☐ PHOTOS ☐ DRAWINGS ☐ TESTS ☐ REPORTS
☐ SAMPLES

3.16 ☐ OTHER
(EXPLAIN): _____

3.17 ATTACHED DATA INCLUDES DESCRIPTION, SPECIFICATIONS, DRAWINGS, PHOTOGRAPHS, PERFORMANCE AND TEST DATA ADEQUATE FOR EVALUATION OF REQUEST; APPLICABLE PORTIONS OF DATA ARE CLEARLY IDENTIFIED.

3.18 ATTACHED DATA ALSO INCLUDES A DESCRIPTION OF CHANGES TO CONTRACT DOCUMENTS THAT PROPOSED SUBSTITUTION WILL REQUIRE FOR ITS PROPER INSTALLATION.

3.19 THE UNDERSIGNED CERTIFIES THAT THE FOLLOWING PARAGRAPHS, UNLESS MODIFIED BY ATTACHMENTS, ARE CORRECT:

- A. Proposed Substitution has been fully checked and coordinated with Contract Documents.
- B. Proposed Substitution does not affect dimensions shown on Drawings.
- C. The undersigned will pay for changes to building design, including Architectural and Engineering design, detailing, and construction costs caused by requested Substitution.
- D. Proposed Substitution will have no adverse affect on the construction schedule, or specified warranty requirements.
- E. Maintenance and service parts will be locally available for proposed substitution.
- F. The undersigned further states that the function, appearance, and quality of proposed Substitution are equivalent or superior to specified item.

3.20 THIS REQUEST FOR PRODUCT SUBSTITUTION ALSO CONSTITUTES A REPRESENTATION THAT I, AS THE CONTRACTOR:

- A. Has investigated proposed Product and determined that it meets or exceeds the quality level of the specified Product.
- B. Shall provide the same warranty for the Substitution as for the specified Product.

- C. Shall coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.
- D. Waives claims for additional costs or time extension that may subsequently become apparent.
- E. Shall reimburse the Owner and the Engineer/Architect for review or redesign services associated with re-approval by authorities.
- F. Shall reimburse the Owner for all additional engineering/architectural services claimed by the Engineer/Architect for extra services associated with the review of the Contractor's substituted item since it could not have been originally included in the Engineer/Architect's professional services agreement. Reimbursement shall be based on the man-hours expended, at current billing rates.

CONTRACTOR'S AUTHORIZED
REPRESENTATIVE (TYPEWRITTEN):

AUTHORIZED
SIGNATURE:

DATE:

END OF SECTION 012500

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Schedule of Values

1.02 SCHEDULE OF VALUES

- A. Submit for approval prior to the start of the work a Schedule of Values that indicates a breakdown of the labor, materials and equipment and other costs used in the preparation of the bid. This schedule shall be in sufficient detail to indicate separate figures for such items as excavation, concrete, equipment and all other items making up the lump sum price. The cost breakdown shall be separately itemized for each lump sum bid item in the project.
- B. Where the cost breakdown includes items for bond payment, insurance payment, job set-up, or job mobilization, these items will be paid based on paid invoices and copies of cancelled checks.
- C. Submit a Schedule of Values to the Engineer/Architect for review and approval within thirty (60) calendar days from the date shown on the Notice to Proceed.

1.03 FORM OF SUBMITTAL

- A. Submit typewritten Contract Cost Breakdown on AIA Form G703 - Application and Certificate for Payment Continuation Sheet or EJCDC 1910-8-E. The Engineer reserves the right to revise the form or provide a form prepared by the Engineer.
- B. Use the Table of Contents of the Contract Specifications as a basis for format for listing costs of work for Sections under Divisions 1-16 as sections apply to work. Not all Sections need be assigned a breakout price as determined by the Engineer/Architect.
- C. Identify each line item with number and title as listed in Table of Contents.
- D. Provide dollar values for each line item for labor, overhead, profit, material, and equipment components for each category of work if requested by the Engineer.
- E. List quantities of materials specified under unit price allowances.
- F. The Schedule of Values, after approval by the Engineer/Architect, shall be the basis for the Contractor's Application for Payment.
- G. The first Application for Payment will not be reviewed prior to an approved breakdown.

1.04 PREPARATION OF SCHEDULE OF VALUES

- A. In addition to the above, provide a separate line item cost for each of the following items which shall be supported by proof where specified below:
 - 1. Performance and payment bonds. (Submit proof of this amount.)
 - 2. Insurance. (Submit proof of this amount.)
 - 3. Mobilization and Demobilization (Amounts shall be equal in value).
 - 4. Temporary facilities and measures as specified in Section 015000.
 - 5. Project Coordination Meetings as specified in Section 013100.
 - 6. Preparation of the Project Construction Schedule, and updates, as specified in Section 013300.
 - 7. Preparation of Weekly Schedules as specified in Section 013100

8. Rubbish removal and daily cleaning up.
 9. Construction photographs as specified in Section 013233. (Submit proof of this amount.)
 10. All Cash Allowance items as contained in Section 012100.
 11. On-site, full time superintendent starting on the date of the Notice To Proceed and ending on the date that all punch list items are completed, which for the purposes of the Schedule of Values, shall be the contract completion date.
 12. Exploratory digging as specified in Section 312333.
 13. Underground utility mapping services as specified in Section 312333.
 14. Engineer's Office Equipment. (Submit proof of this amount.)
 15. Surveyor used for layout. (Submit proof of this amount.)
 16. Record Drawing retainage amount specified in Section 017839.
 17. Final cleaning.
- B. Show total costs including overhead and profit.
- C. Provide additional details and data to substantiate the cost breakdown as requested by the Engineer.

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 NOT USED

END OF SECTION 012973

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Work of this Section includes:
 - 1. Requests for Interpretation or for information
 - 2. Coordination between contractors, if applicable
 - 3. Administration of subcontracts
 - 4. Coordination of work with other Contractors, utility companies, and the Owner/Engineer
 - 5. Communication and coordination requirements
 - 6. Qualifications of Contractor's job site superintendent
- B. Site staffing requirements for the Contractor's superintendent are also specified herein, the costs for which shall be included in the Contract price.

1.02 REQUEST FOR INTERPRETATION OR INFORMATION

- A. The Contractor shall use the Request for Interpretation/Information Form included within this Section when the Contractor feels that additional information is needed to perform the work of the Contract.
- B. The Engineer/Architect may not respond to any requests unless the form is used.
- C. The Engineer/Architect's verbal response(s) to the Contractor's formal requests, if provided, shall not constitute an official response and if acted upon by the Contractor are done so at the Contractor's own risk and liability and shall not be subject to claims for additional compensation.
- D. A signed email of the form will be accepted. The original of the form must be signed and provided to the Engineer/Architect's project manager.
- E. The Engineer/Architect will respond in writing to the request as soon as possible.

1.03 COORDINATION BETWEEN CONTRACTORS

- A. During the progress of the Work, other Contractors may be engaged in performing other work or may be awarded other contracts for other work on this Project. Each Contractor shall coordinate all the work to be done with the work of each Contractor(s) through the Owner.
- B. Each Contractor shall fully cooperate with each other Contractor(s) and carefully fit its own work to that provided under other contracts as shown or specified in the Contract Documents and as may be coordinated by the Owner/Engineer/Architect.
- C. Each Contractor shall not commit or permit any act that will interfere with the timely performance of work by any other Contractor.
- D. The Contractor shall conduct his/her own operations, and to cooperate with such other parties, so as to cause as little interference as possible with the work by others.
- E. The Contractor agrees to make no claim against the Owner/Engineer/Architect for additional payment due to delays or other conditions created by the operation of others.
- F. If there is a difference of opinion as to the respective project rights of each Contractor doing the work, within the limits of or adjacent to the Project, the Owner/Engineer/Architect shall decide as to the respective rights of the various parties involved in order to secure completion of the

work in a satisfactory manner. The Owner/Engineer/Architect's decision shall be final and binding on each Contractor.

- G. If any portion of the work of the Contractor, or any of his/her subcontractors, depends upon the proper execution of the work by others, the Contractor shall promptly give written notice to the Engineer/Architect of all purported defects in the installed work as renders it unsuitable for proper execution and completion of his own work. The Contractor shall further notify the Engineer/Architect of all supposed delays, in the performance of his/her work, as will affect the timely performance of his own work or the project.
- H. The Contractor's lack of notice shall constitute an acceptance by him/her that the work of others is fit and proper for the reception of the Contractor's own work, except as to defects developing in the work that could not have been reasonably foreseen.
- I. The Contractor's lack of notice shall also constitute an acceptance by him/her and an acknowledgement of the timely performance of work by other Contractors or the Owner and that no claims for additional compensation may result.
- J. If the Owner/Engineer/Architect determines that the Contractor is failing to coordinate his own work with the work of others, then the Owner shall have the right to enforce the provisions of the Contract as related to non-performance.
- K. The Owner/Engineer/Architect shall not be liable for any damages suffered by this Contractor by reason of any other Contractor's failure to comply with the directions so issued by the Owner/Engineer/Architect, or by reason of another Contractor's default in performance; it being understood that the Owner does not guarantee the continued efficiency or work production of any Contractor and by execution of the Contract, the Contractor fully understood the potential coordination problems associated with projects involving multiple prime construction contracts.
- L. The Contractor's attention is specifically directed to the fact that he may not have exclusive occupancy of the work area within the limits of the Contract. Each Contractor shall afford the Owner, other Contractors, and utilities reasonable opportunity for the storage of their materials and equipment, and the execution of their work, and shall connect and coordinate his work with theirs as required by the Contract Documents.

1.04 SUBCONTRACTOR ADMINISTRATION AND COORDINATION

- A. Terms and conditions of the Contract shall be binding upon each subcontractor.
- B. Furnish each subcontractor and major equipment vendor at least one (1) copy of the Plans and Technical Specifications.
- C. Provide at least one (1) copy of each approved shop drawing to each subcontractor whose work may depend upon the contents of the shop drawing submittal. The Owner reserves the right to stop all work, without claims for delay, until such time as appropriate subcontractors are furnished with appropriate shop drawings.
- D. Each Contractor shall sequence and schedule the work of subcontractors. Coordinate construction and administration activities of subcontractors. The Engineer and Owner will not accept telephone calls, facsimiles or office visits from any subcontractors on the project. Subcontractor and vendor questions and clarifications shall be directed to the Engineer by the Contractor.
- E. The Contractor's on-site project superintendent shall inspect all the work of all of his/her subcontractors, as it is being constructed. The Contractor's subcontractor shall not be

permitted to do any work on the site without the Contractor's job site superintendent also being there to inspect the work as it is being performed.

1.05 UTILITY COORDINATION

- A. Comply with the requirements of 16 NYCRR Part 753 – Protection of Underground Facilities. Submit a letter stating the case number.
- B. Comply with the utility coordination requirements contained in the General Conditions.

1.06 PUBLIC/PRIVATE UTILITIES

- A. Notify all public and private utilities in accordance with Article 20, Section 322-a of the New York State General Business Law for location and markout of existing utilities in the vicinity of the work.
- B. Repair all utilities damaged during the Work to the standards and approval of the respective utility at no cost to the Owner.

1.07 SPECIFIC COORDINATION REQUIREMENTS

- A. The Contractor shall sequence and schedule work so as not to interfere with the work by others and to afford each Contractor the time to complete their contractual obligations with the Owner. Coordinate the work of this Contract with the work by others. Coordination includes, but is not limited to, the following:
 - 1. Schedule work with all trades throughout the project to prevent interference.
 - 2. Accomplish work in coordination with the other Contractors in a manner that will allow each Contractor adequate time (at the proper stage of construction as determined by the Owner/Engineer/Architect) to perform and complete the work of their contract.
 - 3. The Contractor shall annotate on each of his own shop drawings and submittals, information that is relevant to the work of others or where potential conflicts in the installed work may occur. The Contractor shall "bubble the area of potential conflict so as to alert the reviewer.
 - 4. Each prime Contractor shall provide the Engineer/Architect with a list of shop drawings that they may require to properly coordinate the work. If a list is not provided to the Engineer within fifteen (15) calendar days from the date of the Notice to Proceed, then it shall be taken that shop drawings of other prime Contractors are not required. Each prime Contractor shall be responsible for providing the list within the time specified.
 - 5. In case of conflicts due to improper coordination by any Contractor, the Owner/Engineer/Architect's resolution will be final. No compensation will be awarded for extra work required to resolve conflicts or to coordinate the work of all contracts.
 - 6. Coordinate space requirements, supports, and installation of mechanical, electrical and plumbing work which may be indicated diagrammatically on the Drawings. Follow routing shown for pipes, ducts, and conduit as closely as practicable. Place runs parallel with building lines. Utilize spaces efficiently to maximize accessibility for other installations, maintenance, and to facilitate repairs.
 - 7. In finished areas, except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of all fixtures and outlets with finish elements and work by all other trades.
- B. Shop Drawings and Submittals Coordination Procedure:
 - 1. The Engineer/Architect will forward copies of relevant shop drawings to all prime Contractors, whose work may be subject to that of others, as solely determined by the Engineer.

2. The Contractor shall then, within five (5) calendar days of receipt, review said shop drawings provided by the Engineer/Architect for the purposes of resolving field and fabrication problems and as a way to coordinate the work.
 3. Immediately notify the Engineer/Architect should a purported conflict in the work be discovered so that the Engineer/Architect can investigate and take appropriate action.
 4. If a shop drawing was so provided by the Engineer/Architect and a conflict in the work was not brought to the attention of the Engineer/Architect, then the conflict shall be immediately corrected by the Contractor submitting the shop drawing.
- C. Each Contractor shall also coordinate the work by complying with the following:
1. Construction Schedule: Each Contractor shall provide a construction schedule as specified in Section 013216 - Construction Schedule.
 2. Weekly Schedule: By 3:00 PM of each Friday during the construction period, each Contractor shall fax or email a typed memo addressed to the Engineer/Architect/Owner's resident field engineer/inspector and designated office project manager summarizing the work for the following two weeks. The memo shall also be faxed or emailed to each Prime Contractor's home office and the Owner. The memo shall briefly itemize the planned activities for the coming weeks. The memo shall also include a summary of expected material/equipment deliveries, concrete pours, utility tie-ins, excavated material removals and other heavy construction traffic that may impact the work activities for the coming week.
 3. Email Account: Each Contractor shall maintain an email account that shall be used to improve communication. An email shall not constitute a formal advisement regarding the terms and conditions of the contract. Email shall only be considered an informal way of notifying relevant parties of project related activities.
 4. Email List: Each Contractor, within five (5) calendar days from the Notice To Proceed, provide a list of email addresses for each major equipment supplier and local representative, if such exists. A contact person shall be provided for each email address.
 5. W/MBE Utilization Plans: All Contractors shall provide a W/MBE Utilization Plan in accordance with the requirements contained in other portions of the Contract Documents, but in no case more than thirty (30) calendar days from the date of the Notice To Proceed.
 6. Work Plan: All Contractors shall within fifteen (15) calendar days from the date of the Notice to Proceed, submit to the Engineer a type written work plan in bullet format of the sequence of construction activities from start to finish of construction. A facsimile will not be accepted. All work plans shall include a description of the different major phases of construction as pertaining to the individual construction contract. As a minimum each work plan shall include the tasks and subtasks specified in Section 013216 for the project schedule.
 - a. Each Prime Contractor's work plan shall be complete and shall address every phase of the scope of the Contract.
 - b. The Engineer/Architect will forward all work plans to all other Prime Contractors.
 - c. Each Prime Contractor shall then prepare a construction schedule as specified below using the work plans prepared by others and his/her own.
 7. Equipment and Startup Schedule: All Contractors shall also submit a preliminary equipment delivery schedule and a preliminary startup schedule for all equipment and systems being furnished under the Contract. This schedule shall be submitted within 30 calendar days from the date of the Notice To Proceed.
 - a. Include an early and late date for each item.
 - b. Indicate the time necessary to physically install and ready each item so that other work can be completed by other Prime Contractors.
 - c. The Engineer/Architect may waive this schedule if the Contractor has adequately shown the information on the construction schedule, in the opinion of the Engineer/Architect.

- D. Project Coordination Meetings: All Contractors shall participate in and attend the Project Coordination Meetings as specified below:
1. Up to five (5) project coordination meetings will be held at the Engineer/Architect's or Owner's office as specified herein and in Section 013216.
 2. The meetings will be held when so called for by the Engineer/Architect.
 3. Each meeting may last up to eight (8) hours with one hour for lunch.
 4. The Engineer/Architect will prepare the final agreed version of the schedule and distribute it to all Contractors.
 5. The Engineer/Architect reserves the right not to hold these meetings if in his/her opinion they are not needed.
 6. All Prime Contractors shall be required to attend the meetings.
 7. The time associated with attendance at the meetings shall be included in the lump sum bid and be subject to a credit of \$150 per hour for each unused hour that the Contractor does not attend.

1.08 CONTRACTOR'S JOB SITE SUPERINTENDENT

- A. Each Contractor shall employ an on-site superintendent as specified herein below. He/She shall be a full-time employee of the Contractor.
- B. Each Contractor shall name the job site superintendent within five (5) days of the Notice To Proceed. A letter to the Engineer/Architect shall be provided.
- C. He/She shall have the authority to sequence and schedule the work, and to staff the project, so as not to interfere with the work by others and to complete the work daily within the time so required.
- D. Each Superintendent shall have a minimum of five (5) years of experience as a job site superintendent for projects of equal size and complexity.
- E. Contract G superintendent shall not be a foreman or crew supervisor and shall be qualified and experienced person who shall act to schedule and sequence the work on a daily basis.
- F. Contract E superintendent may be a foreman or crew supervisor.
- G. Contract P superintendent shall not be a foreman or crew supervisor and shall be qualified and experienced person who shall act to schedule and sequence the work on a daily basis.
- H. Each superintendent shall be qualified to perform the duties so required to successfully complete the work in accordance with the Contract Documents.
- I. The superintendent for Contract G, E & P shall be on the site for each work day, full time, starting within twenty one (21) calendar days from the date of the Notice To Proceed through the date of Final Completion, including all punch list items.
- J. All other construction superintendents shall be on the project site while work under his/her contract is being performed, either by direct forces or by subcontractors as stipulated above for subcontractor coordination.
- K. Each superintendent shall also visit the site daily when work is not being performed under their Contract for coordination purposes, through the Owner/Engineer. He/She shall remain on the site for a minimum of one (1) hour, if work is being performed by others. He shall telephone the Engineer/Architect's designated field representative to advise him/her that they are on the site to discuss matters related to coordination.

- L. Each superintendent shall speak English. If required by the Engineer/Architect, provide a resume for the proposed superintendent that shall be typed and shall list the qualifications of the superintendent. Prior to the Contractor assigning a superintendent to the project, he may wish to arrange an interview with the Engineer/Architect to determine the proposed superintendent's ability to properly coordinate the work through the Owner/Engineer. The Contractor shall employ a superintendent acceptable to the Owner.

1.09 THIS SPACE LEFT INTENTIONALLY BLANK.

RFI COVER SHEET

CONTRACT: _____ DATE: _____

CONTRACT No: _____ CONTRACTOR: _____

REQUEST FOR INFORMATION Page **of****RFI-****PROBLEM DESCRIPTION:**ACTION: Field Order ☐Change Order ☐Clarify Only ☐**SPECIFICATION / DRAWING REFERENCE**INITIATED BY: _____
DATE REQUIRED BY: _____CM/RE
APPROVAL: _____ Date: _____
(SIGNATURE)**PROBLEM SOLUTION:****ANSWERED**BY: _____
(Signature) (DATE)RE ☐ or PM ☐APPROVAL: _____
(SIGNATURE) (DATE)

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Work of this Section includes the requirements for progress meetings.

1.02 PRE-CONSTRUCTION CONFERENCE

- A. The Contractor is required to attend the pre-construction conference at a location, date, and time selected by the Owner.
- B. The owner, a partner, or a corporate officer representing the Contractor shall attend the conference. The job site superintendent and office project manager for the Contractor shall also attend.
- C. The Engineer will prepare an agenda for the conference.

1.03 PROGRESS MEETINGS

- A. Progress meetings will be held approximately once every two (2) weeks during the project. The Owner may elect to hold meetings more or less frequently.
- B. At least seven (7) calendar days advance notice will be given by the Engineer or the date for the next upcoming meeting will be set during an on-going progress meeting.
- C. Attendance at progress meetings shall be mandatory for the Contractor. An amount of \$1,000 shall be deducted from the Contract Amount for each announced meeting not attended by the Contractor.
- D. The Contractor shall be represented at each announced progress meeting by either an owner, partner, or corporate officer representing the Contractor. The job site superintendent and office project manager for the Contractor shall also attend.
- E. Subcontractors shall attend when requested by the Owner or Engineer at no cost to the Owner.
- F. Meetings will be conducted by Engineer at a location selected by the Owner, normally at or adjacent to the project site.
- G. The minimum agenda will cover:
 - 1. Review minutes of previous meetings.
 - 2. Identify present problems and resolve them.
 - 3. Plan work progress during next work period.
 - 4. Review the status of off-site fabrication and delivery schedule.
 - 5. Review shop drawings and submittal schedules.
 - 6. Review change order status.
 - 7. Review status of construction progress schedule.
 - 8. Coordinate access requirements.
 - 9. Other business related to the work.

1.04 OTHER MEETINGS

- A. The Contractor shall attend special meetings which may be required or called for by Federal, State or Local authorities, utility companies, Owner, Engineer or any other firm, person or organization related to the project.

1.05 CONDUCTING MEETINGS

- A. General - This paragraph covers Owner and/or Engineer meetings with Contractor and/or his subcontractors. Neither Owner nor Engineer wishes to meet solely with a subcontractor and requests for such meetings will be discouraged. If a meeting is deemed necessary, every effort will be made to have Contractor attend. If, for some reason, circumstances do not allow such, the meeting may be held, minutes of the meeting will be sent to contractor and decisions on any major questions will be reserved until contractor has been consulted. Subcontractors may accompany contractor to meetings provided contractor notifies Engineer in advance.
- B. Chairman - When Engineer or Engineer and Owner attend meetings, Engineer, or his duly authorized representative, will act as chairman. Should Owner-Contractor meetings be necessary, Owner will chair such meetings.
- C. Notices - Engineer or Owner will issue notices of meetings to all parties concerned and will note, thereof, who must attend and who may attend if they so desire. When Contractor desires a formal meeting, make a request through Engineer. Except when Engineer determines that a prompt meeting is essential, all notices will be issued at least one week in advance of the meeting date.
- D. Agenda - All parties shall inform Engineer of items desired to be discussed and Engineer will notify all parties of all items to be considered. This is to allow each party to fully prepare for the meeting. This shall not be construed to mean that other items cannot be brought up at the meetings.
- E. Time Limits - It is the intent to hold productive and efficient meetings and to keep them as short as is reasonably possible. The Chairman will be the sole judge as to whether or not further discussion on any matter is warranted and all discussions shall cease when he so orders.
- F. Minutes - Minutes of meetings will be kept, written and distributed by the Chairman or his duly authorized representative. Minutes of all meetings will be available upon request to the Chairman.
- G. Conduct - It is the intent to conduct all meetings in an orderly manner, to reasonably discuss all items and to hear and observe the rights and opinions of all parties. The Chairman will allow each party to speak; however, he reserves the right to order any individual to leave the meeting at any time for any reason.

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 NOT USED

END OF SECTION 013119

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. This Section specifies the requirements for preparing construction schedules and for keeping them up to date.
- B. All schedules shall be submitted in accordance with the requirements contained herein in Section 013300.
- C. Refer to Section 013100 regarding the requirements for attendance at Project Coordination Meetings and additional requirements concerning the submission of other project coordination and sequencing information.

1.02 SCHEDULE PREPARATION MILESTONE DATES & REQUIREMENTS

- A. Each Contractor shall prepare Draft #1 Construction Schedule for presentation and discussion during Project Coordination Meeting No. 1.
 - 1. The Engineer/Architect will provide at least seven (7) calendar days written notice regarding the date of the first meeting.
 - 2. At the Engineer/Architect's discretion, Project Coordination Meeting No. 1 may immediately take place on the same date and directly following the Pre-Construction Conference. The Notice To Proceed will contain information regarding the Pre-Construction Conference and Project Coordination Meeting No. 1 should it be so decided by the Engineer.
 - 3. Draft #1 Construction Schedule shall be prepared as specified hereinafter.
 - a. The schedule shall show all the major and subordinate tasks necessary to complete the project in the specified time and interim milestones.
 - b. It shall allow adequate time for other Prime Contractors to complete their related work as best estimated by the Contractor. It being understood that the Contractor's allotted time for others to perform their work is non-binding and does not relieve the Contractor from completing all the work in the specified contract completion time in accordance with the Contract Documents. It also being understood that this is the Contractor's realistic best estimate of the time needed for others to complete their related work.
 - c. The schedule shall also show the dependencies and time allocated for each task.
 - 4. The date, place, and time for Project Coordination Meeting No. 2 shall be established at the first meeting, but in no case be more than fourteen (14) calendar days from the date of the first meeting.
- B. As a result of the first meeting, a better understanding of each Contractor's time requirements will have been achieved. Within five (5) working days of the date of Project Coordination Meeting No. 1, each Contractor shall prepare Draft #2 Construction Schedule and submit it to the Engineer/Architect and each other Prime Contractor for review. Each Contractor shall mail his/her schedule to all parties via Overnight Mail with a Return Receipt Requested.
 - 1. Project Coordination Meeting No. 2 shall be attended by all Prime Contractors for the purpose of jointly developing a Combined Construction Schedule. The meeting shall focus on the time needed to complete each task and subordinate task and for establishing task dependencies.
 - 2. All Contractors shall deliver to the Engineer the electronic file of his/her Draft #2 Construction Schedule at the meeting. The Engineer will use the data files to prepare the Draft Combined Construction Schedule.
 - 3. The date, place, and time for Project Coordination Meeting No. 3 shall be established at the meeting.

- C. The purpose of Project Coordination Meeting No. 3 is to review the Engineer's Draft Combined Construction Schedule and to make minor adjustments as are needed.
- D. The Engineer/Architect, after the third meeting and as soon as possible, will make the agreed upon changes and provide final versions to all Prime Contractors for adoption as the Final Combined Construction Schedule.
 - 1. The final schedule shall be implemented by all Prime Contractors on a daily basis. All tasks and subordinate tasks shall be completed on schedule.
 - 2. Each Contractor shall increase resources as are needed to comply with the established milestone dates should the schedule start to lag.
- E. The Engineer/Architect's decision regarding the time allotted for a given task shall be final and each Contractor shall apply necessary resources to accomplish the work. Submission of a bid shall be intended to mean that the Contractor agrees that the determination is binding.

1.03 PRIME CONTRACTOR(S) SCHEDULE TYPES

- A. The General Contractor shall prepare a Gantt Chart type schedule as specified hereinafter.
- B. Contractor P shall prepare a Gantt Chart type schedule as specified hereinafter.
- C. Contractor E shall prepare a Gantt Chart type schedule as specified hereinafter.

1.04 CONSTRUCTION SCHEDULE - GENERAL

- A. Coordinate the work and maintain the construction schedule. In the event actual progress begins to lag the schedule, promptly employ additional means and methods of construction to make up the lost time.
- B. Keep the construction schedule current and revise and resubmit as often as necessary to accurately reflect the conditions of the work, past progress and anticipated future progress.
- C. Each construction schedule shall be properly coordinated with all Contracts, completed, submitted, and deemed received by the Engineer prior to the first payment application.
- D. The schedule, when approved by the Engineer/Architect and the Owner, shall establish the dates for starting and completing work for the various portions of the Contract. It shall be the duty of the Contractor to conform to his/her own schedule and to perform the work within the time limits indicated. Failure to adhere to the approved schedule shall expose the Contractor to disputes, claims and additional costs incurred by others.
- E. Coordinate letting of subcontracts, material purchases, shop drawing submissions, delivery of materials, and sequence of operations, to conform to the schedule.
- F. Coordinate the construction schedule with the proposed schedules of the equipment suppliers and subcontractors.
- G. The schedule shall be plotted out in color and shall be 36-inch by 40-inch. It shall contain as many sheets as are necessary to show all rolled down tasks. Partially printed schedules will not be accepted. Each Contractor shall arrange to have it plotted on a color plotter suitable for the intended application.
- H. Prepare the schedule in a manner so that the actual progress of the work can be recorded and compared with the expected progress.
- I. The schedule shall use the following convention:

1. Tasks for the General Contractor in blue ink.
 2. Task links/task dependency in blue ink.
 3. Tasks for the Plumbing Contractor in green ink.
 4. Tasks for the Electrical Contractor in red ink.
 5. Tasks for the HVAC Contractor in black ink.
 6. Milestone dates (zero duration) by a red diamond.
 7. The end date for each task and subtask at the end of a bar.
 8. The description of all major tasks within the bar. The bar shall be red.
 9. Critical path.
- J. The construction schedule shall also show the following:
1. Critical sequence items where new units must come on-line before existing facilities go off-line, if applicable to the project.
 2. Engineer's construction office set up, as specified.
 3. Computer delivery, if so specified elsewhere.
 4. Telephone service and high speed internet cable installation.
 5. Lead time for control panels that are packaged as systems.

1.05 CONSTRUCTION SCHEDULE - GANTT CHART TYPE

- A. The schedule shall show, in detail, the proposed sequence of the work and the estimated date of starting and completing each stage of the work in order to complete the project within the contract time.
- B. Prepare the schedule in a manner so that the actual progress of the work can be recorded and compared with the expected progress.
- C. Coordinate the construction schedule with the proposed schedules of the equipment suppliers and subcontractors.
- D. The schedule shall be plotted out in color and shall be 36-inch by 40-inch. It shall contain as many sheets as are necessary to show all rolled down tasks. Partially printed schedules will not be accepted. Each Contractor shall arrange to have it plotted on a color plotter suitable for the intended application.

1.06 REVISION OF PROJECT PROGRESS SCHEDULE

- A. Each Prime Contractor shall evaluate, coordinate with other Contractors, and provide updated construction schedules monthly in accordance with job requirements. Each update shall be submitted to the Engineer/Architect for information purposes and be provided by the last Friday of every month.
- B. Each Contractor shall modify his construction schedule to accommodate coordination of the construction contracts by the Owner/Engineer/Architect without claims for additional compensation or delay.
- C. The Engineer will provide an electronic version of the Final Combined Construction Schedule for use in keeping the schedule up to date.
- D. From time to time, and at stages deemed appropriate by the Engineer/Architect, the Engineer/Architect may issue updated schedules to reflect the project's status. The percent complete for each task may be shown, as determined by the Engineer/Architect.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 013216

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Project record documents shall be prepared as specified herein.

1.02 QUALITY ASSURANCE

- A. The Contractor shall employ a land surveyor licensed in the State where the project is located. The surveyor shall be acceptable to the Engineer in terms of experience and qualifications.
 - 1. Submit evidence of the surveyor's errors and omissions (professional liability) insurance coverage in the form of an insurance certificate.
 - 2. The surveyor shall maintain a minimum coverage of \$1,000,000 for professional liability.
 - 3. The Owner, Engineer, and Contractor shall be named as insurance certificate holders.
 - 4. A thirty-day cancellation notice shall be provided.
 - 5. Physical work shall not be performed until the certificate is provided and approved by the Owner.
- B. All instruments used on the project shall be of professional quality and in first class condition.
 - 1. All instruments shall have been calibrated by a manufacturer's service station within the last month from the date of first use on the job site.
 - 2. Submit certificate of calibration or paid invoice showing that the unit has been calibrated, if so required by the Engineer/Architect.

1.03 SUBMITTALS FOR REVIEW

- A. Submit name, address, and telephone number of Surveyor before starting survey work.
- B. Surveyor's professional liability insurance certificate.
- C. On request, submit documentation verifying accuracy of survey work.
- D. Submit a copy of the site drawing signed by the land surveyor showing locations of other benchmarks set by the surveyor, baseline location and offset hubs. If requested, the Engineer will provide a reproducible drawing or a drawing in digital format for use by the surveyor.

1.04 PROJECT RECORD DOCUMENTS

- A. Maintain a complete and accurate log of control and survey work as the project progresses.
- B. Submit record documents under the provisions of Section 017839.

1.05 EXAMINATION

- A. Verify locations of survey control points prior to starting work.
- B. Promptly notify Engineer/Architect of any discrepancies discovered.

1.06 SURVEY REFERENCE POINTS

- A. The Contractor's surveyor shall locate and protect survey control and reference points located throughout the project site.
- B. Control datum for survey is that indicated on the Drawings or will be provided by the Engineer.

- C. The Contractor shall protect survey control points prior to starting any site work. Preserve permanent reference points during construction.
- D. Promptly report to the Engineer/Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
 - 1. The surveyor shall replace dislocated survey control points based on original survey control when directed by the Engineer/Architect.
 - 2. Make no changes without prior written notice to Engineer/Architect.
- E. The surveyor shall set control lath for rough and final grading purposes. Lath shall be placed at sufficient intervals to control grade or as directed by the Engineer/Architect.
- F. All new structures, pits, chambers, drainage pools, curbs, roads, swales, and other physical elements shall be located by survey control.
- G. Underground pipelines need not be located using survey control but shall be located using standard survey equipment operated by persons experienced in their operation.

1.07 SURVEY REQUIREMENTS

- A. The Engineer/Architect will provide one (1) benchmark.
- B. The Contractor shall, with his own forces, obtain working or construction lines or grades as needed subject to the check of the surveyor. The surveyor shall set offsets.
- C. Establish elevations, lines, offsets and levels. Locate and lay out by instrumentation and similar appropriate means:
 - 1. Site improvements including pavements, stakes for grading, curbs, fill and topsoil placement, utility locations, slopes and invert elevations.
 - 2. Grid or axis for structures.
 - 3. Building foundation, column locations, ground floor elevations, and equipment foundations.
- D. Provide tie distances on record drawings to all underground structures, valves, pipes, and utilities installed as work of this Contract.
- E. General Contractor's surveyor shall locate all proposed new structures to be constructed or installed for all of the project contracts (Contract E & P) as required by each Prime Contractor.

1.08 AS-BUILT DOCUMENTATION

- A. As-built survey drawings shall be prepared by the Surveyor upon the completion of construction on the project. As-Built surveys shall be provided by the Surveyor upon request by the Engineer. The following data shall be secured by the Surveyor from physical surveys of the completed construction.
 - 1. The locations and elevations of all structures, utilities, roadway pavements, curbs, and fence line.
- B. The Contractor shall provide the Owner a final survey prepared by a licensed surveyor: in AutoCad format (AutoCad 14 or higher) on CD, project in NAD 83 State Plane New York East FIPS 3101 Feet, and in PDF format, and scaled to print on 24" x 36" plan sheets with scales matching those used on the project plans.

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 NOT USED

END OF SECTION 013223

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Pre and post-construction photography.

1.02 PHOTOGRAPHY

- A. Preconstruction Photographs: Provide photographs, taken within the limits of the work, to document existing conditions. Engineer/Architect will designate the date and location of the exposures that will generally be taken just prior to the construction operations. The minimum number of photographs required shall be sixty-four (64). Two (2) duplicate sets of all photos in JPEG format on CD or electronic media shall be provided.
- B. Progress Photographs: The Engineer/Architect will take progress photographs for the Owner's record. The Contractor shall secure his/her own progress photographs.
- C. Final Photographs: Provide post-construction photographs, taken within the limits of the work, to document the final project and the conditions at final payment and issuance of the Final Certificate. The Final Payment will not be processed until such time as the photographs are provided. Engineer/Architect will designate the date and location of the exposures that will be taken. The minimum number of photographs required shall be sixty-four (64). Two (2) duplicate sets of all photos in JPEG format on CD or electronic media shall be provided.
- D. Annotate the following on the back side of each print:
 - 1. Project name and number.
 - 2. Photographer's identification, address, and telephone number.
 - 3. Date and time picture was taken.
 - 4. Location of picture relative to a specific location on the site, (for example, "10 ft. southeast of Operations Building").
 - 5. Direction in which camera was aimed.

1.03 PRINTS

- A. Paper Surface (Color): Smooth, glossy.
- B. Contrast (Color): High.
- C. Size for photographs: 4-inch x 6-inch.
- D. Commercially purchased album pages suitable for a 3 ring binder shall protect the prints. Deliver to the Engineer/Architect prints placed in the protector page. One (1) print per slot. Do not cover the annotations on the backside of the photograph.
- E. Panoramic photographs shall be taken at appropriate locations.
- F. Bind each set of photographs in a large capacity binder with plastic cover front and back as manufactured by National or equal. Each binder shall be sequentially numbered and show the name of the project on the binder and front cover using white on black ½ inch laminated lettering tape by Brother or equal. Provide an index with each set of photographs in a form acceptable to the Owner.

1.04 ELECTRONIC FILES

- A. Deliver electronic files to Engineer/Architect with prints. Provide typed table of contents for each set of prints for each submission.
- B. Minimum 5 mega pixel resolution, JPEG format.
- C. Landscape from position.
- D. JPEG files shall be turned over to the Owner with all rights for use and reproduction of the files for the Owner's own use.

1.05 TECHNIQUE

- A. Provide factual presentation. Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.

1.06 SUBMITTALS

- A. Deliver prints within seven (7) working days after exposure with transmittal letter in accordance with the requirements of Section 013300.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 013233

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. This Section specifies the requirements for making submissions for the project. Electronic submissions will be required unless expressly noted otherwise.
- B. Refer to Section 013216 - Construction Schedule for the requirements concerning the submission of construction schedules and for making updates thereto.

1.02 IDENTIFICATION OF SUBMITTALS

- A. Each and every submission shall be provided by the Contractor and shall be accompanied by a SUBMISSION TRANSMITTAL FORM. The Contractor shall use the specimen form made a part of this Section. *Submittals not containing the form will be returned to the Contractor un-reviewed.* The Architect/Engineer will not review project submissions until such time as the form is completed in its entirety. Identify each submittal and resubmittal using the form.
- B. Each individual submittal shall be identified with a 'submission log number' as specified here in this example: 033000.01-1
 - 1. The Section number for which the submittal applies, followed by a period, shall be indicated, "033000."
 - 2. The submittal within the Section shall be indicated by the next grouping "01". For instance and in this example, the concrete design mix may be submission "01", the waterstop catalog cut may be "02", and so on. Submittals shall be sequentially numbered within the Specification Section, i.e. 01, 02, etc.
 - 3. The number of times the submission was made shall be preceded by a dash and a numerical suffix as follows: "-1". In this example, the concrete design mix is being submitted for the first time. Use the number "1" for the first time it is being submitted.
 - 4. Subsequent submissions of the concrete design mix shall utilize the original number and a sequential numeric suffix, i.e. "2" for a resubmission, "3" for the second resubmission, and so on. Substitute the new number for the original "1".
- C. Where a layout drawing, containing different elements of the project, is being submitted and there is a question as to what the log number might be, then the Contractor shall contact the Architect/Engineer so that an agreed upon log number can be assigned.
- D. It is incumbent on the Contractor to initially assign the submission log number designation to each submission. Submissions not containing a log number, as specified above, will be returned to the Contractor un-reviewed by the Architect/Engineer.
- E. Every submittal shall also be accompanied by a Transmittal Letter (or "Speed Form") addressed to the Architect/Engineer's Project Manager as hereinafter defined.

1.03 COORDINATION OF SUBMITTALS

- A. Prior to submitting to the Architect/Engineer, fully coordinate all interrelated work. As a minimum, do the following:
 - 1. Determine and verify all field dimensions and conditions by field measuring existing conditions and the installed work of this Contract and work by others.
 - 2. Coordinate with all trades, subcontractors, vendors, system and equipment suppliers and manufacturers, public agencies, and utility companies and secure all necessary approvals, in writing.

- B. Make submittals in groups containing all associated items that in some way depend upon each other.
 - 1. This also applies to color charts, as one color may not be able to be selected without the selection of other colors so as to form a color-coordinated group.
 - 2. The Architect/Engineer may elect not to review partial or incomplete submissions, whereupon he will notify the Contractor of the additional submissions that are required before a review can be made.

1.04 TIMING OF SUBMITTALS

- A. Make submittals far enough in advance of scheduled dates of installation to provide time for reviews, for securing necessary approvals, for possible revisions and re-submittals, and for placing orders and securing delivery. The Architect/Engineer will review submittals in a manner as expedient as possible, and will generally send a written response to the Contractor within seven (7) calendar days of receipt of submittals.
- B. Submissions may be returned reviewed, unreviewed, rejected, returned conditioned upon submission of related items, or for other reasons set forth in the Contract Documents.
- C. Make submissions well in advance as the returning, rejecting or disapproval of submissions or other similar circumstances are possible and are deemed "avoidable delays". Costs for these delays or those attributed to Contractor's tardiness in making submittals shall be borne by the Contractor.
- D. **All** submittals requiring Architect/Engineer's review (except operations manuals) as required under the technical specifications of these documents shall be submitted within **FORTY FIVE (45)** consecutive calendar days after the date of the Notice to Proceed. An amount of **\$250** per calendar day shall be deducted from payment due the Contractor for **each** day that an outstanding submittal exists, said amount being the cost associated with the Architect/Engineer's review.
- E. Operation and maintenance manuals shall be submitted at least **FORTY FIVE (45)** consecutive calendar days prior to scheduled startup of the unit or system.
- F. If material or equipment is installed before it has been deemed to be in general compliance with the Contract Documents, as determined by the Architect/Engineer, the Contractor shall be liable for its removal and replacement at no extra charge and without an increase in contract time.

1.05 DESTINATION OF SUBMITTALS

- A. Each submission of documents shall be accompanied by a transmittal form containing the name of the project, the contract name, the Architect/Engineer's project manager, a submittal ID number, and a description of content for the submitted items.
- B. A copy of the TRANSMITTAL FORM shall also be provided to the Architect/Engineer's resident engineer/inspector at the job site.
- C. Electronic submittals shall be transmitted through the Newforma® Project Center website or by email, pending instruction by the Architect/Engineer. H2M architects + engineers is using a project information application called Newforma® Project Center. One of its components is Newforma Info Exchange, a web application that facilitates sending and sharing transmittals, and file sharing.
- D. As an external team member on this project the Contractor will be required to access the H2M architects + engineers/Newforma Info Exchange website for information related to the project,

including file transfers, RFI, Submittals, Action Items, and project Calendar information. The Contractor will have access to this website using any internet-capable computer running Internet Explorer or Firefox. All data transmitted through the H2M architects + engineers/Newforma Info Exchange website is encrypted and logged. Further instructions will be provided to the Contractor after the contract is awarded.

- E. Other submissions, such as material samples or other items as instructed by the Architect/Engineer, shall be sent to the Architect/Engineer's office as follows:

H2M architects + engineers

538 Broad Hollow Road - 4th Floor East

Melville, New York 11747

Attention: H2M Project Manager (Named at Pre-Construction Conference or in the Notice to Proceed)

1.06 CLARITY OF SUBMITTALS

- A. All printed materials shall be neat, clean, professionally drafted by hand or by computer, clear, legible, and of such quality that they can be easily reproduced by normal photocopying or blueprinting machines.
- B. All electronic submittals shall be produced with a minimum resolution of 300 dpi.
- C. Binders of information shall be separated into groups, subsystems, or similar equipment/function. Copies not conforming to this paragraph will be returned to the Contractor without the Architect/Engineer's review.

1.07 CONTRACTOR'S REPRESENTATION

- A. By making a submission, the Contractor represents that he has determined and verified all field measurements and dimensions, field construction criteria, site and building constraints in terms of limitations in moving equipment into an enclosed space, materials, catalog and model numbers and similar data and that he has checked and coordinated each submission with other work at or adjacent to the project site in accordance with the requirements contained in Section 013100 - Project Management and Coordination and the Contract Documents.
- B. Every SUBMISSION TRANSMITTAL FORM shall contain the Contractor's approval stamp and date showing that the submittal has been approved by the Contractor. The Architect/Engineer will not review submittals that have not yet been reviewed and approved by the Contractor.

1.08 ENGINEER/ARCHITECT'S REVIEW

- A. Architect/Engineer will review and comment on each submission conforming to the requirements of this Section.
 - 1. Architect/Engineer's review will be for conformance with the design concept of the project and will be confined to general arrangement and compliance with the Contract Documents only, and will not be for the purpose of checking dimensions, weights, clearances, fittings, laying lengths, tolerances, interference's, for coordinating the work by others or subcontractors.
 - 2. The Architect/Engineer's review of a separate item, or portion of a system, does not represent a review of an assembly or system in which the item functions.
- B. The Architect/Engineer will mark submittals as follows:
 - 1. NO EXCEPTION TAKEN (A) - No corrections, no marks. The content of this submittal has been reviewed by the Architect/Engineer and been found to be in general compliance with the Contract Documents. No further submission of this submittal is required and the

information contained in the submittal may be built into the work in accordance with the Contract Documents.

2. MAKE CORRECTIONS NOTED (B) - Minor amount of corrections. The content of this submittal has been reviewed by the Architect/Engineer and has been found in general to be in compliance with the Contract Documents. The notations made on the submittal by the Architect/Engineer shall be incorporated into the work in accordance with the terms and conditions of the Contract Documents. No further submission of this submittal is required.
 3. AMEND AND RESUBMIT (C) - The content of this submittal has been reviewed by the Architect/Engineer and this review has determined that additional data and/or modification to the submitted data or other changes are required to bring the work represented in this submittal into compliance with the Contract Documents. This submittal shall be reviewed and revised in accordance with the Architect/Engineer's comments and resubmitted to the Architect/Engineer for review. The information contained on the resubmittal shall not be incorporated into the work until the submittal is returned to the Contractor marked "NO EXCEPTION TAKEN" or "MAKE CORRECTIONS NOTED".
 4. REJECTED (D) - The content of this submittal has been reviewed by the Architect/Engineer and has been determined not to be in accordance with the requirements contained in the Contract Document and requires too many corrections or other justifiable reason. The submittal shall be corrected and resubmitted or a submittal of an alternate shall be provided. No items are to be fabricated under this mark.
 5. SUBMIT SPECIFIED ITEM (E) - The content of this submittal has been reviewed by the Architect/Engineer and this review has indicated that the work displayed in the submittal is not in compliance with the Contract Documents. The Contractor shall submit another submittal for this portion of the work, which complies with the Contract Documents.
 6. RECEIVED (R) - This submittal is accepted on the project and filed for record purposes only, in accordance with the terms and conditions of the Contract Documents. Documents marked "RECEIVED" will not be returned.
- C. No payment will be made on any item for which a submission is required if such submission:
1. has not been made,
 2. has been made but was not stamped "No Exceptions Taken" by Architect/Engineer,
 3. has been made and stamped "Make Corrections Noted", but contractor has not complied with Architect/Engineer's notes marked on the submittal,
 4. has been made and stamped "No Exceptions Taken", but item provided does not conform to the shop drawing nor to the Contract Documents.
- D. Submittals not required by these specifications will not be recognized or processed.
- E. Suffolk County Department of Public Works standard review stamp will be used containing similar notations.
- F. Provide an 8-inch by 10-inch space for the Architect/Engineer's review stamp.

1.09 RESUBMISSIONS

- A. Prepare new and additional submissions, make required corrections, and resubmit corrected copies until found in compliance with the Contract Documents.
- B. On, or with, re-submittals, clearly describe revisions and changes made, other than the corrections requested by Architect/Engineer, which did not appear on the previous submissions.

1.10 CONTRACTOR'S RESPONSIBILITIES

- A. Architect/Engineer's review of submittals shall not relieve the Contractor of his/her responsibility for any deviation from the requirements of the Contract Documents nor relieve the Contractor from responsibility for errors or omissions in the submittals.
- B. No portion of the work requiring a submission shall be commenced until the Architect/Engineer has found the submission in general compliance with the Contract Documents.
- C. The Contractor shall provide written notification of any specification or drawing deviation.

1.11 EXCESS COSTS FOR ENGINEERING/ARCHITECTURAL SERVICES

- A. The Owner will charge to the Contractor, and will deduct from the partial and final payments due the Contractor, all excess engineering and architectural expenses incurred by the Owner for extra services (work) conducted or undertaken by the Architect/Engineer as stipulated below:
 - 1. Services and other similar charges because of the Contractor's errors, omissions, or failures to conform to the requirements of the Contract Documents as related to administrative charges associated with non-compliance with the requirements for making project submissions.
 - 2. Services and other similar charges required to examine and evaluate any changes or alternates proposed by the Contractor and which may vary from the Contract Documents.
 - 3. Services and other similar charges as a result of the Contractor's proposed substitution of materials, equipment or products which require a redesign of any portion of the project, as contained in the Contract Documents at the time of bid.
 - 4. Services and other similar charges as a result of the Contractor's proposed substitution of products which require an engineering and/or architectural evaluation, beyond the time stipulated in Section 012500, to determine if the substituted product is equal to that specified.
 - 5. Services and other similar charges as a result of changes by the Contractor to dimensions, weights, sizes, voltages, phase, horsepower, materials of construction, and similar physical or operating characteristics of the product furnished which require redesign of the project in any way.
 - 6. Services and other similar charges for the review of resubmissions of shop drawings that have been marked as "No Exceptions Taken" ☐ or "Make Corrections Noted".
 - 7. Services and other similar charges for the review of shop drawings submitted more than two (2) times for the same product or portion of the work.

1.12 MISCELLANEOUS SUBMITTALS

- A. Provide a Submittal Schedule within seven (7) calendar days from the date of the Notice to Proceed. The Submittal Schedule shall list all submittals for the project referenced by draft log number. Provide the estimated date that the submittal will be transmitted to the Architect/Engineer for review.
- B. Within seven (7) calendar days from the date of the Pre-Construction Meeting, submit a Proposed Products List. This list shall be a complete listing of all products proposed for use, with name of manufacturer, service headquarters, trade name and model number of each product. Partial listings will not be accepted.
- C. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

1.13 SUBCONTRACTOR LIST

- A. The Contractor shall submit, on AIA Form G705, within THIRTY (30) calendar days after the date of the Notice to Proceed, a list of all subcontractors, including the names of the major subcontractors that were submitted at the time of the bid.
- B. Indicate M/WBE subcontractors in accordance with the requirements contained in other portions of the Project Manual.

1.14 MATERIAL SAFETY DATA SHEETS (MSDS)

- A. Comply with "Right to Know" requirements of Chapter 551 of Laws of New York, 1980, concerning notification of the use of toxic substances.
- B. Any product or substance used by the Contractor or its subcontractors which is listed in Subpart Z of OSHA Part 1910 Title 29 of the Code of Federal Regulations entitled "Toxic and Hazardous Substances" shall be identified to the Owner/Architect/Engineer by the Contractor's submission of a standard Material Safety Data Sheet (MSDS) in accordance with "Right To Know" requirements.
- C. Products will not be permitted to be kept on site without a MSDS.

1.15 SHOP DRAWINGS

- A. Submit shop drawings for all fabricated work, for all manufactured items and for items specifically required by the specifications.
- B. Submit one (1) electronic copy of each standard drawing, catalog cut, or other material. All shop drawings or submittals that are not in the standard 8-1/2" x 11" format shall be submitted both electronically and in paper. Samples shall be delivered directly to the office of the Architect/Engineer. The Architect/Engineer will return an electronic copy of each submittal once reviewed.
- C. Subcontractors shall submit shop drawings directly to the Contractor for checking. Thoroughly check subcontractors' shop drawings for measurements, sizes of members, details, materials, and conformance with the Contract Documents.
 - 1. Return submittals which are found to be inaccurate or in error.
 - 2. Do not submit to the Architect/Engineer until all corrections have been made.
- D. Clearly show the relationship of the various parts of the project and where the information provided on the submission depends upon field measurements and existing conditions.
- E. The Contractor shall make all measurements, confirm existing conditions, and include them on the shop drawings before making a submission to the Architect/Engineer.
- F. Submissions for a single item, or group of related items shall be complete.
- G. When submitting manufacturers' catalogs, pamphlets or other data sheets, in lieu of prepared shop drawings, clearly mark the items being submitted for review.
- H. If the shop drawings contain any departures from the contract requirements, specifically describe them in the letter of transmittal.
 - 1. Where such departures require revisions to layouts, structural, architectural, electrical, HVAC or any other changes to the work as shown, Contractor shall, at his own expense, prepare and submit revised drawings accordingly.
 - 2. Make drawings the same size as the Contract Drawings and to the same scale.

1.16 SAMPLES

- A. Where required, or where requested by the Architect/Engineer, submit sample or test specimens of materials to be used or offered for use.
 - 1. Samples shall be representative, in all respects, of the material offered or intended, shall be supplied in such quantities and sizes as may be required for proper examination and tests, and shall be delivered to Architect/Engineer, prepaid, along with identification as to their sources and types of grades.
 - 2. Submit samples well in advance of anticipated use to permit the making of tests or examinations.
- B. Samples will be checked for conformance with the design and for compliance with the Contract Documents.
- C. Work shall be in accordance with the approved sample. The use of materials or equipment for which samples are requested or required to be submitted is not permitted until such time that the Architect/Engineer has completed his review.

1.17 MANUFACTURER'S INSTRUCTIONS

- A. When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, to Architect/Engineer.
- B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation. Provide manufacturer's instructions with shop drawings.

1.18 CERTIFICATIONS

- A. Submit certifications of compliance indicated in the Contract Documents.
- B. Certifications shall be complete and exact, they shall be properly authenticated by the written signature, in ink, of an owner, officer or duly authorized representative of the person, firm or organization issuing such certification and they shall guarantee that the materials or equipment are in complete conformance with the requirements of these specifications.

1.19 COLORS AND PATTERNS

- A. Unless the precise color and pattern are specified, whenever a choice of color or pattern is available in a specified product, submit accurate color and pattern charts for Architect/Engineer's and Owner's review and selection.

1.20 MANUFACTURER'S SERVICE CENTER

- A. The product of a manufacturer who does not maintain an adequate nearby service center and a sufficient stock of spare parts are subject to rejection by Architect/Engineer solely on that basis.
- B. With each submission, submit information on manufacturer's facilities and give complete details of his service policies and capabilities, and a general idea of the stock of spare parts available. Submit this information in the form of a certification. Also include names, addresses and telephone numbers of at least three of the service center's present customers who are in the area of the project.

1.21 TEST RESULTS AND INSTALLATION

- A. Whenever field startup services are specified, the Contractor shall obtain from the manufacturer and submit to the Architect/Engineer Manufacturer Startup Reports (MSR's). The report shall detail the results of the field visit and all special conditions resulting from the startup.
- B. Whenever field or factory tests are required on materials, equipment and systems, such tests shall be performed and the test results submitted to Architect/Engineer in the form of a MSR.
- C. Do not deliver to the project or incorporate into the work any materials or equipment for which Architect/Engineer has not completed his review and found same to be in general conformance with the Contract Documents.
- D. Submit MSR's within thirty (30) calendar days after the date of the startup or factory test.

1.22 SPARE PARTS LIST

- A. Prepare a list of all spare parts specified to be provided in other Sections. Compile the total list for the purposes of reviewing actual spare parts delivered versus spare parts specified to be provided. The list shall reference the Section, model number, and quantity to be provided.

1.23 WAIVER OF CERTAIN SUBMITTAL REQUIREMENTS

- A. Unless otherwise specified, the requirement to submit data and samples for products specified for approval will be waived for products specified by brand name if the specifically named products are furnished for the work. In such cases, the Contractor shall submit two (2) copies of required Product Data directly to the Architect/Engineer's field representative for information and verification during its incorporation into the work. The SUBMISSION TRANSMITTAL FORM shall always be used.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

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SUBMITTAL COVER SHEET

<Project Number> - <Project Name>

(This completed sheet must accompany each submittal for a valid submission)



SUBMITTAL INFORMATION:

Submission Date:
Date

00 00 00 - 0.00 . A (1)
Submittal Number

Received by H2M:
Date

Substitution: ☐ CHECK HERE IF SUBMISSION IS FOR A SUBSTITUTION.
Provide additional information as per Sections 016100 and 012500.

Submission No:
No.

Text Reference:
Article Paragraph

Specification Section:
Spec. Section #

Submittal Title

Spec. Section Name

Reference Drawings:
As Applicable

CONTRACTOR INFORMATION:

Contract For:

Contact:

Company Name:

Email:

Contractor Address:
Street

City State Zip

Phone:

Fax:

Reviewed By:
Name

Review Date:
Date

SUPPLIER INFORMATION:

Company Name:

Contact:

Fax:

Phone:

Email:

CONTRACTOR'S CERTIFICATION STATEMENT:

We hereby represent that we have determined and verified all field measurements, field construction criteria, materials, dimensions, catalog numbers, and similar data and we have reviewed and approved this submittal and checked and coordinated each item with the other applicable approved Shop Drawings and all Contract requirements.

Signed

CONTRACTOR'S COMMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Codes
- B. Governing agencies
- C. Permits

1.02 CODES

- A. Comply with the requirements of the various codes referred to in these Specifications. Such codes shall be the date of the latest revision in effect at the time of receiving bids.
- B. If there is a conflict between local, state, and/or Federal regulatory requirements, seek a consultation with the State Department of Labor. Resolve conflicts to the satisfaction of the State Department of Labor prior to commencing work.
- C. Electrical Work: Conform to the requirements of the National Electrical Code (NEC) unless otherwise shown or specified. The Owner will be the sole judge of the interpretation of these rules and requirements.

1.03 GOVERNING AGENCIES

- A. All work shall conform to and be performed in strict accordance with all governing agencies such as, but not limited to:
 - 1. Occupational Safety and Health Act - OSHA
 - 2. State Department of Environmental Conservation
 - 3. State Building Code
 - 4. State Fire Code
 - 5. National Fire Protection Association - NFPA
 - 6. National Electrical Code
 - 7. State Plumbing Code
 - 8. New York State Energy Code
 - 9. County Department of Health
 - 10. Town Codes, Rules, Laws and Ordinances
 - 11. Sewer District Sewer Use Code
 - 12. Local Water District
 - 13. Electric utility
 - 14. Gas Utility
 - 15. Suffolk County Department of Public Works

1.04 PERMITS AND INSPECTIONS

- A. Representatives of the Owner shall have access to the work for inspection purposes. The Contractor shall provide facilities suitable to the Owner to facilitate inspections of the installed work.
- B. Obtain and pay for all permits, fees, licenses, certificates, inspections and other use charges required in connection with the work.
- C. Such permits include, but are not limited to:
 - 1. Dewatering Permit

2. Water service permits
3. Clearing and tree removal
4. Transportation and disposal of construction debris
5. Building permits that are required by the municipality where the work is located. Arrange for inspections of the work by the municipal building department before closing in the installed work, if so required. Work will not be accepted for payment until such inspections are performed and accepted by the building department.

D. Obtain a New York Board of Fire Underwriters inspection and certificate.

1.05 LISTINGS

- A. Equipment and materials for which Underwriters' Laboratories, Inc. (UL) provides product listing service, shall be listed and bear the listing mark. Alternately, ETL Testing Laboratories, Inc. Product Safety Testing Listing is acceptable if the listed product has been tested to the applicable UL Standard.

1.06 FIRE RESISTANT CONSTRUCTION MATERIALS AND ASSEMBLIES

- A. Conform to the fire rating classifications based upon the test methods and acceptance criteria in the Standard, Fire Tests of Building Construction and Materials for which Underwriters' Laboratories, Inc. (UL) provides listings.
- B. Materials and assemblies shall comply with the acceptance criteria, detailed description of the assembly, its performance in the fire test and other pertinent details such as specification of materials, Classification coverage, and alternate assembly details.
- C. Alternatively, fire resistance rating classifications by other issuing organizations listed in the Fire and Building Codes are acceptable.

1.07 COORDINATION WITH ELECTRIC UTILITY COMPANY

- A. Comply with the utility company requirements for the incoming electric service.
- B. Pay the utility company's charges in connection with the installation of the incoming service.
- C. An allowance for the utility company's charges is included in Section 012100.
- D. Comply with the utility company requirements for the incoming electric service.

1.08 COORDINATION WITH WATER UTILITY

- A. Comply with the water utility requirements for water and fire service connections. Obtain and pay for all necessary permits from the water utility. Obtain authority to connect to the existing water mains.
- B. Make necessary connections to existing public water mains under supervision of the water utility representative. Connections to existing public water mains will be made by the water utility.
- C. Pay the water department's charges for the connections.

1.09 COORDINATION WITH SANITARY SEWER UTILITY

- A. Comply with the public utility requirements for the connection of sanitary sewer lines to the public utility services. Obtain and pay for all necessary permits from public sewer department. Obtain authority to connect to their existing sanitary sewers.
- B. Make necessary connections to existing public sewer lines under the supervision of sewer department's representative. Connections to the existing public sanitary sewer will be made by the public sewer department.
- C. Pay the sewer department's charges for the connections.

1.10 COORDINATION WITH TELEPHONE UTILITY COMPANY

- A. Comply with the utility company requirements for the incoming telephone service. Pay the utility company's charges in connection with the installation of the incoming service. An allowance for the utility company's charges is included in Section 012100.
- B. Comply with the utility company requirements for the incoming telephone service. There are no utility company charges associated with the installation of the incoming service.
- C. Contact the local telephone company and arrange for the removal and relocation of existing telephone equipment.
- D. Pay charges associated with relocation of telephone equipment by the utility.

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 NOT USED

END OF SECTION 014100

PART 1 - GENERAL

1.01 ABBREVIATED SUMMARY

- A. This Section explains the format of the specifications.

1.02 SPECIFICATION FORMAT

- A. The Specifications are generally arranged according to the Construction Specifications Institute (CSI) format. Most of the technical requirements are specified in the technical specifications of the document, which are grouped into forty-eight (48) major divisions. Most of the legal and administrative requirements are included in Division 1, General Conditions, Information For Bidders, and the Contract (agreement).
- B. Technical sections are arranged in numerical order, however section numbers may not be consecutive from section to section.
- C. Page numbering is subordinate to each section.
- D. Most sections are generally broken down into three (3) parts:
 - 1. PART 1 - GENERAL
 - 2. PART 2 - PRODUCTS
 - 3. PART 3 - EXECUTION
- E. Not all these parts may be used and in some cases, the title of some of the parts may be different than listed above. Paragraph numbers are subordinate to each part.
- F. The Contractor is advised that the format described here is flexible in nature.
 - 1. There is some overlapping of specified information between various portions of the Specifications.
 - 2. In all cases, the entire requirements of the Contract Documents for the project shall apply.
- G. Explanations:
 - 1. Many technical sections begin with a paragraph titled "SECTION INCLUDES", "DESCRIPTION", or similar wording.
 - a. In these paragraphs, a brief listing of the specified products may appear or a brief description of the work generally specified in that section is presented.
 - b. These descriptions or listings are not all inclusive, but merely are provided as an aid in locating subject matter.
 - c. In some cases special cost related items of work are called to the attention of the Contractor in these opening paragraphs.
 - 2. "RELATED SECTIONS" or "RELATED WORK" or similar wording paragraphs list or reference related work specified elsewhere in the Contract Documents. Such listing is not all inclusive, rather, they are merely an aid to the Contractor in locating some of the other Specification Sections wherein work is specified which has a particularly close interrelationship with the work specified in that section.
 - a. It shall be understood that all of the Work, and all of the Specifications and other portions of the Contract Documents, are interrelated, and that the total of all requirements set forth in all of the Contract Documents shall be met.
 - b. Equipment suppliers and manufacturers shall be advised of the requirements for making submittals and delivering products, as specified in Division 1 sections, even if said sections are not referenced therein that section.
 - 3. "REGULATORY REQUIREMENTS" or "REFERENCES" or similar wording paragraphs describe standards, laws, guidelines, regulations, and standards related to workmanship

and installation of the products specified which shall be followed by the Contractor in completing the work specified therein that section as if it was written there in that section. All such requirements and references shall be latest issue in effect at the time of the bid opening.

4. When a "GUARANTEE" or "WARRANTY" paragraph appears in the section it is calling attention to a guarantee which extends beyond the period of the Contractor's Guarantee called for in the administrative portion of the Contract Documents or it states special requirements specific to the equipment, systems or products specified in that section.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 014223

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Work of this Section includes the requirements for pre-installation meetings.

1.02 PRE-INSTALLATION MEETINGS

- A. The Contractor shall convene a pre-installation meeting at the site prior to commencing work of the installing new equipment.
- B. Pre-installation meetings are to be convened at least one week prior to commencing work on the section. The contractor shall arrange and require attendance of Owner/Engineer and parties directly affecting, or affected by, work of the specific section.
 - 1. At least seven (7) calendar days advance notice is to be given.
 - 2. The contractor shall prepare agenda and preside at meeting. At a minimum the following items are to be discussed:
 - a. Review conditions of installation, preparation and installation procedures.
 - b. Review coordination with related work.

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 NOT USED

END OF SECTION 014320

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Requirements for monitoring the quality of the constructed project.
- B. Work of this Section also includes services of an independent testing laboratory for quality assurance testing.
- C. The services of the testing laboratory will be paid for out of the cash allowance included by the Contractor in the price as bid in accordance with the requirements contained herein and in Section 012100 - Allowances.

1.02 REFERENCES

- A. ASTM C1077 - Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation.
- B. ASTM D3740 - Practice for Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
- C. ASTM D4561 - Practice for Quality Control Systems for an Inspection and Testing Agency for Bituminous Paving Materials.
- D. ASTM E699 - Practice for Criteria for Evaluation of Agencies Involved in Testing, Quality Assurance, and Evaluating Building Components in Accordance with Test Methods Promulgated by ASTM Committee E6.

1.03 QUALITY ASSURANCE - CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.
- B. Comply with specified standards as a minimum quality for the work except when more stringent tolerances, codes, or specified requirements indicate higher standards or workmanship that is more precise.
- C. Perform work by persons qualified to produce workmanship of specified quality.
- D. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.
- E. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

1.04 MOCK-UP

- A. Tests will be performed under provisions identified in this Section and identified in the respective product specification sections.
- B. Assemble and erect specified items with specified attachment and anchorage devices, flashing, seals, and finishes.
- C. Accepted mock-ups shall be a comparison standard for the remaining work.

- D. Where a mock-up has been accepted by the Architect/Engineer and is specified to be removed, then the Contractor shall remove the mock-up and the clear area when directed to do so by the Architect/Engineer.

1.05 QUALITY ASSURANCE - TESTING LABORATORY

- A. In order to establish compliance with the Contract Documents, materials shall be tested, examined and evaluated before they are incorporated into the work. During and after installations, additional tests, examinations, and evaluations shall be made to determine continued compliance throughout the course of the work.
- B. Testing laboratory shall be a reputable, experienced firm that is capable of performing all of the required testing and authorized to operate in the state in which the project is located.
- C. Perform all sampling and testing in accordance with specified procedures and use the materials, instruments, apparatus, and equipment required by the codes, regulations and standards. Where specific testing requirements or procedures are not described, perform the testing in accordance with all pertinent codes and regulations and with recognized standards for testing.
- D. In the event that samples and test specimens are not properly taken, handled, stored or delivered or if other requirements of this Section are not complied with, Architect/Engineer reserves the right to delegate any or all of this work to others, or to take whatever action deemed necessary to ensure that sampling and testing are properly accomplished, for which all costs shall be borne by Contractor.
- E. Architect/Engineer reserves the right to disapprove the use of a specific testing laboratory, even after prior approval, if the laboratory fails to meet or comply with the requirements of this Section. If this should occur, immediately discharge the testing laboratory and retain the services of a different laboratory acceptable to Architect/Engineer.
- F. The testing laboratory shall meet the following criteria:
 - 1. Be capable of performing all of the required tests.
 - 2. Be regularly engaged in performing the types of services required.
 - 3. Have adequate facilities, materials, equipment, and personnel to perform the services.
 - 4. Have an adequately trained, experienced and qualified staff.
 - 5. Have at least one registered professional engineer licensed in the state in which the project is located who shall be capable of performing field tests, supervising laboratory testing and interpreting test results. The professional engineer shall be thoroughly knowledgeable in materials, soils, asphalt paving and concrete.
 - 6. Shall be able to be on the Project site within two hours after being notified.
 - 7. Comply with the requirements of ASTM C1077, ASTM D3740, and ASTM E699.
 - 8. Testing Equipment: Calibrated at reasonable intervals with devices of an accuracy traceable to either National Bureau of Standards or accepted values of natural physical constants.

1.06 REFERENCE STANDARDS

- A. Conform to reference standards by date that the project was last bid.
- B. Obtain copies of standards when required by Contract Documents.
- C. Should specified reference standards conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.

- D. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.07 SUBMITTALS

- A. Within fifteen (15) calendar days from the date of the Notice to Proceed, submit documentation from three (3) testing laboratories that clearly indicates experience, location, qualifications of staff, and descriptions of any limitations or restrictions of the firm.
 - 1. Include a price schedule for standard tests and a billing rate schedule for technician classifications.
 - 2. Based upon this information, the Architect/Engineer will select one firm to be the primary testing laboratory and one firm to act as a standby.
- B. Certified copies of each test report shall be mailed directly to the Architect/Engineer. The Contractor shall arrange with the laboratory to secure copies.
- C. Each report shall be in writing and shall include the testing method used, the test results, the specified results, the exact location of where the test specimens were taken, the date taken, Project identification, Contractor's name and other pertinent information required for a complete and meaningful test report.
- D. Each report shall be signed and certified by a responsible officer of the testing laboratory.
- E. Mail reports directly to Architect/Engineer within 24 hours after the sample is taken, except in those instances when tests cannot be immediately performed because of required curing, incubation periods, or lengthy testing procedures.
- F. The laboratory shall verbally communicate test results when requested by the Architect/Engineer. This does not eliminate nor replace the requirements for a written report.

1.08 SCHEDULING - LABORATORY SERVICES

- A. Except where otherwise specified, the Architect/Engineer will determine the number of samples to be taken, the date and time samples will be taken and tests made, the number and type of tests to be performed, who will collect the samples, how they will be handled and stored and when laboratory personnel are required on site.
- B. Architect/Engineer will notify Contractor of his/her decision to take samples and/or have tests made and provide him with the pertinent information. Contractor is responsible for notifying the testing laboratory and for having the testing performed, on schedule.
- C. In addition to the above, Contractor shall make his own arrangements for the sampling and testing of materials he proposes to incorporate into the work. This shall not be paid for out of the cash allowance.
- D. Notify Architect/Engineer at least 72 hours in advance of the times at which scheduled samples or tests will be conducted.
- E. If samples and/or tests cannot be taken or performed when required, delay the work until such time that they can be accomplished. Where possible, any work that has been installed but has not been sampled or tested as required, shall be tested by other means. Upon Architect/Engineer's request, uncover any work, which has been buried or covered, and perform special tests designated by Architect/Engineer. If the work cannot be tested by other means, Architect/Engineer may declare the work unacceptable. All costs associated with noncompliance and for special testing shall be borne by the Contractor and not be paid for out of the cash allowance.

- F. Should the testing laboratory be scheduled to take or collect samples or to perform tests, and finds that it is unable to do so as a result of delays in construction, inclement weather, or any other reason, reschedule the tasks for a date acceptable to Architect/Engineer. Costs associated with times testing laboratory is unable to perform scheduled services shall be borne by the Contractor and will not be paid for under the allowance.
- G. Plan all work and operations to allow for the taking and collection of samples and allow adequate time for the performance of tests. Delay the progress of questionable work until the receipt of the certified test reports.

1.09 TESTING REQUIREMENTS

- A. Dry Paint Thickness Measurement: Perform dry paint thickness using calibrated SSPC Type 2 fixed probe gages.
- B. Compaction Testing - Soil:
 - 1. Perform compaction testing in accordance with ASTM D6938, Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth) or ASTM D1556 Density and Unit Weight of Soil In Place by the Sand Cone Method.
 - 2. Perform tests and analysis of fill material in accordance with ANSI/ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5-lb. Rammer and 12-inch Drop.
- C. Compaction Testing - Asphaltic Concrete Pavement:
 - 1. Perform asphaltic concrete compaction testing in accordance with ASTM D2950 - Standard Test Method of Density of Bituminous Concrete in Place by Nuclear Methods.
 - 2. Calibrate nuclear density measurement equipment based on theoretical maximum specific gravity of asphaltic concrete pavement material.
 - 3. Perform test to determine theoretical maximum specific gravity in accordance with ASTM D2041 Theoretical Maximum Specific Gravity of Bituminous Pavement Mixtures. Perform test on mix at plant prior to delivery. Collect sample at plant in accordance with ASTM D979 - Sampling Bituminous Paving Mixtures and perform test in approved laboratory if plant does not have necessary equipment.
- D. Concrete Testing:
 - 1. Collect samples in accordance with ASTM C172, Practice for Sampling Freshly Mixed Concrete.
 - 2. Make test cylinders in accordance with ASTM C31, Standard Practice for Making and Curing Concrete Test Specimens in the Field.
 - 3. Test concrete cylinders in accordance with ASTM C39, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
 - 4. Test slump and air entrainment.
- E. Asphalt Testing:
 - 1. Collect samples at point of delivery in accordance with ASTM D979, Standard Practice for Sampling Bituminous Paving Mixtures.
 - 2. Perform extraction test in accordance with ASTM D2172, Standard Test Methods for Quantitative Extraction of Bitumen from Bituminous Paving Mixtures.
 - 3. Perform gradation test in accordance with ASTM C136, Method for Sieve Analysis of Fine and Coarse Aggregates.

1.10 TESTING SCHEDULE

- A. Dry Paint Thickness Measurement:

1. Make five (5) separate spot measurements spaced evenly over 100 square feet of area.
 2. For structures exceeding 1000 square feet of finished surface, three 100 square feet areas shall be randomly selected by the Architect/Engineer plus one 100 square foot area for each additional 1000 square feet of finished surface. This requirement shall be subject to change as required by the Architect/Engineer.
- B. Compaction Testing of Soil:
1. Pipe Installation: As directed by the Architect/Engineer.
 2. Concrete flatwork: As directed by the Architect/Engineer.
 3. Pavement subgrade: As directed by the Architect/Engineer.
- C. Concrete Testing: Make six (6) concrete test cylinders for each 50 c.y. or fraction thereof.
1. Test two (2) cylinders at 7 days.
 2. Test two (2) cylinders at 28 days.
 3. The remaining cylinders shall be tested at a time to be determined by the Architect/Engineer. This requirement shall be subject to change as required by the Architect/Engineer.
- D. Asphalt Testing: As directed by the Architect/Engineer.
- E. Compaction Testing of Pavement:
1. One test for every 1,000 square feet of each pavement course.

1.11 FIELD OBSERVATION OF CONTRACTOR'S WORK

- A. The Architect/Engineer will provide periodic observation of the Contractor's work.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions. Verify that the existing substrate is capable of structural support or attachment of new Work being applied or attached. Examine and verify specific conditions described in individual specification sections. Verify that utility services are available, of the correct characteristics, and in the correct locations.

3.02 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance. Seal cracks or openings of substrate prior to applying next material or substance.
- B. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 FIELD QUALITY CONTROL

- A. Allow representatives of the testing laboratory access to the work at all time. Provide all equipment, labor, materials, and facilities required by the laboratory to properly perform its functions. Cooperate with and assist laboratory personnel during the performance of their work.

- B. Test specimens and samples shall be taken by the person(s) designated in other Sections, or as directed by Architect/Engineer. Conduct field sampling and testing in the presence of Architect/Engineer. Provide all materials, equipment, facilities and labor for securing samples and test specimens and for performing all field-testing.

END OF SECTION 014500

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Asbestos and lead-based paint certification.
- B. Moisture control.

1.02 RELATED SECTIONS

- A. Section 014100 – Regulatory Requirements
- B. Section 015719 – Temporary Environmental Controls

1.03 ASBESTOS AND LEAD-BASED PAINT CERTIFICATION

- A. Contractor shall submit the enclosed “Asbestos and Lead-Based Paint Certification” upon completion of all work.

1.04 MOISTURE CONTROL

- A. The Contractor shall maintain a strict policy and protocol for the control of water infiltration and moisture build-up during the course of the project. The plans and specifications are not intended to depict each and every condition or detail of construction. As the knowledgeable party in the field, the Contractor is in the best position to verify that all construction is completed in a manner which will provide a watertight structure. The Contractor has the sole responsibility for ensuring the watertight integrity of the structure. The Contractor's contractual obligations include, but are not limited, to the following:
- B. Water Infiltration: If the Contractor observes water infiltration (unintended) into a completed building or an ongoing construction site, he must immediately report the condition to the Owner and Architect/Engineer, and shall immediately take steps to investigate the source of the water infiltration, identify the responsible party (person who performed work that resulted in water infiltration) and devise a procedure to promptly eliminate water infiltration into the building.
- C. Handling of Water-Damaged Building Materials and Construction:
 - 1. Contractor shall inspect all building materials delivered to the site for pre-existing water damage, as well as existing mold growth.
 - 2. If in-place construction becomes wet, notify the Owner and Architect/Engineer immediately. The Owner and Architect/Engineer will determine whether or not the work shall be removed and replaced, or if the type of material can be permitted to dry.
 - 3. Under no circumstances may new or additional construction be placed over, or otherwise enclose, wet building materials.
- D. Visible Mold/Mildew:
 - 1. If the Contractor observes any substance that appears to be mold or other fungal growth and/or an unidentified substance within a completed building or the ongoing construction site, he shall immediately suspend construction operations in the area, and report the condition to the Owner and Architect/Engineer.
 - 2. No person shall be allowed back into the affected area without permission of the Owner.

1.05 SUBMITTALS

- A. Contractor shall submit completed and notarized “Certification of Asbestos and Lead-Based Paint” form.

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 NOT USED

3.02 CERTIFICATE OF ASBESTOS AND LEAD-BASED PAINT

3.03 (NEW WORK)

3.04 CLIENT'S NAME:

3.05 PROJECT LOCATION:

3.06 PROJECT ADDRESS:

3.07 PROJECT NAME:

3.08 PROJECT NUMBER:

3.09 CERTIFICATION:

3.10 THIS CONTRACTOR HEREBY CERTIFIES THAT NO ASBESTOS-CONTAINING MATERIAL AND LEAD-BASED PAINT, AS DEFINED BY APPLICABLE FEDERAL AND STATE REGULATIONS, HAS BEEN FURNISHED OR INSTALLED AT THE REFERENCED PROJECT:

3.11 CONTRACTOR NAME:

3.12 SIGNATURE:

3.13 ADDRESS:

3.14 TELEPHONE:

DATE EXECUTED:

3.15 THIS FORM SHALL BE NOTARIZED

END OF SECTION 014536

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. This Section supplements the General Conditions.
- B. The Work of this Section includes temporary facilities, utilities, and controls to be furnished by the Contractors for this project as it is specified herein.
- C. This Section is made a part of all Construction Contracts associated with the project. It contains specific references to the particular Contractor supplying said product or service. If no reference is provided then the requirement applies to all Prime Construction Contractors.
- D. Temporary electric shall be provided by the Prime Electrical Contractor as specified in Section 015113 located in the Contract Documents for Contract E except as required herein.

1.02 CARE AND PLACEMENT

- A. All temporary and permanent facilities and controls and all other elements on the project site shall meet all standards of the Occupational Safety and Health Act of 1970 and subsequent revisions. Each Contractor shall comply with all requirements of the Act.
- B. Each Contractor shall take every precaution and shall provide such equipment and facilities as are necessary or required for the safety of its employees and persons at the site.
- C. In the event of damage to existing and/or temporary facilities, the Contractor shall immediately make all repairs and replacements to an equal condition prior to the event.

1.03 QUALITY PERFORMANCE

- A. Comply with and perform all work in accordance with the requirements of local authorities and utility companies having jurisdiction, and all applicable codes, regulations and ordinances.
- B. Secure approvals from the appropriate jurisdictions and utility companies on all repairs, relocations, connections, disconnections and the Work.
- C. All barricades, warning signs, lights, temporary signals and other protective devices shall conform with "Manual on Uniform Traffic Control Devices for Streets and Highways", US Government Printing Office.

1.04 SUBMITTALS

- A. Each Contractor shall provide a list of contact numbers as follows:
 - 1. Contractor's superintendent and office project manager (home, beeper, cellular, office, fax, trailer, and email address).
 - 2. All subcontractors.
 - 3. All utility companies.
 - 4. Emergency services such as fire department, police, and ambulance.
 - 5. Each Contractor shall also submit the following:
 - a. Name and qualifications of person or persons who shall be available to render first aid.
 - b. Names, addresses and telephone numbers of at least (2) other personnel who can be telephoned and act on behalf of Contractor in the event of emergencies or other problems requiring prompt attention during winter shutdown, holidays, nights and

other periods when the Contractor's superintendent may be absent from the project site.

- B. The General Contractor shall provide a sketch showing routing of temporary water service for construction purposes and for exfiltration tank testing. Provide cuts and plumber's certification for backflow device(s).
- C. Update contact list and provide to Engineer for any changes throughout the course of the project.

1.05 CONTRACTOR'S RESPONSIBILITY

- A. Each Contractor shall be responsible for the installation, performance, maintenance, and repair of all temporary facilities and controls specified herein this Section as originally provided.
- B. The Owner reserves the right to immediately correct a Contractor caused action, if in the opinion of the Owner, the situation may result in the immediate loss of life, property, and degradation of the environment. The costs for actions taken by the Owner shall be deducted from money due or to become due to the Contractor. Amounts in excess shall be paid by the Contractor.
- C. If the Contractor caused situation is not deemed immediate, then the Contractor shall, within 24 hours of receipt of written and/or verbal notice, correct the defect or unsatisfactory condition.
- D. The Owner may repair, correct, replace, or install temporary facilities to correct the situation if the Contractor fails to perform within the allowed time. The costs to make the corrections shall be deducted from money due or to become due to the Contractor. Amounts in excess shall be paid by the Contractor.

PART 2 - PRODUCTS

2.01 GENERAL

- A. The Owner may use temporary power lines, pipes, roadways or other facilities that each Contractor furnishes, installs, and maintains (then removes at the completion of the work), during the period of construction.
- B. The location of all temporary power lines, roadways, and other necessary temporary facilities shall be subject to the approval of the Engineer, and these shall be located and operated so as not to interfere with the operation of the facilities.

2.02 WATER FOR CONSTRUCTION PURPOSES

- A. Each Contractor shall obtain water from the nearest potable water source as designated by the Owner.
- B. The Owner will pay for water usage for general construction activities such as dust control and for sanitary purposes, like hand washing.
- C. Potable water process tank exfiltration testing will not be paid for by the Owner. The General Contractor shall include the costs for all water for this purpose in the price as-bid.
- D. Each Contractor shall provide material and labor and secure necessary permits to install his or her own backflow prevention device at the supply point where it is connected to the Owner's system.
 - 1. The water purveyor shall approve the device.

2. The device shall be tested and certified as functioning properly.
 3. Post the certification in a location acceptable to the water purveyor.
- E. A water meter shall also be installed on any water service lines used to supply water for exfiltration testing.
- F. Each Contractor shall exercise measures to conserve water.
- G. Provide insulation and heat tracing to prevent freezing of temporary piping. Drain hoses at the end of each use.
- H. All Contractors, subcontractors, and personnel involved in the project shall be permitted to use water for construction purposes as provided under this paragraph.

2.03 SANITARY FACILITIES

- A. The General Contractor shall provide and maintain temporary toilet facilities and enclosures for the duration of the project for use by all other Prime Contractors.
- B. These facilities shall be maintained in a strictly sanitary manner and be screened from the general public.
- C. All facilities shall be in accordance with the Occupational Safety and Health Act (OSHA) standards and all other applicable local codes.
- D. The locations of such facilities shall be determined by the Engineer or the Owner and be shown on the General Contractor's Site Utilization Plan.
- E. All applicable codes and regulations regarding the maintenance and method of waste disposal for these facilities will be strictly enforced. These facilities shall be of the portable type.
- F. The Owner's sanitary facilities will not be available for use by any Contractor.
- G. Comply with the requirements also contained in Section 015719 – Temporary Environmental Controls.

2.04 HEAT

- A. Each Contractor shall provide and pay for heating devices and fuel as required to maintain adequate heat for specific construction operations; i.e. painting, application of coatings, etc., where so specified elsewhere in these specifications.
- B. The General Contractor shall heat buildings/structures to properly apply paint in accordance with Section 099100 requirements of Contract G.
- C. The Plumbing Contractor shall heat buildings/structures to properly apply paint to piping in accordance with Section 099100.
- D. Each Contractor shall maintain minimum ambient temperature of 40 degrees F in areas where construction is in progress, unless indicated otherwise in specifications or as required by proposed working conditions and manufacturer's installation/application instructions.

2.05 VENTILATION

- A. Each Contractor shall ventilate enclosed areas to assist in the curing of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors or gases.

- B. The General and Plumbing Contractors shall ventilate buildings to safely apply paint in accordance with Section 099100 requirements.

2.06 BARRIERS AND PROTECTION

- A. Each Contractor shall provide railings, barricades, signs, fences and other protective devices to prevent unauthorized entry to construction areas, to allow for the Owner's safe use of the site and to protect existing facilities and adjacent structures from damage from the work.
- B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing buildings.
- C. Provide protection for plant life designated to remain.
- D. Protect vehicular traffic, stored materials, public utilities, site and structures from damage.
- E. Provide warning signs, detour signs and other traffic control devices to insure the safety of plant operators and to adequately direct traffic around the work. Illuminate barricades, obstructions, and warning signs from sunset to sunrise.

2.07 TEMPORARY FENCING

- A. Each Contractor is responsible for performance compliance with OSHA standards.
- B. Each Contractor shall provide temporary safety fence around all open excavations or other dangerous conditions on the construction site.
 - 1. All temporary safety fencing shall be designed and erected in compliance with OSHA standards, but in no case less stringent than these specifications for fencing.
 - 2. Fence is to be bright orange in color, a minimum of 4 feet high, and properly secured using 1" diameter steel pipe at 4'-0" on-center as support posts.
 - 3. Stake each support post to a depth of 18" and tamp securely into place.
 - 4. Each post shall be plumb.
 - 5. Secure fencing to posts using heavy-duty 12" long cable ties or tie wire.
 - 6. The fence and supports shall remain the property of the Contractor and be promptly removed at the appropriate time.

2.08 TEMPORARY HANDRAILS AND SCAFFOLDS

- A. All temporary handrailing and scaffolds shall be designed and erected in compliance with OSHA standards. Each Contractor is responsible for performance compliance with OSHA standards.
- B. Handrails shall be securely installed and maintained in accordance with OSHA regulations until the permanent railing or grating has been permanently installed and approved by the Engineer.
- C. All scaffolding and platforms shall be erected in a safe and substantial manner complying with OSHA requirements.
- D. All temporary handrails and scaffolds shall be designed by a professional engineer licensed in the state where the project is being constructed.
 - 1. The design drawings and details shall be stamped by the licensed engineer and submitted for record purposes.
 - 2. The Contractor's design engineer shall visit the site to certify that the handrailing and/or scaffolds have been erected pursuant to the stamped design.

- E. The General Contractor shall install temporary handrails around the inside perimeter of each open tank that is to be retrofit under Contract G.
- F. The General Contractor shall protect all openings in building/structures of any type such as shafts, deck openings, and other building related chases.

2.09 EROSION CONTROL

- A. Each Contractor shall provide measures to keep the ground surface well drained, but avoid erosion of embankments, excavations, the project site, and adjacent areas.
- B. Each Contractor shall comply with all local codes, rules, and regulations concerning soil erosion.
 - 1. Use hay bales or silt fences to control erosion to the satisfaction of the Engineer and regulatory agencies. Use hay bales or silt fences to stop silt and sediment from reaching surface waters, parking lots and roads.
 - 2. Leave erosion control methods in place until ground cover is established or until date of substantial completion.
- C. The General Contractor shall install and maintain erosion control measures as shown on the Drawings.
- D. Comply with the requirements also contained in Section 015719 – Environmental Protection.

2.10 DUST CONTROL

- A. Each Contractor shall provide measures to control dust resulting from the work.
- B. Control dust at locations and in such quantities and frequencies as required to prevent dust from becoming a nuisance to the surrounding area.
- C. In the event the Contractor does not adequately provide for dust control, or should insufficient quantities of dust control agents be placed and Contractor fails to place additional quantities within 4 hours after Engineer's direction, Owner will perform the required work by whatever means deemed expedient and all expenses incurred by Owner will be charged to and paid by Contractor.
- D. Take care in selecting and applying dust control agents so as not to make roadways or walkways slippery, muddy or hazardous. Dust control agents shall be acceptable to the Engineer.
- E. The General Contractor shall provide general dust control all roadways and construction areas throughout the project site.

2.11 RUBBISH REMOVAL

- A. The General Contractor shall be responsible for overall rubbish removal.
- B. Burning of rubbish and trash will not be permitted.
- C. The General Contractor shall clean up trash as specified in Section 011400 - Work Restrictions or more often if the trash interferes with the work of others, presents a hazard or if directed by the Engineer.
- D. Dispose of rubbish and waste materials in accordance with state regulations and local ordinances.

- E. The General Contractor shall also place rubbish containers at locations selected by the Engineer.
 - 1. Furnish adequately sized rubbish containers from the date of initial mobilization to the date of final payment.
 - 2. As a minimum, the Contractor shall furnish ten (10) 55-gallon general trash containers. Secure the top of each container to the container.
 - 3. Secure the container itself so that it does not get blown about the site.
- F. The General Contractor shall be responsible for maintaining the site free of trash.
- G. Each Contractor shall assist the General Contractor in maintaining the site free of trash and debris.
 - 1. It shall be the sole responsibility of the General Contractor to prevent trash from being blown about the site.
 - 2. Provide a worker to police the site at least for 1 hour at the end of each day that work is being undertaken by the General Contractor.

2.12 SNOW REMOVAL

- A. The General Contractor shall be responsible for maintaining roads, walkways, sidewalks, and parking areas/lots free of snow.
- B. Provide snow plowing during and after each snow fall equal to or greater than 1.0 inch as reported by the local weather service.
- C. Any damage resulting from the Contractor's snow clearing operations shall be immediately repaired at no additional cost to the Owner.

2.13 ENCLOSURES

- A. Each Contractor shall provide and maintain temporary enclosures, sheds, or fenced-in areas to accommodate protection for products, material and equipment.
- B. Store equipment that cannot be exposed to outdoors in accordance with Section 016500 - Product Delivery, Storage and Handling.

2.14 SECURITY

- A. Each Contractor shall provide security and facilities to protect work from unauthorized entry, vandalism and theft.
- B. Coordinate with Owner's security program, if applicable.
- C. Each Contractor has full responsibility for the working area until final acceptance and payment.
- D. The General Contractor shall maintain the perimeter fence that pre-existed prior to the start of construction. A temporary perimeter fence shall be required at all times during the construction and until the new perimeter fence is installed, or until the project is accepted by the Owner.
- E. It shall be the General Contractor's responsibility to lock all gates to the site, and on the access road, at the end of each work day.
- F. All company vehicles shall be conspicuously identified, through sufficiently sized lettering on both the passenger and driver sides, with the company name, address and telephone number
 - 1. All employee owned vehicles shall have an 8-1/2 inch by 11 inch sign with the company name, address and telephone number placed on the dashboard on the driver side.

- 2. Vehicles may be subject to search by the Owner or owner's representative.
- G. Submit to the Owner a complete listing of all employees that will or might be performing work at the project site.

2.15 PARKING

- A. The General Contractor shall provide an area suitable for parking at least three (3) vehicles adjacent to each field office by leveling the surface and installing 3 inches of QPS over the level surface.
- B. Do not allow heavy construction vehicle parking on existing pavement, if existing pavement is not scheduled for replacement or restoration.
- C. Provide and maintain access to fire hydrants, building entrances, process tanks, doors and the work in general.
- D. Each Contractor shall have his or her employees and subcontractors park in areas designated by the Owner/Engineer/Architect.
- E. If designated on the Contract Drawings, then only use those areas for parking.
- F. Where trades work from their trucks, then coordinate the parking of trucks with other prime contractors.
- G. If a Site Utilization Plan has been specified, then parking shall be as sited in the plan.

2.16 DAMAGES

- A. Each Contractor, with the prior approval of the Owner/Engineer/Architect, shall promptly repair any damage, directly or indirectly caused by the Contractor's operations.
- B. All repairs shall be to the complete satisfaction of the Owner and equal in quality to that which pre-existed.

2.17 FIRST AID FACILITIES & EMERGENCY TELEPHONE NUMBERS

- A. Each Contractor shall provide and maintain adequately equipped first aid facilities in a location or at locations that are readily accessible to workmen, Engineer and visitors to the site.
- B. Provide at least one on-site employee who is properly trained in first aid and who shall be available to render first aid whenever construction is in progress.
- C. Provide a list of emergency telephone numbers as specified above.
- D. Post the list of emergency telephone numbers as directed by the Engineer and provide updates as necessary for any changes.

2.18 POLLUTION CONTROL

- A. Do not permit pollutants, such as chemicals, fuels, lubricants, calcium chloride, sewage, water containing sediments and other deleterious, poisonous, toxic or oxygen demanding substances to enter or leach into streams, lakes, wetlands, other surface waters, into groundwater, or into the air.

- B. In waters used for public water supply or used for trout, salmon or other game or forage fish spawning or nursery, control measures must be adequate to assure that turbidity in the receiving water will be increased not more than 10 standard turbidity units (s.t.u.) in the absence of other more restrictive locally established limitations, unless otherwise permitted by the State.
- C. In no case shall the classification for the surface water be violated, unless otherwise permitted by the State.
- D. In water used for other purposes, the turbidity shall not exceed State limits.

2.19 REMOVALS

- A. Remove all items provided under this Section except as otherwise specified.

PART 3 - EXECUTION

3.01 PROTECTION OF EXISTING UTILITIES AND PUBLIC WORKS

- A. Maintain and protect existing utilities and public works including, but not limited to, conduits, sewers, water mains, electric and telephone conductors or conduits, and gas mains encountered during the construction.
- B. In the event that it is not possible to cross over, under, around or otherwise avoid the existing utility, the owner of the utility shall be notified that the utility must be altered or moved.
- C. In the event that damage shall result to any service pipe for water or gas, or any private or public sewer or conduit, the Contractor shall immediately, and at its own expense, repair same to the satisfaction of the Engineer/Architect.
- D. Any contents from the pipes, sewers or conduits shall be immediately removed and disposed in accordance with applicable laws.

3.02 REMOVAL OF UTILITIES, FACILITIES AND CONTROLS

- A. Remove temporary above grade or buried utilities, equipment, facilities and materials, immediately following substantial completion and prior to release of retainage.
- B. Remove underground installations to a minimum depth of 2 feet.
- C. Regrade site to restore to existing slope and elevation, and restore the surface.
- D. Clean and repair damage caused by installation or use of temporary work.
- E. Restore existing facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.
- F. Remove temporary parking and access roads.
- G. Regrade area to existing slope and elevation and restore the surface to its existing condition.
- H. Final payment will not be processed until all removals have been completed to the satisfaction of the Owner/Engineer/Architect.

3.03 PROTECTION OF EXISTING PROPERTY

- A. Protect existing structures and finishes during performance of the work.
- B. Protect existing trees and plants during performance of the work.
- C. Do not deposit excavated materials or store materials around trees or plants or attach guy wires to trees.

END OF SECTION 015000

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. The Prime Electrical Contractor shall install and maintain temporary light and electricity for use by others.
- B. Temporary electricity shall be installed within fifteen (15) calendar days from the date of the pre-construction conference to all areas of the site where new work is planned or where temporary electric facilities are shown on the Contract Drawings, except as specified herein below.
 - 1. Temporary electric shall be installed to the Engineer/Architect's office within two (2) weeks from the date of the Notice to Proceed.
 - 2. Temporary light and electric for all buildings being constructed or renovated as work of this project shall be installed required and within 2 days of notification by the Engineer/Architect.
 - 3. Temporary electric shall be installed to all areas where tanks are being constructed as soon as the subgrade elevation has been reached and prior to the start of slab construction.

1.02 SERVICE

- A. Provide 100-amp temporary power to the Engineer's trailer.
- B. Provide 100-amp temporary electrical services for each area requiring electric.
- C. Furnish means for connection of small power tools.
- D. Furnish five (5) 100 foot high capacity, heavy-duty power extension cords for use throughout the site by others.
- E. Applications for electrical service shall be completed by the Contractor.
- F. The cost for installations, including labor, material, tools, removals, and supplies shall not be eligible for payment under any cash allowance and shall be included in the price as bid.
 - 1. Provide wire and electrify the trailer.
 - 2. Maintain the service throughout the project up to final completion.
 - 3. Remove the service prior to the last day of final completion.

1.03 TEMPORARY LIGHT AND ELECTRICITY

- A. The Prime Electrical Contractor shall make all necessary arrangements for temporary electric service at the site of the Work.
- B. Install and maintain temporary light and power in accordance with the National Electrical Code.
- C. At the Contractor's option, a properly sized generator may be provided during this period with all costs associated with its operation and maintenance being paid for by the Contractor.
- D. Provide wiring and other equipment for temporary light and power in accordance with recognized industry standards.
 - 1. Wiring for temporary light and single-phase power shall, in general, consist of 3 wire, 120/240 volt with branch circuits of #12 conductors minimum.

2. Provide branch circuits with weatherproof medium base type lamp holders for temporary lighting as required to maintain a minimum of 10 foot candles in the work areas of all buildings being constructed or renovated as work of this project.
 3. Provide branch circuits with fused ground type receptacle outlet for single-phase power.
 4. Provide lamps and fuses, including replacements.
 5. Provide new materials for temporary light and power, except that transformers need not be new if they are in satisfactory operating condition.
 6. Provide ground fault protection (such as portable plug-in type ground fault circuit interrupters) on single-phase 15 and 20 amp receptacle outlets.
 7. Provide receptacle outlets, portable cord connectors and attachment plugs with standard NEMA configurations.
- E. Upon completion of the project, remove all temporary electric light and power work and restore all affected finishes and connections.
- F. Include the costs in the bid price to relocate the temporary electric service at least four (4) time during the course of construction. The electric service shall be relocated within two (2) days notice by the Engineer/Architect.

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 NOT USED

END OF SECTION 015113

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. The Work of this Section includes the furnishing of the Engineer/Architect's Field Office (Trailer).
 - 1. The Engineer/Architect's Field Office shall be furnished by the General Contractor.
 - 2. It shall be provided within the time period specified hereinafter.
- B. The General Contractor shall also furnish the following to the Owner/Engineer all in accordance with the specifications contained herein as follows:
 - 1. Miscellaneous equipment and supplies
 - 2. Materials
 - 3. Computer system with associated peripheral computer related equipment
 - 4. Services as may be specified herein.
- C. This Section also specifies the requirements for Field Offices to be established by all Prime Contractors for the exclusive use of the respective Prime Contractor.

1.02 CARE AND PLACEMENT

- A. Field offices shall be placed where directed by the Engineer/Architect in accordance with site utilization requirements.
- B. All field offices shall be installed to meet all standards of the Occupational Safety and Health Act of 1970 and subsequent revisions.
- C. In the event of damage to existing facilities, including but not limited to: tanks, driveways, walks, pavement, buildings, pipes, conduits, valves, and electrical facilities then immediately make all repairs and replacements to an equal condition prior to the event.

1.03 QUALITY PERFORMANCE

- A. Comply with and perform all work in accordance with the requirements of local authorities and utility companies having jurisdiction.

1.04 SUBMITTALS

- A. The General Contractor shall submit the following:
 - 1. Computer system quotation for Engineer/Architect's approval prior to placing order.
 - a. The Engineer will provide the specifications for all components of the computer system, including model number and manufacturer, prior to the submission of this item.
 - b. Submit two quotations if so required by the Engineer/Architect.
 - 2. Catalog cuts of miscellaneous equipment and supplies if they are different from that specified.
- B. The Contractor shall also provide a listing of the companies providing specified services with telephone number and contact name. Provide references for each company when requested.

PART 2 - PRODUCTS

2.01 TEMPORARY LIGHT, ELECTRICITY & TELEPHONE/FAX (CONTRACT E)

- A. Provide 100-amp temporary power to the Engineer's trailer.

- B. The Electrical Contractor shall install two (2) new telephone services (telephone and fax/modem) for the exclusive use of the Engineer/Architect. The telephone services shall be provided to the Engineer's construction office located on the site as selected by the Engineer. The costs associated with providing the Engineer's telephone services shall be included in the price as-bid and is not eligible for payment out of any cash allowance.

2.02 SANITARY CONNECTION

- A. Each Contractor shall install an approved Suffolk County Department of Health Services on-site sanitary disposal system for their trailer, if required.
- B. The on-site system shall have a minimum capacity of 300 gallons per day.
- C. The restroom facilities provided, as part of the trailer shall be connected by a licensed plumber to the on-site sewage disposal system.

2.03 OFFICE OF PRIME CONTRACTORS

- A. The General, Plumbing and Electrical Contractors shall provide and maintain during the life of this contract separate and suitable offices at the site that shall be used as the Contractor's superintendent office.
- B. Provide adequate facilities for maintaining record documents, for holding small meetings and a telephone upon which calls may be received from Owner, Engineer/Architect and others. The telephone shall be equipped with a fax machine and an answering machine.
- C. Each Contractor shall install, maintain, and repair if necessary, temporary electric and telephone to their own field office.

2.04 MATERIALS, EQUIPMENT AND SERVICES FURNISHED TO THE OWNER BY THE GENERAL CONTRACTOR

- A. The General Contractor shall provide the following computer system, to be paid for out of the cash allowance stipulated herein, consisting of the following:
 - 1. Computer
 - 2. Printer
 - 3. Scanner
 - 4. Digital camera
 - 5. Tablet Computer
- B. The computer shall be furnished to the Owner within 30 days from the date the Engineer provided the computer system specifications.
- C. The General Contractor shall include the cash allowance as specified in Section 012100 in the lump sum bid for the computer and computer accessories to be provided under this paragraph.
 - 1. The initial equipment purchase shall be paid for out of this cash allowance.
 - 2. Paper for the printer shall not be eligible under this cash allowance.
 - 3. Printer replenishable supplies shall not be eligible under this cash allowance.
- D. The General Contractor shall also furnish the following equipment and services that shall not be eligible under any cash allowance. All items specified herein shall be new and remain the property of the Owner unless otherwise stated. The following shall be furnished:
 - 1. Two (2) Texas Instruments advanced scientific calculators equal to TI-60 or equal.
 - 2. Three (3) 23-gallon plastic wastepaper basket.
 - 3. One large set of triangles and one each of engineer's scale and architect's scale.

4. New 50-person industrial first aid station, OSHA approved, by Acme United or equal, order no. ACM-1403 (Huntington Business Products) or equal.
 5. Thermometer, with indoor and outdoor sensing bulbs, and high, low instantaneous reading, with magnetic reset function by Radio Shack or equal.
 6. Four (4) outdoor thermometers for recording curing temperatures of placed cold weather concrete (TAYLOR Model No. 6076-35)
 7. One (1) infrared temperature thermometer (EXTECH Model #42509)
 8. Two U.L. and F.M. approved fire extinguishers with a minimum rating of 4A-60B:C.
 9. Dry type color photocopier with all necessary equipment and supplies.
 - a. Model shall be capable of reproducing 8½" x 11", 8½" x 14" and 11" x 17" size papers.
 - b. Photocopier shall remain the property of the Contractor.
 - c. Manufacturer support through project completion.
 10. Standard manufacturer operating manuals for all equipment supplied.
 11. Three (3) 30" x 60" desks with 4 side drawers and a locking center drawer.
 12. Three (3) new swivel task chairs for use with desk equal to order no. SUP-12223643 by Superior Chair (Huntington Business Products).
 13. Four (4) guest chairs.
 14. Three drafting style stools for use with the drafting table.
 15. One (1) new rolling stand with top, Model No. 76MR/76TP from Plan Hold, catalog #27, or equal.
 16. Two (2) 48" x 60" reference tables.
 17. Five (5) folding chairs.
 18. One (2) drafting tables constructed in the office.
 19. One (1) new electronic professional labeler, model PT-2100 with AC adapter by Brother.
 - a. Supply ½ inch laminated, adhesive back TZ Series tape cartridges.
 - b. Eight (8) each of the following shall be furnished:
 - 1) black on white,
 - 2) red on white,
 - 3) white on black.
 20. One (1) adjustable, electric heavy-duty three hole punch, by Swingline or equal.
 21. Bottled water cooler with hot water that shall remain the property of the Contractor.
 22. Refrigerator that shall remain the property of the Contractor. Provide 10 cu.ft. unit with separate freezer section..
 23. K-cup style coffee maker that shall remain the property of the Owner.
 24. One (1) 3'x 5' cork bulletin board with wall mounting hardware.
 25. One (1) 3'x 5' white board with wall mounting hardware and dry erase marker set.
 26. One (1) four port switch wireless N router by Linksys and necessary cable for connection to office equipment.
 27. Fireproof Filing Cabinets - Provide three - four (4) drawer, legal size, fireproof filing cabinets with lock and keys.
 - a. Cabinets shall be Global Business Furniture., or equal.
 - b. Provide with legal size hangers and with 60 legal size-hanging folders all the same color.
- E. Janitorial Services - Provide janitorial services two (2) times each week. Thoroughly clean and dust entire office and leave in a condition satisfactory to Engineer. Provide this service through final completion.
- F. Bottled Water Service – Provide bottled water service on a continuous basis through final completion.
- G. Coffee Service – Provide coffee service including cups, stirrers, sugar, sugar substitute and non-dairy creamer on a continuous basis through final completion.

- H. Supplies - Provide on a continual basis through substantial completion and release of retainage, as required: Paper for computer printer, copier and calculator and all required supplies for facsimile and copier, two (2) desk staplers and staples, large and small paper clips, two (2) tape dispensers and tape rolls, two (2) desk scissors pairs and necessary replacement batteries for all equipment supplied.
- I. Ownership of Furnishings - All items to be provided by Contractor under this paragraph shall remain the property of the Owner unless otherwise stated.
- J. Internet Access Service - The General Contractor shall also pay for monthly Internet access fees at a cost not to exceed \$45.00 per month for the length of the contract up to the date of final completion.
 - 1. This cost shall be included in the price as bid and shall be billed directly to the General Contractor.
 - 2. The service provider shall be selected by the Engineer. The General Contractor shall arrange for the service.
 - 3. Internet access will be used by the Engineer and the Owner to send email to manufacturers, vendors, Engineer's home office, the Contractor's home office, other prime Contractors, regulatory agencies and the like.
 - 4. Cable high speed internet service shall be provided if available, the monthly service charge will be paid by the Contractor.
 - 5. The Contractor may use this service at the discretion of the Engineer. Only project related transmissions will be allowed.
 - 6. The Contractor may elect to combine the cable internet service with the required telephone service.
- K. All items specified herein are subject to the approval of the Engineer.
- L. Equipment shall be delivered to the site and turned over to the Engineer via a type written transmittal form.
- M. All equipment that is to remain the property of the Contractor shall be new.
 - 1. Equipment that is to remain the property of the Owner shall also be new and be provided in it's factory packaging, unopened until delivered to the Owner (Engineer).
 - 2. Maintenance of all supplied equipment shall be the Contractor's responsibility up to substantial completion.
- N. All items shall be delivered prior to the first application for payment, but no later than the day the Engineer's Trailer is delivered.

2.05 REMOVALS

- A. Remove all items provided under this Section except as otherwise specified.

PART 3 - EXECUTION

3.01 REMOVAL OF UTILITIES, FACILITIES AND CONTROLS

- A. Remove temporary above grade or buried utilities, equipment, facilities and materials.
- B. Remove underground installations to a minimum depth of 2 feet or as specified elsewhere.
- C. Regrade area to existing slope and elevation and restore the surface to its existing condition or to the condition shown on the Contract Drawings.

- D. The General Contractor shall inventory all equipment that has been turned back to the Contractor prior to agreeing to final payment.
- E. All equipment and furnishings that require assembly shall be assembled for the Owner's/Engineer's use by the Contractor.

END OF SECTION 015213

PART 1 - GENERAL

1.01 SUMMARY

- A. Furnish all labor, materials, equipment and appliances necessary to maintain both vehicular and pedestrian traffic, to protect the public from all damage to person and property, and to minimize inconveniences to the residences and businesses adjacent to the Contract area for the duration of the Contract in accordance with the specifications, the appropriate State, County or local agency, and in accordance with the Manual of Uniform Traffic Control Devices (MUTCD).
- B. When vehicular or pedestrian traffic, or both, are to be maintained over existing highways within the scope of the Project, plan and carry out the Work to provide for the safe and convenient passage of such traffic.
- C. Keep the portion of the Project that is open to traffic in such condition that traffic will be adequately accommodated. Provide and maintain in a safe condition temporary approaches or crossings and intersections, and access to trails, roads, streets, businesses, parking lots, residences, garages, and driveways. Notify the owners of adjoining properties at least 24 hours prior to the time planned to begin any work that will interfere with their normal passage. Special attention shall be given to student crossing areas. When students are present, all the Contractor's equipment shall reduce the moving speed and stop when children are crossing the street.
- D. A Police Officer shall be utilized when work is done at the intersection with heavily traveled roads.

1.02 SYSTEM DESCRIPTION

- A. Maintain traffic over a reasonably smooth travelway which shall be so marked by signs, delineations and/or other methods so that a person who has no knowledge of conditions can safely, and with a minimum of discomfort and inconvenience, ride, drive or walk over all or any portion of the roadway under construction. This shall include the maintenance of temporary pavement in accordance with the appropriate temporary pavement specifications.
- B. Maintenance and protection of traffic over roadways during construction is considered as important and necessary an item of work as is the actual construction itself. Conduct operations in a manner to ensure the safety of motorists, pedestrians and employees.
- C. Protect the user from damage to person and property by reason of any construction operation (i.e., painting, paving, blasting, tree work, demolition, etc.) by such protective screens, devices or methods as are approved by the appropriate governing agency.
- D. The Contractor shall be responsible for the maintenance within the limits of the Contract of the entire pavement, drainage facilities and other highway elements, both old and new, beginning on the date construction commences and ending on the date the Contract is officially accepted.
- E. Schedule work to minimize the amount of the old travelway that is destroyed or substantially damaged at any one time.
- F. Throughout the course of the work, the health and welfare of the people shall be provided for. At least one-week in advance of proposed work, ascertain the specific needs of individuals whose homes or places of business may be inaccessible for periods of time while required work is in progress. In all such cases, make all arrangements with health, safety and protective

agencies to ensure that emergency or incidental needs of seriously hampered people will be addressed. Roads shall not be closed to traffic completely during the work.

- G. Separate payment will not be made for the detours. All costs thereof shall be included in the price bid for the assorted items of maintenance of traffic.
- H. If the Contractor reroutes traffic over detours that are not specified to be established, obtain approval of the local authorities having jurisdiction. Make all necessary arrangements with such authorities regarding the establishment, maintenance and repair of such detours, the regulations and direction of traffic thereon, and signing. Adequate directional and detour signs, acceptable to the local authorities, shall be furnished by the Contractor and shall be erected by him at the locations where such authorities may direct. The cost of all work regarding such detours shall be borne by the Contractor.
- I. Maintain access to driveways at all times during work. This may require daily relocation of breakaway barricades, or provide provisions for temporary driveway access.

1.03 SUBMITTALS

- A. Submit a detailed maintenance and protection of traffic scheme and schedule to the appropriate local agency and secure written approval from that agency prior to beginning work. Submit a copy of the approved plan. The Traffic Control Plan shall provide for the treatment of conditions caused by and encountered during the work on the Project.
- B. The Traffic Control Plan shall be based on the requirements provided in the MUTCD and Section 619 of the New York State Standard Specifications. Conduct work in accordance with the provisions of the traffic control or detour plan. Deviate from the plan only if approved by the local agency or Engineer.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Materials used shall comply with the requirements for the assorted items or materials as established in the specifications or the Contract plans. Traffic control devices need not be new but shall be in good condition.
- B. Temporary signs, delineators, attenuators, barricades, lighting and other warning and guiding devices shall be as approved by the appropriate State, county and local agency, and shall remain the property of the Contractor.
- C. Cones shall be standard 28-inch height. The minimum diameter at the base shall be 12-inches. Cone color: orange.
- D. Thirty- to fifty-gallon drums or containers set on end may be used as delineators, provided they are orange with white reflectorized bands. Other markers or delineators may be circular or rectangular in shape, and shall be constructed of reflective sheeting having a minimum area of 20 square inches or reflective buttons having a minimum diameter of three inches.
- E. All materials, equipment and workmanship for electrical installations shall comply with the Standard Code Requirements. Electrical work shall be performed by licensed electricians. Obtain, supply and pay for all required electrical permits, certificates and energy. Make all necessary arrangements with the utility company for service points.
- F. Warning signs used in conjunction with work zone activities shall have an orange background with black legend.

- G. Provide Portable Variable-Message Signs with cellular communications for the duration of the project in accordance with Section 619-3.10 of the New York State Department of Transportation Standard Specifications, and latest addenda.

PART 3 - EXECUTION

3.01 PROTECTION

- A. General - provide a travelway suitable for maintaining a minimum of one lane of traffic in each direction. Keep travelway well-drained and reasonably smooth and hard at all times, and free of potholes, bumps, irregularities and depressions that hold or retain water.
- B. Prior to beginning work, place traffic control devices where shown on the submittal or directed by the roadway authority having jurisdiction.
- C. Erect barricades, detour signs, warning lights and other facilities approved by the State or appropriate agency at the beginning, end and for the entire length of any detours to adequately warn the traveling public that the road is closed and indicate the direction and route of the detour. Conduct operations to ensure a minimum of delay to traffic.
- D. Furnish, erect and maintain proper reflectorized signs, indicating to motorists the status of the work in or adjacent to the roadway.
- E. Traffic control devices shall also be placed to provide traffic control for personnel doing inspections, sampling, testing, or taking measurements required for the project.
- F. Keep signs clean, mounted at the indicated height and placed to be effective both day and night. Sign supports shall display the sign panel in a vertical position. Use signs, warnings, delineators and barricades to adequately inform the motorist of any unusual or unsafe condition and to safely and clearly guide driver through the Contract area. Place and light such signs, barricades, warnings or devices to give timely warning and permit the motorist to take the necessary action to traverse the area safely. Barricades and signs shall be lighted when and as required. Prevent or minimize glare from lights that may interfere with traffic and that may disturb residents.
- G. Delineate areas where there is a drop-off near the edge of the travel lanes and areas on which it is unsafe to travel. Where the drop-off is less than six inches and where soft or unsafe areas occur, an approved delineator shall be placed along the edge of the travelway at intervals of not more than 200 feet. Where the drop-off is greater than 18 inches, a continuous delineation consisting of a white board or band shall be used in addition to individual delineators.
- H. Keep signs, delineators and markers clean at all times.
- I. All reflective delineators or markers shall be yellow or amber in color, except those at entrances to commercial establishments, where a green reflective marker shall be placed on each side of the designated safe entrance to the establishment. Keep the entire entrance area between adjacent green markers safe and smooth for convenient ingress and egress. Mount delineators so that the bottom of the reflective unit is four feet above the elevation of the travelway. Any area judged by the roadway agency with jurisdiction to be particularly hazardous shall be marked by use of signal flashers with a large reflectorized orange lens in addition to the reflective markers.
- J. All signs, markers and other facilities shall indicate actual conditions existing and shall be moved, removed or changed immediately as conditions require. Details and types of signs, temporary barricades, timber curb and other devices are shown on Standard Structure Sheets, Manual of Uniform Traffic Control Devices, of the New York State Department of

Transportation. These are minimum requirements. The Contractor shall have an adequate quantity of each available for use as required. If conditions warrant additional signs may be required. In that event, they shall be consistent with the arrangements, material requirements and details of those shown on the Standard Structure Sheets.

- K. Lighted barricades shall be fully equipped with complete electrical facilities including fixtures, lamps, conduits, switches, cut-outs, boxes, cable and all other required equipment, appurtenances and connections to the service points designated by the utility company as necessary to install and light the barricades. Set and adjust time switches and other equipment as required to put the lighting system in satisfactory operation.
- L. Use lights during hours of low visibility to delineate traffic lanes and to guide traffic.
- M. Flashing arrowboards shall be positioned at the beginning of the taper for all mainline travel lane closures. One arrowboard shall be used for each taper. The arrowboards shall be mounted so that the base of the panel is at least seven (7) feet above the pavement surface. Arrowboards shall not be used for lane shifts where there is no reduction in the number of lanes.
- N. Whenever it is necessary to maintain traffic, employ a sufficient number of competent trained flag persons during the time traffic is to be maintained. Provide a sufficient number of competent flagpersons in areas where traffic is congested, particularly where construction equipment is operating. Workers shall wear hard-hats and safety vests in accordance with Section 107-05 of the Standard Specifications of the New York State Department of Transportation. Flagpersons shall wear orange hard-hats and safety vests while flagging. Flagpersons shall be equipped with stop/slow paddles and follow the procedures stipulated for flagpersons in the MUTCD. Flagpersons should be instructed in their duties. Flagpersons shall be in good physical condition including sight and hearing, mentally alert, and shall have a courteous but firm manner, neat appearance and a sense of responsibility for the safety of the public. Safety shirt, jacket and vest garments shall be reflectorized for nighttime operations with reflective material that shall be orange in color. When controlling traffic, traffic directors shall be equipped with STOP/SLOW paddles
- O. Employ flag persons to assist directing and channelizing traffic safely away from the construction operations. The Contractor shall bear all cost for flag persons. Incorporate in the price bid for the various items that require traffic control.
- P. If the Contractor fails to maintain roads in a safe and passable condition, the Owner shall have the right to order this work done by others at the cost and expense of the Contractor. The Contractor will be given notice of unsatisfactory condition of the submitted to the Contractor; the Owner may order this work done and deduct the cost of it from payment due under this Contract.
- Q. Equipment or machinery having crawler tracks or other treads that mar or damage pavements shall not move over or operate from newly constructed or existing pavements unless precautions are taken to prevent damage to the pavements.
- R. Damage to existing pavements within the limits of the Project or adjacent thereto, which in the opinion of the Engineer was caused by the Contractor's operations shall be repaired by the Contractor as directed by the Engineer, at the Contractor's expense or the repairs will be made by others and the cost of such repairs will be deducted from moneys due the Contractor.
- S. Any restrictions of required traffic lane widths or diversion of traffic at any time will be subject to the approval of the Engineer and Township.

- T. Except as necessary during actual working hours, and then only with the specific approval of the Engineer, the Contractor shall not occupy with his equipment, materials or personnel, any roadway or sidewalk area within or adjacent to the Project that is open to traffic.
- U. Work which closes or alters the use of existing roads and streets shall not be undertaken until adequate temporary or permanent provisions for traffic have been approved by the Engineer, the Chief of Police, and the Fire Prevention Bureau. The Traffic Safety Coordinator of the Board of Education shall be notified.
- V. Where it is necessary for pedestrians to cross, or walk within the limits of the Project, provide, maintain and remove temporary sidewalks as shown on the Plans or directed by the Engineer.
- W. Maintain all barricades, detour signs, warning lights and other facilities throughout the work. Do not remove barricades, detour signs, warning lights and other facilities until directed to by the governing road agency.

3.02 MAINTENANCE

- A. Furnish materials, labor and equipment at any time, day or night, to immediately repair, remedy and prevent washouts, formation of holes, ruts and depressions, sunken trenches and the destruction or sinking of temporary pavements. This applies when the work is underway and when the work is temporarily suspended for any period. Special attention shall be given to maintenance of a satisfactory travelway over weekends, holidays and during the winter season.
- B. Damage to any portion of the work occasioned by lack of adequate maintenance shall be repaired by the Contractor at his own expense.

3.03 ACCESS

- A. Construct and maintain at all times, where required, temporary bridges or bridging across pipe trenches, excavations, obstructions and newly laid pavements to provide adequate ingress and egress for pedestrian and vehicular traffic to and from private driveways, business and commercial establishments or for main street intersections and heavily traveled crossings.
- B. After the installation of all pipes and necessary appurtenances thereto, immediately backfill all trenches; compact same with the surface of the fill graded off; and install temporary pavement to permit the resumption of traffic without delay. The surfaces of all trenches shall be maintained continually by the Contractor to carry traffic smoothly, safely and without interruptions or slowdowns until the permanent pavement has been restored.

3.04 EXISTING SIGNS

- A. All existing highway signs and supports within the Contract limits are to remain under the control and jurisdiction of the Engineer, and shall be properly maintained for the duration of the Contract by the Contractor.
- B. When shown on the plans or ordered, remove existing signs; store, protect and keep them clean; and replace them in the Contract area designated by the Engineer. Signs not to be replaced shall be cleaned and delivered to the entity that installed the signs as directed by the Engineer.
- C. Signs or markers lost or damaged because of negligence on the part of the Contractor shall be replaced at the Contractor's expense.

END OF SECTION 015526

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Control of environmental pollution and damage that the Contractor must consider for air, water, and land resources in preparing a bid and while constructing the project. This Section includes management of site aesthetics, noise, solid and liquid waste and wastewater, and other pollutants that may be generated by the Contractor.
- B. Include all costs associated with environmental protection as specified herein and as specified in other Sections of these specifications in the total price bid.
- C. General Contractor shall provide and install erosion control measures as detailed on the contract plans. All Contractors shall abide by the intent of this section to prevent environmental pollution and damage through the course of their work.

1.02 DEFINITIONS

- A. Environmental pollution and damage is defined as the presence of chemical, physical, or biological elements or agents which:
 - 1. Adversely effect human health or welfare,
 - 2. Unfavorably alter ecological balances of importance to human life,
 - 3. Impact wetlands,
 - 4. Effect other species of importance to man, or;
 - 5. Degrade the utility of the environment for aesthetic, cultural, and historical purposes.
- B. Definitions of Pollutants:
 - 1. Sediment: Soil and other debris that has been eroded and transported by runoff water.
 - 2. Solid Waste: Rubbish, debris, garbage, and other discarded solid materials resulting from industrial, commercial, and agricultural operations and from community activities.
 - 3. Rubbish: Combustible and noncombustible wastes such as paper, boxes, glass and crockery, metal and lumber scrap, tin cans, and bones.
 - 4. Debris: Combustible and noncombustible wastes, such as leaves, tree trimmings, ashes, and waste materials resulting from construction or maintenance and repair work.
 - 5. Chemical Waste: Petroleum products, bituminous materials, salts, acids, alkalies, herbicides, pesticides, organic chemicals, and inorganic wastes.
- C. Sanitary Wastes:
 - 1. Sewage: Domestic sanitary sewage and human and animal waste.
 - 2. Garbage: Refuse and scraps resulting from preparation, cooking, dispensing, and consumption of food.

1.03 SUBMITTALS

- A. Submit the following under provisions of Section 013300:
 - 1. Environmental Protection Plan / Erosion Control Plan: After the Contract is awarded and prior to the commencement of the work, meet with the Engineer to discuss the proposed Environmental Protection Plan and to develop mutual understanding relative to details of environmental protection. Not more than twenty (20) days after the meeting, prepare and submit to the Engineer for approval, a written and/or graphic Environmental Protection Plan including, but not limited to, the following:
 - 2. Methods for protection of features to be preserved within authorized work areas including trees, shrubs, vines, grasses, ground cover, landscape features, air and water quality, fish and wildlife, soil, historical, and archeological and cultural resources.

3. Permits, licenses, and the location of the solid waste disposal area(s).
 4. Drawings showing locations of any proposed temporary excavations or embankments for haul roads, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials.
- B. Prepare an Erosion Control Plan describing and showing methods for erosion control that shall be employed by the Contractor to protect adjoining wetlands.
- C. Prepare a Work Area Plan showing the proposed activity in each portion of the area and identifying the areas of limited use or nonuse. Plan shall include measures for marking the limits of use areas. This plan may be incorporated within the Erosion Control Plan.
- D. Approval of the Contractor's Environmental Protection Plan / Erosion Control Plan will not relieve the Contractor of responsibility for adequate and continued control of pollutants and other environmental protection measures.

PART 2 – PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 PROTECTION OF ENVIRONMENTAL RESOURCES

- A. Protect environmental resources within the project boundaries and those affected outside the limits of permanent work during the entire period of this Contract. Confine activities to areas defined by the Contract Documents.
- B. Protection of Land Resources: Prior to construction, identify all land resources to be preserved within the work area. Do not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, top soil, and land forms without permission from the Engineer. Do not fasten or attach ropes, cables, or guys to trees for anchorage unless specifically authorized, or where special emergency use is permitted.
- C. Work Area Limits: Prior to any construction, mark the areas that require work to be performed under this Contract. Mark or fence isolated areas within the general work area that are to be saved and protected. Protect monuments, works of art, and markers before construction operations begin. Convey to all personnel the purpose of marking and protecting all necessary objects.
- D. Protection of Landscape: Protect trees, shrubs, vines, grasses, land forms, and other landscape features shown on the drawings to be preserved by marking, fencing, or using any other approved techniques.
1. Box and protect from damage existing trees and shrubs to remain on the construction site.
 2. Immediately repair all damage to existing trees and shrubs by trimming, cleaning, and painting with antiseptic tree paint.
 3. Do not store building materials or perform construction activities closer to existing trees or shrubs than the farthest extension of their limbs.
- E. Reduction of Exposure of Unprotected Erodible Soils: Plan and conduct earthwork to minimize the duration of exposure of unprotected soils. Clear areas in reasonably sized increments only as needed to use. Form earthwork to final grade as shown. Immediately protect side slopes and back slopes upon completion of rough grading.
1. Temporary Protection of Disturbed Areas: Construct diversion ditches and berms to retard and divert runoff from the construction site to protected wetlands areas as defined in the Clean Water Act and federal, state and local regulations

2. Erosion and Sedimentation Control Devices:
 - a. Construct or install all temporary and permanent erosion and sedimentation control features as shown or specified in the Contract Documents and as required by the Owner pursuant to direction of the regulatory authority.
 - b. Maintain temporary erosion and sediment control measures such as berms, dikes, drains, hay bales, erosion control fencing, sedimentation basins, grassing, and mulching, until permanent drainage and erosion control facilities are completed and operative.
 3. Manage borrow areas on and off Owner property to minimize erosion and to prevent sediment from entering nearby property, watercourses and local streets.
 4. Manage and control spoil areas on and off Owner property to limit spoil to areas shown on the Environmental Protection Plan and prevent erosion of soil or sediment from entering nearby property, watercourses or streets.
 5. Protect adjacent areas from degradation by temporary excavations and embankments.
- F. Handle and dispose of solid wastes in such a manner that will prevent contamination of the environment.
1. Place solid wastes (excluding clearing debris) in containers that are emptied on a regular schedule.
 2. Transport all solid waste off Owners' property and dispose of waste in compliance with Federal, State, and local requirements.
 3. Store chemical waste away from the work areas in corrosion resistant containers and dispose of waste in accordance with Federal, State, and local regulations.
 4. Handle discarded materials other than those included in the solid waste category as directed by the Engineer.
- G. Protection of Water Resources: Keep construction activities under surveillance, management, and control to avoid pollution of surface and ground waters and sewer systems. Implement management techniques to control water pollution by the listed construction activities that are included in this Contract.
- H. Washing and Curing Water: Do not allow wastewater directly derived from construction activities to enter water areas. Collect and place wastewater in retention ponds allowing the suspended material to settle, the pollutants to separate, or the water to evaporate.
- I. Control movement of materials and equipment during construction to prevent violation of water pollution control standards of the Federal, State, or local government.
- J. Monitor water areas affected by construction.
- K. Protection of Fish and Wildlife Resources:
1. Keep construction activities under surveillance, management, and control to minimize interference with, disturbance of, or damage to fish and wildlife.
- L. Protection of Air Resources: Keep construction activities under surveillance, management, and control to minimize pollution of air resources.
1. Burning is not permitted on the job site. Keep activities, equipment, processes, and work operated or performed, in strict accordance with the State and Federal emission and performance laws and standards.
 2. Maintain ambient air quality standards set by the Environmental Protection Agency and State, for those construction operations and activities specified.
- M. Particulates: Control dust particles, aerosols, and gaseous by-products from all construction activities, processing, and preparation of materials (such as from asphaltic batch plants) at all times, including weekends, holidays, and hours when work is not in progress.

- N. Particulates Control: Maintain all excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, spoil areas, borrow areas, and all other work areas within or outside the project boundaries free from particulates which would cause a hazard or a nuisance. Sprinkle, chemical treatment of an approved type, light bituminous treatment, baghouse, scrubbers, electrostatic precipitators, or other methods are permitted to control particulates in the work area.
- O. Hydrocarbons and Carbon Monoxide: Control monoxide emissions from equipment to Federal and State allowable limits.
- P. Odors: Control odors of construction activities and prevent obnoxious odors from occurring.
- Q. Reduction of Noise: Minimize noise using every action possible. Perform noise-producing work in less sensitive hours of the day or week as directed by the Engineer. Maintain noise-produced work at or below the decibel levels and within the time periods specified in accordance with OSHA and local ordinances, whichever is more restrictive.
 - 1. Perform construction activities involving repetitive, high-level impact noise only between 8:00 a.m. and 5:00 p.m unless otherwise permitted by local ordinance or by the Engineer.
 - 2. Repetitive impact noise on the property shall not exceed the following dB limitations:
 - 3. Provide sound-deadening devices on equipment and take noise abatement measures that are necessary to comply with the requirements of this Contract, consisting of, but not limited to, the following:
 - a. Use shields or other physical barriers to restrict noise transmission.
 - b. Provide soundproof housings or enclosures for noise-producing machinery.
 - c. Use efficient silencers on equipment air intakes.
 - d. Use and maintain efficient intake and exhaust mufflers on internal combustion engines.
 - e. Line hoppers and storage bins with sound deadening material.
 - f. Conduct truck loading, unloading, and hauling operations so that noise is kept to a minimum.

END OF SECTION 015719

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. The operations, equipment, and materials necessary to maintain wastewater flow at all times during the work.
 - 1. Conduct operations in such a manner as to insure optimum health and safety.
 - 2. Provide uninterrupted flow conveyance around work locations.
 - a. Maintain traffic on roadways and access to driveways and parking areas during the bypassing operations.
 - b. Provide for diversion of flow at an upstream manhole by plugging if necessary, and direct the flow into an existing downstream manhole or adjacent system.
 - c. Bypass system shall be sufficient capacity to handle existing flow plus additional flow that may occur during rainfall.
 - d. Sewer surcharging will not be allowed.
 - e. Maintain temporary bypass system in operation until service can be completely restored.
- B. Pump raw sewage back into the sanitary system.
- C. Be completely responsible for the violation of any law, or the creation of a danger to public health, due to laxity in the diversion of flows.

1.02 SYSTEM DESCRIPTION

- A. Contracts G & P shall provide temporary bypass pumping systems as needed to implement the work of their respective contracts.
- B. Each temporary pump shall be capable of conveying the design operating flow rate.
 - 1. Refer to the hydraulic profile for design flow information.
 - 2. The flow varies throughout the day.
 - 3. The lowest flow typically occurs between the hours of 1:00 a.m. and 6:00 a.m.
 - 4. Flow will be higher during precipitation.
- C. Provide pump control elements such as floats to prevent surcharging of wastewater into the piping system and overflow from structures.
- D. Pumps handling raw and partially treated wastewater shall be capable of passing a sphere of at least 3-inches in diameter.
- E. Pump suction and discharge openings shall be at least 4-inches in diameter.
- F. Maintain sanitary conditions to allow work to be performed. Protect equipment, suction piping and discharge piping main from inclement weather, freezing conditions and traffic.
- G. Prevent leakage and spillage of wastewater.
- H. Provide walkways over obstructions on sidewalks to maintain pedestrian traffic.
- I. Provide ramps or below grade piping to maintain vehicular traffic.
- J. Provide alarm system to indicate increase above normal operating liquid level in wet well / tank/ sewer lines.

- K. Electrical system and components in sewers and raw wastewater wet wells shall comply with the National Electric Code requirements for Class I, Group D, Division 1 locations.
- L. Noise levels shall not exceed the levels indicated in Section 015719.
- M. Provide spare suction and discharge piping at the project site.
- N. For temporary sanitary wastewater conveyance systems located in roadways, provide signs and traffic controls in accordance with the State Manual of Uniform Traffic Control Devices.
- O. Obtain confined space entry permit as needed, from Owner.

1.03 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Provide a written plan of the proposed temporary sanitary wastewater conveyance system to the Engineer at least two weeks prior to the need for the system.
 - 1. The written plan shall include number size and type of pumps, material, diameter and proposed route of piping and/or hoses, control system, back-up and spare equipment, and estimated duration of bypass operation.
 - 2. Provide a schematic diagram of the system if so requested by the Engineer.
 - 3. Provide a written emergency response plan that indicates the action to be taken by the Contractor should there be a failure of a component of the wastewater conveyance system.

PART 2 - PRODUCTS

2.01 PRODUCTS

- A. Provide close coupled centrifugal pump with vacuum priming compressor mounted to a diesel engine or electric motor on skid base or two-wheeled highway trailer, or submersible pump.
- B. Provide solids handling ball type check valve with flexible rubber seat and quick release access feature with centrifugal pumps.
- C. Provide compact unit mounted on skid base or two-wheeled highway trailer. Either option shall include overnight running fuel tank.
- D. Engines shall be equipped with critical silencers and be housed to minimize noise during operation.
- E. Provide suction hose from source to pump.
- F. Provide plugs in the upstream manholes/tanks to prevent flow from the upstream sanitary sewer/tanks through the sewers/pipelines in the work location.
- G. Road Crossings: Fabricated of galvanized steel and engineered to provide minimal head-loss when used on pumping projects. Road crossing shall be manufactured to remain in compliance with federal bridge laws of 20,000 lbs. single axle. Entrance and exit ramps shall be sloped. Piping connections shall be flanged. Vehicle width clearance 12 feet. Tie down at each corner out of path of vehicle travel. Manufacturer: Rain for Rent.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Provide walkways over obstructions on sidewalks to maintain pedestrian traffic.
- B. Provide drivable ramp over obstructions to maintain vehicular traffic.
- C. Provide alarm system to indicate increase above normal operating liquid level in wet well.
- D. Test temporary conveyance system to the satisfaction of the Engineer prior to usage.
- E. Provide full-time personnel to continuously operate the bypass system to assure continuous wastewater conveyance for entire time use of the system is required.

3.02 PLUGGING AND BLOCKING

- A. Insert a sewer line plug into the line at a manhole upstream of the sewer section in which work is to be performed.
 - 1. Design of the plug shall allow all or any portion of the sewage flow to be released in an emergency.
 - 2. Remove plug and restore normal flow following the specified rehabilitation work.
- B. Flow Control Precautions:
 - 1. When flow in a sewer line is plugged, block or bypassed, take sufficient precautions to protect sewer lines from damage due to surcharging.
 - 2. Take precautions to insure that sewage flow control operations do not cause flooding or damage to adjacent property.
 - 3. Repair any damage due to lack of flow control at no cost to the Owner.

3.03 PUMPING AND BYPASSING

- A. Supply necessary pumps, conduits and other equipment to divert the flow of sewage around the location in which work is to be performed.
- B. Furnish necessary labor, supervision and materials to set up and operate the pumping and bypass system.
- C. Be responsible for sewage spills and sewage back-ups into buildings plus costs and fines associated with the clean-up of sewage spills and sewage back-ups.

3.04 SAFETY REQUIREMENTS

- A. Be familiar with Safe Working Requirements in confined spaces.
- B. Perform gas-free testing prior to entering each manhole, and periodically throughout the workday.
- C. If dangerous, hazardous or explosive gases are detected, remove these by forced ventilation to a level permitting entry in accordance with OSHA regulations.

END OF SECTION 015720

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Project sign

1.02 REFERENCES

- A. Lumber Standard: American Softwood Lumber Standard; U.S. Department of Commerce Product Standard PS1.
- B. Softwood Plywood Standard: Construction and Industrial; U.S. Department of Commerce Product Standard PS1.
- C. New York State Department of Transportation Standard Specifications.

1.03 SUBMITTALS

- A. Submit under provision of Section 013300.
- B. Submit proof sheet of sign.
- C. Color samples: match specified colors.

1.04 QUALITY ASSURANCE

- A. Painter's Qualifications: Sign shall be prepared by a professional sign painter.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Framing and Posts: Standard Grade Douglas Fir, Hem-Fir, White Pine or Southern Pine: S4S; preservative treated.
- B. Sign: Aluminum blank sign board with vinyl sheeting. Panel material shall be either Aluminum Alloy 6061-T6, 5154-H38 or 5052-H38 and shall conform to the requirements of New York State Department of Transportation Specification 715-04.
- C. Type: Caslon 540 with the exception of the logotype.
- D. Select finishes to withstand weathering, fading and chipping for duration of sign placement.

2.02 FABRICATION

- A. Sign and structure shall be designed to withstand 100 mile per hour wind velocity.
- B. Prepare surface of aluminum sign board before application of vinyl sheeting. The board shall not be handled between the cleaning operation and application of sheeting except by device or clean canvas gloves.
- C. Cover aluminum blanks with vinyl sheeting to achieve background color.
- D. Apply sheeting to the aluminum panel by the vacuum application process or mechanical process in accordance with the recommendations of the sheeting manufacturer.

- E. Silk screen copy and logo on this surface.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Sign shall be in place from the start of construction until 90 days after substantial completion. The signs shall be removed and remain the property of the Contractor. Fill post holes when sign is removed.
- B. Set posts plumb, 4 feet minimum into the ground.
- C. Embed posts in concrete and compact.
- D. Fasten sign in a level position securely to posts with heavy-duty stainless steel fasteners. Provide at least three (3) equally spaced lag bolts into each post.
- E. Provide bracing between posts.

3.02 PROTECTION

- A. Maintain the sign clean, plumb and level.
- B. Repair deterioration and damage.
- C. When directed after project closeout, remove sign from site.

END OF SECTION 015813

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. This Section includes the general requirements for products that are to be furnished, installed, or otherwise incorporated into the project.

1.02 QUALITY ASSURANCE APPLIES TO ALL PRODUCTS

- A. In addition to the Contractor's warranties and guarantees on materials and equipment required under the General Conditions of the Contract and the Technical Specifications contained hereinafter, the Contractor shall also be responsible for all materials, equipment, and products that have or is planned to be incorporated into the work.
 - 1. The Contractor shall be responsible for the finished work and that it accurately and completely complies with these Contract Documents.
 - 2. The Contractor shall be responsible for work performed by subcontractors, equipment suppliers, and material vendors.
 - 3. The Contractor shall be satisfied as to the product's performance before it is ordered for installation. At the Contractor's option, he/she shall have tested each product to determine compliance with these specifications.
- B. The Engineer may check all or any portion of the work and the Contractor shall afford all necessary assistance to the Engineer/Architect in carrying out such checks.
 - 1. Such checking by the Engineer/Architect shall not relieve the Contractor of any responsibilities for the accuracy or completeness of the work.
 - 2. Such checking is a courtesy service being provided by the Owner and does not relieve the Contractor of his/her responsibilities under this Construction Contract.
- C. If witnessed shop tests or inspections are required at the point of manufacture, the Contractor shall keep the Engineer/Architect advised as to the progress of the work to allow inspection at the proper time and place. Provide at least two (2) weeks advance notice before scheduled shop tests.
- D. Should a dispute arise as to the quality of workmanship, equipment or material performance, then the final decision regarding acceptability with these Contract Documents shall be that of the Owner.
- E. At the request of the Engineer/Architect, the Contractor shall promptly provide the services of a competent representative of the manufacturer at the project site, fully equipped and prepared to answer questions, perform tests, make adjustments and to prove compliance with the Contract Documents free of all additional charges. Proof of compliance shall be the responsibility of the Contractor, and such special visits to the project site by the manufacturer shall not be eligible under any cash allowances or stipulated man-hours necessary to startup the system and/or train the Owner as may be specified in the Technical Specifications.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- A. Equipment shall have been in successful regular operation under comparable conditions for a period of at least five (5) years.
 - 1. This time requirement does not apply when the manufacturer posts an Owner/Engineer acceptable Performance Bond or Letter of Credit for the duration of the time period that will guarantee replacement of the equipment in the event of failure.
 - 2. The bond shall be in a form that is acceptable to the Owner's legal council.

- B. The Owner reserves the right to reject any material or equipment manufacturer who, although he appears to be qualified and meets the technical requirements, does not provide satisfactory evidence indicating adequate and prompt post-installation repair and maintenance service, as required to suit the operational requirements of the Owner.
- C. Whenever it is required that the Contractor furnish materials or manufactured articles or shall do work for which no detailed specifications are set forth, the materials or manufactured articles shall be of the best grade in quality and workmanship obtainable on the market from firms of established good reputation, or, if not ordinarily carried in stock, shall conform to the usual standards for first-class materials or articles of the kind required.
- D. Perform work in full conformity and harmony with the intent to secure the best standard of construction and equipment of the work as a whole or in part.
- E. Items of any one type of material or equipment shall be the product of a single manufacturer.
 - 1. For ease of the Owner in maintaining and obtaining service for equipment and for obtaining spare parts from as few places as possible, to the maximum extent possible, use equipment of a single manufacturer.
 - 2. The Engineer reserves the right to reject any equipment from various manufacturers if suitable equipment can be secured from fewer manufacturers and to require that source of materials be unified to the maximum extent possible.
- F. Substitute equipment shall not be fabricated nor installed until after written decision to accept request is received from the Engineer/Architect.

2.02 CONTROL PANELS, MCC'S AND SWITCHBOARDS

- A. All control panels, motor control centers, and switchboards shall be fabricated with pilot lights, selector switches, PLC, graphics display panels, elapsed time meters and other components that shall match.
 - 1. This does not require that all components be one manufacturer, but does require that the like components be of the same manufacturer.
 - 2. The Contractor shall coordinate the shop drawing submittals to indicate that all components have been selected on this basis.
 - 3. This requires the Contractor to advise each control panel supplier that product options are limited in this regard.
- B. Replacement of unlike products delivered to the job site shall be the responsibility of the Contractor.
- C. All costs associated with the replacement shall be borne by the Contractor.

2.03 NAMEPLATES

- A. Each unit of equipment shall have the manufacturer's name or trademark on a stainless steel nameplate securely affixed in a conspicuous place.
- B. The manufacturer's name or trademark may be cast integrally with stamp, or otherwise permanently marked upon the item of equipment.
- C. Such other information as the manufacturer may consider necessary for complete identification shall be shown on the nameplate.

2.04 FABRICATIONS

- A. Insofar as possible, shop prefabricate all items complete and ready for installation.

- B. Accurately fabricate all items to the details shown on the Drawings and on the shop drawings found in compliance with the Contract Documents.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Prior to work under any Section, carefully inspect the work of all other prime trades and verify that all such work is in conformance with the Contract Documents and is complete to the point where the work under that Section may properly commence.
- B. Avoid the need to remove and replace work and to avoid unnecessary cutting and patching.
- C. Inspect all surfaces to be sure that they have been properly prepared before applying new work to such surfaces.
- D. Verify that all work can be installed in strict accordance with the drawings and the approved shop drawings. Immediately report discrepancies to Engineer/Architect.
- E. Do not proceed with the work under any Section until these conditions are obtained.

3.02 INSTALLATION

- A. Furnish and install materials and equipment in accordance with the instructions of the applicable manufacturer, fabricator or processors, except as otherwise provided in the Contract Documents.
- B. All work shall be done in a workmanlike manner and set to proper lines and grades. The work shall be square, plumb and/or level as the case may be.
- C. Where performance criteria are specified, do all work necessary to attain the required end results.

3.03 FIELD QUALITY CONTROL

- A. Neither observations by Engineer/Architect nor inspections, tests or approvals by other persons shall relieve the Contractor from his obligations to perform the work in accordance with the requirements of the Contract Documents.
- B. If the Contract Documents, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction require any work to specifically be inspected, tested or approved by some public body, the Contractor shall assume full responsibility therefore, pay all costs in connection therewith, and furnish the Engineer/Architect with the required certificates of inspection, testing or approval.
- C. The Owner reserves the right to independently perform laboratory tests on random samples of material or performance tests on equipment delivered to the site.
 - 1. These tests, if made, will be conducted in accordance with the appropriate referenced standards or specification requirements.
 - 2. The entire shipment represented by a given sample, samples or piece of equipment may be rejected on the basis of the failure of samples or pieces of equipment to meet specified test requirements.
 - 3. All rejected materials or equipment shall be removed from the site, whether stored or installed in the work, and the required replacements shall be made, all at no additional cost to Owner.

3.04 ADJUST AND CLEAN

- A. Upon the completion of installations, and as a condition of its acceptance, visually inspect all work, adjust all components for proper alignment and touch-up abrasions and scratches to make them completely invisible.
- B. Thoroughly examine all materials and equipment with protective or decorative finishes for defects and damage prior to being covered.
 - 1. In the case of buried items of work, restore protective surface covers so as to conform to the Contract Documents prior to being backfilled, buried or embedded, as the case may be.
 - 2. In the case of exposed items of work, for which a decorative finish is required, all scratches, discoloration's, unmatched colors, disfigurations and damages shall be repaired and touched-up so as to provide a neat, clean finish, and be uniform in color.

3.05 UNCOVERING WORK

- A. Unless otherwise specified or directed by Engineer/Architect, no work shall be covered until it has been observed, tested, photographed, measured, and authorized to be covered by Engineer.
- B. Tie distances to above ground physical structures as reference points to all underground utilities, conduits, pits, manholes, valves, and pipelines shall be obtained by the Contractor prior to covering the work. Immediately comply with the Engineer/Architect's direction to uncover the work if tie distances were not obtained.
- C. If any work has been covered with Engineer/Architect's consent and Engineer/Architect considers it necessary or advisable that covered work be observed or tested, the Contractor, at Engineer's request, shall uncover, expose or otherwise make available for observation, or testing as Engineer may require, that portion of the work in question, furnishing all necessary labor, material and equipment.
 - 1. If it is found that such work is defective, the Contractor shall bear all the expenses of such uncovering, exposure, observation, and testing of satisfactory reconstruction, including compensation for additional engineering services and an appropriate deductive change order shall be issued.
 - 2. If, however, such work is not found to be defective, the Contractor shall be allowed an increase in the contract price or an extension of the contract time, or both, directly attributable to such uncovering, exposure, observation, testing and reconstruction if he makes a claim therefore as provided in the General Conditions.

3.06 DEFECTIVE WORK

- A. The repair, removal, replacement and correction of defective work is a part of this Contract and shall be promptly performed in accordance with the requirements set forth in the General Conditions or other portions of the Contract Documents. All costs in connection with the correction of defective work shall be borne by the Contractor.
- B. Products that fail to maintain the performance or other salient requirements of the Contract Documents, shows undue wear, or other deleterious effects during the maintenance period, shall be considered defective.

END OF SECTION 016100

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. The Section includes the transportation, handling, storage and protection of products that are to be incorporated into the work.
- B. The procedures for turning equipment over to the Owner for installation by others is also included herein.

1.02 GENERAL

- A. Items shall be delivered as complete assemblies direct from the manufacturer with all internal wiring, piping, valving, and control devices intact except where partial disassembly is required by transportation regulations, protection of components, or where physical constraints may exist or be created for the setting of the item.
- B. Coordinate the disassembly and reassembly requirements with the manufacturer. Determine the need and extent of reassembly prior to bid.
 - 1. All labor, material and equipment costs associated with the disassembly and reassembly of the product shall be included in the Contract Price.
 - 2. Where reassembly of equipment is necessary, then the manufacturer shall provide reassembly instruction at the project site.
 - 3. A technician shall be present during the entire reassembly procedure and the manufacturer shall certify, in writing, that the unit was reassembled properly in accordance with instructions provided by the manufacturer and that all as-specified warranties remain in effect.
 - 4. The manufacturer's reassembly inspection time shall be in addition to the field service time specified and shall be included in the Contract Price. This time shall not be eligible for payment under any cash allowance item.
- C. In the case where equipment is to be installed by others, then the supplying contractor shall be responsible for its reassembly. If reassembly is necessary and the unit(s) are to be set inside an enclosure or building, reassemble the equipment inside said enclosure. The equipment once reassembled shall be turned over to the installing contractor as specified below.

1.03 PACKING

- A. Transport products in containers, crates, boxes or similar means such that the products are protected against damage that may occur during transportation.
- B. All parts shall be packaged separately or in container where parts of similar systems are grouped.
- C. Part numbers shall be indicated on the individual part. Use indelible ink to mark part numbers.
- D. All equipment shipments shall be included with a parts list showing a description (name) of the part and the manufacturer's part number.
 - 1. The parts list shall be shipped in a plastic zippered envelope with the words "Parts List" lettered on it in indelible ink.
 - 2. The parts list shall be placed inside the shipping container so that it is on the top of the contents.
- E. Equipment shall be shipped with storage, handling and installation instructions.

1. The Engineer reserves the right to withhold payment for equipment delivered to the site until such time as the storage, handling and installation instructions are supplied by the manufacturer.
 2. In the case where operation and maintenance manuals have been provided by the manufacturer, which includes the installation instructions, then the installation instructions shall also be included with the equipment shipment.
- F. All control panels shall be wood crated.
1. All sides of the control panel shall be covered with 3/4" plywood.
 2. The control panel number or name shall be printed on all sides of the crate in 1' high black lettering.
 3. The manufacturer's name, Contractor's name and project name shall also be printed on the front of the crate.
 4. All control panels and centers shall be packaged with three (3) copies of the approved wiring diagram inside the control panel enclosure in a separate plan holder attached to the inside door. The words "APPROVED FOR CONSTRUCTION" shall be indicated on each page of the wiring diagram.
- G. Delicate instruments and devices, reagents, chemicals, and glassware shall be shipped in packaging normally provided by the manufacturer.
- H. The Contractor shall require the manufacturer to be responsible for the proper packing of all products.

1.04 SHIPPING AND DELIVERY

- A. Product deliveries shall be accompanied with a bill of lading indicating the place of origination and the Contractor's purchase order number.
- B. Inspect shipments immediately upon delivery, to assure compliance with requirements of the Contract Documents and those products are undamaged.
- C. Promptly remove damaged material and unsuitable items from the job site.
- D. Provide equipment and personnel to handle products by methods to prevent soiling; disfigurement or damage.

1.05 STORAGE

- A. Store sensitive products and all spare parts in weather tight, climate controlled enclosures in an environment favorable to product.
- B. Store and protect products in accordance with the manufacturer's instructions.
- C. All other products that are to be installed underground or products such as pipe, valves, and fittings shall be stored outdoors but shall be blocked off the ground and covered with impervious sheet coverings.
- D. Store fabricated products above the ground on blocking or skids.
- E. Store loose granular materials in well-drained areas on solid surfaces to prevent mixing with foreign matter.
- F. Provide adequate ventilation to avoid condensation.

- G. In accordance with manufacturer's instructions protect bearings, couplings, shafts, rotating components, and assemblies. Protection of said equipment shall be continuous until the time the equipment is placed into permanent service.
- H. 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.
- I. Do not store volatile liquids in any building on site.
- J. Storage of products shall be the responsibility of the supplying contractor. The installing contractor shall take all necessary precautions to protect the equipment being furnished by others.
- K. Store with seals and labels intact and legible.

1.06 EQUIPMENT INSTALLED BY OTHERS

- A. All products, except products noted on the Drawings or specified, shall be furnished and installed under this Contract.
 - 1. Only noted or specified products shall be furnished under this Contract for installation by others.
 - 2. If it is not noted on the Drawings or specified, then the product shall be furnished and installed under the Contract.
- B. The Contractor shall furnish these products to the Owner. These products shall be stored as specified above.
- C. The Owner will then advise the installing contractor that the product(s) are ready for installation.
 - 1. In the case where the product is stored in a proper enclosure, but not stored inside the building to be constructed under this project, then the installing contractor shall move the product into the building to a location adjacent to the final location shown on the Drawings.
 - 2. In all cases, the installing contractor shall be responsible for moving from storage, uncrating, anchoring, mounting and installing the product as required by the Contract Documents.
- D. The Contractor and installing contractor(s) shall be present at the time the equipment is turned over to the Owner. Immediately thereafter, the Owner will turn the product over to the installing contractor for installation.
- E. The Owner, Contractor, Architect/Engineer and the installing contractor shall inspect the condition of the product at this time.
 - 1. Any defects in the product will be noted and the Contractor will be advised to make all repairs immediately.
 - 2. The installing contractor shall still be required to install the product if the damage is deemed cosmetic by the Architect/Engineer.
 - 3. The manufacturer's installation instructions or wiring diagram shall be turned over to the installing contractor at this time by the Contractor.
 - 4. Any damage occurring to the product during moving, setting and mounting the unit(s) shall be the responsibility of the installing contractor.
 - 5. The Contractor is advised to take photographs to document the condition prior to it being turned over to the installing contractor.
 - 6. The installing contractor is advised to take photographs to document the condition prior to its acceptance.
- F. The supplied unit(s) remain the property of the Contractor until final acceptance of the work.

- G. Any damage caused to the unit(s) due to improper installation, workmanship, and non-compliance with the manufacturer's written installation instructions shall be the responsibility of the contractor who caused said damage. The burden of proof shall rest with the supplying Contractor.
- H. In the event the Contractor discovers misuse, abuse or improper installation of the unit(s) by the installing contractor, then he shall immediately notify the Architect/Engineer in writing. The Architect/Engineer will investigate the accusations and make a determination. The Architect/Engineer's determination shall be binding and agreed to by both parties.
- I. If the Architect/Engineer's determination substantiates the accusations of the Contractor, then the Contractor shall install the unit(s), the costs for which will be paid for as extra work. All costs associated with the extra work change order, including engineering and attorney fees of the Owner and Contractor will be deducted from money due the installing contractor.

1.07 PROTECTION OF WORK

- A. The Contractor shall protect the installed work. All costs for protection shall be borne by the Contractor. Provide coverings as necessary to protect installed products from damage, from traffic and subsequent construction operations. Remove when no longer needed.
- B. Cover and protect equipment from dust, moisture or physical damage. Protect finished floor surfaces prior to allowing equipment or materials to be moved over such surfaces. Maintain finished surfaces clean, unmarred and suitably protected until accepted by the Owner.
- C. Additional time required to secure replacements and to make repairs will not be considered by the Architect/Engineer to justify any extension in the Contract Time of Completion. In the event of the damage, promptly make replacement and repairs to the approval of the Engineer at no additional costs.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 016500

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Cleaning during the progress of the work
- B. Cleaning prior to final payment

1.02 SCHEDULING

- A. Sequence, schedule, and coordinate final cleaning work with the final cleaning work to be performed by other prime contractors.
- B. Perform final cleaning at least five (5) days before the date set for ceremonies to dedicate the new facility wherein the Owner will provide tours to the general public and/or dignitaries. The site shall be clean, organized, and totally free of construction debris, tools, and equipment.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Cleaning materials shall be appropriate to the surface and materials being cleaned.
- B. Provide pads to protect finished surfaces from cleaning materials.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Post signs to advise building occupants if wet and/or slippery floor conditions exist during cleaning operations.

3.02 PROGRESS CLEANING

- A. Keep all buildings, enclosures, and confined areas where work is being performed under the Contract free from unattended combustible materials.
- B. Remove rust spots as they develop.

3.03 FINAL CLEANING

- A. Remove dust, dirt, grease, stains, paint drips and runs, plastic, labels, tape, glue, rope, and other foreign materials from visible interior and exterior surfaces.
- B. Do not move dust from spot to spot. Remove directly from the surface on which it lies by the most effective mean such as appropriately treated dusting cloths or vacuum tools. When doing high cleaning, do not allow dust to fall from high areas onto furniture and equipment below.
- C. Dismantle and remove all temporary structures, scaffolding, fencing, and equipment. Remove waste materials, rubbish, lumber, block, tools, machinery, and surplus materials.
- D. Perform the following prior to final payment:
 - 1. Broom clean all exterior concrete surfaces and vacuum clean all interior concrete surfaces.
 - 2. Dust and spot clean painted and vinyl covered walls.

3. Clean and polish all unpainted metal on doors such as trim, hardware, kickplates and doorknobs.
4. Vacuum clean carpets and mats.
5. Vacuum clean acoustic ceilings.
6. Repair, patch, and touch-up marred surfaces to specified finish and to match adjacent surfaces.
7. Remove foreign material from brick.
8. Replace all broken and scratched glass and mirrors.
9. Replace all damaged insect screens.
10. Wash and clean interior and exterior window surfaces. All glass shall be clean and free of dirt, grime, streaks and excessive moisture. Wipe drippings and other marks from windowsills, sashes and woodwork. Do not use windowsills in lieu of ladders.
11. Polish bright metal by damp wiping and drying with a suitable cloth. If a polished appearance is not thereby produced, apply appropriate metal polish.
12. Clean and polish all stainless steel surfaces, including control panels supplied under this Contract.
13. Clean furniture and equipment in accordance with manufacturers instructions.
14. Clean all paved roads, lots and drives which were paved as work under this Contract and all existing paved surfaces using a mechanical street cleaner.
15. Repair or repaint damaged pavement markings.
16. Vacuum and clean with a damp cloth light fixtures, including glass and plastic lenses, ceiling and wall mounted lights, cover panels, side panels, louvers, fixture frames and lamps.
17. Clean supply vents and exhaust grilles. Clean gutters and downspouts.
18. Remove all rust spots and stains from new and pre-existing concrete, painted surfaces, and all other surfaces.
19. Clean and polish all new toilet facilities constructed under this project.
20. Clean and disinfect all pre-existing toilet facilities that were entered upon and used by the Contractor during the project.
21. Replace damaged existing toilet fixtures, such as sinks, toilet bowls, urinals, and mirrors, with in-kind units if so directed by the Architect/Engineer.
22. Wash all existing floors that were in any way impacted by the construction operations.
23. Rake clean landscaped surfaces. Final mow all areas grassed and sodded during the work.
24. Inspect interior and exterior surfaces, and all work areas, to verify that the entire work is clean and ready for use by the Owner. The project will not be considered substantially complete until all final cleaning has been performed.
25. Polish all new handrail installed as work of this contract with a commercially available aluminum cleaner recommended by the railing manufacturer.
26. Clean dirt that has accumulated between grating and grating angles/supports.
27. Vacuum the inside of all control panels provided under this Contract after the panel has been wired.
28. Pressure wash curbs, walks and concrete platforms on new and existing process tankage.
29. Pressure wash all gravity thickener sumps using hot water and cleaner. Remove all stains on concrete, grating, and surrounding surfaces caused by sludge. Clean sump even if the Owner has been operating the gravity thickener for any period after the date of Substantial Completion.
30. Fill in all holes in concrete that remain after temporary handrail is removed. Non-shrink grout shall be used.
31. Thoroughly clean all pits, galleries, manholes, pipes, channels, tanks, wells and all structures entered upon.
32. Broom clean and hot pressure wash all pipe trenches.

END OF SECTION 017423

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Work of this Section includes the following:
 - 1. Starting systems
 - 2. Testing, adjusting, and balancing
 - 3. Updating of manufacturer's operations and maintenance manuals and wiring diagrams
- B. Work of this Section also includes stipulated man-hours that shall be provided by the Prime Electrical Construction Contractor for startup participation of equipment and systems.

1.02 STARTING SYSTEMS

- A. Each Contractor shall coordinate, schedule, and sequence the start-up of various equipment and systems.
- B. Where the start-up of a system or piece of equipment is dependent upon the start-up of other system(s) or equipment, then the Contractor shall schedule and sequence the start-ups to coincide.
- C. Notify the Engineer/Architect at least 14 calendar days prior to the start-up of each item or system so that he can schedule the startup with the Owner, utilities, and other Prime Contractors.
- D. Verify that each piece of equipment or system has been checked for proper:
 - 1. lubrication,
 - 2. drive rotation,
 - 3. belt tension,
 - 4. motor starter heater size,
 - 5. fuse size,
 - 6. water pressures,
 - 7. terminal connections,
 - 8. control sequence
 - 9. For conditions which may cause damage or delay the start-up procedure.
- E. Verify that the equipment has been installed in accordance with the manufacturer's requirements.
- F. Complete all pre-startup checklists that may be required by the system vendor.
 - 1. In the event that start-up activities are delayed as a result of the Contractor's failure to properly check the completed installation and a manufacturer's representative is on the job site waiting for corrections to be made, then the Engineer may, at his/her sole discretion, postpone start-up until such time as the corrections have been made without any extra costs.
 - 2. The Owner may deduct from money due the Contractor the excess cost of engineering associated with having the Engineer present during the start-up.
 - 3. The deduction shall be equal to the engineer's effective billing rate times the total number of hours delayed during the start-up activities.
- G. Verify that tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- H. Verify that wiring and support components for equipment are complete and tested.

- I. Execute start-up under supervision of applicable Contractor's personnel in accordance with manufacturer's instructions.
- J. The Contractor shall have the job site superintendent present during all start-up activities.
- K. Provide manufacturer's authorized technician at the site when specified and in accordance with the requirements contained in Section 014500 - Quality Control.
- L. Submit manufacturer's start-up reports (MSR's) in accordance with Section 013300.

1.03 STIPULATED STARTUP PARTICIPATION FOR PRIME ELECTRICAL CONSTRUCTION CONTRACTOR

- A. The Prime Electrical Construction Contractor shall provide the services of the job site foreman or superintendent who shall participate in the startup of equipment or systems that were furnished by others so as to achieve proper and sustained service.
- B. The Prime Electrical Construction Contractor shall include in the Contract price TWO HUNDRED FORTY (240) man-hours of participation service exclusively dedicated for providing startup services for equipment furnished by other Contractors.
 - 1. The Owner reserves the right to receive a credit for each unused hour at the prevailing wage in effect at the time, said amount not being less than SEVENTY FIVE DOLLARS (\$75) per hour in any case.
 - 2. This service shall be provided when directed by the Engineer. Sufficient advance notice will be provided.
- C. The Prime Electrical Construction Contractor shall provide a separate line item in the Schedule of Values for this service.
 - 1. Provide with each requisition for payment, concerning this stipulated amount, a field report documenting the equipment item or system, date(s) of service, name of Contractor's worker(s), hour(s) worked, brief description of work performed during startup, and the prevailing wage rate paid them.
 - 2. The field report shall be signed by the Engineer's field representative.
- D. Requisitions for payment out of this stipulated amount will not be processed without an executed field report unless proof of manhours expended can be proved otherwise.

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 – EXECUTION

3.01 NOT USED

END OF SECTION 017500

PART 1 - GENERAL

1.01 SUMMARY

- A. Testing of piping.
- B. Testing of tanks vented to atmosphere.
- C. Pipe leakage testing shall comply with the conditions noted in the Schedule.

1.02 DEFINITIONS

- A. Leakage (or exfiltration) - The quantity of water to be supplied into the newly laid pipe, any valved section thereof, manhole, or other appurtenance, necessary to maintain the specified leakage test pressure after the pipe has been filled with water and the air expelled.
- B. Infiltration - The quantity of water that enters into any pipe, manhole, or other appurtenance when the static groundwater elevation is at the maximum elevation above the pipe or appurtenance as specified hereinafter.

1.03 QUALITY ASSURANCE

- A. Prior to Substantial Completion, pressure pipes and non-pressure pipes shall meet specific leakage requirements. These leakage requirements shall be satisfied by the basic materials alone. Where joint fillers and the like have been specified, primarily to protect jointing materials, and secondarily to provide a factor of safety, they shall not be applied until after leakage tests have been completed and have been accepted by Engineer.
- B. Engineer will witness all tests. Tests not witnessed will be considered as not having been performed.
- C. Do not close or cover up work until it has been observed for proper and satisfactory construction and installation in compliance with the Contract Documents. Should incomplete or unacceptable work be covered, the Contractor shall, at his/her own expense, uncover all work so that it may be properly observed. After such observations, repair and replace the work that was found defective, unsatisfactory, and not in accordance with the Contract Documents. After such repair and replacement, bring all work to completeness and status as it was before it was closed and covered, all at the Contractor's own expense. Submit for review and approval proposed corrective action to correct failed systems.
- D. Successful completion of required tests shall be in no way interpreted as relieving the Contractor of responsibility for defects that become apparent subsequent to the time of testing. It shall be the sole right of the Engineer/Architect to determine whether defects exist. Retest all portions of the work deemed necessary by the Engineer/Architect prior to Substantial Completion.

1.04 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Provide details and specifications on testing apparatus.
- C. Provide certified test results on forms approved by the Engineer/Architect.

1.05 SEQUENCING AND SCHEDULING

- A. Notify Engineer/Architect and governing agencies, if necessary, at least 48 hours in advance of a scheduled test so that the test may be witnessed.
- B. Test underground pipe prior to backfilling.
- C. At Engineer/Architect's discretion, additional sections of pipelines may be required to be tested as soon as pipe is laid and prior to backfilling when working conditions or the standard of workmanship have been altered.

PART 2 - PRODUCTS

2.01 TESTING APPARATUS

- A. Provide labor, plugs, measuring equipment, and other apparatus, complete, to perform testing.
- B. Provide clean water, air, nitrogen, and other materials as required to accomplish testing.
- C. Provide plugs and caps capable of withstanding test pressures.
- D. Provide temporary flanges, plugs, bulkheads, thrust blocks, weighing, bracing and other items necessary to prevent joints from separating, and to prevent injuries or damage.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Plug open ends, adequately block bends, tees, ends, and other fittings, and do whatever is necessary to brace piping system so that it will safely withstand the pressures developed under the tests and so that no damage or injury shall occur to the pipeline, people or property.
- B. Before tests are conducted, isolate, or remove any regulator, gauge, trap, or other apparatus or equipment that may be damaged by test pressures.

3.02 GENERAL

- A. Trapped Air: Trapped air may cause a false indication of the rate of leakage. Points of concern include ends of lines, stubs, house connections and high points in pipelines. No credit will be made for this condition and no adjustment will be made to the allowable leakage. When trapped air is suspected of causing a test failure, do whatever is necessary to evacuate the air and repeat tests until the actual leakage is equal to or less than allowable rate of leakage.
- B. Water Absorption: No credit will be given for absorption of water in pipe and manhole walls. If necessary, fill pipes and manholes with water well in advance of testing and allow them to soak in order to eliminate or minimize the effects of absorption.

3.03 TESTS FOR NON-PRESSURE PIPING

- A. General:
 - 1. Leakage shall be determined by exfiltration testing. The Engineer/Architect reserves the right to also require infiltration testing.
 - 2. Air testing is not permitted.
 - 3. Leakage testing shall include the main non-pressure pipe, house connections, and appurtenances on the section of pipeline being tested.

4. Limit pipeline test sections to runs between adjacent structures. Manholes may be tested simultaneously with pipes.
 5. Adequately plug ends of house connections, stubs, and openings from which water may escape.
 6. Use clean water for exfiltration tests.
 7. Determine groundwater levels by installing piezometers, test holes or test pits at intervals not to exceed 1,000 feet.
- B. Pipe Exfiltration Test:
1. The minimum water level required for testing is 4 feet above the crown of the upstream (highest) end of the pipe being tested or 2 feet above the maximum groundwater level along the test section, whichever is greater.
 2. Install a watertight plug in the downstream end of the manhole pipe.
 3. Fill upstream manhole with water and conduct test for six (6) hours.
 4. Upon satisfactorily completing the test, remove the downstream plug in the presence of Engineer/Architect. Do not touch nor remove anything until approved by Engineer/Architect.
 5. Maximum allowable exfiltration is one hundred (100) gallons per inch diameter per mile per day.
- C. Pipe Infiltration Test:
1. The minimum head of groundwater required for infiltration testing is 2 feet above the crown of the pipe at the upstream end but must in all cases reach its normal level.
 2. Infiltration may be measured with an approved graduated container capable of intercepting all inflow, by a pipeline V-notch weir, or by other approved methods. When using instream type measuring devices, do not measure flows until steady state conditions are established.
 3. Maximum allowable infiltration is one hundred (100) gallons per inch diameter per day per mile of pipe.
 4. Where groundwater level is at least 2 feet above the highest manhole joint, manholes may be included in the test. No visible leakage will be permitted in manholes.

3.04 TESTS FOR PRESSURE PIPES

- A. Leakage testing shall include the main exiting pipe, service connections, and other appurtenances on the section of pipeline being tested.
- B. Test pipes prior to applying insulation and before they are concealed or furred-in.
- C. Provide all necessary gauges. Gauges shall be standard pressure type with a minimum 6 inch diameter dial and a pressure range not in excess of 150% of the maximum required test pressure.
- D. Provide and maintain at the site a gauge stand with an approved laboratory calibrated test gauge. Periodically check test gauge used for testing against the test gauge, and whenever requested by Engineer.
- E. Where it is necessary for testing, tap pipes and insert approved plugs after testing is completed.
- F. Provide a hand or motor driven compressor to maintain the required test pressure constant throughout the duration of the test. If a water pump is used, pump water from a container with a known volume of water. If an air or inert gas pump is used, leakage shall be determined and calculated by the cycling of the pump.
- G. Provide test gauges at each end of the line being tested.

H. Conduct leakage test in accordance with the requirements contained in the Schedule.

3.05 ALLOWABLE LEAKAGE

- A. The maximum allowable leakage for the various piping systems is presented in the schedule.
- B. It is the intent of this Contract to secure piping systems without leakage.
 - 1. Each section of pipe and within each structure shall not exceed the allowable leakage.
 - 2. It is also the intent to secure a piping system free from visible drips, streams and leaks. Therefore, even if a portion of the system meets the requirements for allowable leakage, visible leaks are not permitted and shall be repaired.
- C. Leakage tests will be considered satisfactorily passed when the rate of leakage is equal to or less than the stipulated allowances, there is no evidence of visible leaks, and there is no evidence of other system defects.

3.06 TEST FOR TANKS VENTED TO ATMOSPHERE

- A. Prior to testing liquid holding tanks open to the atmosphere, backfill to finished grade. Piping and equipment within the tank that might affect the watertightness of the tank shall be completely installed and operable.
- B. Isolate each individual tank for testing.
 - 1. Fill with clean, potable water to the maximum operating level.
 - 2. After a suitable stabilization period, the maximum operating level shall be reestablished and a twenty-four (24) hour leakage test shall be performed.
 - 3. During the test, no water shall be added to or taken from the tank. The drop in the water level shall be recorded at the end of the period.
 - 4. The allowable loss is no more than 1/4-inch per eight hours and no running leaks shall be visible.
 - 5. Leaks shall be repaired by methods and materials approved by the Engineer prior to the start of the corrective action.
 - 6. Leakage shall be corrected prior to the performance of equipment testing.
 - 7. During the testing of each individual tank, as outlined in this paragraph, all immediately adjacent tanks shall be empty of water.
- C. After each individual tank has passed the leakage test, all tanks within each complex shall be filled with water to the normal operation level to check complex structural integrity and the hydraulics of operation.

3.07 RETESTING

- A. Pipes, tanks and manholes not passing the tests shall have all defects corrected with methods approved by the Engineer/Architect to the inspection and satisfaction of Engineer/Architect, and shall be retested and re-corrected as often as is necessary until the test requirements have been met.
- B. It is the intent of this Contract to obtain work meeting test requirements on their own and solely through the use of the normal integral sealing components.
 - 1. Joint leaks shall not be stopped using concrete, caulking, mortar, or other patching materials.
 - 2. Leaking pipe joints shall be re-jointed and leaking manhole joints shall have joints reset, or replaced if necessary.
- C. Methods other than rejoining, resetting or replacing joint seals shall require the written approval of Engineer/Architect.

3.08 SCHEDULE

3.09 LEAKAGE TESTING REQUIREMENTS

SERVICE	FLUID	PRESSURE	DURATION (HRS.)	ALLOWABLE LEAKAGE (NOTE 1)		
				UNDERGROUND		EXPOSED
				INFIL.	EXFIL.	
NON-PRESSURE PIPING	WATER	4FT.	6	100	100	NONE
PRESSURE PIPING	WATER	(NOTE 2)	(NOTE 2)	0	0	0

A. SCHEDULE NOTES:

- Maximum allowable leakage in gallons/day/inch diameter per mile of pipe, or gallons/day/inch diameter/mile for manholes. Where a percentage is shown, the loss shall not exceed the percentage of the starting test pressure.
- Maintain 100 psi or two times operating pressure, whichever is greater, for 2 hours.

END OF SECTION 017550

PART 1 - GENERAL

1.01 SUBMITTALS

- A. Submit the following documents to the Engineer before Substantial Completion:
 - 1. Project Record Documents as specified in Section 017839.
 - 2. Operations and Maintenance Manuals prepared in accordance with Section 017823 and be updated as a result of start-up activities.
 - 3. Manufacturer's Start-up Reports (MSR's) for all equipment and systems where manufacturer field time is specified.
 - a. Each MSR shall be signed by the field technician(s) who attended the start-up.
 - b. If the manufacturer is taking exception to the installation or if the warranty is voided, he shall provide a statement to that effect and provide reasons and justification to explain the company's position.
 - 4. One binder containing original counterparts of all warranties, guarantees, bonds, or affidavits as specified in the Technical Specification Sections. These documents shall contain the original signatures and be placed in a plastic sheet protector, one document per protector.
 - 5. Spare parts checklist itemizing all spare parts furnished under the Contract summarized by Section.
 - 6. Electrical Underwriter's Certificate where the prime construction contract includes electrical construction or where this Contract is for a Prime Electrical Construction Contract.
- B. Submit the following items to the Engineer with the final application for payment:
 - 1. Final Application for Payment prepared by the Engineer for Contractor's execution showing final amount of Contract including change orders.
 - 2. Maintenance Bond prepared in accordance with the Contract or General Conditions.
 - 3. Utility company signoffs and inspection approvals, if applicable.
 - 4. Federal, state, county, town and local signoffs and inspection approvals, where applicable.
 - 5. Contractor's Certified Payrolls
 - 6. OSHA cards for all workers
 - 7. Contractor's Affidavit of Payment of Debts and Claims (G706)
 - 8. Contractor's Affidavit of Release of Liens (G706A)
 - 9. Consent of Surety to Final Payment (G707)
 - 10. As Built Documentation
 - 11. Spare Parts (provide proof of delivery transmittal signed by owner)
- C. All documents shall be complete, signed, dated, and notarized (where applicable) and be subject to the Engineer/Architect's acknowledgment of receipt or approval.

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 NOT USED

END OF SECTION 017800

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. This Section specifies the requirements for Operations and Maintenance Manuals required to be prepared by system suppliers and equipment manufacturers.
- B. The Contractor shall submit Operations and Maintenance Manuals for all equipment.
- C. Where the technical specifications call for the submission of manuals, said manuals shall be prepared in accordance with the requirements contained herein. It being understood that manuals shall be submitted for all equipment even if it is not specifically called out in the specifications.

1.02 MANUAL CONTENTS AND FORMAT

- A. All Operations and Maintenance Manuals shall be as specified hereinafter.
- B. The binder shall be 8 1/2" x 11", metal hinge, vinyl, large capacity by National or Equal. It shall show the name of the manufacturer or supplier and project name on the spine of the binder.
- C. A cover shall be provided showing the names of the Owner, Engineer/Architect, Contractor, and Manufacturer.
 - 1. It shall show the Contractor's order number and manufacturer's project number.
 - 2. The address of the manufacturer, service station telephone number, project title, contract number, and year shall also be shown.
- D. Provide tabbed color dividers for each separate product and system.
 - 1. The name of the product shall be typed on the tab.
 - 2. A separate tab shall also be provided for information such as troubleshooting instructions, spare parts list, etc.
- E. An index shall be provided in the back of the binder, with a separate tab, providing a quick way for the operator to find key and important topics contained in the manual.
- F. A separate listing for all charts, graphs, tables, figures and shop drawings shall be provided directly following the table of contents.
- G. Each manual shall contain one (1) copy of all shop drawings deemed in compliance with the Contract Documents by the Engineer submitted for the equipment or system for which the manual is prepared.
 - 1. Only these shop drawings shall be included in the manual.
 - 2. All shop drawings larger than 8 1/2" x 11" shall be folded and placed in a heavy duty, top loading plastic sheet protector with the title of the drawing showing; one (1) drawing per protector page.
- H. For systems being furnished with control panels, each manual shall contain a catalog cut for every electrical device installed inside the control panel or motor control center.
- I. Where emergency generator(s) are included as work of this Contract, the manufacturer's standard manual will be allowed if the manual clearly shows the instructions for the particular model of generator. Cross out chapters and paragraphs that do not apply to the Owner's generator.

- J. Where manuals are prepared for treatment systems for water or wastewater, a process chapter, written in plain language for the operators, shall be prepared by the manufacturer providing the following:
1. A general discussion regarding the theory of the process.
 2. A specific discussion relating the theory to the project as designed and constructed. Provide capacities, sizes, loading rates, application criteria, design values, and design assumptions.
 3. Provide model numbers for equipment comprising the system.
 4. Provide figures, tables, and graphs to assist the operator in understanding the operation of the treatment system.
 5. Where operator interfaces are provided, provide step-by-step instructions for changing a process control variable such as set points.
 - a. The instructions shall be numbered and written such as "press", "hold" "scroll", etc.
 - b. Each operator interface instruction sheet shall be laminated and placed in the binder.
 - c. Another laminated sheet shall be provided and placed inside the control panel.
- K. Each manual shall contain the following as a minimum:
1. Table of contents
 2. Final version of the warranty statement approved by the Engineer/Architect
 3. Nameplate data of each component, year of installation, contract number and specification number
 4. Name, address and telephone number of the manufacturer and the manufacturer's local representative(s)
 5. Installation instructions
 6. Operation instructions including adjustments, the interrelation of components and the control sequence describing break-in, start-up, operation and shutdown
 7. Emergency operating instructions and capabilities
 8. Maintenance requirements include routine procedures and guide for preventative maintenance and troubleshooting; disassembly, repair and reassembly instructions; and alignment, adjusting, balancing, and checking instructions
 9. Troubleshooting guide and corrective maintenance (repair) procedures for all electrical and mechanical equipment. These guides shall list the most frequent and common problems, together with the symptoms, possible causes of the trouble, and remedies
 10. Drawings (pictures or exploded views) which clearly depict and identify each part, suitable for assembly and disassembly of entire system and each component
 11. Wiring and control diagrams, if applicable
 12. Panelboard circuit directories including electrical service characteristics, if applicable
 13. Part list with current prices; ordering information; and recommended quantities of spare parts to be maintained in storage
 14. Charts of valve tag numbers, with location and function of each valve, keyed to the process and instrumentation diagram prepared as part of the Contract Documents
 15. Name, address, and telephone number of nearest parts supply house and nearest authorized repair service center.
 16. List of recommended spare parts and the recommended number of each per unit and per group of units.
- L. Submit two (2) copies of a preliminary draft manual at least fourteen (14) calendar days prior to the date set for start-up.
1. The Engineer/Architect will review the manual for content and compliance with these specifications.
 2. Written comments will be provided, but the manual will not be returned.
 3. One (1) manual will be used at start-up, to record changes that should be made to the final manual.
 4. This copy of the manual will be retained on the site until such time as the final, updated manual is provided.

- M. All electronic Operations and Maintenance Manuals shall be as specified herinafter.
 - 1. All files shall be in Adobe PDF character searchable format and submitted on USB Flash Drive.
 - 2. Files shall be organized by specification section and then by product.
 - 3. An electronic index and list of all charts, graphs, tables, figures, and shop drawings shall be included.
 - 4. All information provided in the paper Operations and Maintenance Manuals shall be included in the electronic version.
- N. Two (2) weeks after the date the unit was placed into service and the Owner has gained beneficial use, submit five (5) copies of the final updated Operations and Maintenance Manual. Refer to Section 017500 - Starting and Adjusting for requirements related to updating the manual(s).
- O. Where installation instructions are not included with the manual, they shall be shipped at least ten (10) days prior to the date the equipment is scheduled for installation.

1.03 RETAINAGE

- A. The Engineer will retain from payment due the Contractor, for failure to submit manuals as specified, an amount equal to 2% of the scheduled value for the equipment or system for which the manual applies. This Contract requirement only applies when a manual is specified to be provided in the Technical Specifications for a particular system or piece of equipment.

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 NOT USED

END OF SECTION 017823

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. This Section includes:
 - 1. Maintenance of documents
 - 2. Recording of record information
 - 3. Submission of record documents
- B. Work of this section also includes the furnishing of underground pipeline documentation.

1.02 PLANS AND SPECIFICATIONS FURNISHED TO THE CONTRACTOR

- A. One (1) complete set of Contract Documents (plans, specifications and addenda) will be furnished to the Contractor in electronic PDF format on CD. The Contractor will be required to print out hard copy sets for field and internal use.
- B. Hard copy sets of Contract Documents (plans, specifications and addenda) can be furnished to the Contractor at \$300 per set, if requested.

1.03 MAINTENANCE OF DOCUMENTS

- A. The Contractor shall maintain at the site one (1) set of the following: drawings, specifications, addenda, change orders, approved shop drawings, test reports, operations and maintenance manuals, and shop drawing log.
- B. The Contractor shall make these documents available for use by the Owner, Engineer/Architect, regulatory agencies and other parties designated by the Owner.
- C. Provide a drawing rack for storage of plans.
- D. Maintain these documents in a clean, dry, legible condition throughout the entire contract period.
- E. Make documents available at all times for inspection by Engineer and Owner.

1.04 RECORDING OF RECORD INFORMATION

- A. Affix a stamp to each Contract Drawing and Shop Drawing reading as follows: "RECORD DOCUMENT" - "NAME OF PROJECT" - "CONTRACTOR NAME" in 2-inch high printed letters.
- B. Keep the record documents current as the work progresses. Record information concurrent with construction progress.
- C. The Contractor shall include a lump sum amount in the bid amount for preparation of record drawings as follows: Contract G = \$25,000; Contract E = \$20,000; Contract P = \$15,000;
 - 1. Stipulated amount will be released when the record drawings have been accepted by the Engineer.
 - 2. Satisfactory evidence shall be provided by the Contractor demonstrating compliance with these specifications and said drawings have been delivered and deemed in compliance with the specifications by the Engineer/Architect.
 - 3. Progress payments will be allowed against the line item in the Schedule of Values only if record documents are considered accurate and up-to-date by the Engineer.
- D. Do not permanently conceal any work until required information has been recorded.

- E. Legibly mark the Contract Plans to record actual construction, including, but not limited to the following:
 - 1. All as-built work.
 - 2. All approved field changes and conditions.
 - 3. Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvements.
 - 4. Location of underground conduits, boxes, devices. Wire sizes (AWG) and types installed. Number of active and spare wires in each conduit and conduit size (applicable where work involves electrical construction).
 - 5. Tied-down location of all underground process lines and buried valves.
- F. Shop Drawings: Maintain as record documents. Legibly mark-up to show changes made due to field conditions encountered during construction.

1.05 PROJECT RECORD DOCUMENTS

- A. Maintain a complete and accurate log of control and survey work as it progresses.
- B. The General Contractor shall on completion of major site improvements, prepare a certified survey illustrating dimensions, locations, angles, and elevations of construction, site work and underground facilities installed as work of Contract G.
- C. The Contractor's surveyor site drawings shall also show the location of property line perimeter fence. The property line of the site shall be indicated on the plans.
- D. The primary electric service installed by LIPA shall also be located on the record drawings prepared by the Contractor's surveyor.

1.06 SUBMITTAL OF RECORD DOCUMENTS

- A. At Substantial Completion, the Contractor shall deliver one (1) preliminary record set of as-built documents to the Engineer/Architect with all changes conspicuously ballooned or otherwise emphasized.
- B. The work will not be considered substantially complete until such time as the preliminary record documents are delivered and acceptable to the Engineer. Mark this set "Preliminary Record Drawings".
- C. Prior to Final Completion, the Contractor shall conform the preliminary record drawings to the comments made by the Engineer and then provide the Owner a complete set of as-built drawings prints and one electronic copy on CD/DVD of all drawings in PDF format.
- D. As-built drawings shall be the same size as the Contract Drawings, with 1/2-inch margins space on three sides and a 2-inch margin on the left side for binding.
- E. Each drawing shall bear in the title box the words "FINAL RECORD DRAWINGS" and the name of the Contractor in heavy black lettering 1/2 inch high and be certified as complete and accurate.
- F. As a convenience, Engineer will make available to the Contractor mylar sepias or electronic media of the Contract Drawings for the sole purpose of the Contractor preparing as-built drawings.
- G. Electronic media made available is without guarantee of compatibility with the Contractor's software or hardware.

1. If the Contractor wishes to take advantage of this offer, the Contractor will be required to execute an indemnification and hold harmless agreement with the Engineer and pay the Engineer/Architect \$20.00 per Contract Drawing sheet to cover the cost of providing mylar sepia's.
2. Electronic media will be provided free of charge on disc in a zipped format.
3. Payment shall be by check, payable to Holzmacher, McLendon & Murrell, P.C., in advance of picking up the requested materials.
4. Electronic media shall be returned to the Engineer upon acceptance of the as-built drawings by the Owner.

1.07 RELATED DOCUMENTS

- A. Provide certificate of release of liens if requested by the Engineer.

1.08 UNDERGROUND PIPELINE DOCUMENTATION – CONTRACT P

- A. The installing Contractor shall document the location of all underground pipelines by taking digital photographs of the installed pipelines prior to backfilling. At least 3 digital photographs shall be taken of each pipe section before it has been backfilled.
- B. The installing Contractor shall provide each pipe installation crew with a digital camera capable of a 3 mega-pixel quality picture using Smart Media, Compact Flash Media, or Memory Stick cards as the media within the camera.
- C. At the end of each day that pipe has been installed, the crew foreman shall hand deliver to the Resident Engineer the removable media.
1. The Engineer/Architect will then download the photographs onto the Owner's computer and delete the photographs from the media.
 2. The media will be returned to the crew foreman within two working days from the date it was delivered.
 3. The Contractor shall have at least three (3) 256 MB media cards available for this purpose to be used on a rotating basis.
- D. Installed work will not be eligible for payment until documentation is provided.
- E. In addition, the underground piping shall be marked with construction grade spray paint before the photos have been taken to indicate the pipelines in the pictures.
1. The Contractor shall assign a separate paint color to each line to be shown in the picture.
 2. The paint color, once selected by the Contractor, shall be used for the entire run of piping.
 3. The marks shall be large and long enough to be visible in the picture. Where practical, spray paint the name of the contents that will be conveyed in the pipe, e.g. "THICK. SLUDGE", "SBR EFFL."
 4. This requirement is necessary so that the pipe lines shown in the pictures can be easily named and referenced at a later date.

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 NOT USED

END OF SECTION 017839

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. The Section includes the requirements for delivering spare parts specified to be furnished under the provisions of the Contract Documents.

1.02 QUALITY ASSURANCE

- A. Spare parts shall be delivered as complete assemblies direct from the manufacturer such that the part is fully functional and ready to be installed.

1.03 DELIVERY, STORAGE AND HANDLING OF SPARE PARTS

- A. Comply with the requirements of Section 016500 for packing, delivery, storage and handling requirements for all parts delivered to the site of the work.
- B. All spare parts required to be furnished under a Section of the Specifications shall be packaged in one separate box, crate or container with the words "SPARE PARTS" lettered on all sides of the container.
- C. The equipment name or system name for which the spare parts are being provided shall also be lettered on the container.
- D. A separate packing list for the spare parts shall be included in the container.
- E. The Contractor shall store all spare parts indoors immediately upon delivery of the spare parts to the site. Spare parts will not be accepted by the Owner/Engineer if the spare parts have been stored outdoors for more than 8 hours upon delivery to the site.
- F. The storage location shall be secure.

1.04 TURN OVER OF SPARE PARTS

- A. Spare parts shall be turned over to the Owner/Engineer approximately two (2) weeks prior to the Engineer/Architect's preparation of the Final Punch List.
 - 1. Spare parts will not be accepted until this time.
 - 2. The Certificate of Substantial Completion will not be issued until all spare parts are delivered.
- B. The following procedure shall be followed:
 - 1. The Contractor shall provide a formal letter of transmittal listing the name or description of the part, part number, model number, manufacturer (or supplier), and system component name and the Section where it was specified to be provided.
 - 2. Two (2) counterparts of the letter shall be provided.
 - 3. The Contractor shall turn each part individually over to the Owner/Engineer/Architect.
 - 4. The Owner/Engineer/Architect will initial next to the part description on each counterpart of the transmittal letter.
 - 5. The initials represent that the part was received.
 - 6. One transmittal counterpart will be returned to the Contractor.

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 NOT USED

END OF SECTION 017843

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Work of this Section includes the requirements for demonstrating and training of installed systems, equipment, and products.
- B. Manufacturer field services and the credit for unused service time is also included herein.

1.02 MANUFACTURER'S FIELD SERVICES

- A. When specified in individual specification sections require field services to be provided, said services shall be provided by qualified, authorized and factory trained representative(s) of the manufacturer (supplier).
- B. Field services shall generally consist of:
 - 1. installation supervision,
 - 2. verify terms of the manufacturer's warranty,
 - 3. equipment and system calibration,
 - 4. startup supervision,
 - 5. and operation and maintenance instructions to the Owner's employees.
- C. Such services do not include service time to correct a factory fault, correct problems resulting from a factory wiring or control logic error, or errors caused by poor or improper installation by the Contractor.
- D. Sale representatives are not acceptable.
- E. The time specified to be provided under the specification sections shall be exclusive of travel time to and from the facility or site. For the purposes of this Contract, one (1) day shall be defined as eight (8) hours exclusive of breaks or mealtime.
- F. The times specified to be provided by the manufacturer does not relieve the manufacturer from providing sufficient service time to place the equipment or systems into satisfactory operation and to obtain the specified performance. The manufacturer shall provide, as a minimum, the times specified in the Specification Sections.
- G. Where manufacturer services are specified for control panel or control center startup, the representative shall be experienced and trained to work on and field rewire such devices.
 - 1. Field representatives for control panel startup shall understand the control sequence specified and, in the case of programmable logic controllers, are able to make revisions to the factory program using handheld programming devices or laptop computers.
 - 2. The time spent by the representative to correct a PLC program shall not be included in the time specified for startup.
 - 3. The Owner will not pay for time spent in the field to correct a PLC programming problem.
- H. If for any reason, the specified service days are not used, then the Owner shall receive a credit equal to \$500.00 (FIVE HUNDRED DOLLARS AND ZERO CENTS) for each unused field service day specified.
- I. A change order to the Contract reducing the Contract Price, by the dollar amount equivalent to the unused field service days, will be issued.
- J. Submit manufacturers' startup reports (MSR's) in accordance with the requirements contained in Section 013300 - Submittals.

1.03 SUBMITTALS

- A. The Contractor shall prepare a list of all manufacturer specified field time required by the technical specifications. Compile this summary listing and submit it to the Engineer for review in accordance with the requirements contained in Section 013300.
- B. Provide manufacturer's field training outline to Engineer for approval.
- C. Manufacturer's Startup Reports shall be provided prior to receiving full payment for installation.

1.04 QUALITY CONTROL

- A. The Contractor shall adhere to all instructions provided by the manufacturer's authorized representative.
- B. All verbal instructions necessary to satisfy performance of the equipment or the system shall be immediately provided by the Contractor. The manufacturer shall document all verbal orders in writing at a time suitable to the Contractor.
- C. All written instructions provided in operation, maintenance, and installation guides and manuals, provided by the manufacturer of such equipment and or system, shall be complied with by the Contractor.
- D. The Contractor shall comply with all manufacturer requirements such that written or implied warranties remain in full force during the time period so specified elsewhere in the technical specifications.
- E. Should manufacturer's instructions conflict with Contract Documents, request clarification from Engineer before proceeding.
- F. Actions and/or non performance by the Contractor that may void manufacturer warranties shall not constitute a release of the specified warranty, and all warranty claims made by the Owner shall be paid for by the Contractor as if the manufacturer's warranty was still in effect.

1.05 SCHEDULING - FIELD SERVICES

- A. The Contractor shall arrange field service on dates acceptable to the Owner and Engineer.
- B. The service visits shall be scheduled at least 2 weeks in advance so that the Owner and Engineer can adequately staff the date.
- C. Operator training will not be allowed until such time as the Manufacturer's Operation and Maintenance Manuals have been supplied and approved by the Engineer.
 - 1. The field service technician shall review the contents of the manual with designated employees of the Owner.
 - 2. Field services will not be deemed provided until the MSR is provided.

1.06 DEMONSTRATION AND INSTRUCTIONS

- A. Demonstrate operation and maintenance of products to Owner's personnel prior to date of Substantial Completion.
- B. Utilize manufacturer's and vendor's Operation and Maintenance Manuals as basis for instruction. Review contents of the manual with the Owner's personnel in detail to explain all aspects of operation and maintenance.

- C. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of the equipment or of the system.
- D. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.
- E. The Contractor shall arrange to have the manufacturer's Operation and Maintenance Manuals updated with information that has been added during start-up activities.
- F. The final manual shall contain the most recent information and reflect all operational and maintenance aspects of the final installed and functioning system or equipment component of the system.
- G. Any changes to control panel wiring diagrams or interconnection wiring schematics shall be made and new prints provided as an update to previously approved manuals.
- H. Manufacturer field time shall be as specified in individual Sections of the Technical Specifications.
- I. For control panels, explain the control sequence, timing structure, and safety precautions when working inside the panel, terminal wiring system, PLC program, if applicable, operator interface(s) and control logic.
- J. Explain PLC LED input and output numbering system, if applicable. If control relays are used, explain technique for their replacement.

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 NOT USED

END OF SECTION 017900

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Retain an independent utility locator service company with a minimum of five (5) years of experience to field locate, mark, and stakeout existing underground utilities and service connections. The company shall be equipped with the latest state-of-the-art equipment.
- B. If required, determine the exact location of utilities by hand excavated test pits or through vacuum methods. Support and protect all utilities to remain in place.
- C. Field locate, mark, and stakeout underground utilities prior to excavation.
- D. Use different colored markers for each separate utility run. Immediately take digital photographs to document the mapped utilities and provide same to the Engineer.
- E. Contractor shall be responsible for the location of all utilities within areas of excavation, and all costs associated with the repair of utilities hit/damaged during construction.

1.02 TEST HOLES

- A. Test holes shall be performed by air vacuum excavation key-hole technology or other non-destructive techniques on existing utilities. One call notification and permit applications shall be made prior to test hole excavation as necessary.
- B. The test holes shall be staked at the site by contractor personnel utilizing a tape or survey instrument as deemed necessary. Test hole openings shall be a minimum 8" x 8" and typically not larger than 12" x 12". Excavate to expose the utility in a careful manner with the utmost concern for the safety of personnel, the public and surrounding property. Complete a field test hole form for each excavation that indicates at a minimum parameters required by the ASCE/CI Standard 38-02, which includes: depth to the utility, outside diameter, height of conduits or encasement, utility material, pavement type/ thickness and general soil type.
- C. Place permanent marker over a reference point on the utility flush with grade. Typically this reference point is the centerline of pipes or the edge of concrete structures. A minimum of three (3) ties shall be taken to the permanent marker. The depth to the reference point on the utility shall also be measured plumb to the permanent marker.
- D. Backfill excavation utilizing excavated materials or a self-compacting aggregate. Pavement restoration shall be made as per temporary pavement requirement on the Contract Drawings.
- E. Locate test hole permanent markers using conventional or GPS survey equipment. The test hole markers shall be directly located to provide horizontal and vertical coordinates for the locations relative to the project coordinate system.
- F. Do not backfill test holes until directed by the Engineer. Photographs of exposed piping shall be taken by the Contractor and kept on file for the duration of the project. Duplicate prints shall be provided to the Engineer. Annotate on the back of each print the location of the photograph, the name of the exposed line, and the date it was taken. All photographs shall be taken using a digital camera. The digital file shall be provided to the Engineer. All prints shall be 4 inches by 6 inches. Trenching for new buried pipelines shall not be started until the locations of existing pipes and utilities are verified.

1.03 SUBMITTALS

- A. Submit detailed experience and qualifications description of underground utility locator service. Experience and qualifications package should include a description of the types of utility locator equipment and experience that can be provided.
- B. At conclusion of project, provide two (2) sets of paper and one (1) copy of electronic plans documenting all utilities located and identified. All documentation shall be referenced to existing data (horizontal and vertical) previously established.

1.04 COORDINATION AND SCHEDULING

- A. General Location: Within areas of excavations all utilities shall be field located and their locations marked at least one (1) day prior to the performance of the required excavation.
- B. The performance of hand excavated test pits or vacuum excavations to determine the utilities exact location shall be performed just prior to performing the work to minimize the time that excavated areas will be exposed to erosive conditions.
- C. Coordinate work with the Engineer to minimize utility disruptions and facility operations. The Engineer shall be notified at least three (3) working days prior to performing the work, and should be provided a schedule for the works progression

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 FIELD QUALITY CONTROL

- A. The Engineer may limit or restrict scheduling of the utility locator service based upon project progress.

END OF SECTION 023000

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Demolition and removal of structures and site improvements.
 - 2. Abandoning in-place below-grade construction.
 - 3. Disconnecting, capping or sealing, and abandoning in-place site utilities.
- B. Related Sections:
 - 1. Section 011000 "Summary of Work" for use of the premises and phasing requirements.
 - 2. Section 013233 "Construction Photographs" for preconstruction photographs taken before building demolition.

1.02 DEFINITIONS

- A. Demolish: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged.
- B. Recycle: Recovery of demolition waste for subsequent processing in preparation for reuse.
- C. Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner. Include fasteners or brackets needed for reattachment elsewhere.

1.03 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.
- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
 - 1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.04 SUBMITTALS

- A. Proposed Protection Measures: Submit informational report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.
 - 1. Adjacent Buildings: Detail special measures proposed to protect adjacent buildings to remain.
- B. Structure Demolition Plan: Drawings indicating the following:
 - 1. Locations of temporary protection and means of egress for adjacent occupied buildings.
- C. Predemolition Photographs: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by demolition operations. Comply with Section 013233 "Construction Photographs." Submit before the Work begins.

1.05 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

- B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

1.06 PROJECT CONDITIONS

- A. Structures to be demolished will be vacated and their use discontinued before start of the Work.
- B. Buildings immediately adjacent to demolition area will be occupied. Conduct demolition so operations of occupied buildings will not be disrupted.
 - 1. Provide not less than 3 business days notice of activities that will affect operations of adjacent occupied buildings.
 - 2. Maintain access to existing walkways, exits, and other facilities used by occupants of adjacent buildings.
 - a. Do not close or obstruct walkways, exits, or other facilities used by occupants of adjacent buildings without written permission from authorities having jurisdiction.
- C. Owner assumes no responsibility for buildings and structures to be demolished.
 - 1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
 - 1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Engineer and Owner. Hazardous materials will be removed by Owner under a separate contract.
- E. On-site storage or sale of removed items or materials is not permitted.

1.07 COORDINATION

- A. Arrange demolition schedule so as not to interfere with operations of adjacent occupied buildings.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS

- A. Satisfactory Soils: Comply with requirements in Section 312316.13 - Trenching

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting demolition operations.
- B. Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during building demolition operations.
- C. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

3.02 PREPARATION

- A. Existing Utilities: Locate, identify, disconnect, and seal or cap off indicated utilities serving buildings and structures to be demolished.
 - 1. Arrange to shut off indicated utilities with utility companies.

2. If removal, relocation, or abandonment of utility services will affect adjacent occupied buildings, then provide temporary utilities that bypass buildings and structures to be demolished and that maintain continuity of service to other buildings and structures.
 3. Cut off pipe or conduit a minimum of 24 inches below grade. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing according to requirements of authorities having jurisdiction.
- B. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.
- C. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished.
1. Strengthen or add new supports when required during progress of demolition.

3.03 PROTECTION

- A. Existing Utilities: Maintain utility services to remain and protect from damage during demolition operations.
1. Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction.
 2. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and authorities having jurisdiction.
 - a. Provide at least 3 business days notice to occupants of affected buildings if shutdown of service is required during changeover.
- B. Temporary Protection: Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction and as indicated. Comply with requirements in Section 015000 "Temporary Facilities and Controls."
1. Protect adjacent buildings and facilities from damage due to demolition activities.
 2. Protect existing site improvements, appurtenances, and landscaping to remain.
 3. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
 4. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 5. Provide protection to ensure safe passage of people around building demolition area and to and from occupied portions of adjacent buildings and structures.
 6. Protect walls, windows, roofs, and other adjacent exterior construction that are to remain and that are exposed to building demolition operations.
 7. Erect and maintain dustproof partitions and temporary enclosures to limit dust, noise, and dirt migration to occupied portions of adjacent buildings.
- C. Remove temporary barriers and protections where hazards no longer exist. Where open excavations or other hazardous conditions remain, leave temporary barriers and protections in place.

3.04 DEMOLITION, GENERAL

- A. General: Demolish indicated structures and site improvements completely. Use methods required to complete the Work within limitations of governing regulations and as follows:
1. Do not use cutting torches until work area is cleared of flammable materials. Maintain portable fire-suppression devices during flame-cutting operations.
 2. Maintain fire watch during and for at least two hours after flame cutting operations.
 3. Maintain adequate ventilation when using cutting torches.

4. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
- B. Engineering Surveys: During demolition, perform surveys to detect hazards that may result from building demolition activities.
- C. Site Access and Temporary Controls: Conduct building demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
 2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.
- D. Explosives: Use of explosives is not permitted.

3.05 DEMOLITION BY MECHANICAL MEANS

- A. Existing Utilities: Demolish existing utilities and below-grade utility structures as indicated on Drawings.
- B. Fill abandoned utility structures with Type B pea gravel and cover with filter fabric at sub grade of roadway.
 1. Piping: Disconnect piping at unions, flanges, valves, or fittings.

3.06 SITE RESTORATION

- A. Below-Grade Areas: Completely fill below-grade areas and voids resulting from structure demolition operations with satisfactory soil materials according to backfill requirements in Section 312316.13 "Trenching and Backfilling".

3.07 REPAIRS

- A. Promptly repair damage to adjacent buildings caused by demolition operations.

3.08 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site.
 1. Do not allow demolished materials to accumulate on-site.
 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Do not burn demolished materials.

3.09 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by building demolition operations. Return adjacent areas to condition existing before building demolition operations began.
 1. Clean roadways of debris caused by debris transport.

END OF SECTION 024116

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. The purpose of this section is to outline the scope of work and work procedures required for the removal of asbestos cement pipe that is anticipated to be encountered during the water main replacement on Greenvale Circle & related intersections.
- B. Determination of limits of asbestos cement pipe was based upon Water Department records. The contractor shall verify in field via test holes the limits of asbestos cement pipe prior to commencement of the water main replacement.
- C. Federal (EPA and OSHA) and New York State Department of Labor (NYS DOL) regulations (ICR 56.11), Project Drawings and Project Documents.
- D. The Contractor shall be aware of all conditions of the Project and is responsible for field verifying quantities and locations of all ACM to be removed prior to submission of any bid. Failure to do so shall not relieve the Contractor of its obligation to furnish all labor and materials necessary to perform the Work. The quantities presented in this Specification are approximate and should not be used solely as the basis for any bid. In the event that suspect materials not included in this Specification are encountered while the work is in progress, such material shall be tested for asbestos content or assumed positive for asbestos content, and removed in accordance with the procedures herein. Any discovery of new ACM shall not delay the progress of the Work. Payment for any additional work shall be considered on a case-by-case basis by the Engineer.
- E. Any special job conditions, including any site specific variances are to be obtained by the Contractor, and any fees associated with procuring these variances shall be included in the Contractor's bid.
- F. The Contractor's industrial hygiene practices during asbestos abatement will be monitored by the Owner's representative; however the Contractor shall be responsible for monitoring his own construction safety work practices for compliance with the OSHA regulations.

1.02 SPECIAL JOB CONDITIONS

- A. Any special job conditions, including any site specific variances, are to be obtained by the Contractor, and any fees associated with procuring these variances shall be included in the Contractor's bid.

1.03 CODES, PERMITS AND COMPLIANCE

- A. The Contractor shall assume full responsibility and liability for compliance with all applicable Federal, State, and local laws, rules, and regulations pertaining to Work practices, protection of workers, authorized visitors to the site, persons, and property adjacent to the Work.
- B. Perform asbestos related Work in accordance with Federal and New York State regulations. Where more stringent requirements are specified, adhere to the more stringent requirements.
- C. State Licenses: The Contractor must maintain current licenses pursuant to the New York State Department of Labor (NYSDOL) and New York State Department of Environmental Conservation (NYSDEC) for all Work related to this Project.

1.04 APPLICABLE STANDARDS AND REGULATIONS

- A. The Contractor shall comply with the following codes and standards, except where more stringent requirements are shown or specified:
- B. Federal Regulations:
 - 1. 29 CFR 1910.1001, "Asbestos" (OSHA)
 - 2. 29 CFR 1910.1200, "Hazard Communication" (OSHA)
 - 3. 29 CFR 1910.134, "Respiratory Protection" (OSHA)
 - 4. 29 CFR 1910.145, "Specification for Accident Prevention Signs and Tags" (OSHA)
 - 5. 29 CFR 1926, "Construction Industry" (OSHA)
 - 6. 29 CFR 1926.1101, "Asbestos, Tremolite, Anthophyllite, and Actinolite" (OSHA)
 - 7. 29 CFR 1926.500 "Guardrails, Handrails and Covers" (OSHA)
 - 8. 40 CFR 61, Subpart A, "General Provisions" (EPA)
 - 9. 40 CFR 61, Subpart M, "National Emission Standard for Asbestos" (EPA)
 - 10. 49 CFR 171-172, Transportation Standards (DOT)
- C. New York State Regulations:
 - 1. 12 NYCRR, Part 56, "Asbestos", Industrial Code Rule 56 (DOL)
 - 2. 6 NYCRR, Parts 360, 364, Disposal and Transportation (DEC)
 - 3. 10 NYCRR, Part 73, "Asbestos Safety Program Requirements" (DOH)
 - 4. New York State Department of Health (NYSDOH) Training Requirements
- D. Standards and Guidance Documents:
 - 1. American National Standard Institute (ANSI) Z88.2-80, Practices for Respiratory Protection
 - 2. ANSI Z9.2-79, Fundamentals Governing the Design and Operation of Local Exhaust Systems
 - 3. EPA 560/585-024, Guidance for Controlling Asbestos Containing Materials in Buildings (Purple Book)
 - 4. EPA 530-SW-85-007, Asbestos Waste Management Guidance

1.05 DELIVERY AND STORAGE

- A. Deliver non-contaminated materials to the job site in original packages with containers bearing manufacturer's name and label.
- B. Store all materials at the job site in a suitable and designated area.
 - 1. Store materials subject to deterioration/damage away from wet/damp surfaces and under cover.
 - 2. Protect materials from unintended contamination.
- C. Remove damaged or deteriorated materials from the job site. Materials contaminated with asbestos shall be disposed of as asbestos debris as herein specified.

PART 2 - PRODUCTS

2.01 PROTECTIVE CLOTHING

- A. Provide personnel utilized during the Project with disposable protective whole body clothing, head coverings, gloves and foot coverings. Provide disposable plastic or rubber gloves to protect hands. Cloth gloves may be worn inside the plastic or rubber for comfort, but shall not be used alone. Make sleeves secure at the wrists and make foot coverings secure at the ankles by the use of tape, or provide disposable coverings with elastic wrists or tops.

2.02 DISPOSAL BAGS, DRUMS, AND CONTAINERS

- A. Provide 6 mil polyethylene disposal bags printed with asbestos caution labels. Bags shall also be imprinted with U.S. Department of Transportation required markings.
- B. If the asbestos waste has the potential to damage or puncture the disposal bags, burlap sacks shall be utilized as a liner inside the polyethylene disposal bags to prevent puncture or damage to the disposal bags. In addition, 30 or 55 gallon capacity fiber or metal drums capable of being sealed air and water tight may also be used. Affix asbestos caution labels on lids and at one-third points around drum circumference to assure ready identification.
- C. Containers and bags must be labeled with the names of the waste generator and the location at which the waste was generated in accordance with 40 CFR Part 61 NESHAPS.
- D. Labeled ACM waste containers or bags shall not be used for non-ACM waste. Any material placed in labeled containers or bags, whether turned inside out or not shall be disposed of as ACM waste.

2.03 HEPA VACUUM EQUIPMENT

- A. All dry vacuuming performed under this contract shall be performed with High Efficiency Particulate Absolute (HEPA) filter equipped industrial vacuums conforming to ANSI Z9.2.
- B. Provide tools and specialized equipment including scraping nozzles with integral vacuum hoods connected to a HEPA vacuum with flexible hose.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

- A. Perform all asbestos removal Work using wet removal procedures. Dry removal procedures are not permitted.

3.02 WORK AREA PREPARATION

- A. Work Area preparation shall be performed in accordance with NYSDOL regulations.
- B. Remove all items attached to or in contact with ACM. HEPA vacuum and wet wipe with amended water all removed items prior to their removal from the Work Area and before the start of asbestos removal operations.

3.03 REMOVAL OF ASBESTOS CONTAINING MATERIALS

- A. Asbestos-containing materials shall be removed in accordance with NYSDOL and the Contract Documents.
- B. Sufficiently wet asbestos materials with a low pressure, airless fine spray of surfactant to ensure full penetration prior to material removal. Re-wet material that does not display evidence of saturation.
- C. One Worker shall continuously apply amended water while ACM is being removed.
- D. Perform cutting, drilling, abrading, or any penetration or disturbance of asbestos containing material in a manner to minimize the dispersal of asbestos fibers into the air. Use equipment and methods specifically designed to limit generation of airborne asbestos particles. All power operated tools used shall be provided with HEPA equipped filtered local exhaust ventilation.

- E. Power or pressure washers will not be allowed to be used for asbestos removal or clean-up procedures.

3.04 ACM WASTE CONTAINERIZING, DECONTAMINATION AND LOAD OUT PROCEDURES

- A. Packaging of ACM shall conform to OSHA Standard 29 CFR 1926.1101, DOT 49 CFR 171, 172, and 173, and EPA Standard 40 CFR Part 61 and the requirements as herein specified.
- B. The cleaned containers of asbestos material and equipment shall be placed in water tight carts with doors or tops that shall be closed and secured. These carts shall be held in the holding area pending removal. The carts shall be wet cleaned and/or HEPA vacuumed at least once each day.

3.05 WORK AREA CLEANING PROCEDURES

- A. Following completion of gross abatement and after all accumulations of asbestos waste materials have been containerized, decontamination procedures shall be followed as specified in Title 15 or ICR 56, unless otherwise stated in the variance(s) utilized by the Contractor.
- B. Following each decontamination procedure the PM shall inspect the Work Area for effectiveness of the cleanings. If necessary, additional cleaning shall be performed by the Contractor as directed by the PM.

3.06 ASBESTOS WASTE

- A. Applicable Regulations: All asbestos waste shall be stored, transported and disposed of in accordance with the following regulations as applicable:
 - 1. NYS DEC 6 NYRCC part 360 and 364
 - 2. US EPA NESHAPS 40 CFR 61
 - 3. US EPA Asbestos Waste Management Guidance EPA/530 SW85

END OF SECTION 028000

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Broad Scope: Asbestos containing materials (ACM) have been identified at the project site. Samples of various suspect materials have been collected and analyzed; additional samples may be required as existing materials are removed or revealed during the course of work. The scope of work and procedures outlined herein shall be followed by a New York State Department of Labor (NYS DOL) certified asbestos abatement contractor.
- B. Related Sections:
 - 1. 022600 – Hazardous Material Assessment
- C. SCOPE OF WORK
 - 1. Removal of the following items described in the asbestos survey as positive for asbestos, in accordance with NYSDOL Industrial Code Rule (ICR) 56:
 - a. Exterior, Roof – Flashing on Plumbing Vents.
 - b. Interior, Bathrooms – Bathroom Tile Wall Mastic.
 - c. Refer to construction drawings.
 - 2. Asbestos Containing materials must be removed only by a New York State Department of Labor (NYS DOL) licensed asbestos abatement contractor (herein referred to as the “Contractor”).
 - 3. The Contractor shall be aware of all conditions of the Project and is responsible for field verifying quantities and locations of all ACM to be removed from the building prior to submission of any bid. Failure to do so shall not relieve the Contractor of its obligation to furnish all labor and materials necessary to perform the Work. The quantities presented in this Specification are approximate and should not be used solely as the basis for any bid. In the event that suspect materials not included in this Specification are encountered while the work is in progress, such material shall be tested for asbestos content or assumed positive for asbestos content, and removed in accordance with the procedures herein. Any discovery of new ACM shall not delay the progress of the Work. Payment for any additional work shall be considered on a case-by-case basis by the Engineer and Owner.
 - 4. All Work shall be performed in strict accordance with the Contract Documents and all applicable codes, rules, and regulations. Where conflicts occur between the Contract Documents and applicable codes, rules, and regulations, the more stringent shall apply.
 - 5. The Contractor's industrial hygiene practices during asbestos abatement will be monitored by the Owner's representative. The Contractor shall be responsible for monitoring his own construction safety work practices for compliance with the OSHA regulations.

1.02 SPECIAL JOB CONDITIONS

- A. Any special job conditions, including variances to be obtained by the Contractor, are described herein.
 - 1. A Site Specific Variance is anticipated for the asbestos abatement work as described in Section 1.01A to alleviate the requirement of full containment.
 - 2. The contractor shall be responsible for obtaining any site specific variances.
 - 3. No chemicals shall be utilized during the removal of mastic.

1.03 CODES, PERMITS AND COMPLIANCE

- A. The Contractor shall assume full responsibility and liability for compliance with all applicable Federal, State, and local laws, rules, and regulations pertaining to Work practices, protection of workers, authorized visitors to the site, persons, and property adjacent to the Work.

- B. Perform asbestos related Work in accordance with New York State Industrial Code Rule 56, 40 CFR 61, and 29 CFR 1926, as specified herein. Where more stringent requirements are specified, adhere to the more stringent requirements.
- C. State Licenses: The Contractor must maintain current licenses pursuant to New York State Department of Labor and Department of Environmental Conservation for all Work related to this Project, including the removal, handling, transport, and disposal of asbestos containing materials.
 - 1. The Contractor must have and submit proof upon request that any persons employed by the Contractor to engage in, or supervise Work on any asbestos Project have a valid NYS asbestos handling certificate pursuant to Industrial Code Rule 56.
 - 2. The Contractor shall comply fully with the variances secured from regulatory agencies in the performance of the Work. The Contractor shall also be responsible for paying and complying with any additional variances. Should the Contractor choose to apply for any variance, approval from the Engineer is first required. In the event that the Contractor chooses to use more than one NYS Applicable Variance in the same Work Area simultaneously, the Contractor is responsible for complying with all conditions of each variance and any NYS DOL interpretations concerning the use of these variances together.
- D. Agency Notifications: The Contractor shall prepare written notification to EPA Region 2, and to the NYSDOL at least 10 days prior to commencement of Work, when applicable. The Contractor shall be responsible for use and payment of any notifications required for performance of the Work.
- E. It is the sole responsibility of the Contractor to determine what, if any patents are applicable to the Project. The Contractor shall pay all royalties and/or license fees. He shall defend all suits or claims for infringement of any patent rights and save the Owner, Architect, Engineer, and Construction Manager harmless from loss, including attorney's fees, on account thereof.
- F. Before commencement of Work, the Contractor shall review and adhere to the Contract Documents. Failure to adhere to the Contract Documents shall constitute a breach of the Contract and the Owner shall have the right to and may terminate the Contract provided, however, the failure of the Owner to so terminate shall not relieve the Contractor from future compliance.

1.04 APPLICABLE STANDARDS AND REGULATIONS

- A. The Contractor shall comply with the following codes and standards, except where more stringent requirements are shown or specified:
- B. Federal Regulations:
 - 1. 29 CFR 1910.1001, "Asbestos" (OSHA)
 - 2. 29 CFR 1910.1200, "Hazard Communication" (OSHA)
 - 3. 29 CFR 1910.134, "Respiratory Protection" (OSHA)
 - 4. 29 CFR 1910.145, "Specification for Accident Prevention Signs and Tags" (OSHA)
 - 5. 29 CFR 1926, "Construction Industry" (OSHA)
 - 6. 29 CFR 1926.1101, "Asbestos, Tremolite, Anthophyllite, and Actinolite" (OSHA)
 - 7. 29 CFR 1926.2, "Variances from safety and health standards" (OSHA)
 - 8. 29 CFR 1926.500 "Guardrails, Handrails and Covers" (OSHA)
 - 9. 40 CFR 61, Subpart A, "General Provisions" (EPA)
 - 10. 40 CFR 61, Subpart M, "National Emission Standard for Asbestos" (EPA)
 - 11. 49 CFR 171-172, Transportation Standards (DOT)
 - 12. 40 CFR Part 763, "Asbestos Hazard Emergency Response Act" (AHERA)

- C. New York State Regulations:
 - 1. 12 NYCRR, Part 56, "Asbestos", Industrial Code Rule 56 (DOL)
 - 2. 6 NYCRR, Parts 360, 364, Disposal and Transportation (DEC)
 - 3. 10 NYCRR, Part 73, "Asbestos Safety Program Requirements" (DOH)
 - 4. New York State Department of Health (NYSDOH) Training Requirements
- D. Standards and Guidance Documents:
 - 1. American National Standard Institute (ANSI) Z88.2-80, Practices for Respiratory Protection
 - 2. ANSI Z9.2-79, Fundamentals Governing the Design and Operation of Local Exhaust Systems
 - 3. EPA 560/585-024, Guidance for Controlling Asbestos Containing Materials in Buildings (Purple Book)
 - 4. EPA 530-SW-85-007, Asbestos Waste Management Guidance

1.05 AUTHORITY TO STOP WORK

- A. The Owner shall have the authority to stop the abatement work at any time a determination is made that conditions are not within Specification and applicable regulations. The stoppage of work shall continue until conditions have been corrected to the satisfaction of the Owner. Standby time to resolve the problems shall be at the contractor's expense.

1.06 SUBMITTALS

- A. Pre-contract Submittals. After bids are opened, the apparent low bidder shall submit the following documentation, in accordance with the project deadlines outlined in the Contract Documents. Failure to submit all required documentation truthfully or in a timely manner may be cause for rejection of the bid.
 - 1. Contractor license issued by New York State Department of Labor.
 - 2. A list of Projects performed within the past two (2) years and include the dollar value of all Projects. Provide Project references to include Owner, consultant, and air monitoring firm's name, contact persons, address, and phone number.
 - 3. A standard operating procedures manual describing Work practices and procedures, equipment, type of decontamination facilities, respiratory program, special removal techniques, etc.
 - 4. Citations/Violations/Legal Proceedings: Submit a notarized statement describing:
 - a. Any citations, violations, criminal charges, or legal proceedings undertaken or issued by any law enforcement, regulatory agency, or consultant concerning performance on previous abatement contracts. Briefly describe the circumstances citing the Project and involved persons and agencies as well as the outcome of any actions.
 - b. Any litigation or arbitration proceedings arising out of performance on past Projects.
 - c. Any liquidated damages assessed within the last 2 years.
 - 5. Preliminary Schedule: Provide an estimate of manpower to be utilized and the time required for completion of each major Work Area. Include estimated size and number of crews and work shifts.
- B. Pre-Work Submittals. The Contractor shall submit 3 copies of the documents listed below, in accordance with the project deadlines outlined in the Contract Documents:
 - 1. Progress Schedule:
 - a. Show the complete sequence of abatement activities and the sequencing of Work within each building or building section.
 - b. Show the dates for the beginning and completion of each major element of Work including substantial completion dates for each Work Area, building, or phase.
 - 2. Notifications: As required by Federal, State and local regulatory agencies together with proof of transmittal (i.e. certified mail return receipt).

3. Permits: As required by State and local regulations, including arrangements for storage, transportation, and disposal of contaminated material.
 4. Abatement Work Plan: Provide plans which clearly indicate the following:
 - a. All Work Areas/containments numbered sequentially.
 - b. Locations and types of all decontamination enclosures.
 - c. Entrances and exits to the Work Areas/containments.
 - d. Type of abatement activity/technique for each Work Area/containment.
 - e. Number and location of negative air units and exhaust.
 - f. Proposed location and construction of storage facilities and field office.
 - g. Location of water and electrical connections to building services.
 5. Subcontractor List: List of all subcontractors to be used on the Project (i.e. Waste Hauler).
 6. Material Safety Data Sheets (MSDS): Copies of MSDS for each chemical or material used for the Project (encapsulant, surfactant, mastic remover, etc.).
 7. Laboratory: Submit the NYS Department of Health ELAP certification for the laboratory that will be analyzing the OSHA personnel air samples.
- C. Project Close-out Submittal. Submit the following at the closeout of the Project:
1. Copies of all waste disposal manifests, seals, and disposal logs.
 2. OSHA compliance air monitoring records conducted during the Work.
 3. Daily progress log.
 4. Entry and exit log.
 5. A list of each Worker used in the performance of the Project, including name, social security number, and NYS DOL certification number.

1.07 HEALTH & SAFETY

- A. Worker Protection: The Contractor shall comply with OSHA and provide and maintain all safety measures necessary to properly protect all individuals that enter the work area.
- B. Emergency Actions: In an emergency affecting the safety of life, the work, or adjoining property, the Contractor shall immediately act in such a manner to prevent such threatened loss or injury.
- C. Fire Protection, And Emergency Egress: The Contractor shall be responsible to the security and safeguarding of all areas turned over by the Owner to the Contractor. The Contractor shall designate to his workers and other building occupants the means of egress in case of emergency.
- D. The Contractor shall establish emergency and fire exits from the work area. First aid kit, two (2) full sets of protective clothing and respirators shall be provided for use by qualified emergency personnel in the clean room of the decontamination facility.
- E. Contractor shall provide fire watch and logbook throughout the entire term of the project, to protect against fire and unauthorized entry into and around the work area. Any intrusion or incident shall be documented in the logbook. Fire watch personnel shall be present during off-hours shift such as night shift, weekends and holidays when abatement work is not in progress. Fire watch shall be a certified asbestos handler by NYSDOL.

1.08 PRE-CONSTRUCTION CONFERENCE

- A. Prior to start of preparatory Work under this Contract, and in accordance with the deadlines outlined in the Contract Documents, the Contractor shall attend a pre-construction conference attended by Owner, Facility Personnel, and Engineer, if requested.

- B. Agenda for this conference shall include but not necessarily be limited to:
1. Contractor's scope of Work, Work plan, and schedule to include number of Workers and shifts.
 2. Contractor's safety and health precautions including protective clothing and equipment and decontamination procedures.
 3. Owner & Engineer's duties, functions, and authority.
 4. Contractor's Work procedures including:
 - a. Methods of job site preparation and removal methods.
 - b. Respiratory protection.
 - c. Disposal procedures.
 - d. Cleanup procedures.
 - e. Fire exits and emergency procedures.
 5. Contractor's plan for twenty-four (24) hour project security both for prevention of theft and for barring entry of unauthorized personnel into Work Areas.
 6. Temporary utilities.
 7. Handling of furniture and other moveable objects.
 8. Storage of removed asbestos containing materials.
 9. Waste disposal requirements and procedures.
- C. In conjunction with the conference, if requested, the Contractor shall accompany the Owner and/or Engineer on a pre-construction walk-through documenting existing condition of finishes and furnishings, reviewing overall Work plan, location of fire exits, fire protection equipment, water supply and temporary electric tie-in.

1.09 PROJECT MONITORING, AIR SAMPLING, AND INSPECTIONS

- A. The Owner shall engage the services of an Environmental Consultant (the Consultant) or Engineer who shall serve as the Owner's Representative in regard to the performance of the asbestos abatement Project and provide direction as required throughout the entire abatement period.
- B. The Contractor is required to ensure cooperation of its personnel with the Consultant/Engineer for the air sampling and project monitoring functions described below. The Contractor shall comply with all direction given by the Consultant/Engineer during the course of the Project.
- C. The Consultant/Engineer shall provide the following administrative services:
1. Review and approve or disapprove all submittals, shop drawings, schedules, and samples.
 2. Assure that all notifications to governmental agencies by the Contractor are submitted in a timely manner and are correct in content.
 3. Review and approve the Contractor's OSHA compliance testing laboratory.
- D. The Consultant/Engineer shall staff the Project with a NYSDOL-trained and certified Project Monitor to act on the Owner's behalf at the job site. This individual shall be designated as the Abatement Project Monitor (APM).
1. The APM shall be on-site at all times the Contractor is on-site. The Contractor shall not be permitted to conduct any Work unless the APM is on-site.
 2. The APM has the authority to direct the actions of the Contractor verbally and in writing if the Contractor is not performing in compliance with the Project Documents and all regulations. Such authority does not in any way diminish the Contractor's sole responsibility to perform all Work in accordance with the Contract Documents and regulations. However, only the Owner shall have the authority to Stop Work when gross work practice deficiencies or unsafe practices are reported by the APM or when ambient fiber concentrations outside the removal area exceed 0.01 f/cc or background level, whichever is greater.

- a. Such Stop Work order shall be effective immediately and remain in effect until corrective measures have been taken and the situation has been corrected.
 - b. Standby time required to resolve the situation shall be at the Contractor's expense.
 3. The APM shall provide the following services:
 - a. Inspection of the Contractor's Work, practices, and procedures, including temporary protection requirements, for compliance with all regulations and Project specifications.
 - b. Provide abatement Project air sampling as required by applicable regulations (NYS, AHERA). Sampling will include pre-abatement (backgrounds), work area preparation, during abatement and clearance sampling.
 - c. Verify daily that all Workers used in the performance of the Project are certified by the appropriate regulatory agency.
 - d. Monitor the progress of the Contractor's Work, and report any deviations from the schedule to the Owner.
 - e. Monitor, verify, and document all waste load-out operations.
 - f. Verify that the Contractor is performing personal air monitoring daily, and that results are being returned and posted at the site as required.
 4. Inspections shall be conducted at various milestones as Work progresses by the APM. Additional inspections shall be conducted as required by Project conditions. Progression from one phase of work to the next by the Contractor shall be permitted only after visual inspection and verbal approval by the APM.
- E. The Consultant/Engineer shall provide abatement project air sampling and analysis as required by applicable regulations (New York State and/or AHERA). Sampling will include background, pre-abatement, during-abatement and clearance sampling.
 1. Unless otherwise required by applicable regulations, the Consultant shall have samples analyzed by Phase Contrast Microscopy (PCM) using NIOSH Method 7400. Results shall be available within 24 hours of completion of sampling.
 2. If the air sampling during abatement reveals airborne fiber levels at or above 0.01 fibers/cc or the background level (whichever is greater) outside the Work Area, then the Owner shall issue an immediate Stop Work order. The Contractor shall then inspect the barriers for leakage and HEPA vacuum and/or wet clean the surface outside the Work Area. The Contractor shall bear the burden of any and all costs incurred by this delay.
 3. Final air clearance sampling will be conducted by Transmission Electron Microscopy (TEM) in accordance with 40 CFR Part 763 (AHERA), as applicable.

1.10 CONTRACTOR AIR SAMPLING

- A. In addition to the requirements of OSHA 1926.1101, the Contractor shall be required to perform personal air monitoring every Work shift in each Work Area during which abatement activities occur in order to determine that appropriate respiratory protection is being utilized (OSHA Monitoring).
- B. The Contractor shall conduct air sampling that is representative of both the 8-hour time weighted average and 30-minute short-term exposures to indicate compliance with the permissible exposure and excursion limits.
- C. The Contractor's laboratory analysis of air samples shall be conducted by an NYS DOH ELAP approved laboratory.

1.11 WORK SUPERVISION

- A. The Contractor shall designate a full-time Project Supervisor who shall meet the following qualifications:
 1. The Project Supervisor shall hold New York State certification as an Asbestos Supervisor.

2. The Project Supervisor shall meet the requirements of a "Competent Person" as defined by OSHA 1926.1101 and shall have a minimum of one year experience as a supervisor.
 3. The Project Supervisor must be able to read and write English fluently, as well as communicate in the primary language of the Workers.
- B. If the Project Supervisor is not on-site, all Work shall be stopped. The Project Supervisor shall remain on-site whenever asbestos removal is being performed. The Project Supervisor cannot be removed from the Project without the written consent of the Owner and the Engineer.
- C. The Project Supervisor shall maintain the Project Log Book required by New York State Department of Labor and section 2.03 of the specifications and the Waste Disposal Log required by section 4.04 of the specifications.
- D. The Project Supervisor shall be responsible for the performance of the Work and shall represent the Contractor in all respects at the Project site. The Supervisor shall be the primary point of contact for the Asbestos Project Monitor.

1.12 DELIVERY AND STORAGE

- A. Deliver non-contaminated materials to the job site in original packages with containers bearing manufacturer's name and label.
- B. Store all materials at the job site in a suitable and designated area.
1. Store materials subject to deterioration or damage away from wet or damp surfaces and under cover.
 2. Protect materials from unintended contamination.
- C. Remove damaged or deteriorated materials from the job site. Materials contaminated with asbestos shall be disposed of as asbestos debris as herein specified.

1.13 TEMPORARY UTILITIES

- A. Shut down and lock out all electrical power to the asbestos Work Areas.
- B. Provide temporary 120-208 volt, single phase, three wire, 100 amp electric service with Ground Fault Circuit Interrupters (GFCI) for all electric requirements within the asbestos Work Area.
1. Where available, obtain from Owner's existing electrical system. Otherwise provide power from other sources (i.e. generator).
 2. Provide temporary wiring and "weatherproof" receptacles in sufficient quantity and location to serve all HEPA equipment and tools.
 3. Provide adequate "weatherproof" receptacles, to incorporate use by the APM for air sampling equipment.
 4. All power to the Work Area shall be brought in from outside the area through GFCI's at the source.
- C. Provide temporary lighting with "weatherproof" fixtures for all Work Areas including decontamination chambers.
1. The entire Work Area shall be kept illuminated at all times work is in progress.
 2. Provide lighting adequate for the purposes of performing required inspections.
- D. All temporary devices and wiring used in the Work Area shall be capable of decontamination procedures including HEPA vacuuming and wet-wiping.
- E. Utilize domestic water service, if available, from Owner's existing system. Provide hot water heaters with sufficient capacity to meet Project demands.

PART 2 - PRODUCTS

2.01 PROTECTIVE CLOTHING

- A. Provide personnel utilized during the Project with disposable protective whole body clothing, head coverings, gloves and foot coverings. Provide disposable plastic or rubber gloves to protect hands. Cloth gloves may be worn inside the plastic or rubber for comfort, but shall not be used alone. Make sleeves secure at the wrists and make foot coverings secure at the ankles by the use of tape, or provide disposable coverings with elastic wrists or tops.
- B. Provide sufficient quantities of protective clothing to assure a minimum of four (4) complete disposable outfits per day for each individual performing abatement Work.

2.02 DISPOSAL BAGS, DRUMS, AND CONTAINERS

- A. Provide 6 mil polyethylene disposal bags printed with asbestos caution labels. Bags shall be imprinted with U.S. Department of Transportation required markings.
- B. If the asbestos waste has the potential to damage or puncture the disposal bags, burlap sacks shall be utilized as a liner inside the polyethylene disposal bags to prevent puncture or damage to the disposal bags. In addition, 30 or 55 gallon capacity fiber or metal drums capable of being sealed air and water tight may also be used. Affix asbestos caution labels on lids and at one-third points around drum circumference to assure ready identification.
- C. Containers and bags must be labeled with the names of the waste generator and the location at which the waste was generated in accordance with 40 CFR Part 61 NESHAPS.
- D. Labeled ACM waste containers or bags shall not be used for non-ACM waste or trash. Any material placed in labeled containers or bags, whether turned inside out or not shall be handled and disposed of as ACM waste.

2.03 HEPA VACUUM EQUIPMENT

- A. All dry vacuuming performed under this contract shall be performed with High Efficiency Particulate Absolute (HEPA) filter equipped industrial vacuums conforming to ANSI Z9.2.
- B. Provide tools and specialized equipment including scraping nozzles with integral vacuum hoods connected to a HEPA vacuum with flexible hose.

2.04 POWER TOOLS

- A. Any power tools used to drill, cut into, or otherwise disturb asbestos material shall be equipped with HEPA filtered local exhaust ventilation.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

- A. Should the area beyond the Work Area(s) become contaminated with asbestos containing materials or elevated fiber levels, immediately stop Work and institute emergency procedures. Contaminated non-Work Areas shall be isolated and decontaminated in accordance with procedures established for asbestos removal. All costs incurred in decontaminating such non-Work Areas and the contents thereof shall be borne by the Contractor, at no additional cost to the Owner.

- B. NYS DOL certificates shall be on site prior to admittance of any Contractor's employees to the asbestos Work Area.
- C. Perform all asbestos removal Work using wet removal procedures. Dry removal procedures are not permitted.
- D. The following documents shall be posted at the site at an easily accessible location:
 - 1. Company Asbestos Abatement license.
 - 2. Worker's asbestos handling certificates (copies are acceptable provided Workers have original certificates in their possession).
 - 3. Project specifications.
 - 4. Project drawings.
 - 5. Notifications and variances.
 - 6. Applicable regulations.
 - 7. Material Safety Data Sheets.
 - 8. Abatement Work plan.
 - 9. List of emergency telephone numbers.
 - 10. Waste Disposal Log.
- E. The Work Area must be vacated by building occupants prior to decontamination enclosure construction and Work Area preparation.

3.02 PERSONNEL DECONTAMINATION ENCLOSURE

- A. Full (five room) Decontamination Facility: The Contractor shall provide a full decontamination enclosure system for large asbestos projects in accordance with OSHA Standard 29 CFR 1926.1101 and 12NYCRR Part 56 (ICR 56).
- B. Remote Decontamination Facility: The Contractor shall provide a remote personnel decontamination enclosure system for small asbestos projects, asbestos projects that utilize multiple tents, and exterior asbestos roof projects in accordance with OSHA Standard 29 CFR 1926.1101 and 12NYCRR Part 56 (ICR 56).
- C. Decontamination Enclosure System Utilities: Lighting, heat, and electricity shall be provided as necessary by the Contractor.

3.03 WASTE DECONTAMINATION ENCLOSURE

- A. Waste/Equipment Decontamination Enclosure System: This system is located adjacent to the work area and personnel decontamination system. If the decontamination chamber is accessible to the public it shall be fully framed and sheathed to prevent unauthorized entry. A remote decontamination unit may be used that complies with subpart 56-9 of NYS Industrial Code Rule 56 of Title 12, section 30 of the Labor Law. This remote enclosure system must be on the property and stationary, within 50 feet of the building.
- B. Where only one egress from the Work Area exists, the holding area of the waste decontamination enclosure system may branch off from the personnel decontamination enclosure equipment room, which then serves as the waste wash room.
- C. The waste wash room water shall be drained, collected, and filtered as specified in ICR 56.
- D. In small asbestos projects where only one egress from the Work Area exists, the shower room may be used as a waste washroom. In this instance, the clean room shall not be used for waste storage, but shall be used for waste transfer to carts, which shall immediately be removed from this enclosure.

3.04 WORK AREA ENTRY AND EXIT PROCEDURES

- A. Personnel Entrance and Decontamination Procedures for Gross Removal Operations utilizing full decontamination facility, the following entry/exit procedures shall be used for gross removal using full containment:
1. All workers and authorized visitors shall enter the work area through the worker decontamination enclosure system.
 2. All individuals who enter the work area shall sign the entry log, located in the clean room, upon each entry and exit. The log shall be permanently bound and shall identify fully the facility, agents, contractor(s), the project, each work area and worker respiratory protection employed. The site supervisor shall be responsible for the maintenance of the log during the abatement activity.
 3. Each worker or authorized visitor shall, upon entering the job site, remove street clothes in the clean room and put on a clean respirator (with new filters, if appropriate) and clean protective clothing before entering the work area through the shower room and equipment room.
 4. Each worker or authorized visitor shall, each time he leaves the work area: remove gross contamination from clothing before leaving the work area; proceed to the equipment room and remove all clothing except the respirator; still wearing the respirator, proceed to the shower room; clean the outside of the respirator with soap and water while showering; remove filters, wet them, and dispose of them in the container provided for that purpose; wash and rinse the inside of the respirator; and thoroughly shampoo and wash himself/herself.
 5. Following showering and drying off, each worker or authorized visitor shall proceed directly to the clean room, dress in street clothes, and exit the decontamination enclosure system immediately. Disposable clothing of the type worn inside the work area is not permitted outside the work area.
- B. Personnel Entrance and Decontamination Procedures for Removal Operations utilizing remote decontamination facility: The following entry/exit procedures shall be used for removal work areas.
1. All individuals who enter the Work Area shall sign the entry log, located in the clean room, upon each entry and exit. The log shall be permanently bound and shall identify fully the facility, agents, contractor(s), the project, each Work Area, and worker respiratory protection employed. The job supervisor shall be responsible for the maintenance of the log during the abatement activity.
 2. Each worker shall remove street clothes in the clean room; wear two disposable suits, including gloves, hoods and non-skid footwear; and put on a clean respirator (with new filters) before entering the work area.
 3. Each worker shall, before leaving the work area or tent, shall clean the outside of the respirators and outer protective clothing by wet cleaning and/or HEPA vacuuming. The outer disposable suit shall be removed in the work area and the worker shall then proceed to the shower room. The inner disposable suit and respirator shall be wet wiped and HEPA vacuumed thoroughly before removing and prior to aggressive shower.
 4. Following showering and drying off, each worker or authorized visitor shall proceed directly to the clean room, dress in street clothes, and exit the decontamination enclosure system immediately.

3.05 WORK AREA PREPARATION

- A. Work Area preparation shall be performed in accordance with ICR 56, the Contract Documents and the approved Asbestos Work Plan.
- B. Temporary lighting within the work area and decontamination system shall be provided as required to achieve minimum illumination levels.

- C. Unless otherwise specified for removal, the Contractor shall either protect all fiberglass insulation on piping, ductwork, tanks, etc. in the Work Area using two layers of six mil polyethylene or remove the insulation as asbestos containing waste. If the Contractor elects to remove the fiberglass insulation, he shall be responsible for reinsulation, if reinsulation of removed ACM is part of the Contract or Project.
- D. Emergency exits. Emergency exits and routes shall be established and clearly marked with florescent paint or other effective designations to permit easy location from anywhere within the work area. Emergency exits shall be secured to prevent access from uncontaminated areas and yet permit emergency exiting. Exits shall be checked daily against exterior blockage or impediments to exiting.
- E. Remove all items attached to or in contact with ACM only after the Work Area enclosure is in place. HEPA vacuum and wet wipe with amended water all removed items prior to their removal from the Work Area and before the start of asbestos removal operations.
- F. If, required, suspended ceiling tiles shall only be removed after Work Area preparation is complete. Non-contaminated ceiling tiles shall be HEPA vacuumed and removed from the Work Area before asbestos removals begin. Contaminated ceiling tiles shall be disposed of as asbestos waste.
- G. For tent enclosures: the Contractor shall use negative pressure ventilation equipment to continuously exhaust the enclosed area. A minimum of two (2) volume changes per hour is required. All required air monitoring must be successfully completed before the tent/barrier is collapsed.

3.06 NEGATIVE AIR PRESSURE FILTRATION SYSTEM

- A. Provide a portable asbestos filtration system that develops a minimum pressure differential of negative 0.02 in. of water column within all full enclosure areas relative to adjacent unsealed areas and that provides a minimum of 4 air changes per hour in the Work Area during abatement.
- B. The system shall include a series of pre-filters and filters to provide High Efficiency Particulate Air (HEPA) filtration of particles down to 0.3 microns at 100% efficiency and below 0.3 microns at 99.9% efficiency. Provide sufficient replacement filters to replace pre-filters every 2 hours, secondary pre-filters every 24 hours, and primary HEPA filters every 600 hours of operation.
- C. At no time will the unit exhaust indoors, within 50 feet of a receptor, including but not limited to windows and doors, or adversely affect the air intake of the building.
- D. The Contractor shall provide either a manometer or a photohelic style negative air pressure gauge with chart recorder to measure and record negative pressure differential across the Work Area barriers without interruption 24 hours per day as directed by the Environmental Consultant.
- E. There shall be at least a 12-hour settling period after the Work Area is fully prepared and the negative filtration units have been started to ensure integrity of the barriers. Unless otherwise specified in the variance(s) utilized by the contractor.

3.07 REMOVAL OF ASBESTOS CONTAINING MATERIALS

- A. Asbestos-containing materials shall be removed in accordance with ICR 56, the Contract Documents and the approved Asbestos Work Plan.

- B. Sufficiently wet asbestos materials with a low pressure, airless fine spray of surfactant to ensure full penetration prior to material removal. Re-wet material that does not display evidence of saturation.
- C. One Worker shall continuously apply amended water while ACM is being removed.
- D. Perform cutting, drilling, abrading, or any penetration or disturbance of asbestos containing material in a manner to minimize the dispersal of asbestos fibers into the air. Use equipment and methods specifically designed to limit generation of airborne asbestos particles. All power operated tools used shall be provided with HEPA equipped filtered local exhaust ventilation.
- E. Power or pressure washers will not be allowed to be used for asbestos removal or clean-up procedures.

3.08 ACM WASTE CONTAINERIZING, DECONTAMINATION AND LOAD OUT PROCEDURES

- A. Packaging of ACM shall conform to OSHA Standard 29 CFR 1926.1101, DOT 49 CFR 171, 172, and 173, and EPA Standard 40 CFR Part 61 and the requirements as herein specified. Materials to be transported through a non-Work area building space shall be placed in hard wall shipping containers for handling.
- B. The cleaned containers of asbestos material and equipment shall be placed in water tight carts with doors or tops that shall be closed and secured. These carts shall be held in the holding area pending removal. The carts shall be wet cleaned and/or HEPA vacuumed at least once each day.
- C. The exit from the decontamination enclosure system shall be secured to prevent unauthorized entry.
- D. Where the waste removal enclosure is part of the personnel decontamination enclosure, waste removal shall not occur during shift changes or when otherwise occupied. Precautions shall be taken to prevent short circuiting and cycling of air outward through the shower and clean room.

3.09 WORK AREA CLEANING PROCEDURES

- A. Following completion of gross abatement and after all accumulations of asbestos waste materials have been containerized, decontamination procedures shall be followed as specified in ICR 56, unless otherwise stated in the variance(s) utilized by the Contractor.
- B. Following each decontamination procedure (i.e., first, second, and third cleanings) the APM shall inspect the Work Area for effectiveness of the cleanings. If necessary, additional cleaning shall be performed by the Contractor as directed by the APM.
- C. As a result of any air sampling results that indicate high fiber levels, the Contractor will clean or reclean the affected areas at no additional expense to the Owner.

3.10 TENT ENCLOSURES

- A. Tent enclosures may only be used in areas specifically permitted by NYS Department of Labor Code Rule 56 or a Project specific variance issued by the NYS Department of Labor.
- B. The Contractor shall restrict access to the immediate area where tent removal procedures are taking place using barrier tape and/or construction barriers. Caution signs shall be posted.
- C. Remote personnel and waste decontamination enclosures shall be constructed. Configuration shall be as required by Project size.

- D. During removal activity, a HEPA vacuum or small capacity negative pressure filtration unit shall be used to provide a negative air pressure inside the tent. A minimum of six air changes per hour is required.
- E. Workers shall wear two disposable suits for all phases of Work. Workers exiting the tent shall HEPA vacuum the outer suit, enter the airlock, remove the outer suit and then place it back into the Work Area. A clean second suit shall be donned before exiting the airlock and proceeding to the decontamination enclosure or another tent.
- F. ACM removal shall follow procedures defined in Section 3.07.
- G. Waste material shall be placed in properly labeled 6 mil plastic bags or other appropriate containers. The outside of the bags or containers shall be wet wiped and/or HEPA vacuumed before being passed into the airlock for double- bagging. The bags or containers shall then be transported to the decontamination enclosure and then bagged for a third time and transported to the waste storage container. All transportation of waste bags and containers outside the Work Area shall be in watertight carts.
- H. The APM shall conduct a visual inspection of the Work Area for cleanliness and completion of abatement.

3.11 GLOVEBAG REMOVAL

- A. Glovebag removals may only be used as specifically permitted by NYS Department of Labor Code Rule 56, Applicable Variance 108 (AV 108) Glovebag Operations, or a Project specific variance issued by the NYS Department of Labor. Glovebags may only be used on piping.
- B. As specified in applicable regulations and variances, glovebag removals are only permitted to be conducted within tent enclosures complying with these specifications. Removal and disposals must also be conducted in conformance with all Project variance conditions.
- C. The Contractor shall restrict access to the immediate area where tent/glovebag removal procedures are taking place using barrier tape and/or construction barriers. Caution signs shall be posted.
- D. Remote personnel and waste decontamination enclosures shall be constructed. Configuration shall be as required by Project size.
- E. The glovebags shall be smoke tested by the APM before removal operations commence. Glovebags that do not pass the smoke test shall be resealed and then retested.
- F. After glovebag removals are complete, tent decontamination procedures shall be followed.

3.12 RESTORATION OF UTILITIES, FIRESTOPPING, AND FINISHES

- A. After final clearance, remove locks and restore electrical and HVAC systems. All temporary power shall be disconnected, power lockouts removed and power restored. All temporary plumbing shall be removed.
- B. Finishes damaged by asbestos abatement activities including, but not limited to, plaster/paint damage due to duct tape and spray adhesives, and floor tile lifted due to wet or humid conditions, shall be restored prior to final payment, unless the damaged surfaces are to be replaced during renovation activities.
 - 1. Finishes unable to be restored shall be replaced under this Contract.
 - 2. All foam and expandable foam products and materials used to seal Work Area openings shall be completely removed upon completion of abatement activities.

- C. All penetrations (including, but not limited to, pipes, ducts, etc.) through fire rated construction shall be firestopped using materials and systems tested in accordance with ASTM E814 on Projects where re-insulation is part of the required work.

3.13 ASBESTOS WASTE

- A. Applicable Regulations: All asbestos waste shall be stored, transported and disposed of in accordance with the following regulations as a minimum:
 - 1. NYS DEC 6 NYCRRNYRCC part 360 and 364.
 - 2. US EPA NESHAPS 40 CFR 61.
 - 3. US EPA Asbestos Waste Management Guidance EPA/530-SW85.
- B. Waste Storage Containers.
 - 1. As work progresses, remove sealed and labeled bags of ACM from the Work area and place in a lockable trailer, dumpster, or other container approved for storage or transport of asbestos waste. Open containers will not be permitted on-site (i.e. open dumpster with canvas cover, etc.).
 - 2. The container interior shall be plasticized and sealed with a minimum of two (2) layers of 6 mil polyethylene.
 - 3. While on-site, the container shall be labeled with EPA Danger signage:

**DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD**

- 4. The danger sign legend, text size, style and arrangement shall conform to the requirements of EPA Standard 40 CFR Part 61.149 (d) (1).
- 5. The New York State Department of Environmental Conservation Asbestos Hauler's Permit number shall be stenciled on both sides and back of the container.
- 6. Once the container is loaded at the site, the door(s) will be locked at all times.
- 7. Before the container is removed from the Project Site for transportation to the Disposal Site, the door(s) shall be locked. The locks shall be removed at the Disposal Site by the operator of the Disposal Facility.
- 8. The Owner may initiate random checks at the Disposal Site to insure that the procedures outlined herein are complied with.

3.14 DISPOSAL AND TRANSPORTATION OF ASBESTOS-CONTAMINATED WASTES

- A. Sealed and labeled disposal bags or waste wrapped in two layers of plastic sheeting sealed airtight shall be used to transport asbestos-contaminated waste to the landfill. Procedures for hauling and disposal shall comply with 40 CFR, Part 61, 49 CFR, Part 171 and 172, and other applicable state, regional, and local government regulations.
 - 1. An asbestos waste shipment record or waste manifest shall accompany asbestos waste, which is transported to a disposal site.
 - 2. The waste manifest shall be completed by the Contractor.
 - 3. The waste manifest shall have the appropriate signatures of the APM, the Contractor, and the Hauler representatives prior to any waste being removed from the site.
 - 4. Copies of the completed waste manifest shall be retained by APM and the Contractor and shall remain on site for inspection. The Contractor shall forward originals of the waste manifest, which include final sign-off by the disposal facility, to Consultant/Engineer within 14 days of the waste container being removed from the site. Failure to do so may result in payment being withheld from the Contractor.

3.15 DISPOSAL SITE

- A. The Contractor's Hauler and Disposal Site shall be approved by the Owner.
- B. The Contractor shall have the Hauler provide the estimated date and time of arrival at the Disposal Site.
- C. Unless specifically approved by the Owner, the Contractor shall not permit any off-site transfers of the waste or allow the waste to be transported or combined with any other off-site asbestos material. The Hauler must travel directly to the disposal site without unauthorized stops.

END OF SECTION 028200

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Related Sections:
 - 1. 022600 – Hazardous Material Assessment
- B. This lead-based paint and material removal project will consist of the localized removal of loose and/or damaged lead based paint in the areas indicated in the report attached herewith.
- C. The work shall include, but not be limited to removal and disposal of the following:
 - 1. All positive lead containing materials greater than regulatory level of 1.0 described in the lead paint inspection report attached within Specification Section 022600.
- D. The Contractor shall be aware of all conditions of the Project and is responsible for verifying quantities and locations of all Work to be performed. Failure to do so shall not relieve the Contractor of its obligation to furnish all labor and materials necessary to perform the Work.
- E. All Work shall be performed in strict accordance with the Project Documents and all governing codes, rules, and regulations. Where conflicts occur between the Project Documents and applicable codes, rules, and regulations, the more stringent shall apply.

1.02 PERMITS AND COMPLIANCE

- A. The Contractor shall assume full responsibility and liability for compliance with all applicable Federal, State, and local laws, rules, and regulations pertaining to Work practices, protection of Workers, authorized visitors to the site, persons, and property adjacent to the Work.
- B. The Contractor must maintain current licenses pursuant to New York State Department of Labor, Department of Environmental Conservation and Environmental Protection Agency for all Work related to this Project, including the removal, handling, transport, and disposal of lead containing materials.
- C. The Contractor must have and submit proof upon request that any persons employed by the Contractor to engage in or supervise Work on any lead Project have prior experience on similar projects. If in the course of the project there should be materials or surfaces that contain asbestos, the contractor and all workers must be certified by the NYS Department of Labor as handlers and contractor/supervisors. It is then the responsibility of the contractor to also follow the asbestos specification for this project.
- D. It is the sole responsibility of the Contractor to determine what, if any, patents are applicable to the Project. The Contractor shall pay all royalties and/or license fees. He shall defend all suits or claims for infringement of any patent rights and save the Owner, Architect, Engineer, Environmental Consultant, and Construction Manager harmless from loss, including attorney's fees, on account thereof.
- E. Failure to adhere to the Project Documents shall constitute a breach of the Contract and the Owner shall have the right to and may terminate the Contract provided, however, the failure of the Owner to so terminate shall not relieve the Contractor from future compliance.

1.03 SUBMITTALS

- A. Pre-contract Submittals: Within 3 days after bids are opened, the three apparent low bidders shall submit the following documentation. Failure to submit all required documentation truthfully or in a timely manner may be cause for rejection of the bid.

1. Contractor certifications issued by the Environmental Protection Agency.
 2. The number of years engaged in lead-based paint renovation and remodeling projections.
 3. A list of Projects performed within the past two (2) years and include the dollar value of all Projects. Provide Project references to include Owner, consultant, contact persons, address, and phone number.
 4. A list of owned equipment available to be used in the performance of the Project.
 5. An outline of the Worker training course and medical surveillance program conducted by the Contractor.
 6. A standard operating procedures manual describing Work practices and procedures, equipment, type of decontamination facilities, respiratory program, special removal techniques, etc.
 7. Citations/Violations/Legal Proceedings: Submit a notarized statement describing:
 - a. Any citations, violations, criminal charges, or legal proceedings undertaken or issued by any law enforcement, regulatory agency, or consultant concerning performance on previous lead contracts. Briefly describe the circumstances citing the Project and involved persons and agencies as well as the outcome of any actions.
 - b. Any Stop Work Orders issued on Projects within the past 2 years.
 - c. Any litigation or arbitration proceedings arising out of performance on past Projects.
 - d. Any liquidated damages assessed within the last 2 years.
 8. Preliminary Schedule: Provide an estimate of manpower to be utilized and the time required for completion of each major Work Area. Include estimated size and number of crews and work shifts.
- B. Pre-Work Submittals: Within 7 days prior to the pre-construction conference, the Contractor shall submit 3 copies of the documents listed below:
1. Progress Schedule:
 - a. Show the complete sequence of lead related activities and the sequencing of Work within each building section.
 - b. Show the dates for the beginning and completion of each major element of Work including substantial completion dates for each Work Area or phase.
 - c. Show projected percentage of completion for each item, as of the first day of each month.
 - d. Show final inspection dates.
 2. Permits: As required by State and local regulations, including arrangements for storage, transportation, and disposal of contaminated material.
 3. Lead Activities Work Plan: Provide plans which clearly indicate the following:
 - a. All Work Areas/containment's numbered sequentially.
 - b. Locations and types of all decontamination enclosures.
 - c. Entrances and exits to the Work Areas/containment's.
 - d. Type of lead related activity/technique for each Work Area/containment.
 - e. Proposed location and construction of storage facilities and field office.
 - f. Location of water and electrical connections to building services.
 4. Equipment: Submit manufacturer's data sheets/product descriptions of all equipment and products including HEPA vacuums, respirators, protective clothing, chemicals, etc. identified in this specification.
 5. Samples: Submit samples of warning notices to be posted, replacement materials, etc.
 6. Worker Training, Medical Surveillance, and Certification:
 - a. The Contractor shall submit a list of persons to be employed for the Project.
 - b. Present evidence that Workers have received proper training required by the regulations and the medical examinations required by OSHA 29 CFR 1926. 62.
 - c. Submit documentation that Workers have been fit tested specifically for respirators used on the Project.
 - d. Submit copies of Proof of Lead Renovation Remolding certification for each person employed in the disturbance of lead.

7. Logs: Specimen copies of daily progress log, visitor's log, and disposal log.
 8. Material List: A complete materials list of all items proposed to be furnished and used under this Contract.
 9. Subcontractor List: List of all subcontractors to be used on the Project (i.e. Waste Hauler).
 10. Material Safety Data Sheets (MSDS): Copies of MSDS for each chemical or material used for the Project (paint stripper, surfactant, etc.)
 11. Project Supervisor: Resume of the proposed Project Supervisor.
 12. Rental Notifications: Notices sent to rental suppliers informing them of the nature of the Work that the Contractor intends to use the equipment for.
 13. Worker's Acknowledgments: Statements signed by each employee that the employee has received training in the proper handling of lead containing paint; understands the health implications and risks involved; and understands the use and limitations of the respiratory equipment to be used.
 14. Laboratory: Submit the documentation that the laboratory performing the OSHA personnel air samples is recognized as an Environmental Protection Agency National Lead Laboratory Accredited Program (NLLAP) accredited laboratory.
 15. HUD Title X: "Guidelines for the Evaluation and Control of Lead Based Paint."
- C. Project Close-out Submittals: Submit the following at the closeout of the Project:
1. Copies of all waste disposal manifests, seals, and disposal logs.
 2. OSHA compliance air monitoring records conducted during the Work.
 3. Daily progress log.
 4. Entry and exit log.
 5. A list of all EPA Certified Workers used in the performance of the Project, including name, social security number.
 6. Required Employee Statements including Medical Examination Statement, Worker's Acknowledgment Statement, and Employee Training Statement.

1.04 PRE-CONSTRUCTION CONFERENCE

- A. Prior to start of preparatory Work under this Contract, the Contractor shall attend a pre-construction conference attended by Owner, Facility Personnel, and Environmental Consultant.
- B. Agenda for this conference shall include but not necessarily be limited to:
1. Contractor's scope of Work, Work plan, and schedule to include number of Workers and shifts.
 2. Contractor's safety and health precautions including protective clothing and equipment and decontamination procedures.
 3. Environmental Consultant's duties, functions, and authority.
 4. Contractor's Work procedures including:
 - a. Methods of job site preparation and removal methods.
 - b. Respiratory protection.
 - c. Disposal procedures.
 - d. Cleanup procedures.
 - e. Fire exits and emergency procedures.
 5. Contractor's plan for twenty-four (24) hour project security both for prevention of theft and for barring entry of unauthorized personnel into Work Areas.
 6. Temporary utilities.
 7. Handling of furniture and other moveable objects.
 8. Storage of removed lead containing paint.
 9. Waste disposal requirements and procedures.
- C. In conjunction with the conference the Contractor shall accompany the Owner and Environmental Consultant on a pre-construction walk-through documenting existing condition of

finishes and furnishings, reviewing overall Work plan, location of fire exits, fire protection equipment, water supply and temporary electric tie-in.

1.05 APPLICABLE STANDARDS AND REGULATIONS

- A. The Contractor shall comply with the following codes and standards, except where more stringent requirements are shown or specified:
- B. Federal Regulations:
 - 1. 29 CFR 1910, Occupational Safety and Health Standards
 - 2. 29 CFR 1926, Safety and Health Regulations for Construction
 - 3. 40 CFR 148, Hazardous Waste Injection Restrictions
 - 4. 40 CFR 260, Hazardous Waste Management System: General
 - 5. 40 CFR 261, Identification and Listing of Hazardous Waste
 - 6. 40 CFR 262, Standards Applicable to Generators of Hazardous Waste
 - 7. 40 CFR 263, Standards Applicable to Transporters of Hazardous Waste
 - 8. 40 CFR 264, Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
 - 9. 40 CFR 265, Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
 - 10. 40 CFR 268, Land Disposal Restrictions
 - 11. 40 CFR 745, Lead; Identification of Dangerous Levels of Lead; Proposed Rule
 - 12. 49 CFR 172, Hazardous Material Table, Special Provisions, Hazardous Material Communications, Emergency Response Information, and Training Requirements
 - 13. 49 CFR 178, Specifications for Packaging
 - 14. HUD 0005646, (1990; Rev May 1991) Lead-Based Paint: Interim Guidelines for Hazard Identification and Abatement in Public and Indian Housing
- C. Standards and Guidance Documents:
 - 1. American National Standard Institute (ANSI) Z88.2-80, Practices for Respiratory Protection
 - 2. ANSI Z9.2-79, Fundamentals Governing the Design and Operation of Local Exhaust Systems
 - 3. UL 586, (1990) High-Efficiency, Particulate, Air Filter Units
 - 4. NIOSH OSHA Booklet 3142, Lead in Construction
 - 5. NFPA 701, (1989) Methods of Fire Test for Flame-Resistant Textiles and Films
 - 6. EM 385-1-1, (1992) U.S. Army Corps of Engineers Safety and Health Requirements Manual

1.06 NOTICES

- A. The Contractor shall post and/or provide notification to building occupants 10 days prior to beginning lead activities. The posting shall include the following information:
 - 1. The locations of the lead Renovation Remolding Project.
 - 2. The amounts and types of materials being removed and/or disturbed.
 - 3. The commencement and completion dates of the Project.
 - 4. The name, address, and certification of the Lead Contractor.
 - 5. The name and address of the Environmental Consultant and laboratory.

1.07 PROJECT MONITORING AND WIPE SAMPLING

- A. The Owner shall engage the services of an Environmental Consultant (the Consultant) who shall serve as the Owner's Representative in regard to the performance of the lead-based paint Project and provide direction as required throughout the entire lead period.

- B. The Contractor is required to ensure cooperation of its personnel with the Consultant for the wipe sampling and project monitoring functions described below. The Contractor shall comply with all direction given by the Consultant during the course of the Project.
- C. The Consultant shall provide the following administrative services:
 - 1. Review and approve or disapprove all submittals, shop drawings, schedules, and samples.
 - 2. Assure that all notifications to governmental agencies by the Contractor are submitted in a timely manner and are correct in content.
 - 3. Review and approve the Contractor's OSHA compliance testing laboratory.
- D. The Consultant shall staff the Project with a trained person(s) to act on the Owner's behalf at the job site. At a minimum the trained person(s) shall be certified as a lead inspector or risk assessor. This individual shall be designated as the Lead Project Monitor (LPM).
 - 1. The LPM shall be on-site at all times the Contractor is on-site. The Contractor shall not be permitted to conduct any Work unless the LPM is on-site.
 - 2. The LPM shall have the authority to direct the actions of the Contractor verbally and in writing to ensure compliance with the Project documents and all regulations. The LPM shall have the authority to Stop Work when gross work practice deficiencies or unsafe practices are observed.
 - a. Such Stop Work order shall be effective immediately and remain in effect until corrective measures have been taken and the situation has been corrected.
 - b. Standby time required to resolve the situation shall be at the Contractor's expense.
 - 3. The LPM shall provide the following services:
 - a. Inspection of the Contractor's Work, practices, and procedures, including temporary protection requirements, for compliance with all regulations and Project specifications.
 - b. Verify daily that all Workers used in the performance of the Project are certified by the appropriate regulatory agency.
 - c. Monitor the progress of the Contractor's Work, and report any deviations from the schedule to the Owner.
 - d. Monitor, verify, and document all waste load-out operations.
 - e. Verify that the Contractor is performing personal air monitoring daily, and that results are being returned and posted at the site as required.
 - 4. The following minimum inspections shall be conducted by the LPM. Additional inspections shall be conducted as required by Project conditions. Progression from one phase of work to the next by the Contractor is only permitted with the approval of the LPM.
 - a. Pre-Construction Inspection: The purpose of this inspection is to verify the existing conditions of the Work Areas and to document these conditions.
 - b. Pre-Commencement Inspection: The purpose of this inspection is to verify the integrity of each containment system prior to disturbance of any lead containing material. This inspection shall take place only after the Work Area is fully prepped for removal.
 - c. Work Inspections: The purpose of this inspection is to monitor the Work practices and procedures employed on the Project and to monitor the continued integrity of the containment system. Inspections within the removal areas shall be conducted by the LPM during all preparation, removal, and cleaning activities at least twice every Work shift. Additional inspections shall be conducted as warranted.
 - d. Visual Clearance Inspection: The purpose of this inspection is to verify the Contractor's certification that all materials have been removed from the Work Area and the absence of all visible accumulations of debris in the Work Area.
 - e. Punch List Inspection: The purpose of this inspection is to verify the Contractor's certification that work has been completed as contracted and the existing condition of the area prior to its release to the Owner.
 - 5. The LPM shall perform lead wipe (lead-dust clearance) sampling as follows:

- a. Wipe samples shall be collected from one sill surface and floor area surface where doors have been removed following the lead contractor's final cleaning of the work area. Lead wipe samples shall be analyzed by a NLLAP laboratory. Results shall be available within 24 hours of completing sampling.
6. The LPM shall perform a pilot air monitoring project as follows:
 - a. Air samples shall be collected during the first phase of the lead project to determine if lead removal methods are generating airborne lead dust at concentrations exceeding regulatory guideline for locations exterior the Work Area. At least one air sample will be collected at the entrance to the Work Area and at critical barriers.
 - b. Should it be established that airborne lead-dust concentrations, exterior to the work area, are within the applicable guidelines, no further air monitoring will be performed. Should airborne lead-dust concentrations, exterior the work area, be determined to exceed the applicable guideline concentration, additional engineering controls will be implemented and the pilot project repeated. Once affective engineering controls have been established and implemented, no further air monitoring will be performed.
 - c. Lead air samples shall be analyzed by a NLLAP laboratory. Results shall be available within 24 hours of completing sampling.

1.08 CONTRACTOR AIR SAMPLING

- A. In addition to the requirements of OSHA 1926.62, the Contractor shall be required to perform personal air monitoring to determine that appropriate respiratory protection is being utilized.
- B. The Contractor's laboratory analysis of air samples shall be conducted by NLLAP approved laboratory, subject to approval of the Environmental Consultant.
- C. Results of personnel air sample analyses shall be available, verbally, within twenty-four (24) hours of sampling and shall be posted upon receipt. Written laboratory reports shall be delivered and posted at the Work site within five (5) days.

1.09 PROJECT SUPERVISOR

- A. The Contractor shall designate a full-time Project Supervisor who shall meet the following qualifications:
 1. The Project Supervisor shall hold Lead certification for the renovation & remodeling of lead-based paint.
 2. The Project Supervisor shall have a minimum of one-year experience as a supervisor.
 3. The Project Supervisor must be able to read and write English fluently, as well as communicate in the primary language of the Workers.
- B. Prior to the commencement of Work, the Contractor shall submit the proposed Project Supervisor's resume to the Owner and Environmental Consultant for approval.
- C. If the Project Supervisor is not on-site at any time whatsoever, all Work shall be stopped. The Project Supervisor shall remain on-site until the Project is complete. The Project Supervisor cannot be removed from the Project without the written consent of the Owner and the Environmental Consultant.
- D. The Project Supervisor shall maintain the Project Log Book required by section 2.03 of the specifications and a Waste Disposal Log.
- E. The Project Supervisor shall be responsible for the performance of the Work and shall represent the Contractor in all respects at the Project site. The Supervisor shall be the primary point of contact for the Lead Project Monitor.

1.10 MEDICAL REQUIREMENTS

- A. Employers must make available medical examinations to all employees covered under the medical surveillance program. Medical exams must be performed:
 - 1. Medical Surveillance should have undergone an initial medical surveillance examination
 - 2. At least annually when tests within the preceding 12 months indicated a blood lead level at or above 40 µg/dl;
 - 3. Prior assignment for each employee for the first time to an area in which lead concentrations are above the action level;
 - 4. As soon as possible when employee has developed signs or symptoms of lead exposure;
 - 5. For employees medically removed from work area; and
 - 6. For employees as final medical determination.
- B. The medical exam consists of the following:
 - 1. A detailed work and medical history with particular attention to past lead exposure (occupational and non-occupational), personal habits (smoking, hygiene), and past gastrointestinal, hematological, renal, cardiovascular, reproductive and neuralgic problems.
 - 2. Through physical examination with particular attention to tooth, gums, hematological, gastrointestinal, renal cardiovascular, and neurological systems. Pulmonary status must be evaluated if respiratory protection will be used.
 - 3. Blood sample and analysis which determines:
 - a. Blood lead level;
 - b. Hemoglobin and Hematocrit determinations, red cells indices and examination of peripheral smear Morphology;
 - c. Zinc protoporphyrin;
 - d. Blood Urea Nitrogen (BUN);
 - e. Respirator Health Check;
 - f. Pulmonary function testing;
 - g. Chest X-ray;
 - h. Electrocardiogram.
- C. Employees may seek a secondary physician for a second opinion to review initial results, and conduct examination consultations and laboratory tests deemed necessary. If two physicians disagree and are unable to resolve differences a third physician may be contacted (see OSHA Lead Standard [29 CFR 1910.1025(j)] for more details).

1.11 TRAINING

- A. As required by applicable regulations, prior to assignment to lead Work instruct each employee with regard to the hazards of lead, safety and health precautions, and the use and requirements of protective clothing and equipment.
- B. Establish a respirator program as required by ANSI Z88.2 and 29 CFR 1910.134, and 29 CFR 1926.62. Provide respirator training and fit-testing.

1.12 RESPIRATORY PROTECTION

- A. Select respirators from those approved by the National Institute for Occupational Safety and Health (NIOSH), Department of Health and Human Services.
- B. Respirators shall be individually fit-tested to personnel under the direction of an Industrial Hygienist. Fit-tested respirators shall be permanently marked to identify the individual fitted, and use shall be limited to that individual. Fit-test records shall be maintained on site for each employee.

- C. Respiratory protection will be based upon whether Class 1, 2, and 3 tasks are being performed, in accordance with 29 CFR 1926.62.
- D. No respirators shall be issued to personnel without such personnel participating in a respiratory training program.
- E. High Efficiency Particulate Air (HEPA) respirator filters shall be approved by NIOSH and shall conform to the OSHA requirements in 29 CFR 1910.134 and 29 CFR 1926.62.
- F. A storage area for respirators shall be provided by the Contractor in the clean room side of the personnel decontamination enclosure where they will be kept in a clean environment.
- G. The Contractor shall provide and make available a sufficient quantity of respirator filters so that filter changes can be made as necessary during the Workday. Filters will be removed and discarded during the decontamination process. Filters cannot be reused. Filters must be changed if breathing becomes difficult.
- H. Filters used with negative pressure air purifying respirators shall not be used any longer than one eight (8) hour Workday.
- I. Any authorized visitor, Worker, or supervisor found in the Work Area not wearing the required respiratory protection shall be removed from the Project site and not be permitted to return.
- J. The Contractor shall have at least two (2) Powered Air Purifying Respirators stored on site designated for authorized visitors use. Appropriate respirator filters for authorized visitors shall be made available by the Contractor.

1.13 DELIVERY AND STORAGE

- A. Deliver all materials to the job site in original packages with containers bearing manufacturer's name and label.
- B. Store all materials at the job site in a suitable and designated area.
- C. Store materials subject to deterioration or damage away from wet or damp surfaces and under cover.
- D. Protect materials from unintended contamination.
- E. Remove damaged or deteriorated materials from the job site. Materials contaminated with lead shall be disposed of as lead debris as herein specified.

1.14 TEMPORARY UTILITIES

- A. Shut down and lock out all electrical power to the lead Work Areas.
- B. Provide temporary 120-280 volt, single phase, three wire, 100 amp electric service with Ground Fault Circuit Interrupters (GFCI) for all electric requirements within the lead Work Area.
 - 1. Where available, obtain from Owner's existing system. Otherwise provide power from other sources (i.e. generator).
 - 2. Provide temporary wiring and "weatherproof" receptacles in sufficient quantity and location to serve all HEPA equipment and tools.
 - 3. Provide wiring and receptacles as required by the Environmental Consultant for air sampling equipment.
 - 4. All power to the Work Area shall be brought in from outside the area through GFCI's at the source.

- C. Provide temporary lighting with "weatherproof" fixtures for all Work Areas including decontamination chambers.
 - 1. The entire Work Area shall be kept illuminated at all times.
 - 2. Provide lighting as required by the Environmental Consultant for the purposes of performing required inspections.
- D. All temporary devices and wiring used in the Work Area shall be capable of decontamination procedures including HEPA vacuuming and wet wiping.
- E. Utilize domestic water service, if available, from Owner's existing system. Provide hot water heaters with sufficient capacity to meet Project demands.

PART 2 - PRODUCTS

2.01 PROTECTIVE CLOTHING

- A. Provide personnel utilized during the Project with disposable protective whole body clothing, headcoverings, gloves and foot coverings. Provide disposable plastic or rubber gloves to protect hands. Cloth gloves may be worn inside the plastic or rubber for comfort, but shall not be used alone. Make sleeves secure at the wrists and make foot coverings secure at the ankles by the use of tape, or provide disposable coverings with elastic wrists or tops.
- B. Provide sufficient quantities of protective clothing to assure a minimum of four (4) complete disposable outfits per day for each individual performing lead Work.
- C. Eye protection and hard hats shall be provided and made available for all personnel entering any Work Area.
- D. Authorized visitors shall be provided with suitable protective clothing, headgear, eye protection, and footwear whenever they enter the Work Area.

2.02 SIGNS AND LABELS

- A. Provide warning signs and barrier tapes at all approaches to lead Work Areas. Locate signs at such distance that personnel may read the sign and take the necessary protective steps required before entering the area.
 - 1. Provide danger signs in vertical format conforming to 29 CFR 1926. Minimum 20" x 14" displaying the following legend.

**DANGER
LEAD WORK AREA
POISON
NO SMOKING OR DRINKING
AUTHORIZED PERSONNEL ONLY
RESPIRATORS AND PROTECTIVE
CLOTHING ARE REQUIRED IN THIS AREA**

- 1. Provide 3" wide yellow barrier tape printed with black lettered, "DANGER LEAD REMOVAL". Locate barrier tape across all corridors, entrances and access routes to lead Work Area. Install tape 3' to 4' AFF.
- B. Provide lead danger labels affixed to all lead materials, scrap, waste, debris and other products contaminated with lead.
 - 1. Provide lead danger labels of sufficient size to be clearly legible, displaying the following legend, or equivalent:

**DANGER
CONTAINS LEAD
AVOID CREATING DUST
POISON HAZARD**

1. Provide the following lead labels, of sufficient size to be clearly legible, for display on waste containers (bags or drums) which will be used to transport lead contaminated material in accordance with United States Department of Transportation 49 CFR, Part 745.
2. Generator identification information shall be affixed to each waste container indicating the following printed in indelible ink:
 - a. Generator Name:
 - b. Facility Name:
 - c. Facility Address:

2.03 PROJECT LOG BOOK

- A. Provide a permanently bound Project log book of minimum 8-1/2" x 11" size. Log book shall contain on title page the Project name, name, address and phone number of Owner; name, address and phone number of Environmental Consultant; name, address and phone number of Lead Contractor; emergency numbers including, but not limited to local Fire/Rescue department.
- B. All entries into the log shall be made in non-washable, permanent ink and such pen shall be strung to or otherwise attached to the log to prevent removal from the log-in area. Under no circumstances shall pencil entries be permitted.
- C. All persons entering and exiting the Work Area shall sign the log and include name, social security number, and time.
- D. The Project Supervisor shall document all Work performed daily and note all inspections.

2.04 SCAFFOLDING AND LADDERS

- A. Provide all scaffolding and/or staging as necessary to accomplish the Work of this Contract. Scaffolding may be of suspension type or standing type such as metal tube and coupler, tubular welded frame, pole or outrigger type or cantilever type. The type, erection and use of all scaffolding and ladders shall comply with all applicable OSHA construction industry standards.
- B. Provide scaffolding and ladders as required by the Environmental Consultant for the purposes of performing required inspections.

2.05 SURFACTANT (AMENDED WATER)

- A. Wet all lead-containing materials prior to removal with surfactant mixed and applied in accordance with manufacturer's printed instructions.

2.06 ENCAPSULANT

- A. Following lead scrapping, an encapsulant material shall be applied to the scrapped surfaces and remaining surfaces containing lead-based paint.
- B. Approved Manufacturer:
 1. KapsulKote Inc.: KapsulKote II System – PrimerKote and FinishKote
 2. Premier Coatings, Inc.: Lead Block

3. GLOBAL Encasement, Inc.: LeadLock GE-40
4. Fiberlock Technologies, Inc.: L-B-C Lead Barrier Compound
5. Fiberlock Technologies, Inc.: LeadMaster

2.07 DISPOSAL BAGS, DRUMS, AND CONTAINERS

- A. Provide 6 mil polyethylene disposal bags. Bags shall also be imprinted with U.S. Department of Transportation required markings.
- B. Provide 30 or 55 gallon capacity fiber or metal drums capable of being sealed air and water tight if lead waste has the potential to damage or puncture disposal bags. Affix lead caution labels on lids and at one-third points around drum circumference to assure ready identification.
- C. Containers and bags must be labeled with the names of the waste generator and the location at which the waste was generated.
- D. Labeled lead waste containers or bags shall not be used for non-lead waste or trash. Any material placed in labeled containers or bags, whether turned inside out or not shall be handled and disposed of as lead waste.

2.08 HEPA VACUUM EQUIPMENT

- A. All dry vacuuming performed under this contract shall be performed with High Efficiency Particulate Absolute (HEPA) filter equipped industrial vacuums conforming to ANSI Z9.2.
- B. Provide tools and specialized equipment including scraping nozzles with integral vacuum hoods connected to a HEPA vacuum with flexible hose.
- C. Approved Manufacturers:
 1. Hako Minuteman
 2. Micro-Trap Inc.
 3. Control Resource Systems, Inc.

2.09 POWER TOOLS

- A. Any power tools used to drill, cut into, or otherwise disturb lead material shall be equipped with HEPA filtered local exhaust ventilation.

2.10 POLYETHYLENE SHEETING

- A. All polyethylene (plastic) sheeting used on the Project (including but not limited to sheeting used for critical and isolation barriers, fixed objects, walls, floors, ceilings, waste container) shall be at least 6 mil fire retardant sheeting.
- B. Decontamination enclosure systems shall utilize at least 6 mil opaque fire retardant plastic sheeting. At least 2 layers of 6 mil reinforced fire retardant plastic sheeting shall be used for the flooring.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

- A. Should the area beyond the Work Area(s) become contaminated with lead containing materials, immediately stop Work and institute emergency procedures. Contaminated non-Work Areas shall be isolated and decontaminated in accordance with procedures established for lead

removal. All costs incurred in decontaminating such non-Work Areas and the contents thereof shall be borne by the Contractor, at no additional cost to the Owner.

- B. Medical approval, fit test reports, Worker Acknowledgments, and EPA certificates shall be on site prior to admittance of any Contractor's employees to the Work Area.
- C. Perform all lead removal Work using wet removal procedures. Mix and apply surfactant in accordance with manufacturers written instructions. Dry removal procedures are not permitted.
- D. The following documents shall be posted at the site at an approved location:
 - 1. Company license.
 - 2. Daily personal air monitoring results.
 - 3. Worker's EPA certificates (copies are acceptable provided Workers have original certificates in their possession).
 - 4. Medical records.
 - 5. Fit test reports.
 - 6. Project specifications.
 - 7. Project drawings.
 - 8. Notifications.
 - 9. Applicable regulations.
 - 10. Material Safety Data Sheets.
 - 11. Lead Work plan.
 - 12. List of emergency telephone numbers.
 - 13. Waste Disposal Log
- E. The Work Area must be vacated by building occupants prior to decontamination enclosure construction and Work Area preparation.

3.02 PERSONNEL DECONTAMINATION ENCLOSURE

- A. Provide a personnel decontamination enclosure contiguous to the Work Area, unless otherwise specified. The decontamination enclosure shall be attached to the Work Area and not located within it. If the decontamination chamber is accessible to the public it shall be fully framed and sheathed to prevent unauthorized entry. Alternately, a remote decontamination enclosure can be situated within 150 feet of the Work Area. Contamination enclosure requirements set forth in this part shall apply with the exception to Section 3.02B. Access to the Work Area will not be directly through the decontamination enclosure.
- B. Access to the Work Area will be from the clean room through an air-lock to the shower, through an air lock to the equipment room then into the Work Area. Each airlock shall be a minimum of three feet from door to door.
- C. The decontamination enclosure ceiling and walls shall be covered with two layers of opaque 6 mil fire retardant polyethylene sheeting. Two layers of 6 mil fire retardant reinforced polyethylene sheeting shall be used to cover the floor.
- D. Establish a triple layer of six mil fire retardant polyethylene at the decontamination chamber doorways, weighted to insure a tight seal of the enclosure. Prior to establishing doorway seals move all required tools, scaffolding, and equipment into the Work Area.
- E. The entrance to the clean room shall have a lockable door. Provide suitable lockers for storage of Worker's street clothes. Storage for respirators along with replacement filters and disposable towels shall also be provided.
- F. Provide a temporary shower with individual hot and cold water supplies and faucets. Provide a sufficient supply of soap and shampoo. There shall be one shower for every six workers. The

shower room shall be constructed in such a way so that travel through the shower chamber shall be through the shower. The shower shall not be able to be bypassed.

- G. Shower water shall be drained, collected and filtered through a system with at least a 5.0 micron particle size collection capability containing a series of several filters with progressively smaller pore sizes to avoid rapid clogging of the system. The filtered waste water shall then be collected in a non-corrosive container and disposed of as lead waste according to all applicable laws.
- H. The equipment room shall be used for the storage of tools and equipment. A labeled 6 mil plastic waste bag for collection of contaminated clothing shall be located in this room.
- I. The personal decontamination enclosure shall be cleaned and disinfected minimally at the end of each Work shift and as otherwise directed by the Lead Project Monitor.

3.03 WORK AREA ENTRY AND EXIT PROCEDURES

- A. Access to and from the Work Area is permitted only through the personnel decontamination enclosure.
- B. Workers shall sign the entry/exit log upon every entry and exit.
- C. The following procedures shall be followed when entering the Work Area:
 - 1. Before entering the Work Area, workers shall proceed to the clean room, remove all street clothes, and don protective clothing, equipment, and respirators. Two layer of protective clothing shall be required when a remote decontamination enclosure is being utilized.
 - 2. Workers shall proceed from the clean room through the shower room and the equipment room and into the Work Area.
- D. The following procedures shall be followed when exiting the Work Area:
 - 1. Before leaving the Work Area, gross lead contamination will be removed by wet cleaning and HEPA vacuuming. At least two wet cleanings shall be performed with separate cleaning solutions and rinse waters.
 - 2. In the equipment room, workers shall remove disposable clothing, but not respirators, and shall place clothing in plastic disposal bags for disposal as contaminated debris prior to entering the shower room. For remote decontamination enclosures, one layer of protective clothing shall be removed prior to exiting the Work Area air lock.
 - 3. Workers shall shower thoroughly while wearing respirators, then wash respirator with soap and water prior to removal. Disposal towels shall be provided as well as a 6 mil plastic disposal bag for the collection of the contaminated towels.
 - 4. Upon exiting the shower, workers shall don new disposable clothing if work shift is to continue or street clothes to exit area. Under no circumstances shall workers enter public non-Work Areas in disposable protective clothing.

3.04 WORK AREA PREPARATION

- A. Danger signs shall be posted at all approaches to the Work Area. Post all emergency exits as emergency exits only on the Work Area side, post with caution signs on the non-Work Area side. Provide all non-Work Area stairs and corridors accessible to the Work Area with warning tapes at the base of stairs and beginning of corridors. Warning tapes shall be in addition to caution signs. The Work Area shall be considered to include the entire room in which the window or door being addressed is located and any exterior locations constructed to enable the activities.
- B. Shut down and lock out the building heating, ventilating, and air conditioning and electrical systems. Provide temporary electric power and lighting as specified herein.

- C. All surfaces and objects within the Work Area shall be pre-cleaned using HEPA vacuuming and/or wet-wiping methods. Dry sweeping and any other methods that raise dust shall be prohibited.
- D. Movable objects within the Work Area shall be HEPA vacuumed and/or wet-wiped and removed from the Work Area.
- E. Should a construction barrier be constructed at the window or door opening being addressed, Section 3.05K will not be required.
- F. All non-movable equipment in the Work Area shall be completely covered with 2 layers of fire retardant polyethylene sheeting, at least 6 mil in thickness, and secured in place with duct tape and/or spray adhesive.
- G. Provide enclosure of the Work Area necessary to isolate it from unsealed areas of the building in accordance with the approved Work plan and as specified herein.
- H. Seal off all openings including but not limited to windows, diffusers, grills, electrical outlets and boxes, doors, floor drains, and any other penetrations of the Work Area enclosure, using 2 layers of at least 6 mil fire retardant polyethylene sheeting to form a critical barrier.
- I. Provide temporary framing and sheathing at openings larger than 32 square feet, which form the limits of the Work Area. Sheathing thickness must be a minimum of 3/8 inch and all sheathing shall be caulked and the Work Area side sealed with two layers of 6 mil fire retardant polyethylene sheeting to form an isolation barrier.
- J. Isolation barriers shall be installed at all elevator openings in the Work Area. Elevator controls shall be modified so that elevators bypass the Work Area.
- K. Provide two layers of 6 mil fire retardant polyethylene sheeting over all floor, wall, and ceiling surfaces. Isolation barriers shall also be covered with two layers (for a total of four layers). Sheeting shall be secured with spray adhesive and then sealed with duct tape. All joints in polyethylene sheeting shall overlap 12" minimum. Note that floor sheeting does not eliminate dust clearance sampling of the floor area below the sheeting and/or sampling of the sheeting floor area. Failure of either type of dust clearance sampling requires additional cleaning of the Work Area by the Contractor at no additional expense to the Owner.
- L. Frame out emergency exits. Provide double layer 6 mil fire retardant polyethylene sheeting and tape seal opening. Post as emergency exits only. Within the Work Area, mark the locations and directions of emergency exits throughout the Work Area using exit signs and/or duct tape.

3.05 RENOVATION AND REMOLDING OF LEAD-BASED PAINT

- A. Renovation and Remolding shall be conducted in accordance with the Contract Documents and the approved Lead Work Plan.
- B. If Lead-based Paint surfaces need to be addressed then it should be accomplished with a low pressure, airless fine spray of surfactant to ensure full penetration prior to material removal. Re-wet material if it does not display evidence of saturation.
- C. One Worker shall continuously apply amended water while lead based paint is being removed.
- D. Removal of lead-based paint shall be accomplished through manual scrapping.

- E. Perform cutting, drilling, abrading, or any penetration or disturbance of lead containing material in a manner to minimize the dispersal of lead into the air. Use equipment and methods specifically designed to limit generation of airborne particles. All power operated tools used shall be provided with HEPA equipped filtered local exhaust ventilation.
- F. Upon removal of lead from the substrate, the newly exposed surfaces shall be HEPA vacuumed and/or wet cleaned. Surfaces must be thoroughly cleaned using necessary methods and any required solvents to completely remove any adhesive, mastic, etc. Wet and bag the debris as it is removed, using a 6 mil plastic disposable bag.
- G. All removed material shall be placed into 6 mil plastic disposal bags or other suitable container upon detachment from the substrate or whenever there is enough accumulation to fill a single bag or container. Maintain the surfaces of the Work Area free of accumulation of lead debris.
- H. Dust-tight enclosed inclined chutes shall be used for materials dropped from distances greater than 10 ft.
- I. Large components shall be wrapped in two layers of 6 mil polyethylene sheeting. Sharp components likely to tear disposal bags shall be placed in fiber drums or boxes and then wrapped with sheeting.
- J. Power or pressure washers will not be allowed to be used for lead-based paint removal or clean-up procedures.
- K. All construction and demolition debris determined by the Environmental Consultant to be contaminated with lead shall be handled and disposed of as lead waste.

3.06 EQUIPMENT AND WASTE CONTAINER DECONTAMINATION AND REMOVAL PROCEDURES

- A. External surfaces of contaminated containers and equipment shall be cleaned by wet cleaning and/or HEPA vacuuming in the Work Area before moving such items into the waste decontamination enclosure system airlock by persons assigned to this duty. The Work Area persons shall not enter the airlock. Large components may be moved directly to a waste container when a remote decontamination enclosure is being utilized. The component must be decontaminated within the work area and pose no health concerns when removed from the Work Area.
- B. The cleaned containers of lead material and equipment are to be dried of any excessive pooled or beaded liquid, placed in uncontaminated plastic bags or sheeting, as the item's physical characteristics demand, and sealed airtight.
- C. Containers and equipment shall be moved from the work area and into a holding area by persons dressed in clean personal protective equipment, who have entered from uncontaminated areas.
- D. The cleaned containers of lead material and equipment shall be placed in water tight carts with doors or tops that shall be closed and secured. These carts shall be held in the holding area pending removal. The carts shall be wet cleaned and/or HEPA vacuumed at least once each day.
- E. The exit from the decontamination enclosure system shall be secured to prevent unauthorized entry.
- F. Where the waste removal enclosure is part of the personnel decontamination enclosure, waste removal shall not occur during shift changes or when otherwise occupied. Precautions shall be taken to prevent short circuiting and cycling of air outward through the shower and clean room.

3.07 WORK AREA DECONTAMINATION

- A. Following completion of gross removal activities and after all accumulations of lead waste materials have been containerized, the following decontamination procedures shall be followed, unless otherwise specified.
- B. Daily Cleaning:
 - 1. According to the HUD Guidelines, "A thorough cleanup of the entire area under active abatement should occur daily during the entire abatement process. This daily cleanup should consist of the following:
 - a. Large Debris:
 - 1) Large demolition-type debris (e.g., doors, windows, trim) should be wrapped in 6-mil plastic, sealed with tape, and moved to the area designated for trash storage on the property. Since lead-contaminated debris is a potentially hazardous waste, it should never be stored outside while awaiting removal/disposal. Consequently, an area inside the property must be designated as a temporary trash storage area, unless an approved container is to be located exterior to the building.
 - b. Small Debris:
 - 1) Small debris should be collected by wet mopping or wet sweeping and disposed of properly. However, before any sweeping occurs, the affected surfaces should be sprayed with a fine mist of water, to keep surface dust from becoming airborne and potentially containing other areas of the property and lead workers. Dry sweeping is prohibited. The swept debris should be placed in double 4-mil or single 6-mil plastic bags, properly sealed, and moved to the designated trash storage area. Care should be taken not to overload trash bags, which otherwise may rupture or puncture during handling and transport.
 - c. Exterior Cleanup:
 - 1) Using a containment system should protect unabated areas potentially affected by exterior lead activities. Because weather can adversely affect the exterior of the containment, the surface plastic of the containment system should be removed at the end of each workday. On a daily basis, as well as during final cleanup, the immediate area should be examined visually to ensure that no lead debris has escaped containment. Any such debris should be raked or wept swept and placed in single 6-mil or double 4-mil plastic bags, which should then be sealed and stored along with other contaminated debris.
 - 2) At the conclusion of the lead activities, a final cleanup must occur. This is a much more thorough process than the daily cleanup. Failure to perform an adequate final cleanup will result in failure to pass post-lead-dust clearance.
- C. Preliminary Final Cleanup:
 - 1. Before final cleanup can begin and before abated surfaces can be painted or sealed, the plastic sheeting used for containment must be removed. This contaminated plastic sheeting must be removed and disposed of very carefully. Removal should start with upper-level plastic, as applicable. The plastic should be sprayed or misted with water to hold down dust, and then folded in upon itself to trap any dust residues inside. Before removal of floor plastic, it should be sprayed and swept as detailed earlier in this chapter. It should be folded carefully from the corners/ends to the middle to trap any remaining lead dust and placed into double 4-mil or single 6-mil plastic bags that are then sealed and removed from the premises. As with daily cleanups, this plastic removal process requires the use of protective equipment, especially appropriate respirators. Plastic sheets used to isolate contaminated rooms from non-contaminated rooms should not be removed at this time. These sheets should remain until after the preliminary final cleanup/final cleanup is complete and satisfactory lead dust clearance results are obtained. Then the plastic sheets used to isolate contaminated rooms from non-contaminated rooms should be carefully removed as described above.

2. After the plastic has been removed from the contaminated area, the entire area should be HEPA-vacuumed as detailed in [HUD Guidelines] Section 10.2.1, starting with the rooms farthest from the entrance to avoid retracking dust through the already-cleaned area. In each room, vacuuming should begin with the ceilings and proceed down the walls, making sure every surface is treated, including doors and door trim, windows, window sills, wells, and trim, baseboards, etc
3. The entire affected area should next be washed down with a TSP solution as detailed above and then it should be HEPA-vacuumed again using the steps already outlined. The contractor must not deviate from or skip any step. To do so could mean that hazardous levels of lead dust and residue could be embedded in the new paint and mobilized later when that paint deteriorates or is abraded.
4. Prior to and after isolation and critical barriers are removed, the Lead Project Monitor shall inspect the Work Area for cleanliness. If necessary, additional cleaning shall be performed by the Contractor as directed by the Lead Project Monitor.
5. As a result of any visual inspection by the Lead Project Monitor, the Contractor will clean or reclean the affected areas at no additional expense to the Owner.

D. Final Cleanup Procedures

1. The final clean-up procedures is as follows:
 - a. Remove the top layer of 6-mil poly and seal in bags or clean 6-mil poly.
 - b. Remove bags of poly and store in a secure area.
 - c. Vacuum all surfaces with a HEPA-equipped vacuum beginning with the ceiling and working down.
 - d. Wash all surfaces with TSP (trisodium phosphate) detergent.
 - e. Vacuum all surfaces a second time.
 - f. Wash all surfaces a second time.
 - g. Remove all contaminated equipment and material to secure storage area.
 - h. Removal final layer of poly, except isolation and critical barriers are to remain. Isolation and critical barriers are to be removed following satisfactory lead wipe clearance results.
 - i. Vacuum floors with HEPA-equipped vacuums.
 - j. Wash surfaces again with TSP.
 - k. Vacuum again.
 - l. Seal surfaces with paint, polyurethane, or wax.

E. Cleanup Confirmation (Lead Dust Clearance)

1. The LPM will be collection lead wipe samples to confirm the effectiveness of the cleanup activities. Lead-dust results shall be available within 24 hours of completing sampling. Following satisfactory reporting of the results, all isolation and critical barriers shall be removed. Should results indicate lead-dust present at concentrations exceeding the acceptable guideline level, the Contractor will clean or reclean the affected areas at no additional expense to the Owner.
2. The established clearance level for dust-lead for floors is 40 micrograms per square foot (ug/ft²) and for window sills the clearance level is 250 micrograms per square foot (ug/ft²). This level has been established as part of Title 40 of the Code of Federal Regulations Part 745 (40 CFR Part 745). If the contractor should fail the wipe tests for lead dust clearance, the contractor shall pay for additional testing until clearance is obtained.

3.08 RESTORATION OF UTILITIES, FIRESTOPPING, AND FINISHES

- A. After final clearance, remove locks and restore electrical and HVAC systems. All temporary power shall be disconnected, power lockouts removed and power restored. All temporary plumbing shall be removed.

- B. Finishes damaged by lead activities including, but not limited to, plaster/paint damage due to duct tape and spray adhesives, and floor tile lifted due to wet or humid conditions, shall be restored prior to final payment, unless the damaged surfaces are to be replaced during renovation activities.
 - 1. Finishes unable to be restored shall be replaced under this Contract.
 - 2. All foam and expandable foam products and materials used to seal Work Area openings shall be completely removed upon completion of lead activities.

PART 4 - DISPOSAL OF LEAD WASTE

4.01 APPLICABLE REGULATIONS

- A. All lead waste shall be stored, transported and disposed of in accordance with the following regulation(s) as a minimum:
 - 1. NYS DEC 6 NYCRR

4.02 TRANSPORTATION AND DISPOSAL SITE

- A. The Contractor's Hauler and Disposal Site shall be approved by the Owner.
- B. The Contractor shall give twenty-four (24) hour notification prior to removing any waste from the site. Waste shall be removed from the site only during normal Working hours unless otherwise specified. No waste may be taken from the site unless the Environmental Consultant is present and authorizes the release of the waste as described herein.
- C. The Contractor shall have the Hauler provide the estimated date and time of arrival at the Disposal Site.
- D. Upon arrival at the Project Site, the Hauler must possess and present to the Environmental Consultant a valid New York State Department of Environmental Conservation Hauler's Permit. The Environmental Consultant may verify the authenticity of the hauler's permit with the proper authority.
- E. The Hauler, with the Contractor and the Environmental Consultant, shall inspect all material in the transport container prior to taking possession and signing the Waste Manifests.
- F. Unless specifically approved by the Owner, the Contractor shall not permit any off-site transfers of the waste or allow the waste to be transported or combined with any other off-site lead material. The Hauler must travel directly to the disposal site without unauthorized stops.

4.03 WASTE STORAGE CONTAINERS

- A. All waste containers shall be fully enclosed and lockable (i.e. enclosed dumpster, trailer, etc.), open containers will not be permitted on-site (i.e. open dumpster with canvas cover, etc.).
- B. The Environmental Consultant shall verify that the waste storage container tags (license plates) match that listed on the New York State Department of Environmental Conservation permit. Any container not listed on the permit shall be removed from the site immediately.
- C. The container shall be plasticized and sealed with a minimum of one (1) layer of 6 mil polyethylene on the sides and two (2) layers of 6 mil polyethylene on the floor.
- D. While on-site, the container shall be labeled with EPA Danger signage:

**DANGER
CONTAINS LED**

**AVOID CREATING DUST
POISON HAZARD**

- E. The New York State Department of Environmental Conservation Hauler's Permit number shall be stenciled on both sides and back of the container.
- F. Once the container is loaded at the site, the door(s) will be locked at all times.
- G. The container is not permitted to be loaded unless it is properly plasticized, has the appropriate danger signage affixed, and has the permit number appropriately stenciled on the container.
- H. Before the container is removed from the Project Site for transportation to the Disposal Site the locks shall be removed at the Disposal Site by the operator of the Disposal Facility and returned by the Disposal Facility to the Contractor.
 - 1. The Owner may initiate random checks at the Disposal Site to insure that the procedures outlined herein are complied with.

END OF SECTION 028300

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Repair of cracked, spalled, calcinated and hollow areas on concrete tank interior floors and walls.

1.02 SUBMITTALS

- A. Submit under provisions of Section 013300 - Submittals.
- B. Submit manufacturers' product data and application requirements for proposed materials used to repair spalls and cracks.
- C. Submit documentation on characteristics of proposed media for abrasive blasting.
- D. Submit documentation indicating product applicators are trained and approved by product manufacturer.

1.03 REGULATORY REQUIREMENTS

- A. Coatings shall comply with NYCRR, Part 205, of the New York State Department of Environmental Conservation (NYSDEC).
- B. Transport debris and rubbish in accordance with New York State Department of Environmental Conservation Law, Article 27, Treatment and Disposal of Refuse and Other Solid Waste.

1.04 EXISTING CONDITIONS

- A. Allow Owner to conduct an inspection after tank cleaning to identify areas for repair.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. A cementitious epoxy resin compensated 3-component, solvent free, coating material with corrosion inhibitor, used as bonding primer and reinforcement corrosion protection. Cementitious epoxy shall be Sika Armatec-110 Epocem or approved equal.
- B. A two-component, polymer-modified, Portland cement based, fast-setting, trowel-grade mortar. It is a high-performance repair mortar for horizontal surfaces offer the additional benefit of Sika FerroGard 901, a penetrating corrosion inhibitor. This mortar shall be Sikatop-122 Plus or approved equal.
- C. A two-component, polymer-modified, Portland cement based, fast-setting, trowel-grade mortar. It is a high-performance repair mortar for vertical surfaces offer the additional benefit of Sika FerroGard 901, a penetrating corrosion inhibitor. This mortar shall be Sikatop-123 Plus or approved equal.
- D. Flexible crack sealant, a hydrophobic polyurethane that is designed to corm flexible gaskets of plug joints and cracks in concrete for water infiltration. The crack sealant shall be WikaFix HH LV or approved equal.
- E. Water: Potable, clean and free from oils, acids, alkali organic matter and other deleterious material.

PART 3 - EXECUTION

3.01 PROTECTION

- A. Protect pipe openings so that no materials enter into the lines during preparation and repair.

3.02 SURFACE PREPARATION

- A. Interior Abrasive blasting: Utilize abrasive blasting to remove all existing coatings and deposits at the area to be repaired. Remove loose material to sound substrate. Equipment shall have ample capacity to furnish the required volume of compressed air to operate the blast effectively. The air shall be free of oil or moisture. Media shall be composed principally of silica grains. Do not utilize previously used media for abrasive blasting. Conduct abrasive blasting to prevent spread of media to adjoining property.
- B. Surfaces to be repaired and coated shall be clean.
- C. Mechanical chipping: Where necessary, and as directed by the Engineer, use chipping hammers to remove unsound concrete.

3.03 REPAIR/RESTORATION

- A. Prepare surface in accordance with manufacturers recommendations. Surface must be clean and sound, remove all deteriorated concrete, dirt, oil, grease, and other bond-inhibiting materials from the area to be repaired. Repair area should not be less than 1/8" in depth.
- B. Preparation work should be done by high pressure water blast, scabbler or other appropriate mechanical means to obtain an exposed aggregate surface profile of +/- 1/16 ".
- C. Saw cut edges to a dovetail configuration is recommended.
- D. Substrate should be Saturated Surface Dry (SSD) with clean water prior to application. No standing water should remain during application.
- E. Steel reinforcement should be thoroughly prepared by mechanical cleaning to remove all traces of rust. For priming of reinforcement steel apply Sika Armatec 110 EpoCem or approved equal.
- F. Prime concrete substrate surfaces with a brush or sprayed applied coat of Sika Armatec 110 EpoCem or approved equal.
- G. The repair mortar must be applied to the wet scrub coat before it dries.

3.04 CLEANUP

- A. Maintain work area in a neat, orderly fashion. Debris such as used sand, muck, rust, scale, shall be frequently cleaned up and removed from the site. Thinners used to clean spray guns and other tools and equipment shall be held in containers and removed from the site to an approved disposal area by the Contractor. Do not clean equipment in tank.
- B. After completion of repair, thoroughly clean tank interior. Sweep broom clean.
- C. Upon completion of the work, remove all excess material, rigging, empty containers, and supplies, from the site. Buildings and grounds shall be left in as good condition as when work was started.

- D. Transport debris and rubbish in accordance with New York State Department of Environmental Conservation Law, Article 27, Treatment and Disposal of Refuse and Other Solid Waste.

END OF SECTION 030130.71

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Formwork for cast-in-place concrete, with shoring, bracing and anchorage.
- B. Openings for other work.
- C. Form accessories.
- D. Form stripping.

1.02 RELATED REQUIREMENTS

- A. Section 032000 - Concrete Reinforcing.
- B. Section 033000 - Cast-in-Place Concrete.
- C. Section 042000 - Unit Masonry: Reinforcement for masonry.
- D. Section 051200 - Structural Steel Framing: Placement of embedded steel anchors and plates in cast-in-place concrete.
- E. Section 312316 - Excavation: Shoring and underpinning for excavation.

1.03 REFERENCE STANDARDS

- A. ACI CODE-318 - Building Code Requirements for Structural Concrete and Commentary; 2019 (Reapproved 2022).
- B. ACI PRC-347 - Guide to Formwork for Concrete; 2014 (Reapproved 2021).
- C. ACI SPEC-301 - Specifications for Concrete Construction; 2020.
- D. COE CRD-C 572 - Corps of Engineers Specifications for Polyvinylchloride Waterstop; 1974.

PART 2 PRODUCTS**2.01 FORMWORK - GENERAL**

- A. Provide concrete forms, accessories, shoring, and bracing as required to accomplish cast-in-place concrete work.
- B. Design and construct concrete that complies with design with respect to shape, lines, and dimensions.
- C. Comply with applicable state and local codes with respect to design, fabrication, erection, and removal of formwork.

2.02 FORMWORK ACCESSORIES

- A. Form Release Agent: Capable of releasing forms from hardened concrete without staining or discoloring concrete or forming bugholes and other surface defects, compatible with concrete and form materials, and not requiring removal for satisfactory bonding of coatings to be applied.
 - 1. Do not use materials containing diesel oil or petroleum-based compounds.

2. Composition: Colorless, reactive, water-based compound.
 - a. Products:
 - 1) Kaufman Products Inc; FormKote Emulsion: www.kaufmanproducts.net/#sle.
 - 2) Nox-Crete Inc; BIO-NOX: www.nox-crete.com/#sle.
 - 3) SpecChem, LLC; Bio Strip WB (water-based): www.specchemllc.com/#sle.
 - 4) Substitutions: See Section 016000 - Product Requirements.
- B. Embedded Anchor Shapes, Plates, Angles and Bars: As specified in Section 051200.
- C. Waterstops: PVC, complying with COE CRD-C 572.
 1. Manufacturers:
 - a. BoMetals, Inc; _____: www.bometals.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 ERECTION - FORMWORK

- A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI SPEC-301.
- B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.

3.02 APPLICATION - FORM RELEASE AGENT

- A. Apply form release agent on formwork in accordance with manufacturer's recommendations.
- B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.
- C. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings that are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

3.03 INSERTS, EMBEDDED PARTS, AND OPENINGS

- A. Provide formed openings where required for items to be embedded in passing through concrete work.
- B. Locate and set in place items that will be cast directly into concrete.
- C. Coordinate with work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other work.
- D. Install accessories in accordance with manufacturer's instructions, so they are straight, level, and plumb. Ensure items are not disturbed during concrete placement.

3.04 FORM CLEANING

- A. Clean forms as erection proceeds, to remove foreign matter within forms.
- B. Clean formed cavities of debris prior to placing concrete.

3.05 FORM REMOVAL

- A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.

END OF SECTION 031000

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

- A. Section 031000 - Concrete Forming and Accessories.
- B. Section 033000 - Cast-in-Place Concrete.

1.02 REFERENCE STANDARDS

- A. ACI CODE-318 - Building Code Requirements for Structural Concrete and Commentary; 2019 (Reapproved 2022).
- B. ACI MNL-66 - ACI Detailing Manual; 2020.
- C. ACI SPEC-301 - Specifications for Concrete Construction; 2020.
- D. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2018, with Editorial Revision (2018).
- E. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2018a.
- F. CRSI (DA4) - Manual of Standard Practice; 2018, with Errata (2019).

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Comply with requirements of ACI MNL-66. Include bar schedules, shapes of bent bars, spacing of bars, and location of splices.
 - 1. Prepare shop drawings under seal of a Professional Structural Engineer experienced in design of work of this type and licensed in New York.

PART 2 PRODUCTS

2.01 REINFORCEMENT

- A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi) (420 MPa).
- B. Stirrup Steel: ASTM A1064/A1064M steel wire, unfinished.
- C. Steel Welded Wire Reinforcement (WWR): Galvanized, deformed type; ASTM A1064/A1064M.
 - 1. Form: Flat Sheets.
- D. Reinforcement Accessories:
 - 1. Tie Wire: Annealed, minimum 16 gauge, 0.0508 inch (1.29 mm).
 - 2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
 - 3. Provide stainless steel components for placement within 1-1/2 inches (38 mm) of weathering surfaces.

2.02 RE-BAR SPLICING:

- A. Coupler Systems: Mechanical devices for splicing reinforcing bars.
 - 1. Comply with ACI CODE-318 steel reinforcing design strength requirements for splices in tension and compression.
 - 2. Products:
 - a. Dayton Superior Corporation; _____: www.daytonsuperior.com/#sle.
 - b. Splice Sleeve North America, Inc; NMB Splice Sleeve System: www.splicesleeve.com/#sle.
 - c. Substitutions: See Section 016000 - Product Requirements.
- B. Dowel Bar Splicer with Dowel-Ins: Mechanical devices for splicing reinforcing bars.
 - 1. Comply with ACI CODE-318 steel reinforcing design strength requirements for splices in tension and compression.

2.03 FABRICATION

- A. Fabricate concrete reinforcing in accordance with CRSI (DA4) - Manual of Standard Practice.
- B. Welding of reinforcement is not permitted.
- C. Locate reinforcing splices not indicated on drawings at point of minimum stress.

PART 3 EXECUTION**3.01 PLACEMENT**

- A. Place, support and secure reinforcement against displacement. Do not deviate from required position.
- B. Do not displace or damage vapor barrier.
- C. Maintain concrete cover around reinforcing as follows:
 - 1. Supported Slabs and Joists: 1.5 inch (____ mm).
 - 2. Walls (exposed to weather or backfill): 2 inch (____ mm).
 - 3. Footings and Concrete Formed Against Earth: 3 inch (____ mm).
- D. Comply with applicable code for concrete cover over reinforcement.

END OF SECTION 032000

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
 - 1. Footings.
 - 2. Foundation walls.
 - 3. Slabs-on-grade.
 - 4. Concrete toppings.
 - 5. Underslab vapor retarder.

1.02 REFERENCES

- A. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials; 2010 (Reapproved 2015).
- B. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; 1991 (Reapproved 2009).
- C. ACI 301 - Specifications for Structural Concrete; 2016.
- D. ACI 302.1R - Guide to Concrete Floor and Slab Construction; 2015.
- E. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).
- F. ACI 305R - Guide to Hot Weather Concreting; 2010.
- G. ACI 306R - Guide to Cold Weather Concreting; 2016.
- H. ACI 308R - Guide to External Curing of Concrete; 2016.
- I. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2017).
- J. ACI 347R - Guide to Formwork for Concrete; 2014.
- K. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2018, with Editorial Revision (2018).
- L. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement; 2016.
- M. ASTM A706/A706M - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement; 2016.
- N. ASTM A184/A184M - Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement; 2017.
- O. ASTM C1059/C1059M - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete; 2013.
- P. ASTM C1116/C1116M - Standard Specification for Fiber-Reinforced Concrete; 2010a (Reapproved 2015).

- Q. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures; 2015.
- R. ASTM C150/C150M - Standard Specification for Portland Cement; 2018.
- S. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete; 2016.
- T. ASTM C172/C172M - Standard Practice for Sampling Freshly Mixed Concrete; 2014a.
- U. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2016.
- V. ASTM C192/C192M - Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory; 2019.
- W. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a (Reapproved 2016).
- X. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2011.
- Y. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field; 2018b.
- Z. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2016, with Editorial Revision (2016).
- AA. ASTM C330/C330M - Standard Specification for Lightweight Aggregates for Structural Concrete; 2017a.
- AB. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2018.
- AC. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2017.
- AD. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2015.
- AE. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2017a.
- AF. ASTM C989/C989M - Standard Specification for Slag Cement for Use in Concrete and Mortars; 2017.
- AG. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2018.
- AH. ASTM D2103 - Standard Specification for Polyethylene Film and Sheeting; 2015.
- AI. ASTM D4397 - Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications; 2016.
- AJ. ASTM D448 - Standard Classification for Sizes of Aggregate for Road and Bridge Construction; 2012 (Reapproved 2017).
- AK. ASTM E1155 - Standard Test Method for Determining F(F) Floor Flatness and F(L) Floor Levelness Numbers; 2014.

- AL. ASTM E1643 - Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2011 (Reapproved 2017).
- AM. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2017.
- AN. AWS D1.4/D1.4M - Structural Welding Code - Reinforcing Steel; 2011.
- AO. PS 1 - Structural Plywood; 2009.
- AP. ACI 350 - Concrete Sanitary Engineering Structures.
- AQ. ANSI/ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.

1.03 ACTION SUBMITTALS

- A. The contractor shall comply with the requirements of Division 01 Specification of the Project Manual, Section 013300 - SUBMITTALS.
- B. Product Data: For each type of product indicated.
- C. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
 - 2. Submit mix design mixtures for each type of concrete to be used on the Project at least 30 calendar days prior to the first scheduled concrete pour. The Contractor's testing laboratory shall develop concrete mix designs and test all materials and mixes for conformance with ACI 301 and these specifications. The costs associated with development of the design mix and testing of samples shall be included in the bid price.
 - 3. Submit the following:
 - a. Name, address, and telephone number of Contractor's laboratory.
 - b. Mix proportions.
 - c. Source of cement, type, brand, and certified copies of mill reports, including physical and chemical analysis.
 - d. Sources of fine aggregates and results of test made in accordance with ASTM C33/C33M and ASTM C40.
 - e. Source of coarse aggregates and results of tests made in accordance with ASTM C33/C33M.
 - f. Catalog cuts of all admixtures.
 - g. Furnish test results of slump, air entrainment and water-cement ratio for each mix design.
 - 4. For each mix proposed, make and cure four (4) standard 6 inch concrete test specimens to the laboratory in accordance with ASTM C192/C192M. Furnish compression test results made in accordance with ASTM C39/C39M. Break two (2) cylinders at seven (7) days and two (2) at 28 days.
 - 5. If the concrete is intended to be pumped, design mix accordingly and submit certification that it has been tested for pumping.
 - 6. If adopted mix fails to produce concrete meeting the requirements for strength and placibility, the Architect may order additional cement or adjustments to mix proportions at no extra cost to the Owner.
- D. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, spacing, locations, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections,

tie spacing, hoop spacing, and supports for concrete reinforcement including steel bars and wire fabric.

- E. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer licensed in the state where the project is located; detailing fabrication, assembly, and support of formwork. Shop drawings shall bear the signature and seal of the same licensed Professional Engineer.
 - 1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and reshoring installation and removal
 - 2. Shop drawings shall indicate formwork dimensioning, materials and arrangement of joints and ties.
 - 3. Manufacturer's instructions: Indicate installation procedure and interface required with adjacent work
- F. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
 - 1. Location of construction joints is subject to approval of the Architect, if not shown on the drawings.
- G. Samples: For waterstops, vapor retarders, and vapor retarder tape.

1.04 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and testing agency.
- B. Welding certificates.
- C. Material Certificates: For each of the following, provided by manufacturers:
 - 1. Cementitious materials.
 - 2. Admixtures.
 - 3. Form materials and form-release agents.
 - 4. Steel reinforcement and accessories.
 - 5. Curing compounds.
 - 6. Bonding agents.
 - 7. Adhesives and Vapor retarders.
 - 8. Semi rigid joint filler.
 - 9. Joint-filler strips.
 - 10. Repair materials.
- D. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.
- E. Field quality-control reports.
- F. Minutes of preinstallation conference.
- G. Furnish transit-mix delivery slips to Owner's Representative.

1.05 QUALITY ASSURANCE

- A. Comply with Referenced Standards specified in Division 01 Section "References" in addition to ACI 301.
- B. Perform testing under the provisions of Division 01 Section "Quality Requirements" and the "FIELD QUALITY CONTROL" Article of Part 3 listed in this specification.

- C. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
- D. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- E. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C1077 and ASTM E329 for testing indicated.
 - 1. The contractor shall provide an adequately sized, insulated curing box to house concrete cylinders at the discretion of the Architect, for the 48-hour period between concrete pour and sample collection pick-up by the Testing Laboratory (ASTM C31/C31M). As directed by the Architect, the contractor shall cure additional cylinders in the same fashion as the in-place concrete.
 - 2. Curing box shall be located away from the main construction area and shall be blocked up off the ground.
 - 3. A log sheet shall be provided in a waterproof sheet protector to log in the placement and removal of the concrete test samples by the testing laboratory.
 - 4. Minimum information to be logged for each pour date shall include: date of pour, date of pick-up, weather conditions at the time of pour, testing
- F. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer. To further insure consistency, coloration, finish and quality; all aggregates, cement, water and other ingredients shall each be secured from the same source for the duration of the project.
 - 1. The batching plant and raw materials may be subject to inspections and test performed by the Architect.
- G. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D1.4M, "Structural Welding Code - Reinforcing Steel."
- H. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 301, "Specifications for Structural Concrete", Sections 1 through 5.
 - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials".
 - 3. ACI 304R - "Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete".
- I. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.
- J. Preinstallation Conference: Conduct conference at Project site.
 - 1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Concrete subcontractor.
 - 2. Review special inspection and testing and inspecting agency procedures for field quality control, cold- and hot-weather concreting procedures, curing procedures, construction

contraction and isolation joints, and joint-filler strips, semi rigid joint fillers, forms and form removal limitations, shoring and reshoring procedures, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement.
- B. Store cement off the ground in a dry, weatherproof, adequately ventilated structure with provisions to prevent the absorption of water.
- C. Transport dry concrete batches from the central plant to the site in approved truck mixers conforming to the requirements of the Truck Mixer Manufacturer's Agitating Standards. Each truck shall contain a plate stating the capacity, drum speeds and be provided with a revolution counter.
- D. Packaged material shall be delivered and stored in the original packages until ready for use. Packages or materials showing evidence of water or other damage shall be rejected.
- E. Protect all materials from freezing.

1.07 COORDINATION

- A. Coordinate work under provisions of Division 01 Specification of this Project Manual.
- B. The Contractor shall provide at least five (5) working days advance notice prior to formwork closure to the Architect.
- C. Coordinate work of other Sections in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors, and other inserts.
- D. Notify Architect a minimum of three (3) working days prior to commencement concrete pours.

1.08 REGULATORY REQUIREMENTS

- A. Conform to ACI 304R and all applicable codes for placement of concrete and related work.

1.09 ENVIRONMENTAL REQUIREMENTS

- A. Do not place concrete when the ambient temperature is below 40 deg. F. or when the concrete temperature exceeds 85 deg. F. Under certain circumstances, the Engineer may approve the placement of concrete under the above conditions, provided that the procedures of ACI 305R and ACI 306R are strictly adhered to.
- B. Do not place concrete when the conditions may adversely affect the placing, curing or finishing of concrete, or its strength.
- C. Comply with the requirements contained in Section 016500 - NON-PENETRATING ROOFTOP SUPPORT SYSTEMS.

PART 2 - PRODUCTS

2.01 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 - 1. Plywood, metal, or other approved panel materials.
 - 2. Steel forms: Minimum 16 gage thick, stiffened to support weight of concrete with minimum deflection.
 - 3. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. Douglas Fir Species, solid one side grade and sound
- B. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum unless indicated otherwise on the drawings.
- C. Form-Release Agent: Commercially formulated, colorless, water based, non-toxic, V.O.C. compliant, environmentally safe material which will not stain concrete, absorb moisture or impair natural bonding or color characteristics of coating intended for use on concrete; manufactured by DAYTON SUPERIOR or equal. Agent shall not be detrimental to the environment.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- D. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 - 1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
 - 2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.
 - 3. For Concrete Tanks: Furnish snap-ties with 1 inch plastic cone and waterseal washer.

2.02 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A615/A615M, Grade 60, deformed.
- B. Galvanized Reinforcing Bars: ASTM A615/A615M, Grade 60; ASTM A706/A706M, deformed bars; ASTM A767/A767M, Class II zinc coated after fabrication and bending.
- C. Steel Bar Mats: ASTM A184/A184M, fabricated from ASTM A615/A615M, Grade 60 ; ASTM A706/A706M, deformed bars, assembled with clips.

2.03 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A615/A615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
 - 2. Provide load bearing pad on bottom to prevent vapor barrier puncture.

- C. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
 - 2. Provide load bearing pad on bottom to prevent vapor barrier puncture.
- D. Mechanical Splicing Systems: Components for field splices using taper threaded splices designed for use with specified grades of reinforcing to facilitate standard bar-to-bar connections, pre-caging applications, hooked bar applications, closure pours, precast connections, rebar terminations and anchorages, transition splices, segmental construction and connections to structural steel.
 - 1. Manufacturer:
 - a. nVent LENTON
 - b. Engineer approved equivalent.

2.04 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 - 1. Portland Cement: ASTM C150/C150M, Type IA, gray. Supplement with the following:
 - a. Fly Ash: ASTM C618, Class F or C.
 - b. Ground Granulated Blast-Furnace Slag: ASTM C989/C989M, Grade 100 or 120.
 - 2. Silica Fume: ASTM C1240, amorphous silica.
 - 3. Normal-Weight Aggregates: ASTM C33/C33M, No. 57 or 67 crushed stone coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
 - a. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
 - b. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
 - 4. Lightweight Aggregate: ASTM C330/C330M, 3/4 inch, nominal maximum aggregate size.
 - 5. Water: ASTM C94/C94M, clean and not detrimental to concrete.

2.05 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C260/C260M.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 - 1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
 - 2. Retarding Admixture: ASTM C494/C494M, Type B.
 - 3. Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type D.
 - 4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
 - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type G.
 - 6. Plasticizing and Retarding Admixture: ASTM C 1017, Type II.

2.06 VAPOR RETARDERS

- A. Sheet Vapor Retarder: ASTM E1745, Class C or polyethylene sheet, ASTM D4397 not less than 10 mils thick. Include manufacturer's recommended adhesive or pressure-sensitive tape.
 - 1. Products: Subject to compliance with requirements, provide the following:
 - a. Carlisle Coatings & Waterproofing, Inc.; Blackline 400

- b. Grace Construction Products, W. R. Grace & Co.; Florprufe 120
 - c. Insulation Solutions, Inc.; Viper VaporCheck 10.
 - d. Meadows, W. R., Inc.; Perminator 10 mil.
 - e. Reef Industries, Inc.; Griffolyn 10 mil Green.
 - f. Stego Industries, LLC; Stego Wrap 10 mil Class A.
 - g. Or approved equal.
- B. Fine-Graded Granular Material: Clean mixture of crushed stone, crushed gravel, and manufactured or natural sand; ASTM D448, Size 10, with 100 percent passing a 3/8-inch sieve, 10 to 30 percent passing a No. 100 sieve, and at least 5 percent passing No. 200 sieve; complying with deleterious substance limits of ASTM C33/C33M for fine aggregates.
- 1. Depth Requirements:
 - a. Slab on grade: 6 inches (unless otherwise noted in the Geotechnical Report).
 - b. Footings: 12 inches (unless otherwise indicated in the Geotechnical Report).

2.07 FLOOR AND SLAB TREATMENTS

- A. Slip-Resistive Emery Aggregate Finish: Factory-graded, packaged, rustproof, non-glazing, abrasive, crushed emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials with 100 percent passing No. 4 sieve.
- 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dayton Superior Corporation; Emery Tuff Non-Slip
 - b. Lambert Corporation; EMAG-20
 - c. L&M Construction Chemicals, Inc.; Grip It
 - d. Metalcrete Industries; Metco Anti-Skid Aggregate

2.08 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 8 oz. /sq. yd. when dry.
- B. Moisture-Retaining Cover: ASTM C171, polyethylene film or white burlap-polyethylene sheet weighing approximately 8 oz. / sq. yd. bonded to prevent separation during use.
- C. Membrane curing compound: Moisture Retention complying with ASTM C309. Products: EUCOCURE VOX by Euclid Chemical Company or equal.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C309, Type 1, Class B, dissipating.
- 1. Products: Eucocure VOX as manufactured by Euclid Chemical Company or approved equal.

2.09 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, 1/2" asphalt-saturated cellulosic fiber.
- B. Bonding Agent: ASTM C1059/C1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- C. Epoxy Bonding Adhesive: three-component, solvent-free, moisture tolerant, epoxy modified cementitious product.

1. Product: Armathec 110 EpoCem as manufactured by Sika Corporation or specifically approved equal.
 2. Types I and II, non-load bearing Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- D. Non-Shrink Grout: Premixed compound, free of chlorides, with non-metallic aggregate, cement water reducing and plasticizing agents; capable of minimum compressive strength of 2400 psi at 48 hours and 7000 psi at 28 days. Grout shall be suitable for contact with potable water. For equipment bases and pipe supports, use non-shrink grout by Master Builders, Embeco 636, Unisorb V-1 or equal.
- E. Reglets: Fabricate reglets of galvanized-steel sheet not less than 26 gauge material; in the longest lengths possible with alignment splines for joints; secure to formwork; Type CO as manufactured by Fry Reglet or approved equal. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.
- F. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inches (0.85 mm) thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.
- G. Extrudable Strip Waterstop: One part polyurethane, extrudable swelling waterstop to create a compression seal; SikaSwell S-2 as manufactured by Sika Corp. or specifically approved equal.
- H. Field Applied Waterstop Grout: Krystol Waterstop Grout, crystalline grout to be applied in accordance with the manufacturer's specifications at joints and penetrations. Manufacturer: Kryton International Inc. (800)267-8280 or approved equal.

2.10 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
1. Cement Binder: ASTM C150/C150M, Portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
 4. Compressive Strength: Not less than 4000 psi at 28 days when tested according to ASTM C39/C39M.

2.11 PARGING

- A. Parge exterior faces of above-grade masonry walls, where indicated, in 2 uniform coats to a total thickness of 3/4 inch. Dampen wall before applying first coat and scarify first coat to ensure full bond to subsequent coat.
- B. Use a steel-trowel finish to produce a smooth, flat, dense surface with a maximum surface variation of 1/8 inch per foot. Form a wash at top of parging and a beveled return concealed at the bottom edge.
- C. Damp-cure parging for at least 24 hours and protect parging until cured.

2.12 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 211.1 and ACI 301.
 - 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than Portland cement in concrete as follows:
 - 1. Fly Ash: 25 percent.
 - 2. Combined Fly Ash and Pozzolan: 25 percent.
 - 3. Ground Granulated Blast-Furnace Slag: 50 percent.
 - 4. Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag: 50 percent Portland cement minimum, with fly ash or Pozzolan not exceeding 25 percent.
 - 5. Silica Fume: 10 percent.
 - 6. Combined Fly Ash, Pozzolans, and Silica Fume: 35 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
 - 7. Combined Fly Ash or Pozzolans, Ground Granulated Blast-Furnace Slag, and Silica Fume: 50 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
 - 8. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.
- C. Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use plasticizing admixture in concrete, as required, for placement and workability.
 - 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 - 3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.

2.13 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Proportion normal-weight concrete mixture as follows:
 - 1. Minimum Compressive Strength: Pier, Mat and Spread Footings; foundation walls, slab on grade and slab on metal deck: 4000 psi at 28 days.
 - 2. Maximum Water-Cementitious Materials Ratio: 0.50 for all concrete building elements.
 - 3. Slump Limits (Conventional Mix):
 - a. Slabs: 3 inches plus or minus one inch (initial slump prior to admixtures).
 - b. Piers, Foundation Walls and Footings: 4 inches plus or minus one inch (initial slump prior to admixtures).
 - 4. Slump Limits (Pump Mix):
 - a. Final slump (Slabs): 6 1/2 inches plus or minus one inch.
 - b. Final Slump (Foundation, walls and footings): 7 1/2 inches plus or minus one inch
 - 5. Air Content:
 - a. Piers, Mats and Spread Footings: 5.5 percent, plus or minus 1.0 percent. at the point of delivery.
 - b. Slabs: 3 percent, plus or minus 1.0 percent at point of delivery. Do not allow air content of trowel finished concrete floors to exceed 3 percent.
 - 6. Large Aggregates: 3/4" crushed stone; ASTM C33/C33M, No. 67.
 - 7. Use Admixtures only when approved by the Engineer.
 - 8. Mix Grout in accordance with the manufacturer's instructions and specifications.

2.14 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.15 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C94/C94M and ASTM C1116/C1116M, and furnish batch ticket information.
 - 1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C94/C94M. Mix concrete materials in appropriate drum-type batch machine mixer.
 - 1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
 - 2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd..
 - 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify lines, levels, and measurements before proceeding with formwork. Ensure that dimensions agree with the plans.
- B. Inspect the formwork and reinforcing that it has been properly set and secured and that all items to be embedded, built-in or pass through concrete are at their proper locations and elevations.
- C. The General Construction Contractor shall verify that all other prime contractors have installed concrete inserts, sleeves, and embedded elements of the project, such as conduit, and their work has been totally completed and inspected by the Architect.
- D. Ensure that all points of contact with new grout are free from oil, grease and scale.

3.02 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
 - 1. Class A, 1/8 inch for smooth-formed finished surfaces.
 - 2. Class B, 1/4 inch for rough-formed finished surfaces.
 - a. Hand trim sides and bottom of earth forms and remove loose soil to the satisfaction of the Architect.
 - b. Remove water from forms and excavations and divert water flow to avoid washing over, under or through freshly placed concrete.

- D. Construct forms tight enough to prevent loss of concrete mortar. Align form joints.
- E. Do not apply form release agent where concrete surfaces are to receive special finishes or applied coatings that may be affected by the agent.
- F. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 1. Install keyways, reglets, recesses, and the like, for easy removal.
 - 2. Do not use rust-stained steel form-facing material.
- G. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- H. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- I. Chamfer: Provide 3/4" inch chamfer on all exterior horizontal and vertical corners and edges of permanently exposed concrete.
- J. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- K. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- L. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- M. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement. Do not apply form release agent where concrete surfaces are to receive special finishes or applied coatings that may be affected by the agent.
- N. Where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack with non-metallic/ non-shrink grout.
- O. Prepare previously placed concrete by cleaning with steel brush and apply a Bonding Agent in accordance with the manufacturer's specifications and instructions.

3.03 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
 - 2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
 - 3. Install dovetail anchor slots in concrete structures as indicated.
 - 4. Ensure that all inserts and embedded items are not disturbed during concrete placement.

3.04 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.
 - 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
 - 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.05 SHORES AND RESHORES

- A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.
 - 1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.
- B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.
- C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.06 VAPOR RETARDERS

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E1643 and manufacturer's written instructions.
 - 1. Lap joints 6 inches and seal with manufacturers recommended tape.
- B. Granular Course: Cover vapor retarder with fine-graded granular material, moisten, and compact with mechanical equipment to elevation tolerances of plus 0 inch or minus 3/4 inch.

3.07 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars. Use reinforcing splices at minimum of locations and only at locations of minimum stress. Review locations of splices with Architect. Splice locations shall be

approved during shop drawing review phase. Rebar splice overlap shall be the minimum length as per ACI 318.

1. Weld reinforcing bars according to AWS D1.4/D1.4M, where indicated.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.
- F. Take necessary measures to ensure that reinforcement is not disturbed during the placement of concrete.

3.08 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
 3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 5. Space vertical joints in walls as indicated or at 20' o.c. maximum. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 6. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction / Control Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
 1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 3/16"-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
 1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
 2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Section 079200 - JOINT SEALANTS are indicated.
 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

- F. Ensure joint fillers and devices are not disturbed during placement of concrete.
- G. Install all joint fillers and devices in accordance with the manufacturer's instructions and specifications for floor and wall finish.
- H. Install joint device anchors. Maintain correct position to allow joint cover flush with floor and wall finish.
- I. Install joint covers in one-piece length when adjacent construction activity is complete.
- J. Apply sealants in joint devices in accordance with the manufacturer's specifications and instructions.

3.09 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
 - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
 - 2. Place concrete with the aid of mechanical vibrators which are capable of transmitting to the concrete not less than 3,000 impulses per minute. Maintain at least three (3) vibrators in good working condition, ready for use when concrete placement begins in any one area.
 - 3. Do not interrupt successive placement. Do not permit cold joints to occur.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 - 1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
 - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - 1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 2. Maintain reinforcement in position on chairs during concrete placement.
 - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - 4. Slope surfaces uniformly to drains where required.
 - 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

- F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- G. Hot-Weather Placement: Comply with ACI 301 and ACI 305R and as follows:
1. Maintain concrete temperature below 95 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.
 3. Maintain records of concrete placement. Record date, locations, quantity, air temperature and test samples taken.
 4. In areas with floor drains, maintain floor elevations at walls; pitch surfaces uniformly to the drains maintaining a 1% slope.
 5. Cure floor surfaces in accordance with ACI 308R.
 6. Apply curing compound in accordance with the manufacturer's specifications and instructions in two (2) coats with the second coat at right angles to the first.

3.10 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
1. Apply to concrete surfaces exposed to public view.
- C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:
1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.11 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, re-straightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

- B. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and re-straighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, and ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
 2. Finish surfaces to the following tolerances, according to ASTM E1155, for a randomly trafficked floor surface:
 - a. Specified overall values of flatness, F (F) 30; and of levelness, F (L) 20; with minimum local values of flatness, F (F) 24; and of levelness, F (L) 15; for suspended slabs.
 3. Finish and measure surface so gap at any point between concrete surface and an unlevelled, freestanding, 10-ft. long straightedge resting on two high spots and placed anywhere on the surface does not exceed 3/16 inch.
- C. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.
1. This surface shall be used for interior and exterior walking surfaces unless noted otherwise. Finish edges of exterior walkway flags with steel tooled radius edge.
 2. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
- D. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, equipment pads, and elsewhere as indicated.
1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.
- E. Slip-Resistive Finish: Before final floating, apply slip-resistive finish where indicated and to concrete stair treads, platforms, and ramps. Apply according to manufacturer's written instructions and as follows:
1. Uniformly spread 25 lb. /100 sq. ft. of dampened slip-resistive over surface in one or two applications. Tamp aggregate flush with surface, but do not force below surface.
 2. After broadcasting and tamping, apply float finish.
 3. After curing, lightly work surface with a steel wire brush or an abrasive stone and water to expose slip-resistive aluminum granules.

3.12 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. All exposed horizontal and vertical wall and slab corners shall have a 3/4" wide chamfered edge.
- D. Equipment Bases and Foundations:
1. Coordinate sizes and locations of concrete bases with actual equipment provided.
 2. Construct concrete bases 6 inches high unless otherwise indicated; and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.

3. Minimum Compressive Strength: 4000 psi at 28 days.
 4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 12 inch centers around the full perimeter of concrete base.
 5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base, and anchor into structural concrete substrate.
 6. Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 7. Cast anchor-bolt inserts into bases. Install anchor bolts to elevations required for proper attachment to supported equipment.
- E. Grout: Install grout in accordance with the manufacturer's specifications and instructions. Moisten concrete and grout surfaces and allow drying until damp. Remove all standing water. Pump or inject grout into tight spaces to ensure intimate contact with the existing grout. Cure grout with an appropriate membrane in accordance with the manufacturer's specifications and instructions.

3.13 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 and ACI 305R for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb./sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308R and ACI 308.1, by one or a combination of the following methods:
1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.

- F. Liquid sealer/hardener to be applied on exposed concrete cured with moisture retentive or absorptive covers. The following materials provide varying levels of protection, sealant and hardness. Review products for project appropriateness.
 - 1. Euclid: Euco Diamond Hard (Liquid Sealer and Hardener)
 - 2. L&M Construction Chemicals: Seal Hard (Liquid Sealer and Hardener)
 - 3. Curecrete Chemical Company: Ashford Formula (Liquid Sealer and Hardener)
 - 4. Midwest Floor Care: Structure Formula (Liquid Sealer and Hardener)
 - 5. Or approved equal.

3.14 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
 - 1. Defer joint filling until concrete has aged at least three month(s). Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semi rigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.15 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Engineer. Remove and replace concrete that cannot be repaired and patched to Engineer's approval.
- B. Immediately remove all rust spots that have developed during the construction period as soon as directed by the Architect. Remove all rust spots that have formed by the use of temporary handrails.

3.16 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage a special inspector and/or qualified testing and inspecting agency to perform field tests and inspections and prepare test reports. Contractor is responsible to notify the Owners representative at least 72 hours prior to the scheduled work that requires inspection / testing. The presence of the Inspector engaged by the Owner does not relieve the contractor of Quality Control Requirements.
- B. Testing and Inspecting: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
- C. Inspections:
 - 1. Steel reinforcement placement.
 - 2. Headed bolts and studs.
 - 3. Steel reinforcement welding.
 - 4. Concrete placement, including conveying and depositing.
 - 5. Curing procedures and maintenance of curing temperature.
 - 6. Verification of concrete strength before removal of shores and forms from beams and slabs.
- D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C172/C172M shall be performed according to the following requirements:
 - 1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.

- a. Frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 - b. One (1) additional test cylinder shall be taken during cold weather and be cured under the same conditions as the concrete it represents.
2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C173/C173M, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
5. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
6. Compression Test Specimens: ASTM C31/C31M.
 - a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
 - b. Cast and field cure two Insert number sets of two standard cylinder specimens for each composite sample.
7. Compressive-Strength Tests: ASTM C39/C39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
 - a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
 - b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
9. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
10. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7 and 28-day tests.
11. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
12. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42 or by other methods as directed by Architect.
13. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
14. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

- E. Measure floor and slab flatness and levelness according to ASTM E1155 within 72 hours of finishing.

END OF SECTION 033000

PART 1 GENERAL

1.01 SUMMARY

- A. Related Documents:
 - 1. Drawings and general provisions of the Subcontract apply to this Section.
 - 2. Review these documents for coordination with additional requirements and information that apply to work under this Section.
- B. Section Includes:
 - 1. Grout for uses other than masonry.
 - 2. Pressure Grouting.
- C. Related Sections:
 - 1. Division 01 Section "General Requirements."

1.02 REFERENCES

- A. General:
 - 1. The following documents form part of the Specifications to the extent stated. Where differences exist between codes and standards, the one affording the greatest protection shall apply.
 - 2. Unless otherwise noted, the referenced standard edition is the current one at the time of commencement of the Work.
 - 3. Refer to Division 01 Section "General Requirements" for the list of applicable regulatory requirements.
- B. ASTM International:
 - 1. ASTM C33 Concrete Aggregates
 - 2. ASTM C40 Organic Impurities in Fine Aggregates for Concrete
 - 3. ASTM C88 Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
 - 4. ASTM C117 Material Finer Than 75µm Sieve in Mineral Aggregates by Washing
 - 5. ASTM C136 Sieve Analysis of Fine and Coarse Aggregates
 - 6. ASTM C150 Portland Cement
 - 7. ASTM C289 Potential Reactivity of Aggregates (Chemical Method)
 - 8. ASTM C494 Chemical Admixtures for Concrete
 - 9. ASTM C881 Epoxy-Resin-Base Bonding Systems for Concrete
 - 10. ASTM D2419 Sand Equivalent Value of Soils and Fine Aggregate
 - 11. ASTM E329 Inspection and Testing Agencies for Concrete, Steel, Bituminous

1.03 SUBMITTALS

- A. Submit under provisions of Section 013300 - SUBMITTALS.
- B. Manufacturer's data shall be provided for bonding compounds, dry pack , nonshrink, pressure grout, retardants, epoxy grout, and polymer concrete.
- C. Test reports, accompanied by a manufacturer's statement that previously tested material is of similar type, quality, and manufacture as that which is proposed for use on this projects, shall be submitted for:
 - 1. Cement.
 - 2. Aggregates.
 - 3. Retardants.

4. Bonding compounds.
 5. Epoxy resin.
- D. The subcontractor's testing laboratory shall provide evidence of the most recent inspection of its facilities by the Cement and Concrete Reference Laboratory of the National Bureau of Standards and evidence of correction of deficiencies noted in the inspection report before materials specified in this section are delivered to the job site.

1.04 QUALITY ASSURANCE

- A. Conformance with the specified requirements will be demonstrated testing performed by an independent testing laboratory retained by the Owner.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Cement: Portland cement shall be ASTM C150/C150M, Type II or Type V, containing less than 0.6 percent alkali.
- B. Aggregate:
1. General: Aggregate shall be non reactive and shall be washed before use. When sources of aggregate are changed, test reports shall be provided for the material from the new source prior to commencing grout work.
 2. Fine Aggregate: Fine aggregate shall be sand or crushed stone conforming to ASTM C33/C33M as modified herein. When tested in accordance with ASTM C136/C136M, gradation shall be such that 100 percent by weight passes a standard No. 8 sieve and not less than 45 percent by weight pass a standard No. 40 sieve. Variation from the specified gradation in individual tests will be accepted if the average of three consecutive tests is within the following variation:

Standard Sieve	Permissible variation in individual test
No. 30 or coarser	2 percent by weight
No. 50 or finer	0.5 percent by weight

- C. Admixtures:
1. Water Reducing Retarder: Water reducing retarder shall comply with ASTM C494/C494M, Type D and shall be Master Builders Pozzolith 300-R, Sika Corporation Plastiment or approved equal.
 2. Lubricant: Lubricant additive for cement pressure grouting shall be Intrusion Prepakt Intrusion Aid, Sika Intraplast N, or approved equal.
- D. Water:
1. Water for washing aggregate, for mixing and for curing shall be potable, shall not contain more than 1000 mg/l of chlorides as Cl, nor more than 1300 mg/l of sulfates as SO₄, and shall not contain impurities which may change the setting time by more than 25 percent or a reduction of more than 5 percent of the compressive strength of the grout at 14 days when compared to the results for grout made with distilled water.

2.02 GROUT

- A. Drypack Grout:
1. Drypack grout shall be one of the following:

- a. a mixture of approximately one part cement, 1-1/2 parts sand, water reducing retarder and sufficient water to make a stiff workable mix.
 - b. W.R. Meadows Wedjroc Dry Pack.
 - c. Euclid Chemical Dry Pack.
 - d. or approved equal.
- B. Cement Grout:
 1. Cement grout shall be a mixture of one part cement, two parts sand proportioned by volume admixtures for pressure grouting and sufficient water to form a workable mix.
- C. Nonshrink Grout:
 1. Nonmetallic aggregate nonshrink grout shall be one of the following:
 - a. U.S. Grout Five Star grout.
 - b. Master Builders Masterflow 713.
 - c. Burke Company Non-Ferrous, Non-Shrink Grout.
 - d. or approved equal.
- D. Epoxy Grout for Crack Repair and Dowel Anchorage:
 1. Except for applications involving pressure grouting or crack injection, epoxy shall be a high modulus, moisture insensitive, two component, 100 percent solids, thermosetting modified polyamide epoxy compound. The material shall conform to ASTM C881/C881M, Type I, Grade 3 such as Sika Corporation Sikadur Hi-Mod series, Adhesive Technology Corporation Solidbond 200, or approved equal which is capable of not sagging in horizontal or overhead anchoring applications.
 2. Epoxy for applications involving pressure grouting or crack injection, shall be a high modulus, moisture insensitive, two component, injection grade, 100 percent solids blend of epoxy resin compounds. The material shall conform to ASTM C881/C881M, Type I, Grade 1 such as Sika Corporation Sikadur 52, Adhesive Technology Corporation SLV 300 series, or equal which is capable of achieving complete penetration of hairline and larger cracks.
- E. Polymer Concrete for Resurfacing and Patching:
 1. Polymer concrete shall consist of a liquid binder and dry aggregate mixed together to make a flowable mortar. The liquid binder shall be a chemical and oil resistant, stress relieved, low modulus, moisture insensitive, two component epoxy resin compound. The binder material shall conform to ASTM C881/C881M, Type 3, Grade 1 such as Sika Corporation Sikadur Lo-Mod series, Adhesive Technology Corporation 400 series, or equal with a consistency similar to light weight oil for proper mixing with the aggregate. The aggregate shall be oven dry, kept in sealed packages until the time of mixing and be of size and consistency compatible with recommendations of the manufacturer of the liquid binder for the intended application.
- F. Adhesive Resin for Dowel Anchorage:
 1. ICC approved, structural epoxy; prepackaged in cartridges for manually or pneumatically operated caulk gun and automatically mixed at nozzle. Subject to compliance with current ICC evaluation report provide one of the following: HIT RE500-SD Adhesive Anchoring System, Hilti, Inc. (ICC ESR-2322), HIT-HY 200 MAX-SD Adhesive Anchoring System, Hilti, Inc. (ICC ESR-3013), SET-XP Adhesive Anchoring Systems, Simpson Strong-Tie Co. (ICC ESR-2508).

2.03 PRESSURE GROUTING EQUIPMENT

- A. Pressure grouting equipment shall include a mixer and holdover agitator tanks designed to place grout at pressures up to 50 psi (0.345 MPa). Gauges indicating grouting pressure shall

be provided and the mixer shall be equipped with a meter capable of indicating to within 1/10 cubic foot (0.003 m³) the volume of grout placed.

PART 3 EXECUTION

3.01 GENERAL

- A. Bonding compounds for use with grout is specified in Section 033000 - FIRE EXTINGUISHERS. Primer, if required for polymer concrete, is to be provided and installed per the manufacturer's recommendations.

3.02 DRYPACK GROUT

- A. Drypack grout is to be used for built-up surfaces, setting miscellaneous metal items and minor repairs.
- B. Surfaces required to be built-up with drypack grout are to be roughened by brushing, cleaned and coated with the bonding compound before application of grout. The grout is to be applied to the required thickness and cured in accordance with Section 033000 - FIRE EXTINGUISHERS.

3.03 CEMENT GROUT

- A. Cement grout is to be used for filling nonbearing portions of equipment pads and pressure grouting.
- B. Except for the specialized requirements for pressure grouting, grout is to be mixed and placed in the same manner as cast-in-place concrete. Grout is to be mixed for at least one minute and diluted grout is to agitated until placed.

3.04 NONSHRINK GROUT

- A. Nonshrink, nonmetallic aggregate grout is to be used under equipment, bearing plates and column base plates. Nonshrink, metallic aggregate grout is to be used under rotating equipment where high strength and fatigue are of concern, to grout anchor bolts and to grout reinforcing steel. Grout is to be placed and cured in accordance with the manufacturer's recommendations.
- B. Holes required for grouting shall be blown clean with compressed air and are to be free of dust or standing water. Horizontal holes for grouting are to be drilled at a slight downward angle and with the inserted dowel or bolt bent to match.

3.05 EPOXY GROUT

- A. Epoxy grout shall be used for repairing cracks by pressure grouting or gravity, repairing structural concrete and may be used for setting dowels or bolts in holes. Concrete is to be primed in accordance with the grout manufacturer's recommendations.
- B. The use of epoxy grout must comply with the following restrictions:
 - 1. Limited to areas where exposure, on an intermittent or continuous basis, to acid, chlorine gas or to machine or diesel oils, is extremely unlikely.
 - 2. Limited to applications where exposure to fire or to concrete temperatures above the product heat deflection temperature or 120 deg F (40 deg C)(whichever is less) is extremely unlikely. Overhead applications are not allowed.
 - 3. Holes for the anchors shall be drilled (not cored), shall be blown clean with compressed air and shall be free of dust or standing water.

4. The anchor type, size and embedment depth shall be as shown on the drawings and the anchor must be installed in accordance with the manufacturer's recommendations.
5. The anchor must not be loaded until after the full curing period has elapsed.

3.06 PRESSURE GROUTING

- A. Prior to grouting, cracks and holes to be grouted shall be washed clean. Washing is not required for grouting soil voids. Once started, grouting shall be continuous until completed. In case of a mechanical failure or other stoppage of the work, the grout equipment shall be washed out sufficiently to ensure that fresh only grout is pumped when the work is restarted.

3.07 FIELD QUALITY CONTROL

- A. The Testing Laboratory will:
 1. Special Inspect installation of anchors in accordance with applicable ICC Evaluation Report, where special inspection is indicated on Contract Documents or where Subcontractor's design engineer has used ICC anchor capacities that require Special Inspection.
 2. Subcontractor will reimburse Owner for cost of Special Inspection, where anchors are sized by Subcontractor's design engineer using ICC Special Inspection values.
 3. Develop and utilize an effective method of field marking anchor and dowel test locations and results.
- B. Testing of grout mixes for conformance to manufacturer's specified strength: The Owner's independent testing laboratory shall take four test samples of each day's grout mix and test grout mix samples at 7 and 28 days. Test reports shall be submitted to the Owner / Architect for review under the provisions of Division 01 Section "General Requirements."
- C. Test 25 percent of reinforcing steel dowels installed with adhesive resin on a given day in tension using pullout procedure. Test to 80% of specified yield strength of the dowel or 150% of the ICC rated static capacity whichever is the lesser with special inspection. Dowels specifically noted on the drawings as "No test required" do not require tension testing.
- D. If the failure rate of dowels exceeds 10 percent, testing will be increased to 100 percent of that day's installation of similar anchors or dowels. Testing will be reduced to 25 percent of that day's installation when the failure rate is reduced to 10 percent or less. Failed dowels will be replaced at no additional cost to the Owner . Subcontractor will reimburse Owner for cost of additional testing. The testing agency will produce daily reports of all testing activities: copies of daily reports will be submitted to the Owner / Architect in a timely manner.

END OF SECTION 036000

PART 1 GENERAL

1.01 RELATED SECTIONS

- A. Drawings and general provisions of the Agreement, including General and Supplementary Conditions, and Division 01 of the Project Manual, apply to work of this Section.

1.02 SUMMARY

- A. This Section includes mortar for all concrete unit masonry, ACMU masonry, brick masonry, glass unit masonry, cast stone, precast concrete units, and adhered masonry units.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Section 034500 - Precast Architectural Concrete
 - 2. Section 036000 - Grouting
 - 3. Section 040523 - Masonry Accessories
 - 4. Section 042113 - Brick Masonry
 - 5. Section 042200 - Concrete Unit Masonry
 - 6. Section 042200.11 - Reinforced Unit Masonry
 - 7. Section 042300 - Glass Unit Masonry
 - 8. Section 044300 - Stone Masonry
 - 9. Section 047200 - Cast Stone
 - 10. Section 079200 - Sealants

1.03 STANDARDS

- A. All work of this section shall conform to industry standards and/or manufacturer's recommendation.
- B. ASTM C91 "Standard Specifications for Masonry Cement".
- C. ASTM C109 "Standard Test Method for Compressive Strength of Hydraulic Cement Mortars".
- D. ASTM C144 "Standard Specification for Aggregate for Masonry Mortar".
- E. ASTM C150 "Standard Specification for Portland Cement".
- F. ASTM C207 "Standard Specifications for Hydrated Lime for Masonry Purposes".
- G. ASTM C270 "Standard Specifications for Mortar for Unit Masonry".
- H. ASTM C780 "Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry".
- I. ASTM C979 "Standard Specification for Pigments for Integrally Colored Concrete".
- J. ASTM C1506 "Standard Test Method for Water Retention of Hydraulic Cement-Based Mortars and Plasters".

1.04 SUBMITTALS

- A. Submit pursuant to Section 013300 - Submittal Procedures.
- B. Submit pursuant to Section 016000 - Product Requirements.

- C. Submit certificates of compliance and manufacturer's technical data describing: cement, lime, sand and admixture products specified.
- D. Submit manufacturer's technical data describing integral coloring specified.
- E. Submit small mortar samples depicting integral coloring. Provide manufacturer's entire range of available colors. Plastic samples representing available colors are not acceptable.
- F. Mortar mix designs for each type of mortar. Include description of type and proportions of ingredients.
 - 1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109 for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.
- G. Submit results of tests of field specimens.

1.05 QUALITY ASSURANCE

- A. All work of this section shall be performed by experienced workers familiar with the work and according to manufacturer's recommendations and/or industry standards.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Pursuant to manufacturer's published instructions.
- B. Protect against moisture exposure and damage.

PART 2 PRODUCTS

2.01 MORTAR MATERIALS

- A. Portland Cement: ASTM C150, Type I or Type II.
 - 1. Provide white cement for integral coloring where required to obtain desired mortar color.
- B. Sand: ASTM C144; local mason sand.
- C. Water: Clean, potable and salt free.
- D. Lime: ASTM C207, Type S mortar.
- E. Provide all cement products from one manufacturer.

2.02 ADMIXTURES

- A. Admixtures containing calcium chlorides are prohibited.
- B. All mortar for exterior concrete masonry applications shall contain an integral water-repellent admixture such as:
 - 1. BLOCKTITE Mortar Admixture by Euclid Chemical Company.
 - 2. DRY-BLOCK® System by GCP Applied Technologies, Inc.
 - 3. MasterPel® 210E by Master® Builders Solutions.
- C. Mortar water-repellent admixture shall be same water-repellent admixture used in the manufacture of the concrete masonry units.
- D. Apply at dosage recommended by the manufacturer.

- E. Do not use integral water repellent mortar admixture with clay masonry applications.

2.03 INTEGRAL COLORING

- A. Product: dry mixture of pure, non-fading, alkali-resistant iron-oxide pigments possessing uniform dispersion characteristics specifically intended for mixing into mortar and complying with ASTM C979.
- B. Color selection by Architect.

2.04 MORTAR MIX

- A. Prepare mortar mixes pursuant to "Property Specification Requirements" of ASTM C270 for types indicated on Drawings and herein specified. Do not exceed manufacturer's recommended pigment to cement ratio in colored mortar.
- B. Exterior Concrete Unit Masonry (above grade)
 - 1. Mortar:
 - a. Type S (minimum average compressive strength at 28 days: 750 lb./sq. in.).
 - b. Mix: Portland cement/lime/sand.
 - 2. Admixture:
 - a. Coloring pigments, color as selected by Architect.
 - b. Must contain admixture for waterproofing
 - 1) Submittals must specify water repellent agent.
 - 2) Submit product literature for approval prior to using mortar on any finished area.
- C. Exterior Brick Masonry (above grade)
 - 1. Mortar:
 - a. Type N
 - 1) Proportion Portland cement, Lime and Sand in a 1:1:6 ratio
 - 2. Admixture:
 - a. Coloring pigments, color as selected by Architect.
 - b. Submit product literature for approval prior to using mortar on any finished area
- D. Interior Concrete Unit Masonry
 - 1. Mortar:
 - a. Type S (minimum average compressive strength at 28 days: 750 lb./sq. in.).
 - b. Mix: Portland cement/lime/sand.
 - c. Color: Standard gray
 - 1) Standard gray at CMU to be painted.
 - 2) Integral coloring at interior ground face ACMU. Mortar color as selected by Architect.
- E. Tests
 - 1. Prepare mix designs and conduct tests using a recognized laboratory.

PART 3 EXECUTION

3.01 MIXING

- A. Mix mortar by methods that will ensure accurate proportioning of all required ingredients to a uniform consistency.
- B. Mechanically mix between 3 to 5 min. Hand mixing is prohibited.

- C. Select ingredients that are compatible.
- D. Do not combine two air entraining materials within same mortar mix.

3.02 RETEMPERING

- A. Use mortar within 2-1/2 hours of initial mixing.
- B. Discard unused mortar after it has begun to set. Do not re-temper mortar that has begun to set.

3.03 ADMIXTURES

- A. Mix admixtures into mortar pursuant to manufacturer's published instructions.

3.04 INTEGRAL COLORING

- A. Provide integral coloring to mortar for all exterior walls and interior ACMU walls if any.
- B. Mix into mortar pursuant to manufacturer's published instructions.

3.05 FIELD QUALITY CONTROL

- A. Inspectors: Owner will engage qualified independent inspectors to perform inspections and prepare reports. Allow inspectors access to scaffolding and work area, as needed to perform inspections.
- B. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests, inspections and prepare test reports:
 - 1. Payment for these services will be made by Owner.
- C. Mortar Tests: Test each type of mortar in accordance with ASTM 780, testing with same frequency as masonry samples.
 - 1. Test three samples for each 5,000 square feet of wall area or portion thereof; test one sample at 7 days and two samples at 28 days for each set.

END OF SECTION 040513

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Brick veneer.
- B. Mortar and Mortar Coloring.
- C. Joint Filler.
- D. Cavity Wall Drainage System.
- E. Installation of Steel Lintels, Door Frames and items furnished by other sections in Masonry.
- F. Cleaning of Brick.

1.02 RELATED SECTIONS

- A. Section 042200 – Concrete Unit Masonry.
- B. Section 055000 – Metal Fabrications.
- C. Section 072100 - Thermal Insulation.
- D. Section 079200 - Joint Sealants.

1.03 REFERENCES

- A. ACI 530 - Building Code Requirements for Masonry Structures.
- B. ACI 530.1 - Specifications for Masonry Structures.
- C. ANSI/ASTM A82 - Cold-Drawn Steel Wire for Concrete Reinforcement.
- D. ANSI/ASTM C55 - Concrete Building Brick.
- E. ANSI/ASTM C216 - Facing Brick (solid masonry units made from clay or shale).
- F. ASTM A525 - Steel Sheet, Zinc-Coated (galvanized) by the Hot-Dip Process.
- G. ASTM C145 - Solid Load Bearing Concrete Masonry Units.
- H. IMIAC - International Masonry Industry All-Weather Council: Recommended Practices and Guide Specification for Cold Weather Masonry Construction.
- I. UL - Underwriters' Laboratories.

1.04 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Submit samples in duplicate of brick masonry units including special shapes, and mortar colors proposed for use in exposed work for approval by the Architect/Engineer.
- C. Shop drawing: Layout of control joint placement.

- D. Submit brick certifications from manufacturer, indicating that brick masonry units meet or exceed project specifications.
- E. Submit hot/cold weather masonry construction plan to Architect/Engineer for review.
- F. Submit samples or mortar color to Architect/Engineer for preliminary approval prior to building sample wall.
- G. Build a sample masonry wall at the job site in a location as directed by the Architect/Engineer to obtain approval of the Architect/Engineer and Owner. The sample wall shall:
 - 1. Be a corner approximately 4'-0" long by 4'-0" wide by 3'-0" high, and demonstrate the proposed color range, texture, and bond, special coursing, special shapes, in wall flashing, mortar coloring and all other workmanship. All brick shipped for the sample shall be included in the panel.
 - 2. Prior to start of masonry construction work obtain the Architect/Engineer and Owner approval of the sample wall.
 - 3. Should sample be rejected, provide additional sample walls until acceptance is obtained from Architect/Engineer and Owner.
 - 4. Use panel as standard of comparison for all masonry work built of same material.
 - 5. Do not destroy or move panel until masonry construction work is completed and accepted by Architect/Engineer.

1.05 DELIVERY AND STORAGE

- A. Materials shall be delivered and stored under the provisions of 016500 so as to avoid damage from breakage, moisture, staining or damage of any kind.
- B. Protect materials and work from damage. Keep masonry units dry.
- C. Cover work at end of each day's work with non-staining waterproof material so as to prevent entrance of excess water at top of wall.

1.06 QUALITY CONTROL

- A. Conform to ACI/ASCE 530 and 530.1.
- B. Special Inspections required, refer to Section 014500.

1.07 WEATHER

- A. No masonry work shall be installed in an atmosphere with temperature less than 40°F unless work is protected in a manner previously approved by the Architect/Engineer.
- B. Hot Weather Construction - Protect masonry construction from direct exposure to wind and sun when erected in an ambient air temperature of 99°F (37°C) in shade with relative humidity less than 50%. Conform to the recommendations of the Structural Clay Products Institute and the Concrete Masonry Association & IMIAC.
- C. For cold weather masonry construction, submit to Architect/Engineer for review and approval, a cold weather masonry construction plan, identifying all measures contractor shall take for cold weather masonry construction. Conform to the recommendations of the Structural Clay Products Institute and the Concrete Masonry Association & IMIAC.

1.08 PROTECTION

- A. Protect materials and work from damage. Keep masonry units dry.

- B. Cover work at end of each day's work with non-staining waterproof material so as to prevent entrance of excess water at top of wall.
- C. Do not install damaged or chipped units.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Brick shall be of the standard modular type unless indicated otherwise. Bricks shall conform to ASTM Specification C216-87. Brick type, size, texture, color and range shall be as selected by the Architect/Engineer to match the existing brick on site. For assistance contact:
 - 1. Rocco Maggio
Consolidated Brick
127 W. 24th Street, 3rd Floor, New York, New York 10011.
Telephone No.: 212-645-6700
 - 2. Ken Johnson
Belden Tri-State Building Materials
333 7th Avenue, New York, New York 10001
Telephone No.: 347-723-9428
 - 3. Kyle Evans
Kings Building Material
10 Powerhouse Road, Roslyn Heights, NY 11577
Telephone No.: 631-786-4513

2.02 MORTAR

- A. Mortar Coloring: Mortar coloring shall be added and mixed into the brick mortar as directed by the Architect/Engineer. Color: as selected by the Architect/Engineer.
- B. Mortar and grout materials and mix proportions shall meet applicable requirements of ASTM C270-866, Type N made with lime. Color shall be close to that of masonry units involved and shall be approved by the Architect. Mortar coloring shall be factory added and mixed into mortar. Hand mixing of color mortar at the jobsite is prohibited. Contractor to submit color samples to Architect/Engineer for selection. Once color selection is made, Contractor shall provide design mix to Architect/Engineer.
- C. Mortar Materials:
 - 1. Portland Cement: Cement shall conform to ASTM Specification C150-61, Type 1
 - 2. Lime: Hydrated lime shall be Type S or Type N, conforming to ASTM Specification C207-49. Quicklime shall conform to ASTM Specification C5-59. It shall be slaked in accordance with the manufacturer's directions.
 - 3. Lime Putty: Putty shall be a stiff mixture of lime and water. Keep putty moist until used. Putty made from quicklime shall be slaked and allowed to soak at least 24 hours before using. Putty made from Type S hydrated may be used immediately after mixing.
 - 4. Sand shall conform to ASTM Specification C144-(52T) except that sand for mortar in 1/4 inch wide joints shall pass a No. 16 sieve.
 - 5. Mixing Water: Water shall be clean and potable.
- D. Storage of Materials: Store materials under cover in a dry place and in a manner to prevent damage or intrusion of foreign matter. During freezing weather, protect all masonry units with tarpaulins or other suitable material. Store cement, lime and air-setting mortars in watertight sheds with elevated floors. Protect reinforcement from the elements; immediately before placing, reinforcement shall be free from loose rust, ice, or other foreign coatings that will destroy or reduce the bond.

- E. Mortar for Masonry Units: Mortar shall be mixed in the proportions of 1 part Portland, 1/2 to 1-1/4 parts hydrated lime or lime putty, and 4-1/2 to 6 parts of sand by volume to meet the requirements of ASTM C270-866.
- F. Mixing Mortar: Mix all cementitious materials and sand in a mechanical batch mixer for a minimum of 5 minutes. Adjust the consistency of the mortar to the satisfaction of the mason but add only as much water as is compatible with convenience in using the mortar. All mortar shall be used within 2-1/2 hours of the initial mixing. It shall not be used after it has begun to set.
- G. At exterior walls, integrally mix manufacturer's approved water repellent admixture compatible with masonry sealant into the mortar.

2.03 ACCESSORIES

- A. All-Inclusive Cavity Wall Drainage System: Total Flash System as manufactured by Mortar Net USA, Limited or equal. All-inclusive flashing/drainage system 12-inches high, 45 mil EPDM membrane with adhered cavity drainage/mortar collection material and weep tabs, preformed inside/outside corner boots and end dams, 28 gauge stainless-steel drip edge and preformed corners, 16 gauge stainless-steel termination bar, and BTL-1 sealant. This system replaces the separate requirements for flashing, weeps, mortar collection products, drip edge and termination bar and entire system shall be provided by the manufacturer.
- B. Cavity Wall Drainage Plane: WallNet as manufactured by Mortar Net USA; CavClear Masonry Mat as manufactured by Archovations, Inc., PO Box 241, Hudson, WI 54016, or equal. Install masonry drainage mat continuously throughout full-height and full-width of all exterior masonry cavities during construction of exterior wythe.
- C. Joint filler shall be equal to WillSeal 150 as manufactured by Willseal, 34 Executive Drive, Hudson, NH 03051; Telephone 800-274-2813; Website www.willseal.com. The joint filler material shall be the thickness as required for the width of joint intended and recessed deep enough allowing for the rod and sealant at the exposed face of the veneer masonry. Joint filler shall be a preformed, pre-compressed polyurethane foam system impregnated with an acrylic based, flame-resistant, and weatherproof sealant. The product is non-drying, non-shrinking, and self-expanding, with a 5-year manufacturer's warranty.
- D. Vertical control joints shall be generally be located:
 - 1. At major changes in wall height.
 - 2. At changes in wall thickness.
 - 3. At control joints in foundations, in roof, and in floors.
 - 4. At chases and recesses for piping, columns, fixtures, etc.
 - 5. At one or both sides of wall openings.
 - 6. Near wall intersections.
 - 7. Near return angles in L, T, and U-shaped structures.
- E. Maximum spacing of control joints should in no case exceed 24'-0".
- F. Veneer anchors shall be used for wood frame construction substrate only and be minimum 14 gauge, hot-dipped galvanized, with 3/16-inch diameter tie wire, spaced at 16 inches on center vertically and horizontally, DW-10 by Hohmann & Barnard or approved equal. Fasteners shall be ring shank nails and have a minimum 2" embedment into framing.
- G. Refer to Section 042200 – Concrete Unit Masonry for additional masonry reinforcing.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Lay out work to avoid use of less than 4" faced units at jambs in exposed work.

3.02 GENERAL

- A. Mortar shall be thoroughly mixed and kept moist but shall not be retempered for use after initial set.
- B. Lay only dry masonry units.
- C. Use masonry saw for cutting exposed surfaces. Cut units to provide 1/8" clearance around electrical boxes and similar items.
- D. Do not use chipped, cracked or broken units.
- E. Set units plumb, true to line, and level.
- F. Adjust units to final position while mortar is soft and plastic. If unit is displaced after mortar has stiffened, remove unit, clean joints and unit of mortar and reset with fresh mortar.
- G. When joining fresh work to set or partially set masonry clean exposed surface and remove loose mortar before laying fresh masonry.
- H. When necessary to stop a horizontal run, run back one-half block length in each course, do not tooth.
- I. Locate control joints as indicated on the contract drawings. Install expansion material and apply sealant.
- J. Flashing System and Weep-Vents: Set flashing system and weep vent filler in place, aligning front of weep vent with exterior face of CMU. Install flashing and weep vent filler at drainage courses at base of wall and at all lintels and bond beams where through-wall flashing is required. Install weep vent filler at top of wall below bond beams to provide continuous air ventilation within wall.
- K. Install masonry drainage mat continuously throughout full-height of all exterior masonry cavities during construction of exterior wythe.

3.03 LAYING BRICK

- A. Lay brick in a running bond except where otherwise noted. Secure to masonry backup as described in specifications and as indicated on plans.
- B. Lay all brick masonry straight, plumb and true to line. Align brick coursing and as detailed on drawings.
- C. Lay each brick in full joint of mortar on its bed and ends. Incorporate reinforcing pintles into mortar bed. Slush and fill each joint with mortar with each course of brick as work progresses.
- D. Protect all freshly constructed masonry from injury of any kind. Replace injured work in a manner satisfactory to the Architect/Engineer. Completely point and thoroughly wash all finished exposed masonry surfaces with masonry cleaner in accordance with manufacturer's printed instructions.

- E. Construct brick masonry walls after concrete unit masonry backup walls have been constructed. Do not construct brick masonry walls and concrete unit masonry back-up walls in the same construction sequence.

3.04 JOINTS

- A. Nominal thickness shall be 3/8" (9 mm) and uniform.
- B. Shove vertical joints tight.
- C. Tool joints slightly concave in surfaces to be exposed or painted.
- D. Strike joints flush in surfaces to be covered.

3.05 BUILT-UP WORK

- A. Cooperate with other trades in building with items in masonry work.
- B. Grout solid around built-in items and in door frames.
- C. Steel lintels shall extend into side walls at jambs, minimum 8" bearing on each side.

3.06 POINTING AND CLEANING

- A. Dry brush masonry surfaces after mortar has set, at end of each day's work and after final points.
- B. Cut out and repoint defective joints.
- C. At final completion of masonry work, fill holes in joints and tool to match adjacent work.
- D. Leave work and surrounding surfaces clean and free of efflorescence, mortar spots and droppings.
- E. Clean masonry with approved masonry cleaner, to the satisfaction of the Architect/Engineer.

3.07 TOLERANCES

- A. Maximum Variation from Unit to Adjacent Unit: 1/32 inch.
- B. Maximum Variation from Plane of Wall: Not to exceed 1/4 inch in 10 feet and 1/2 inch in 20 feet or more.
- C. Maximum Variation from Plumb: Not to exceed 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
- D. Maximum Variation from Level Coursing: 1/8 inch in 3 feet and 1/4 inch in 10 feet; 1/2 inch in 30 feet.
- E. Maximum Variation of Joint Thickness: 1/8 inch in 3 feet.
- F. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

END OF SECTION 042113

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Concrete masonry units.
 - 2. Masonry Lintels.
 - 3. Thermal Brick Support System.
 - 4. Mortar and grout.
 - 5. Steel reinforcing bars.
 - 6. Masonry joint reinforcement.
 - 7. Ties and anchors.
 - 8. Embedded flashing.
 - 9. Cavity Drainage System.
 - 10. Miscellaneous masonry accessories.
 - 11. Masonry Cell Insulation.
 - 12. Installation of Door Frames, Lintels and items furnished by other sections.
 - 13. Cleaning of masonry.

1.03 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.04 PERFORMANCE REQUIREMENTS

- A. Provide unit masonry that develops indicated net-area compressive strengths at 28 days.
 - 1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.
 - 2. Determine net-area compressive strength of masonry by testing masonry prisms according to ASTM C1314.
- B. Fire Rated Assemblies: Tested in accordance with ANSI/UL 263 "Fire Tests of Building Construction and Materials" conforming to UL Assembly No. U906.

1.05 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Owner will engage a qualified independent testing agency to perform preconstruction testing indicated below. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
 - 1. Concrete Masonry Unit Test: For each type of unit required, according to ASTM C140/C140M for compressive strength.
 - 2. Mortar Test (Property Specification): For each mix required, according to ASTM C109/C109M for compressive strength, ASTM C 1506 for water retention, and ASTM C91/C91M for air content.
 - 3. Mortar Test (Property Specification): For each mix required, according to ASTM C780 for compressive strength.

4. Grout Test (Compressive Strength): For each mix required, according to ASTM C1019.
5. Prism Test: For each type of construction required, according to ASTM C1314.

1.06 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For the following:
 1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
 2. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Show elevations of reinforced walls.
 3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
- C. Samples for Initial Selection:
 1. Colored mortar.
 2. Weep holes/vents.
- D. Samples for Verification: For each type and color of the following:
 1. Exposed CMUs.
 2. Pigmented mortar. Make Samples using same sand and mortar ingredients to be used on Project.
 3. Accessories embedded in masonry.

1.07 INFORMATIONAL SUBMITTALS

- A. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.
 1. Submittal is for information only. Neither receipt of list nor approval of mockup constitutes approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.
- B. Qualification Data: For testing agency.
- C. Material Certificates: For each type and size of the following:
 1. Masonry units.
 - a. Include data on material properties material test reports substantiating compliance with requirements.
 - b. For masonry units, include data and calculations establishing average net-area compressive strength of units.
 2. Cementitious materials. Include brand, type, and name of manufacturer.
 3. Pre-blended, dry mortar mixes. Include description of type and proportions of ingredients.
 4. Grout mixes. Include description of type and proportions of ingredients.
 5. Reinforcing bars.
 6. Joint reinforcement.
 7. Anchors, ties, and metal accessories.
- D. Mix Designs: For each type of mortar. Include description of type and proportions of ingredients.
 1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C109/C109M for compressive strength, ASTM C 1506 for water retention, and ASTM C91/C91M for air content.

2. Include test reports, according to ASTM C1019, for grout mixes required to comply with compressive strength requirement.
- E. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 402/602.
- F. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.08 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM C1093 for testing indicated.
- B. In accordance with the Statement of Special Inspections, the Special Inspector shall provide, and coordinate inspections and verifications as noted on Contract Drawings.
- C. Special Testing Inspections: Owner shall employ a Special Inspection Agency to provide required inspections in accordance with current Building Code of New York State.
- D. The Special Inspector shall submit copies of reports to Architect, Engineer, Owner's Site Representative and Contractor on day that tests are made. Include date of testing, weather conditions, building location and test location.
- E. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
- F. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.
- G. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 402/602 unless modified by requirements in the Contract Documents.
 1. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2018.
 2. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
 3. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
 4. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications; 2020a.
 5. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.
 6. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2020.
 7. ASTM D696 - Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between - 30 C and 30 C with a Vitreous Silica Dilatometer; 2016.
 8. ASTM E514/E514M - Standard Test Method for Water Penetration and Leakage Through Masonry; 2020.

- H. Mock-up Panels: Build sample panels to verify selections made under sample submittals and to demonstrate aesthetic effects. Comply with requirements in Section 014500 - QUALITY CONTROL for mockups.
1. Build sample panels for typical exterior wall in sizes approximately 72 inches long by 48 inches high by full thickness.
 2. Where masonry is to match existing, erect panels adjacent and parallel to existing surface.
 3. Protect approved sample panels from the elements with weather-resistant membrane.
 4. Approval of sample mock-up panel is for the following items:
 - a. Color, texture, and blending of masonry units;
 - b. Relationship of mortar and sealant colors to masonry unit colors;
 - c. Tooling of joints;
 - d. Aesthetic qualities of workmanship;
 - e. Reinforcing, flashing, control joint and sealant installations;
 - f. Other material and construction qualities specifically requested by Architect in writing.
 5. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless such deviations are specifically approved by Architect in writing.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Deliver pre-blended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store pre-blended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weatherproof dispensing silos.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.10 PROJECT CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 1. Extend cover a minimum of 24 inches down both sides of walls and hold cover securely in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 2. Protect sills, ledges, and projections from mortar droppings.

3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 402/602.
1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and higher and will remain so until masonry has dried, but not less than 7 days after completing cleaning.
- E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 402/602.

PART 2 - PRODUCTS

2.01 MASONRY UNITS, GENERAL

- A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.
- B. Fire-Resistance Ratings: Where indicated, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing according to ASTM E119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

2.02 CONCRETE MASONRY UNITS

- A. Regional Materials: CMUs shall be manufactured within 500 miles of Project site from aggregates and cement that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of the Project site.
- B. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
 2. Provide bullnose units for outside corners unless otherwise indicated.
- C. Integral Water Repellent: Provide units made with integral water repellent for exposed units and where indicated.
1. Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested according to ASTM E514/E514M as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive, with test period extended to 24 hours, shall show no visible water or leaks on the back of test specimen.
 - a. Products : Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) ACM Chemistries, Inc.; RainBloc.
 - 2) BASF Group; MasterPel 240
 - 3) Grace Construction Products, W. R. Grace & Co.; Dry-Block.
- D. CMUs: ASTM C90.
1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi.

2. Density Classification: Normal weight.
3. Size: Manufactured to dimensions 3/8 inch less than nominal dimensions. Provide in sizes indicated on the drawings.
4. Exposed Faces: Provide color and texture matching the range represented by Architect's sample or as indicated on the drawings.
5. Faces to Receive Plaster: Where units are indicated to receive a direct application of plaster, provide textured-face units made with gap-graded aggregates.

2.03 THERMAL BRICK SUPPORT SYSTEM

- A. Thermal Brick Support System with components fabricated from hot-dip galvanized steel as manufactured by Hohmann & Barnard or Architect approved equal. Type: TBS-B (Bracket Style) and TBS-F (Fin Style) as indicated on the drawings.
 1. Bracket Depth: As indicated on the drawings.
 2. Bracket Length: As indicated on the drawings.
 3. Projecting Leg Depth: As indicated on the drawings.
- B. Fasteners:
 1. Provide fasteners of type, grade, and class required to produce connections suitable for anchoring brick support system to other types of construction indicated and capable of withstanding design loads.
 2. Fastener Materials: Fabricate fasteners and anchors from stainless steel, ASTM A240/A240M or ASTM A666, Type 304 stainless steel; temper as required to support loads imposed without exceeding allowable design stresses.
- C. Finishes:
 1. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel hardware and with ASTM A123/A123M for other steel products.
 2. Stainless Steel: Mill-produced finish.

2.04 MORTAR AND GROUT MATERIALS

- A. Regional Materials: Aggregate for mortar and grout, cement, and lime shall be extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
- B. Portland Cement: ASTM C150/C150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- C. Hydrated Lime: ASTM C207, Type S.
- D. Portland Cement-Lime Mix: Packaged blend of Portland cement and hydrated lime containing no other ingredients.
- E. Masonry Cement: ASTM C91/C91M.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Essroc, Italcementi Group; Brixment or Velvet.
 - b. Holcim (US) Inc; Mortamix Masonry Cement.
 - c. Lafarge North America Inc.; Magnolia Masonry Cement.
 - d. Lehigh Cement Company; Lehigh Masonry Cement.
- F. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C979/C979M. Use only pigments with a record of satisfactory performance in masonry mortar.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Davis Colors; True Tone Mortar Colors.
 - b. Lanxess Corporation; Bayferrox Iron Oxide Pigments.
 - c. Solomon Colors, Inc.; SGS Mortar Colors.
- G. Colored Cement Product: Packaged blend made from Portland cement and hydrated lime or mortar cement and mortar pigments, all complying with specified requirements, and containing no other ingredients.
- H. Aggregate for Mortar: ASTM C144.
 1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
 2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
 3. White-Mortar Aggregates: Natural white sand or crushed white stone.
 4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- I. Grout: ASTM C476. 3,000 psi minimum
 1. Fine aggregate: sand.
 2. Coarse aggregate: 3/8" chip gravel
- J. Aggregate for Grout: ASTM C404.
- K. Cold-Weather Admixture: Non-chloride, noncorrosive, accelerating admixture complying with ASTM C494/C494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Euclid Chemical Company (The); Accelguard 80.
 - b. Grace Construction Products, W. R. Grace & Co.; Morset.
 - c. Sonneborn Products, BASF Aktiengesellschaft; Trimix-NCA.
- L. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs, containing integral water repellent by same manufacturer.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. ACM Chemistries, Inc.; RainBloc for Mortar.
 - b. BASF Aktiengesellschaft; MasterPel 240MA Mortar Admixture.
 - c. Grace Construction Products, W. R. Grace & Co. - Conn.; Dry-Block Mortar Admixture.
- M. Water: Potable.

2.05 REINFORCEMENT

- A. Uncoated Steel Reinforcing Bars: ASTM A615/A615M or ASTM A996/A996M, Grade 60 (Grade 420).
- B. Epoxy coated reinforcement shall conform to ASTM A775/A775M.
- C. Masonry Joint Reinforcement, General: ASTM A951/A951M.
 1. Interior Walls: Mill- galvanized, carbon steel.
 2. Exterior Walls: Hot-dip galvanized, carbon steel.

3. Wire Size for Side Rods: 0.187-inch diameter.
 4. Wire Size for Cross Rods: 0.148-inch diameter.
 5. Wire Size for Veneer Ties: 0.187-inch diameter.
 6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
 7. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.
- D. Masonry Joint Reinforcement for Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.

2.06 TIES AND ANCHORS

- A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated.
1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A153/A153M, Class B-2 coating.
 2. Steel Sheet, Galvanized after Fabrication: ASTM A1008/A1008M, Commercial Steel, with ASTM A153/A153M, Class B coating.
 3. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- B. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch diameter, hot-dip galvanized steel wire.
 2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch (25 mm) of masonry face, made from 0.187-inch diameter, hot-dip galvanized steel wire.
- C. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
1. Connector Section: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from 0.060-inch thick, steel sheet, galvanized after fabrication 0.105-inch thick, steel sheet, galvanized after fabrication.
 - a. 0.108-inch thick, galvanized sheet may be used at interior walls unless otherwise indicated.
 2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.25-inch diameter, hot-dip galvanized steel wire.
 3. Corrugated Metal Ties: Metal strips not less than 7/8 inch wide with corrugations having a wavelength of 0.3 to 0.5 inch and an amplitude of 0.06 to 0.10 inch made from 0.105-inch thick, steel sheet, galvanized after fabrication with dovetail tabs for inserting into dovetail slots in concrete and sized to extend to within 1 inch of masonry face.
- D. Partition Top anchors:
1. PTA type, Model 420 by Hohmann & Barnard, Inc. or approved equal, 0.105-inch thick metal plate with 3/8-inch diameter stainless steel rod, Type 304, 6 inches long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Use in conjunction with NS Neoprene Sponge to allow for vertical expansion and contraction.
 2. PTA type, Model 422, by Hohmann & Barnard or approved equal, 12 gauge thick with 7/16 inch holes. Fabricate from steel, Hot-dip galvanized after fabrication. Use in conjunction with NS Neoprene Sponge to allow for vertical expansion and contraction.
 3. PTA Type, Model 364, by Hohmann & Barnard or approved equal, 12 gauge by 7 inches long (T-shape to engage Gripstay Channel), Type 304 Stainless Steel with PTA Rectangular Clear Butyrate Tube, ASTM D696, with compressible filler to allow for vertical deflection of construction above. Use this PTA with lateral shear resistance in conjunction with

th H & B Gripstay Channels and NS Neoprene Sponge as a complete assembly prior to grouting.

- E. Rigid Anchors for intersecting walls: Fabricate from steel bars 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches or with cross pins unless otherwise indicated.
 - 1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A153/A153M.

2.07 MISCELLANEOUS ANCHORS

- A. Unit Type Inserts in Concrete: Cast-iron or malleable-iron wedge-type inserts.
- B. Dovetail Slots in Concrete: Furnish dovetail slots with filler strips, of slot size indicated, fabricated from 0.034-inch, galvanized steel sheet.
- C. Anchor Bolts: L-shaped steel bolts complying with ASTM A307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A153/A153M, Class C; of dimensions indicated.
- D. Post-installed Anchors: chemical anchors.
 - 1. Load Capacity: Capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E488/E488M, conducted by a qualified independent testing agency.
 - 2. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5 unless otherwise indicated.
 - 3. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 A1 stainless-steel bolts, ASTM F593, and nuts, ASTM F594.

2.08 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:
 - 1. Fabricate continuous flashings in sections 96 inches long minimum, but not exceeding 12 feet. Provide splice plates at joints of formed, smooth metal flashing.
 - 2. Fabricate through-wall metal flashing embedded in masonry from copper, with ribs at 3-inch intervals along length of flashing to provide an integral mortar bond.
 - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Cheney Flashing Company; Cheney 3-Way Flashing (Sawtooth).
 - 2) Keystone Flashing Company, Inc; Keystone 3-Way Interlocking Thruwall Flashing.
 - 3) Sandell Manufacturing Co., Inc; Mechanically Keyed Flashing.
 - 3. Fabricate through-wall flashing with snaplock receiver on exterior face where indicated to receive counterflashing.
 - 4. Fabricate through-wall flashing with drip edge unless otherwise indicated. Fabricate by extending flashing 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.
 - 5. Metal Drip Edge: Fabricate from stainless steel. Extend at least 3 inches into wall and 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.
 - 6. Metal Expansion-Joint Strips: Fabricate from stainless steel to shapes indicated.
- B. Flexible Flashing: Use the following unless otherwise indicated:
 - 1. Elastomeric Thermoplastic Flashing: Composite flashing product consisting of a polyester-reinforced ethylene interpolymer alloy.

- a. Products: Subject to compliance with requirements, provide the following:
 - 1) Mortar Net USA, Ltd.; Total Flash.
 - 2) CavClear Masonry Mat; MasonPro, Inc.
 - 3) Or approved equal.
 - 4) Monolithic Sheet: TPO Elastomeric thermoplastic flashing, 0.040 inch thick with integral stainless steel drip edge, drainage matrix, integral weeps, stainless steel termination bar and #14 x 2 Stainless fasteners spaced 6" apart.
 - 5) Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.
- C. Application: Unless otherwise indicated, use the following:
 - 1. Where flashing is indicated to receive counterflashing, use metal flashing.
 - 2. Where flashing is indicated to be turned down at or beyond the wall face, use metal flashing.
 - 3. Where flashing is partly exposed and is indicated to terminate at the wall face, use metal flashing or flexible flashing with a metal drip edge.
 - 4. Where flashing is fully concealed, use flexible flashing.
- D. Solder and Sealants for Sheet Metal Flashings: As specified in Section 076200 - QUALITY CONTROL.
 - 1. Solder for Stainless Steel: ASTM B32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.
 - 2. Solder for Copper: ASTM B32, Grade Sn96, 96 percent tin and 4 percent silver.
 - 3. Elastomeric Sealant: ASTM C920, chemically curing urethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- E. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.09 MASONRY DRAINAGE MAT

- A. Manufacturer and Type: CavClear Masonry Mat as manufactured by Archovations, Inc., 701 Second Street, Hudson, WI 54016, (715) 381-5773 or approved equal.
 - 1. Description: Full-height Air Space Maintenance and Cavity Drainage Mat. The masonry drainage mat shall be specifically designed for masonry cavities to prevent mortar from contacting the backup and ensure water management. The masonry drainage mat shall be fluid conducting, non-absorbent, mold and mildew resistant polymer mesh consisting of 100% recycled plastic with binder fibers. Masonry drainage mat is to be a non-woven textile product in random pattern and have voids no greater than 1/4" in diameter. Masonry mat is to be designed for substantially continuous installation behind the full-height of all masonry.
 - 2. Masonry Drainage Mat Thickness: Select masonry mat thickness of as indicated on the drawings inches to allow no more than 3/8 inch tolerance between the masonry mat and masonry wythe.
 - 3. Sizes: 16 inch high by 8 foot length pieces and/or 8 inch high by 8 foot long pieces as needed to accommodate building components.

2.10 WEEP VENTS

- A. Manufacturer and Type: CavClear Weep Vents as manufactured by Archovations, Inc., 701 Second Street, Hudson, WI 54016, (715) 381-5773 or approved equal.
 - 1. Description: Non-woven mesh with notched bottom.

2. Color: as selected by the Architect from the manufacturer's full color offering to match mortar.
3. Size: 3/8 inch by size to match masonry unit dimensions.

2.11 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Pre-molded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.
- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D226/D226M, Type I (No. 15 asphalt felt).
- D. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
- E. Single Wythe Cavity Weep units: Provide continuously in base joint of single wythe masonry installations. Units shall be Cavity Weep TM CV 5010 as manufactured by MTI or approved equal.
- F. Grout Stop: Provide Hohmann & Barnard, Inc. - HGS Mortar / Grout Screen or approved equal; ASTM D5034, non-corrosive, high strength 1/4 inch mesh polypropylene monofilament screening in widths conforming to CMU units. Cut away as required to allow grout flow at reinforced core locations.

2.12 MASONRY CELL INSULATION

- A. Molded-Polystyrene Insulation Units: Rigid, cellular thermal insulation formed by the expansion of polystyrene-resin beads or granules in a closed mold to comply with ASTM C578, Type I. Provide specially shaped units designed for installing in cores of masonry units.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Concrete Block Insulating System; Korfil.
 - b. Or approved equal.

2.13 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
 1. Do not use calcium chloride in mortar or grout.
 2. Use Portland cement-lime masonry cement mortar unless otherwise indicated.
 3. For exterior masonry, use Portland cement-lime masonry cement mortar.
 4. For reinforced masonry, use Portland cement-lime masonry cement mortar.
 5. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Pre-blended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a pre-blended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

- C. Mortar for Unit Masonry: Comply with ASTM C270, Property Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.
1. For masonry below grade or in contact with earth, use Type M.
 2. For reinforced masonry, use Type S.
 3. For mortar parge coats, use Type N.
 4. 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 N.
 5. For interior non-load-bearing partitions, Type O may be used instead of Type N.
- D. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.
1. Pigments shall not exceed 10 percent of Portland cement by weight.
 2. Mix to match Architect's sample.
 3. Application: Use pigmented mortar for exposed mortar joints with the following units:
 - a. Architectural CMUs.
 - b. Cast stone trim units.
- E. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.
1. Mix to match Architect's sample.
 2. Application: Use colored aggregate mortar for exposed mortar joints with the following units:
 - a. Architectural CMUs.
 - b. Cast stone trim units.
- F. Grout for Unit Masonry: Comply with ASTM C476.
1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 402/602 for dimensions of grout spaces and pour height.
 2. Proportion grout in accordance with ASTM C476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 3000 psi.
 3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C143/C143M.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
 2. Verify that foundations are within tolerances specified.
 3. Verify that reinforcing dowels are properly placed.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

- A. Build chases and recesses to accommodate items specified in this and other Sections.

- B. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.
- C. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

3.03 TOLERANCES

- A. Dimensions and Locations of Elements:
 - 1. For dimensions in cross section or elevation do not vary by more than plus 1/2 inch or minus 1/4 inch .
 - 2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch.
 - 3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.
- B. Lines and Levels:
 - 1. For bed joints and top surfaces of bearing walls do not vary from level by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
 - 2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
 - 3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet or 1/2 inch maximum.
 - 4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
 - 5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
 - 6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
- C. Joints:
 - 1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch with a maximum thickness limited to 1/2 inch.
 - 2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
 - 3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
 - 4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. 3 mm.

3.04 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Lay exposed masonry in running bond unless indicated otherwise on the Contract Drawings; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4-inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar before laying fresh masonry.
- E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- G. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.
- H. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.
 - 1. Install compressible filler in joint between top of partition and underside of structure above.
 - 2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c. unless otherwise indicated.
 - 3. Wedge non-load-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.
 - 4. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 078446 - INSULATING SHEATHING.

3.05 MORTAR BEDDING AND JOINTING

- A. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- B. Set cast-stone trim units in full bed of mortar with full vertical joints. Fill dowel, anchor, and similar holes.
 - 1. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
 - 2. Allow cleaned surfaces to dry before setting.
 - 3. Wet joint surfaces thoroughly before applying mortar.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
- D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.06 MASONRY-CELL INSULATION

- A. Pour granular insulation into cavities to fill void spaces. Maintain inspection ports to show presence of insulation at extremities of each pour area. Close the ports after filling has been confirmed. Limit the fall of insulation to one story high, but not more than 20 feet.
- B. Install molded-polystyrene insulation units into masonry unit cells before laying units.

3.07 MASONRY JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
 - 1. Space reinforcement not more than 16 inches o.c.
 - 2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
 - 3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.
- E. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.08 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

- A. Anchor masonry to structural steel and concrete where masonry abuts or faces structural steel or concrete to comply with the following:
 - 1. Provide an open space not less than 2 inches wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
 - 2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
 - 3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.09 CONTROL AND EXPANSION JOINTS

- A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form control joints in concrete masonry using one of the following methods:
 - 1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
 - 2. Install preformed control-joint gaskets designed to fit standard sash block.
 - 3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake out joint for application of sealant.
 - 4. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.
- C. Control Joint Locations:
 - 1. At major changes in wall height.
 - 2. At changes in wall thickness.
 - 3. At control joints in foundations, roofs and floors.
 - 4. At chases and recesses for piping, columns, fixtures, etc.
 - 5. At one side of wall openings less than 6 feet unless indicated otherwise.
 - 6. At both sides of wall opening exceeding 6 feet.
 - 7. At or near wall intersections.
 - 8. Near return wall angles in L, T, and U shaped structures.
 - 9. All other cases, maximum spacing between joints shall not exceed 30 feet.

3.10 LINTELS

- A. Provide masonry lintels where shown and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are shown without structural steel or other supporting lintels.
- B. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.11 FLASHING

- A. General: Install embedded flashing in masonry at lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.
- B. Install flashing as follows unless otherwise indicated:
 - 1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
 - 2. At lintels, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
 - 3. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Section 079200 "Joint Sealants" for application indicated.
 - 4. Install metal drip edges with ribbed sheet metal flashing by interlocking hemmed edges to form hooked seam. Seal seam with elastomeric sealant complying with requirements in Section 079200 - JOINT SEALANTS for application indicated.
 - 5. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal drip edge.
 - 6. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal flashing termination.
 - 7. Cut flexible flashing off flush with face of wall after masonry wall construction is completed.
- C. Install single-wythe CMU flashing system in bed joints of CMU walls where indicated to comply with manufacturer's written instructions. Install CMU cell pans with upturned edges located below face shells and webs of CMUs above and with weep spouts aligned with face of wall. Install CMU web covers so that they cover upturned edges of CMU cell pans at CMU webs and extend from face shell to face shell.
- D. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

3.12 DRAINAGE MAT INSTALLATIONS

- A. Install masonry drainage mat continuously throughout full-height of all exterior masonry cavities during construction of exterior wythe; follow manufacturer's installation instructions. Verify that air space width is no more than 3/8 inch greater than masonry mat thickness. Install horizontally between joint reinforcement. Stagger end joints in adjacent rows. Use multiple layers at bottom of wall and above through-wall flashings when air space depth exceeds masonry mat thickness by more than 3/8 inch. Extend extra mat at least to top of base

flashing. Butt adjacent pieces to moderate contact. Fit to perimeter construction and penetrations without voids.

3.13 WEEP VENT INSTALLATIONS

- A. Place weep vents in head joints at exterior wythe of cavity wall located immediately above ledges and flashing, spaced 24 inches on center, unless otherwise shown. Leave the side of the masonry units forming the vent space unbuttered and clear of mortar. Install with notched side down. Slide vent material into joint as the two masonry units forming the weep vent are placed.

3.14 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
 - 1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
 - 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 402/602.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
 - 1. Comply with requirements in ACI 530.1/ASCE 6/TMS 402/602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
 - 2. Limit height of vertical grout pours to not more than 60 inches.
- D. Steel reinforcement bars, unless otherwise detailed on plans, shall be placed as follows:
 - 1. Install #5 bar, vertically at all corners and at door and window jambs and 32" o.c. typical in all 10" walls.
 - 2. Install #5 bar, vertically at all corners and at door and window jambs and 48" o.c. typical in all 12" walls.
 - 3. Fill all concrete masonry unit cells containing reinforcement bars solid with mortar.
 - 4. Remove pre-molded insulation from block cores containing vertical reinforcing bars.
 - 5. Reinforcement Bars shall be lapped at splices as follows:

Bar Size	Min. Lap Distance
#4	24 inches
#5	30 inches
#6	36 inches
#7	42 inches

3.15 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of materials that fail to meet specified requirements shall be done at Contractor's expense.
- B. Inspections: Level 1 special inspections according to the Building Code of New York State.

1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
 2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
 3. Place grout only after inspectors have verified proportions of site-prepared grout.
- C. Testing Prior to Construction: One set of tests.
- D. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.
- E. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C140/C140M for compressive strength.
- F. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C780.
- G. Mortar Test (Property Specification): For each mix provided, according to ASTM C780. Test mortar for compressive strength.
- H. Grout Test (Compressive Strength): For each mix provided, according to ASTM C1019.
- I. Prism Test: For each type of construction provided, according to ASTM C1314 at 28 days.

3.16 PARGING

- A. Parge exterior faces of below-grade masonry walls, where indicated, in 2 uniform coats to a total thickness of 3/4 inch. Dampen wall before applying first coat and scarify first coat to ensure full bond to subsequent coat.
- B. Use a steel-trowel finish to produce a smooth, flat, dense surface with a maximum surface variation of 1/8 inch per foot. Form a wash at top of parging and a cove at bottom.
- C. Damp-cure parging for at least 24 hours and protect parging until cured.

3.17 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.

3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

3.18 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.
- B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
 1. Crush masonry waste to less than 4 inches in each dimension.
 2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Section 312323 - FILL.
 3. Do not dispose of masonry waste as fill within 18 inches of finished grade.
- C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042200

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Structural steel.
 - 2. Grout.
 - 3. Base Plates.
- B. Related Requirements:
 - 1. Division 01 - "Quality Requirements" for independent testing agency procedures and administrative requirements.
 - 2. Section 053100 - "Metal Decking" for field installation of shear connectors through deck.
 - 3. Section 055000 - "Metal Fabrications" for steel lintels and shelf angles not attached to structural-steel frame not defined as structural steel.
 - 4. Section 055100 "Metal Stairs".
 - 5. Section 099113 "Exterior Painting" and for surface-preparation and priming requirements.

1.03 DEFINITIONS

- A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."
- B. Seismic-Load-Resisting System: Elements of structural-steel frame designated as "SLRS" or along grid lines designated as "SLRS" on Drawings, including columns, beams, and braces and their connections.
- C. Heavy Sections: Rolled and built-up sections as follows:
 - 1. Shapes included in ASTM A6/A6M with flanges thicker than 1-1/2 inches (38 mm).
 - 2. Welded built-up members with plates thicker than 2 inches (50 mm).
 - 3. Column base plates thicker than 2 inches (50 mm).

1.04 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.05 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.06 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

- B. Shop Drawings: Show fabrication of structural-steel components.
 - 1. Shop drawings and required calculations shall bear the seal and signature of a registered Professional Engineer licensed in the state in which the project is located. Structural steel shop drawings will not be reviewed without said seal and signature.
 - a. A full set of engineered calculations for all beam to column moment connections shall be submitted to the engineer of record for approval. The steel fabricator drawings shall not be reviewed without said engineering calculations affixed with a seal and signature of a professional engineer licensed in the state in which the project is located.
 - 2. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 - 3. Include embedment Drawings.
 - 4. Indicate profiles, sizes, spacing and locations of structural members, openings, attachments, fasteners, connections, cambers, holes and other pertinent data. Include locations of structural members, openings, attachments and loads.
 - 5. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
 - 6. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.
 - 7. For structural steel connections indicated to comply with design loads, include structural design data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Delegated-Design Submittal: For structural-steel connections indicated to comply with design loads, include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.07 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For installer / fabricator.
- B. Welding certificates: Submit certificates certifying that welders employed in the work have met AWS qualifications within the previous 12 months.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- D. Mill test reports for structural steel, including chemical and physical properties. Indicate structural strength, destructive and non-destructive test analysis.
- E. Product Test Reports: For the following:
 - 1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
 - 2. Direct-tension indicators.
 - 3. Tension-control, high-strength, bolt-nut-washer assemblies.
 - 4. Shear stud connectors.
 - 5. Shop primers.
 - 6. Non-shrink grout.

1.08 QUALITY ASSURANCE

- A. Fabricator shall have a minimum of five (5) years documented experience with performing the work of this section.
- B. Installer Qualifications: A qualified installer specializing in performing the work of this section with a minimum of three (3) years of documented experience.

- C. Delegated Connection Designer: Connections not fully detailed on the contract drawings shall be designed under the direct supervision of a professional structural engineer experienced in the design of this work and licensed in the state in which the work is located. The shop drawings shall bear the seal and signature of same professional engineer.
- D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 1. Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8/D1.8M. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.
 - 2. Welders who are welding structural members fabricated in the shop or in the field, in the five boroughs must have a NYCDOB issued welder licence.
- E. Comply with applicable provisions of the following specifications and documents:
 - 1. AISC Code of Standard Practice for Steel Buildings and Bridges - AISC 303.
 - 2. AISC Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings - AISC 360.
 - 3. RCSC's "Specification for Structural Joints Using ASTM A325 or ASTM A490 Bolts."

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store and handle products to/at the site under the supervision of Division 01 of this Project Manual.
- B. Schedule deliveries of materials to the site at intervals which will ensure uninterrupted progress of the work.
- C. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
 - 1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.
- D. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
 - 1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
 - 2. Clean and experience. who bolts and nuts that become dry or rusty before use.
 - 3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F1852 fasteners and for retesting fasteners after lubrication.

1.10 COORDINATION

- A. Coordinate the work under Division 01 specification of this Project Manual.
- B. Coordinate the selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturer's recommendations to ensure that shop primers and topcoats are compatible with one another.
- C. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions and directions for installation.
- D. Coordinate the work of this section with utility installations and all other adjacent work.

- E. Coordinate the work of this section such that general progress of the Work is not interrupted.

1.11 FIELD MEASUREMENTS

- A. Verify that field measurements are as shown on the plans and approved shop drawings.
- B. The contractor is responsible for the proper location and elevations of the work.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator, including comprehensive engineering analysis by a qualified professional engineer, to withstand loads indicated and comply with other information and restrictions indicated where beam end reactions are not shown on drawings. Connection designer shall design shear connections to resist the reaction resulting from the maximum allowable uniform load of the beam found in the AISC Specification being applied along its full length.
 - 1. Select and complete connections using AISC 360.
 - 2. Use Load and Resistance Factor Design; data are given at factored-load level.
- B. Moment Connections: Type FR, fully restrained. Provide design and details of moment connections to resist forces shown on the contract drawings.
- C. Construction: Moment frame and Braced frame.

2.02 STRUCTURAL-STEEL MATERIALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. W-Shapes: ASTM A 992/A 992M.
- C. Channels, Angles, M-Shapes: ASTM A 36/A 36M.
- D. Plate and Bar: ASTM A 36/A 36M.
- E. Cold-Formed Hollow Structural Sections: ASTM A500/A500M, Grade C, seamless structural tubing.
- F. Steel Pipe: ASTM A53/A53M, Type E or Type S, Grade B.
 - 1. Weight Class: as indicated on the contract documents.
 - 2. Finish: Black except where indicated to be galvanized.
- G. Welding Electrodes: Comply with AWS requirements.

2.03 BOLTS, CONNECTORS, AND ANCHORS

- A. Zinc-Coated High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A 325 (ASTM A 325M), Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH (ASTM A 563M, Class 10S) heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.
 - 1. Finish: Hot-dip zinc coating.
 - 2. Direct-Tension Indicators: ASTM F959/F959M, Type 325 (ASTM F 959M, Type 8.8), compressible-washer type with mechanically deposited zinc coating finish.

- B. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F436, Type 1, hardened carbon-steel washers; all with plain finish.
- C. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A490 (A 490M), Type 1, heavy-hex steel structural bolts or tension-control, bolt-nut-washer assemblies with splined ends; ASTM A563, Grade DH, (ASTM A563M, Class 10S) heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers with plain finish.
 - 1. Direct-Tension Indicators: ASTM F959, Type 490 (ASTM F 959M, Type 10.9), compressible-washer type with plain finish.
- D. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F1852, Type 1, round head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.
 - 1. Finish: Plain.
- E. Shear Connectors: ASTM A108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.
- F. Anchor Bolts: ASTM A307, Grade C for non-moment resisting anchor rods. ASTM F1554, 36 and 55 ksi yield strength for moment resisting anchor rods.
 - 1. Nuts: ASTM A563 heavy-hex carbon steel.
 - 2. Plate Washers: ASTM A36/A36M carbon steel.
 - 3. Washers: ASTM F436/F436M, Type 1, hardened carbon steel.
 - 4. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.
- G. Threaded Rods: ASTM A 36/A 36M.
 - 1. Nuts: ASTM A563 ASTM A563M heavy-hex carbon steel.
 - 2. Washers: ASTM F 436 (ASTM F 436M), Type 1, hardened carbon steel.
 - 3. Finish: Plain.
- H. Clevises: Made from cold-finished carbon steel bars, ASTM A108, Grade 1035.
- I. Eye Bolts and Nuts: Made from cold-finished carbon steel bars, ASTM A108, Grade 1030.
- J. Sleeve Nuts: Made from cold-finished carbon steel bars, ASTM A108, Grade 1018.

2.04 PRIMER

- A. Primer: Comply with Division 09
- B. Primer: SSPC-Paint 15, Type I, red oxide.
- C. Ensure primer is compatible with required topcoat.
- D. Galvanizing Repair Paint: ASTM A 780/A 780M.

2.05 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.
- B. Grout shall consist of a premixed compound with cement, water reducing and plasticizing additives capable of developing a minimum compressive strength of 7000 psi at 28 days.

2.06 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," and to AISC 360.
 - 1. Camber structural-steel members where indicated.
 - 2. Fabricate beams with rolling camber up.
 - 3. Identify high-strength structural steel according to ASTM A6/A6M and maintain markings until structural steel has been erected.
 - 4. Mark and match-mark materials for field assembly.
 - 5. All wide flange structural steel members shall be fabricated in accordance with ASTM A992/A992M. All miscellaneous steel members including channels, angles, S, HP, and M shapes shall be fabricated in accordance with ASTM A36/A36M.
 - 6. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
 - 7. All shop connections shall be welded or high strength bolted.
 - 8. Bearing surfaces shall be planed true to provide full bearing over the entire surface.
 - 9. Continuously seal joined members by intermittent welds and plastic filler. Grind welds smooth where exposed or where interference with other building materials is encountered,
 - 10. Splicing is not permitted unless indicated on the Contract Documents or accepted on the final approved Shop Drawings.
- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
 - 1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.
- C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces. Mechanically thermal cut bolt holes shall not be permitted unless prior approval by the Architect is obtained in writing.
- D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 2, "Hand Tool Cleaning," or SSPC-SP 3, "Power Tool Cleaning," unless a more stringent cleaning method is required for selected primers and / or other coatings.
- F. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.
- G. Shop prime non-exposed steel members after fabrication in accordance with SSPC- PA. Do not prime surfaces that will be fireproofed, field welded or are in contact with concrete or high strength bolts.
- H. Paint exposed structural steel members in accordance with the applicable Division 09 Specification section.
- I. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.
 - 1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning unless approved by the Architect in writing.
 - 2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
 - 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.07 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM F3125/F3125M, Grade A325 or Grade A490 Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Snug tightened unless otherwise shown on the contract documents or required by the connection designer.
- B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
 - 1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

2.08 SHOP PRIMING

- A. Shop prime steel surfaces except the following:
 - 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).
 - 2. Surfaces to be field welded.
 - 3. Surfaces of high-strength bolted, slip-critical connections.
 - 4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
 - 5. Galvanized surfaces.
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
 - 1. SSPC-SP 2, "Hand Tool Cleaning."
 - 2. SSPC-SP 3, "Power Tool Cleaning."
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
 - 2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

2.09 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A123/A123M.
 - 1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.
 - 2. Galvanize lintels, shelf angles and welded door frames attached to structural-steel frame and located in exterior walls.

2.10 SOURCE QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform shop tests and inspections.
 - 1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

- B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.
 - 1. Inspection and Tests will not relieve the contractor of responsibility for providing materials, fabrication and erection procedures in compliance with the specified requirements. The contractor shall verify that all materials meet or exceed the requirements specified in these specifications, Contract drawings and related references. Materials not in compliance with the specified requirements will be rejected and required to be removed from the site.
- C. Bolted Connections: Inspect and test shop-bolted connections according to RCSC's "Specification for Structural Joints Using ASTM F3125/F3125M , Grade A325 or Grade A490 Bolts."
- D. Welded Connections: Visually inspect shop-welded connections according to AWS D1.1/D1.1M type required for materials being welded and the following inspection procedures, at testing agency's option:
 - 1. Liquid Penetrant Inspection: ASTM E165/E165M.
 - 2. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
 - 3. Ultrasonic Inspection: ASTM E164.
 - 4. Radiographic Inspection: ASTM E94.
- E. In addition to visual inspection, test and inspect shop-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
 - 1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
 - 2. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other drawings for compliance with requirements.
 - 1. Prepare a certified survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other drawings showing dimensions, locations, angles, and elevations.
- B. Proceed with installation only after unsatisfactory conditions have been corrected. Commencement of installation will indicate that the erector accepts the conditions which exist.

3.02 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.
 - 1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.
 - 2. Clean bearing surfaces and other surfaces which will be in permanent contact with the work.

3.03 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
- B. Proceed with the installation only after unsatisfactory conditions have been corrected. Commencement of installation will indicate that the erector accepts the conditions which exist.
- C. Allow for erection loads and for sufficient temporary bracing to maintain structure safe, plumb and in true alignment until completion of erection and installation of permanent bracing.
- D. Coordinate placement of anchors in concrete or masonry construction for securing bearing plates.
- E. Erect all components in accordance with the approved shop drawings.
- F. Field weld components and shear studs as indicated on approved shop drawings and in accordance with AWS D1.1/D1.1M.
- G. Do not field cut or alter structural members without written approval of the Engineer.
- H. Bearing Plates and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
 - 1. Set plates for structural members on wedges, shims, or setting nuts as required.
 - 2. Weld plate washers to top of baseplate.
 - 3. Snug-tighten Pretension anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
 - 4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
 - 5. Coordinate placement of anchors in concrete or masonry construction for securing base plates.
- I. Maintain erection tolerances of structural steel within AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."
- J. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 - 1. Level and plumb individual members of structure.
 - 2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
- K. Splice members only where indicated.
- L. Do not use thermal cutting during erection unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.
- M. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

- N. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.
- O. Erect all components in accordance with approved shop drawings. After erection, prime welds, abrasions and surfaces not shop primed or galvanized as required, except surfaces to be in contact with concrete.
- P. Field weld components and shear studs as indicated on the approved shop drawings and in accordance with AWS D1.1/D1.1M.

3.04 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM F3125/F3125M, Grade A325 or Grade A490 Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Snug tightened Pretensioned unless specifically identified as pretensioned or slip-critical on the contract documents or calculations by the Delegated Connection designer.
- B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
 - 1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
 - 2. Remove backing bars or runoff tabs where indicated, back gouge, and grind steel smooth.
 - 3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," for mill material.
 - 4. Connections and abrasions shall be cleaned, prepared and finished in the same manner and with the same materials used in shop finishing.

3.05 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
 - 1. Verify structural-steel materials and inspect steel frame joint details.
 - 2. Verify weld materials and inspect welds.
 - 3. Verify connection materials and inspect high-strength bolted connections.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- C. Bolted Connections: Inspect and test high strength bolted connections according to RCSC's "Specification for Structural Joints Using ASTM F3125/F3125M, Grade A325 or Grade A490 Bolts."
- D. Welded Connections: Visually inspect field welds according to AWS D1.1/D1.1M.
 - 1. In addition to visual inspection, test and inspect field welds according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
 - a. Liquid Penetrant Inspection: ASTM E165/E165M.
 - b. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
 - c. Ultrasonic Inspection: ASTM E164.
 - d. Radiographic Inspection: ASTM E94.

- E. Post Installed Mechanical Anchors, Adhesive Anchors and Screw Anchors: Comply with 2020 New York State Building Code Table 1705.3.
 - 1. The special inspection shall include the verification of compliance with approved construction documents and standards established by the Commissioner pursuant to Section 28-113.2.2 of the Administrative Code.
- F. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
 - 1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
 - 2. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.
- G. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.06 TOLERANCES

- A. All members shall be installed within AISC tolerances and as follows:
 - 1. Maximum variation from plumb: 1/4" (6mm) per story, non-cumulative.
 - 2. Maximum offset from true alignment: 1/4" (6mm).

3.07 REPAIRS AND PROTECTION

- A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A780/A780M.
- B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
- C. Touchup Painting: Cleaning and touchup painting are specified in Section 099100 - Painting
- D. Touchup Priming: Cleaning and touchup priming as specified in Division 9 "High-Performance Coatings" or compatible primer established at the fabricators shop to be compatible with the final finish.

3.08 ADJUSTING

- A. All misfits due to errors in location, fabrication, inaccuracies in the setting of anchor bolts or other items of attachment or support shall be immediately reported to the Engineer and corrected in a manner subject to the approval of the Engineer.
- B. Submit method of correction to the Architect under Division 01 Specification provisions.
- C. Proceed with corrective work only after receiving written approval from the Architect.
- D. All corrections shall be made at no additional cost to the Owner.

END OF SECTION 051200

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Roof deck and accessories.
 - 2. Composite floor deck.
 - 3. Formed steel cant strips.
 - 4. Pourstop angles, cell closures and end forms to contain wet concrete.
 - 5. Bearing plates and angles
 - 6. Framing for openings up to and including 18 inches.
 - 7. Closure panels for cell voids.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of deck, accessory, and product indicated provide deck profile characteristics and dimension, structural properties and finish.
 - 1. Include a statement indicating costs for each product having recycled content.
- B. Shop Drawings:
 - 1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction. Indicate temporary shoring of decking where required. Indicate welded connections using standard AWS A2.0 welding symbols and indicate net weld lengths.

1.04 INFORMATIONAL SUBMITTALS

- A. Submit under the provisions of Section 013300 - SUBMITTALS.
- B. Welding certificates.
- C. Product Certificates: For each type of steel deck by product manufacturer.
- D. Manufacturer's instructions: indicate special installation sequence and special instructions required for proper installation.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that each of the following complies with requirements:
 - 1. Power-actuated mechanical fasteners.
- F. Research/Evaluation Reports: For steel deck.

1.05 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.
- B. Installer: Company specializing in performing the work of this section with a minimum of three (3) years of documented experience.

- C. Design deck layout, spans, fastening and joints under the supervision of a Professional Structural Engineer experienced in the design of this work and licensed in the State in which the project is located.
- D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
- E. Fire-Test-Response Characteristics: Where indicated, provide steel deck units identical to those tested for fire resistance per ASTM E119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
- F. FM Global Listing: Provide steel roof deck evaluated by FM Global and listed in its "Approval Guide, Building Materials" for Class 1 fire rating and Class 1-90 windstorm ratings.
- G. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."
- H. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of pre-consumer recycled content is not less than 25 percent.

1.06 PERFORMANCE REQUIREMENTS

- A. Metal decking design shall be in accordance with SDI Design Manual for Composite Decks, Form Decks, and Roof Decks. Substitutions shall be designed to meet or exceed published section properties of the specified materials. Section properties shall be computed in accordance with American Iron and Steel Institute Specification for the Design of Cold Formed Steel Structural Members.
- B. Lateral deflection of diaphragm shall not exceed $1/500$ of the story height. Maximum vertical deflection shall not exceed $L/240$ of the span length.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Cut plastic wrap to encourage ventilation.
- C. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.
- D. Do not handle products in a manner which will distort or damage materials.
- E. Do not store decking directly on the ground.
- F. Store materials in a manner which will permit ease of access for inspection and identification.
- G. Schedule delivery of the materials to the site at intervals which will ensure uninterrupted progress of the work.
 - 1. Protect and ventilate acoustical cellular roof deck with factory-installed insulation to maintain insulation free of moisture.

1.08 FIELD MEASUREMENTS

- A. Verify that field measurements are as shown on the contract drawings and approved shop drawings as required by the manufacturer.
- B. The contractor is responsible for the proper locations and elevations of the work of this section.

1.09 COORDINATION

- A. Coordinate the work under provisions of Section 013100 - PROJECT MANAGEMENT AND COORDINATION.
- B. Coordinate the work of this section with utility installations and all other adjacent work.
- C. Coordinate the work such that the general progress of the work is not interrupted.

1.10 PERFORMANCE REQUIREMENTS

- A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."
- B. Metal decking design shall be in accordance with SDI Design Manual for Composite Decks, Form Decks, and Roof Decks. Substitutions shall be designed to meet or exceed published section properties of the specified materials. Section properties shall be computed in accordance with the American Iron and Steel Institute Specification for the Design of Cold Formed Steel Structural Members
- C. Lateral deflection of diaphragm shall not exceed 1/500th of the story height. Maximum vertical deflection shall not exceed L/240th of the span length.
- D. Fire-Resistance Ratings: Comply with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- E. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

PART 2 - PRODUCTS

2.01 METAL ROOF DECK

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Nucor Corp.; Vulcraft Division.
 - 2. Canam.
 - 3. New Millennium Building Systems.
 - 4. Substitutions shall be permitted only after receiving approval from the Architect/Engineer.
- B. Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:
 - 1. Galvanized and Shop-Primed Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Minimum 33 Ksi yield strength, G60 zinc coating; cleaned, pretreated, and primed with manufacturer's standard baked-on, rust-inhibitive primer.
 - a. Color: Manufacturer's standard.
 - 2. Deck Profile: Type B or as indicated on the drawings.
 - 3. Profile Depth: 1-1/2 inches (38 mm) or as indicated on the drawings.

4. Design Uncoated-Steel Thickness: 20 gauge unless otherwise indicated.
5. Span Condition: Triple span.
6. Side Laps: Overlapped.

2.02 COMPOSITE FLOOR DECK

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Nucor Corp.; Vulcraft Group.
 2. Canam.
 3. New Millennium Building Systems.
 4. Architect/Engineer approved equivalent.
- B. Composite Form Deck: Fabricate ribbed-steel sheet composite form-deck panels to comply with "SDI Specifications and Commentary for Composite Steel Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:
 1. Prime-Painted Steel Sheet: ASTM A1008/A1008M, Structural Steel (SS), Grade 80 (550) minimum, with top and underside surface shop primed with manufacturer's standard baked-on, rust-inhibitive primer.
 - a. Color: Manufacturer's standard.
 2. Galvanized and Shop-Primed Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade 80 (550), G60 (Z180) zinc coating; cleaned, pretreated, and primed with manufacturer's standard baked-on, rust-inhibitive primer.
 - a. Color: Gray.
 3. Profile Depth: As indicated on the contract drawings.
 4. Design Uncoated-Steel Thickness: As indicated on the contract drawings.
 5. Span Condition: Triple span.
 6. Side Laps: Overlapped.

2.03 ACCESSORIES

- A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Welded Materials: AWS D1.1/D1.1M.
- C. Primer: Flexible, Rust inhibitive.
- D. Touch-up Primer: Red Oxide Type.
- E. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.
- F. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 (4.8-mm) minimum diameter.
- G. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber. one inch thick profile to fit tight to decking in compression.
- H. Shear Connectors: 3/4 inch diameter, 4 1/2" inch long welded headed studs. locate as indicated on the contract drawings.
- I. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), of same material, gauge and finish as deck; of profile indicated or required for application.

- J. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 31 for overhang and slab depth.
- K. Piercing Hanger Tabs: Piercing steel sheet hanger attachment devices for use with floor deck.
- L. Weld Washers: Mild steel, uncoated, 3/4 inch outside diameter, 1/8 inch thick.
- M. Recessed Sump Pans: Single-piece steel sheet, 14 gauge or 0.0747 inch (1.90 mm) thick, of same material and finish as deck, with 3-inch (76-mm) wide flanges and sloped recessed side pans of 1-1/2 inch (38-mm) minimum depth below deck surface. For drains, cut holes in the field.
- N. Galvanizing Repair Paint: ASTM A780/A780M.
- O. Bearing Plates and Angles: ASTM A36/A36M steel, unfinished.
- P. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.
- Q. Closure Panels: Neoprene Blend-FR as manufactured by Carrington Specialty Products, Inc., or approved equal.
 - 1. Fire-rated Neoprene-blend formed to match profile of deck at each location.
 - 2. Install compatible backer rod and sealant to seal all edge conditions airtight.
 - 3. Physical Characteristics:
 - a. Nominal Density: 5 to 7 pcf.
 - b. Tensile Strength: 50 psi.
 - c. Elongation: 150% to break.
 - d. Compression Set: 50% of original thickness.
 - e. Compression Strength: 2 to 5 psi (at 25% deflection).
 - f. Working Temperature: -40 to 160 degrees F.
 - g. Water Absorption by Weight: 5% maximum.
 - h. Flammability: HF-1 as per UL 94.

2.04 SOURCE QUALITY CONTROL

- A. Testing and analysis of components will be performed under provisions of Section 014500 - QUALITY CONTROL.
- B. Inspection and tests will not relieve the Contractor of responsibility for providing materials and fabrication and erection procedures in compliance with specified requirements. The Contractor is to verify that all materials meet or exceed the requirements specified in these specifications.
- C. Materials not in compliance with the specified requirements will be rejected

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected. Beginning of installation means that the installer accepts the existing conditions.

3.02 INSTALLATION, GENERAL

- A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.
- B. Install temporary shoring before placing deck panels if required to meet deflection limitations.
- C. Locate deck bundles to prevent overloading of supporting members.
- D. Clean all bearing surfaces of debris and foreign matter.
- E. Verify bearing surface is smooth and flat.
- F. Bear decking on steel supports with 1 1/2 inch (38 mm) minimum bearing.
- G. Provide decking free of amounts of lubricants or oils which would impair the adhesion of spray on fireproofing or painting.
- H. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
- I. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- J. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
- K. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.
- L. Fasten deck to steel support members at ends and intermediate supports with fusion welds at 12 inches on center maximum, parallel with the deck flute and at each transverse flute. Weld washers are to be used only with decks 24 gauge or thinner.
- M. Mechanically fasten male/female side laps at 24 inches on center maximum for decking thinner than 20 gauge. Weld male/female side laps at 18 inches on center maximum for decks 20 gauge and heavier.
- N. Reinforce steel deck openings from 6 to 18 inches (150 to 460 mm) in size with 2 inches x 2 inches x 1/4 inch (50 mm x 50 mm x 6 mm) steel angles. Place angles perpendicular to flutes; extend minimum two flutes beyond each side of opening and fusion weld to deck at each flute.
- O. Install 6 inch (150 mm) minimum wide sheet steel cover plates, of same thickness as decking, where deck changes direction. Fusion weld 12 inches (300 mm) on center maximum.
- P. Install sheet steel closures and angle flashings to close openings between deck and walls, columns and openings.
- Q. Install single row of foam flute closures above walls and partitions perpendicular to deck flutes.
- R. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.
- S. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

3.03 ROOF-DECK INSTALLATION

- A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches (38 mm) long, and as follows:
 - 1. Weld Diameter: 3/4 inch (19 mm), nominal.
 - 2. Weld Spacing: Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support. Space welds 12 inches (305 mm) apart in the field of roof and 6 inches (150 mm) apart in roof corners and perimeter based on roof-area definitions in FMG Loss Prevention Data Sheet - FM DS 1-28.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of 1/2 of the span or 18 inches (457 mm), and as follows:
 - 1. Mechanically fasten with self-drilling, No. 10 (4.8-mm-) diameter or larger, carbon-steel screws.
 - 2. Mechanically clinch or button punch.
 - 3. Fasten with a minimum of 1-1/2-inch- (38-mm-) long welds where deck is thicker than 20 gauge.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm), with end joints as follows:
 - 1. End Joints: Lapped 2 inches (51 mm) minimum.
- D. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and weld flanges to top of deck flutes. Space welds not more than 6 inches apart with at least one weld at each corner.
 - 1. Install reinforcing channels or zees in ribs to span between supports and weld .
- E. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.
- F. Place metal cant strips in position and fusion weld.
- G. Install sheet steel closures and angle flashings to close openings between deck and walls, columns and openings.

3.04 FLOOR-DECK INSTALLATION

- A. Fasten floor-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:
 - 1. Weld Diameter: 3/4 inch (19 mm), nominal.
 - 2. Weld Spacing: Weld edge ribs of panels at each support. Space additional welds an average of 12 inches (305 mm) apart, but not more than 18 inches (457 mm) apart.
 - 3. Weld Spacing: Space and locate welds as indicated.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of half of the span or 36 inches (914 mm), and as follows:
 - 1. Mechanically fasten with self-drilling, No. 10 (4.8-mm-) diameter or larger, carbon-steel screws.
 - 2. Fasten with a minimum of 1-1/2-inch- (38-mm-) long welds where deck is thicker than 20 gauge.

- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm), with end joints as follows:
 - 1. End Joints: Lapped.
- D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations unless otherwise indicated. Where steel angles are not utilized, install stops at floor edge upturned to the top surface of the slab to contain wet concrete. Provide stop of sufficient strength to remain in place and stationary without distortion.
- E. Floor deck closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and deck.
- F. Position floor drain pans with the flanges bearing on the top surface of deck. Fusion weld at each deck flute.
- G. Install piercing hanger tabs at 14 inches (355 mm) apart in both directions, within 9 inches (228 mm) of walls at ends, and not more than 12 inches (305 mm) from walls at sides unless otherwise indicated.

3.05 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Field welds will be subject to inspection.
- C. Testing agency will report inspection results promptly and in writing to Contractor and Architect.
- D. Remove and replace work that does not comply with specified requirements.
- E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.06 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A780/A780M and manufacturer's written instructions.
- B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.
- C. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION 053100

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Shop and field fabricated ferrous metal items.
- B. Structural steel members.
- C. Weld repairs to steel lap seams.

1.02 RELATED SECTIONS

- A. Section 055133 - Metal Ladders
- B. Section 099870 - Steel Tank Coating System

1.03 REFERENCES

- A. ASTM A563/A563M - Standard Specification for Carbon and Alloy Steel Nuts (Inch and Metric); 2021a.
- B. AISC - Code of Standard Practice - Manual of Steel Construction - Allowable Stress Design (ASD).
- C. ASTM A36/A36M - Structural Steel.
- D. ASTM A53/A53M - Hot-Dipped, Zinc-coated Welded, and Seamless Steel Pipe.
- E. ASTM A108 - Steel Bars, Carbon, Cold-Finished, Standard Quality.
- F. ASTM A123/A123M - Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products.
- G. ASTM A153/A153M - Zinc Coating (Hot Dip) on Iron and Steel Hardware.
- H. ASTM A307 - Carbon Steel Externally Threaded Standard Fasteners.
- I. ASTM A563/A563M - Carbon and Alloy Steel Nuts.
- J. ASTM A568/A568M - General Requirements for Steel, Carbon and High-Strength Low-Alloy Hot-Rolled Sheet and Cold-Rolled Sheet.
- K. AWS A2.4 - Symbols for Welding, Brazing, and Nondestructive Examination.
- L. AWS D1.1/D1.1M - Structural Welding Code.
- M. SSPC (Steel Structures Painting Council) - Painting Manual.

1.04 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Shop Drawings:
 - 1. Indicate profiles, sizes, connections, reinforcing, anchorage, size and type of fasteners, and accessories.
 - 2. Include erection drawings, elevations, and details where applicable.

- C. Indicate welded connections using standard AWS A2.0 welding symbols. Indicate net weld lengths.
- D. Welders' Certificates: Certify welders employed on the Work have met AWS qualification within the previous twelve (12) months.
- E. Manufacturer's Mill Certificate: Certify that Products meet or exceed specified requirements.

1.05 QUALIFICATIONS

- A. Prepare Shop Drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the project is located. Shop drawings must be signed and sealed by a Professional Structural Engineer.
- B. Fabricate structural steel members in accordance with AISC Code of Standard Practice.

1.06 FIELD MEASUREMENTS

- A. Verify field measurements.
- B. Replacement fabrications shall be of same dimensions, strength, and gage as original members, unless noted differently on drawings.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Steel Sections: ASTM A36; sizes to match existing where not indicated on drawings.
- B. Plates: ASTM A283; gage to match existing where not indicated on drawings.
- C. Pipe: ASTM A53, Grade B; schedule to match existing where not indicated on drawing.
- D. Bolts, Nuts, and Washers ASTM A325 and Teflon coated: ASTM A325
- E. Welding Materials: AWS D1.1; type required for materials being welded.

2.02 FABRICATION

- A. Fit and shop assemble in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.
- C. Continuously seal joined members by continuous welds.
- D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline.
- E. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise. Components shall be comparable in size and capacity to existing components in similar anchorage situations.
- F. Fabricate support framing for openings and edges where existing supports are inadequate.

2.03 FINISHES

- A. Prepare surfaces to be primed. Refer to Section 099870 - Steel Tank Coating System.
- B. Do not prime surfaces in direct contact with concrete or where field welding is required.
- C. Shop prime structural steel members.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work, including the removal of existing metal fabrications that require replacement.
- B. Beginning of installation means erector accepts existing conditions.
- C. Verify that opening sizes and dimensional tolerances are acceptable.
- D. Verify that supports are correctly positioned.

3.02 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.

3.03 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Field weld components indicated on shop drawings.
- D. Connections shall be capable of transferring loads identical to capacity of existing connections.
- E. Perform field welding in accordance with AWS D1.1. Provide a fire watch during all hot work operations.
- F. Secure to prevent movement and anchor by welding.
- G. Obtain Engineer approval prior to site cutting or making adjustments not scheduled.

END OF SECTION 055000

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Agreement, including General and Supplementary Conditions, and Division 01 of the Project Manual apply to work of this Section.

1.02 SUMMARY

- A. This Section includes, but is not limited to, the following:
 - 1. Exterior aluminum roof access ladders.
 - 2. Ladder safety post.
- B. Related Sections: The following Sections contain requirements that relate to this Section.
 - 1. Section 055000 - Metal Fabrications
 - 2. Section 061000 - Rough Carpentry

1.03 STANDARDS

- A. All work of this section shall conform to CABO/ANSI, industry standards and manufacturer's recommendations.
- B. ASTM B 209 "Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate".
- C. ASTM B 221 "Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes".
- D. American Welding Society (AWS) applicable welding methods and standards.
- E. OSHA 1910.27 - Fixed Ladders.
- F. FS TT-P-645A "Primer, Paint, Zinc Chromate, Alkyd Type".
- G. NAAMM Metal Finishes Manual.

1.04 SUBMITTALS

- A. Pursuant to Section 013300 - Submittal Procedures.
- B. Submit pursuant to Section 016100 - Product Requirements.
- C. Product Data:
 - 1. Manufacturer's data sheets on each ladder.
 - 2. Manufacturer's product data on the following accessories if specified:
 - a. Safety Post
 - b. Security Door
- D. Shop Drawings:
 - 1. Detail fabrication and erection of each ladder indicated. Include plans, elevations, sections, and details of metal fabrication and their connections.
 - 2. Provide templates for anchors and bolts specified for installation under other Sections.
 - 3. Provide reaction loads for each hanger and bracket.
- E. Manufacturer's Qualifications:
 - 1. See requirements in Quality Assurance paragraph below.

1.05 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: A firm experienced in producing aluminum metal ladders similar to those indicated for this Project.
 - 1. Record of successful in-service performance.
 - 2. Sufficient production capacity to produce required units.
 - 3. Professional engineering competent in design and structural analysis to fabricate ladders in compliance with industry standards and local codes.
- B. Installer Qualifications: Competent and experienced firm capable of selecting fasteners and installing ladders to attain designed operational and structural performance.
- C. Product Qualifications: Product design shall comply with OSHA 1910.27 minimum standards for ladders.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Pursuant to manufacturers published instructions.
- B. Protect against moisture exposure and damage.
- C. Deliver materials to job site in good condition and properly protected against damage to finished surfaces.
- D. Storage on site:
 - 1. Store material in a location and in a manner to avoid damage. Stack to prevent bending.
 - 2. Store aluminum, bronze, and stainless-steel components and materials in clean, dry location, away from uncured concrete and masonry. Cover with waterproof paper, tarpaulin, or polyethylene sheeting and provide for circulation of air inside covering.
- E. Keep handling on site to a minimum. Exercise care to avoid damage to finished materials.

1.07 WARRANTY - ALUMINUM LADDERS

- A. Manufacturer has responsibility for an extended Corrective Period for work of this Section for a period of 5 years from date of Substantial Completion against all the conditions indicated below, and when notified in writing from Owner, manufacturer shall promptly and without inconvenience and cost to Owner correct said deficiencies.
 - 1. Defects in materials and workmanship.
 - 2. Deterioration of material and surface performance below minimum OSHA standards as certified by independent third-party testing laboratory. Ordinary wear and tear, unusual abuse or neglect excepted.
 - 3. Within the warranty period, the manufacturer shall, at its option, repair, replace, or refund the purchase price of defective ladder.
- B. Manufacturer shall be notified immediately of defective products and be given a reasonable opportunity to inspect the goods prior to return. Manufacturer will not assume responsibility, or compensation, for unauthorized repairs or labor.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. O'Keeffe's Inc., 100 N. Hill Drive, Suite 12, Brisbane California 94005, (415) 824-4900 (Basis of Specification).

- B. ALACO Ladder Company, 5167 G Street, Chino, CA 91710, (888) 310-7040.
- C. FIXFAST USA, 6210 S. Indianapolis Rd., Whitestown, IN 46075, (888) 637-7872.
- D. Architect approved equivalent from established ladder manufacturer.

2.02 ACCESS LADDER WITH ROOF OVER RAIL EXTENSIONS (EXTERIOR)

- A. Manufacturer: Ladder shall be Model Number 502, as manufactured by O'Keeffe's Inc., 100 N. Hill Drive, Suite 12, Brisbane California 94005, (415) 824-4900
- B. Rungs shall be no less than 1¼" in section and 24" long, formed from tubular aluminum extrusions, alloy 6063-T6, and shall be squared and deeply serrated on all sides to provide maximum grip and foot traction. Rungs shall be able to withstand a 1,000 lb. load without failure. Centerline of rungs shall be as indicated on the drawings from face of wall.
- C. Channel side rails, where specified, shall be no less than .125" wall thickness by 3" wide.
- D. Heaving duty tubular side rails, where specified, shall be assembled from two interlocking aluminum extrusions no less than .125" wall thickness by 3" wide. Construction shall be as follows: self-locking stainless-steel fasteners' full penetration inert-gas heliarc welds; clean, smooth and burr-free surfaces.
- E. Finishes: Mill finish aluminum.
- F. Alternate bottom support required.

2.03 MISCELLANEOUS MATERIALS

- A. Fasteners: Same basic metal as fastened metal. Do not use metals which are corrosive or incompatible with materials joined.
 - 1. Provide concealed fasteners for interconnection of handrail and railing components and for their attachment to other work except where exposed fasteners are unavoidable or are the standard fastening method for handrail and railing system indicated.
- B. Anchors and inserts: Anchors of type, size, and material required for loading and installation condition shown, and recommended by manufacturer. Use nonferrous metal or hot-dipped galvanized anchors and inserts for exterior locations and elsewhere as required for corrosion resistance. Use expansion bolt devices for drilled-in-place anchors.
- C. Primer paint for steel and iron: Manufacturer's standard rapid curing, rust-inhibiting primer; compatible with finish coats of paint. Coordinate selection of metal primer with finish paint requirements specified in Section 099100 - Painting.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Coordinate anchorages. Furnish setting drawings, templates, and anchorage structural loads for fasteners resistance.
- B. Do not begin installation until supporting structure is complete and ladder installation will not interfere with supporting structure work.
- C. If supporting structure is the responsibility of another installer, notify Architect of unsatisfactory supporting work before proceeding.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions and in proper relationship with adjacent construction.

3.03 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 055133

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Metal bar gratings.
 - 2. Metal frames and supports for gratings.
- B. Related Sections:
 - 1. Section 051200 "Structural Steel Framing" for structural-steel framing system components.

1.03 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design gratings, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Gratings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.
 - 1. Floors: Uniform load of 125 lbf/sq. ft. (6.00 kN/sq. m) or concentrated load of 2000 lbf (8.90 kN), whichever produces the greater stress.
 - 2. Floors: Uniform load of 250 lbf/sq. ft. (11.97 kN/sq. m) or concentrated load of 3000 lbf (13.40 kN), whichever produces the greater stress.
 - 3. Walkways and Elevated Platforms Used as Exits: Uniform load of 100 lbf/sq. ft. (4.79 kN/sq. m).
 - 4. Limit deflection to L/360 or 1/4 inch (6.4 mm), whichever is less.
- C. Seismic Performance: Provide gratings capable of withstanding the effects of earthquake motions determined according to ASCE 7.

1.04 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Pressure Locked Galvanized Metal Gratings.
 - 2. Clips and anchorage devices for gratings.
 - 3. Paint products.
- B. Shop Drawings: Include plans, sections, details, and attachments to other work.
- C. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.05 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified professional engineer.
- B. Mill Certificates: Signed by manufacturers of stainless-steel sheet certifying that products furnished comply with requirements.

- C. Welding certificates.
- D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

1.06 QUALITY ASSURANCE

- A. Metal Bar Grating Standards: Comply with NAAMM MBG 531, "Metal Bar Grating Manual" and NAAMM MBG 532, "Heavy-Duty Metal Bar Grating Manual."
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- C. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

1.07 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with gratings by field measurements before fabrication.

1.08 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages for 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

2.01 FERROUS METALS

- A. Wire Rod for Bar Grating Crossbars: ASTM A510/A510M.
- B. Galvanized-Steel Sheet: ASTM A653/A653M, structural quality, Grade 33 (Grade 230), with G90 (Z275) coating.
- C. Expanded-Metal Galvanized Steel: ASTM F1267, Class 2, Grade A.

2.02 FASTENERS

- A. General: Unless otherwise indicated, provide Type 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
- B. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, nuts, and, where indicated, flat washers; ASTM F593 for bolts and ASTM F594 for nuts, Alloy Group 2 (A4).
- C. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.

1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- D. Plain Washers: Round, ASME B18.22.1 (ASME B18.22M).
- E. Lock Washers: Helical, spring type, ASME B18.21.1 (ASME B18.21.2M).
- F. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E488/E488M, conducted by a qualified independent testing agency.
 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5, unless otherwise indicated.
 2. Material for Exterior Locations and Where Stainless Steel is Indicated: Alloy Group 2 (A4) stainless-steel bolts, ASTM F593, and nuts, ASTM F594.

2.03 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy that is welded.
- B. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Shop Primers: Provide primers that comply with Section 099113 - EXTERIOR PAINTING and Section 099123 - INTERIOR PAINTING and Section 099600 "High-Performance Coatings."
- D. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- E. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
- F. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- G. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

2.04 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 (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form from materials of size, thickness, and shapes indicated, but not less than that needed to support indicated loads.
- D. Fit exposed connections accurately together to form hairline joints.

- E. Welding: Comply with AWS recommendations and the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
- F. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space the anchoring devices to secure gratings, frames, and supports rigidly in place and to support indicated loads.
 - 1. Fabricate toeplates to fit grating units and weld to units in shop unless otherwise indicated.
 - 2. Fabricate toeplates for attaching in the field.
 - 3. Toeplate Height: 4 inches (100 mm) unless otherwise indicated.

2.05 METAL BAR GRATINGS

- 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. Barnett Bates Corporation.
 - 2. Borden Metal Products (Canada) Limited.
 - 3. IKG Industries; a division of Harsco Corporation.
 - 4. Ohio Gratings, Inc.
- B. Pressure-Locked Steel Grating: Fabricated by pressing rectangular flush-top crossbars into slotted bearing bars or swaging crossbars between bearing bars.
 - 1. Bearing Bar Spacing: 15/16 inch (24 mm) o.c.
 - 2. Bearing Bar Depth: As required to comply with structural performance requirements.
 - 3. Bearing Bar Thickness: As required to comply with structural performance requirements.
 - 4. Crossbar Spacing: 4 inches (102 mm) o.c.
 - 5. Grating Mark: As indicated.
 - 6. Traffic Surface: Serrated.
 - 7. Steel Finish: Hot-dip galvanized with a coating weight of not less than 1.8 oz./sq. ft. (550 g/sq. m) of coated surface.
- C. Removable Grating Sections: Fabricate with banding bars attached by welding to entire perimeter of each section. Include anchors and fasteners of type indicated or, if not indicated, as recommended by manufacturer for attaching to supports.
 - 1. Provide no fewer than four weld lugs for each heavy-duty grating section, with each lug shop welded to two bearing bars.
 - 2. Provide no fewer than four saddle clips for each grating section composed of rectangular bearing bars 3/16 inch (4.8 mm) or less in thickness and spaced 15/16 inch (24 mm) or more o.c., with each clip designed and fabricated to fit over two bearing bars.
 - 3. Provide no fewer than four weld lugs for each grating section composed of rectangular bearing bars 3/16 inch (4.8 mm) or less in thickness and spaced less than 15/16 inch (24 mm) o.c., with each lug shop welded to three or more bearing bars. Interrupt intermediate bearing bars as necessary for fasteners securing grating to supports.
 - 4. Provide no fewer than four flange blocks for each section of aluminum I-bar grating, with block designed to fit over lower flange of I-shaped bearing bars.
 - 5. Furnish threaded bolts with nuts and washers for securing grating to supports.
 - 6. Furnish self-drilling fasteners with washers for securing grating to supports.
 - 7. Furnish galvanized malleable-iron flange clamp with galvanized bolt for securing grating to supports. Furnish as a system designed to be installed from above grating by one person.
 - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Kee Industrial Products, Inc.; Grating Clip.

2) Lindapter North America, Inc.; Grate-Fast.

- D. Fabricate cutouts in grating sections for penetrations indicated. Arrange cutouts to permit grating removal without disturbing items penetrating gratings.
 - 1. Edge-band openings in grating that interrupt four or more bearing bars with bars of same size and material as bearing bars.
- E. Do not notch bearing bars at supports to maintain elevation.

2.06 GRATING FRAMES AND SUPPORTS

- A. Frames and Supports for Metal Gratings: Fabricate from metal shapes, plates, and bars of welded construction to sizes, shapes, and profiles indicated and as necessary to receive gratings. Miter and weld connections for perimeter angle frames. Cut, drill, and tap units to receive hardware and similar items.
 - 1. Equip units indicated to be cast into concrete or built into masonry with integrally welded anchors. Unless otherwise indicated, space anchors 24 inches o.c. and provide minimum anchor units in the form of steel straps 1-1/4 inches wide by 1/4 inch thick by 8 inches long.
- B. Galvanize steel frames and supports in the following locations:
 - 1. Exterior.
 - 2. Interior, where indicated.
 - 3. Carrier angles for Galvanized Steel Grate treads and toeplates.

2.07 STEEL FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish gratings, frames, and supports after assembly.
- C. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.
 - 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing gratings to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing gratings. Set units accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
- C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete or masonry.
- D. Fit exposed connections accurately together to form hairline joints.
 - 1. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior

units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

- E. Attach toeplates to gratings by welding at locations indicated.
- F. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
- G. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

3.02 INSTALLING METAL BAR GRATINGS

- A. General: Install gratings to comply with recommendations of referenced metal bar grating standards that apply to grating types and bar sizes indicated, including installation clearances and standard anchoring details.
- B. Attach removable units to supporting members with type and size of clips and fasteners indicated or, if not indicated, as recommended by grating manufacturer for type of installation conditions shown.
- C. Attach non-removable units to supporting members by welding where both materials are same; otherwise, fasten by bolting as indicated above.

3.03 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099113 - EXTERIOR PAINTING and Section 099123 - INTERIOR PAINTING.
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION 055305.11

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Treated Wood Members.
- B. Miscellaneous Framing, Blocking, Furring and Sheathing.
- C. Fasteners.
- D. Framing accessories.

1.02 QUALITY ASSURANCE

- A. Lumber Grading Rules and Wood Species to be in conformance with the Voluntary Product Standards PS 20 Grading rule of the following associations apply to materials furnished under this section:
 - 1. Southern Pine Inspection Bureau (SPB).
 - 2. Western Wood Products Associations (WWPA).
 - 3. American Wood Preserves Bureau (AWPB).
 - 4. American Plywood Association (APA).
 - 5. National Fire Protection Agency (NFPA).
 - 6. Lumber Grading Agency by ALSC.
 - 7. Building Officials and Code Administration (BOCA).
- B. Requirements of regulatory agencies. Comply with the following:
 - 1. Fire retardant treated wood: Testing agency, UL label rating, acceptable to governing Building Officials.
 - 2. All lumber and plywood shall be grade-marked.
 - 3. In lieu of grade stamping exposed to view lumber and plywood, submit manufacturer's certificate under provisions of Section 014500 that products meet or exceed specified requirements.

1.03 REFERENCES

- A. AITC - American Institute of Timber Construction.
- B. ALSC - American Lumber Standards Committee: Softwood Lumber Standards.
- C. APA - American Plywood Association.
- D. APA/EWS - American Plywood Association - Engineered Wood Systems.
- E. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2013.
- F. ASTM D2559 - Standard Specification for Adhesives for Bonded Structural Wood Products for Use Under Exterior Exposure Conditions; 2012a (Reapproved 2018).
- G. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2018c.
- H. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C; 2019a.

- I. AWWA - (American Wood Preservers Association) C1 - All Timber Products Preservative Treatment by Pressure Process.
- J. BOCA: 2310.2: Fire Retardant Treated Wood (1993).
- K. WWPB - Western Wood Products Association.
- L. Lumber Grading:
 - 1. Standard Grading and Dressing Rules No. 16, current edition, for Douglas Fir, Western Hemlock, West Red Cedar, White Fir, and Sitka Spruce, published by West Coast Lumber Inspection Bureau, or
 - 2. "Current Grading Rules", issued by the Western Wood Products Association.
- M. Extended ASTM E84 Fire Test Method, Factory Mutual Research Report J.I. 1R9Q9. AC.

1.04 SUBMITTALS

- A. Certification:
 - 1. Pressure Treated Wood: Submit certification by treating plant stating chemicals and process used, net amount of salts retained and in conformance with applicable standards.
 - 2. Preservation Treated Wood: Submit certification for waterborne preservative that moisture content was reduced to 19% maximum, after treatment.
 - 3. Fire-Retardant Treatment: Submit certification by treating plant stating that fire-retardant treatment materials comply with governing ordinances and that treatment will not bleed through finished surfaces.

1.05 PRODUCT DELIVERY, STORAGE AND PROTECTION

- A. All materials shall be inspected upon receipt at job site. No faulty or damaged materials shall be accepted. It shall be contractor's responsibility to produce finished items of work in first-class condition, free from all defects.
- B. Do not handle products in a manner which will damage, warp or distort products.
- C. Do not store products directly on the ground; protect from elements.

1.06 WARRANTY

- A. Provide 30-year manufacturer's written warranty for pressure treated and fire resistant treated wood items.
- B. Provide five-year manufacturer's warranty for exterior grade sheathing.

PART 2 - PRODUCTS

2.01 MATERIALS – LUMBER AND FRAMING

- A. Materials shall meet the Federal specifications, commercial standards, product standards and these specifications, unless more restrictive requirements are indicated on drawings.
- B. All lumber for blocking, plates and nailers located within a maximum distance of 18 inches from grade or in contact with masonry or concrete shall be treated in accordance with AWPB Standards LP-2 . All lumber shall be dried after treatment and have moisture content in each piece of 19% or less, or shall conform to the applicable grading standards for the species involved. All cuts, planed surfaces, bored holes, etc., shall be treated at the jobsite by dipping or liberally brushing with same materials as specified in AWPB Standard LPA2A. All lumber

shall be grade marked. Lumber treated by any method other than AWPB Standards LP-2 will not be accepted.

- C. Non-Structural Light Framing: Douglas Fir Larch species, No. 2 grade, 19 percent maximum moisture content or equivalent stress grade.
- D. Miscellaneous Framing: No. 2 species, 19 percent maximum moisture content or equivalent stress grade.
- E. All interior lumber to be used for framing, blocking, furring shall be SPIB or WCLB treated with fire retardant to obtain flame spread rating of 25 or less when treated according to ASTM E84. Treat cuts, etc. as recommended by manufacturer of flame retardant materials.
- F. Rough hardware, nails, screws, bolts, etc., for securing lumber in place shall be commercial quality, any suitable type and finish for interior dry location, galvanized or nonferrous hardware for all exterior work and for interior work in toilets.

2.02 MATERIALS – SHEATHING

- A. Backing panels: APA C-D plugged, exterior type, 3/4 inch and 5/8 inch thick, as indicated on drawings.
- B. Finish panels: APA A-B, exterior type, 3/4 inch thick, free of knots and/or plugs on exposed side, as indicated on drawings.
- C. All plywood shall comply with APA Standards and be of thickness indicated on drawings.
- D. Moisture content of the plywood at the time of installation and at the time roofing is installed shall be less than 19 percent.

2.03 FASTENERS

- A. Nails and Fasteners: Hot-dipped galvanized steel in accordance with ASTM A153/A153M for exterior, high humidity and treated wood locations, unfinished steel elsewhere.
- B. Anchors: Toggle bolt type for anchorage to hollow masonry. Expansion shield and lag bolt type for anchorage to solid masonry or concrete. Bolt or ballistic fastener for anchorages to steel.
- C. Lumber to lumber: Cement coated or annular threaded nails of sufficient length to penetrate 1.25 inches into adjoining members, except as otherwise indicated.

2.04 ACCESSORIES

- A. Construction Adhesive: Waterproof; air cured, rubber based, cartridge dispensed, Liquid Nail 601, manufactured by Macco Adhesives, The Glidden Company, or approved equal.

PART 3 - EXECUTION

3.01 VERIFICATION

- A. Verify existing conditions under provisions of Section 013100.
- B. Verify that walls and other substrates are at the proper elevations and ready to receive work of this section.

3.02 PREPARATION OF SURFACES

- A. Surfaces to receive new wood members shall be free of all dirt, debris, and loose materials. Exposed surfaces shall be mechanically scraped if necessary, to remove projections.
- B. Surfaces shall have no free water present in any form (rain, dew, frost, snow or ice).
- C. Contractor is responsible to inspect all exposed surfaces to see that conditions are satisfactory for installation of new work.

3.03 WORKMANSHIP

- A. Work shall be performed in conformance with good trade practice, recommendations of manufacturers, building codes and these specifications unless specifically indicated otherwise on the drawings and shall be well fitted and securely fastened in its proper location with nails, screws, bolts or other approved fastening devices.

3.04 FIRE RETARDANT

- A. Required for wood blocking and nailers.
- B. Treat to flame spread rating of 25 or less and fuel contribution of 30 or less when tested in accordance with ASTM E84. Re-dry to maximum 19 percent moisture content.
- C. Each piece of treated wood shall bear UL label of compliance.

3.05 CLEAN-UP

- A. Clean or replace any adjacent surfaces of materials damaged by treated lumber.

3.06 INSTALLATION - FRAMING

- A. Set structural members level and plumb, in correct position.
- B. Make provisions for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb and in true alignment until completion of erection and installation of permanent bracing.
- C. Place horizontal members flat, crown side up.
- D. Construct load bearing framing and curb members full length without splices.
- E. Double members at all openings. Space short members over and under opening to member spacing.
- F. Bridge framing in excess of 8 feet span at mid-span.
- G. Coordinate installation of adjacent construction.
- H. Warped wood members shall not be used unless they can be fastened adequately to permanently hold them in their required alignment.

3.07 INSTALLATION - SHEATHING

- A. Nailing pattern and spacing shall be in accordance with APA recommendations or as listed in the 2020 Building Code of New York State..

- B. Install telephone and electrical panel back boards with plywood sheathing material where required. Size the back board by 12 inches (25 cm) beyond size of electrical panel.
- C. Fasteners:
 - 1. Fastener heads shall be flush with wood surface and shall penetrate adjoining piece minimum 1.25 inches.
 - 2. The installed withdrawal resistance shall be a minimum of 100 pounds per nail.

3.08 SITE TREATMENT OF WOOD MATERIALS

- A. Apply preservative treatment in accordance with manufacturer's published instructions.
- B. Brush apply two coats of preservative treatment on wood in contact with cementitious materials and roofing and related metal flashings. Treat site-sawn cuts.
- C. Allow preservative to dry prior to erecting members.

3.09 SCHEDULE

- A. Provide nailers, blocking, furring, and reinforcement as called for in all other specified Sections, or as required in the field during construction, in accordance with the requirements of this Section.

END OF SECTION 061000

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Glass fiber reinforced, resin fabrications.
- B. FRP guardrail and handrail systems.
- C. FRP gratings, support systems and connections.
- D. FRP stair treads.
- E. FRP toeplates

1.02 REFERENCE STANDARDS

- A. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position; 2018.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.
- C. FM (AG) - FM Approval Guide; current edition.
- D. ITS (DIR) - Directory of Listed Products; current edition.
- E. UL (DIR) - Online Certifications Directory; Current Edition.

1.03 DESIGN REQUIREMENTS

- A. Grating and stair design Live and Dead Loads: 100 lbs/sq ft (690 kPa) or a concentrated load of 300 pounds with deflection limited to 1/360 of span unless noted otherwise on the design drawings.
- B. Railing systems shall be designed to withstand a single concentrated 200 pound point load applied in any direction at any point along the top rail in accordance with the Building Code of New York State.
- C. Molded grating and molded stair treads shall not deflect more than 1/4" and structural support members shall not deflect more than L/180 of span for structural members unless specifically stated otherwise in drawings and/or supplementary conditions. Connections shall be designed to transfer the design loads.
- D. Layout: Each grating section shall be readily removable, except where indicated on drawings. Manufacturer to provide openings and holes where located on the contract drawings. Grating openings which fit around protrusions (pipes, cables, machinery, etc.) shall be discontinuous at approximately the centerline of opening so each section of grating is readily removable.
- E. Design items with sufficient strength for handling stresses.
- F. The FRP standard railing system, including connections, shall be designed to meet the configuration and loading requirements of OSHA 1910.23 and IBC with a minimum 2.0 factor of safety.
- G. Additional ADA handrail to be installed where indicated on plans.

- H. The completed ladder installation shall meet the following load requirements set forth in OSHA 1910.27. The ladder shall also be capable of supporting a concentrated vertical load of 1,200 pounds applied at the mid-span of the rung. Manufacturer shall be required to provide supporting test data for rung capacity.
- I. All ladders shall be designed and laid out in strict accordance with OSHA 1910.27.
- J. Temperature exposure is limited to 100°F (38°C) unless specifically stated otherwise in drawings and/or supplementary conditions.
- K. Stair Tread Design:
 - 1. Load/Deflection: Fibertred® stair treads shall meet manufacturer's published recommended loading with deflection not to exceed the following:
 - a. Concentrated load of 500 pounds, placed at the centerline of a 36" tread span with a maximum deflection not to exceed 0.32".
 - b. The concentrated load is applied at the centerline of the tread, over a width of 4" and a depth of 6", starting at the nosing edge to simulate the landing of a foot.
 - c. The manufacturer shall certify that the stiffness of all panels manufactured are never more than 2.5% below the published load-deflection values.

1.04 SUBMITTALS

- A. See Section - 013300 - SUBMITTALS for submittal procedures.
- B. Product Data: Provide data on specified component products.
- C. Shop Drawings: Indicate design load parameters, dimensions, adjacent construction, materials, thicknesses, fabrication details, required clearances, field jointing, tolerances, connections, colors, finishes, methods of support, integration of plumbing and electrical components, and anchorages.
- D. Samples: Submit two samples, 6 x 6 inch (152 x152 mm) in size, illustrating color, texture, and finish.
- E. Maintenance Data: Include instructions for stain removal, surface and gloss restoration, and general cleaning recommendations.
- F. Stair assembly shop drawings shall bear the seal and signature of a registered professional engineer licensed in the state of New York.

1.05 QUALITY ASSURANCE

- A. Designer Qualifications: Design under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in New York.
- B. The material covered by these specifications shall be furnished by an ISO-9001:2008 certified manufacturer of proven ability who is regularly engaged in the manufacture, fabrication and installation of FRP systems.
- C. Manufacturer Qualifications: Company specializing in architectural glass fiber and resin components with five years documented experience with sufficient production capacity to produce required units without causing delay in the work.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. All systems, sub-systems and structures shall be shop fabricated and assembled into the largest practical size suitable for transporting.
- B. Protect components from damage by retaining shipping protection in place until installation.
- C. Identify and match-mark all materials, items and fabrications for installation and field assembly.
- D. All materials and equipment necessary for the fabrication and installation of guardrail/handrail and appurtenances shall be stored before, during, and after shipment in a manner to prevent cracking, twisting, bending, breaking, chipping or damage of any kind to the materials or equipment, including damage due to over exposure to the sun. Any material which, in the opinion of the Architect, has become damaged as to be unfit for use, shall be promptly removed from the site of work, and the Contractor shall receive no compensation for the damaged material or its removal.

1.07 FIELD CONDITIONS

- A. Do not install site fabricated components when site conditions may be detrimental to successful installation.
- B. Maintain temperature and humidity conditions favorable to proper curing of resin during and after installation.
- C. Field verify measurements for stair and railing assemblies that require coordination and consideration to existing and new previously installed construction, including items installed under other prime contracts.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Glass Fiber and Resin Fabrications:
 - 1. Fibergrate Composite Structures, Inc.; Vi-Corr® molded grating, Fibertred® stair treads and Dynaform SAFRAIL railing systems
 - 2. Strongwell; DURAGRATE Molded grating and Strongwell Railing system. .
 - 3. Substitutions: See Section 016100 - Product Requirements.

2.02 REGULATORY REQUIREMENTS

- A. Conform to FM Assembly Design No. UL 94 V-0..
- B. Conform to applicable code for a flame/smoke index rating of 25/0 in accordance with ASTM E84 listed product requirements.

2.03 MATERIALS

- A. Pultruded FRP Materials:
 - 1. Materials used in the manufacture of the FRP products shall be raw materials in conformance with the specification and certified as meeting the manufacturer's approved list of raw materials.
 - 2. All structural shapes are to be manufactured by the pultrusion process with a glass content minimum of 45%, maximum of 55% by weight. The structural shapes shall be composed of fiberglass reinforcement and resin in qualities, quantities, properties,

arrangements and dimensions as necessary to meet the design requirements and dimensions as specified in the Contract Documents.

3. Fiberglass reinforcement shall be a combination of continuous roving, continuous strand mat, and surfacing veil in sufficient quantities as needed by the application and/or physical properties required.
4. The visual quality of the pultruded shapes shall conform to ASTM D4385.
5. FRP guardrail/handrail shall be manufactured using a pultruded process utilizing vinyl ester resin with flame retardant and ultraviolet (UV) inhibitor additives. Unless a phenolic resin system is utilized, a synthetic surface veil fabric shall encase the glass reinforcement. FRP shapes shall achieve a flame spread rating of 25 or less in accordance with ASTM test method E84, the flammability characteristics of UL 94 V0 and the self-extinguishing requirements of ASTM D635.
6. FRP products exposed to weather shall contain an ultraviolet inhibitor. Should additional ultraviolet protection be required, a one mil minimum UV coating may be applied. Products manufactured with a phenolic resin system shall be coated with a one mil minimum UV coating.
7. All exposed railing surfaces shall be smooth and true to form, consistent with ASTM D4385.

Fiberglass Pultruded Material Properties				
Properties	Test	Units	Value	
Tensile Strength	ASTM D790	psi	30,000	
Tensile Modulus	ASTM D638	psi	2.5×10^6	
Flexural Strength	ASTM D790	psi	30,000	
Flexural Modulus	ASTM D790	psi	1.8×10^6	
Flexural Modulus (Full Section)		psi	2.8×10^6	
Short Beam Shear (Transverse)	ASTM D2344	psi	4,500	
Shear Modulus (Transverse)	N/A	psi	4.5×10^5	
Coefficient of Thermal Expansion	ASTM D696	in/in/deg F	8.0×10^{-6}	
Flame Spread	ASTM E84	N/A	25 or less	

B. FRP Molded Grating Materials:

1. All mechanical performance standards set forth by the Fiberglass Grating Manufacturers Council (FGMC) in the FRP Composites Grating Manual for Pultruded and Molded Grating and Stair Treads.
2. A flame spread rating of 25 or less in accordance with ASTM E84, and flammability characteristics of UL 94 V0 and the self-extinguishing requirements of ASTM E84. (Polyester resin is available without flame retardant and UV inhibitor additives.)
3. NSF® Standard 61 Certified with flammability characteristics of UL 94 V0 and the self-extinguishing requirements of ASTM E84.
4. Food-grade with flammability characteristics of UL 94 V0 and the self-extinguishing requirements of ASTM D635.

Resin Systems	
Description	Resin Base
Chemical Resistant - Fire Retardant	Vinyl Ester
Industrial Grade - Fire Retardant	Isophthalic
Architectural Grade - Fire Retardant	Orthophthalic
High Temperature – Low Smoke/Low Flame	Phenolic
Low Flame/Class 1 Smoke	Custom Blend

C. FRP Molded Grating System:

1. Grating shall be reinforced with continuous rovings of equal number of layers in each direction. The top layer of reinforcement shall be no more than 1/8" below the top surface of the grating so as to provide maximum stiffness and prevent resin chipping of unreinforced surfaces. Percentage of glass (by weight) shall not exceed 35% so as to achieve maximum corrosion resistance, and as required to maintain the structural requirements of the CONTRACT.
2. The FRP molded grating and treads shall be manufactured by the open mold process.
3. Grating shall be 2 inches square mesh with a 2 inch depth with a tolerance of plus or minus 1/16 inch mesh centerline to centerline. Grating shall be a molded type with a meniscus top surface. Color shall be as selected by the Engineer.
4. Grating Pedestal Support System:
 - a. Grating pedestals shall be adjustable. Pedestal shall consist of molded bases and tops, with DYNAFORM® pedestals joining the bases and tops and Type 316 stainless steel threaded rods for adjustability.
 - b. Pedestals shall be 2-1/8 inches x 3/16 inch square tube as manufactured by the pultrusion process. Adjustability shall be achieved with a 316 stainless steel all-thread component that threads into the molded fittings. Color shall be light gray.
 - c. Provide Quad and Single Head Mini Pedestal support heads with retainer clips for grating supports as indicated on the approved manufacturer shop drawings.
 - d. Provide Type 316 stainless steel retainer and M saddle clips spaced at maximum of four feet apart with a minimum of four per piece of grating, for each grating connection and anchorage point as recommended by the manufacturer and as indicated on the approved shop drawings.
 - e. Design: Pedestal floor system shall be designed for a uniform load of 50 psf or concentrated load of 300 lb. Deflection of supported grating is not to exceed 0.375 inch. Grating pedestals are to be laid out according to the manufacturers published literature or as indicated in the contract drawings.
5. Provide 3 inch x 3 inch x 3/8 inch thick FRP ledge angles as required to mount grates to concrete surfaces. Provide 3/8 inch diameter 316SS Hilti Kwik Bolt TZ anchors stainless steel expansion type epoxy set anchors spaced at 16 inches o.c. maximum or less if required for loading conditions.
6. Provide FRP embedment angles at recessed grating locations as indicated on the drawings. Coordinate provision of these embedments with the timing of the concrete installations in order to set into formwork prior to concrete installations.
7. Provide manufacturers embedment sleeves / angles for fixed handrails set into the poured concrete flatwork.
8. Molded stairtreads shall be 1-1/2 inches (38.1 mm) thick in a 1-1/2 inches (38.1 mm) x 6 inches (152.4 mm) rectangular mesh pattern. The resin system will be the same as the molded grating. The stairtread shall come complete with anti-slip nosing.

2.04 FRP RAILINGS

- A. The FRP standard railing system, including connections, shall be designed to meet the configuration and loading requirements of OSHA 1910.23 and IBC with a minimum 2.0 factor of safety.
- B. Guardrail height is 42" (1067mm) from the top of walkway to the top of the guardrail.
- C. The rails and posts shall be:
 1. 1 3/4 inches x 1 3/4 inches x 0.125 inch (50.8 mm x 50.8 mm x 3.81 mm) square tubes with 1 3/4 inch x 6 inch bottom plates and angle connectors to vertical subframe support

- posts with Quad-Head Pedestal caps and threaded adjustment rods set into support legs in sizes indicated or required to accommodate loading requirements.
2. Provide continuous Toe Plates with corner and splice connectors bolted to the rail posts with 1/4 inch diameter stainless steel round head bolt assemblies as per the manufacturer.
 3. The pultruded parts shall be made with a fire retardant resin that achieves a flame spread rating of 25 or less in accordance with ASTM test method E84, flammability characteristics of UL 94 V0 and meet the self-extinguishing requirement of ASTM E84. The resin matrix shall be polyester and shall contain a UV inhibitor. The color shall be chosen from manufacturer's standard colors.
- D. The SAFRAIL fiberglass standard railing system shall be fabricated into finished sections by fabricating and joining together the pultruded square tube using glass-reinforced thermoset components; epoxy bonded and connected as shown in the fabrication details. Railing sections shall be fabricated to the size shown on the approved fabrication drawings and shall be piece marked with a water proof tag.
- E. For Side Mount: Post shall be constructed with a pultruded bottom plug. Length shall be sufficient to extend a minimum of 1 inch (25.4 mm) beyond the uppermost bolt hole to prevent crushing of post tubing. Bolt holes shall provide clearance of 1/16 inch (1.59 mm) for 1/2 inch (12.7 mm) diameter bolts/studs. On square tubes, holes shall be on longitudinal center line of post, 1 inch (25.4 mm) from bottom of post (minimum) and not less than 3 inches (76.2 mm) apart on center. Posts shall be fastened with stainless steel anchor bolts or studs, 1/2 inch (12.7 mm) diameter.
- F. Post locations shall be no greater than 18 inches (457 mm), nor less than 9 inches (229 mm) from horizontal or vertical change in handrail direction. For square tubes, post centers shall be no greater than 60 inches (1524 mm) apart on any straight run or rail, or 48 inches (1220 mm) apart on any inclined rail section.

2.05 FRP STAIR TREADS

- A. FRP Stair treads shall be Fibertred® as manufactured by Fibergrate Composite Structures Incorporated or approved equal. Fibertred® stair treads shall be of a one-piece molded construction and shall have a 1 1/2 inch x 6 inch rectangular mesh pattern providing unidirectional strength in the tread span direction. Fibertred® shall be reinforced with continuous rovings in each direction. The top layer of reinforcement shall be no more than 1/8 inch below the top surface of the tread so as to provide maximum stiffness and prevent resin chipping of unreinforced surfaces. Percentage of glass (by weight) shall not exceed 35% so as to achieve maximum corrosion resistance, and as required to maintain the structural requirements. After molding, no dry glass fibers shall be visible on any surface of bearing bars or cross bars. All bars shall be smooth and uniform with no evidence of fiber orientation irregularities, interlaminar voids, porosity, resin rich or resin starved areas.
- B. Non slip surfacing: Fibertred® stair treads shall be manufactured with a concave, meniscus profile on the top of each bar providing maximum slip resistance. For additional safety, and to meet OSHA requirements, stair treads shall be manufactured with a 1 1/2 inch solid, molded nosing. Nosing shall be gritted with an angular quartz grit, integrally molded into the top surface of the nosing area only.
- C. Fire rating: Fibertred® stair treads shall be fire retardant with a tested flame spread rating of 25 or less when tested in accordance with ASTM E84. Test data performed only on the resin shall not be accepted.
- D. Resin system: The resin system used in the manufacture of Fibertred® stair treads shall be Vi-Corr®. Manufacturer may be required to submit corrosion data from tests performed on actual

stair tread products in standard chemical environments. Corrosion resistance data of the base resin from the manufacturer is not a true indicator of stair tread product corrosion resistance and shall not be accepted.

- E. Thickness: 1-1/2 inch thick with a tolerance of plus or minus 1/16 inch.
- F. Mesh Configuration: 1-1/2 inch x 6 inch rectangular mesh pattern with double cross bars on 6 inch centers which allows optimum utilization and ease of fabrication.
- G. Hardware: Type 316 stainless steel hold down clips shall be provided and spaced as recommended by the manufacturer. A minimum of four hold-down clips shall be required for each tread.

2.06 FABRICATION

- A. Mold Material: Metal type.
- B. Finish other surfaces not in contact with the mold to match the molded surfaces in appearance.
- C. Finish trim corners and edges.
- D. Cure components prior to shipment and remove material that may be toxic to plant or animal life.
- E. The fabricated railing sections shall be supplied complete with fittings by the FRP manufacturer. The components used to join fabricated sections together may be shipped loose, to be epoxied and riveted together in the field by the contractor.
- F. All ladder rungs shall penetrate the wall of the tube side rails and shall be connected to the rails with both epoxy and rivets to provide both a chemical and mechanical lock, respectively.
- G. Ladders shall be fully shop assembled. Ladder cages shall be test assembled and drilled to ensure a proper fit in the field.

2.07 FINISH

- A. Color: as selected by the Engineer.
- B. Exposed to view Surface Texture: Railing surfaces shall be smooth. grating surfaces shall be non-slip..

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are ready to receive work and dimensions are as indicated on shop drawings.

3.02 PREPARATION

- A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions and directions for installation of anchorages, including concrete inserts, sleeves, anchor bolts and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

3.03 INSTALLATION

- A. Install fabrications in accordance with shop drawings and fabricator's instructions.
- B. Fasten grating panels securely in place with hold down fasteners as specified herein.
- C. Fastening to in-place construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous FRP fabrications to in-place construction; include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts and other connectors as determined by the Design Engineer.
- D. Follow manufacturer's instructions when cutting or drilling fiberglass products or using resin products; provide adequate ventilation. Field cut and drill fiberglass reinforced plastic products with carbide or diamond tipped bits and blades for drilling and fitting required for installation of miscellaneous FRP fabrications. Set FRP fabrication accurately in location, alignment and elevation; with edges and surfaces level, plumb, true and free of rack; measured from established lines and levels.
 - 1. All field cut and drilled edges, holes and abrasions shall be sealed with a catalyzed resin compatible with the original resin as recommended by the manufacturer.
- E. The fabricated handrail sections shall be installed as shown on the approved shop drawings. The handrail sections shall be accurately located, erected plumb and level. The sections shall be fastened to the structure as shown on the approved shop drawings.

3.04 TOLERANCES

- A. Maximum variation from true position: 1/4 inch (6 mm).
- B. Maximum offset from true alignment: 1/8 inch (3 mm).

3.05 CLEANING

- A. Clean components of foreign material without damaging finished surface.
- B. Hand rub smooth surfaces with polishing cream.
- C. Clean fabrications in accordance with fabricator's instructions.

3.06 PROTECTION

- A. Place protective structural covering over installed units.

END OF SECTION 068200

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. The work described in this Section of the specifications includes but is not limited to cold applied water based emulsified asphalt dampproofing and protective drainage board for exterior below grade foundations.

1.02 RELATED WORK

- A. Section 033000 – Cast-In-Place Concrete
- B. Section 072100 – Thermal insulation

1.03 REFERENCES

- A. ASTM D1187/D1187M - Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal; 1997 (Reapproved 2018).
- B. ASTM D1227/D1227M - Standard Specification for Emulsified Asphalt Used as a Protective Coating for Roofing; 2019.
- C. ASTM D41/D41M - Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing; 2011 (Reapproved 2016).

1.04 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Submit copies of manufacturer's current certification to ISO 9002, primers, and associated auxiliary materials shall be included.
- C. Submit references clearly indicating that the materials proposed have been installed for not less than five years on projects of similar scope and nature. Submit references for a minimum of ten projects.
- D. Submit manufacturer's complete set of standard instructions and details for dampproofing.
- E. Submit manufacturer's product data for drainage board. Submit 12-inch x 12-inch sample upon request.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and protect products under the provisions of Section 016500 - PRODUCT DELIVERY, STORAGE AND HANDLING.
- B. Deliver materials to jobsite in undamaged and manufacturer's original unbroken containers, dry, undamaged, seals and labels intact.
- C. Cold applied elastomeric membrane should be stored in closed containers outdoors.
- D. Store membrane at temperature of 5°C (40°F) and above to facilitate handling.

- E. Membrane contains petroleum solvents and is flammable. Keep away from open flame or excessive heat. Do not allow smoking or welding in the working area. Use in well ventilated area.

1.06 QUALITY ASSURANCE

- A. Maintain ambient temperatures above 40 degrees F for 24 hours before and during application until cured.
- B. Protect from rain until coating has set, do not expose to UV. Application shall be protected or covered within 7 days of application.
- C. Dampproofing shall be carried out by applicators skilled in this work in strict accordance with manufacturer's printed instruction. Submit proof of minimum five years' applicators experience.
- D. Perform Work in accordance with the printed requirements of the manufacturer and this specification. Maintain one copy of manufacturer instructions on site.
- E. Components used in this section shall all be sourced from one manufacturer.
- F. No installation work shall be performed during rainy or inclement weather and on frost or wet covered surfaces.
- G. Ensure continuity of the dampproofing membrane throughout the scope of this section.
- H. Work shall be so scheduled as to provide a watertight seal at the end of each working day on the areas worked upon during the day.

1.07 PROTECTION

- A. Protect all surfaces not to be treated. Provide adequate protection of materials and work of this section from damage by weather, backfilling operations and other causes.
- B. Protect work of other trades from damage resulting from work of this section. Make good such damage at own expense to satisfaction of the Architect/Engineer.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. MasterSeal 614 or 615 by Master Builders Solutions Construction Systems, 889 Valley Park Drive, Shakopee, MN 55379. Tel: (800) 433-9517; Web: www.master-builders-solutions.com/en-us.
- B. MasterSeal 975 polypropylene drainage board system by Master Builders Solutions Construction Systems, 889 Valley Park Drive, Shakopee, MN 55379. Tel: (800) 433-9517; Web: www.master-builders-solutions.com/en-us.
- C. Or approved equal.

2.02 MATERIALS

- A. On concrete walls receiving dampproofing, apply one of the following:
 - 1. Trowel apply one coat of MasterSeal 614 long fiber reinforced complying with ASTM D1227/D1227M, Type 2, Class I and ASTM D1187, Type 1; or

2. Brush, roller and spray apply two coats of MasterSeal 615 short fiber reinforced complying with ASTM D1227/D1227M, Type 2, Class I, and ASTM D1187/D1187M, Type 1.
- B. Drainage Board System: High-impact polypropylene dimpled core with fully bonded geotextile fabric to prevent blockage of water flow rates through the core and die cutting of the dampproofing membrane.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.
1. Verify substrate surfaces are durable, free of matter detrimental to adhesion or application of dampproofing.
 2. Verify items which penetrate surfaces to receive dampproofing are securely installed.
 3. Surfaces to receive dampproofing shall be fully cured, dry and free of oil, form release agents, curing compounds, grease, laitance and loose material.
 4. Allow the manufacturer's required minimum cure time for new concrete. Ensure concrete is smooth and free from voids and honeycombing prior to application.
- B. Report in writing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.
- C. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the Owner.

3.02 PREPARATION

- A. Protect adjacent surfaces not designated to receive dampproofing.
- B. Clean and prepare surfaces to receive dampproofing in accordance with manufacturer's published instructions. Surface should be free of oil, grease, dirt, laitance, and loose material. Dry surfaces shall be dampened with water and kept damp until application.
- C. Apply mastic to seal penetrations, small cracks or minor honeycomb in substrate. Remove unnecessary projections and fill voids to provide relatively smooth surfaces.

3.03 INSTALLATION

- A. Prime surfaces and apply product in accordance with manufacturer's published instructions.
- B. Trowel Grade: Trowel apply at minimum rate of 7 gallons per 100 square feet to produce a minimum dry film thickness of 60 mills.
- C. Brush, Roller and Spray Grade: Brush, roll or spray apply at rate of 1.5 to 2.5 gallons per 100 square feet, depending on substrate texture, to produce a minimum dry-film thickness of 15 mils per coat. Apply material in 2 coats by brush, roller or spray for a total minimum dry-film thickness of 30 mils. Allow first coat to dry tacky before applying second coat.
- D. Fill in crevices and grooves, providing continuous coating and free from breaks and pinholes. Carry coating over exposed top and outside edge of footing. Spread around joints, grooves, and slots, and into chases, corners, reveals, and soffits. Bring coating to finished grade.
- E. Install below grade insulation after protective drainage board in conjunction with material application and curing.

- F. Place backfill at least 24 to 48 hours after application, but within 7 days. Do not rupture or damage film or displace coating or membranes.

3.04 CLEANING AND PROTECTION

- A. Clean tools and equipment immediately with hot, soapy water. Cured material can be removed with solvent.
- B. Clean up and properly dispose of debris remaining on Project site related to application.
- C. Remove temporary coverings and protection from adjacent Work areas.
- D. Protect application from damage during construction.

3.05 FIELD QUALITY CONTROL

- A. Section 014500 - QUALITY CONTROL: Field testing and inspection.
- B. Inspect dampproofing application and test for minimum dry film thickness specified.

END OF SECTION 071113

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Rigid thermal board insulation.
- B. Thermal accessories.

1.02 RELATED SECTIONS

- A. Section 033000 – Cast-in-Place Concrete.
- B. Section 042113 – Brick Masonry.
- C. Section 042200 – Concrete Unit Masonry.
- D. Section 061000 – Rough Carpentry.

1.03 REFERENCES

- A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2013.
- B. ASTM C272/C272M - Standard Test Method for Water Absorption of Core Materials for Sandwich Constructions; 2018.
- C. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2017.
- D. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2017.
- E. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2017.
- F. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C; 2019a.
- G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.
- H. NFPA 255 - Test of Surface Burning Characteristics of Building Materials.
- I. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SYSTEM DESCRIPTION

- A. Provide continuity of thermal, vapor and air barrier at building enclosure elements.

1.05 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Submit manufacturer product data and technical information for each product and installation.

- C. Manufacturer's certificate: Certify that products meet or exceed specified requirements.
- D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for each product.

1.06 QUALITY ASSURANCE

- A. Surface Burning Characteristics: As determined by testing identical products according to ASTM E84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- B. All foam plastic insulation shall meet, and be installed in accordance with, the Building Code of New York State Chapter 26.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
- B. Protect foam plastic board as follows:
 - 1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
 - 2. Protect against ignition at all times. Do not deliver foam plastic board materials to project site before installation time.
 - 3. Quickly complete installation and concealment of foam plastic board insulation in each area of construction.
- C. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside of manufacturer's absolute limits.

PART 2 - PRODUCTS

2.01 MANUFACTURERS AND MATERIALS

- A. Rigid thermal cavity insulation shall be Styrofoam CavityMate insulation as manufactured by the Dow Chemical Company, Foamular 250 as manufactured by the Owens-Corning Company, or approved equal, having the following requirements:
 - 1. The insulation shall be extruded polystyrene board, impervious to moisture and closed-cell structure with no voids between cells.
 - 2. Insulation shall meet the following specifications as a minimum:
 - a. Thermal Resistance per ASTM C518 & ASTM C177 = R-5.0/inch
 - b. Flammability per ASTM E84 = less than 25
 - c. Moisture Resistance (absorption % by volume) per ASTM C272 = 0.3
 - d. Moisture Resistance (absorption % by volume) per ASTM C355 = 0.6
 - e. Density (lb/ct) per ASTM C303 = 2.1
 - f. Compressive Strength (psi) perpendicular to board face per ASTM C1621 (0.1" Deflection or Yield) = 25
 - g. Thermal Expansion (in/in deg F) per ASTM D696 = .00005
 - h. Maximum Operating Temperature (F) for continuous use = 165
- B. Rigid thermal below grade insulation shall be equal to Styrofoam Highload 40 Insulation as manufactured by the Dow Chemical Company, Foamular 400 high compressive strength

insulation as manufactured by the Owens-Corning Company or approved equal, having the following requirements:

1. The insulation shall be extruded polystyrene board, impervious to moisture and closed-cell structure with no voids between cells.
 2. Insulation shall meet the following specifications as a minimum:
 - a. Thermal Resistance per ASTM C518 & ASTM C177 = R-5.6/inch
 - b. Flammability per ASTM E84 = less than 25
 - c. Moisture Resistance (absorption % by volume) per ASTM C272/C272M = 0.3
 - d. Moisture Resistance (absorption % by volume) per ASTM C355 = 0.6
 - e. Density (lb/ct) per ASTM C303 = 2.1
 - f. Compressive Strength (psi) perpendicular to board face per ASTM C1621 (0.1" Deflection or Yield) = 40
 - g. Thermal Expansion (in/in deg F) per ASTM D696 = .00005
 - h. Maximum Operating Temperature (F) for continuous use = 165
- C. Unfaced Paver Insulation Panels (Horizontal Use): Extruded-polystyrene board insulation complying with ASTM C578, Type VII: 60.0 psi compressive strength minimum, 2-foot x 8-foot size; unfaced; square edge; fabricated with 1/2" x 1/4" drainage channels on the bottom long edge. R-value minimum as per ASTM C518 5.0 per inch. Surface burning characteristics per ASTM E84: Flame Spread = 15, Smoke Developed = 165. Styrofoam Plazamate or approved equal.
- D. Accessories:
1. Tape and Sealants: Type recommended by insulation manufacturer to meet requirements of C402.4.2 of the International Energy Construction Code.
 2. Adhesive: Type recommended by insulation manufacturer for application.
 3. 1 inch x 2 inch mesh insulation netting: Polypropylene, NT120 by ADO Products or equal, tested in accordance with ASTM D5034.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify site conditions under provisions of Section 013100 - PROJECT MANAGEMENT AND COORDINATION.
- B. Verify that substrate, adjacent materials, and insulation are dry and clean and are ready to receive insulation.

3.02 INSTALLATION - GENERAL

- A. Clean substrates of substances that may be harmful to insulation or vapor retarders, including removal of projections capable of puncturing vapor retarders, or that interfere with insulation attachment.
- B. Comply with manufacturer's written instructions applicable to products and applications indicated.
- C. Install insulation that is undamaged, dry, and unsoiled, and that has not been left exposed to ice, rain, or snow at any time.
- D. Extend insulation to envelope entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation.
- E. Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using spray polyurethane insulation.

3.03 INSTALLATION - FOUNDATION & CAVITY WALL PERIMETER

- A. Adhere a 6 inch (150 mm) wide strip of polyethylene sheet over joints with double beads of adhesive each side of joint. Tape seal joints. Extend sheet full height of joint.
- B. Apply adhesive in three continuous beads per board length, press units firmly against inside substrates. Tape seal all joints.
- C. Install boards horizontally. Place boards in a method to maximize contact bedding. Stagger joints. Butt edges and ends tight to adjacent board and to protrusions.
- D. Extend boards over control and expansion joints, unbonded to foundation or masonry 3 inches (75 mm) to one side of joint.
- E. Cut and fit insulation tight to protrusions or interruptions to the insulation plane.
- F. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both directions.

3.04 PROTECTION

- A. Protect installed insulation and vapor barriers from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.
- B. Protect work until placement of backfill or concrete.

3.05 CLEAN-UP

- A. Remove all rubbish accumulated in connection with this Section. Coordinate recycling of waste materials.
- B. Replace any materials damaged by installation of materials associated with this section.

END OF SECTION 072100

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Provide all labor, equipment, and materials to install roof insulation over the properly prepared new metal deck substrate.

1.02 RELATED SECTIONS

- A. Section 053113: Steel Roof Deck.
- B. Section 061000: Rough Carpentry.
- C. Section 075323: EPDM Roofing
- D. Section 076200: Metal Flashing and Trim.
- E. Section 079200: Caulking and Sealants.

1.03 REFERENCES

- A. ASTM C165 - Standard Test Method for Measuring Compressive Properties of Thermal Insulations; 2007 (Reapproved 2017).
- B. ASTM C208 - Standard Specification for Cellulosic Fiber Insulating Board; 2012, with Editorial Revision (2017).
- C. ASTM C209 - Standard Test Methods for Cellulosic Fiber Insulating Board; 2020.
- D. ASTM C272/C272M - Standard Test Method for Water Absorption of Core Materials for Sandwich Constructions; 2018.
- E. ASTM D5 - Test Method for Penetration of Bituminous Materials
- F. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2017.
- G. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2018.
- H. ASTM C728 - Standard Specification for Perlite Thermal Insulation Board; 2017a.
- I. ASTM D1621 - Standard Test Method for Compressive Properties Of Rigid Cellular Plastics; 2016.
- J. ASTM D1622 - Standard Test Method for Apparent Density of Rigid Cellular Plastics; 2020.
- K. ASTM D2126 - Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging; 2020.
- L. ASTM D312/D312M - Standard Specification for Asphalt Used in Roofing; 2016a.
- M. ASTM E108 - Standard Test Methods for Fire Tests of Roof Coverings; 2020a.
- N. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.

- O. FM DS 1-29 - Roof Deck Securement and Above-Deck Roof Components; 2016, with Editorial Revision (2020).
- P. FS HH-I-1972 Insulation Board, Polyisocyanurate.
- Q. FS LLL-1-535B Insulation Board, Thermal (Perlite).
- R. NRCA (RM) - The NRCA Roofing Manual; 2018.
- S. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.04 SUBMITTALS

- A. Submit under provisions of Section 013300 - SUBMITTALS.
- B. Provide manufacturer's current product literature, installation specification data and detail sheets for each product. Provide Safety Data Sheets (SDS) for all products containing "Hazardous Materials" as defined on lists issued by both the Federal and State governments. Maintain copies of SDS sheets at the jobsite.
- C. Provide approval letters from insulation manufacturer for use of their insulation within this particular roofing system type. Provide a 12" x 12" sample of each insulation type and 12" x full profile fiber cant strip.
- D. Submit manufacturer's shop drawings indicating complete installation details of tapered insulation system, including identification of each insulation block, sequence of installation, insulation block layout, drain locations, roof slopes, thicknesses, crickets and saddles. Drawings shall also include outline of roof, complete board layout of components, thickness and the average R-value for the completed insulation system.
- E. Certifications:
 - 1. Submit roof manufacturer's certification that insulation installation method is acceptable to the roof manufacturer.
 - 2. Submit roof manufacturer's certification that insulation furnished is acceptable to roofing manufacturer as a component of the roofing system and is eligible for roofing manufacturer's warranty.
 - 3. Submit certification that insulation and fastening system furnished is Tested and Approved by an independent testing laboratory for I-90 Wind Uplift Requirements and ASTM E108 Class 1A fire classification. Insulation installation shall comply with FM Loss Prevention Data Sheet FM DS 1-29 patterns for specified wind uplift resistance.

1.05 QUALITY ASSURANCE

- A. Comply with local, state and federal regulations, safety standards and codes. Use the strictest document when a conflict arises. Schedule work to coincide with commencement of installation of new roofing system.
- B. Whenever specification items found herein are less stringent than Manufacturers' requirements, Manufacturers' requirements shall be followed and the Architect/Engineer shall be notified before proceeding.
- C. The responsibility for proper installation of all components of the roofing system lies with the Contractor. The Contractor shall inform the Architect/Engineer of any conditions detrimental to the quality of construction or long term performance of the roofing system and shall not proceed with the work until the conditions are corrected.

- D. The Contractor selected for this work must be approved by the primary materials Manufacturer or approved equal, and is capable of providing the specified Manufacturer's guarantee.
- E. Applicator Qualifications: Company specializing in roof deck insulation application, with minimum of 5 years documented experience certified by roofing system manufacturer.
- F. Comply with Factory Mutual System Approval Guide to provide FMRC-Approved roof assembly meeting Class IA-90 (FM Standard 4470) requirements for fire resistance and wind uplift in accordance with FM Loss Prevention Data Sheets 1-28 and 1-29 and Underwriter's Laboratories, Inc. (UL) Class A Fire Hazard Classification.
- G. Products and equipment requiring or using Chlorofluorocarbons (CFC's) during the manufacturing process will not be permitted.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle materials in accordance with Section 016500. Follow manufacturer's printed instructions in handling and storing products.
- B. All materials shall be delivered to the job in original unopened containers or bundles and stored in a place protected from the elements and from damage by tampering.
- C. Store all insulation materials in a manner to protect them from the wind, sun and moisture damage prior to and during installation. Any insulation that has been exposed to any moisture shall be immediately removed from the project site.
- D. Store materials off the ground in a watertight, ventilated enclosure. Any warped, broken or wet insulation boards shall be immediately removed from the site.
- E. Proceed with insulation work when existing and forecasted weather conditions permit work to be performed in accordance with manufacturer's recommendations and warranty requirements.

PART 2 - PRODUCTS

2.01 APPROVED EQUAL

- A. Contractor shall submit any product not specified prior to the award date in accordance with Section 013300 - SUBMITTALS to the Architect/Engineer in order for the product to be considered for approval.

2.02 INSULATION MATERIALS

- A. Provide thicknesses of insulation required to meet the minimum R-value; provide combination of types and thicknesses to provide a complete system:
 - 1. Tapered Polyisocyanurate Roof Insulation
 - a. Tapered insulation design must be provided by roof system manufacturer.
 - 1) Qualities: Factory manufactured, closed cell polyisocyanurate foam core bonded to heavy duty glass fiber mat facers.
 - 2) Board Size: Minimum 4' x 4', Thickness: Minimum 1".
 - 3) Required R-Value: Minimum 30.0.
 - 2. Source
 - a. E'NRG'Y-2 by NRG Barriers, Inc.
 - b. Ultra Gard Gold II by Schuller Roofing Systems.
 - c. GAFTEMP Isotherm R by GAF.
 - d. Pre-approved Equal.
 - 3. Requirements

- a. ASTM E108, Class 1A
- b. I-90 Uplift
- c. Federal Specification HH-I-1972, Class I
- 4. Physical Properties
 - a. Dimension Stability: ASTM D2126, 2% max.
 - b. Compressive Strength: ASTM D1621, 25 psi min.
 - c. Vapor Permeability: ASTM E96/E96M, 1 perm max.
 - d. Foam Core Density: ASTM D-162, 2.0 pcf min.
 - e. Water Absorption: ASTM C-20, <1%
 - f. R-Factor HR per inch Thickness, ASTM C518, 5.6 design value.
 - g. Minimum Long Term Thermal Resistance Value: LTTR = 30.

2.03 RELATED MATERIALS

- A. Fiber cant and tapered edge strips: Preformed rigid insulation units of sizes/shapes indicated, matching insulation board or of perlite or organic fiberboard, as per the approved manufacturer.
 - 1. Acceptable Manufacturers:
 - a. Johns Manville
 - b. Garland Company, Inc.
 - c. Celotex
 - d. International Permalite, Inc.
 - e. Pre-approved Equivalent
- B. Protection Board: Premolded semi-rigid composition board, GP DensDeck Prime or equal 3/4" thick.
- C. Asphalt: ASTM D312/D312M, Type III, Steep Asphalt.

PART 3 - EXECUTION

3.01 INSPECTION OF SURFACES

- A. Roofing contractor shall be responsible for preparing an adequate substrate to receive insulation.
 - 1. Verify that work which penetrates roof deck has been completed.
 - 2. Verify that wood nailers are properly and securely installed.
 - 3. Examine surfaces for defects, rough spots, ridges, depressions, foreign material, moisture, and unevenness.
 - 4. Do not proceed until defects are corrected.
 - 5. Do not apply insulation until substrate is sufficiently dry.
 - 6. Broom clean substrate immediately prior to application.
 - 7. Use additional insulation to fill depressions and low spots that would otherwise cause ponding water.

3.02 PREPARATION

- A. The entire roof surface shall be swept free of all dust, dirt, grime, debris or other foreign material. Conduct daily NRCA deck dryness test. Report findings daily to Architect/Engineer.
- B. Thoroughly clean and reseal all exposed metal joints and penetrations to result in a watertight seal. The repair of damaged roof deck shall be performed prior to system installation.
- C. Ensure roof deck is clean and dry, continuous, and ready for application of roofing system.

3.03 ROOF INSULATION INSTALLATION

- A. Insulation shall be laid over vapor barrier with edges parallel to the roof edges.
- B. Insulation boards shall be laid in a cross pattern. Joints (staggered) with the joints between the long dimensions of the boards continuous.
- C. Space roof Insulation 1/4" from all vertical flashing.
- D. No more insulation shall be laid than can be completely covered in a day's work.
- E. Remove and replace any wet insulation. Roofing shall not be applied over wet insulation.
- F. Offset the joints of subsequent insulation layers a minimum of 6" over the underlying insulation layer.
- G. Install preformed forty-five (45) degree cant strips at junctures of vertical surfaces. Provide preformed, tapered edge strips at perimeter of edges of roof that do not terminate at vertical surfaces. Tape joints of insulation as per manufacturer's requirements.
- H. Install new 1/4:12 minimum tapered perlite crickets/saddle as needed to insure positive water flow at locations indicated. Comply with manufacturer's guidelines for proper installation of tapered insulation.
- I. Mechanical Attachment:
 - 1. Install one layer of rigid insulation board with end joints staggered so all open joints will be eliminated. Each insulation board shall be butt firmly against adjoining panels. All open joints shall be eliminated.
 - 2. Approved protection board three quarter (3/4") inch thickness shall be installed over insulation.
 - 3. All insulation shall be neatly cut and fitted around all through-roof projections. The boards shall be cut to fit one quarter (1/4") inch away from the vertical surface.
 - 4. Protection and insulation boards shall be mechanically fastened to roof deck utilizing fasteners and pattern from manufacturer.
- J. Fully Adhered Attachment
 - 1. Install one layer of rigid insulation board with end joints staggered so all open joints will be eliminated. Each insulation board shall be butt firmly against adjoining panels. All open joints shall be eliminated.
 - 2. Approved protection board three quarter (3/4") inch thickness shall be installed over insulation.
 - 3. All insulation shall be neatly cut and fitted around all through-roof projections. The boards shall be cut to fit one quarter (1/4") inch away from the vertical surface.

3.04 WATER CUT-OFF

- A. At the end of each day's work, provide temporary water cut-offs at the edge of the insulation. Remove cut-offs when work commences.
- B. Remove water cut-offs before proceeding with work.

3.05 APPLICATION OF CANT STRIP

- A. Install four inch by four-inch perlite cant strips at the juncture of all vertical surfaces and roof where there are no expansion joints. Where 4" cant strips will not fit, use the largest practical

size. Cant strips shall be set into adhesive or hot, steep asphalt over the secured insulation, depending on roofing system.

3.06 CLEANING

- A. Remove debris and cartons from roof deck. Leave insulation clean and dry, ready to receive roofing membrane.
- B. Remove adhesive or bituminous markings from finished surfaces. In areas where finished surfaces are soiled by tar or any other source of soiling caused by work of this section, consult manufacturer of surfaces for cleaning advice and conform to their instructions. Repair or replace defaced or disfigured finishes caused by work of this section.

END OF SECTION 072200

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Air Barriers: Materials that form a system to stop passage of air through exterior walls, joints between exterior walls and roof, and joints around frames of openings in exterior walls.

1.02 DEFINITIONS

- A. Air Barrier: Air tight barrier made of material that is relatively air impermeable but water vapor permeable, both to the degree specified, with sealed seams and with sealed joints to adjacent surfaces. Note: For the purposes of this specification, vapor impermeable air barriers are classified as vapor retarders.

1.03 REFERENCE STANDARDS

- A. AATCC Test Method 127 - Water Resistance: Hydrostatic Pressure Test; 2018.
- B. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016.
- C. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2020.
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.
- E. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.
- F. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials; 2013.
- G. ICC-ES AC38 - Acceptance Criteria for Water-Resistive Barriers; 2016.
- H. ICC-ES AC148 - Acceptance Criteria for Flexible Flashing Materials; 2017.
- I. ICC-ES AC212 - Acceptance Criteria for Water-Resistive Coatings Used as Water-Resistive Barriers over Exterior Sheathing; 2015.

1.04 SUBMITTALS

- A. See Section 013300 - SUBMITTALS, for submittal procedures.
- B. Product Data: Provide data on material characteristics.
- C. Shop Drawings: Provide drawings of special joint conditions.
- D. ABAA Field Quality Control Submittals: Submit third-party reports of testing and inspection required by ABAA QAP.
- E. Manufacturer's Installation Instructions: Indicate preparation.
- F. ABAA Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.

- G. ABAA Installer Qualification: Submit documentation of current contractor accreditation and current installer certification. Keep copies of all contractor accreditation and installer certification on site during and after installation. Present on-site documentation upon request.
- H. Testing Agency Qualification Statement.

1.05 QUALITY ASSURANCE

- A. Air Barrier Association of America (ABAA) Quality Assurance Program (QAP); www.airbarrier.org/sle:
 - 1. Installer Qualification: Use accredited contractor, certified installers, evaluated materials, and third-party field quality control audit.
 - 2. Manufacturer Qualification: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture. Use secondary materials approved in writing by primary material manufacturer.
- B. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

1.06 MOCK-UP

- A. Install materials in mock-up specified in Section(s) 042200.

1.07 FIELD CONDITIONS

- A. Maintain temperature and humidity recommended by the materials manufacturers before, during and after installation.

PART 2 PRODUCTS

2.01 AIR BARRIER MATERIALS (WATER VAPOR PERMEABLE AND WATER-RESISTIVE)

- A. Air Barrier, Fluid Applied: Vapor permeable, elastomeric waterproofing.
 - 1. Air Barrier Coating:
 - a. Material: Acrylic.
 - b. Air Permeance: 0.004 cubic feet per minute per square foot (0.02 L/s/sq m), maximum, when tested in accordance with ASTM E2178.
 - c. Water Vapor Permeance: 5 perms (287 ng/(Pa s sq m)), minimum, when tested in accordance with ASTM E96/E96M, Procedure B.
 - d. Ultraviolet and Weathering Resistance: Approved in writing by manufacturer for minimum of 6 months weather exposure after application.
 - e. Elongation: 300 percent, minimum, when tested in accordance with ASTM D412.
 - f. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.
 - g. Nail Sealability: Pass, when tested in accordance with ASTM D1970/D1970M.
 - h. VOC Content: 50 g per L or less.
 - i. Code Acceptance: Comply with applicable requirements of ICC-ES AC212.
 - j. Sealants, Tapes and Accessories: As recommended by coating manufacturer.
 - k. Products:
 - 1) Parex USA, Inc.; Parex USA WeatherSeal Spray & Roll-on: www.parexusa.com/sle.

2.02 ACCESSORIES

- A. Sealants, Tapes, and Accessories for Sealing Weather Barrier and Sealing Weather Barrier to Adjacent Substrates: As specified or as recommended by weather barrier manufacturer.
- B. Primer for Flexible Flashing: Product recommended by manufacturer of flexible flashing for substrate.
- C. Flexible Flashing: Sheathing fabric saturated with air barrier coating and complying with the applicable requirements of ICC-ES AC148.
 - 1. Flexible Flashing: use flashing material as recommended by the approved Weather Barrier manufacturer for the various conditions encountered on the project. Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber or rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spun-bonded polyolefin to produce an overall thickness of not less than 64 mil.
 - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) DuPont (E. I. du Pont de Nemours and Company); DuPont Flashing Tape.
 - 2) Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Vycor Butyl Self Adhered Flashing.
 - b. Primer for Flexible Flashing: Product recommended by manufacturer of flexible flashing for substrate.
- D. Liquid Flashing: One part, fast curing, non-sag, gun grade, trowelable liquid flashing.
 - 1. Products:
 - a. Parex USA, Inc.; Parex USA WeatherTECH with WeatherFlash:
www.parexusa.com/sle.
- E. Thinners and Cleaners: As recommended by material manufacturer.
- F. Fasteners: Provide corrosion resistant fasteners with plastic caps in types and sizes recommended by the approved Weather Barrier manufacturer for the type of construction (metal, wood or masonry) being utilized on the project.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces and conditions are ready to accept the work of this section.

3.02 PREPARATION

- A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.
- B. Clean and prime substrate surfaces to receive adhesives in accordance with manufacturer's instructions.

3.03 INSTALLATION

- A. Install materials in accordance with manufacturer's instructions.
- B. Water-Resistive Barriers: Install continuous barrier over surfaces indicated, with sheets lapped to shed water but with seams not sealed.

- C. Air Barriers: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.
- D. Vapor Retarders: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.
- E. Apply sealants and adhesives within recommended application temperature ranges. Consult manufacturer if temperature is out of this range.
- F. Mechanically Fastened Sheets - On Exterior:
 - 1. Install sheets shingle-fashion to shed water, with seams generally horizontal.
 - 2. Overlap seams as recommended by manufacturer but at least 6 inches.
 - 3. Overlap at outside and inside corners as recommended by manufacturer but at least 12 inches (305 mm).
 - 4. Attach to framed construction with fasteners extending through sheathing into framing. Space fasteners at 12 to 18 inches (305 to 460 mm) on center along each framing member supporting sheathing.
 - 5. For applications specified to be air tight, seal seams, laps, penetrations, tears, and cuts with self-adhesive tape; use only large-headed, gasketed fasteners recommended by the manufacturer.
 - 6. Where stud framing rests on concrete or masonry, extend lower edge of sheet at least 4 inches (100 mm) below bottom of framing and seal to foundation with sealant.
 - 7. Install air barrier and vapor retarder UNDER jamb flashings.
 - 8. Install head flashings under weather barrier.
 - 9. At openings to be filled with frames having nailing flanges, wrap excess sheet into opening; at head, seal sheet over flange and flashing.
- G. Coatings:
 - 1. Prepare substrate in manner recommended by coating manufacturer; treat joints in substrate and between dissimilar materials as recommended by manufacturer.
 - 2. Mastic Coating: Install by trowel or roller to minimum thickness of 1/4 inch (6 mm); use sheet seal to join to adjacent construction, seal air tight with sealant.
 - 3. Use flashing to seal to adjacent construction and to bridge joints.
- H. Openings and Penetrations in Exterior Weather Barriers:
 - 1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches (125 mm) onto weather barrier and at least 6 inches (150 mm) up jambs; mechanically fasten stretched edges.
 - 2. At openings to be filled with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with at least 4 inches (100 mm) wide; do not seal sill flange.
 - 3. At openings to be filled with non-flanged frames, seal weather barrier to all sides of opening framing, using flashing at least 9 inches (230 mm) wide, covering entire depth of framing.
 - 4. At head of openings, install flashing under weather barrier extending at least 2 inches (50 mm) beyond face of jambs; seal weather barrier to flashing.
 - 5. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.
 - 6. Service and Other Penetrations: Form flashing around penetrating item and seal to weather barrier surface.

3.04 FIELD QUALITY CONTROL

- A. See Section 014500 - QUALITY CONTROL, for additional requirements.

- B. Coordination of ABAA Tests and Inspections:
 - 1. Provide testing and inspection required by ABAA QAP.
 - 2. Notify in ABAA writing of schedule for air barrier work. Allow adequate time for testing and inspection.
 - 3. Cooperate with ABAA testing agency.
 - 4. Allow access to air barrier work areas and staging.
 - 5. Do not cover air barrier work until tested, inspected, and accepted.
- C. Do not cover installed weather barriers until required inspections have been completed.
- D. Obtain approval of installation procedures by the weather barrier manufacturer based on a mock-up installed in place, prior to proceeding with remainder of installation.
- E. Take digital photographs of each portion of the installation prior to covering up.

3.05 PROTECTION

- A. Do not leave materials exposed to weather longer than recommended by manufacturer.
- B. Do not leave paper- or felt-based barriers exposed to weather for longer than one week.

END OF SECTION 072726

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Glass fiber reinforced plastic (FRP/GRP) Tank Cover Panels, Access Hatches, and Structural Framing and Beams.
- B. FRP/GRP trim and flashing.
- C. Fasteners and anchors.
- D. Gaskets.
- E. Accessories and appurtenances.

1.02 REFERENCES

- A. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2012.
- B. ANSI A326.3 - American National Standard Test Method for Measuring Dynamic Coefficient of Friction of Hard Surface Flooring Materials; 2021.
- C. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics; 2010 (Reapproved 2018).
- D. ASTM D570 - Standard Test Method for Water Absorption of Plastics; 1998 (Reapproved 2010).
- E. ASTM D638 - Standard Test Method for Tensile Properties of Plastics; 2014.
- F. ASTM D695 - Standard Test Method for Compressive Properties of Rigid Plastics; 2015.
- G. ISO 9001 - Quality Management Systems — Requirements; 2015.
- H. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials; 2016.
- I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.

1.03 PERFORMANCE REQUIREMENTS

- A. Design Requirements:
 - 1. The roof system shall be designed and furnished by the manufacturer as a complete system. Materials shall comply with Federal and Local laws or ordinances, applicable codes, standards, regulations, and/or regulatory agency requirements.
 - 2. Structural framing and deck panels shall meet performance and design criteria listed herein for span conditions indicated on the drawings. Individual units shall demonstrate compliance with design criteria by large-scale testing.
 - a. FRP Deck Panels: Uniform Load and Deflection Test
 - b. FRP Structural Components: 3 Point Load Bending Test
 - 3. Air Leakage
 - a. Air leakage shall not exceed 0.2 cfm/sf at negative pressure of 0.2 inches of water column for a 5-minute duration per test.

- b. Air Leakage Test in accordance with Procedural Standards for Adjusting, Balancing, of Environmental Systems.
 - c. Testing shall be conducted by independent test agency certified by Associated Air Balance Council (AABC) or National Environmental Balancing Bureau (NEBB).
- 4. Design Loads shall comply with local codes with combined loads determined by Allowable Stress Method.
 - a. Live or Snow: 20 psf.
 - b. Wind Uplift: 55 psf.
 - c. Dead Load: 25 psf
 - 1) Deck panels: Individual unit weight plus other materials attached to and supported by panels.
 - 2) Cover structure: Individual unit weight plus other materials attached to and supported by cover structure.
- 5. Design Limits
 - a. Dead + Live or Snow Load: Deflection Limit: $L/240$ (max.); Factor of Safety: 2.5.
 - b. Wind Uplift less Dead Load: Deflection Limit = $L/60$ (max.); Factor of Safety: 1.88.
 - c. Personnel Load: Cover shall be capable of supporting 300 pound concentrated load over 30 inch by 30 inch square area located at panel midspan with $L/240$ deflection limit or total deflection not to exceed $5/8$ inch.
- 6. Cover Panel Removability:
 - a. Each cover panel shall be removable without having to remove any adjacent cover panel.
 - b. Each cover panel shall be removable vertically and without cutting of a cover component.
- 7. Slip Resistance of Cover System
 - a. Cover panels, end-to-end joint flashing and side-joint, locking channel shall utilize TreadMAX integral, non-skid surface technology or meet the following criteria:
 - 1) The cover shall have a slip-resistant walking surface designed for operator foot traffic.
 - 2) Non-skid surface shall be an integral (embedded) part of the cover panel and not achieved by use of coatings/paint, adhesive tapes, or other applied product after the manufacturing process.
 - 3) Slip resistance tread shall be at minimum bi-directional.
 - b. Minimum average Dynamic Coefficient of Friction (DCOF) shall be 0.50 per ANSI A137.1 and ANSI A326.3 Dynamic Coefficient of Friction Tests.
 - c. Minimum wet Pendulum Test Value (PTV) shall be 45, with Four S (96) hard rubber slider, per AS HB198:2014 (AS/NZS 4586) Pendulum Test.
- 8. Collateral loads shall not be applied to the roof panels.

1.04 SUBMITTALS

- A. Submit under provisions of Section 013300 - SUBMITTALS.
- B. Product Data: Manufacturer's data sheets on each product to be used including:
 - 1. Manufacturer's technical data, including calculations, demonstrating compliance with specified design criteria noted in the PERFORMANCE REQUIREMENTS Article.
 - 2. Storage and handling instructions.
 - 3. Installation instructions.
- C. Shop Drawings including layouts, product description, connection and framing details, fastener types and spacing.
 - 1. Drawings shall be approved prior to manufacture and fabrication.
- D. Certifications as specified herein.

1.05 QUALITY ASSURANCE

- A. Tank cover supplier shall manufacture and fabricate all FRP components in its own facility, which must be ISO 9001 certified..
- B. Manufacturer shall submit names and addresses of ten (10) previous projects of comparable scope completed in the last five (5) years to the Architect/Engineer.
- C. Contractor shall verify all field dimensions for development of manufacturer's drawings.
- D. Contractor shall review and confirm in writing approval of manufacturer's drawings.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Materials shall be unloaded and stored per manufacturer's instructions to prevent damage.
- B. When handling materials, spreader bars shall be used when lifting FRP panels and surfaces protected from cuts, gouges, abrasions and impacts. Wire slings shall not be used unless panels are protected.
- C. During storage, bundled panels shall be kept dry and under cover but ventilated. For water drainage and air circulation, panels shall be stored off of the ground with one end elevated. Standing water must be removed from top of and in between sheets.
- D. At time of delivery, all materials shall be inspected for shipping damage. Freight company and manufacturer shall be notified immediately of any damage or quantity shortages.
 - 1. Contractor shall protect FRP materials from cuts, scratches, gouges, abrasions, and impacts. When lifting FRP materials, spreader bars shall be used (not wire slings unless materials are fully protected). FRP components shall not be dragged across one another unless separated by a non-scratching spacer.

1.07 WARRANTY

- A. The baffle wall manufacturer shall warrant that the work described herein shall be free from defects, workmanship and material. The flat cover manufacturer shall replace, or repair only faulty workmanship or defective material furnished by it that is reported to it within one (1) year from the date of shipment

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design: FRP XL3 Tank Cover Systems shall be as manufactured by Enduro Composites, Inc., located at 16602 Central Green Blvd., Houston, TX 77032; Tel: 800-231-7271, 713-358-4000; Email: sales@endurocomposites.com; Web: www.endurocomposites.com.
- B. Substitutions: See Section 012500 - PRODUCT SUBSTITUTION PROCEDURES and Section 016100 - BASIC PRODUCT REQUIREMENTS.

2.02 GLASS FIBER REINFORCED XL3 TANK COVER SYSTEM

- A. XL3 Tank Cover Panels:
 - 1. Resin type for FRP tank cover decking shall be UV stabilized, Isophthalic Polyester or Vinyl Ester.
 - 2. Glass fiber reinforcements shall be 50% (min) of the material weight.

3. Materials shall be fire retardant and have flame spread rating of 25 or less per ASTM E84.
 4. Materials shall exhibit these Physical Properties (at a minimum):
 5. Tensile Strength 30,000 psi ASTM D638
 6. Flexural Strength 30,000 psi ASTM D790
 7. Flexural Modulus 2,270,000 psi ASTM D790
 8. Compressive Strength 30,000 psi ASTM D695
 9. Izod Impact (Notched) 20 ASTM D256
 10. Water Absorption .20% max ASTM D570
 11. Cover panels shall be sealed at side-laps with EPDM gasket. Side-lap gaskets shall be factory installed and oriented
 12. vertically so they are compressed when the locking channel is placed into position.
 13. Cover panels shall utilize integral TreadMAX non-skid surface technology. Note:
coatings/paints, adhesive tapes, or other applied product after the manufacturing process will not be accepted nor approved as a substitution.
 14. Color of deck panels shall be standard gray.
- B. Access Hatches (as indicated on the drawings)
1. Access hatches shall be raised or flat with one-leaf hatch door fabricated from pultruded fiberglass components.
 2. Access hatches and framing shall fit within a single deck panel so that individual deck panels with hatches can be removed without affecting adjacent panels. Standard sizes include 11 inches by 15 inches, 19 inches by 24 inches, 22 inches by 22 inches, and 22 inches by 36 inches. See drawings for size(s) required.
 3. Underside of raised hatch lids shall be sealed with factory installed, 3/8" diameter neoprene bulb gasket. Perimeter hatch curb shall be sealed to decking surface with compatible adhesive sealant as recommended by the manufacturer.
 4. Underside of Flat hatch lids shall be sealed with factory installed, 1/4" EPDM Flat gasket. Perimeter hatch curb shall be sealed to decking surface with compatible adhesive sealant as recommended by the manufacturer.
 5. Hatches shall have a stainless steel, gas piston hold-open device. Gas Piston shall be designed to aid in opening and to hold open the hatch once locked in place.
 6. Hatch lids shall have factory applied non-skid, UV resistant surface with stainless steel lift handles.
 7. View port hatches, if indicated on drawings, shall be 12 inches square or less.
- C. Trusses (as required by the manufacturer or as indicated on the drawings)
1. Trusses shall be designed and provided by tank cover manufacturer and conform to these specifications:
 - a. Truss components not exposed to inside of tank shall be hot dip galvanized steel.
 - b. Truss components exposed to inside of tank shall be Type 316 stainless steel.
 - c. Trusses shall have minimum 6 foot 8 inches of headspace from top of tank cover to bottom of top chord.
 - d. Trusses shall be provided in single sections not exceeding 30 feet long. Longer sections shall be bolted together by the contractor in accordance with the manufacturer's approved Shop Drawings.
- D. Flashing and Trim
1. FRP flashing shall be isophthalic polyester with dimensions, and profile as indicated on the drawings and as required by the manufacturer.
 2. Non-radius end flashing shall be factory attached to individual deck panels.
 3. Flashing with a radius or at the perimeter of a circular tank shall be a separate part and field attached by the installing contractor.
- E. Air Vents and Connections (as indicated on the drawings)

1. FRP gooseneck ventilation piping (if indicated on drawings) with bird screen shall be provided by cover manufacturer.
 2. FRP stub-vent connections with a blind flange, where indicated on drawings, shall be provided by cover manufacturer.
 3. Connections shall extend at least 6 inches above the top of tank cover deck.
- F. FRP Structural Framing (as indicated on the drawings)
1. Resin type for FRP beams and framing members shall be vinyl ester.
 2. Glass fiber reinforcements shall be a minimum of 50% of the material weight.
 3. Structural components shall be fire retardant with flame spread rating of 25 or less per ASTM E84.
 4. If cover is flush mounted, ledger angles shall be Type 316 Stainless Steel.
 5. All connections for attachment to FRP beams or fastening connections shall be Type 316 Stainless Steel angles or plates.
- G. Pipe Penetrations
1. Existing or new pipe penetrations shall be retrofitted by contractor to penetrate cover at 90-degree angle.
 2. Pipe penetrations shall be flashed in the field with a Sealtite retrofit, zipper type, pipe flashing or equal as provided by cover manufacturer.
- H. Hardware
1. Fasteners, anchorage, hinges, and other structural accessories located on underside of cover shall be Type 316 Stainless Steel.
 2. Perimeter flashing anchors, concrete anchors, or other hardware not exposed to the inside environment of tank shall be Type 304 Stainless Steel.
 3. Fasteners to attach tank cover decking to structural supports shall be Type 316 Stainless Steel.
- I. Gaskets and Sealants
1. All panel side laps and perimeter conditions shall have gaskets.
 2. Gaskets under flashing with radius and at perimeter of circular tanks shall be installed by the contractor.
 3. Adhesive sealant shall be applied by contractor at various locations as required by manufacturer for odor containment.

2.03 ACCESSORIES

- A. Accessories shall include flashing, trim, closures, sealant, fasteners, and other items as required for a complete installation.
- B. FRP/GRP flashing and trim shall be in thickness, dimensions, and profile as required.
- C. Fasteners
1. Structural fasteners shall be Type 316 stainless steel with seal washers and installed per manufacturer's instructions.
 2. Side lap and flashing fasteners shall be Type 316 stainless steel SB2 grommets and installed per manufacturer's instructions.
- D. Closures and Sealant
1. Closures shall be EPDM material and match panel profile.
 2. Sealant for opaque roofing shall be 3/32 x 1/2 inch, non-shrink/non-hardening butyl tape.
 3. Sealant for translucent roofing shall be Boss 385 Silicon or Silglaze II SCS 2800 caulk.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Installation shall not begin until substrates have been properly prepared.

3.02 INSTALLATION

- A. Materials shall be installed in accordance with Manufacturer's Installation Instructions and Drawings.
- B. Before placing and attaching components, erector must confirm alignment and location of bearing plates, surfaces, brackets, saddles, etc. All bearing surfaces must be clean and free of debris.
- C. Before placing secondary framing members or deck, erector must check the alignment and location of supports.
- D. Erection shall proceed according to sequence shown on the approved drawings.
- E. If applicable, contractor shall install structural members, beam seats, or ledger angles in locations shown on the approved drawings. Contractor shall assemble trusses as required.

END OF SECTION 074133.11

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Ethylene-propylene-diene-monomer (EPDM) roofing system.
 - 2. Roof edge systems.
 - 3. Cover Board.
 - 4. Tapered Roof insulation.
 - 5. Roof Insulation.
 - 6. Vapor retarder.
 - 7. Walkway Systems.
 - 8. Expansion Joints.

1.03 DEFINITIONS

- A. Roofing Terminology: Definitions in ASTM D1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" apply to work of this Section.

1.04 SUBSTITUTIONS / OR EQUALS

- A. Substitutions or Equals for the roofing material manufacturer and items listed in this specification shall be submitted in conformance with Division 1 and as otherwise modified by the following:
 - 1. A proposed Substitution/or Equal submission package must be submitted to the Architect no later than ten (10) business days prior to the bid date. Otherwise, any Substitution/or Equal other than the manufacturer specified will not be considered.
 - 2. Submittal to Architect shall include:
 - a. Identification of Project - Project Name;
 - b. Name of Submitting Bidder;
 - c. Telephone and Email address of Submitting Bidder;
 - d. Manufacturer's Name of Proposed or Equal/Substitution;
 - e. Model, line or material type;
 - f. Equivalent line by line item comparison for each item listed in the materials section of this specification, including each of the optional accessories. Note: Each proposed item must have proposed manufacturer and model/product numbers.
 - g. Addresses of two locations within 30 miles of the proposed site, where the proposed Substitution/or Equal manufacturer has installed their similar roofing product and name and telephone number of a contact person to be able to arrange a site visit.
 - h. A copy of the final signed warranty signed and issued by the manufacturer for the two projects provided.
 - 3. Partial and/or Failure to follow any of the procedures outlined in Division 01 or above may subject the entire submission for rejection.
 - 4. Incomplete submissions may not be reviewed.
 - 5. Substitution/ or Equals if found acceptable will be approved via addenda, which will be issued to all bidder's.
 - 6. In order to include an approved Substitution/or Equal in the bid, the bidder must acknowledge on the bidders bid form that the bidder intends to provide the approved Substitution/or Equal and the bidder shall also list the name of the approved

Substitution/or Equal manufacturer as well on the bidders bid form. Failure of the bidder to express their intent to use the approved Substitution/or Equal as part of the bid will exclude the bidder from being able to utilize another Manufacturer from the one specified.

7. If a bidder uses a Substitution/or Equal, the bidder will take responsibility to pay for the re-engineering and coordination of all other items that are to be provided that have been defined in the Contract Documents as additional items to the roofing system, including but not limited to all deck preparation/modifications, additional flashings or modification to existing roof drains.

1.05 PREINSTALLATION MEETINGS

- A. Preinstallation Roofing Conference: Conduct conference at Project site.
 1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
 2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
 3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 4. Review the use and staging of hoisting equipment required for the project including safety , OSHA regulations pertaining to operation and use of this equipment.
 5. Review Contractor's (and their Subcontractor's) responsibility to comply with OSHA regulations, requirements for provision and implementation of safety equipment and regulations. Additionally, Contractor shall keep on-site at all times a minimum of three complete additional safety units (i.e.: harnesses, rigging gear, hardhats, safety vests, etc.) for use by site visitors requiring access to the work.
 6. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
 7. Review structural loading limitations of roof deck during and after roofing.
 8. Review the location of any fresh-air intakes for the building with the building owner which may have to be covered or re-directed to maintain intakes during roofing operations.
 9. Review base flashings, special roofing details, roof drainage, roof penetrations; raising and/or replacement of equipment curbs, disconnection and re-connection of mechanical roof mounted equipment; and condition of other construction that affects roofing system.
 10. Review governing regulations and requirements for insurance and certificates if applicable.
 11. Review temporary protection requirements including but not limited to safety lines, roof barriers, walkway protections as required by OSHA during and after roofing installations.
 12. Review roof installation observations during construction; notifications and repair procedures after roofing installation with the manufacturer's field representative.
 13. Asbestos abatement work coordination.
 14. Debris removal procedures and requirements.

1.06 ACTION SUBMITTALS

- A. Submittals shall be made in accordance with Section 013300 - SUBMITTALS.
- B. Product Data: For each type of product.
- C. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work, including:
 1. Base flashings and membrane terminations including laps, seam layout, direction of laps and flashing details.
 2. Tapered insulation, including slopes.

3. Roof plan showing orientation of steel roof deck and orientation of roofing and fastening spacing's and patterns for mechanically fastened roofing.
 4. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
- D. Samples for Verification: For the following products:
1. Membrane roofing, of color required, 12 inch x 12 inch.
 2. Insulation Board - 12" x 12" sample.
 3. Cover Board - 12 inch x 12 inch.
 4. Walkway pads or rolls, of color required.
- E. Manufacturers complete installation Instructions.
- F. MSDS Sheets for all materials.

1.07 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and manufacturer.
- B. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
1. Submit evidence of complying with performance requirements.
- C. Product Test Reports: For components of roofing system, tests performed by manufacturer and witnessed by a qualified testing agency.
- D. Research/Evaluation Reports: For components of roofing system, from ICC-ES.
- E. Sample Warranties: For manufacturer's special warranties.

1.08 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For roofing system to include in maintenance manuals.

1.09 QUALITY ASSURANCE

- A. Perform work in accordance with NRCA Roofing and Waterproofing Manual and manufacturer's instructions.
- B. Single Source Responsibility: Roofing system materials and components shall be supplied and warranted by membrane manufacturer for specified roofing system and specified membrane manufacturer's warranty and shall be in compliance with specified regulatory requirements.
- C. Regulatory Requirements for Roof Assembly:
1. Comply with Factory Mutual System Approval Guide to provide FMRC-Approved roof assembly meeting Class 1A-120 (FM 4470) requirements for fire resistance and wind uplift in accordance with FM Loss Prevention Data Sheets FM DS 1-28 and FM DS 1-29.
 2. Underwriters Laboratories, Inc. (UL): Class A Fire Hazard Classification
 3. Conform to applicable code(s) for roof assembly fire hazard requirements.
 4. Conform to loading requirements indicated in ASCE 7 for applicable building location, exposure and use.
 5. Factory Mutual (FM) 1A-120 Compliance/Roof Assembly.
- D. Qualifications.
1. Manufacturer: Company specializing in manufacturing the products specified in this section with 10 years documented experience.

2. Applicator: Company specializing in performing the work of this section with 5 years documented experience. Installer shall be a qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
 1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
 2. All curable materials must be stored between 60° F and 80°F.
- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
- D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.
- E. Protect adjacent materials and surfaces against damage from roofing work. Do not store materials on previously completed roofing.

1.11 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.12 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.
 1. Special warranty includes membrane roofing, base flashings, roof insulation, fasteners, cover boards, substrate board, roofing accessories, edge materials, copings, and other components of roofing system.
 2. Warranty Period: 20 years from date of Substantial Completion with no dollar limitation (NDL) on the cost or quantity of repairs. Pro-rated roofing warranties will not be accepted.
 3. The warranty shall include coverage for wind speed with peak gusts of 120 mph measured at 30 feet above ground level. Certification is required with bid submittal indicating the manufacturer has reviewed and agreed to such wind coverage.
 4. Warranty shall also provide coverage for roof leakage caused by hail up to and including 2 inch in diameter.
 5. Materials and Workmanship for the following items shall be included in the manufacturer's warranty:
 - a. Membranes.
 - b. Flashings, including metal flashings and accessories supplied by roofing membrane manufacturer.
 - c. Insulation.
 - d. Fasteners and adhesives.
 - e. Accessories.

- f. Roof drains.
- g. Roof Edge and coping systems.
- 6. The warranty deliverables shall include the following:
 - a. Original of the warranty with original signature of a roofing manufacturer's company official authorized to sign the warranty.
 - b. An additional three copies of the signed warranty noted above.
 - c. Record set of as-built roofing drawings.
 - d. Final Roof Inspection Report by the manufacturer's authorized Field Representative.
- B. Warranty: This project is being constructed in an existing Commercial Building with an EPDM roof having an in-place existing warranty. Contractor will be required to provide a roofing contractor that is approved by the existing roofing manufacturer. Contractor shall maintain and modify existing warranty to include the work required by this project. Contractor shall meet with and provide for all required meetings, and construction inspections by an authorized Field Representative from the Roofing manufacturer issuing and modifying / extending the current warranty. Contractor shall provide to the building owner (with a copy to the Tenant), an original Warranty copy signed by a current authorized representative of the Roofing manufacturer at the completion of the work and prior to final payment claim submittal.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Source Limitations: Obtain components including roof insulation for roofing system from manufacturer approved by membrane roofing manufacturer.

2.02 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roofing and base flashings shall remain watertight.
 - 1. Accelerated Weathering: Roofing system shall withstand 2000 hours of exposure when tested according to ASTM G 152, ASTM G154, or ASTM G155.
 - 2. Impact Resistance: Roofing system shall resist impact damage when tested according to ASTM D 3746 or ASTM D 4272.
- B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roofing manufacturer based on testing and field experience.
- C. Roofing System Design: Tested by a qualified testing agency to resist the following uplift pressures:
 - 1. Corner Uplift Pressure: -38.2lbf/sq. ft.
 - 2. Perimeter Uplift Pressure: -45.9lbf/sq. ft.
 - 3. Field-of-Roof Uplift Pressure: -56.2lbf/sq. ft.
- D. Energy Star Listing: Roofing system shall be listed on the DOE's ENERGY STAR "Roof Products Qualified Product List" for low -slope roof products.
- E. Energy Performance: Roofing system shall have an initial solar reflectance index of not less than 0.70 and an emissivity of not less than 0.75 when tested according to CRRC-1.
- F. Exterior Fire-Test Exposure: ASTM E108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

- G. Fire-Resistance Ratings: Comply with fire-resistance-rated assembly designs indicated. Identify products with appropriate markings of applicable testing agency.

2.03 EPDM ROOFING

- A. EPDM: ASTM D4637/D4637M, Type II, scrim or fabric internally reinforced, uniform, flexible EPDM sheet.
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Firestone Building Products Company, LLC.: Black Rubberguard EPDM
 - b. Carlisle SynTec Incorporated.
 - c. Johns Manville.
 - d. Versico Incorporated.
 3. Thickness: 90 mils, nominal.
 4. Exposed Face Color: Black.

2.04 AUXILIARY ROOFING MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing.
1. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the following limits for VOC content:

a. Plastic Foam Adhesives:	50 g/L.
b. Gypsum Board and Panel Adhesives:	50 g/L.
c. Multipurpose Construction Adhesives:	70 g/L.
d. Fiberglass Adhesives:	80 g/L.
e. Single-Ply Roof Membrane Adhesives:	250 g/L.
f. Single-Ply Roof Membrane Sealants:	450 g/L.
g. Non-membrane Roof Sealants:	300 g/L.
h. Sealant Primers for Nonporous Substrates:	250 g/L.
i. Sealant Primers for Porous Substrates:	775 g/L.
j. Other Adhesives and Sealants:	250 g/L.
- B. Protection Sheet: Epichlorohydrin or neoprene non reinforced flexible sheet, 55- to 60-mil- (1.4- to 1.5-mm-) thick, recommended by EPDM manufacturer for resistance to hydrocarbons, non-aromatic solvents, grease, and oil.
- C. Bonding Adhesive, splice cleaners, splice cement and splice tape: Manufacturer's standard.
- D. Prefabricated Control or Expansion Joint Flashing: Type approved for the total roof system by roofing manufacturer.
- E. Seaming Material: Manufacturer's standard, synthetic-rubber polymer primer and 6 inch (75-mm-) wide minimum, butyl splice tape with release film.
- F. Lap Sealant: Manufacturer's standard, single-component sealant, colored to match membrane roofing.
- G. Molded Pipe Flashings inside and outside corner flashing: as recommended by membrane manufacturer.
- H. Water Cutoff Mastic: Manufacturer's standard butyl mastic sealant.

- I. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch (25 by 3 mm) thick; with anchors.
- J. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, molded pipe boot flashings, preformed inside and outside corner sheet flashings, reinforced EPDM securement strips, T-joint covers, in-seam sealants, termination reglets, cover strips, and other accessories.
 - 1. Provide white flashing accessories for white EPDM membrane roofing.
- K. Walkway Pads: Protective surfacing for roof traffic shall be non-slip textured, pressure-sensitive walkway pads (with Factory-Applied Tape on the underside of the walkway) adhered to the membrane surface in conjunction with primer. Color to match roofing.
- L. Roof edge and coping system materials: Material shall be as specified herein or in Section(s) 077100 - Roof Specialties - Copings; Coping Covers, Scuppers, Flashings and Roof edge systems shall be included in the Roofing manufacturer's 20 year Total System NDL Warranty. Kynar finish for all metal components shall be as selected by Architect. Provide complete system with concealed cover plate, extenders, Factory-fabricated corners, end caps and fasteners.

2.05 SUBSTRATE BOARDS / THERMAL BARRIER

- A. Substrate Board / Thermal Barrier: ASTM C1278/C1278M, cellulosic-fiber-reinforced, water-resistant gypsum substrate, 1/2 inch (12.7 mm) thick.
 - 1. Products: Subject to compliance with requirements, provide the following:
 - a. Georgia-Pacific; DensDeck Prime Roof Board.
 - b. USG Corporation; Securock Gypsum-Fiber Roof Board.
 - c. Or approved equal.
- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM 4470, designed for fastening substrate panel to roof deck.

2.06 VAPOR RETARDER

- A. Self-Adhering-Sheet Vapor Retarder: ASTM D1970/D1970M, polyethylene film laminated to layer of rubberized asphalt adhesive, minimum 40-mil total thickness; maximum permeance rating of 0.1 perm; cold applied, with slip-resisting surface and release paper backing. Provide primer when recommended by vapor-retarder manufacturer.

2.07 ROOF INSULATION

- A. General: Preformed roof insulation boards manufactured or approved by EPDM roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated. Minimum LTTR of 30 required.
- B. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 1, Grade 3, felt or glass-fiber mat facer on both major surfaces.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Firestone Building Products; Tapered ISO 95+ TM GL Insulation.
 - b. Carlisle Syntec Systems; InsulBase Polyisocyanurate insulation.
 - c. Or approved equal.
- C. Tapered Insulation: Provide factory-tapered insulation boards fabricated to minimum slope of 1/4 inch per 12 inches (1:48) for new roof installations (unless otherwise indicated for re-roofing projects). Minimum LTTR-30, 4' x 4' board size.

- D. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated or at least twice the slope of the tapered insulation in the field of the roof areas.

2.08 INSULATION ACCESSORIES

- A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with roofing.
- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM 4470, designed for fastening roof insulation and cover boards to substrate, and acceptable to roofing system manufacturer.
- C. Flexible FAST Adhesive: Sure-Seal FAST 100 or 100 LV Adhesive: A low rise two-component spray-applied or extruded bead applied, to approved insulations to compatible substrates (concrete, cellular lightweight insulating concrete, gypsum, cementitious wood fiber, wood or steel) or smooth or gravel surfaced BUR, modified bitumen or cap sheets.
- D. Cover Board: ASTM C1278/C1278M, cellulosic-fiber reinforced, water-resistant gypsum substrate, 5/8 inch.
 - 1. Products: Subject to compliance with requirements, provide the following:
 - a. Georgia-Pacific; DensDeck Prime Roof Board.
 - b. USG Corporation; Securock Gypsum-Fiber Roof Board.
 - c. Securshield HD Plus Coverboard.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work:
 - 1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
 - 2. Verify that perimeter wood blocking, curbs, and nailers are securely anchored to roof deck at roof perimeters, penetrations and terminations in accordance with Factory Mutual 1-49 requirements and that nailers match thicknesses of insulation .
 - 3. Steel Decks: Verify that surface plane flatness and fastening of steel roof deck complies with manufacturer's requirements.
 - 4. Concrete Decks:
 - a. Verify that minimum concrete drying period recommended by roofing system manufacturer has passed.
 - b. Verify that concrete substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D4263.
 - c. Verify that concrete-curing compounds that will impair adhesion of roofing components to roof deck have been removed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

3.03 ROOFING INSTALLATION, GENERAL

- A. Install roofing system according to roofing system manufacturer's written instructions.
- B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.04 SUBSTRATE BOARD / THERMAL BARRIER INSTALLATION

- A. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.
 - 1. Fasten substrate board to top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of roof according to roofing system manufacturers' written instructions.

3.05 VAPOR-RETARDER INSTALLATION

- A. Self-Adhering-Sheet Vapor Retarder: Prime substrate if required by manufacturer. Install self-adhering-sheet vapor retarder over area to receive vapor retarder, side and end lapping each sheet a minimum of 3-1/2 inches and 6 inches, respectively. Seal laps by rolling.
- B. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into roofing system.

3.06 INSULATION INSTALLATION

- A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.
- B. Comply with roofing system and insulation manufacturer's written instructions for installing roof insulation.
- C. Install tapered insulation under area of roofing to conform to slopes indicated. Form crickets and saddles as indicated on approved roof installation shop drawings.
- D. Install insulation under area of roofing to achieve required LTTR of 30 minimum. Install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.
- E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.
- F. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.
- G. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
- H. Mechanically Fastened Insulation: Install insulation to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
- I. Fasten insulation to resist uplift pressure at corners, perimeter, and field of roof.

- J. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction. Loosely butt cover boards together and fasten to roof deck.
 - 1. Fasten cover boards according to requirements in FM Global's "RoofNav" for specified Windstorm Resistance Classification.
 - 2. Fasten cover boards to resist uplift pressure at corners, perimeter, and field of roof.

3.07 ADHERED MEMBRANE ROOFING INSTALLATION

- A. Adhere roofing over area to receive roofing according to membrane roofing system manufacturer's written instructions. Unroll membrane roofing and allow to relax before installing.
- B. Start installation of roofing in presence of roofing system manufacturer's technical personnel.
- C. Accurately align roofing, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- D. Bonding Adhesive: Apply to substrate and underside of roofing at rate required by manufacturer, and allow to partially dry before installing roofing. Do not apply to splice area of roofing.
- E. In addition to adhering, mechanically fasten roofing securely at terminations, penetrations, and perimeters.
- F. Apply roofing with side laps shingled with slope of roof deck where possible.
- G. Tape Seam Installation: Clean and prime both faces of splice areas, apply splice tape, and firmly roll side and end laps of overlapping roofing according to manufacturer's written instructions to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of roofing terminations.
- H. Repair tears, voids, and lapped seams in roofing that do not comply with requirements.
- I. Spread sealant or mastic bed over deck-drain flange at roof drains, and securely seal membrane roofing in place with clamping ring.
- J. Adhere protection sheet over membrane roofing at locations indicated.

3.08 WALKWAY INSTALLATION

- A. Flexible Walkways: Install walkway products in locations indicated. Adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.09 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components, and to furnish reports to Architect.
- B. Manufacturer's Field Services: The manufacturer's authorized Field Representative and Roofing Quality Control Inspector shall provide the following:
 - 1. Attend and conduct Pre-installation Meeting.
 - 2. Perform preparatory, initial, follow-up and final inspections for roof insulation and roofing system.

3. Prepare and submit inspection reports for each inspection made.
- C. Upon completion of the installation the manufacturer's authorized Field Representative shall conduct an on-site inspection in the presence of the Architect/Engineer to insure that the installation has been installed in accordance with the manufacturer's specifications.
- D. Flood Testing: Flood test each roofing area for leaks, according to recommendations in ASTM D 5957, after completing roofing and flashing but before overlying construction is placed. Install temporary containment assemblies, plug or dam drains, and flood with potable water.
 1. Flood to an average depth of 2-1/2 inches with a minimum depth of 1 inch and not exceeding a depth of 4 inches. Maintain 2 inches of clearance from top of base flashing.
 2. Flood each area for 24 hours.
 3. After flood testing, repair leaks, repeat flood tests, and make further repairs until roofing and flashing installations are watertight.
- E. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.
- F. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.
- G. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.10 PROTECTING AND CLEANING

- A. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.
- B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements, repair substrates, and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 075323

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Sheet metal flashing, flashing accessories, flashing sleeves and collars at mechanical and plumbing items, which extend through the roof or wall surfaces.
- B. Fastening hardware such as nails, screws, reglet wedge blocks, etc.
- C. Sheet metal capping over wood trim.

1.02 REFERENCES

- A. ASTM A-446 Specification for Steel Sheet
- B. ASTM B-209 Specification for Aluminum Sheet
- C. ASTM B-221 Specification for Aluminum Extruded Shapes
- D. FS QQ-L-201 Specification for Lead Sheet
- E. ASTM A792 Steel Sheet, Aluminum-Zinc Alloy-Coated, by the Hot-Dip Process
- F. ASTM B32 Solder Metal
- G. ASTM B209 Aluminum and Alloy Sheet and Plate
- H. ASTM B486 Paste Solder
- I. ASTM D226 Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
- J. ASTM D486 Asphalt Roof Cement, Asbestos-free
- K. FS O-F-506 Flux, Soldering, Paste and Liquid
- L. WH Warnock Hersey International, Inc., Middleton, WI.
- M. FM Loss Prevention Data Sheet
- N. NRCA National Roofing Contractors Association – Roofing Manual
- O. SMACNA Architectural Sheet Metal Manual

1.03 SUBMITTALS

- A. Section 013300 Submittal Procedures.
- B. Product Data: Submit manufacturer's literature of all materials specified herein to Architect/Engineer for approval in accordance with requirements described in General Requirements. Obtain approval from Architect/Engineer in writing prior to delivery and installation.
- C. Shop Drawings: Submit shop drawings for all metal flashing and trim. Submitted shop drawings shall include, but shall not be limited to the following:

1. Dimensioned drawings of all metal flashing at roof and wall penetrations and at changes and terminations of roofing and wall materials. Indicate proposed material, gauge and accessories.
 2. Indicate material profile, jointing pattern, jointing details, method of lapping joints, providing for expansion and turning corners, fastening methods, flashing terminations, and other installation details.
- D. Samples: Submit two samples 12 inches long illustrating typical gauge, external corner, internal corner, junction to vertical dissimilar surface, flashing and capping material and finish.

1.04 QUALITY CONTROL

- A. Fabricator and Installer: Company specializing in sheet metal flashing work with 6 years' experience. Provide documentation of experience with a minimum of twelve references for custom fabrication work upon request.
- B. Reference standards
1. Comply with details and recommendations of SMACNA Manual for workmanship, methods of joining, anchorage, provisions for expansion, etc.
- C. Manufacturer's Warranty
1. Pre-finished metal material shall require a written 20-year non-prorated warranty covering fade, chalking and film integrity. The material shall not show a color change greater than 5 NBS color units per ASTM D-2244 or chalking excess of 8 units per ASTM D-659. If either occurs material shall be replaced per warranty, at no cost to the Owner.
- D. Contractor's Warranty
1. The Contractor shall provide the Owner with a notarized written warranty assuring that all sheet metal work including caulking and fasteners to be watertight and secure for a period of five years from the date of final acceptance of the building. Warranty shall include all materials and workmanship required to repair any leaks that develop, and make good any damage to other work or equipment caused by such leaks or the repairs thereof.

1.05 DELIVERY, STORAGE AND PROTECTION

- A. Deliver and store materials in manufacturer's original, unopened containers or packages with labels intact and legible under the provisions of Section 016500.
- B. Stack pre-formed and pre-finished material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- C. Prevent contact with materials, which may cause discoloration or staining. Materials shall be stored in a safe, dry place.

1.06 GENERAL REQUIREMENTS

- A. Proper Surfaces: Surfaces to which roofing and flashings are to be applied shall be even, smooth, sound, thoroughly clean and dry, and free from all defects that might affect the application. Report any unsatisfactory surfaces to Architect/Engineer in writing, prior to commencing work.
- B. Accessories: All accessories or other items essential to the completeness of the metal flashing installation, though not specified, shall be provided. All such items, unless otherwise indicated on drawings or specified, shall be of same material as the item to which applied. Nails, screws and bolts shall be of the types best suited for the purpose intended and shall be of a composition that is compatible with the metal that it will contact.

- C. Dissimilar Materials: Where materials come in contact with dissimilar metals, an insulating paint or tape shall be applied between the dissimilar metals to prevent electrolysis between the two materials.
- D. Workmanship: Except as otherwise indicated on drawings or specified, the workmanship of metal flashing work, method of forming joints, anchoring, cleating, provisions for expansion, etc. shall conform to the standard details and recommendations of the following:
 - 1. The Aluminum Association.
 - 2. Federal Specifications.
 - 3. ASTM.
 - 4. Architectural Sheet Metal Manual, latest edition as published by the Sheet Metal and Air Conditioning Contractors National Association, Inc.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Flashing, counter flashing, flashing associated with mechanical and plumbing items and material for trim capping.
 - 1. Material: Continuous sheet, ASTM B209, .040 inch thickness. Coil stock will not be permitted. Provide proper size material to cap scheduled items, 20 inch (510 mm) width minimum for roof flashing.
 - 2. Mill finish for all roof penetration flashing.
 - 3. Finish – shop precoated with Kynar 500 or Hylar 5000 baked enamel finish.
 - 4. Flashing Nails: Standard round wire roofing type, hot dipped zinc coated steel; minimum 19/64 inch (7.54 mm) head diameter and 0.104 inch (0.356 mm) shank diameter; of sufficient length to penetrate through roof sheathing into wood substrate. Screws, bolts and nuts for fastening aluminum sheet metal work shall be made of aluminum alloys 6061-T6. Washers of similar material shall be used to prevent tearing of sheet metal.
- B. AST exhaust/roof penetration flashing, counter flashing and associated items.
 - 1. Material: Continuous 12 gauge sheet with welded seams ground smooth. Coil stock will not be permitted. Provide proper size and shaped material to cap scheduled items per approved mock up and as detailed in the approved shop drawings.
 - 2. Finish: Satin finish shall be No. 4 finish for exposed roof penetration flashing.
 - 3. Form exposed surfaces from single sheet of stock, free of joints whenever possible. Form surfaces flat without distortion. Maintain surfaces without scratches or dents. Shop assemble components and package complete with stainless steel anchors and fittings.
- C. Aluminum Sill: .040 aluminum continuous sheet sill, where indicated on drawings.
- D. Aluminum Capping: .032 Aluminum sheet material, color as selected by Owner.
- E. Nails for fastening aluminum sheet metal work shall be made of aluminum alloys 6062 or 5056 meeting Federal Specification FF-N-105, Type 2, Style 20. Screws, bolts and nuts for fastening aluminum sheet metal work shall be made of aluminum alloys 6061-T6. Washers of similar material shall be used to prevent tearing of sheet metal.

2.02 ACCESSORIES

- A. Sealant: Specified in Section 079200 – Joint Sealants.
- B. Slip Sheet: Resin paper.

2.03 FABRICATION

- A. Form sections true to shape, accurate in size, square and free from distortion or defects.
- B. Fabricate cleats, interlockable with sheet.
- C. Form pieces in longest possible lengths, in single-length sheets. Short lengths or splices will be unacceptable.
- D. Hem exposed edges on underside ¼ inch, miter and seam corners.
- E. Fabricate vertical faces with bottom edge formed outward ¼ inch and hemmed to form drip.
- F. Form corners from one piece with 18 inch minimum legs. Solder joints.
- G. Prime and paint all wood trim scheduled to receive capping.
- H. Form flashings to protect roofing materials from physical damage and to shed water. Seal metal joints.
- I. Apply bituminous paint on concealed surfaces of flashings.

PART 3 - EXECUTION

3.01 FABRICATION

- A. All metal flashing and trim work shall be fabricated in strict accordance with the detailed drawings and with best trade practices. Ends of fabricated sheets shall be fastened to make joints watertight and still provide for expansion and contraction. Lines and angles shall be sharp and true. Plane surfaces shall be free from waves and buckles. No oil canning shall be accepted in finished work. Seams shall be watertight.

3.02 EXAMINATION

- A. Section 013100 – Project Management and Coordination: Verification of existing conditions before starting work. Inspect all surfaces to which metal or metal accessories are to be installed. Do not install metal work unless such surfaces are sound, dry, clean and free of defects that might be detrimental to the metal work. Report any unacceptable conditions to the Architect/Engineer in writing before commencing work.
- B. Protect contact areas of dissimilar metals with heavy asphalt or other approved coating, specifically made to stop electrolytic action.
- C. Verify roof openings, curbs, pipes, sleeves, ducts, or vents through roof are solidly set, cant strips and reglets are in place, and nailing strips located.
- D. Verify membrane termination and base flashings are in place, sealed, and secure.
- E. Beginning of installation means acceptance of existing conditions.
- F. Field measure site conditions prior to fabricating work.

3.03 INSTALLATION

- A. Flashing shall be installed in strict accordance with trade practices. Completed installation shall be true to line with shapes undistorted, not damaged, and with properly shaped angles. Provide

expansion joints and other means for relieving stresses from expansion and contraction of the material.

- B. Install work watertight, without waves, warps, buckles, fastening stress, or distortion, allowing for expansion and contraction.
- C. All accessories or other items essential to the completeness of sheet metal installation, whether specifically indicated or not, shall be provided and of the same material as item to which applied.
- D. Flashing set into masonry shall be sealed with mortar. Tool joints tight and smooth.
- E. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- F. Seal joints watertight.
- G. Prime paint all wood trim scheduled to receive capping.

3.04 MANUFACTURED SHEET METAL SYSTEMS

- A. Installing Contractor shall be responsible for determining if the sheet metal systems are in general conformance with roof manufacturer's recommendations and warranty requirements.
- B. Furnish and install manufactured sheet metal systems in strict accordance with manufacturer's printed instructions.

3.05 SHOP FABRICATED SHEET METAL

- A. Installing Contractor shall be responsible for determining if the sheet metal systems are in general conformance with roof manufacturer's recommendations and warranty requirements.
- B. Metal work shall be shop fabricated to configurations and forms in accordance with recognized sheet metal practices.
- C. Hem exposed edges. Angle bottom edges of exposed vertical surfaces to form drip.
- D. All corners for sheet metal shall be lapped with adjoining pieces fastened and set in sealant.
- E. Install sheet metal to comply with Architectural Sheet Metal manual, Sheet Metal and Air Conditioning Contractor's National Associations, Inc.

3.06 ERECTION TOLERANCES

- A. Maximum Variation from Alignment: 1/8 inch.

3.07 GUARANTEE

- A. The Contractor shall guarantee that all materials and workmanship provided by this section shall be guaranteed free of defects for a period of five (5) years from date of acceptance. Any defects arising within this period shall be promptly corrected without additional cost. This is in addition to the manufacturer's warranty.

END OF SECTION 076200

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Copings.

1.03 REFERENCE STANDARDS

- A. ANSI/SPRI/FM 4435/ES-1 - Test Standard for Edge Systems Used with Low Slope Roofing Systems; 2017.
- B. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.
- C. FM (AG) - FM Approval Guide; current edition.

1.04 PERFORMANCE REQUIREMENTS

- A. General Performance: Roof specialties shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Single Ply Roofing Industry (SPRI) Wind Design Standard: Manufacture and install copings tested according to SPRI ES-1, Test Method RE-3, and be capable of resisting the following design pressures:
 - 1. Design Pressure: As indicated on Drawings.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.05 ACTION SUBMITTALS

- A. See Section 013300 - SUBMITTALS.
- B. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- C. Shop Drawings: For roof specialties. Include plans, elevations, expansion-joint locations, keyed details, and attachments to other work. Distinguish between plant- and field-assembled work. Include the following:
 - 1. Details for expansion and contraction; locations of expansion joints, including direction of expansion and contraction.
 - 2. Pattern of seams and layout of fasteners, cleats, clips, and other attachments.
 - 3. Details of termination points and assemblies, including fixed points.
 - 4. Details of special conditions.

- D. Samples for Verification: For copings made from 12-inch lengths of full-size components including fasteners, cover joints, accessories, and attachments.
- E. Color Samples for Initial Selection Purposes: Submit manufacturer's color samples of materials, consisting of complete color chart representing manufacturer's full range of available colors.

1.06 INFORMATIONAL SUBMITTALS

- A. See Section 013300 - SUBMITTALS.
- B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for copings. Submit evidence of compliance with ANSI/SPRI/FM 4435/ES-1, test method RE-3, meeting the wind speed and pressures required in this section and in accordance with the AHJ and the governing Building Code.
- C. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum twenty-five (25) years documented experience.
- D. Installer Qualifications: Company specializing in the installation of products specified in this section with minimum five (5) years documented experience.
- E. Warranty Documentation: Submit sample warranties covering workmanship, wind speed and finishes.

1.07 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For roofing specialties to include in maintenance manuals.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Do not store roof specialties in contact with other materials that might cause staining, denting, or other surface damage. Store roof specialties away from uncured concrete and masonry.
- B. Protect strippable protective covering on roof specialties from exposure to sunlight and high humidity, except to extent necessary for the period of roof specialties installation.

1.09 WARRANTY

- A. Provide a fully executed manufacturer's warranty as specified for the Coping System, when installed per manufacturer's instructions. Product Warranty Period:
 - 1. Wind, 215 mph: Lifetime.
 - 2. Five-year workmanship warranty covering replacement or repair of products that are defective in material or workmanship.
- B. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace roof specialties that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 30 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 EXPOSED METALS

- A. Aluminum Sheet: ASTM B209, alloy as standard with manufacturer for finish required, with temper to suit forming operations and performance required.
 - 1. Surface: Smooth, flat finish.
 - 2. Exposed Coil-Coated Finishes: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - a. Three-Coat Fluoropolymer: AAMA 2605. System consisting of primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70 percent PVDF resin by weight.
 - b. Concealed Surface: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

2.02 CONCEALED METALS

- A. Aluminum Sheet: ASTM B209, alloy and temper recommended by manufacturer for type of use and structural performance indicated, mill finished.
 - 1. Material: 0.063 inch aluminum

2.03 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
 - 1. Thermal Stability: ASTM D1970/D1970M; stable after testing at 240 deg F.
 - 2. Low-Temperature Flexibility: ASTM D1970/D1970M; passes after testing at minus 20 deg F.
 - 3. Products: Subject to compliance with requirements, provide one of the following:
 - a. Carlisle Coatings & Waterproofing; CCW WIP 300HT.
 - b. Grace Construction Products, a unit of W. R. Grace & Co.; Ultra.
 - c. Henry Company; Blueskin PE200 HT.

2.04 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.
- B. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to meet performance requirements. Furnish the following unless otherwise indicated by the manufacturer:
 - 1. Fasteners for Aluminum: Aluminum or Series 300 stainless steel.
- C. Elastomeric Sealant: ASTM C920, elastomeric polyurethane polymer sealant of type, grade, class, and use classifications required by roofing-specialty manufacturer for each application.
- D. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

2.05 COPINGS

- A. Copings: Manufactured coping system consisting of formed-metal coping cap in section lengths not exceeding 12 feet, concealed anchorage; corner units, end cap units, and 8 inch

wide concealed splice plates with factory-applied , dual, non-curing, isocryl butyl sealant strips at each joint. Splice plates finish shall match coping cap finish.

1. Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Metal-Era, Inc.: Edge Systems One Coping (Basis of Design)
 - 1) Tel.: 1-800-558-2162
 - b. MM Systems Corporation.
 - c. Hickman Company, W. P.
 - d. Merchant & Evans, Inc
 - e. Perimeter Systems; a division of Southern Aluminum Finishing Company, Inc.
 - f. Petersen Aluminum Corporation.
2. Coping-Cap Material: aluminum, 0.063 (8-16 inches wide) inch thick.
 - a. Finish: Three-coat fluoropolymer.
 - b. Color: As selected by Architect from manufacturer's full color range.
3. Inside and Outside Corners, Transition Miters, T-Miters, Z miters, Step-up Miters and Peak/Valley Miters: Factory mitered and continuously welded.
4. Endcaps and Endwall Flashings, Pilaster Caps: Factory Fabricated to match coping finish and profiles, welded where possible.
5. Coping-Cap Attachment Method: Snap-on, fabricated from coping-cap material.
6. Snap-on-Coping Anchor Plates: Concealed, galvanized-steel sheet, 12 inches wide, with integral cleats.
7. Continuous Cleats: 20 gauge galvanized steel. Provide at inside and outside face edges.
8. Type: Tapered
9. Outside Face: As indicated on the drawings.
10. FM Approved Ratings:
 - a. Perimeter rating: 1-150.
 - b. Corner Rating: 1-225
11. ANSI/SPRI/FM 4435/ES-1, Test Method RE-3 compliant, when tested at the pressures specified or required by the AHJ.

2.06 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
- B. Examine walls, roof edges, and parapets for suitable conditions for roof specialties.
- C. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 UNDERLAYMENT INSTALLATION

- A. Self-Adhering Sheet Underlayment: Install wrinkle free. Apply primer if required by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer rather than nails for installing underlayment at low temperatures. Apply in shingle fashion to shed water. Overlap edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days.

3.03 INSTALLATION, GENERAL

- A. General: Install roof specialties according to manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete roof-specialty systems.
 - 1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
 - 2. Provide uniform, neat seams with minimum exposure of solder and sealant.
 - 3. Install roof specialties to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture. Tie into specified roofing system in accordance with the approved roofing manufacturer's specifications and instructions to support issuance of the Total System Roofing Warranty inclusive of edge metals specified herein.
 - 4. Torch cutting of roof specialties is not permitted.
 - 5. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
 - 1. Coat concealed side of uncoated aluminum roof specialties with bituminous coating or install a compatible separator membrane where in contact with wood, ferrous metal, or cementitious construction.
- C. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.
 - 1. Space movement joints at a maximum of 12 feet with no joints within 18 inches of corners or intersections unless otherwise shown on Drawings.
 - 2. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.
- D. Fastener Sizes: Use fasteners of sizes that will penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
- E. Seal joints with sealant as required by roofing-specialty manufacturer.
- F. Seal joints as required for watertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F.

3.04 COPING INSTALLATION

- A. Install cleats, anchor plates, and other anchoring and attachment accessories and devices with compatible concealed fasteners.
- B. Anchor copings to meet performance requirements.
 - 1. Interlock face and back leg drip edges of snap-on coping cap into cleated anchor plates anchored to substrate at 30-inch centers maximum or manufacturer's and FM required spacing to comply with performance requirements.

3.05 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder and sealants.
- C. Remove temporary protective coverings and strippable films as roof specialties are installed. On completion of installation, clean finished surfaces including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain roof specialties in a clean condition during construction.
- D. Replace roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 077100

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Aluminum gutters, conductors, downspouts, and accessories.

1.02 REFERENCES

- A. ASTM B32 - Solder Metal.
- B. ASTM B209 - Aluminum and Aluminum Alloy Sheet and Plate.
- C. SMACNA - Architectural Sheet Metal Manual.

1.03 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Product Data: Each type of product specified. Submit manufacturer's detailed technical product data, installation instructions and recommendations, dimensions of individual components, profiles, and finishes.
- C. Shop Drawings: Show fabrication and installation of commercial gutter system including fully dimensioned roof plans, jointing methods, fastening methods, expansion joint locations, sections and details of components and other related trims.
- D. Finish & Color Selection: Furnish manufacturer's technical data for specified finish and color chart showing full range of colors available.
- E. Samples: Upon request, submit two samples, 6 inches (150 mm) long, illustrating component design, finish, color and configuration.

1.04 REGULATORY REQUIREMENTS

- A. Conform to applicable code(s) for size and method of rain water discharge.

1.05 QUALITY ASSURANCE

- A. Obtain all components and related accessories from one single source manufacturer.
- B. Follow manufacturer's printed instructions for installing commercial gutter system. Follow primary roofing manufacturer's printed instructions for installing associated roof material for flashing gutter system to roof.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Section 016500.
- B. Stack preformed and prefinished material to prevent twisting, bending or abrasion, and to provide ventilation. Store in a clean, dry location.
- C. Prevent contact with materials during storage which may cause discoloration, staining or damage.

- D. Products furnished with strippable protective masking shall not be exposed to direct sunlight for more than 30 minutes without removing masking.
- E. Do not install finished materials with scars or abrasions.

1.07 COORDINATION

- A. Coordinate work under provisions of Section 013100 and with adjoining work for proper sequencing to ensure protection from inclement weather and to protect materials and their finish against damage.
- B. Do not install commercial gutter system during inclement weather. When installing in cold climates, warm adhesives, caulks, and primers to at least 50 degrees fahrenheit prior to application.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Aluminum: ASTM B209, 3003 alloy, H14 temper; 0.040 inch-thick square; mill finish interior. Minimum 10 foot lengths.
 - 1. Manufactured with 1" telescoping and notched end.
 - 2. Factory punched with fastening holes elongated to allow for thermal movement.
 - 3. Gutters shall be press formed on a CNC Press to provide repeated true and accurate profiles.
 - 4. Support bracket shall be manufactured from 0.125" x 1.00" aluminum, factory punched for fasteners.
 - 5. Interior straps shall be manufactured from 0.125" x 1.00" aluminum.

2.02 COMPONENTS

- A. Gutters: SMACNA style profile seamless, 6" K-style, ogee profile.
- B. Downspouts: SMACNA rectangular profile seamless 3"x4".

2.03 FABRICATION

- A. Form gutters and downspouts of profiles and sizes indicated in accordance with approved shop drawings.
- B. Fabricate with required connection pieces.
- C. Form sections square, true and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints.
- D. Hem exposed edges of metal.
- E. Solder shop formed metal joints. After soldering, remove flux. Wipe and wash solder joints clean. Weather seal joints.
- F. Fabricate gutter and downspout accessories; seal watertight.

2.04 ACCESSORIES

- A. Anchorage Devices: Type recommended by fabricator.

- B. Gutter Supports: Hidden hangers at 30" o.c. maximum
- C. Downspout Supports: Straps, 60" maximum spacing (minimum 3) finished to match downspout.
- D. End Caps: Fabricate to gutter profile.
- E. Mitered Corners: Miter shall be precision saw cut with a continuous heliarc weld watertight joint.
- F. End Caps: Provide factory end caps at all gutter ends and wall abutments.
- G. Liner Expansion Joint: Provide manufacturer's elastomeric expansion joints with cover plates at 40' intervals or as shown on shop drawings.
- H. Fasteners: Aluminum finish exposed fasteners same as flashing metal.
- I. Leaf Screen: aluminum welded screen, sized to fit and cover entire length of gutter without gaps.
- J. Boot Cap: Provide 4"x3"x12" cast iron boot cap, Zurn model Z192 or equal, to transition into drain pipe at each downspout location.
 - 1. Provide with cleanout port
- K. Sealant: Shall be polyurethane or silicon based waterproofing type, compatible with aluminum gutter, downspout, and abutting dissimilar materials for intended application.
- L. Primer: Zinc chromate type.
- M. Protective Backing Paint: Bituminous.

2.05 FABRICATION

- A. Form gutters and downspouts of profiles and sizes indicated in accordance with approved shop drawings.
- B. Fabricate with required connection pieces.
- C. Form sections square, true and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints.
- D. Hem exposed edges of metal.
- E. Solder shop formed metal joints. After soldering, remove flux. Wipe and wash solder joints clean. Weather seal joints.
- F. Fabricate gutter and downspout accessories; seal watertight.

2.06 DRAINWARE

- A. Downspout & Elbows: Provide downspout in sizes and locations as indicated on plans. Downspouts shall be manufactured from 0.040/0.032 aluminum, finished to match gutter. Downspout elbows shall have heliarc welded joints.
- B. Outlets: At all downspout locations provide aluminum outlets to connect liner to downspout.

- C. Wall Brackets: Provide Style 1 Wall brackets at 60" maximum spacing (minimum 3 brackets). Brackets shall be manufactured from 0.125" x 1.00" aluminum, finished to match downspout.

2.07 FINISHES

- A. Coating Type: High Performance Coating, two-coat, shop applied, 70% Polyvinylidene Fluoride (PVDF) coating based on Elf Arkema Chemicals, Inc. Kynar 500 or Ausimont USA, Inc. Hylar 5000 resin, meeting AAMA 2605 specification.
- B. Color: Select from manufacturer's full range of 56 EZ Mix Colors.
- C. Apply bituminous protective backing on surfaces in contact with dissimilar materials.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. The installer must examine substrates and conditions under which commercial gutter system will be installed. All wood plates and/or fascia boards shall be installed true, straight, and free of splits, cracks, or other irregularities. Do not proceed with installation until unsatisfactory conditions are corrected.

3.02 PREPARATION

- A. Prior to the installation of the commercial gutter system, soffits, extenders, and associated cornice profiles shall be installed.
- B. Installer shall thoroughly read and follow manufacturer's installation instructions before proceeding with installation.

3.03 INSTALLATION

- A. General: The commercial gutter system shall be installed in strict accordance with manufacturer's printed instructions and approved shop drawings. Deviations from the instructions are not allowed.
- B. Gutter: Install gutter onto support brackets and fasten to substrates with aluminum or stainless-steel nails maximum 30 inches o.c. Rivet and seal liner joints with high grade exterior sealant as recommended by gutter manufacturer.
- C. Slope gutters 1/8 inch per foot minimum to leader locations.
- D. Expansion Joints: Install elastomeric expansion joints as shown on plans and/or shop drawings. Maximum expansion joint spacing shall be 40' centers.
- E. Install interior straps by fully engaging them into gutter's hemmed edge, complete by securely riveting.

END OF SECTION 077123

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Penetrations in fire-resistance-rated walls.
 - 2. Penetrations in horizontal assemblies.
 - 3. Penetrations in smoke barriers.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product specified.
- B. Product Schedule: For each penetration firestopping system. Include location and design designation of qualified testing and inspecting agency.

1.04 FIELD QUALITY CONTROL

- A. Section 014500 - QUALITY CONTROL: Field inspection and testing.
 - 1. Inspect the installed firestopping after application and curing for integrity, prior to its concealment.
 - 2. Ensure that actual thicknesses, densities, and bond strengths meet requirements for specified ratings.
 - 3. Re-inspect the installed firestopping for integrity of fire protection, after installation of subsequent work.
 - 4. Provide written inspection report and certification to the Architect, indicating installation meets or exceeds requirements of contract documents.

1.05 FIELD MOCK-UP

- A. Field Mock-up Installations: Prior to installing firestopping, erect mock-up installations for each type firestop system indicated in the Firestop Schedule to verify selections made and to establish standard of quality and performance by which the firestopping work will be judged by the Owner or Owner's Representative. Obtain acceptance of mock-up installations by the Owner or Owner's Representative before start of firestopping installation. Provide at least 72 hours notice to Owner or Owner's Representative prior to inspection.

1.06 INFORMATIONAL SUBMITTALS

- A. See Section 013300 - SUBMITTALS, for Submittal Procedures.
- B. Qualification Data: For qualified Installer.
- C. Installer Certificates: From Installer indicating penetration firestopping has been installed in compliance with requirements and manufacturer's written recommendations.
- D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for penetration firestopping.

1.07 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by FM Global according to FM 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."
- B. Installer Qualifications: A firm experienced in installing penetration firestopping similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its penetration firestopping products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.
- C. Fire-Test-Response Characteristics: Penetration firestopping shall comply with the following requirements:
 - 1. Penetration firestopping tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
 - 2. Penetration firestopping is identical to those tested per testing standard referenced in "Penetration Firestopping" Article. Provide rated systems complying with the following requirements:
 - a. Penetration firestopping products bear classification marking of qualified testing and inspecting agency.
 - b. Classification markings on penetration firestopping correspond to designations listed by the following:
 - 1) FM Global in its "Building Materials Approval Guide."
 - 2) UL Fire Resistance Directory.
 - (a) Firestop Devices (XHJI)
 - (b) Fire Resistance ratings (BXRH)
 - (c) Through Penetration Firestop Systems (XHEZ)
 - (d) Fill Voids or Cavity Materials (XHHW)
 - (e) Forming Materials (XHKU)
- D. Preinstallation Conference: Conduct conference at Project site.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials undamaged in manufacturer's clearly labeled, unopened containers, identified with brand, type, and UL label where applicable.
- B. Coordinate delivery of materials with scheduled installation date to allow minimum storage time at job-site.
- C. Store materials under cover and protect from weather and damage in compliance with manufacturer's requirements.
- D. Comply with recommended procedures, precautions or remedies described in material safety data sheets as applicable.
- E. Do not use damaged or expired materials.

1.09 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install penetration firestopping when ambient or substrate temperatures are outside limits permitted by penetration firestopping manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

- B. Install and cure penetration firestopping per manufacturer's written instructions using natural means of ventilation's or, where this is inadequate, forced-air circulation.

1.10 COORDINATION

- A. Do not use materials that contain flammable solvents.
- B. Scheduling:
 - 1. Schedule installation of Cast in Place firestop devices after completion of floor formwork, metal form deck, or composite deck but before placement of concrete.
 - 2. Schedule installation of other firestopping materials after completion of penetrating item installation but prior to covering or concealing of openings.
- C. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.
- D. Weather Conditions: Do not proceed with installation of firestop materials when temperatures exceed the manufacturer's recommended limitations for installation printed on product label and product data sheet.
- E. During installation, provide masking and drop cloths to prevent firestopping materials from contaminating any adjacent surfaces.
- F. Coordinate construction of openings and penetrating items to ensure that penetration firestopping is installed according to specified requirements.
- G. Coordinate sizing of sleeves, openings, core-drilled holes, Cast-in place sleeves or cut openings to accommodate penetration firestopping.
- H. Coordinate construction of openings and penetrating items to ensure that penetration firestopping is installed according to specified requirements.
- I. Coordinate sizing of sleeves, openings, core-drilled holes, Cast-in place sleeves or cut openings to accommodate penetration firestopping.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Hilti, Inc.
 - 2. 3M Fire Protection Products.
 - 3. STI Firestop
 - 4. Tremco, Inc.; Tremco Fire Protection Systems Group.
 - 5. USG Corporation.

2.02 PENETRATION FIRESTOPPING

- A. Provide penetration firestopping that is 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 construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

- B. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 - 1. Fire-resistance-rated walls include fire walls fire-barrier walls smoke-barrier walls and fire partitions.
 - 2. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Penetrations in Horizontal Assemblies: Provide penetration firestopping with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 - 1. Horizontal assemblies include floors floor/ceiling assemblies and ceiling membranes of roof/ceiling assemblies.
 - 2. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.
 - 3. T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
- D. Penetrations in Smoke Barriers: Provide penetration firestopping with ratings determined per UL 1479.
 - 1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at 0.30-inch wg at both ambient and elevated temperatures.
- E. W-Rating: Provide penetration firestopping showing no evidence of water leakage when tested according to UL 1479.
- F. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E84.
- G. VOC Content: Penetration firestopping sealants and sealant primers shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - 1. Sealants: 250 g/L.
 - 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 - 3. Sealant Primers for Porous Substrates: 775 g/L.
- H. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.
 - 1. Permanent forming/damming/backing materials, including the following:
 - a. Slag-wool-fiber or rock-wool-fiber insulation.
 - b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
 - c. Fire-rated form board.
 - d. Fillers for sealants.
 - 2. Temporary forming materials.
 - 3. Substrate primers.
 - 4. Collars.
 - 5. Steel sleeves.
- I. Identification Labels:
 - 1. Furnished by fire stopping manufacturer of suitable material for permanent field identification of through-penetration firestops.
 - 2. Identify the following:
 - a. Warning Wording

- b. Manufacturer Name.
 - c. Product Catalog number.
 - d. Tested System number.
 - e. F-rating.
 - f. T-rating, if applicable.
 - g. Firestop Contractor name.
 - h. Firestop Contractor Contact Number.
 - i. Firestop Inspection Date & Inspector Initials.
3. Field fabricated labels are not acceptable.

2.03 FILL MATERIALS

- A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.
1. Hilti CP 680 M or P Cast-In-Place Firestop Device
 - a. Add Aerator adapter when used in conjunction with aerator ("sovent") system.
 2. Hilti CP 681 Tub Box Kit for use with tub installations.
 3. Specified Technologies Inc. CID cast-in devices.
- B. Sealants, caulking materials or foams for use with non-combustible items including items including steel pipe, copper pipe, rigid steel conduit and electrical metallic tubing (EMT), the following products are acceptable:
1. Hilti FS-ONE MAX Intumescent Firestop Sealant.
 2. Hilti CP 604 Self-leveling Firestop Sealant.
 3. Hilti CP 620 Fire Foam
 4. Hilti CP 606 Flexible Firestop Sealant
 5. Hilti CP 601s Elastomeric Firestop Sealant.
- C. Sealants, caulking materials or foams for use with sheet metal ducts the following products are acceptable:
1. Hilti FS-ONE MAX Intumescent Firestop Sealant.
 2. Hilti CP 606 Flexible Firestop Sealant
 3. Hilti CP 601s Elastomeric Firestop Sealant:
- D. Firestop Joint Spray: sprayable fire-rated mastic for deck flutes and joints where greater movement is expected:
1. Hilti Firestop Joint Spray CFS-SP-WB.
- E. Mineral Wool plugs for filling steel deck flute and wall gap openings:
1. Hilti CP 777 Friction Fit sized and cut to depth for deck flute openings as recommended by the manufacturer.
 2. Hilti CP 767 continuous filler strip for filling continuous gaps at top of walls.
- F. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
1. Hilti FS-ONE MAX Intumescent Firestop Sealant
 2. Hilti CP 620 Fire Foam
 3. Hilti CP 601s Elastomeric Firestop Sealant
 4. Hilti CP 606 Flexible Firestop Sealant.
- G. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized-steel sheet.

- H. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.
 - 1. Hilti FS-ONE MAX Intumescent Firestop Sealant
 - 2. Hilti CP 604 Self-leveling Firestop Sealant
- I. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with steel lining on one side.
 - 1. Hilti CP 643N Firestop Collar
 - 2. Hilti CP 644 Firestop Collar.
 - 3. Hilti CP 645 / 648 E Wrap Strips.
- J. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.
 - 1. Acceptable materials are "BIO FIRESHIELD "Novasit K-10".
- K. Pillows/Bags / Pads: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.
 - 1. Hilti CP 617 Firestop Putty Pad
- L. Foams, intumescent sealants, or caulking materials for use with flexible cable or cable bundles, the following products are acceptable:
 - 1. Hilti FS-ONE MAX High Performance Intumescent Firestop sealant
 - 2. Hilti CP 620 Fire Foam
 - 3. Hilti CP 601s Elastomeric Firestop Sealant.
 - 4. Hilti CP 606 FS Flexible Firestop Sealant.
- M. Sleeves: Re-penetrable cable management device for electrical and telecommunication cabling and cable bundles for use with appropriate Firestopping sealant, fill mortar, putty or other devices and materials. Concrete assemblies up to 3 hour and Gypsum Board assemblies up to 4 hour.
 - 1. Hilti CP 653 Speed Sleeve.
- N. Non-curing, re-penetrable intumescent putty or foam materials for use with flexible cable or cable bundles, the following products are acceptable:
 - 1. Hilti CP 618 Firestop Putty Stick
 - 2. Hilti CP 658T Firestop Plug.
- O. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:
 - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and sloped surfaces, unless indicated firestopping limits use of nonsag grade for both opening conditions.
- P. Non-curing, re-penetrable materials used for large openings and complex penetrations made to accommodate cable trays and bundles, multiple steel and copper pipes, electrical busways in raceways, the following products are acceptable.
 - 1. Hilti FS 657 Fire Block
 - 2. Hilti CP 675T Firestop Board / Brick
- Q. Materials used for large openings and complex penetrations made to accommodate cable trays and bundles, multiple steel and copper pipes. electrical busways in raceways, the following products are acceptable:

1. Hilti FS 637 Trowelable Firestop Compound.
- R. Mineral Fiber Fire Safing insulation:
 1. Provide insulation as manufactured by USG INTERIORS, INC. Product "Thermafiber Safing", CAFCO INDUSTRIES LTD., FIBREX INC. or approved equal. Density shall be 4 pcf with thickness to suit condition
 - a. Provide 20 gauge minimum metal plate where required for fire safing support to comply with fire ratings
 - b. Do not use fibrous safing insulation unless it is in conjunction with a compatible smoke seal as specified herein.
- S. Mineral Wool
 1. Loose mineral wool, rated noncombustible when tested according to ASTM E136, free of asbestos and glass fiber, and suitable for stuffing into metal deck flutes to an in place density of 6 to 12 pcf.

2.04 MIXING

- A. For those products requiring mixing before application, comply with penetration firestopping manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Verification of Conditions: Examine areas and conditions under which Work is to be performed and identify conditions detrimental to proper or timely completion.
- B. Surface Cleaning: Clean out openings immediately before installing penetration firestopping to comply with manufacturer's written instructions and with the following requirements:
 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping.
 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping. Remove loose particles remaining from cleaning operation.
 3. Remove laitance and form-release agents from concrete.
- C. Priming: Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- D. Masking Tape: Use masking tape to prevent penetration firestopping from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing firestopping seal with substrates.

3.03 INSTALLATION

- A. General: Install penetration firestopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
 - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping.
- C. Install fill materials for firestopping by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
 - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 - 3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.04 IDENTIFICATION

- A. Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
 - 1. Identify the following:
 - a. "WARNING - FIRESTOP MATERIAL - DO NOT DISTURB. NOTIFY BUILDING MANAGEMENT OF ANY DAMAGE".
 - b. Manufacturer Name: _____.
 - c. Product Catalog number: _____.
 - d. Tested System number: _____.
 - e. F rating: _____.
 - f. T rating, if applicable.
 - g. Firestop Contractor name: _____.
 - h. Firestop Contractor Contact Number: _____.
 - i. Firestop Inspection Date & Initials: _____.
 - j. T-rating, if applicable.
 - k. Firestop Contractor name.
 - l. Firestop Contractor Contact Number.
 - m. Firestop Inspection Date & Inspector Initials.

3.05 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping is without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping and install new materials to produce systems complying with specified requirements.

FIRESTOP SCHEDULE

Project No:	Contractor Name and Address:	Date Submitted:
Project Title:	Supplier/Installer Name and Address:	Company Field Advisor Name and Address:
	Manufacturer Name and Address:	

[illegible]

END OF SECTION 078413

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Preparation of sealant substrate surfaces.
- B. Sealants and joint backing.
- C. Joint sealants to be provided at:
 - 1. Joints of all material requiring caulking or sealants and to prevent water, moisture, and air infiltration.
 - 2. Perimeter of wall openings, joints, and ends.
 - 3. Perimeter of piping wall and/or floor penetrations.
 - 4. Intersections of different materials requiring caulking and sealants.

1.02 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM C717 - Standard Terminology of Building Seals and Sealants.
 - 2. ASTM C834 - Specification for Latex Sealants.
 - 3. ASTM C920 - Specification for Elastomeric Joint Sealants.
 - 4. ASTM D1056 - Flexible Cellular Material- Sponge or Expanded Rubber.
 - 5. ASTM C1193 - Standard Guide for Use of Joint Compounds.
- B. Federal Specifications (FS):
 - 1. FS SS-S-200 - Sealing Compounds, Two Component, Elastomeric, Polymer Type, Jet-Fuel Resistant, Cold Applied.
 - 2. FS TT-S-1657 - Sealing Compound, Single Component Butyl Rubber Based Solvent Release Type (for Buildings and other Types of Construction).
 - 3. SWRI (Sealant, Waterproofing and Restoration Institute) - Sealant and Caulking Guide Specifications.

1.03 SUBMITTALS

- A. Submit under provision of Section 013300.
- B. Manufacturer's complete descriptive product data including chemical characteristics, performance criteria, substrate preparation, limitations, and color availability.
- C. Manufacturer's installation instructions: Indicate special procedures, surface preparation, and perimeter conditions requiring special attention.
- D. Submit schedule of all conditions and joints requiring caulking and sealant proposed for each condition.

1.04 QUALITY ASSURANCE

- A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. All work shall be performed by a qualified caulking and sealant contractor, who has specialized in this type of work for a minimum of five (5) years. Provide a minimum of five (5) references to the engineer for review and approval.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Section 016500 - Product Requirements: Transport, handle, store, and protect products.
- B. Deliver Products in manufacturer's original unopened containers or packages with labels intact, identifying product and manufacturer, date of manufacture, lot number, shelf life, curing time, and mixing instructions, where applicable.
- C. Store and handle materials to prevent deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.06 PERFORMANCE REQUIREMENTS

- A. Install sealants to prevent air and moisture from infiltrating or migrating from the building exterior to the interior.

1.07 PROTECTION

- A. Mask surrounding surfaces.
- B. Protect sealants until cured.

1.08 ENVIRONMENTAL REQUIREMENTS

- A. Install sealant during manufacturer's recommended temperature and humidity ranges and weather conditions for application and cure. Consult manufacturer when sealant cannot be applied during recommended conditions.

1.09 COORDINATION

- A. Coordinate the work with all sections referencing this section.

1.10 WARRANTY

- A. The products covered under this Section shall be covered by the manufacturer's standard 5-year warranty and include coverage for installed sealants and accessories which fail to achieve watertight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 - PRODUCTS

2.01 SEALANT MANUFACTURERS

- A. Subject to compliance with project requirements, manufacturers offering specified items which may be incorporated into the work include the following:
 - 1. Bostik, Inc, Huntingdon Valley, PA, (800) 523-2678, (125) 674-5600.
 - 2. Dow Corning, Midland, MI (517) 496-4000.
 - 3. GE Silicones, Waterford, NY (518) 233-3330.
 - 4. Mameco International, Cleveland, OH, (800) 321-6412, (216) 752-4400.
 - 5. W.R. Meadows, Inc, Elgin, IL (800) 342-5976, (847) 683-4500.
 - 6. Nomaco, Inc., Zebulon, NC, (919) 269-6500.
 - 7. Pecora Corporation, Harleysville, PA, (800) 523-6688, (215) 723-6051.
 - 8. Sika Corporation, Lyndhurst, NJ, (800) 933-7452, (201) 933-8800.
 - 9. Sonneborn Building Products Div. ChemRex, Inc., Shakopee, MN (800) 243-6739, (612) 496-6000.
 - 10. Tremco, Beachwood, OH, (800) 852-3821, (216) 292-5000.
 - 11. USG Corp., Chicago, IL (800) 874-4968, (312) 606-4000.

12. Sherwin-Williams Co. (The), Cleveland, OH (800) 321-8194

2.02 BUILDING SEALANTS (SEE SEALANT SCHEDULE AT THE END OF THIS SECTION FOR SPECIFIC USE OF SEALANTS.)

A. Urethanes:

1. Type 1: Two-Part Urethane: Self-Leveling, ASTM C920, Type M, Grade P, Class 25.
 - a. Chem-Calk CC-550, by Bostik.
 - b. Vulkem 245, by Mameco.
 - c. Vulkem 255, Wide-Joint, by Mameco.
 - d. NR-200 Urexpam, by Pecora Corporation.
 - e. Loxon 2K SL Multi-Component Polyurethane Sealant, by Sherwin-Williams.
2. Type 2: Two-Part Urethane: Non-Sag, ASTM C920, Type M, Grade NS, Class 25.
 - a. Chem-Calk 500, by Bostik.
 - b. Vulkem 227, by Mameco.
 - c. Sonolastic NP 2, by Sonneborn Building Products, ChemRex Inc.
 - d. Loxon 2K NS Multi-Component Polyurethane Sealant, by Sherwin-Williams.
3. Type 3: One-Part Urethane: Self-Leveling, ASTM C920, Type S, Grade P, Class 25.
 - a. Vulkem 45, by Mameco.
 - b. Urexpam NR-201, by Pecora Corporation.
 - c. Sonolastic SL1, by Sonneborn Building Products, ChemRex Inc.
 - d. Sikaflex 1C-SL by Sika.
 - e. Loxon 1K SL Polyurethane Sealant, by Sherwin-Williams.
4. Type 4: One-Part Urethane: Non-Sag, ASTM C920, Type S, Grade NS, Class 25.
 - a. Chem-Calk 900, by Bostik.
 - b. Vulkem 116, by Mameco.
 - c. Sonolastic NP I, by Sonneborn Building Products, ChemRex Inc.
 - d. Loxon 1K Smooth Polyurethane Sealant, by Sherwin-Williams.

B. Silicones:

1. Type 1: One-Part Silicones: ASTM C920, Type S, Grade NS, Class 50.
 - a. 795 Silicone Building Sealant, by Dow Corning.
 - b. 864 Architectural Silicone Sealant, by Pecora Corporation.
 - c. White Lightning Silicone Ultra Sealant, by Sherwin-Williams.
2. Type 2: One-Part Silicones: ASTM C920, Type S, Grade NS, Class 25.
 - a. 999-A Silicone Building & Glazing Sealant, Dow Corning.
 - b. Construction 1200 Sealant, General Electric Company.
3. Type 3: One-Part Silicones: ASTM C920, Type S, Grade NS, Class 25. Vertical Surfaces Only.
 - a. Construction 1200 Sealant, General Electric Company.
 - b. 999-A, Dow Corning.
 - c. 860 Glaziers and Contractors Silicone Sealant, by Pecora Corporation. (colors only)
4. Type 4: One-Part Silicones: ASTM C920, Type S, Grade NS, Class 25 or 50.
 - a. 786 Mildew Resistant Silicone Sealant, Dow Corning.
 - b. SCS 1700 Sanitary Sealant, General Electric.
 - c. 898 Silicone Sanitary Sealant, Pecora Corporation.

C. Acrylics, Latex:

1. Type 1: One-Part Acrylic Latex, Non-Sag, ASTM-C-834-76.
 - a. Chem-Calk 600, by Bostik.
 - b. LC-130, by MACCO Adhesives, The Glidden Company.
 - c. Easa-ply ALS, by W. R. Meadows, Inc.
 - d. AC-20+Silicone Acrylic Latex, by Pecora Corporation.
 - e. Sonolac, Sonneborn Building Products, ChemRex Inc

- f. 950A Siliconized Acrylic Latex Caulk, by Sherwin-Williams.
- D. Acoustical Sealants:
 - 1. Type 1: AC-20 FTR Acoustical and Insulation Sealant, by Pecora Corporation.
 - 2. Type 2: 60+ Unicrylic, by Pecora Corporation.
 - 3. Type 3: Sheetrock Acoustical Sealant, by United States Gypsum.
 - 4. Power House Siliconized Latex Caulk, by Sherwin-Williams
- E. Butyls:
 - 1. Type 1: One-Part Butyl, Non-Sag, FS TT-S-1657.
 - a. Chem-Calk 300, by Bostik.
 - b. BC-158 Butyl Rubber, by Pecora Corporation. (ASTM C1085)
 - c. White Lightning Butyl Rubber Caulk, by Sherwin-Williams. (ASTM C1311)
- F. Preformed Compressible & Non-Compressible Fillers:
 - 1. Type 1: Backer Rod - Closed cell polyethylene foam:
 - a. HBR Backer Rod, by Nomaco.
 - b. #92 Greenrod, by Nomaco.
 - c. Sonofoam Closed-Cell Backer Rod, Sonneborn Building Products, ChemRex Inc.
 - 2. Type 2: Backer Rod - Open cell polyurethane foam:
 - a. Denver Foam, by Backer Rod Mfg Inc.
 - b. Foam Pack II, by Nomaco.
 - 3. Type 3: Neoprene compression seals:
 - a. WE, WF, and WG Series, by Watson Bowman & Acme Corp.
 - b. Will-Seal 150 Precompressed Expanding Foam Sealants, by Will-Seal, a Division of Illbruck.
 - 4. Type 4: Butyl Rod: Kirkhill Rubber Co. (714)529-4901.
- G. Bond Breaker Tape: Polyethylene tape of plastic as recommended by sealant manufacturer, to be applied to sealant-contact surfaces where bond to substrate of joint filler must be avoided for proper performance of sealant.

2.03 PAVING SEALANTS

- A. Type 1: Two-Part Urethane: Self-Leveling, ASTM C920, Type M, Grade P, Class 25.
 - 1. Vulkem 202, by Mameco. (Jet Fuel Resistant) (FS SS-S-200D, Type H only)
 - 2. NR-300 Urexpan, by Pecora Corporation. (FS SS-S-200E)
 - 3. Loxon 2K SL Polyurethane Sealant, by Sherwin-Williams.
- B. Type 2: One-Part Urethane: Self-Leveling, ASTM C920, Type S, Grade P, Class 25.
 - 1. Sonomeric 1 Sealant, by Sonneborn Building Products, ChemRex Inc. (FS SS-S-200E)
 - 2. Vulkem 45, by Mameco.
 - 3. Loxon 1K SL Polyurethane Sealant, by Sherwin-Williams.

2.04 COLORS

- A. Generally, use sealant colors matching color of material joint is located in.
- B. Where a joint occurs between two materials of differing colors and Contractor cannot determine which material to match, contact Architect/Engineer for selection.

2.05 ACCESSORIES

- A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.

- B. Joint cleaner: Non-corrosive and non-staining type, as recommended by sealant manufacturer; compatible with joint forming materials.
- C. Joint backing: Round, closed cell polyethylene foam rod, oversized 50% larger than joint width; as recommended by sealant manufacturer; and compatible with sealant.
- D. Bond breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Verify that field measurements, surfaces, substrates, and conditions are as required, and ready to receive Work.
 - 1. Verify that joint widths are in conformance with sealant manufacturer allowable limits.
 - 2. Verify that contaminants capable of interfering with adhesion have been cleaned from joint and joint properly prepared.
 - 3. Verify that joint backing and release tapes are compatible with sealant.
- B. Report in writing to Architect/Engineer prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.
- C. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the Owner.

3.02 PREPARATION

- A. Prepare and size joints in accordance with manufacturer's instructions. Clean substrates of dirt, laitance, dust, or mortar using solvent, abrasion, or sandblasting as recommended by manufacturer. Remove loose materials and foreign matter which might impair adhesion of sealant.
- B. Verify that joint backing and release tapes are compatible with sealant. Verify sealant is suitable for substrate. Verify that sealant is paintable if painted finish is indicated.
- C. Protect materials surrounding work of this Section from damage or disfiguration.
- D. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
- E. Apply masking tape. Do not allow tape to touch surface to which caulking, or sealant is to be applied.

3.03 INSTALLATION

- A. Perform installation in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Perform installation in accordance with ASTM C1193.
- C. Install sealant to achieve performance requirements, in accordance with manufacturer's instructions.
- D. Prime or seal joint surfaces where recommended by sealant manufacturer. Do not allow primer or sealer to spill or migrate onto adjoining surfaces.

- E. Measure joint dimensions and size material to achieve required 2:1 width/depth ratios.
- F. Install joint backing to achieve a neck dimension no greater than 1/3 of the joint width.
- G. Remove masking tape immediately after tooling of sealant is accomplished and before surface skin has started to form.
- H. Install bond breaker where joint backing is not used.
- I. Install sealants to depths recommended by sealant manufacturer in uniform, continuous ribbons free of air pockets, foreign embedded matter, ridges, and sags, "wetting" joint bond surfaces equally on both sides.
- J. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- K. Tool joints concave unless shown otherwise. Where horizontal joints are between a horizontal surface and a vertical surface, fill joint to form slight cove so that joint will not trap moisture and foreign matter. Dry tool joints. Do not use soap, water, or solvent to tool joints.
- L. Epoxy Floor Joint Sealant: Install sealant at floor construction and control joints in accordance with manufacturer's published instructions and initially under manufacturer's supervision.

3.04 CURING

- A. Cure sealants in compliance with manufacturer's published instructions.

3.05 CLEANING AND PROTECTION

- A. Comply with the requirements of Section 017423.
- B. Remove excess and spillage of sealants promptly as the work progresses, using materials and methods as recommended by sealant and substrate manufacturers. Clean adjoining surfaces to eliminate evidence of spillage without damage to adjoining surfaces or finishes.
- C. Protect sealants until cured and until project completion.

3.06 SEALANT SCHEDULE

- A. Exterior Joints:
 - 1. Perimeters of exterior openings where frames and other penetrations meet exterior facade of building: precast concrete, brick, CMU, polymer reinforced concrete.
 - a. Sealant Urethane Type 2
 - b. Sealant Silicone Type 1 (for prefinished materials only)
 - 2. Expansion and control joints in exterior surfaces of cast-in-place concrete walls, precast architectural wall panels.
 - a. Sealant Urethane Type 2
 - b. Sealant Urethane Type 4
 - c. Preformed Compressible & Non-Compressible Filler Type 1
 - 3. Expansion and control joints in exterior surfaces of unit masonry walls and polymer reinforced concrete, including at metal panels.
 - a. Sealant Urethane Type 2
 - 4. Coping joints, coping-to-facade joints, cornice and wash, or horizontal surface joints not subject to foot or vehicular traffic.
 - a. Sealant Urethane Type 2
 - b. Sealant Urethane Type 4

- c. Sealant Silicone Type 1 (for prefinished materials only)
 - 5. Exterior joints in horizontal wearing and non-wearing surfaces.
 - a. Sealant No. Urethane Type 1
 - b. Sealant No. Urethane Type 3
 - c. Preformed Compressible & Non-Compressible Filler Type 1
 - 6. Paving joints and curbs.
 - a. Sealant Urethane Type 4
 - b. Paving Sealant Type 2
 - 7. Setting bed for threshold and saddles.
 - a. Sealant Acoustical Type 1
 - 8. Painted metal lap or flashing joints.
 - a. Sealant Silicone Type 1
- B. Interior Joints:
- 1. Seal interior perimeters of exterior openings.
 - 2. Expansion and control joints on interior of exterior cast-in-place concrete walls.
 - 3. Expansion and control joints on interior of exterior precast, architectural wall panels.
 - 4. Expansion and control joints on interior of exterior masonry walls.
 - 5. Perimeters of interior hollow metal and aluminum frames.
 - 6. Interior masonry vertical control joints and intersecting masonry walls; CMU-to-CMU, CMU-to-concrete.
 - 7. Joints at intersection of exterior masonry walls and interior gypsum board partitions.
 - 8. For all the above interior joints:
 - a. Sealant Urethane Type 2
 - b. Sealant Urethane Type 4
 - c. Sealant Silicone Type 1 (for prefinished materials only)
 - 9. Exposed interior control joints in drywall and concealed joints.
 - a. Sealant Acrylic, Latex, Type 1
 - b. Sealant Acoustical Type 1
 - c. Sealant Acoustical Type 3
 - d. Sealant Butyl Type 1
 - 10. Joints of underside of precast beams or planks.
 - a. Sealant Urethane Type 2
 - b. Sealant Urethane Type 4
 - 11. Joints at tops of non-load bearing masonry walls at underside of cast-in-place concrete.
 - a. Sealant Urethane Type 2
 - b. Sealant Urethane Type 4
 - 12. Perimeter of bath fixtures: sinks, tubs, urinals, water closets, basins, vanities, etc.
 - a. Sealant Silicone Type 4
 - 13. Interior expansion and control joints in floor surfaces exposed to foot traffic.
 - a. Sealant Urethane Type 2
 - b. Sealant Urethane Type 4
 - c. Preformed Compressible & Non-Compressible Filler Type 1
 - 14. Interior saw-cut contraction joints in exposed concrete floors exposed to forklift traffic.
 - a. Paving Sealant Type 1
 - 15. Interior non-moving joints, including control, contraction, or construction joints, in interior floor slabs exposed to heavy duty traffic.
 - a. Paving Sealant Type 1
 - 16. Painted metal lap joints.
 - a. Sealant Silicone Type 1

END OF SECTION 079200

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. This section describes piping and ductwork sleeves and seals required where piping and ductwork passes through non fire rated floor slabs, interior walls, and exterior wall applications.

1.02 RELATED WORK

- A. Pipe, Valves, and Fittings - Section 232000
- B. Sheet Metal Work - Section 233113
- C. Refrigerant Piping - Section 232300
- D. Condensate Drain Piping - Section 232001
- E. Through Penetration Firestopping – Section 078413

1.03 QUALITY ASSURANCE

- A. Modular Seal components and systems shall be domestically manufactured at a plant with a current ISO-9001:2000 registration. Copy of ISO-9001:2000 registrations shall be a submittal item.

1.04 SUBMITTALS

- A. Submit manufacturer's data sheets on all products. Data sheets shall include dimensions, material, temperature rating, and installation instructions.

PART 2 - PRODUCTS

2.01 INTERIOR WALL PIPE PENETRATIONS

- A. For Concrete or Masonry Interior Walls:
 - 1. Split Wall Acoustical Seals consist of two bolted pipe halves with minimum 3/4" thick neoprene sponge bonded to the inner faces. The seal shall be tightened around the pipe to eliminate clearance between the inner sponge face and the piping. Concrete may be packed around the seal to make it integral with the floor, wall or ceiling if the seal is not already in place around the pipe prior to the construction of the building member. Seals shall project a minimum of 1" past either face of the wall. Where temperatures exceed 240 degrees F, 10# density fiberglass may be used in lieu of the sponge. Seals shall be type SWS as manufactured by Mason Industries, Inc.
 - 2. Spool Type Acoustical Pipe Seals shall consist of a closed cell neoprene sponge interior surrounded by a welded steel sleeve and flange. Concrete shall be packed around the seal to make it integral with the surface if the seal is not already in place around the pipe prior to the construction of the building member. Caulk any residual cracks. Seals shall be type SPS as manufactured by Mason Industries Inc.
 - 3. Provide a minimum 10-gauge pipe

2.02 INTERIOR WALL DUCT SLEEVES AND SEALS

- A. Box in rectangular or round sleeve openings for ductwork with No. 20 gauge galvanized sheet metal. Metal sleeve to be 0.5 to 0.75 inches larger than outside dimensions of duct.

- B. Flange out edges of sheet metal a minimum of 1 ½ inches to secure sleeve to wall.
- C. Pack annular space between ductwork and sleeve completely with mineral fiber. Recess fibrous material into sleeve 0.5 inches.
- D. Caulk openings from wall surface to duct with nonhardening acoustical sealant both sides of wall.
- E. Grout metal sleeve into concrete or cmu wall or seal metal sleeve to gypsum board wall.

2.03 ACOUSTICAL SEALANTS

- A. Acoustical sealants shall be non-hardening type.
- B. Acoustical sealants shall be one of the following products:
 - 1. Acoustical Sealant – Tremco
 - 2. Approved Equal

PART 3 - EXECUTION

3.01 INSTALLATION

- A. In general, the contractor shall provide sleeves at all penetrations.
- B. After installation of the sleeve, completely seal around sleeve to the wall or floor material.
- C. Install pipe sleeves and seals as per the manufacturer's instructions.
- D. Pipe sleeves shall not support weight of the pipe. Provide pipe supports on both sides of the seal.
- E. Provide escutcheon plates for all exposed penetrations.

END OF SECTION 079201

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Non-fire rated metal doors and frames.
- B. Accessories and fittings to be included with the doors and frames are anchors, spreaders, floor clips, cutouts for hardware, and reinforcing for hardware.
- C. Grouting of hollow metal door frames with gypsum materials prior to setting frames.

1.02 RELATED SECTIONS

- A. Section 042113 – Brick Masonry
- B. Section 042200 – Concrete Unit Masonry
- C. Section 079200 - Joint Sealants
- D. Section 087100 - Door Hardware
- E. Section 099100 - Painting

1.03 REFERENCES

- A. ANSI A151.1 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors and Hardware Reinforcing.
- B. ASTM E 90-90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.
- C. ASTM E 413 - Classification for Rating Sound Insulation.
- D. ASTM E 152 - Standard Methods of Fire Tests of Door Assemblies.
- E. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot Dip Process.
- F. AWS D9.1 - Sheet Metal Welding Code.
- G. NAAMM-HMMA 840 - Installation and Storage of Hollow Metal Doors and Frames; Hollow Metal Manufacturers Association.
- H. NAAMM HMMA 860 - Guide Specifications for Hollow Metal Doors and Frames.
- I. NAAMM Metal Finishes Manual.
- J. SDI 100 - Recommended Specifications Standard Steel Doors and Frames.
- K. SDI 105 - Recommended Erection Instructions for Steel Frames.
- L. DHI - The Installation of Commercial Steel Doors and Steel Frames, Insulated Steel Doors in Wood Frames and Builder's Hardware.
- M. DHI A115 Series - Specifications for Steel Doors and Frame Preparation for Hardware.

- N. National Fire Protection Association - NFPA 80 – Fire Doors and Windows.

1.04 SUBMITTALS

- A. Section 013300 - SUBMITTALS: Procedure for submittals.
- B. Shop drawings: Fully describe and locate all items being furnished and include large scale details of principal construction features and internal reinforcement. Indicate door and frame elevations, hardware, reinforcement, anchor types and spacings, location of factory cut-outs for hardware, finishes and fire ratings.
- C. Product Data: Indicate door and frame configuration and finishes with manufacturer's standard details and catalog data demonstrating compliance with thermal and wind load requirements and referenced standards.
- D. Samples:
 - 1. Finishes and patterns: 10-inch square sheets of each material to be furnished indicating gauge, finish and pattern.
- E. Submit manufacturer's recommended cleaning and maintenance instructions.

1.05 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Manufacturer: Minimum five years documented experience producing products specified in this section.
 - 2. Installer: Minimum five years documented experience installing products specified in this section.
- B. Fire Rated Door Construction:
 - 1. Conform to ASTM E 152, labeled and listed by Underwriters Laboratories (UL).
 - 2. Rate of rise of 450 degrees F across door thickness maximum in 30 minutes of fire exposure.
- C. Installed Door Assembly: Conform to NFPA 80 for fire rated minute label as indicated on Drawings.
- D. Coordinate the work with frame opening construction, door and hardware installation.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Section 0016500 - PRODUCT DELIVERY, HANDLING, AND STORAGE: Transport, handle, store and protect product.
- B. Wrap doors and frames separately in extruded polystyrene and crate in such a way as to protect from damage during shipping and receiving at job site. Provide packaging, separators, banding, spreaders and paper wrappings as required.
- C. Doors shall have their wrappings or coverings removed upon arrival at the building site and shall be inspected for damage. It shall be the responsibility of the Contractor to see that any scratches or disfigurement caused in shipping or handling can be satisfactorily repaired/removed or door shall be immediately returned and replaced. Any scratches or disfigurement caused in shipping or handling is to be promptly cleaned and touched up with a rust-inhibitive primer.

- D. Store products in accordance with requirements of NAAMM-HMMA 840, indoors and protect from moisture, construction traffic, and damage.
- E. Store doors and frames on skids a minimum of 4 inches off the ground, in a vertical, upright position with minimum 1/4-inch spacers. Cover to permit air circulation and protect from damage.
- F. Store units covered to protect them from damage but permitting air circulation.

1.07 PERFORMANCE REQUIREMENTS

- A. ANSI A117.1 - Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People.
- B. Thermal Requirements: Provide a minimum thermal U-factor of 0.36 (R-2.78 R-value) for the assembly.
- C. Wind Loading: Design and reinforce doors and frames to withstand wind loading pressures indicated on the structural drawings.

1.08 WARRANTY

- A. Manufacturer's warranty: Furnish system manufacturer's warranty against defects in product workmanship and materials.
- B. Warranty Period: One year from date of shipment.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Curries Company, Mason City, IA (641) 423-1334.
- B. Republic Builders Products, McKenzie, TN (800) 733-3667.
- C. Steelcraft, Cincinnati, OH (513) 745-6400.
- D. Approved equal

2.02 MATERIALS

- A. Exterior Doors: SDI-100 Level II Heavy Duty 1-3/4-inch, Model 1 - Full Flush Design, 16 gauge cold-rolled steel; galvanized in accordance with ASTM A653. Model 777 Trio-E by Curries or equal.
- B. Interior Doors: SDI-100, Level II Heavy-Duty 1-3/4-inch, Model 1 - Full Flush Design, 18 gauge cold rolled steel. Model 747 by Curries or equal.
- C. Exterior Frames: 14 gauge cold-rolled steel, mitered and fully welded; galvanized in accordance with ASTM A653. Model M by Curries or equal.
- D. Interior Frames: 16 gauge, cold rolled steel, mitered and welded, 2-inch profile, for installation in a metal or wood stud and gypsum board partition. Model CM by Curries or equal.

2.03 DOOR FABRICATION

- A. All doors shall be custom made, of the types and sizes shown on approved shop drawings and shall be fully welded seamless construction with no visible seams or joints on their faces or vertical edges. Minimum door thickness shall be 1-3/4 inches.
- B. All doors shall be strong, rigid and neat in appearance, free from warpage and buckle. Corner bends shall be true and straight and of minimum radius for the gauge of metal used.
- C. Face sheets shall be stiffened by continuous vertical formed steel sections occupying the full thickness of the interior space between door faces. These stiffeners shall not be less than 22 gauge, spaced not more than 5 inches apart and securely attached to both face sheets by spot welds not more than 5 inches on center. Spaces between stiffeners shall be sound-deadened and insulated the full height of the door with an inorganic noncombustible material.
- D. Door faces shall be joined at their vertical edges by a continuous weld extending the full height of the door. All such welds shall be ground, filled and dressed smooth to make them invisible and provide a smooth flush surface.
- E. Top and bottom edges of all doors shall be closed with a continuous recessed steel channel not less than 16 gauge, extending the full width of the door and spot welded to both faces. Exterior doors shall have an additional flush closing channel at their top edges, and where required for attachment of weather-stripping, a flush closure also at their bottom edges. Openings shall be provided in the bottom closure of exterior doors to permit the escape of entrapped moisture.
- F. Edge profiles shall be provided on both vertical edges of doors as follows:
 - 1. Single-Acting Swing Doors - Beveled 1/8 inch in 2 inches.
- G. Door core:
 - 1. Polystyrene: Rigid core of polystyrene foam board, 1500 psf compressive strength, 18 psi shear strength. Strength of bond between core and steel face sheet shall exceed strength of core so that delamination will not occur under operating conditions.
 - 2. Acoustical core material for STC rated doors.
 - 3. Vertical Steel Stiffeners: 22-gauge vertical steel stiffeners spaced max. 6" on center, standard welded every 5 inches along the length to a 22-gauge core plate. Core plate is chemically bonded to all interior surfaces. Insulate spaces between stiffeners with foam in place polyurethane insulation for full height of door.
- H. Fabricate in compliance with referenced standards, except where exceeded by the requirements of this Specification. Comply with SDI 100.
- I. Fabricate in accordance with Architect-approved shop drawings, and as follows:
 - 1. Material: 16-gauge galvanized steel.
 - 2. Thickness: 1-3/4 inches (44 mm).
 - 3. Construction: Full flush seamless construction all sides.
 - a. Hinge and Lock Edges: 12-gauge steel channels fastened to both sheets' full height of doors.
 - 4. Factory-prepare fully for all template hardware.
 - 5. Provide reinforcing in doors scheduled for surface-mounted hardware.
 - 6. Fabricate moldings and stops of same material as door face material, gauge in accordance with Architect-approved shop drawings.
- J. Hardware Reinforcements:
 - 1. Doors shall be mortised, reinforced, drilled and tapped at the factory for fully templated hardware only, in accordance with the approved hardware schedule and templates

- provided by the hardware contractor. Where surface-mounted hardware is to be applied, doors shall have reinforcing plates only; all drilling and tapping shall be done by others.
2. Minimum gauges for hardware reinforcing plates shall be as follows:
 - a. Hinge and Pivot Reinforcements - 7 gauge.
 - b. Reinforcements for lock face, flush bolts, holders, concealed or surface mounted closers - 12 gauge.
 - c. Reinforcements for all other surface-mounted hardware - 16 gauge.
 - K. Astragals shall be full height, full welded to face of active leaf.
 - L. Finish: After fabrication, all tool marks and surface imperfections shall be dressed, filled and sanded as required to make all faces and vertical edges smooth, level and free of all irregularities. Doors shall then be chemically treated to insure maximum paint adhesion and shall be coated on all exposed surfaces, with a rust-inhibitive primer which is fully cured before shipment.
 - M. Accessories:
 1. Rubber silencers at interior doors.
 2. Top cap on exterior doors, install cap, weld, grind, fill and finish smooth.
 - N. Protective Coatings:
 1. Primer: Exposed surfaces shall be cleaned, treated with Bonderite chemical and given one baked on shop coat of grey rust inhibiting primer.
 2. Manufacturer's STC and/or fire rating label shall be applied to door edge.

2.04 FRAME FABRICATION

- A. Design and Construction:
 1. All frames shall be custom made fully welded seamless construction with no visible seams and integral trim, of the sizes and shapes shown on approved shop drawings, knocked-down frames will not be accepted.
 2. Fabricate units rigid, neat, and free from warp or buckle. Fabricate welded as specified. Weld exposed joints continuously; grind, dress, and make smooth, flush and invisible.
 3. All finished work shall be strong and rigid, neat in appearance, square, true and free of defects, warp or buckle. Molded members shall be clean cut, straight and of uniform profile throughout their lengths.
 4. Jamb depths, trim, profile and backbends shall be as scheduled by the Architect/Engineer and detailed on approved shop drawings. The two bottom legs of the door frame shall touch (be in contact with) the concrete slab in all openings. In the case where one leg is longer than the other due to the unevenness of the concrete floor, it is required of the Contractor to cut this leg so as both legs are in contact with the floor surface.
 5. Corner joints shall have all contact edges closed and continuously welded tight, and shop mitered with no visible seams. The use of gussets will not be permitted.
 6. Minimum depth of stop shall be 5/8 inch.
 7. Hardware Reinforcements:
 - a. Frames shall be mortised, reinforced, drilled and tapped at the factory for fully templated hardware only, in accordance with the approved hardware schedule and templates provided by the hardware contractor. Where surface-mounted hardware is to be applied, doors shall have reinforcing plates only; all drilling and tapping shall be done by others.
 - b. Minimum thickness of hardware reinforcing plates shall be as follows:
 - 1) Hinge and Pivot Reinforcements - 3/16 inch, 1-1/4 inches x 10 inches minimum.
 - 2) Strike Reinforcements - 1/8 inch.
 - 3) Closer Reinforcements - 1/8 inch.
 - 4) Flush Bolt Reinforcements - 1/8 inch.

- 5) Reinforcements for Surface-Mounted Hardware - 1/8 inch.
 8. Hardware Cutouts:
 - a. Provide cutouts for frames and doors as required.
 - b. Provide security cutouts in frames scheduled to receive security hardware.
 9. Floor Anchors:
 - a. Full width of frame floor anchor clips shall be securely welded inside each jamb, with two holes provided at each jamb for floor anchorage.
 - b. Minimum thickness of floor anchors shall be 16 gauge.
 10. Jamb Anchors:
 - a. Frames for installation in masonry walls shall be provided with adjustable jamb T-Strap anchors. Anchors shall be not less than 16-gauge steel. Straps shall be not less than 2 inches x 10 inches in size, corrugated and/or perforated.
 - b. Frames for installation in stud partitions shall be provided with steel anchors of suitable design, not less than 18-gauge thickness, securely welded inside each jamb as follows:
 - 1) Frames up to 7'-6" height - 3 anchors.
 - c. The number of anchors provided on each jamb shall be as follows (typical for all wall construction types):
 - 1) Frames up to 7'-6" height - 3 anchors.
 - 2) Frames 7'-6" to 8'-0" height - 4 anchors.
 - 3) Frames over 8'-0" height - 1 anchor for each 2 feet or fraction thereof in height.
 11. Frames over 4'-0" wide for installation in masonry walls shall have an angle or channel stiffener, not less than 12 gauge and not longer than the opening width, welded into the head at the factory. Such stiffeners shall not be used as lintels or load-carrying members.
 12. Dust cover boxes, or mortar guards, of not thinner than 26-gauge steel shall be provided at all hardware mortises on frames to be set in masonry or gypsum board partitions.
 13. All frames shall be provided with a steel spreader temporarily attached to the feet of both jambs to serve as a brace during shipping and handling.
 14. Prepare frames for silencers. Provide three single silencers for single doors and mullions of double doors on strike side. Provide two single silencers on frame head at double doors without mullions.
- B. After fabrication, clean frames and treat against corrosion with one coat of rust inhibitive primer baked on. Final field coats of paint are to be applied under Section 099100.
- C. Dimple Frames
- D. Primer: Zinc chromate type.

2.05 FABRICATION GENERAL

- A. Hardware Preparation: Doors and frames shall be factory mortised, reinforced, drilled and tapped at the factory for fully templated hardware only, in accordance with the approved hardware schedule and templates provided by the hardware contractor. Where surface-mounted hardware is to be applied, doors shall have reinforcing plates only.
1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
 2. Reinforce doors and frames to receive non-template, 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 26 Sections.

- B. Astragals shall be provided on double doors as deemed necessary by hardware selection at no additional cost to Owner. Astragal shall be of same material, gauge and finish as door, full height, full welded to face of active leaf.
- C. Provide security cutouts in frames as required. Coordinate requirement with Owner's Security Contractor.
- D. Welding: Weld anchors and reinforcements such that no weld marks are visible on any exposed surface, comply with AWS D9.1. Perform welding with gas tungsten arc (TIG) equipment, alloyed 308 stainless welding rods. Use certified welding operators. Maintain proper welding temperature to avoid discoloring adjacent metal. Clamp components in appropriate jigs to avoid alligating and warpage. Discolored, alligatored, or warped work will not be accepted.

2.06 CLEARANCES

- A. Edge clearances unless otherwise indicated on drawings shall be provided as follows:
 - 1. Between Doors and frames, at head and jambs - 1/8 inch.
 - 2. At Door Sills: Where no threshold is used - 3/8 inch. Maximum to finish floor, where threshold is used - 1/4 inch maximum between door and threshold, or as otherwise noted on contract drawings.
 - 3. Between meeting edges of pairs of doors - 1/8 inch.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Section 013100: Project Management and Coordination: Verification of existing conditions before starting work.
- B. Verify that dimensions are correct and project conditions are suitable for installation. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Remove steel spreaders from welded frames before installation; use of spreaders for installation purposes not permitted.

3.03 INSTALLATION

- A. Install doors and frames in accordance with manufacturer's instructions and referenced standards.
- B. Coordinate installation of doors with installation of frames and hardware specified in Section 087100. Interface with other work and coordinate with electrical requirements for the buildings access control system and conduit. Field cutting of doors or frames is not permitted. Any field cut doors or frames shall be replaced by the contractor at no cost to the Owner.
- C. Coordinate with masonry wall construction for anchor placement and frame grouting. Locate, secure, and brace frames prior to construction of adjacent walls and partitions. Remove shipping spreader before installation of frame. Provide temporary supports and remove only after anchoring frames to permanent construction.
- D. Install all door louvers and vision panel openings plumb and level.

- E. Protect materials to prevent scratching, twisting, denting or otherwise damaging. Finish surfaces having abrasion damage must be repaired and re-primed to make them invisible or they shall be replaced.
- F. Ensure that doors and frames are installed plumb and true, free of warp or twist, within tolerances specified in referenced standards.

3.04 ADJUST AND CLEAN

- A. Clean doors and frames in accordance with manufacturer's instructions.
- B. Field paint doors and frames in accordance with Section 099100.
- C. Restore slight blemishes in finishes in accordance with manufacturer's instructions to match original finish. Remove and provide new doors and frames where repairs are not acceptable to the Architect.
- D. Adjust door for smooth and balanced door movement.
- E. Adjust installed doors for correct swings and site tolerances.

3.05 ERECTION TOLERANCES

- A. Maximum Diagonal Distortion: 1/16-inch measured with straight edge, corner to corner.

3.06 SCHEDULE

- A. Refer to door and frame schedule on Contract Drawings or hardware schedule as referenced in specifications.

END OF SECTION 081100

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Vault Access Hatch and related items.
- B. Clearwell access door and related items.

1.02 RELATED SECTIONS

- A. Section 033000 - CAST-IN PLACE CONCRETE.

1.03 SUBMITTALS

- A. Submit under provisions of Section 013300 - SUBMITTALS.
- B. Indicate on shop drawings plan layout, construction details and required clearances.
- C. Shop Drawing of unit and all accessory installations.

1.04 WARRANTY

- A. Manufacturer's warranty: Materials shall be free of defects in material and workmanship for a period of Ten (10) years from the date of installation. Should a part fail to function in normal use within this period, the manufacturer shall furnish a new part at no charge.

PART 2 - PRODUCTS

2.01 MANUFACTURER

- A. BILCO COMPANY, New Haven, CT.
- B. HALLIDAY PRODUCTS, Orlando, FL.
- C. U.S.F. Fabrication, Inc.
- D. Approved equal.

2.02 ACCESS HATCH

- A. Hatch with automatic hold-open and operating arm, as manufactured by the BILCO Company, New Haven, CT (203) 934-6363, or approved equal. Doors and accessories shall be factory fabricated. Size as shown on the drawings.
 - 1. Cover: Shall be ¼" aluminum diamond pattern plate[, reinforced for a minimum of 300 psf (live load) and H-20 wheel loading.
 - 2. Frame: Channel frame shall be ¼ inch extruded aluminum with bend down anchor tabs around the perimeter. A continuous EPDM gasket shall be mechanically attached to the aluminum frame to create a barrier around the entire perimeter of the cover and significantly reduce the amount of dirt and debris that may enter the channel frame.
 - 3. Doors shall open to 90° and lock automatically in that position. Provide stainless steel pins
 - 4. Hinges: Shall be specifically designed for horizontal installation and shall be through bolted to the cover with tamperproof Type 316 stainless steel lock bolts and shall be through bolted to the frame with Type 316 stainless steel bolts and locknuts.

5. Drain Coupling: Provide a 1-1/2" (38mm) drain coupling located in right front corner of the channel frame.
 6. Lifting mechanisms: Manufacturer shall provide the required number and size of compression spring operators for easy operation. Provide a vinyl grip handle to release the cover enclosed in telescopic tubes to provide, smooth, easy, and controlled cover operation throughout the entire arc of opening and to act as a check in retarding downward motion of the cover when closing. The upper tube shall be the outer tube to prevent accumulation of moisture, grit, and debris inside the lower tube assembly. The lower tube shall interlock with a flanged support shoe fastened to a formed 1/4" gusset support plate.
 7. A removable exterior turn/lift handle with a spring loaded ball detent shall be provided to open the cover and the latch release shall be protected by a flush, gasketed, removable screw plug.
 8. Hardware: Shall be anticorrosion throughout.
 - a. Hinges: Heavy forged aluminum hinges, each having a minimum 1/4" (6.3 mm) diameter Type 316 stainless steel pin, shall be provided and shall pivot so the cover does not protrude into the channel frame.
 - b. Cover shall be equipped with a hold open arm which automatically locks the cover in the open position.
 - c. Cover shall be fitted with the required number and size of compression spring operators. Springs shall have an electro-coated acrylic finish. Spring tubes shall be constructed of a reinforced nylon 6/6 based engineered composite material.
 - d. A Type 316 stainless steel snap lock with fixed handle shall be mounted on the underside of the cover.
 - e. Compression spring tubes shall be an anti-corrosive composite, all hardware and fasteners shall be Type 316 stainless steel material. Springs shall have an electro-coated acrylic finish for corrosion resistance
 9. Factory finish shall be mill finish aluminum with bituminous coating applied to the exterior of the frame.
- B. Fall Protection Grating:
1. Grating panel(s) shall be fiberglass, molded in one piece, with load bearing bars in both directions to allow for use without continuous side support.
 2. Panel shall be designed to support a 300 PSF live load and be high visibility safety yellow in color.
 3. Torsion rod lift assistance shall be provided for ease of operation and a hold open arm shall be included to automatically lock the panel in the fully open 90 degree position.
 4. A release handle shall be provided to close the grating panel and there shall be a provision to lock the panel to prevent unauthorized access.
 5. Hold open arm shall be aluminum with a stainless steel release handle.
 6. All other hardware, including mounting brackets, hinges, torsion rod, padlock loop, and fasteners, shall be type 316 stainless steel.
 7. Manufacturer shall provide a twenty-five year warranty against defects in material and workmanship.
- C. Ladder Safety Post
1. Post shall be high strength, type 304 stainless steel tubing, and mill finish, with a pull-up loop at its upper end.
 2. All hardware, including mounting brackets, hinges, torsion rod, padlock loop, and fasteners, shall be type 316 stainless steel.
 3. Up and down movement shall be controlled by a stainless steel balancing spring mechanism.
 4. Post shall lock automatically when extended, and a release lever must be activated to disengage the post to permit the return to the lowered position.

2.03 FABRICATION

- A. Fabricate components free of visual distortions and defects. Weld corners and joints.
- B. Provide for removal of condensation occurring within components or assembly.
- C. Fit components for weather-tight assembly.
- D. Apply bituminous paint on surfaces of units to be in contact with cementitious materials or dissimilar metals.

2.04 QUALITY ASSURANCE

- A. Guarantee access doors against defects in material and workmanship for a period of ten (10) years.

PART 3 - EXECUTION

3.01 DELIVERY AND STORAGE

- A. Delivery of materials to the site shall be made in unopened cartons with the name of the manufacturer clearly visible on the carton.
- B. Materials shall be stored in a safe, dry place.

3.02 INSTALLATION

- A. Install access doors in accordance at location indicated on the drawings and according to manufacturer's instructions. Set flush in top slab and square and parallel to foundation/vault walls. Set plumb to top slab/floor.
- B. Install hatch in accordance with OSHA regulations.
- C. Installer shall supply and install mechanical fasteners compatible with the roof deck and the hatch.
- D. Manufacturer shall furnish fasteners necessary for ladder safety post installation.
- E. Install ladder safety post in accordance with the manufacturer's installation instructions.

END OF SECTION 083100

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Overhead coiling insulated doors.

1.02 REFERENCES

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2018.
- B. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.
- C. ASTM A924/A924M - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process; 2022.
- D. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.
- E. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014.
- F. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2018.
- G. NEMA MG 1 - Motors and Generators; 2017.
- H. NFRC 102 - Test Procedure for Measuring the Steady-State Thermal Transmittance of Fenestration Systems.

1.03 DESIGN / PERFORMANCE REQUIREMENTS

- A. Overhead coiling insulated doors:
 - 1. Wind Loads: Design door assembly to withstand wind/suction load of 20 psf (958 Pa) without damage to door or assembly components in conformance with ASTM E 330.
 - 2. Operation: Design door assembly, including operator, to operate for not less than 20,000 cycles.
- B. Single-Source Responsibility: Provide doors, tracks, motors, and accessories from one manufacturer for each type of door. Provide secondary components from source acceptable to manufacturer of primary components.
- C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories, Inc. acceptable to authority having jurisdiction as suitable for purpose specified.

1.04 SUBMITTALS

- A. Submit under provisions of Section 013300 - SUBMITTALS.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Details of construction and fabrication.
 - 4. Installation instructions.

- C. Shop Drawings: Include detailed plans, elevations, details of framing members, anchoring methods, required clearances, hardware, and accessories. Include relationship with adjacent construction.
- D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- E. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) long, representing actual product, color, and patterns.
- F. Manufacturer's Certificates: Certify products meet or exceed specified requirements.
- G. Operation and Maintenance Data: Submit lubrication requirements and frequency, and periodic adjustments required.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in performing Work of this section with a minimum of five-years experience in the fabrication and installation of security closures.
- B. Installer Qualifications: Company specializing in performing Work of this section with minimum three-years and approved by manufacturer.
- C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
 - 1. Finish areas designated by Architect.
 - 2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
 - 3. Refinish mock-up area as required to produce acceptable work.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Protect materials from exposure to moisture. Do not deliver until after wet work is complete and dry.
- C. Store materials in a dry, warm, ventilated weathertight location.

1.07 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.08 COORDINATION

- A. Coordinate Work with other operations and installation of adjacent materials to avoid damage to installed materials.

1.09 WARRANTY

- A. Warranty: Manufacturer's limited door and operator system, except the counterbalance spring and finish, to be free from defects in materials and workmanship for 3 years or 20,000 cycles, whichever occurs first.

- B. Warranty: Manufacturer's limited door system warranty for 2 years for all parts and components.
- C. PowderGuard Finish
 - 1. PowderGuard Premium Applied to curtain, guides, bottom bar, headplates: Manufacturer's limited Premium Finish warranty for 2 years.
 - 2. PowderGuard Zinc Base Coat applied to guides, bottom bar, headplates plus PowderGuard Premium applied to curtain and top coat for guides, bottom bar, headplates: Manufacturer's limited Zinc Finish warranty for 4 years.
 - 3. PowderGuard Textured: Applied to curtain, guides, bottom bar, headplates: Manufacturer's limited Textured Finish warranty for 3 years.
 - 4. PowderGuard Zinc Base Coat applied to guides, bottom bar, headplates plus PowderGuard Textured applied to curtain and top coat for guides, bottom bar, headplates: Manufacturer's limited Zinc Finish warranty for 4 years.
 - 5. PowderGuard Max: Applied to curtain, guides, bottom bar, headplates: Manufacturer's limited Max Finish warranty for 5 years.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturer: Overhead Door Corp., 2501 S. State Hwy. 121, Suite 200, Lewisville, TX 75067. ASD. Tel. Toll Free: (800) 275-3290. Phone: (469) 549-7100. Fax: (972) 906-1499. Web Site: www.overheaddoor.com. E-mail: info@overheaddoor.com.
- B. Substitutions: Approved Equal
- C. Requests for substitutions will be considered in accordance with provisions of Section 012500.

2.02 INSULATED OVERHEAD COILING SERVICE DOORS

- A. Overhead Coiling Stormtite Insulated Service Doors: Overhead Door Corporation Model 625.
 - 1. Curtain: Interlocking roll-formed slats as specified following. Endlocks shall be attached to each end of alternate slats to prevent lateral movement.
 - a. Flat profile type F-265i for doors up to 40 feet (12.19 m) wide.
 - b. Front slat fabricated of:
 - 1) 22 gauge galvanized steel.
 - c. Back slat fabricated of:
 - 1) 22 gauge galvanized steel.
 - d. Slat cavity filled with CFC-free foamed-in-place, polyurethane insulation.
 - 1) R-Value: 7.7, U-Value: 0.13.
 - 2) Sound Rating: STC-21.
 - 2. Performance:
 - a. Through Curtain Sound Rating: Sound Rating: STC-28 (STC-30+ with HZ noise generator) as per ASTM E 90.
 - b. Installed System Sound Rating: STC-21 as per ASTM E 90.
 - c. U-factor: 0.91 NFRC test report, maximum U-factor of no higher than 1.00.
 - d. Air Infiltration: Meets ASHRAE 90.1 & IECC 2012/2015 C402.4.3 Air leakage <1.00 cfm/ft².
 - 3. Slats and Hood Finish:
 - a. Galvanized Steel: Slats and hood galvanized in accordance with ASTM A 653 and receive rust-inhibitive, roll coating process, including 0.2 mils thick baked-on prime paint, and 0.6 mils thick baked-on polyester top coat.
 - 1) Polyester Top Coat.
 - (a) Gray polyester.

- 2) Powder Coat:
 - (a) PowderGuard Premium powder coat color as selected by the Architect.
- 3) Non-galvanized exposed ferrous surfaces shall receive one coat of rust-inhibitive primer.
4. Weatherseals:
 - a. Vinyl bottom seal, exterior guide and internal hood seals.
 - b. Interior guide weatherseal.
 - c. Lintel weatherseal.
 - d. Air Infiltration Package, IECC 2012/2015 listed; product to meet C402.4.3 2012 Air leakage <1.00 cfm/ft².
 - 1) Air infiltration perimeter seal package includes: guide cover, guide cap, dual brush exterior guide seal, 4 inch finned lintel brush seal and vinyl bottom seal.
5. Bottom Bar:
 - a. Two galvanized steel angles minimum thickness 1/8 inch (3 mm) bolted back to back to reinforce curtain in the guides.
6. Guides: Three structural steel angles.
7. Brackets:
 - a. Galvanized steel to support counterbalance, curtain and hood.
8. Finish; Bottom Bar, Guides, Headplate and Brackets:
 - a. Finish: PowderGuard Zinc base coat, gray with PowderGuard Premium powder coat color as selected by the Architect.
9. Counterbalance: Helical torsion spring type housed in a steel tube or pipe barrel, supporting the curtain with deflection limited to 0.03 inch per foot of span. Counterbalance is adjustable by means of an adjusting tension wheel.
10. Hood: Provide with internal hood baffle weatherseal.
 - a. 24 gauge galvanized steel with intermediate supports as required.
11. Manual Operation:
 - a. Chain hoist.
12. Windload Design:
 - a. Standard windload shall be 20 PSF.
13. Locking:
 - a. Chain keeper locks for chain hoist operation.
14. Wall Mounting Condition:
 - a. Face-of-wall mounting.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify opening sizes, tolerances and conditions are acceptable.
- B. Examine conditions of substrates, supports, and other conditions under which this work is to be performed.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.
- C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.
- D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.
- E. Coordinate installation of electrical service with Division 26. Complete wiring from disconnect to unit components.
- F. Coordinate installation of sealants and backing materials at frame perimeter as specified in Section 079200.
- G. Install perimeter trim and closures.
- H. Instruct Owner's personnel in proper operating procedures and maintenance schedule.

3.04 ADJUSTING

- A. Test for proper operation and adjust as necessary to provide proper operation without binding or distortion.
- B. Adjust hardware and operating assemblies for smooth and noiseless operation.

3.05 CLEANING

- A. Clean curtain and components using non-abrasive materials and methods recommended by manufacturer.
- B. Remove labels and visible markings.
- C. Touch-up, repair or replace damaged products before Substantial Completion.

3.06 PROTECTION

- A. Protect installed products until completion of project.

END OF SECTION 083336

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Hardware for all new doors.
- B. Accessories and miscellaneous trim.
- C. Coordinate with Owner's security system installer and items to be furnished by Owner's security system installer.

1.02 REFERENCES

- A. American National Standards Institute (ANSI);
 - 1. ANSI A156.3 - National Standard for Exit devices.
 - 2. ANSI A156.4 - National Standard for Door Controls - Closers.
 - 3. ANSI A156.6 - National Standard for Architectural Door Trim.
 - 4. ANSI A156.13 - National Standard for Mortise Locks & Latches.
- B. National Fire Protection Association (NFPA):
 - 1. NFPA 80 - Fire Doors and Windows.
 - 2. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures.
 - 3. NFPA 252 - Fire Tests of Door Assemblies.
- C. Underwriters Laboratories (UL):
 - 1. UL 10B - Fire Tests of Door Assemblies.
 - 2. UL 305 - Panic Hardware.

1.03 GENERAL REQUIREMENTS

- A. Keying:
 - 1. General - Locks must incorporate a security system to ensure that keys used during construction will not open doors after District occupancy. Coordinate permanent locks with District's standard keying.
 - 2. Construction Keys and Inserts - Permanent cylinders with construction inserts are to be assembled into and shipped with all exterior-door locksets. Construction keys are to be shipped with the door locks. Construction insert-extractor keys are to be shipped to the Owner via Registered Mail. Prior to substantial completion, the Contractor shall collect all construction keys and, in the presence of the Owner or Engineer, remove the construction inserts from the lock cylinders and give all construction keys and inserts to the Owner or Architect/Engineer.
- B. Provide all hardware templates for mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping requirements to the door manufacturer. Field cutting of doors or frames for hardware installation is not permitted. Any field cut doors or frames shall be replaced by the contractor at no cost to the Owner.

1.04 SUBMITTALS

- A. Comply with the requirements contained in Section 013300 - SUBMITTALS.
- B. Copy of supplier's Architectural Hardware Consultant (AHC) certificate who will be preparing the hardware schedule submittal.

- C. Product Data: Submit manufacturers' technical product data for each item of hardware. Include whatever information may be necessary to show compliance with requirements and include instructions for installation and for maintenance of operating parts and finishes. Hardware sets will not be considered for approval without technical product data.
- D. Hardware Schedule: Submit final hardware schedule in manner indicated below. Coordinate hardware with doors, frames and related work to ensure proper size, thickness, hand, function and finish of hardware.
 - 1. Final Hardware Schedule Content: Based on finish hardware indicated, organize hardware schedule into "hardware sets" indicating complete designations of every item required for each door or opening. Include the following information:
 - a. Type, style, function, size and finish of each hardware item.
 - b. Name and manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of hardware set cross-referenced to indications on Drawings both on floor plans and in door and frame schedule.
 - e. Explanation of all abbreviations, symbols, codes, etc. contained in schedule.
 - f. Mounting locations for hardware.
 - g. Door and frame sizes and materials.
 - h. Keying information.
 - i. Coordination with access control system.
 - 2. Submittal Sequence: Submit schedule at earliest possible date particularly where acceptance of hardware schedule must precede fabrication of other work (e.g., hollow metal frames) which is critical in the project construction schedule. Include with schedule the product data, samples, shop drawings of other work affected by finish hardware, and other information essential to the coordinated review of hardware schedule.
- E. Templates: Furnish hardware templates to each fabricator of doors, frames and other work to be factory prepared for the installation of hardware. Upon request, check shop drawings of such other work, to confirm that adequate provisions are made for proper location and installation of hardware.

1.05 DELIVERY, STORAGE, AND PROTECTION

- A. Deliver, store and handle materials in accordance with the requirements of Section 016500 - PRODUCT DELIVERY, STORAGE AND HANDLING.
- B. Packing and marking: Package each item of hardware and each lock set separately in individual containers, complete with necessary screws, keys, instructions, and installation template for spotting mortising tools. Mark each container, identifying installation location of each item. Keep knobs suitably covered during construction period.

1.06 QUALITY ASSURANCE

- A. Coordinate the work with other directly affected Sections involving manufacture or fabrication of internal reinforcement for door hardware and recessed items.
- B. Coordinate Owner's keying requirements during the course of the Work. Furnish the Owner with ten (10) keys. Key all door cylinders to match Owner's master cylinder.
- C. Perform work in accordance with the following requirements:
 - 1. ANSI A117.1
 - 2. NFPA 80.
 - 3. NFPA 101.
 - 4. NFPA 252.

- 5. UL 10B.
- 6. UL 305.

D. Regulatory Requirements:

- 1. Conform to applicable code for requirements applicable to doors and frames.
- 2. Conform to ANSI A117.1-2009 "Accessible and Useable Buildings and Facilities" for mounting heights and locations of accessories.

E. Manufacturer: Obtain each type of hardware (latch and lock sets, hinges, closers, etc.) from a single manufacturer, although several may be indicated as offering products complying with requirements.

F. Supplier: A recognized architectural finish hardware supplier, with warehousing facilities, who has been furnishing hardware to similar projects for a period of not less than 10 years, and who employs an experienced Architectural Hardware Consultant (AHC) to prepare the hardware schedule submittal and who is available, at reasonable times during the course of the work, for consultation about project's hardware requirements.

1.07 WARRANTY

- A. Provide manufacturer's standard minimum one-year warranty for all hardware.

1.08 MAINTENANCE PRODUCTS

- A. Provide special wrenches and tools applicable to each different or special hardware component.
- B. Provide maintenance tools and accessories supplied by hardware component manufacturer.

PART 2 - PRODUCTS

2.01 MATERIALS (GENERAL)

- A. Bolts, screws and other fastenings required for the application of the finish hardware shall be of size and type to fit requirements and shall be of same material and finish as the exposed parts of the hardware that they fasten.
- B. Door hardware: Hand of lock shall be as required. If door hand is changed by proper bulletin or change order before hardware is delivered, furnish such hardware items at no additional expense to Owner.
- C. Strikes: Furnish curved lip strikes with dust box of sufficient length to protect trim on all locks or latches.
- D. Hinges: Furnish three hinges for doors up to 90" in height and four hinges for doors up to 120" in height.
- E. Silencers: Use three at single doors, four at pairs of doors on interior frames.
- F. All locks, locksets, latch sets, and bolts shall conform to Federal Specification FF-H-106a/ANSI. All locks shall accept interchangeable, removable cores.
- G. Finishes: Refer to the individual hardware headings for finish designations.

2.02 DOOR HARDWARE

- A. Lockset: Corbin Russwin ML2000 Series mortise lock or approved equal with Lustra lever handle, LWA trim and Best removable core cylinders keyed to District's system. US32D finish, function as noted.
- B. Hinges - Exterior: Stainless steel 4-1/2" x 4-1/2" heavy weight ball bearing, non-rising stainless-steel pin, Model T4A3386 4.5 x 4.5 NRP, manufactured by McKinney or approved equal, stainless steel machine screws furnished by hinge manufacturer.
- C. Hinges - Interior: Stainless steel 4-1/2" x 4-1/2" standard weight ball bearing, non-rising stainless-steel pin, Model TA2714 4.5 x 4.5, manufactured by McKinney or approved equal, stainless steel machine screws furnished by hinge manufacturer.
- D. Closer - Exterior: Parallel arm application, 7500 Series x arm as required, extra duty hold open unless noted otherwise on schedule, 689 finish with SRI pretreatment coating, manufactured by Norton or approved equal.
- E. Closer – Interior Doors: Parallel arm application, 7500 Series x arm as required, extra duty hold open on schedule, 689 finish with SRI pretreatment coating, manufactured by Norton or approved equal, mount closer on less public side of door.
- F. Overhead Stop: Model 6-series-652 as manufactured by Rixson or approved equal.
- G. Flush Bolts: Inactive leaf of double doors, Model 555 x US26D UL Listed for Metal Doors, metal door extension, flush bolts as manufactured by Rockwood or approved equal. Shim and wear plate shall be furnished by hardware manufacturer, top and bottom of door. Provide 24" long rod for doors over 7'-0" tall at top.
- H. Dustproof Strike: Model 570 x US26D as manufactured by Rockwood or approved equal.
- I. Astragal: Astragal shall be of same material, gauge, and finish as metal door, FRP doors use FRP, 2 inches wide, edges rounded, factory finish, supplied by door manufacturer. Astagals shall be full height and fully welded to face of active leaf.
- J. Kick Plates: K1050 12" x 34" (push side) and/or 12" x 33" (pull side) x US32D as manufactured by Rockwood or approved equal.
- K. Door Stop: Wall mount as indicated in hardware sets, Model 400 x US26D finish manufactured by Rockwood or approved equal.
- L. Floor Stop: Floor mount as indicated in hardware sets, Model 441CU x US26D finish manufactured by Rockwood or approved equal.
- M. Exterior Saddle: Aluminum Model S483AV x opening width as manufactured by Reese or approved equal.
- N. Interior Saddle: Aluminum Model S405A x opening width as manufactured by Reese or approved equal.
- O. Weather-stripping: Model 373SS as manufactured by Reese or approved equal, mounted with stainless steel self-tapping screws, min. 8" on center.
- P. Door Sweep: Model 18062CNB as manufactured by Rockwood or approved equal, mounted with stainless steel self-tapping screws, min. 8" on center.

- Q. Door Silencers: Model 608-RKW gray rubber, as manufactured by Rockwood or approved equal.
- R. Provide matching strikes, screws and brackets for all hardware.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that doors and frames are ready to receive work and dimensions are as indicated.

3.02 INSTALLATION

- A. Where not specified under other sections to be performed by manufacturer or suppliers, machine, fit and drill metal doors.
- B. Prepare doors of various types to receive hardware, using templates and instructions provided with the hardware items for jobsite work.
- C. Mount hardware units at heights indicated in "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute, except as specifically indicated or required to comply with governing regulations, and except as may be otherwise directed by the Architect/Engineer.
 - 1. Conform to requirements of ANSI A117.1-2009 "Accessible and Useable Buildings and Facilities"
- D. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted or finished in another way, coordinate removal, storage and reinstallation or application of surface protections with finishing work specified in the Division-9 sections. Do not install surface mounted items until finishes have been completed on the substrate.
- E. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- F. Drill and countersink units which are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
- G. Set thresholds for exterior doors in full bed of butyl rubber or polyisobutylene mastic sealant.

3.03 ADJUSTING

- A. Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly as intended for the application made.
- B. Clean adjacent surfaces soiled by hardware installation.
- C. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy of a space or area, return to the work during the week prior to acceptance or occupancy, and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

- D. Instruct Owner's Personnel in proper adjustment and maintenance of hardware and hardware finishes, during the final adjustment of hardware.

3.04 PROTECTION OF FINISHED WORK

- A. Do not permit adjacent work to damage hardware or finish.

3.05 HARDWARE SETS

- A. Coordinate the Hardware Schedule with the Door Schedule on the Contract Drawings, each set to have:

HS-1 (Exterior Double Doors)

6 ea.	Exterior Hinges
1 ea.	Lockset (Storeroom)
1 ea.	Exterior Closer
1 ea.	Overhead Stop
2 ea.	Flush Bolts
1 ea.	Dustproof Strike
1 ea.	Astragal
1 ea.	Exterior Saddle
1 ea.	Weather-stripping
2 ea.	Door Sweep
4 ea.	Kick Plates

HS-2 (Exterior Single Door)

3 ea.	Exterior Hinges
1 ea.	Lockset (Storeroom)
1 ea.	Exterior Closer
1 ea.	Overhead Stop
1 ea.	Dustproof Strike
1 ea.	Exterior Saddle
1 ea.	Weather-stripping
1 ea.	Door Sweep
2 ea.	Kick Plates

HS-3 (Interior Double Door)

6 ea.	Interior Hinges
1 ea.	Lockset (Storeroom)
1 ea.	Interior Closer
1 ea.	Overhead Stop
2 ea.	Flush Bolts
1 ea.	Dustproof Strike
1 ea.	Interior Saddle
	Door Silencers
4 ea.	Kick Plates

END OF SECTION 087100

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Surface preparation.
- B. Painting, sealing, and filling.
- C. The work described in this section includes, but is not limited to the following:
 - 1. Concrete and Concrete Block Walls.
 - 2. Miscellaneous walls and surfaces, as indicated on painting schedule, plans and details.
 - 3. Gypsum board.
 - 4. Rough, finish, and PVC carpentry.
 - 5. Steel lintels and miscellaneous steel fabrications.
 - 6. Exposed pipes and conduits.
 - 7. Metal doors and frames, access doors, panels, miscellaneous trim, and surfaces not prefinished or excluded specifically.
 - 8. FRP Columns and millwork.
 - 9. Mechanical grilles, convectors, registers, diffusers, panels, etc., not prefinished or excluded specifically.
 - 10. Trowel grade finish for concrete or masonry secondary containment areas.
 - 11. All items provided by other specification sections and/or indicated on contract drawings that are not prefinished or that are furnished in prime coats.
- D. All sections or work referencing this section.
- E. Items not included:
 - 1. Anodized aluminum or stainless-steel surfaces.
 - 2. Prefinished surfaces.

1.02 REFERENCES

- A. 6 NYCRR Part 205 "Architectural & Industrial Maintenance (AIM) Coatings of NYSDEC for VOC content.
- B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2016.
- C. ASTM D3359 - Standard Test Method for Rating Adhesion by Tape Test; 2017.
- D. ASTM D7091 – Standard Practice for Nondestructive Measurement of Dry Film Thickness.
- E. NACE (National Association of Corrosion Engineers) – Industrial Maintenance Painting.
- F. NPCA (National Paint and Coatings Association) – Guide to U.S. Government Paint Specifications.
- G. PDCA (Painting and Decorating Contractors of America) – Painting – Architectural Specifications Manual.
- H. SSPC V1 (PM1) - Good Painting Practice: Painting Manual, Volume 1; 2016.
- I. SSPC V2 (PM2) - Systems and Specifications: Steel Structures Painting Manual, Volume 2; 2015.

1.03 SUBMITTALS

- A. Submit product data under provisions of Section 013300 - SUBMITTALS.
- B. Product Data: Provide data on all finishing products to be used.
- C. Provide confirmation of compliance with 6 NYCRR Part 205 "Architectural & Industrial Maintenance (AIM) Coatings of NYSDEC for VOC content including removal of the quart exemption for some coatings.
- D. Provide schedule indicating all surfaces to be painted, type of primer and finish paint, surface preparation and color to Architect prior to application. Provide manufacturers product number and description.
- E. Samples:
 - 1. Submit two sets of paper chip samples, illustrating range of colors available for each surface finishing product scheduled.
- F. Manufacturer's Instructions: Indicate special surface preparation procedures and substrate conditions requiring special attention.
- G. Submit material safety data sheets (MSDS).
- H. Submit detailed daily reports upon Architect/Engineer's request at any time during the project which are to include the following:
 - 1. The start date and time and the completion date and time of surface preparation to any item or zone. The item or zone (location) must be cleaned in this report.
 - 2. The start date and time and the completion date and time of each coat applied to any item or zone. The item or zone (location) must be clearly defined in the report.
 - 3. The ambient conditions recorded daily on site, every day of surface preparation, coating application, and curing applied coatings. Ambient conditions records shall include wet bulb temperature, dry bulb temperature, surface temperature, relative humidity, dew point, the time conditions were recorded, and the location where the conditions were taken. Also include the weather reported for the previous day and the weather forecasted for the following date of the dated report.

1.04 QUALITY ASSURANCE

- A. The Contractor shall either verify in writing that he intends to apply the products listed or shall submit for approval a list of comparable materials of another listed approved manufacturer. This submittal shall include full identifying product names, descriptive literature, catalog numbers, and color samples.
- B. Consideration will only be given to Suppliers who can demonstrate that their paint system complies with these specifications having had successful and documented experience of the size, quality, performance and reliability to that specified, and who can successfully demonstrate this criteria to the Architect/Engineer.
- C. Manufacturer: Company specializing in manufacturing the products specified in this section with a minimum 5 years documented experience.
- D. Applicator: Company specializing in performing the work of this section with minimum 5 years documented experience and approved by the manufacturer.

- E. No claim by the Contractor as to the unsuitability or unavailability of any material specified, or his unwillingness to use same, or his/her inability to produce first class work with same, will be entertained.

1.05 ENVIRONMENTAL REQUIREMENTS

- A. Conform to the applicable code(s) for flame and smoke ratings requirements for finishes.
- B. Conform and confirm compliance with 6 NYCRR Part 205 "Architectural & Industrial Maintenance (AIM) Coatings of NYSDEC for VOC content including removal of the quart exemption for some coatings.
- C. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- D. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer. Do not apply exterior coatings when unfavorable weather conditions are forecast within 24 hours of application.
- E. Apply exterior paint only when temperature exceeds 50 degrees F or as otherwise required by manufacturer and drying conditions are good and predicted to remain so for at least 24 hours.
- F. Apply interior paint only when inside space and surface temperatures exceed 60 degrees F or as required by manufacturer and will be maintained above that point until paint has dried. Provide and maintain application temperatures for all finishes.
- G. A 24-hour ambient monitor shall be required for all coating phases from surface preparation through complete cure for final coat for both interior and exterior work. The cost of the ambient monitor shall be borne by the Contractor. The ambient monitor or approved equal must be capable of recording dry bulb, relative humidity, dew point, and surface temperature at 15-minute intervals for the duration stipulated above.
- H. Provide minimum lighting levels of 80-foot candles (860 lx) measured mid-height at substrata surface.

1.06 DELIVERY, STORAGE AND PROTECTION

- A. Deliver, store and handle products under the provisions of Section 016500 - PRODUCT DELIVERY, STORAGE AND HANDLING
- B. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- C. Container label to include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- D. Store paint at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.
- E. Do not allow product to freeze.

1.07 PROJECT CONDITIONS

- A. Section 013100 - PROJECT MANAGEMENT AND COORDINATION.

- B. Sequence application to the following:
 - 1. Do not apply finish coats until paintable sealant is applied.
 - 2. Do not apply sealant or primer until surfaces are properly prepared.

1.08 EXTRA MATERIALS

- A. Furnish under provisions of Section 017800 - CLOSEOUT SUBMITTALS. Supply minimum 1 gallon of each color, type, and surface texture used; store where directed.
- B. Label each container with color, type, texture, room locations, in addition to the manufacturer's label.

1.09 PROTECTION OF OTHER WORK

- A. The Contractor shall furnish and lay drop cloths in all areas where painting is being done to protect floors and other work from damage. Contractor shall be responsible for any damage to other work and shall replace any materials which have been damaged to such an extent that they cannot be restored to their original condition.
- B. Protect all finished surfaces by covering or by removing and replacing, in case of small items such as hardware.

1.10 JOB CONDITIONS

- A. Before painting is started in any area, the area shall be cleaned, and excessive dust shall be removed from all areas to be painted. After painting operations begin in a given area, clean only with commercial vacuum cleaning equipment.
- B. Adequate illumination and ventilation shall be provided in all areas where painting operations are in progress.

1.11 INSPECTION OF SURFACES

- A. Before starting any work, surfaces to receive paint finish shall be examined carefully for defects which cannot be corrected by the procedures specified herein and which might prevent satisfactory painting results. Work shall not proceed until such damages are corrected.
- B. The commencing of work shall be construed as acceptance of the surfaces, and thereafter this Contractor shall be fully responsible for satisfactory work as required herein.

1.12 COOPERATION WITH OTHER TRADES

- A. This work shall be scheduled and coordinated with other trades and shall not proceed until other work and/or job conditions are as required to achieve satisfactory results.
- B. The Contractor shall examine the specifications for the various other trades and shall thoroughly familiarize himself with all their provisions regarding painting. All surfaces that are left unfinished by the requirements of other sections except "Items not Included" in this Section, shall be painted or finished as part of the work covered by this Section.

PART 2 - PRODUCTS

2.01 MANUFACTURERS - PAINT

- A. The following requirements listed in this specification are based upon products as manufactured by Tnemec and Sherwin-Williams and are provided as the standard of quality for

the basis of the bid. Substitutions shall be considered during bidding as stipulated in Section 002113. Coating substitutions shall be permitted only after receiving written approval from the Architect/Engineer prior to bid.

2.02 PAINT MATERIAL

- A. Refer to the attached schedule for a listing of the appropriate surfaces for each paint material. The following are the types of materials that shall be used:
1. Modified Aromatic Polyurethane Primer:
 - a. Tnemec Series 1 Omnithane or Sherwin-Williams B65G11 Corothane I Galvapak 1K Zinc Rich Primer.
 2. Polyamidoamine Epoxy:
 - a. Tnemec Series V69 Hi-Build Epoxoline II or Sherwin-Williams Macropoxy 5500LT Potable Water Epoxy (limited colors only) or Macropoxy 646-100 Fast Cure Epoxy.
 3. Aliphatic Acrylic Polyurethane:
 - a. Tnemec Series 73 or 1095 Endura-Shield or Sherwin-Williams B65J-300 Series Hi-Solids Polyurethane 250 (OTC 2 VOC Compliant).
 4. 100% High Solids, Hi-Build Amine Epoxy:
 - a. Tnemec 280 Tnem-Glaze or Sherwin-Williams B62-210 Dura-Plate UHS
 5. Waterborne Cementitious Acrylic Filler:
 - a. Tnemec Series 130 Envirofill or Sherwin-Williams B42W200 Cement-Plex 875 Cementitious WB Block Filler.
 - b. HKWD ONLY: Tnemec Series 205 Terra-Tread FC or PrepRite ProBlock Inter/Exterior Latex Primer/Sealer B51-600 Series.
 6. Modified Polyamine Epoxy:
 - a. Tnemec Series 201 Epoxoprime or Sherwin-Williams B58WQ5100 Corobond 100 Epoxy.
 - b. Tnemec Series 22 Epoxoline or Sherwin-Williams B62-210 Dura-Plate UHS.
 7. Self-Crosslinking Hydrophobic Acrylic:
 - a. Tnemec Series 115 Uni-Bond DF or Sherwin-Williams B66W1 DTM Primer/Finisher.
 8. HDP Acrylic Polymer:
 - a. Tnemec Series 1028 Enduratone or Sherwin-Williams B66-350 Sher-Cryl HPA High Performance Acrylic Gloss.
 9. Waterbased Acrylic Urethane:
 - a. Tnemec Series 1095 Endura-Shield or Sherwin-Williams Pro Industrial Acrolon 100, B66-700 Series
- B. Colors shall be as selected by the Owner and Architect/Engineer.
- C. Gloss levels for paints required are as follows (ref. National Paint & Coatings Association - NPCA):

Sheen Level	Test Method	Gloss Range
Flat	85-degree meter	Below 15
Eggshell	60-degree meter	5 to 20
Satin	60-degree meter	15 to 35
Semi-gloss	60-degree meter	30 to 65
Gloss	60-degree meter	Over 65

- D. Coatings shall be ready mixed, except field catalyzed coatings. Process pigments to a soft paste consistency, capable of being readily and uniformly dispersed to a homogenous coating, good flow, and brushing properties, capable of drying or curing free of streaks or sags.

2.03 MIXING

- A. Mixing or tinting shall be done at factory.
- B. Site mixing will be prohibited.

2.04 APPLICATION EQUIPMENT

- A. Application equipment items are not required to be new, but they shall be adequate and commensurate for the work and workmanship required herein.

2.05 ACCESSORIES MATERIALS

- A. Provide all required ladders, scaffolding, drop cloths, makings, scrapers, tools, sandpaper, dusters, cleaning solvents, and remove waste as required to perform the work and achieve the results specified herein. Materials not specifically indicated but required to achieve the finishes specified shall be of commercial quality and as recommended by the manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Section 013100 – Project Management and Coordination: Verification of existing conditions before starting work.
- B. Verify the surfaces and substrate conditions are ready to receive Work as instructed by the product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- D. Test shop applied primer for compatibility with subsequent cover materials. Test area must be approved by the Architect/Engineer or Architect/Engineer's representative.
- E. Do not begin work until surfaces to receive paint are dry, firm, sound, clean and free of defects or blemishes which would adversely affect the quality or appearance of the finished work.
- F. Verify items are ready to receive finishes. Beginning of work means Contractor accepts existing substrata and surface conditions.
- G. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:
 - 1. Masonry and Stucco: 8 percent.
 - 2. Plaster and Gypsum Board: 8 percent.
 - 3. Concrete: 5 percent measured in accordance with ASTM C2170.
 - 4. Wood: 19 percent, measured in accordance with ASTM D2016.

3.02 PREPARATION - GENERAL

- A. Protect finished surfaces and equipment.
- B. Correct defects and clean surfaces which affect work of this section. Remove any coatings that exhibit loose surface defects.
- C. Impervious Surfaces: Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

- D. Galvanized Surfaces: Remove surface contamination and oils as per SSPC SP-1 solvent cleaning. Apply coat of etching primer.
- E. Uncoated Ferrous Surfaces: Remove scale as per SSPC SP11 power tool clean to bare metal. Apply treatment of phosphoric acid solution. Prime paint after repairs.
- F. Shop Primed and Existing Previously Painted Steel Surfaces: Sand and scrape to remove loose paint and rust, power tool clean, feather edges; clean surfaces with solvent. Prime bare steel surfaces.
- G. Surface Appurtenances: Remove or mask electrical plates, hardware, light fixture trim, escutcheons, fittings, and all other surfaces to be protected from paint prior to preparing surfaces or finishing.
- H. Surfaces: Correct defects and clean surfaces which affect work of this section. Remove or repair existing coatings that exhibit surface defects.
- I. Follow specifications or manufacturer's recommendations for preparing surfaces to be primed and painted, the more stringent shall apply.
- J. Mask, cover or remove surfaces to be protected from paint. Protect electrical, plumbing, and mechanical equipment and systems not to be painted.
- K. Provide adequate lighting.
- L. Clean and sand surfaces to be painted.
- M. Clean and remove scale, oil, or grease from ferrous metal surfaces.

3.03 EXAMINATION – ADDITIONAL REQUIREMENTS

- A. Before painting is started in any area, the area shall be cleaned, and excessive dust shall be removed from all areas to be painted. After painting operations begin in a given area, clean only with commercial heavy-duty vacuum cleaning equipment.
- B. All steel joists and ceiling deck shall be high pressure washed with an industrial detergent capable of removing all contaminants.
- C. All concrete shall be finished as specified prior to paint application.
- D. Adequate illumination and ventilation shall be provided in all areas where painting operations are to take place.
- E. Before starting any work, surfaces to receive paint finish shall be examined carefully for defects which cannot be corrected by the procedures specified herein and which might prevent acceptable painting results. Work shall not proceed until such damages are corrected.
- F. The commencing of work in a specific area only shall be construed as acceptance of the surfaces, and thereafter the Contractor' applicator shall be fully responsible for satisfactory work as required herein.

3.04 PREPARATION – ADDITIONAL REQUIREMENTS

- A. All surfaces shall be prepared as specified in the attached schedule. Surface preparation of steel shall be in accordance with SSPC Standards - Surface Preparation Specifications.

- B. Masonry: All joints shall be tooled slightly concave. After erection, all mortar splatter shall be removed, and all voids and holes shall be patched and leveled flush with the surrounding surfaces and be bagged to simulate surrounding texture. All masonry shall be installed with the intent that it will be painted.
- C. Concrete: All exposed concrete shall be installed with the intent that it will be painted. All bug holes and honeycombed areas shall be patched as specified in Section 033000.
- D. Surface appurtenances: If allowed by the Architect/Engineer, remove or mask electrical plates, hardware, light fixture trim, escutcheons, fittings, and all other surfaces to be protected from paint prior to preparing surfaces or finishing.
- E. Surfaces: Correct defects and clean surfaces, which affect work of this Section. Remove or repair existing coatings that exhibit surface defects.
- F. Do not paint over UL Labels, manufacturer installed equipment nameplates, factory installed nameplates and equipment identification plates.

3.05 APPLICATION

- A. Application of paint shall be in accordance with SSPC - Good Painting Practices.
- B. It is the intent that the above brand names and types of material will give complete coverage with uniform appearance. If any additional coat is necessary for complete coverage and appearance, it shall be done at no additional cost.
- C. All paints to be new stock, delivered to job unopened. Prepare surfaces properly for receiving paint; protect adjacent surfaces not to be painted.
- D. All work shall be carefully done by skilled mechanics. Finished surfaces to be uniform in thickness, coverage, gloss, finish, and color, and free from brush marks. All coats shall be thoroughly dry before applying succeeding coats.
- E. Apply products in accordance with manufacturer's instructions. Do not apply finishes to surfaces that are not dry.
- F. Do not apply finish coats until paintable sealant is applied.
- G. Do not apply sealant or primer until surfaces are properly prepared.
- H. All coatings in multiple coats shall be in contrasting color to each coat with final finish coat chosen by Owner.
- I. Spray, roller and/or brush may be used as appropriate for the various conditions, but the specified dry film thicknesses must be provided.
- J. Thicknesses listed in the Schedule for High Build Coatings can be obtained in one coat by spray, but not necessarily by brush or roller.
- K. The specified DFT shall hold precedence over whatever recommendations are made for other supplier's products.
- L. Minimum air and surface temperature for application of epoxy coatings shall be maintained at 60 degrees F unless otherwise approved by the Architect/Engineer.

- M. Minimum air and surface temperature for 100% solids by volume epoxy coatings shall be 70 degrees F. Optimum temperature of unopened 100% solids epoxy shall be 75 degrees F. Minimum temperature of unopened 100% solids epoxy shall be 60 degrees F.
- N. Heat and dehumidification shall be supplied by equipment that delivers clean, warm, dry air into the space to be coated. Heat shall not be supplied by devices that give off exhaust fumes such as carbon dioxide or carbon monoxide into the area to be coated.
- O. Sand surfaces lightly between coats to achieve required finish.
- P. Vacuum clean surfaces to remove all particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- Q. Where clear finishes are required, tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.
- R. Prime concealed surfaces and cut ends of interior and exterior woodwork with primer paint.
- S. Apply materials to obtain:
 - 1. Owners and Architect/Engineer's satisfaction and approval.
 - 2. Smooth uniform appearance.
 - 3. Complete coverage.
 - 4. Match with approved color sample.
 - 5. Work free of runs, sags, and skips.
 - 6. Sharp, clean edges where finishes or colors change.
 - 7. Surfaces free of defects and damage at time of acceptance.
- T. Fill nail holes and cracks after prime coat. Fill minor imperfections prior to final coats.
- U. Paint all six faces and edges of doors.
- V. Sand metal, wood, and drywall between coats.
- W. Paint PVC pipe in accordance with recommendations of the paint manufacturer and apply primer.

3.06 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT

- A. Paint shop primed equipment.
- B. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- C. Prime and paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, except where items are shop finished.
- D. Paint exposed conduit and electrical equipment occurring in finished areas.
- E. Paint both sides and edges of plywood backboards of electrical and telephone equipment before installing equipment.
- F. Color code equipment, piping, conduit, and exposed duct work in accordance with other Sections.

3.07 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under the provisions of Section 014500.
- B. Dry Film Thickness Testing: Owner will engage the services of a qualified testing and inspecting agency to inspect and test coatings for dry film thickness.
 - 1. If test results show that dry film thickness of applied coating does not comply with specifications or coating manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with specifications and coating manufacturer's written recommendations.
- C. The Architect/Engineer will inspect the painting/coatings as it is being performed.
- D. The Architect/Engineer reserves the right to accept each phase of the work before further work may be conducted, to halt all work deemed to be improper or not in compliance with project specifications, and to require the Contractor to promptly correct all improper practices or deficient work. Contractor shall notify the Architect/Engineer's representative 24 hours minimum prior to the following inspection hold points:
 - 1. Prior to and upon completion of any work the Architect/Engineer reserves the right to accept or reject each phase of the work before further work may be conducted.
 - 2. Prior to the delivery and upon receiving of materials, equipment, supplies, or personnel.
 - 3. Prior to and upon completion of any installation of permanent and nonpermanent items on the project.
 - 4. Prior to the start of work (of any item).
 - 5. Upon completion of work (of any item).
 - 6. Prior to the installation of containment or masking.
 - 7. Upon completion of the removal of containment or masking.
 - 8. Prior to the start of surface preparation (of any section, zone, or area).
 - 9. Upon completion of surface preparation (of any section, zone, or area).
 - 10. Prior to the application of any coating or lining (of any section, zone, or area).
 - 11. Upon completion of application of any coating or lining (of any section, zone, or area).
 - 12. Following the curing of any coating or lining (of any section, zone, or area).
 - 13. Prior to the dismantling or removal of the containment.
 - 14. Upon the completion of the dismantling or removal of the containment.
 - 15. Prior to the dismantling or removal of any ladders, scaffolding, or fabricated access work platforms.
 - 16. Prior to and upon completion of disinfection.
 - 17. Prior to and upon completion of any sampling or testing.
- E. The Architect/Engineer reserves the right to conduct both destructive and nondestructive testing at any time for inspection or evaluation purposes. The Contractor shall repair any areas damaged by testing at no additional cost. For purposes of bidding, the Contractor shall expect to repair six (6) tested areas.

3.08 PROTECTION

- A. Protect adjacent areas from splattering of paint.
- B. Protect painted coating from damage or discoloration until project is accepted by Owner.

3.09 CLEAN UP

- A. Clean work under the provisions of 017423 - CLEANING.

- B. Collect waste materials, which may constitute a fire hazard, place in closed metal containers, and remove daily from site.
- C. Install finished items removed by this Section. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.
- D. Remove masking and protective covering.
- E. Leave factory finish surfaces clean and free of paint.
- F. Clean adjacent area of any paint not scheduled to receive painted coating.
- G. Remove tools, rubbish, equipment, and unused material.

3.10 SCHEDULE

- A. Ferrous Metals, Interior (including, but not limited to, structural AND miscellaneous steel)
 - 1. Shop Surface Preparation - SSPC-SP6/NACE No.3, Commercial Blast Cleaning.
 - 2. Field Surface Preparation - SSPC-SP1 "Solvent Cleaning" and "Low Pressure Water Clean" (as necessary) in accordance with SSPC-SP WJ-4 / NACE WJ-4 to remove all forms of surface contamination and any formations of zinc oxide. Power tool clean all damages to shop applied primer in accordance with SSPC-SP3 "Power Tool Cleaning" and apply spot coat of designated field primer.
 - 3. Shop Primer – Series 1 Omnithane at 2-3 mils or S-W Corothane I Galvapak 1K Zinc Primer at 3-4 mils.
 - 4. Field Primer – Series V69 Epoxoline II at 3-5 mils or S-W Macropoxy 5500LT Potable Water Epoxy at 3-5 mils in finish color.
 - 5. Finish (2 coats) – Series V69 Epoxoline II at 3-4 mils each or S-W Macropoxy 5500LT Potable Water Epoxy at 3-5 mils in finish color.
- B. Ferrous Metals, Exterior (including, but not limited to, structural AND miscellaneous steel)
 - 1. Shop Surface Preparation - SSPC-SP6/NACE No.3, Commercial Blast Cleaning.
 - 2. Field Surface Preparation - SSPC-SP1 "Solvent Cleaning" and "Low Pressure Water Clean" (as necessary) in accordance with SSPC-SP WJ-4 / NACE WJ-4 to remove all forms of surface contamination and any formations of zinc oxide. Power tool clean all damages to shop applied primer in accordance with SSPC-SP15 "Commercial Grade Power Tool Cleaning" and apply spot coat of designated field primer.
 - 3. Shop Primer – Series 1 Omnithane at 2-3 mils or S-W Corothane I Galvapak 1K Zinc Primer at 3-4 mils.
 - 4. Field Primer – Series 1 Omnithane at 2-3 mils or S-W Corothane I Galvapak 1K Zinc Primer at 3-4 mils.
 - 5. Field Intermediate – Series V69 Epoxoline II at 3-5 mils or S-W Macropoxy 5500LT Potable Water Epoxy at 3-5 mils in finish color.
 - 6. Finish (2 coats) – Series 73 Endura-Shield III at 2-3 mils or S-W B65J-300 Series Hi-Solids Polyurethane 250 Aliphatic Polyurethane at 3-5 mils each.
- C. Galvanized Metals
 - 1. Surface Preparation – Per manufacturer's recommendations
 - 2. Prime Coat – Series 115 Uni-Bond DF at 2-4 mils or S-W B66W1 DTM Primer/Finisher at 2-4 mils.
 - 3. Finish (2 Coat) - Series 1028 Enduratone at 2-3.5 mils or S-W Sher-Cryl HPA at 2-3.5 mils each.
- D. Masonry Block Walls, Interior

1. Surface Preparation - Remove all loose mortar, mortar splatter and mortar protrusions. Ensure all surfaces are dry and free of dust and other construction residues. Allow curing for 28 days.
2. Block Filler – Series 130 Envirofill, 60-80 sf/gal or S-W Cement-Plex 875 Cementitious Acrylic WB Block Filler, 50-100 sf/gal.
3. Finish (2 coats) – Series 280 Tneme-Glaze at 7.0-10.0 mils or Dura-Plate UHS at 7.0-10.0 mils each. Finish surface shall be uniformly smooth to the touch, free of voids, holidays, and cleanable.

E. Concrete Walls, Interior

1. Surface Preparation - Prepare all surfaces in accordance with SSPC-SP13 / NACE No.6 removing all loose material, laitance, curing compounds, hardeners, sealers and other contaminants. Establish surface profile in accordance with ICRI 310.2R CSP 3 – 5. Level all protrusions and fill all voids, bug holes or other cavities with a filler or surfacer approved by the coating manufacturer. Allow curing for 28 days.
2. Field Primer – Series 201 Epoxoprime at 5.0-7.0 mils or S-W Corobond 100 Epoxy Primer at 5.0-6.0 mils in finish color.
3. Finish (2 coats) – Series 280 Tneme-Glaze at 7.0-12.0 mils or S-W Dura-Plate UHS at 7.0-10.0 mils each. Finish surface shall be uniformly smooth to the touch, free of voids and cleanable.

F. Exposed Pipes and Conduits, Metal Doors and Frames, Mechanical Grilles, Convectors, etc.

1. Surface Preparation – SSPC-SP1 “Solvent Cleaning” followed by abrasive sanding.
2. Field Primer – Series 115 Uni-Bond DF at 2.0-4.0 mils DFT or S-W B66W1 DTM Primer/Finisher at 2.5-5.0 mils.
3. Finish (2 coats) – Series 1028 Enduratone at 2.0-3.0 mils DFT or S-W B66 Series DTM High Performance Acrylic Semi-Gloss at 2.5-4.0 mils DFT each.

END OF SECTION 099100

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Surface preparation
- B. Interior and Exterior coatings
- C. GAC Vessels
- D. Iron Removal Vessels
- E. Nitrate Removal Vessels

1.02 RELATED SECTIONS

- A. Section 013300 - Submittals
- B. Section 016100 - Basic Product Requirements
- C. Section 016500 - Product Delivery, Storage and Handling
- D. Section 433113 - Activated Carbon-Gas Liquid Purification Filters
- E. Section 466121 - Iron Removal System
- F. Section 466316 - Packed Bed Ion Exchange Vessels

1.03 REFERENCES

- A. ANSI/NSF 61 - Drinking Water System Components - Health Effects
- B. AWWA - C115 - Standard for Flanged Pipe
- C. NACE No. 2/SSPC SP10 - Near-white Blast Cleaning.
- D. NACE No. 3/SSPC SP6 - Commercial Blast Cleaning.
- E. SSPC PA - 1 - Shop, Field, and Maintenance Painting of Steel
- F. SSPC PA 2 - Method for Measuring of Dry Paint Thickness with Magnetic Gages
- G. SSPC VOL 1 - Good Painting Practices - 2002 4th Edition latest edition
- H. SSPC VOL 2 - Systems and Specifications - 2005 Edition latest edition
- I. SSPC SP 3 - Power Tool Cleaning
- J. SSPC SP 2 - Hand Tool Cleaning
- K. SSPC VIS 1-89 - Visual Standard for Abrasive Blast Cleaned Steel.
- L. ASTM D4417-03 - Standard Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel

- M. ASTM E1216-99(2005) - Standard Practice for Sampling for Particulate Contamination by Tape Lift
- N. NACE SP0188-99 Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates

1.04 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Product Data: Provide material data sheets (MDS) and material safety data sheets (MSDS), issued by the manufactures, for all materials and accessories that are to be used.
- C. Samples: Provide a color chart for paint color selection by the Owner and Engineer for approval prior to all aspects of painting.
- D. Manufacturer's instructions: Indicate surface preparation and paint application.
- E. Submit a detailed plan on the method(s) to be employed to protect adjacent equipment and surfaces including, but not limited to, the following:
 - 1. Method of surface preparation.
 - 2. Method of paint application.
 - 3. Quality Control Plan for all phases of construction operations.
- F. Submit detailed daily reports weekly, to include the following:
 - 1. The daily work location, date, start time and finish time, ambient conditions including wet bulb temperature, dry bulb temperature, and steel surface temperature, including hold point inspection observations.
 - 2. All surface preparation operations including location, date, start time and finish time.
 - 3. The date, start time and finish time for all painting operations, including location, wet bulb temperature, dry bulb temperature, and steel surface temperature, of the each coat applied.
 - 4. The name, type, batch numbers, manufacturer's name and amount of coatings used for each application.
- G. The Contractor shall submit to the Engineer letters from manufacturers certifying that the paint being supplied for this project conforms completely to specifications.

1.05 REGULATORY REQUIREMENTS

- A. All coatings shall comply with VOC regulations as promulgated by the Ozone Transport Commission, effective January 2005.

1.06 CERTIFICATES

- A. The Contractor shall submit to the Engineer, immediately upon completion of the job, certification from the manufacturer indicating that the quantity of each coating purchased was sufficient to properly coat all surfaces.
- B. Certification shall make reference to the square footage figures provided to the manufacturer by the Contractor.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, protect and handle products to the site under provisions of Sections 016100 and 016500.

- B. All materials furnished by the Contractor shall be brought to the job site in the original sealed and labeled containers of the paint manufacturer and shall be subject to inspection by the Engineer.
- C. Every container of coatings materials shall have the batch number imprinted on the can, as well as the Federal Specification Number. Colors, where not specified, shall be as selected by the Engineer or Owner.
- D. Store all materials as recommended by the manufacturer. Any materials stored improperly shall be removed from the site immediately. Maintain storage location and temperature log at storage site available for inspection.

1.08 WARRANTY

- A. Provide a 1-year labor and manufacturer's materials warranty for the coating systems.
- B. Warranties are to be submitted in writing to the Engineer prior to product delivery.
- C. Any defects, failures, breakdowns, or discrepancies of the paint or coatings, that reveal themselves within the 1-year warranty period after acceptance of work shall be promptly repaired at no additional cost to the Owner.
- D. Touch up procedures shall be issued by the engineer for areas of coating defects, breakdowns, or discrepancies to be repaired, only if the accumulative areas are less than five square feet, or if the engineer permits.
- E. Remove the entire coating in the area where failure occurs. Touch-up work will not be permitted. The surface is to be prepared as originally scheduled

PART 2 - PRODUCTS

2.01 COATING REQUIREMENTS

- A. All coating systems submitted for use shall be new for the project described. Two component coating materials shall be mixed in accordance with the manufacturers data sheet. No partial kits shall be permitted to be used.
- B. All coating systems submitted for use shall conform and meet the minimum requirements specified by the Engineer for:
 - 1. Adhesion - ASTM-D-3359 and 4541
 - a. Minimum 900 psi as measured with a Type 2 tester
 - 2. Hardness - ASTM-D-3363, 2583, and 2240
 - a. Exterior Finish Coating - No gouging or scratching with an 8H or less pencil
 - 3. Flexibility - ASTM-D-522 and FED-STD-6221
 - a. Exterior Finish Coating - No less than 34% elongation, average of three tests
 - b. Impact Resistance - ASTM-D-2754
 - c. Interior Coating – No visible cracking or delamination of film after 25 inch pounds or less direct impact.
 - d. Exterior Coating - No visible cracking or delamination of film after 34 inch pounds or less direct impact.
 - 4. Abrasion Resistance - ASTM-D 968 and 4060
 - a. No More than 100 mg loss after 1000 cycles

2.02 MANUFACTURERS

- A. TNEMEC COMPANY, INC

- B. PPG INDUSTRIES
- C. SHERWIN-WILLIAMS
- D. Coating substitutions shall be permitted only after receiving written approval from the Engineer prior to bid.

2.03 MATERIALS - GAC / IRON REMOVAL / NITRATE REMOVAL VESSELS - EXTERIOR

- A. TNEMEC Exterior Paint System - Three full coats, one stripe coat.
 - 1. TNEMEC Series 94H2O, Hydro-Zinc, 2.5 - 3.5 mils DFT.
 - 2. TNEMEC Series 27FC Typoxy Stripe Coat (Contrasting Color)
 - 3. TNEMEC Series 27FC Typoxy, 3.0 - 5.0 mils DFT
 - 4. TNEMEC Series 72 Low VOC Acrylic Urethane, 2.5 - 5.0 mils DFT
- B. PPG Exterior Paint System - Three full coats, one stripe coat
 - 1. PPG Amercoat 68MCZ, 2.5 - 3.5 mils DFT
 - 2. PPG Amerlock 2/400 Epoxy Stripe Coat (Contrasting Color)
 - 3. PPG Amerlock 2/400 Epoxy, 3.0 - 5.0 mils DFT
 - 4. PPG Amercoat 450H, 2.5 - 5.0 mils DFT
- C. SHERWIN-WILLIAMS Paint System - Three full coats, one stripe coat.
 - 1. Sherwin-Williams Corothane 1 Galvapak B65G11 or Zinc Clad IV (85), 2.5 - 3.5 mils DFT
 - 2. Sherwin-Williams Macropoxy 646 Stripe Coat (Contrasting Color)
 - 3. Sherwin-Williams Macropoxy 646, 3.0 - 5.0 mils DFT
 - 4. Sherwin-Williams Acrolon 218HS, 2.5 - 5.0 mils DFT

2.04 MATERIALS - GAC VESSELS - INTERIOR

- A. The interior surfaces of each vessel shall be lined with a nominal 35 to 45 mils dry film thickness (dft) Carboline Plasite "4000 series" lining materials. The interior surfaces under the internal cone bottom shall also be lined with 10 to 12 mils dry film thickness (dft) Carboline Plasite "4000 series" materials. Plasite "4000 series" shall meet the requirements of the U.S. Federal Register, Food and Drug Regulations Title 21, Chapter 1, Paragraph 175.300 and NSF 61.

2.05 MATERIALS - IRON / NITRATE REMOVAL VESSELS - INTERIOR

- A. Interior Paint System - Two full coats, one stripe coat.
 - 1. TNEMEC Series 94H2O, Hydro-Zinc, 2.5 - 3.5 mils DFT
 - 2. TNEMEC Series 22 Epoxoline Stripe Coat
 - 3. TNEMEC Series 22 Epoxoline, 25 - 30 mils DFT

2.06 ACCESSORIES

- A. Seam Sealer/Caulk: Shall be as recommended by the coating manufacturer.

2.07 TESTING

- A. The Engineer shall have the right to take random samples of paint from the painter's bucket as it is being applied to the steel structure, tank or mechanical piping. These samples will be sent to the paint manufacturer for analysis to determine constituents and type of coating.

- B. No material of any kind shall be used until it has been inspected and accepted by the Engineer. All materials rejected shall be immediately removed from the work and not again offered for inspection.

2.08 ACCESSORY MATERIALS

- A. Provide all required ladders, scaffolding, drop cloths, maskings, scrapers, tools, sandpaper, cleaning solvents, and remove waste as required to perform the work to achieve the results specified herein. Materials not specifically indicated but required to achieve the finishes specified shall be of commercial quality and as recommended by the manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Contractor shall verify existing ambient condition and substrate conditions prior to proceeding with any work and submit to Engineer's/representative's prior to requesting Engineer's/representative's verification.
- B. Contractor shall verify substrate is properly prepared, properly cleaned, and or properly coated in accordance with project specifications prior to proceeding with any additional work and prior to requesting Engineer's/representative's verification.
- C. Should the contractor request verification from Engineer's/representative's and work is not in conformance with requirements contractor shall pay \$500 per occurrence to cover the costs to the owner.

3.02 PREPARATION - GENERAL

- A. Surface Preparation Schedule:
 - 1. GAC / Iron / Nitrate Removal Vessel - Interior: Abrasive blast all interior surfaces to near-white finish (SSPC SP-10), unless otherwise noted, to achieve an angular surface profile between 2 - 3 mils.
 - 2. GAC / Iron / Nitrate Removal Vessels - Exterior: Shall be abrasive blast cleaned to SSPC SP-6 (commercial blast cleaning) to achieve an angular surface profile between 1.5 - 3 mils.
- B. Cleaned surfaces, when viewed without magnification, shall be free of all visible paint oil, grease, dirt, mill scale, rust, oxides, corrosion products and other foreign matter as noted in Chapter 2, SSPC Painting Manual Volume 2.
- C. Pit filler shall be applied to all voids that are greater than $\frac{1}{4}$ of the original steel surface thickness.
- D. The pit filler shall be applied prior to the application of the first coat and in accordance with manufacturer's instructions. If the manufacture's instructions differ from the project specifications, the more stringent will apply.
- E. All areas shall be cleaned prior to any coating application. All surfaces to be painted shall be dry.
- F. Weld projections or irregular portions of welds, or any steel defects that would interfere with the proper coating shall be ground smooth, as directed.

3.03 APPLICATION

- A. Apply coating in strict conformance with the manufacturer's instructions and requirements. If the manufacturer's instructions differ from the project specifications, the more stringent will apply.
- B. Before coating is applied to surfaces, steps shall be taken, either by circulation of dry air or by the application of heat, to dry the metal surfaces completely.
- C. No coatings shall be applied when the surface temperature is less than 5 degrees Fahrenheit (3 degrees Celsius) above the dew point.
- D. No coatings shall be applied when the relative humidity is above 80% or as recommended by manufacturer.
- E. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer. Do not apply exterior coatings when unfavorable weather conditions are forecast within 24 hours of application.
- F. No surfaces shall be coated that are not in compliance with SSPC surface preparation standards or any other part of the project specifications.
- G. All coatings shall be applied at the rate specified. Deficiencies in film thickness shall be corrected with the proper surface preparation and application of an additional coating or as directed by the Engineer. Coatings in excess of the specified range shall be corrected at the direction of the Engineer.
- H. All coating applications shall be inspected and approved by the Engineer prior to the application of any succeeding coats. All coats shall be applied to the dry film thickness specified.
- I. The minimum and maximum total dry film thickness shall be as indicated in this section. The Mil Gauge shall be calibrated in accordance with the National Institute of Standard and Technology. The Contractor shall have available on the job site a satisfactory magnetic type Mil Gauge for measuring film thickness.
- J. A brush applied stripe coat, of different color, shall be applied to all weld seams, edges, seams, or any non conforming surfaces deemed necessary by the Engineer. The stripe coat shall be applied after the first coat but prior to the second coat.
- K. The coating shall be applied as a continuous film of uniform thickness. Any holidays or areas missed in the application shall be recoated within the maximum re-coat time or be corrected with the proper surface preparation and cleaning prior to the application of the subsequent coating.
- L. All coatings that are specified shall only be acceptable in the number of coats specified in the contract documents.
- M. All coatings shall be checked and verified with a High-Voltage Holiday detector by the Contractor. Testing shall be performed in accordance with NACE SPO188. All Holidays indicated shall be repaired. These areas shall be re-tested after the appropriate curing time. The coating system must pass the Holiday test of the existing coating thickness. The coating system must pass the Holiday test of the newly applied coating thickness.
- N. The Engineer may conduct a final high-voltage Holiday detection in accordance with NACE SPO188 after delivery to the site. The coating must pass the Holiday test regardless of the

existing coating thickness. Any Holidays detected by the Engineer shall be repaired by the fabricator/supplier.

3.04 CLEANING

- A. All surfaces shall be free of all dirt, oil, debris, or any other foreign matter prior to the application of any coating.
- B. The Contractor shall maintain his work area in a neat, orderly fashion. Accumulation of debris, muck, rust, scale, etc., shall be frequently (not to exceed 1 week) cleaned up and removed from the site. Thinners used to clean equipment shall be held in sealed containers and removed from the site to an approved disposal area by the Contractor. Provide certificates from the disposal site indicating that the material has been properly disposed of.
- C. Upon completion of the work, all excess material, rigging, empty containers, cables, tarps, etc., shall be removed from the site. Buildings and grounds shall be left in as good condition as when work was started.

3.05 FIELD QUALITY CONTROL

- A. The Engineer will inspect the painting as it is being performed.
- B. The Engineer reserves the right to accept each phase of the work before further work may be conducted, to halt all Work deemed to be improper or not in compliance with project specifications, and to require the contractor to promptly correct all improper practices or deficient work. Contractor shall notify the Engineer's/representative's 24 hours minimum prior to the following:
 - 1. Prior to the start of work
 - 2. Immediately following surface preparation
 - 3. Immediately prior to each coating or lining application
 - 4. Following the application of each coat
 - 5. Following the curing of the coating or lining
- C. The Engineer reserves the right to conduct any testing, both destructive and nondestructive, at any time for inspection or evaluation purposes.
- D. Any expenses incurred for corrective measures required as the result of improper practices and/or defective or deficient work shall be borne by the contractor and the extent of these corrective measures shall be at the discretion of the engineer.
- E. The Contractor shall provide safe access to all areas, including but not limited to, equipment, containers and spaces for inspection at any time as deemed necessary by the Engineer or his representative
- F. Sufficient lighting shall be provided to ensure proper safety conditions and permit inspection.
- G. All manholes and other tank openings shall remain open as necessary during cleaning, painting and curing operations.

END OF SECTION 099745

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Fire extinguishers and mounting clips.
- B. Fire extinguisher identification decal.

1.02 REFERENCES

- A. NFPA 10 - Standard for Portable Fire Extinguishers; 2017, with Errata (2018).
- B. UL 299 - Dry Chemical Fire Extinguishers.
- C. UL 626 - Water Fire Extinguishers.

1.03 SUBMITTALS

- A. Submit in accordance with Section 013300 - SUBMITTALS.
 - 1. Product Data:
 - 2. Extinguisher type, operational features, color.
 - 3. Materials, construction, features, dimensions and installation requirements.
 - 4. Building floor plans indicating the locations of the different types of extinguishers.

1.04 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Section 017800 - CLOSEOUT SUBMITTALS.
- B. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.05 QUALITY CONTROL

- A. Regulatory Requirements: Conform to NFPA 10 and local jurisdiction for requirements for extinguisher location and mounting.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients, unless protected with an anti-freeze charge.

1.07 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure of hydrostatic test according to NFPA 10.
 - b. Faulty operation of valves or release levers.
 - 2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with project requirements, manufacturers offering Products that may be incorporated in the work include the following:

1. J.L. Industries, Bloomington, MN (800) 554-6077.
2. Larsen's Manufacturing Company, Minneapolis, MN (800) 527-7367.
3. Potter-Roemer, Incorporated, Cerritos, CA (800) 366-3473.
4. Or approved equal.

2.02 MATERIALS

- A. Dry Extinguisher: Provide multipurpose dry chemical type, UL 299; UL-rated 4-A: 60-B: C. 10-pound nominal capacity in enameled steel container at locations noted on plans.
- B. Mounting Bracket: Provide surface mounted wall bracket mounting clips and all required accessories. Metal designed to prevent accidentally dislodging extinguisher, of size required for type and capacity of extinguisher specified. Bright chrome finish.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify wall is finished and acceptable to receive bracket.
- B. Verify location with Architect/Engineer in field before installation.

3.02 INSTALLATION

- A. Install extinguisher and bracket in accordance with manufacturer's published instructions in locations required by authority having jurisdiction and where indicated by Architect/Engineer.
- B. Mount brackets so top of extinguisher is maximum 54" above finished floor and bottom is a minimum of 12" above finished floor.
- C. Install extinguisher clips plumb and level, secure rigidly in place.
- D. Place extinguisher on clips.
- E. Apply identification decal above fire extinguisher, size and location per local authority having jurisdiction.

END OF SECTION 104416

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Loading dock bumpers of molded rubber with attachment frame.

1.02 RELATED REQUIREMENTS

- A. Section 031000 - Concrete Forming and Accessories: Placement of loading dock bumper frame anchors into concrete.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit data on unit dimensions, method of anchorage, and details of construction.
- C. Manufacturer's Installation Instructions: Submit installation requirements.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Loading Dock Bumpers:
 - 1. Blue Giant Equipment Corporation; Molded Rubber Bumper Model Type BG-M410-13: www.bluegiant.com/#sle.
 - 2. Substitutions: See Section 016000 - Product Requirements.

2.02 COMPONENTS

- A. Loading Dock Bumpers: Molded rubber, ozone resistant, nylon reinforced, Shore A Durometer of 70, minimum, and tensile strength of 950 to 1050 psi (6550 to 7240 kPa), minimum.
 - 1. Projection From Wall: 4 inches (102 mm), minimum.
 - 2. Vertical Height: 10 inches (254 mm), minimum.
 - 3. Width: 13 inches (330 mm), minimum.
 - 4. Profile: Rectangular.
- B. Attachment Hardware: 3/4 inches (19 mm) diameter galvanized bolts with expansion shields.
- C. Touch-up Primer: Zinc rich type.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify that anchor placement is acceptable.

3.02 INSTALLATION

- A. Install dock bumpers in accordance with manufacturer's instructions.
- B. Set plumb and level.

- C. Secure angled end frames to concrete; refer to Section 031000 for additional information.

END OF SECTION 111313

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Custom pre-engineered tensioned fabric structure, including fabric, structural steel supporting members, fittings and accessories; doors, frames and hardware; louvers, exhaust fans and lighting from a single supplier.

1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete: Concrete foundations.

1.03 REFERENCE STANDARDS

- A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
- C. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2018.
- D. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2018.
- E. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2018.
- F. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).
- G. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films; 2023.
- H. SSPC-SP 6 - Commercial Blast Cleaning; 2007.
- I. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

1.04 PREINSTALLATION MEETINGS

- A. Pre-installation Meeting: Convene a pre-installation meeting at least two (2) weeks before start of installation of tensioned fabric structure.
 - 1. Require attendance of parties directly effecting work of this section, including Architect, Owner, Contractor, Tensioned Fabric Installation Superintendent, and Manufacturer's Field Representative.
 - 2. Review proper handling of fabric, preparation, installation, adjusting, cleaning, and coordination with other work.

1.05 SUBMITTALS

- A. See Section 013300 - SUBMITTALS, for submittal procedures.

- B. Product Data: Submit manufacturer's product data, including test reports on fabric showing compliance with specified properties; doors, frames, and hardware; louvers, exhaust fans and lighting.
- C. Shop Drawings: Submit construction drawings including plans, elevations, details, dimensions, support steel sizing, cables and hardware, clamp/corner plates, fittings, fabric, fabric layout seams, and the following:
 - 1. Exact interface geometry determination and definitions.
 - 2. Coordination between fabric and structural supports
 - 3. Interfaces to foundation supports.
 - 4. Design loads used in structural calculations.
 - 5. Foundation reaction loads.
 - 6. Details for the installation of doors, frames, and hardware; louvers, exhaust fans and lighting and their connections to the adjoining structure materials.
 - 7. Stamp or seal of delegated design engineer licensed in the State of New York.
- D. Samples: Submit at least 6 inch by 6 inch (152 mm by 152 mm) sample of fabric.
- E. Erection/Stressing Plan: Submit a compressive erection and stressing plan, including drawings and sketches that clearly show the proposed erection procedure for the fabric roof elements, cables, and structural steel during each stage of construction.
- F. Quality Control: Submit outline of manufacturer's Quality Control Program.
- G. Safety Program: Submit copy of manufacturer's safety manual for installation.
- H. Provide Operating and Maintenance Data for all items installed including but not limited to: doors, frames, and hardware; louvers, exhaust fane and lighting.
 - 1. Provide manufacturer's instructions for fabric repair, re-tensioning cables, and cleaning fabric.
- I. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Firm that is capable of assuming complete responsibility for design, engineering, fabrication, delivery, preparation, installation, adjusting, cleaning of structure, and the following:
 - 1. Having minimum of five years experience in design and fabrication of tensioned fabric structures of similar size and complexity to that specified.
 - 2. Employing a licensed professional engineer with minimum of five years experience in tensioned fabric structures using large displacement finite element techniques to perform or supervise the structural design and licensed in New York.
 - 3. Employing a professional staff and qualified consultants experienced with tensioned fabric structures of similar size and complexity to that specified.
 - 4. Employing integrated CAD and finite element computer software programs to ensure adequacy of design and accurate 3-dimensional computer generated models for fabrication of structure; using CAD system to prepare construction drawings and interface with the plotting and cutting process, ensuring high precision fabric cutting.
 - 5. Providing installation directly supervised by a superintendent, directly employed by contractor, with five years of experience in installation of tensioned fabric structures of similar size and complexity to that specified.
- B. Installer Qualifications: Manufacturer or authorized by manufacturer.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Store materials in accordance with manufacturer's instructions, in a clean, dry, well ventilated area, above ground on blocking, and do not allow materials to become wet, stained, or dirty.
- C. Handle materials so as to protect materials, coatings, and finishes during handling and installation to prevent damage or staining.
 - 1. Handle materials in accordance with manufacturer's instructions.
 - 2. Use care in handling of fabric to avoid damage to fabric material and coating.
 - 3. Do not damage, crush, or kink cables.

1.08 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Provide manufacturer's standard twenty-year Structural Frame and ten-year Fabric warranty stating that the manufacturer will replace any part or parts designated as the "Canopy Frame" system found upon examination by the manufacturer to be defective in material and/or workmanship. Warranty shall cover all transportation charges for the parts submitted for replacement or repair under this warranty.
- C. Provide installer's written one year workmanship warranty.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Tensioned Fabric Structures:
 - 1. Hybrid Building Solutions; Contact: Mari-Louise Merkwa, Phone: 716-544-5872, Email: ml@hybridbuildingsolutions.com; Website: www.hybridbuildingsolutions.com
 - 2. Milestone Building and Design; Contact: Bob Shumake, Phone: 360.815.2705, Email: Bob@mbdbuildings.com; Website: www.mbdbuildings.com;
 - 3. Substitutions: See Section 016100 - Product Requirements.

2.02 TENSIONED FABRIC STRUCTURES

- A. Tensioned Fabric Structure: Provide a custom pre-engineered tensioned fabric structure consisting of fabric stretched on steel structural supports, with the following characteristics:
 - 1. Capable of withstanding loads specified in ASCE 7 and local building code without damage or failure; for designer's information, project falls under the following design categories:
 - a. Basic Wind Speed: 128 mph (206 km/h).
 - b. Exposure Category: D.
 - c. Risk Category: II.
 - 2. Capable of maintaining structural integrity in event of a tear propagating in fabric, without endangering occupants.
 - 3. Shape geometry selected for equilibrium based on stress in fabric.
 - 4. Having a smooth uniform fabric surface with even curved edges and interfaces and without wrinkles, cuts, abrasions, stains, marks, surface defects, or seaming aberrations.
 - 5. Ground Snow Load: 20 psf.
 - 6. Roof Snow Load: 21 psf.
 - 7. Gravity Loads: Self weight of truss plus 1 psf for weight of fabric and fixtures.

8. Structure configuration: 100 feet wide by 120 feet long with a minimum side wall clear height of 17.75 feet and minimum peak clear height of 39.75 feet
9. Provide Anchor bolts in size, type, lengths, quantities and configurations as required for the building end reactions provided by the Delegated Design calculations based on the loading requirements specified and required by the AHJ.
10. LED Lighting shall meet Code required footcandle levels throughout the structure for walkways, work surfaces and other elements within the structure.
11. Fabric skirt shall extend past the existing concrete basin walls and layer/ terminate on the ground, fastened with manufacturer provided non-corrosive anchors at the required spacing for wind and local loading requirements.
12. Made of pre-engineered components ready for installation.

2.03 MATERIALS

- A. Fabric: Manufacturer's option, with expected life span of 15 years and minimum warranty period of 10 years.
- B. Supporting Steel Truss Members: Steel members are hot-dip galvanized after fabrication.
 1. Structural Tubing: ASTM A500/A500M, Grade B.
 - a. 30 inch deep heavy wall galvanized, 4-chord truss design with welded joints coated with 97% zinc cold galvanizing for corrosion protection.
 - b. Truss spacing: 12 feet on center spacing
 2. High-Strength Bolts: ASTM F3125/F3125M. Provide Carbon Steel, Mechanically Galvanized.
 3. Anchor Bolts, Threaded Rod: ASTM A36/A36M. Provide Carbon Steel, Mechanically Galvanized.
 4. Welding: Perform in accordance with AWS D1.1/D1.1M.
- C. Paint for Structural Steel Members, Tensioning Nuts, and Fabric Plates:
 1. Surface Preparation: Commercial blast cleaning complying with SSPC-SP6.
 2. Primer: SSPC-Paint 20; minimum dry film thickness (DFT) of 3 to 5 mils, 0.003 to 0.005 inch (0.076 to 0.127 mm).
 3. Intermediate Coat: Polyamide epoxy; minimum dry film thickness (DFT) of 3 to 5 mils, 0.003 to 0.005 inch (0.076 to 0.127 mm).
 4. Finish Coat: Aliphatic polyurethane; minimum dry film thickness (DFT) of 10 mils, 0.010 inch (0.254 mm).
 5. Color as selected by Architect/Engineer.
- D. Cables and End Fittings: Provide structural cables of same type having same modulus of elasticity.
 1. Cables: Stainless steel, Type 304 or 316.
 2. Cables in Contact with Fabric: PVC sleeved.
 3. Cable Length Tolerance: As indicated on drawings.
 4. Swaged and Speltered Fittings: Design and install to develop full breaking strength of cable.
 5. Thimble End Fittings: Design and install to develop a minimum of 90 percent of breaking strength of cable.
 6. Swaged End Fittings, Pins, Nuts, and Washers: Stainless steel.
 7. Tensioning Nuts and Fabric Plates: Galvanized steel, finished with two coats of epoxy paint.
- E. Shackles, Rigging Screws, Clamps, and Tensioning Hardware: Stainless steel architectural finished material only.

- F. Interior Lighting: Predrill base plates to allow conduit to be installed and cabling to run inside support steel for mounting lights under canopy.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine area to receive structure; notify Architect/Engineer if area is not acceptable, and do not begin installation until unacceptable conditions have been corrected.
- B. Examine foundations and anchor bolts for location and elevation; notify Architect/Engineer of inaccuracies, and do not begin installation until unacceptable conditions have been corrected.

3.02 PREPARATION

- A. Prepare an erection plan for all structural and fabric installation activity, including a detailed sequence of the work.
- B. Prepare a clear, flat, smooth, and clean layout area on ground of sufficient size for assembly of fabric panels; prepare area adjacent to location of structure installation.
- C. Check contact surfaces to remove sharp objects, dirt, grease, oil, and other causes for rips, scratching, or other damage to fabric panels during installation.
- D. Use temporary ground sheets where fabric panels are to be dragged across a surface to prevent chaffing or other damage to fabric panel surface.

3.03 INSTALLATION

- A. Comply with pre-established erection plan.
- B. Do not undertake erection of fabric during inclement weather conditions; installer has sole responsibility to determine when conditions are safe for erection.
- C. Install structure in accordance with manufacturer's instructions at location indicated on drawings.
- D. Concrete Foundations:
 - 1. Install concrete foundations and anchor bolts as specified in Section 033000 and as indicated on drawings.
 - 2. Ensure exposed concrete surfaces are smooth, uniform and clean, with no "bug holes," air voids, or other surface blemishes.
 - 3. Ensure concrete has obtained specified minimum compressive strength before erection of support steel.
- E. Support Steel:
 - 1. Erect support steel by manufacturer's shop drawings and as indicated on drawings.
 - 2. Erect support steel plumb, level, and square, to correct location and elevation.
 - 3. Do not perform field welding without approval of Architect/Engineer; use experienced welders.
- F. Install structure in necessary sequence and with sufficient bracing to ensure stability throughout installation.
- G. Architect/Engineer will inspect installed concrete anchors, support steel, cables, and fittings before installation of fabric only to ensure compliance with data submittals.

- H. Install and tension fabric in accordance with manufacturer's instructions.
 - 1. Use care in installation of fabric to avoid damage to base material, coating, and surface treatment.
 - 2. Ensure surfaces of fabric are smooth, uniform, and clean, with even curved edges and interfaces, and with no cuts, scratches, abrasions, stains, marks, blemishes, or welding irregularities.
- I. Repair or replace defective or damaged materials, coatings, and finishes as directed by Architect/Engineer.

3.04 ADJUSTING

- A. Make final adjustments to structure as required for structural integrity, watertightness, geometric shape, and free from objectionable wrinkles when viewed from the normally occupied space.

3.05 CLEANING

- A. Clean structure in accordance with fabric manufacturer's instructions.

END OF SECTION 133100

PART 1 - GENERAL**1.01 SECTION INCLUDES**

- A. Pipe penetration seals.

PART 2 - PRODUCTS**2.01 MANUFACTURERS**

- A. GPT. LINK-SEAL or equal.
- B. NPC, INC. KOR-N-SEAL or equal.

2.02 PIPE PENETRATION SEALS – PROCESS TANKS AND WELLS

- A. Seals shall be modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and wall opening. Links shall be loosely assembled with bolts to form a continuous rubber belt around the pipe with a pressure plate under each bolt head and nut. Bolts and nuts shall be Type 18-8 stainless steel.
- B. After the seal assembly is positioned in the sleeve, tightening of the bolts shall cause the rubber sealing elements to expand and provide a watertight seal between the pipe and wall opening under 40 feet of head. Seal shall be suitable for a temperature range of -40°F to 250°F and submergence in groundwater.

2.03 PIPE PENETRATION SEALS – VAULTS AND PITS

- A. Flexible Pipe to Manhole Connector: NPC, INC. KOR-N-SEAL I which meets or exceeds the requirements of ASTM C923. Installation band to secure opening in manhole wall and pipe clamp shall be Series 304 stainless steel. Connector to be toggle style, wedge style not acceptable.

PART 3 - EXECUTION**3.01 EXAMINATION**

- A. Determine the required inside diameter of each individual wall opening or sleeve. The inside diameter of each wall opening shall be sized as recommended by the manufacturer to fit the pipe and pipe penetration seal to assure a watertight joint. Sizing for correct pipe penetration seal model and number of links per seal may be obtained through manufacturer's catalog.
- B. If pipe outer diameter is nonstandard due to coating or insulation, consult manufacturer for engineering assistance and recommendation before proceeding with wall opening detail.

3.02 INSTALLATION

- A. Install and tighten seal to provide a watertight pipe penetration in accordance with manufacturer's instructions.

END OF SECTION 220510

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Work of this Section includes specifications for the adequate support of exposed piping. Pipe hangers shall be meant to include pipe support systems.
- B. Where product specifications are provided, they are intended to provide a standard of quality.
- C. The Drawings show the layout, sizes, elevations, and general arrangement of piping, valves, primary instrumentation elements, and process equipment. Pipe support systems shall be selected, configured, and installed by the Contractor in order to comply with the requirements contained herein. Install pipe support systems consisting of hangers, supports, clamps, U-bolts, brackets, bracings, attachments, and structural shapes to adequately support piping from building components, tank walls, decking, walkways, slabs, or fabricated structural assemblies specifically designed for this purpose. All piping supports and hardware shall be fabricated and erected of stainless steel as specified herein.

1.02 REFERENCES / QUALITY ASSURANCE

- A. Comply with the following in designing and installing pipe support systems:
 - 1. MSS SP58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.
 - 2. MSS SP69 - Pipe Hangers and Supports - Selection and Application
 - 3. MSS SP89 - Pipe Hangers and Supports - Fabrication and Installation Practice
- B. Terminology used in this Section is defined in MSS SP-90.
- C. All interior and exterior pipe support and hanger systems shall be 304L stainless steel as a minimum.

1.03 SUBMITTALS

- A. Comply with the requirements contained in Section 013300 - Submittals.
- B. Submit the following:
 - 1. Product data and installation instructions.
 - 2. Pipe hanger and support catalog cuts showing manufacturer's figure number, size, materials of construction, and features for each type of support.
 - 3. Provide catalog cuts for all types of stainless-steel pipe support.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Anvil International
- B. Approved equal.

2.02 MATERIALS

- A. Anvil International figure 260 MSS Type 1, with adjustable clevis hangers for non-insulated pipe 2 through 24-inch diameter.
- B. Anvil International figure 260 adjustable wrought clevis hangers, with Figure 167, MSS Type 40 galvanized insulation protection shields sized for supporting insulation having a strength of 4

psi, at 8-foot intervals. Support piping on outside of insulation. Size hangers so that pipe insulation passes through them without interruption. Use these for:

1. Insulated steel pipe 1/2 through 24-inch diameter.
 2. Insulated galvanized steel pipe 1/2 through 24-inch diameter.
 3. Insulated copper pipe 1/2 through 8-inch o.d.
 4. Insulated PVC pipe with no longitudinal movement.
- C. Anvil International Figure 104, MSS Type 6, with adjustable swivel ring, split ring type for:
1. Non-insulated steel pipe, galvanized steel pipe, and copper pipe 1/2 through 2-inch diameter.
 2. Non-insulated cast iron soil pipe up through 8-inch diameter.
- D. Anvil International Figure CT-138R, MSS Type 9, with adjustable wrought tubing ring hanger, either plastic covered for:
1. Non-insulated copper tubing with no longitudinal movement.
 2. Non-insulated PVC pipe, 1/2 through 4-inch diameter, with no longitudinal movement.
- E. Standon, Model S92 Adjustable Pipe Saddle Support. Anchor all base plates to floor with removable anchors in accordance with manufacturer's instructions. Provide neoprene liner between saddle and pipe.
1. Non-insulated steel pipe, galvanized steel pipe, and copper pipe 2-inch through 36-inch diameter.
- F. C-Clamps: Anvil International Figure 66, MSS Type 23. Use these for attaching hangers to steel beams. Welding hanger rods to steel members is not permitted. Provide retaining clip for C-Clamps.
- G. Hanger Rods: Stainless steel threaded both ends or continuous thread. Only stainless-steel threaded rod shall be used on the project. Diameter shall be as required to adequately support the load except where otherwise shown on the Drawings.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrate and conditions under which supports, and anchors are to be installed. Do not proceed with the installation until satisfactory conditions have been corrected by reinforcing the substrate.

3.02 INSTALLATION OF HANGERS AND SUPPORTS

- A. General: Install hangers, supports, clamps, and attachments to support piping properly from building structure; comply with MSS SP-69 and SP-89. Install supports with maximum spacing complying with MSS SP-69.
- B. Space attachment within maximum piping span length indicated in MSS SP-69. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping.
- C. Install hangers and supports complete with necessary bolts, rods, nuts, washers, and other accessories.
- D. Install hangers and supports to allow controlled movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends and similar units.

- E. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.
- F. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes, and so that maximum pipe deflections allowed by ASME B31.9 Building Services Piping Code is not exceeded.

3.03 INSTALLATION OF ANCHORS

- A. Install anchors at proper locations to prevent stresses from exceeding those permitted by ASME B31.9 and to prevent transfer of loading and stresses to connected equipment.
- B. Fabricate and install anchors by welding steel shapes, plates, and bars to piping and to structure. Comply with ASME B31.9 and with AWS Standards D1.1.
- C. Anchor Spacing: Install anchors at ends of principal pipe runs, at intermediate points in pipe runs between expansion loops and bends. Make provisions for preset of anchors as required to accommodate both expansion and contraction of piping.

3.04 EQUIPMENT SUPPORTS

- A. Fabricate structural steel stands to suspend equipment from structure above or support equipment above floor. Structural steel members shall be used where lateral support is required.
- B. Grouting: Form and place non-shrink grout for piping pier supports, thrust blocking, submersible pump discharge elbows, and equipment base plates. Shim to obtain level and plumb before placing grout.

3.05 METAL FABRICATION

- A. Cut, drill, and fit miscellaneous metal fabrications for pipe anchors and equipment supports. Install and align fabricated anchors in indicated locations.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

3.06 ADJUSTING

- A. Hanger Adjustment: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

3.07 SCHEDULE

PIPE SIZE Inches (mm)	MAX. HANGER SPACING Feet (m)	DIAMETER Inches (mm)
1/2 to 1-14 (12 to 32)	6 (1.8)	3/8 (9)
1-1/2 to 2 (38 to 50)	10 (3)	3/8 (9)
2-1/2 to 3 (62 to 75)	10 (3)	1/2 (13)
4 to 6 (100 to 150)	10 (3)	5/8 (15)

SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT
(CONTRACT P)

H2M

- A. Hanger spacing based on copper and steel pipe without valves or other equipment. Increased load due to valve and equipment shall require closer spacing of hangers.
- B. Maximum hanger spacing shall be 4 feet for PVC pipe.
- C. Maximum hanger spacing shall be 2 feet, 8 inches for PE and PB pipe.
- D. Maximum hanger spacing for cast iron pipe less than 10 feet in length shall be 5 feet.

END OF SECTION 220529

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. This Section includes all labor, materials, and equipment necessary to install pipe insulation.

1.02 REFERENCES

- A. ASTM C335 - Steady-State Heat Transfer Properties of Horizontal Pipe Insulation.
- B. ASTM C533 - Specification for Calcium Silicate Block and Pipe Thermal Insulation.
- C. ASTM C534 - Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
- D. ASTM C547 - Mineral Fiber Preformed Pipe Insulation.
- E. ASTM C921 - Properties of Jacketing Materials for Thermal Insulation.
- F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- G. ASTM E96 - Test Method for Water Vapor Transmission of Materials.

1.03 SUBMITTALS

- A. Submit the following in accordance with the requirements contained in Section 013300:
 - 1. Product Data: Provide product description, list of materials and thickness for each service, color charts, and locations of work as specified or noted on the Contract Drawings for review.
 - 2. Manufacturer's Installation Instructions: Indicate procedures that ensure acceptable workmanship and installation standards will be achieved.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Comply with the requirements contained in Section 016500.
- B. Deliver, store and protect products in accordance with manufacturer's instructions.
- C. Deliver materials to site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.
- D. Store insulation in original wrapping and protect from weather and construction activities.
- E. Protect insulation against dirt, water, chemical, and mechanical damage.

1.05 ENVIRONMENTAL REQUIREMENTS

- A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.
- B. Maintain temperature during and after installation for minimum period of 24 hours.

1.06 QUALITY ASSURANCE

- A. Work of this Section shall be performed by persons experienced in the installation of the specified system.
- B. If requested by the Engineer/Owner, submit documentation relative to the installer's qualifications. The Owner and Engineer may elect to visit the installer's previous work.
- C. Submit at least three references who may be contacted regarding the installer's qualifications.

PART 2 - PRODUCTS

2.01 GLASS FIBER

- A. Manufacturers: Owens Corning or equal.
- B. Insulation:
 - 1. High density all service jacket with double adhesive lap seal, two-component, butt strip, closure system. Color to match pipe color code designation.
 - 2. ASTM C547; rigid noncombustible molded type
 - 3. K-Value: ASTM C335, 0.24 at 75° F.
 - 4. Minimum Service Temperature: 0° F.
 - 5. Maximum Service Temperature: 850° F.
 - 6. Maximum Moisture Absorption: 0.2% by volume.
- C. Vapor Barrier Jacket (Interior and Exterior Service):
 - 1. Fiberglass SSL II by Owens Corning or equal.
 - 2. ASTM C 1136
 - 3. Secure with self-sealing longitudinal laps and butt strips.
 - 4. Secure with outward clinch expanding staples and vapor barrier mastic.
- D. Tie Wire: 18 gage stainless steel with twisted ends on maximum 12 inch (300 mm) centers.
- E. Fire and Smoke Hazard Ratings: Class 1 and 2 jacketing materials, mastics, sealants and adhesives shall have a maximum flamespread rating of 25 and a maximum fuel contributed and smoke developed rating of 50 or less, when tested in accordance with ASTM E84 and UL723.
- F. For Exterior Use Only:
 - 1. PVC Cover for Pipe and Fittings:
 - a. High impact, self-extinguishing PVC and suitable for outdoor service. Colored to match pipe designation color.
 - b. Fed. Spec. L-P-535E
 - 2. Physical Property Data:

PROPERTY	TEST METHOD	SPECIFICATION
Specific Gravity	ASTM D792	1.46
Water Sorption		0.05
Moisture Vapor Transmission		less than 0.05
Tensile Strength, psi	ASTM D638	7000

PART 3 - EXECUTION

3.01 PLACEMENT

- A. Install insulation on all copper water lines including fresh water rinse piping and incoming water service piping both protected and unprotected.
- B. Install insulation on all piping installed overhead.
- C. Coordinate work with other trades before insulation is installed.

3.02 EXAMINATION

- A. Verify that piping has been tested and heat traced before applying insulation materials.
- B. Verify that surfaces are clean, foreign material removed and dry.
- C. Paint piping under provisions of Section 099100 before insulation is installed.

3.03 INSTALLATION

- A. Install materials in accordance with manufacturer's instructions.
- B. Minimum pipe insulation thickness shall be in accordance with New York State Energy Code requirements
- C. Inserts and Shields:
 - 1. Application: All piping regardless of size.
 - 2. Shields: 304L Stainless steel between pipe hangers or pipe hanger rolls and inserts.
 - 3. Insert Location: Between support shield and piping, and under the finish jacket.
 - 4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
 - 5. Insert Material: Cork or other heavy density insulating material suitable for the planned temperature range.
 - 6. Neatly finish insulation at supports, protrusions, and interruptions.

END OF SECTION 220719

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. This Section describes the pipe, valves, fittings, and joining materials for use with the piping systems described in this Section and as shown on the Drawings.

1.02 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Section 220529 – Hangers and Supports for Plumbing Piping and Equipment
- C. Section 220553 – Identification for Plumbing Piping and Equipment
- D. Section 220719 – Plumbing Piping Insulation

1.03 ABBREVIATIONS

- A. The following are standard abbreviations:
 - 1. CWP: Cold working pressure.
 - 2. EPDM: Ethylene-propylene-dieneterpolymer rubber.
 - 3. NRS: Nonrising stem.
 - 4. OS&Y: Outside screw and yoke.
 - 5. PTFE: Polytetrafluoroethylene plastic.
 - 6. TFE: Tetrafluoroethylene plastic.
 - 7. NPS: Nominal Pipe Size

1.04 SUBMITTALS

- A. Product Data: For each type of valve indicated: Include body, seating, and trim materials; valve design; pressure and temperature classifications; end connections; arrangement; dimensions; and required clearances. Include list indicating valve and its application. Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories.
- B. Product data on pipe, fittings, gaskets, and bolts. Include dimensions, specifications, and manufacturer. Provide pipe and valve application schedule.
- C. Provide product data, including but not be limited to dimensions, specifications, manufacturer, installation and operation instructions, temperature and pressure ratings, end connections, and required clearances on piping specialties included in this Specification.
- D. Welder Certifications – Furnish the names of pipe welders and welding operators employed by the Contractor to perform the Work who have been qualified to use the welding procedures which have been qualified in accordance with the specified pressure piping codes or AWS or NFPA standards.
- E. Shop Drawings
 - 1. Where deviations from the Drawings and Specifications are proposed for any reason, submit shop drawings identifying proposed deviations showing layout of all piping, fittings, materials, dimensions, and fabrication and installation details. Submit a comparison table of the specified features and ratings of the specified item and those of the proposed deviation to allow a direct comparison.

2. The review of deviations will be for pressure drop only. The review will not address clearances or accessibility. No dimensional or coordination check will be made.
3. The Contractor has the sole responsibility to review the Drawings, coordinate piping fabrication, and provide clearances and access for installation, maintenance and balancing of this Work, and Work of other trades. Unless specifically dimensioned, Drawings indicate approximate locations only. The Contractor has the sole responsibility to locate and route the piping.
4. Submit all layout shop drawings on not less than ¼ inch equals 1 foot scale drawings.

1.05 REFERENCES

- A. Division 1 - Quality Control: Requirements for references and standards.
- B. AGA Z21.22 - Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems.
- C. ANSI C111 – Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings
- D. ASME B16.3 - Malleable Iron Threaded Fittings.
- E. ASME B16.5 – Steel Pipe Flanges and Flanged Fittings
- F. ASME B16.9 – Factory-Made Wrought Steel Buttwelding Fittings
- G. ASME B16.15 – Cast Bronze Threaded Fittings
- H. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
- I. ASME B16.22 - Wrought Copper and Bronze Solder Joint Pressure Fittings.
- J. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings - DWV.
- K. ASME B16.24 – Cast Copper Alloy Pipe Flanges and Flanged Fittings.
- L. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV.
- M. ASME B16.39 – Pipe Unions, Malleable Iron Threaded
- N. ASME-B31.1 – Power Piping.
- O. ASME B31.2 - Fuel Gas Piping.
- P. ASME B31.5 – Refrigeration Piping.
- Q. ASME B31.9 - Building Service Piping.
- R. ASME B36.10M – Welded and Seamless Wrought Steel Pipe
- S. ASME SEC IV - Construction of Heating Boilers.
- T. ASME SEC IX - Welding and Brazing Qualifications.
- U. ASTM A47 – Ferritic Malleable Iron Castings
- V. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.

- W. ASTM A74 - Cast Iron Soil Pipe and Fittings.
- X. ASTM A105 – Forgings, Carbon Steel, for piping components.
- Y. ASTM A126 – Gray Iron Castings for Valves, Flanges, and Pipe Fittings
- Z. ASTM A181 – Forgings, Carbon Steel, for General Purpose Piping
- AA. ASTM A197 –Cupola Malleable Iron
- AB. ASTM A234/A234M - Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.
- AC. ASTM A307 – Carbon Steel Bolts and Studs, 60,000 psi Tensile
- AD. ASTM B32 - Solder Metal.
- AE. ASTM B42 - Seamless Copper Pipe.
- AF. ASTM B62 – Composition Bronze or Ounce Metal Castings
- AG. ASTM B75 – Seamless Copper Tube
- AH. ASTM B88 - Seamless Copper Water Tube.
- AI. ASTM B306 - Copper Drainage Tube (DWV).
- AJ. ASTM B584 – Copper Alloy Sand Castings for General Applications
- AK. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- AL. ASTM B828 – Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings.
- AM. AWS A5.8 – Specification for Brazing Filler Material
- AN. AWWA C651 - Disinfecting Water Mains.
- AO. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves.
- AP. NFPA 30 – Flammable and Combustible Liquids Code
- AQ. NFPA 54 - National Fuel Gas Code.
- AR. NSF 61 – Domestic Water Pipe, Valves, and Fittings.
- AS. International Mechanical Code
- AT. International Plumbing Code
- AU. International Fuel Gas Code
- AV. FM – Factory Mutual Compliance
- AW. UL – Underwriter's Laboratory Compliance

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
 - 1. Protect internal parts against rust and corrosion.
 - 2. Protect threads, flange faces, grooves, and weld ends.
 - 3. Set ball and plug valves open to minimize exposure of functional surfaces.
 - 4. Block check valves in either closed or open position.
- B. Use the following precautions during storage:
 - 1. Maintain valve end protection.
 - 2. Store valves indoors and maintain at higher than ambient dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.
- C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use hand wheels or stems as lifting or rigging points.
- D. Protect all flange faces with wood, plastic or soft metal to prevent damage to parts.
- E. Protect all pipe threads from damage with plastic plugs or caps.
- F. Mark and identify all piping materials in accordance with the Reference Standards specified herein.

PART 2 - PRODUCTS

2.01 GENERAL

- A. When two or more valves of the same type are used in the same service, furnish all valves of this type from the same manufacturer.
- B. Specific manufacturer's model numbers are cited in the following Piping Material Schedules to establish the desired quality and performance for each type valve or material. Equivalent products by other approved manufacturers are also acceptable. Approval shall be subject to review by the Architect/Engineer.

2.02 COPPER PIPING, VALVES AND ACCESSORIES

- A. All exposed small copper piping shall be Type "K" hard drawn copper tubing. All underground piping shall be soft annealed Type "K" copper tubing with compression fittings.
- B. All brass valves and fittings installed on potable water supply piping shall be made of "low-lead" materials (UNS Copper Alloy C89833 or C89520) and have a maximum lead content of 0.25 percent by weight. All low lead brass fittings shall be stamped or embossed with a mark indicating that the product is manufactured from low-lead alloys.
- C. Check valves shall be swing check renewable BUNA-N disc, all bronze, STOCKHAM Figure B-319Y (threaded end) or Figure B-309Y (solder end) - 250 to 300 psi non-shock water or approved equal.
- D. Ball valves for copper piping/tubing and galvanized piping shall be renewable reinforced Teflon seats, adjustable packing gland, non-blowout stem with run port opening. Ball valves shall be STOCKHAM Figure T or S-285 (threaded or soldered ends), or approved equal.

2.03 SANITARY AND VENT PIPING, GRAVITY, BURIED WITHIN 5 FEET OF BUILDING

- A. PVC Schedule 40 Solid Wall Pipe and PVC DWV Fittings: Manufactured from virgin rigid PVC (polyvinyl chloride) vinyl with a Cell Class of 12454 as identified in ASTM D 1784.
 - 1. Fittings: PVC DWV fittings. Injection molded PVC DWV fittings shall conform to ASTM D2665. Fabricated PVC DWV fittings shall conform to ASTM F1866.
 - 2. Joints: solvent-cement joints. Purple primer shall conform to ASTM F656. Solvent cement, not purple in color, shall conform to ASTM D2654.

2.04 SANITARY AND VENT PIPING, GRAVITY, ABOVE GRADE

- A. PVC Schedule 40 Solid Wall Pipe and PVC DWV Fittings: Manufactured from virgin rigid PVC (polyvinyl chloride) vinyl with a Cell Class of 12454 as identified in ASTM D 1784. This system is intended for use in a non-pressure applications where operating temperatures will not exceed 140° F. PVC piping shall not be used in return air plenums.
 - 1. Fittings: PVC DWV fittings. Injection molded PVC DWV fittings shall conform to ASTM D2665. Fabricated PVC DWV fittings shall conform to ASTM F1866. Pipe and fittings shall conform to NFS International Standard 14.
 - 2. Joints: solvent-cement joints. All primers shall conform to ASTM F656. All Solvent cements for use with PVC, shall conform to ASTM D2654. Solvent cements for use with PVC shall conform to SCAQMD 1168/16A containing low VOC levels at maximum 510 grams per liter.

2.05 SANITARY PIPING, PUMPED, ABOVE GRADE

- A. PVC Schedule 40 Solid Wall Pipe and PVC Pressure Fittings: Manufactured from virgin rigid PVC (polyvinyl chloride) vinyl with a Cell Class of 12454 as identified in ASTM D 1784. PVC piping shall not be used in return air plenums.
 - 1. Fittings: Schedule 40 PVC pressure fittings. PVC fittings shall conform to ASTM D2466.
 - 2. Joints: solvent-cement joints. Purple primer shall conform to ASTM F656. Solvent cement, not purple in color, shall conform to ASTM D2654.

2.06 YARD HYDRANT

- A. Exposed head, non-freeze type, Model Z-1385 by Zurn or equal.
- B. Shall be complete with bronze casting and cast aluminum casing guard, all bronze interior parts, bronze seat, and replaceable seat washer. Unit shall be provided with ¼" drain port in valve housing.
- C. Unit shall be for a 1-inch hose connection. Provide operating wheel for each hydrant. Provide a 1-inch to ¾-inch brass reducing fitting for each hydrant.
- D. Provide 50-foot ¾-inch rubber hose for each yard hydrant.

PART 3 - EXECUTION**3.01 GENERAL INSTALLATION REQUIREMENTS**

- A. Unless otherwise shown, route piping in the most direct manner parallel to building lines in accordance with the Drawings. Group piping whenever practical at common elevations.
- B. Accurately align, support and connect piping without forcing.
- C. Locate piping so that access to and clearance around equipment, and minimum piping headroom of 7 feet is maintained, except where otherwise shown.

- D. Space piping so that insulation and flanges, if any, have at least 1-inch clearance after maximum movement.
- E. Where pipe elevations are not shown, pitch supply and return lines to positive drain points and/or coils.
- F. Provide accessible flanges or union connections on the supply and return connections of terminal equipment and other items which must be disconnected for maintenance. Where unions are furnished as an integral part of the equipment, additional unions are not required unless required for access to or removal of components. Arrange equipment piping connections so that maintenance can be made without removing large sections of pipe or relocating the equipment.
- G. In Domestic Water Systems, connect branch lines to the top of the line. For all other liquid systems, connect branch lines to the bottom or lower half of the line, preferably the bottom.
- H. Connect branch lines in steam service and compressed air to the top or upper half of the line, preferably the top.
- I. Use fittings for all changes of direction. Bending of steel pipe is not permissible.
- J. Clean all piping materials before installation to remove grease, loose dirt, mill scale and other foreign matter.
- K. Provide air vents at all high points of water piping, and valved drains at all low points of water piping for complete venting, draining and flushing of the piping system. Locate and provide air vents at multiple high points that are necessary to prevent air binding in the piping system. Install additional air vents and drains if directed by the Architect/Engineer, at no cost to the Owner. As a minimum provide drains and air vents
 1. In each section of piping separated by valves.
 2. On all coils.
 3. For each riser, where riser or runout to riser has a valve installed.
 4. In low point of piping to each down fed convactor or radiator.
- L. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Provide loops, pipe offsets and anchors.
- M. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- N. Install gate or ball valves for shut-off and to isolate equipment, parts of systems, or vertical risers.
- O. Sleeve pipes passing through partitions, walls and floors.
- P. Identify piping under provisions of "Mechanical System Identification" Specification.
- Q. Provide escutcheons at all locations where piping installed exposed to view penetrates wall, partitions, floors and ceilings.
- R. Conceal all pipe installations in walls, pipe chases, utility spaces, above ceilings, below grade or floors, unless indicated to be exposed to view.
- S. Install flexible connectors at inlet and discharge connections of pumps and other vibration producing equipment.

- T. Install strainers on the supply side of each control valve, pressure regulating valve, solenoid valve, trap, and elsewhere as indicated.
- U. For pressurized liquid piping systems installed horizontally make reductions in pipe sizes using eccentric reducer fitting installed with the level side up to allow air venting.
- V. For all nipples up to and including six inches in length provide extra-heavy shoulder type. For all nipples over six inches in length provide corresponding material, quality and thickness as the pipe on which they are used. Do not use close nipples. Provide nipples with designation mark of the manufacturer conforming to the ASTM pipe specifications for system served.
- W. Make connections to all cooling and heating units with single or multiple cooling or heating coils in accordance with the manufacturer's instructions and labeling on equipment
- X. For pressures over 15 psig, use nipples and caps instead of plugs for permanent closures. Plugs in equipment provided by equipment manufacturers are acceptable.
- Y. Do not install piping above electrical panels. Route piping around panels.

3.02 COMPRESSED AIR PIPING SYSTEMS

- A. Where piping elevations are not shown, pitch all lines to positive drain points. Unless shown otherwise on the Drawings include a line size drip leg with two-line size drain valves and a hose end connection at all drain points.
- B. Inspect, clean, cap and tag all piping at the end of each working day.
- C. If copper tubing connections are specified in the piping schedule, comply with the following:
 - 1. Braze all joints in the tubing, except those permitted to be approved brass flared-type gas tubing fittings and those valves or equipment requiring screw connections, with 15 percent silver alloy using Handy Flux made by Hand and Harmon Company. Continuously back-purge all brazed joints back-purged with dry nitrogen or carbon dioxide to prevent the formation of scale within the tubing. Use preformed silver solder insert rings. Do not leave any excess flux inside the completed joints.

3.03 THREADED CONNECTIONS

- A. Ream pipe ends to remove burrs.
- B. Use only standard ANSI taper threads. Threads shall be full, sharp, clean, and free of fins and burrs.
- C. Apply joint sealing tape or paste to male threads only. Do not use paste on compressed air lines. When sealing fuel oil piping, use a thread-sealing compound suitable for oil when making up joints. When sealing natural gas piping, use a thread-sealing compound suitable for natural gas when making up joints.
- D. Do not use close or short nipples of a size where the length of unthreaded pipe is less than the width of a pipe wrench.
- E. Thredolets or similar code-approved fittings may be used for branch connections.
- F. Provide unions at all threaded valve locations to facilitate the removal of the valve.
- G. Joint Sealing Compound; Hercules, RectorSeal or approved equal.

3.04 WELDED CARBON STEEL CONNECTIONS

- A. Perform welding using qualified welders and procedures following specified reference standards.
- B. Do not use mitered welds for elbows.
- C. Welded branch connections may be used in place of welding tees provided that requirements of the applicable ASME Code for pressure piping, B31.1 and/or B31.9 are met.
- D. Weldolets or similar code-approved fittings may be used for branch connections.
- E. Qualifications of welders, welding procedures, performance of welders and welding operators are required complying with the requirements of ASME B31.9 and ASME Boiler and Pressure Vessel Code, Section IX. Keep records and certifications required by code on file and available for inspection.
- F. Whenever welding is done close to walls, floors or building structure, thoroughly clean the surfaces of weld splatter. Remove weld splatter from the surface of all welds, pipe and pipe supports.
- G. Provide long radius pattern for welding elbows unless otherwise shown on the Drawings.
- H. Examine and inspect welded pipe joints as follows:
 - 1. Visually examine all welded pipe joints for imperfections using qualified representatives. Submit qualifications to the Architect/Engineer.
 - 2. Make available to the Architect/Engineer records of visual examinations upon request.
 - 3. Remove weld defects by grinding or chipping and repair or replace joints in accordance with approved procedures.
 - 4. Make shop and field welded joints available to the Owner for nondestructive inspection and examination upon request.

3.05 FLANGED CONNECTIONS

- A. Arrange flange bolt holes to straddle the pipe vertical and horizontal centerlines, and match the orientation of mating flanges.
- B. Install piping to equipment without strain.
- C. Provide gaskets at all flanged connections suitable for the design and temperature of the fluid contained.
- D. Mate flat face flanges together and raised face flanges together.

3.06 COPPER TUBING CONNECTIONS

- A. Provide soldered or brazed in accordance with Part 2 of this Section.
- B. Make soldered and brazed connections in accordance with the procedures in the current edition of the Copper Tube Handbook of the Copper Development Association.
- C. Qualifications of brazers, brazing procedures, and performance of brazers and brazing operators are required in compliance with the requirements of ASME B31.1, ASME B31.9, and the Boiler and Pressure Vessel Code, Section IX. Keep records and certifications required by the code on file and available for inspection.

- D. Make solder joints on all copper water piping with 95/5 solder. Absolutely no lead-based solder will be accepted.
- E. Clean joints thoroughly before soldering.
- F. Remove excess solder and flux with a cloth or brush to leave a uniform clean fillet.
- G. For refrigeration copper tubing connections, comply with ASME B31.5. Make brazed joints on all refrigeration piping.

3.07 CONNECTIONS OF DISSIMILAR METALLIC MATERIALS

- A. Isolate connections between dissimilar metallic materials using dielectric connections. Use dielectric unions or flanges that provide a complete isolation of the two ends, including bolts for flanges, using materials suitable for the design pressure, temperature and fluid contained.

3.08 VALVES

- A. Provide valves of the same size as the pipe in which they are installed, unless shown otherwise on the Drawings. At pumps, match valve size to pipe size and not pump connection size.
- B. Install valves with the stem on or above the horizontal. Install valves with the stem horizontal if requirements of headroom, access or chain operation must be met.
- C. Pack valves and adjust glands before final acceptance.
- D. Install valve extension stems or chain operators where the center of valve hand wheels is more than 6 feet-6 inches above the floor and valve is 2 1/2" and larger. Provide chain hooks where required to prevent fouling of chains on equipment and to clear walkways. Terminate chains approximately 3 feet-6 inches above the floor. Provide worm gear operators or impact hand wheels for all valves 6 inches and larger.
- E. Extended Stems: Where insulation is indicated or specified, provide extended stems arranged to receive insulation and a protective sleeve that allows operation of the valve without breaking the vapor seal or disturbing the insulation.
- F. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- G. Locate valves for easy access and provide separate support where necessary.
- H. Install check valves for proper direction of flow and as follows:
 - 1. Swing Check Valves: In horizontal position with hinge pin level.
 - 2. Lift Check Valves: With stem upright and plumb
- I. Install butterfly valves with stems horizontal to allow support for the disc and the cleaning action of the disc.
- J. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.
- K. Install balancing valves with lengths of straight pipe upstream and downstream of valve as per manufacturer's instructions such that calibrated accuracy is maintained. As a minimum provide straight lengths as per the following table;

REQUIRED	STRAIGHT	LENGTHS

VALVE SIZE	UPSTREAM (IN PIPE DIAMETERS)	DOWNSTREAM (IN PIPE DIAMETERS)
1/2" - 3"	3	1
4"-12"	5	2

- L. Chain wheel Actuators- Valve actuation assembly with sprocket rim, brackets, and chain.
1. Sprocket rim with Chain guides: Ductile Iron (Aluminum for applications exposed to weather), of type and size required for valve.
 2. Brackets: Type, number, size, and fasteners required to securely mount actuator on valve.
 3. Chain: Stainless steel, of size required to fit sprocket rim.
 4. Manufacturers:
 - a. Babbitt Steam Specialty Co.
 - b. Roto Hammer Industries

3.09 CONTROL VALVE INSTALLATION

- A. Install all control valves so that the stem position is not more than 60 degrees from the vertical up position.
- B. Install valves in accordance with the manufacturer's recommendations.
- C. Install control valves so that they are accessible and serviceable, and such that actuators may be serviced and removed without interference from structure or other pipes, ducts and/or equipment.
- D. Install isolation valves at control valves such that control valve body may be serviced without draining the supply/return side piping system. Install unions at all connections to screwed type control valves.

3.10 PRESSURE TESTING, FLUSHING AND CLEANING

- A. Pressure test piping systems in accordance with applicable codes and as described herein.
- B. Pressure testing - Schedule pressure testing so that it may be witnessed by the Architect/Engineer, Owner, or their representative. Perform tests in accordance with the following procedures:
 1. Before testing, complete the installation of each pipe line, including final supports, hangers and anchors. Perform testing before insulation or paint is applied for examination during the test. Clean piping and equipment of metal cuttings and foreign matter as they are installed.
 2. Codes – Pressure test piping to assure integrity of material and workmanship in accordance with the applicable ASME Code for pressure piping (B31) and New York State Code.
 3. Protection of Equipment – Protect equipment, instruments and piping specialties which are not included in the test by either disconnecting from the piping and blanking off the end of the pipe with a blind flange, plug or cap, or isolating by insertion of a line blind or spool piece as required. Disconnect pneumatic control lines and close all openings.
 4. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
 5. Piping may be tested in sections or circuits as required for the progress of the work.
 6. Provide all systems to be pressurized with the appropriate gauges, certified calibrated by the manufacturer, and pressure-relieving devices.
 7. Install relief valve set at a pressure no more than 1/3 higher than the test pressure, to protect against damage by expansion of liquid or another source of overpressure during

- the test. Do not allow test pressure to exceed maximum pressure for any vessel, pump, valve, or other component in system under test.
8. Records - Provide records of all tests showing line designation, test pressure, ambient temperature, date of test, retests and signature of witness.
- C. Pneumatic Test Procedures – Perform pneumatic testing in accordance with ASME B31.9
1. Prior to application of full pneumatic test pressure, perform a preliminary test at 10 psig for a minimum of ten (10) minutes to reveal any major leaks.
 2. After the preliminary test, apply pressure gradually in stages until test pressure is reached.
 3. Test durations:
 - a. For all systems the minimum test duration is that required to thoroughly examine the system for leaks.
 - b. Natural gas piping; Maintain test pressure for a minimum of one hour but not less than ½ hour for each 500 cubic feet of pipe volume. After test, purge the entire system of test gas.
 - c. For all other systems maintain test pressure for a minimum of ten (10) minutes without fluctuation.
 4. Check all joints, valves, etc. for leaks with a thick soap-water solution.
 5. Repair leaks as specified under “Repair of Line Leaks”.
 6. Repeat pneumatic test until there are no leaks.
 7. Ensure that adequate protection is provided to prevent injury to persons or property during leak testing.
 8. Test systems to the pressure indicated under “Pressure Testing Schedule”
- D. Hydrostatic Test Procedures – Perform hydrostatic testing in accordance with ASME B31.9.
1. Perform test using the pressure indicated under “Pressure Testing Schedule”
 2. After hydrostatic test pressure has been applied for at least two hours, examine piping, joints, and connections for leakage while maintaining test pressure. Repeat hydrostatic test until there are no leaks.
 3. Repair leaks as specified under “Repair of Line Leaks”
- E. Service Testing – Perform service testing in accordance with ASME B31.9.
1. For gases and steam and condensate service not over 15 psig, and for nontoxic, noncombustible, nonflammable liquids at pressures not over 100 psig and temperatures not over 200 degrees F a system test with the service fluid is acceptable. This exemption does not apply to natural gas piping.
 2. Bring the piping system up to operating pressure gradually with visual examination at a pressure between one-half and two-thirds of design pressure. Make a final examination at operating pressure.
 3. Repair leaks as specified under “Repair of Line Leaks”
 4. Repeat service test until there are no leaks.
- F. Repair of Line Leaks – Comply with the following procedures for repair of leaks. In each case retest after repairs are made.
1. Soldered/Brazed Joints – Remove solder/brazing alloy and reapply with proper flux.
 2. Flanged Joints - Check to determine flange end alignment and that all bolts are uniformly tightened with the required torque. If leak persists, depressurize the line, remove gasket, examine flange end face, and insert new gasket.
 3. Threaded Joints – Tighten joint to a required torque. If leak does not stop, replace pipe and/or fittings. Do not use pipe dope, cement or seal weld to stop pipe leaks.
 4. Gasketed Joints – Remove existing gasket and insert new gasket.
 5. Welded Steel Joints – Repair pipe in accordance with applicable ASME B31 code.
 6. Leaks in Material – Leaks located in pipe or fitting material require the replacement of that section of pipe or fitting and a repeat of the entire system using the complete procedure

required for that system. Caulking, welding or epoxy is not permitted. Repair all damage caused by leaks.

- G. Flushing – Complete pressure testing requirements prior to flushing. Performance of the flushing may be witnessed by the Architect/Engineer, Owner, or their representative, provide ample notification to all parties in advance of flushing any system. Perform system flushing in accordance with the following procedures:
1. Flush all main and branch steam and liquid piping systems after pressure testing is complete with new potable water while draining the system at all low points. Isolate all connected equipment and flush individually.
 2. Flushing for piping and equipment will be considered complete when water samples taken at all low points indicate clear discharge-with no visible solids. If not clear, continue flushing and sampling until discharge is clear.
- H. Cleaning – Complete flushing requirements prior to cleaning. Performance of the cleaning may be witnessed by the Architect/Engineer, Owner, or their representative, provide ample notification to all parties in advance of cleaning any system. Perform system cleaning in accordance with the following procedures:
1. Clean all steam and condensate lines by blowing them out with live steam. Discharge steam and condensate from each main and branch safely to atmosphere for a minimum of five minutes.
 2. Clean all compressed air, instrument air, and fuel oil lines with oil-free dry compressed air at design pressure through each section so that they are blown free of dirt and debris.
 3. Clean domestic water lines by flushing with water until effluent is visibly as clean as the flushing medium.
 4. Clean hot water/chilled water lines as described below:
 - a. When flushing discharge is clear, fill piping systems with water and sufficient approved alkaline cleaning material to remove dirt, oil and grease. Include all connected equipment in the cleaning.
 - b. Vent system and place in operation, with automatic controls operating at set point temperature or an operating temperature designated by the Architect/Engineer. Circulate the solution through the system for a minimum of 4 consecutive hours.
 - c. After 4 hours, drain system and flush with clean water until the pH at the farthest drain matches the clean water input. Keep strainers unplugged during the cleaning operations. Refill system with clean water.
 5. Clean temporary pump strainers and strainers at coils, etc. every 2 hours periodically during cleaning procedures. Do not remove temporary strainers until all cleaning steps are completed and the operation of the system indicates that the system is free of all foreign matter.
 6. Blow out all piping and equipment after cleaning and final flushing is completed and the system is drained with clean dry instrument air for a minimum of 15 minutes or until all water is expelled from the system. Upon completion seal the system by closing all drains and vents.
 7. Following the Architect/Engineers approval of the above flushing and cleaning procedures, immediately fill each system and chemically treat and monitor in accordance with the "Chemical Treatment Systems" specifications.
- I. Pressure Testing Schedule:

Service	Test Type	Design Operating Pressure (psig)	Test Pressure (psig)
Domestic Water Piping	Hydrostatic		1.5 times maximum working pressure, but not less than 100 psi

1. Drainage and Vent System: Test plug opening to permit system to be filled with water and subject system to 10 foot head of water pressure. System shall hold water for 30 minutes with a drop-in water level not to exceed 4 inches in a 4-inch diameter standpipe, and without visible leakage.
2. Pumped Sewage: Forced sewer tests shall consist of plugging the end of the building sewer at the point of connection with the public sewer and applying a pressure of 5psi (34.5kPa) greater than the pump rating, and maintaining such pressure for 15 minutes.

3.11 PAINTING

- A. Upon completion of the installation, remove all protecting materials, thoroughly remove all scale and grease and leave in a clean condition for painting. Paint in accordance with the requirements of Section 099100 – Painting.

3.12 SCHEDULE – PIPES & VALVES

- A. Refer to Contract Drawing PD2.0

END OF SECTION 221000

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Combination emergency eyewash and shower.

1.02 REFERENCES

- A. ANSI Z358.1 - Emergency Eyewash and Shower Equipment
- B. OSHA 29 CFR 1910.151

1.03 SUBMITTALS

- A. Submit product data under provisions of Section 013300.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. HAWS CORP. of Sparks, NV or approved equal.
- B. A.O. Smith of Ashland City, TN or approved equal.

2.02 EMERGENCY SHOWER AND EYEWASH UNIT

- A. Emergency shower and eyewash unit:
 - 1. Barrier Free unit.
 - 2. Instant action stay open stainless steel ball valve activated by pull lever or stainless steel push flag.
 - 3. Eyewash with stainless steel anti-surge heads and ABS plastic wrap around dust cover.
 - 4. Stainless steel bowl.
 - 5. Flow control to allow both parts of the emergency equipment to be safely used simultaneously.
 - 6. Universal language emergency sign mounted on support riser.
 - 7. Floor mount flange.
 - 8. Compliance with ANSI Z358.1.
 - 9. HAWS Model 8300.158.
- B. Accessories
 - 1. Test Tag: HAWS Model SP 170, card with space for date and initials of inspector and beaded ties. 25 per pack.
 - 2. Refer to Section 224400 - Plumbing Specialties for thermostatic mixing valve.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Provide stainless steel fasteners to attach unit mounting flange to floor.
- B. Install water supply piping to thermostatic mixing valve and from valve to emergency shower and eyewash unit.

3.02 DEMONSTRATION

- A. Demonstrate operation of shower and eyewash with thermostatic mixing valve to Owner.

END OF SECTION 224533

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. This section describes the general requirements for all mechanical items and systems required by the Contract Documents.
- B. Comply with all Contract Requirements, General Conditions, Supplementary Conditions and Division 1 Sections applying to or affecting the Work of Division 23.
- C. Unless specifically dimensioned, the Work shown on the Drawings is in diagrammatic form only to show general arrangement.
- D. Include, in the Work, all accessories and appurtenances, necessary and integral, for the intended operation of any system, component or device, as such systems, components and devices are specified.
- E. Do not install pipe or conduit through ductwork.
- F. If the pipe or duct size shown on the Drawings does not match the connection size of the equipment that it is connected to, provide the necessary transition pieces at the piece of equipment.
- G. Do not use or allow to be used asbestos or asbestos-containing materials on this project. Be rigorous in assuring that all materials, equipment, systems and components thereof do not contain asbestos. Any deviations from this requirement shall be remedied at the Contractor's expense without regard to prior submittal approvals.

1.02 RELATED DOCUMENTS

- A. The General Conditions and General Requirements Division 1 apply to the Work of this Section.

1.03 REFERENCE STANDARDS

- A. Compliance with the following codes and standards shall be required:
 - 1. Codes, Rules and Regulations of the State of New York
 - 2. AABC American Air Balance Council
 - 3. ADC Air Diffusion Council
 - 4. AGA American Gas Association
 - 5. AMCA Air Moving and Conditioning Association
 - 6. ANSI American National Standards Institute
 - 7. ARI American Refrigeration Institute
 - 8. ASA Acoustical Society of America
 - 9. ASHRAE American Society of Heating, Refrigeration and Air Conditioning
 - 10. ASME American Society of Mechanical Engineers
 - 11. ASSE American Society of Sanitary Engineers
 - 12. ASTM American Society for Testing Materials
 - 13. AWS American Welding Society
 - 14. AWWA American Water Works Association
 - 15. BSA Board of Standards and Appeals
 - 16. FM Factory Mutual
 - 17. F.S. or FED Spec. Federal Specification
 - 18. IRI Industrial Risk Insurers

19.	MEA	Materials and Equipment Acceptance
20.	MSS	Manufacturer's Standardization Society of the Valve and Fitting
21.	NACE	National Association of Corrosion Engineers
22.	NEBB	National Environmental Balancing Bureau
23.	NEC	National Electrical Code (NFPA 70) / 2020
24.	NEMA	National Electrical Manufacturers Association
25.	NFPA	National Fire Protection Association
26.	OSHA	Occupational Safety and Health Act
27.	SMACNA	Sheet Metal and Air Conditioning Contractor's National Association
28.	TEMA	Tubular Exchanger Manufacturers Association
29.	UL	Underwriters Laboratories, Inc.
30.	USAS	USA Standards Institute (Formerly ASA)

1.04 DEFINITIONS

- A. "Provide" means furnish and install, complete the specified material, equipment or other items and perform all required labor to make a finished installation.
- B. "Furnish and install" has the same meaning as given above for "Provide."
- C. Refer to General Conditions for other definitions.

1.05 ABBREVIATIONS

- A. Reference by abbreviation may be made in the Specifications and the Drawings in accordance with the following list:
 - 1. HVAC Heating, Ventilating and Air Conditioning
 - 2. CM Construction Manager
 - 3. AC Air Conditioning
 - 4. H & V Heating and Ventilating
 - 5. AWG American Wire Gauge
 - 6. BWG Birmingham Wire Gauge
 - 7. USS United States Standard
 - 8. B & S Brown & Sharpe
 - 9. OS & Y Outside Screw and Yoke
 - 10. IBBM Iron Body Brass Mounted
 - 11. WSP Working Steam Pressure
 - 12. PSIG Pounds per Square Inch Gauge
 - 13. PRV Pressure Reducing Valve
 - 14. GPM Gallons per Minute
 - 15. MBH Thousand BTU per hour
 - 16. BTU British Thermal Units
 - 17. WG Water Gage
 - 18. LB Pound (Also shown as: #)
 - 19. ASME American Society of Mechanical Engineers
 - 20. ASTM American Society for Testing Materials
 - 21. ABMA American Boiler Manufacturers Association
 - 22. ASA American Standards Associates
 - 23. MER Mechanical Equipment Room
- See Drawings for additional abbreviations

1.06 REVIEW OF CONTRACT DOCUMENTS AND SITE

- A. Give written notice with the submission of bid to the Architect/Engineer of any materials or apparatus believed inadequate or unsuitable, in violation of laws, ordinances, rules or regulations of Authorities having jurisdiction, and any necessary items of work omitted. In the absence of such written notice it is mutually agreed that the Contractor has included the cost of all required items in his proposal for a complete project.
- B. Contractors shall acknowledge that they have examined the Plans, Specifications and Site, and that from his own investigations he has satisfied himself as to the nature and location of the Work; the general and local conditions, particularly those bearing upon transportation, disposal, handling and storage of materials; availability of labor, utilities, roads and uncertainties of weather; the composition and condition of the ground; the characters quality and quantity of subsurface materials to be encountered; the character of equipment and facilities needed preliminary to and during the execution of the Work; all federal, state, county, township and municipal laws, ordinances and regulations particularly those relating to employment of labor, rates of wages, and construction methods; and all other matters which can in any way affect the Work or the cost thereof under this Contract. Any failure by the Contractor to acquaint himself with the available information concerning these conditions will not relieve him from the responsibility for successfully performing the Work.
- C. Owner assumes no responsibility for any understanding or representation made during or prior to the negotiation and execution of this Contract unless such understanding or representations are expressly stated in the Contract and the Contract expressly provides that the responsibility, therefore, is assumed by the Owner.

1.07 MEASUREMENTS

- A. Base all measurements, both horizontal and vertical from established bench marks. Make all Work agree with these established lines and levels. Verify all measurements at site; and check the correctness of same as related to the Work.

1.08 LABOR AND MATERIALS

- A. Provide all materials and apparatus required for the Work of new and first-class quality. Furnish, deliver, arrange, erect, connect and finish all materials and equipment in every detail, so selected and arranged as to fit properly into the building spaces.
- B. Remove all materials delivered, or work erected, which does not comply with Drawings or Specifications, and replace with proper materials, or correct such work as directed, at no additional cost to the Owner.

1.09 COVERING OF WORK

- A. Do not cover up or hide from view any duct, piping, fitting, or other work of any kind before it has been examined or approved by the Architect/Engineer and/or other authority having jurisdiction over the same. Remove and correct immediately any unacceptable or imperfect work or unauthorized or disapproved materials discovered immediately after being disapproved.

1.10 PROTECTION

- A. Protect the Work and material of all trades from damage and replace all damaged material with new.
- B. Protect work and equipment until the Work is finally inspected, tested, and accepted; protect the Work against theft, injury or damage; and carefully store material and equipment received

on site which is not immediately installed; close open ends of work with temporary covers or plugs during construction to prevent entry of foreign material.

- C. Preserve all public and private property, along and adjacent to the Work, and use every precaution necessary to prevent damage or injury thereto.

1.11 CUTTING AND PATCHING

- A. Provide all cutting and patching required for the Work. Perform all finish patching.
- B. Furnish and locate all sleeves and inserts required before the floors and walls are built, pay the cost of cutting and patching required for pipes where sleeves and inserts were not installed in time, or where incorrectly located. Provide all drilling required for the installation of hangers.
- C. Punch or drill all holes cut through concrete slabs or arches from the underside. Do not cut structural members without the approval of the Architect/Engineer. Perform all cutting in a manner directed by the Architect/Engineer.
- D. Do not do any cutting that may impair strength of building construction. Do not drill any holes, except for small screws, in beams or other structural members without obtaining prior approval. All Work shall be done in a neat manner by mechanics skilled in their trades and as approved.

1.12 SUBMITTALS

- A. Submit for review, shop drawings for all materials and equipment furnished and installed under this Contract. Submissions shall include but not be limited to:
 - 1. Ductwork layout drawings, air devices and accessories
 - 2. Piping and equipment layout drawings.
 - 3. Piping materials, valves, hangers, supports and accessories
 - 4. Automatic temperature control equipment, diagrams and control sequences
 - 5. Equipment, fixtures, and appurtenances
 - 6. Insulation
- B. Reports
 - 1. Compliance with listings and approvals for equipment and for fire ratings.
 - 2. Acceptance certificates from inspecting agencies.
 - 3. Complete printed and illustrated operating instructions in report format.
 - 4. Manufacturer's performance tests of equipment.
 - 5. Field pipe and duct testing reports.
 - 6. Field operating test results for equipment.
 - 7. Performance report on the balancing of air systems.
 - 8. Performance reports for vibration isolation equipment.
 - 9. Manufacturer's reports on motorized equipment alignment and installation.
- C. Specific references to any article, device, product or material, fixture or item of equipment by name, make or catalog number shall be interpreted as establishing a basis of cost and a standard of quality. All devices shall be of the make and type listed by Special Agencies, such as the Underwriters' Laboratories, and where required, approved by the Fire Department.

1.13 SPACE ALLOTMENTS AND SUBSTITUTIONS

- A. The space allotments and equipment layouts on the Drawings are based on the manufacturer's model indicated or scheduled as the "Basis of Design". Ensure that any equipment that is submitted other than the "Basis of Design" will fit in the space allotment and will provide the

necessary maintenance clearances as recommended by the manufacturer. If maintenance clearances are not met, pay for any changes such that maintenance clearances will be met.

- B. Bear all costs associated with re-layout of the equipment, changes to piping/ductwork, and other changes as required if approved equipment other than the "Basis of Design" equipment is purchased. This shall also include any structural steel modifications and structural steel design changes. Submit, at no cost to the Owner, a steel design stamped by a structural engineer licensed in the state in which the Work is to be performed for structural modifications that must be made resulting from the use of equipment other than the "Basis of Design" or not specified.

1.14 PAINTING

- A. Prime paint all bare supplemental steel, supports and hangers required for the installation of Division 23 Work in accordance with "Painting" Specification Section. Touch up welds of galvanized surfaces with galvanizing primer.

1.15 MATERIAL SAFETY DATA SHEETS

- A. Submit material safety data sheets (MSDS) for all chemicals, hydraulic fluids, seal oils, lubricating oils, glycols and any other hazardous materials used in the performance of the Work, in accordance with the US Department of Labor, Occupational Safety and Health Administration (OSHA) hazard communication and right-to-know requirements stipulated in 29 CFR 1910.1200 (g).

1.16 MOTORS AND STARTERS

- A. Provide new NEMA Standard electric motors, sized and designed to operate at full load and full speed continuously without causing noise, vibration, and temperature rise in excess of their rating. Provide motors with a service factor of at least 1.15.
- B. Equip motors for belt driven equipment with rails with adjusting screws for belt tension adjustment. Weather protect motors exposed to the weather.
- C. Install high efficiency electric motors for air handling units, relief fans, and exhaust fans.
- D. Provide all motors for use with Variable Frequency Drives with "high efficiency inverter duty" insulation class "F" with class "B" temperature rise and that conform to or exceed the International Energy Conservation Code or the Federal EP Act of 1992 requirements for efficiency.
- E. Provide stainless steel nameplates, permanently attached to the motor, and having the following information as a minimum:
 - 1. Manufacturer
 - 2. Type
 - 3. Model
 - 4. Horsepower
 - 5. Service Factor
 - 6. RPM
 - 7. Voltage/Phase/Frequency
 - 8. Enclosure Type
 - 9. Frame Size
 - 10. Full-Load Current
 - 11. UL Label (where applicable)
 - 12. Lead Connection Diagram
 - 13. Bearing Data

- 14. Efficiency at Full Load.
- F. Provide motors whose sound power levels do not exceed that recommended in NEMA MG 1-12.49.
- G. Provide motors with drive shafts long enough to extend completely through belt sheaves when sheaves are properly aligned and balanced.
- H. Protect motor starters on equipment located outdoors in weatherproof NEMA 4X enclosures.
- I. Provide weatherproof NEMA 4X disconnect switches when located outdoors.
- J. Motor Characteristics:
 - 1. As called for in the equipment specifications and schedules.

1.17 ACOUSTICAL PERFORMANCE OF EQUIPMENT AND SYSTEMS

- A. Install the Work in such a manner that noise levels from operation of motor driven equipment, whether airborne or structure-borne, and noise levels created by or within air handling equipment and air distribution and control media, do not to exceed sound pressure levels determined by the noise criteria curves published in the ASHRAE guide.
- B. Acoustical Tests
 - 1. Owner may direct the Contractor to conduct sound tests for those areas he deems too noisy.
 - 2. If NC level exceeds the requirements of the Contract Documents due to improper installation or operation of mechanical systems, make changes or repairs to bring noise levels to within required levels.
 - 3. Retest until specified criteria have been met.

1.18 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. Instructions and Demonstration for Owner's Personnel
 - 1. Provide operating and maintenance instruction to the Owner when project is completed and all HVAC equipment serving the building is ready to be turned over to the Owner.
 - 2. Turn over the HVAC equipment to the Owner only after the final testing and proper balancing of HVAC systems.
 - 3. Instruct the Owner's personnel in the use, operation and maintenance of all equipment of each system.
 - 4. The above instruction requirements are in addition to that specified for specific equipment or systems. Conform to specified requirements if more stringent or longer instruction is specified for specific equipment or systems.

1.19 CODES, RULES, PERMITS & FEES

- A. Give all necessary notices, obtain all permits and pay all government sales taxes, fees, and other costs, in connection with the Work. Unless indicated otherwise, fees for all utility connections, extensions, and tap fees for water, storm, sewer, gas, telephone, and electricity will be paid directly to utility companies and/or agencies by the Owner. File all necessary plans, prepare all documents and obtain all necessary approvals of all governmental departments having jurisdiction; obtain all required certificates of inspection for the Work and deliver same to the Owner's Representative before request for acceptance and final payment for the Work.
- B. Conform to the requirements of the NFPA, NEC, FM, UL and any other local or State codes which may govern.

1.20 RECORD DRAWINGS

- A. During the progress of the Work, make a record set of drawings of all changes by which the actual installation differs from the Drawings.
- B. Create all record drawings in AutoCAD version 2013 or later in .dwg format. Upon completion of the Work, submit to the Architect/Engineer for approval a digital (PDF) set of the record drawings, of the same size as the Drawings for approval. Upon approval by the Architect/Engineer furnish the Owner a digital (PDF) copy of the record drawings along with one hard copy for his records.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 CLEANING AND ADJUSTING

- A. Cleaning
 - 1. Blow out, clean and flush each system of piping and equipment, to thoroughly clean the systems.
 - 2. Clean all materials and equipment; leave in condition ready to operate and ready to receive final finishes where required.
 - 3. Clean the operating equipment and systems to be dust free inside and out.
 - 4. Clean concealed and unoccupied areas such as plenums, pipe and duct spaces and equipment rooms to be free of rubbish and dust.
- B. Adjusting
 - 1. Adjust and align equipment interconnected with couplings or belts.
 - 2. Adjust valves of all types and operating equipment of all types to provide proper operation.
 - 3. Clean all strainers after system cleaning and flushing and again before system startup.
- C. Lubrication
 - 1. Lubricate equipment as recommended by the manufacturer, during temporary construction use.
 - 2. Provide complete lubrication just prior to acceptance.
- D. Permanent Equipment Operating During Construction
 - 1. Use only in same service as the permanent applications.
 - 2. Use disposable filters during temporary operation.
 - 3. Replace expendable media, including belts used for temporary operation and similar materials just prior to acceptance of the Work.
 - 4. Repack packing in equipment operated during construction just prior to system acceptance, using materials and methods specified by the equipment manufacturer.
- E. Retouch or repaint equipment furnished with factory finish as required to provide same appearance as new.
- F. Tools
 - 1. Provide one set of specialized or non-standard maintenance tools and devices required for servicing the installed equipment.

3.02 EQUIPMENT BASES, PLATFORMS AND SUPPORTS

- A. Provide supporting platforms, steel supports, anchor bolts, inserts, etc., for all equipment and apparatus provided.
- B. Obtain prior approval for installation method of structural steel required to frame into building structural members for the proper support of equipment, conduit, etc. Welding will be permitted only when approved by the Architect/Engineer.
- C. Submit shop drawings of supports to the Architect/Engineer for approval before fabricating or constructing.
- D. Provide leveling channels, anchor bolts, complete with nuts and washers, for all apparatus and equipment secured to concrete pads and further supply exact information and dimensions for the location of these leveling channels, anchor bolts, inserts, concrete bases and pads.
- E. Where supports are on concrete construction, take care not to weaken concrete or penetrate waterproofing.

3.03 ACCESSIBILITY

- A. Install valves, dampers and other items requiring access conveniently and accessibly located with reference to the finished building.

3.04 USE OF EQUIPMENT

- A. The use of any equipment, or any part thereof, even with the Owner's consent, is not an indication of acceptance of the Work on the part of the Owner, nor shall it be construed to obligate the Owner in any way to accept improper work or defective materials.

3.05 MODIFICATIONS OF EXISTING WORK

- A. Coordinate the Work with all other contractors and provide necessary dimensions for all openings. Provide all cuts and openings which are necessary for the Work for passage of piping and ductwork.
- B. Upon completion, remove all temporary piping and equipment, shoring, scaffolds, etc., and leave all areas clean and free from material and debris resulting from the Work performed under this Section. Provide patching in areas required.

3.06 EQUIPMENT INSTALLATION

- A. Locate and set equipment anchor bolts, dowels and aligning devices for equipment requiring them.
- B. Level and shim the equipment; coordinate and oversee the grouting work.
- C. Perform field assembly, installation and alignment of equipment under direct supervision provided by the manufacturer or with inspections, adjustments and approval by the manufacturer.
- D. Alignment and Lubrication Certification for Motor Driven Apparatus
 - 1. After permanent installation has been made and connections have been completed, but before the equipment is continuously operated, have a qualified representative of the equipment manufacturer inspect the installation and report in writing on the manufacturer's letterhead on the following:

- a. Whether shaft, bearing, seal, coupling, and belt drive alignment and doweling is within the manufacturer's required tolerances so that the equipment will remain aligned in the normal service intended by the Contract Documents and that no strain or distortion will occur in normal service.
- b. That all parts of the apparatus are properly lubricated for operation.
- c. That the installation is in accordance with manufacturer's instructions.
- d. That suitable maintenance and operating instructions have been provided for the Owner's use.
- e. Make any corrections to items that are required or recommended based on the manufacturer's inspection and have the equipment re-inspected.

E. Belt Drives

1. V-belt drives - a driving and driven sheave grooved for belts of trapezoidal cross-section. Construct belts of fabric and rubber so designed so as not to touch the bottom of the grooves, the power being transmitted by the contact between the belts and V-shaped groove sides. Design drives for a minimum of 150 percent of motor horsepower. Provide companion type driven sheaves.
2. Select drives to provide for 12-1/2 percent variation in speed, plus or minus, from specified speed. Provide all motors with adjustable sheaves except where indicated otherwise in the Specifications or on the Drawings.
3. Install all fans with adjustable pitch sheaves on their drive motors. Select sheaves to provide air quantities under specified conditions. Put air systems into operation, and determine as a result of the completed air balance the actual size of sheaves required to produce specified air quantities on installed systems. The adjustable pitch sheaves shall then be replaced with the proper size fixed sheaves. Remove adjustable pitch sheaves from premises. Provide fixed motor sheaves manufactured by Wood's.
4. Where indicated on the Drawings or specified, provide spare motor, bearings, and belts.

F. Machinery Guards

1. Protect motor drives by guards furnished by the equipment manufacturer or in accordance with the Sheet Metal and Air Conditioning Contractors National Association's Low Pressure Duct Manual. Provide guards of all types approved as acceptable under OSHA Standards.

G. Equipment Start-up

1. Require each equipment manufacturer to provide qualified personnel to inspect and approve equipment and installation and to supervise the start-up of the equipment and to supervise the operating tests of the equipment.
2. If a minimum number of hours for start-up and instruction are not stated with the equipment specifications, these shall be 2 full 8-hour working days as a minimum.
3. Advise Owner of start-up at least 72 hours in advance.

3.07 CLOSEOUT PROCEDURES

A. Field Review and Punchlist:

1. Contractor shall submit written notice of substantial completion prior to requesting 'Substantial Completion Punchlist Inspection'.
2. Contractor shall submit all air test balance reports a minimum of 5 days prior to requesting punchlist inspection. The reports shall be complete for all subject equipment. If any reports are missing or incomplete, contractor shall identify those items and provide a schedule of balancing completion and excepted report submission.
3. If contractor requests a punchlist inspection and engineer finds incomplete work within the work claimed to be substantially complete, the engineer will inform the contractor and may (at engineer's choice) terminate the inspection prior to reviewing all work. The Contractor will be responsible for reimbursing engineer for subsequent punchlist activities.

4. Upon receipt of engineer's punchlist inspection report, the contractor shall respond to each comment with an acknowledgement or disagreement and written explanation of disagreement.
 5. The contractor may respond with acknowledgement by providing photo of corrective action, or at the engineer's choice and upon contractor's written confirmation that all punchlist items have been addressed, may request a final punchlist inspection.
- B. General Operating and Maintenance Instructions: Arrange for each installer of operating equipment and other work that requires regular or continuing maintenance, to meet at the site with the Owner's personnel to provide necessary basic instructions in the proper operation and maintenance of the entire Work. Where installers are not expert in the required procedures, include instruction by the manufacturer's representatives.
- C. Where applicable, provide instruction and training, including application of special coatings systems, at manufacturer's recommendation.
- D. Provide a detailed review of the following items:
1. Maintenance manuals
 2. Record documents and catalog cuts for each piece of equipment.
 3. Spare parts and materials
 4. Tools
 5. Lubricants
 6. Identification systems
 7. Control sequences
 8. Hazards
 9. Cleaning
- E. Warranties, bonds, maintenance agreements, and similar continuing commitments.
- F. Demonstrate the following procedures:
1. Start-up
 2. Shut-down
 3. Emergency operations
 4. Noise and vibration adjustments
 5. Safety procedures
 6. Economy and efficiency adjustments
 7. Effective energy utilization.
- G. Prepare instruction periods to consist of approximately 50% classroom instruction and 50% "hands-on" instruction. Provide minimum instruction periods as follows:

Systems or Equipment	Training Time (Hours)
Supply and Exhaust Fans	2 hrs.
Gas Detection System and Fan Interlocks	3 hrs.
Airflow Panel	2 hrs.
VRF System	2 hrs.

Note: Consult individual equipment specification sections for additional training requirements.

- H. Prepare a written agenda for each session and submit for review and approval. Include date, location, purpose, specific scope, proposed attendance and session duration.

END OF SECTION 230010

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. This Section describes the marking and identification materials for identifying mechanical equipment, ductwork and piping systems.
- B. Mark and identify all mechanical equipment, ductwork and piping systems described herein, and as shown and specified in the Contract Documents.

1.02 REFERENCES

- A. ANSI A13.1 - Scheme for the Identification of Piping Systems.
- B. Z53.1 - Safety Color Code for Marking Physical Hazards.
- C. OSHA 29 CFR 1910 - Subpart J, General Environmental Controls

1.03 SUBMITTALS

- A. Identification Scheme - Submit scheme of identification codes.
- B. Samples - Submit samples of tags, attachments, labeled and identified.
- C. Equipment Schedules - Submit mechanical equipment schedules, listing proposed equipment numbers, and their location and function.
- D. Product Data: Provide manufacturers catalog literature for each product required.

PART 2 - PRODUCTS

2.01 APPROVED MANUFACTURERS

- A. Seton
- B. Bunting
- C. W.H. Brady Company

2.02 PIPE MARKERS

- A. All accessible piping installed indoors for this project, insulated and uninsulated shall be identified with wraparound pipe markers. Pipe markers shall be factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering. "Accessible" piping shall include exposed piping, and piping located above lay-in ceilings. Markers shall include system name, flow arrow, and color code and pipe diameter.
- B. All piping installed outdoors for this project, insulated and uninsulated, shall be identified with wraparound pipe markers. Pipe markers shall be factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering. The marker shall be printed with weather-resistant ink.
- C. Where pipes are too small or not readily accessible for application of pipe markers, a brass identification tag at least 1 ½ inches in diameter, with depressed ½ inch high black letters and numerals, shall be securely fastened at locations specified for pipe markers.

- D. See pipe marker schedule for size requirements of pipe markers.

2.03 MECHANICAL EQUIPMENT MARKERS

- A. Identify all mechanical equipment, bare or insulated, installed in the rooms or on the roof, by means of lettered and numbered nameplate (not stenciled) identifying the equipment and service. Refer to the Drawings for equipment identifications. Nameplates shall be aluminum with permanent 1 ½ inch high white letters on a black background, mechanically affixed and installed in a readily visible location on the equipment. Coordinate the final equipment designation with the Owner.
- B. In addition to markers, all mechanical equipment shall be furnished with the manufacturer's identification plate showing the name of equipment, manufacturer's name and address, date of purchase, model number, and performance data.

2.04 DUCT WORK IDENTIFICATION

- A. Provide full air distribution system identification at each side of a wall penetration, in a mechanical room, at all changes in direction and at no more than 50 foot intervals. Provide arrows identifying direction of flow.
- B. Identification shall be preprinted labels.
- C. Letter Size: 1-1/2 inches in height.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Apply piping system markers in the following locations:
 - 1. Adjacent to each valve and fitting.
 - 2. At each branch location and riser take-off
 - 3. At each side of a pipe passage through floors, walls, ceiling and partitions.
 - 4. At each pipe passage to and from underground areas.
 - 5. Every 20 feet on all horizontal and vertical pipe runs.
- B. Provide arrow markers showing direction of flow incorporated into or adjacent to each piping system marker. Use double-headed arrows if flow is in both directions.
- C. Apply all piping system markers where view is unobstructed; markers and legends shall be clearly visible from operating positions.
- D. Apply all tags and piping system markers in accordance with the manufacturer's instructions. Do not attach tags to valve handle such that the normal or emergency operation of the valve will be hindered.

3.02 SCHEDULES

- A. Pipe Marker Letter Size Schedule:

Outside diameter of insulation or pipe Inches	Letter height Inches	Color field Inches
3/4 to 1-1/4	1/2	8
1-1/2 to 2	3/4	8
2-1/2 to 6	1 - 1/4	12
8 to 10	2 - 1/2	24
Over 10	3 - 1/2	24

END OF SECTION 230555

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. This section specifies requirements for testing, adjusting, and balancing of all air distribution systems, including the equipment and devices associated with each system.
- B. The work includes setting speed and flow, adjusting equipment and devices installed for systems, recording data, conducting tests, preparing and submitting reports, and recommending modifications to the mechanical installations specified in other Sections of the Specifications.

1.02 RELATED WORK

- A. Drawings and general provisions of the Contract, including General Conditions, any Supplemental Conditions and Division 1 Specification Sections, govern the work of this section.

1.03 SUBMITTALS

- A. Submit proof that the testing, adjusting and balancing agency meets the requirements of Section 1.04 "Quality Assurance", and all other specified requirements.
- B. Prior to performing the work, submit sample blank forms of the test reports that will be submitted by the entity performing work of this Section, indicating all data and parameters included.
- C. Submit certified test reports, signed by the authorized representative of the testing and balancing agency. Certify the reports to be proof that the systems have been tested, adjusted and balanced in accordance with the selected reference standards (NEBB or AABC); are an accurate representation of how the systems have been installed; are a true representation of how the systems are operating at completion of the testing, adjusting and balancing procedures; and are an accurate record of all final quantities measured, to establish normal operating values of the systems. Submittal of test report shall be in the following format:
 - 1. Draft Report: Upon completion of testing, adjusting and balancing procedures, prepare draft reports on the approved forms. Draft report may be handwritten, but must be complete, factual, accurate and legible. Organize and format draft reports in the same manner specified herein for the final reports. Submit two complete sets of draft reports. Only one complete set of draft reports will be returned.
 - 2. Final Report: Upon verification and approval of draft reports, prepare final reports, type written and organized and formatted as described herein. Submit two complete sets of final reports.
 - a. Report Format: Submit reports using the standard forms prepared by the referenced standard for each respective item and system to be tested, adjusted and balanced. Include schematic systems diagrams. Enclose the report contents in a 3-ring binder. Divide the contents into the below listed divisions, separating them by divider tabs with titles descriptive of the contents:
 - 1) General Information and Summary.
 - 2) Air Systems.
 - b. Report Contents: Provide the following minimum information, forms and data:
 - 1) General Information and Summary: Identify the testing, adjusting and balancing Agency, Contractor, Owner, Architect/Engineer, and Project on the inside cover sheet. Include addresses, and contact names and telephone numbers. Include a certification sheet containing the seal and name, address, telephone number and signature of the Agency's responsible certified Test and Balance Engineer.

Include in this division a listing of the instrumentation used for the procedures, along with the proof of calibrations.

- 2) Include in the remainder of the reports the appropriate forms containing, as a minimum, the information indicated on the standard report forms prepared by AABC or NEBB, for each item of equipment and system. Prepare a schematic diagram for each item of equipment and system, to accompany each respective report form.
- c. Calibration Reports: Submit proof that all required instrumentation has been calibrated to tolerances specified in the referenced standards within a period not exceeding six months prior to conducting the test procedures.

1.04 QUALITY ASSURANCE

- A. Test, adjust and balance systems and equipment by using competent mechanics regularly employed by a testing, adjusting and balancing Subcontractor whose primary business is the testing, adjusting and balancing of building mechanical systems. The testing, adjusting and balancing Subcontractor shall be a business established for a minimum of 10 years.
- B. The testing, adjusting, and balancing Subcontractor shall be certified by the Associated Air Balance Council (AABC) or the National Environmental Balancing Bureau (NEBB).
- C. Instrumentation type, quantity, and accuracy shall be as described in AABC's "National Standards for Field Measurement and Instrumentation, or Total System Balance, or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems."
- D. All instrumentation shall be calibrated at least every 6 months or more frequently if required by the instrument manufacturer.

1.05 PERFORMANCE REQUIREMENTS

- A. Comply with all applicable Federal, State and Local laws, ordinances, regulations and codes, and the latest industry standards including, but not limited to the entities listed below for procedures, measurements, instruments and test reports for testing, adjusting and balancing work:
 1. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)
 2. Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
 3. National Environmental Balancing Bureau (NEBB)
 4. Associated Air Balance Council (AABC)
- B. Set the air delivery or intake of each grille to be as designed or within five percent of the air flow rates shown on the Drawings.
- C. Set the fan air flow rate to be within five percent above the design value.
- D. Leave all manual volume dampers in the full open position and balance as closely as possible to the design airflows using the fan speed dials (if present) or belt adjustments (if present). Then adjust manual volume dampers to achieve final balancing. Intent is to achieve design airflows at the grilles at the slowest possible fan speeds.

1.06 JOB CONDITIONS

- A. Require the testing and balancing specialist to review his work with the respective manufacturers of the equipment and devices involved, and coordinate and schedule all work.
- B. Furnish and install balancing dampers, pressure taps, gauges, and other components as required for a properly balanced system, whether or not specified herein or shown on the

Drawings, all at no additional cost to the Owner. Make all adjustment or replacement parts recommended by the testing and balancing specialist in strict accordance with the respective equipment manufacturer's recommendations.

- C. Coordinate with the control manufacturer's representative to set the adjustment of the automatically operated dampers to operate as required.

1.07 GENERAL

- A. The Owner will occupy the building during the entire testing, adjusting, and balancing period. Cooperate with the Owner during testing, adjusting, and balancing operations to minimize conflicts with the Owner's operations.
- B. Complete all tests specified herein to the satisfaction of the Architect/Engineer before final acceptance.
- C. The Architect/Engineer, or his representative, is the sole judge of the acceptability of the tests. The Architect/Engineer may direct the performance of any such additional tests, as he deems necessary in order to determine the acceptability of the systems, equipment, material and workmanship. No additional payment will be made for any test required by the Architect/Engineer.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Obtain design drawings and specifications and become thoroughly acquainted with the design intent.
- B. Obtain copies of approved shop drawings of all air handling equipment, air outlets (supply, return and exhaust), and the temperature control diagrams, including intended sequence of operations.
- C. Examine installed work and conditions under which testing is to be done to ensure that work has been completed, cleaned, and is operable. Do not proceed with testing, adjusting and balancing until unsatisfactory conditions have been corrected in a manner approved by the testing and balancing specialist.
- D. Examine the air systems to see that they are free from obstructions. Determine that all dampers and registers are open, moving equipment is lubricated, clean filters are installed, and automatic controls are functioning; and perform other inspections and maintenance activities necessary for proper operation of the systems.

3.02 TESTING, ADJUSTING AND BALANCING

- A. Notify the Owner 48 hours in advance of starting any tests. Do not perform any tests until acknowledgment of notification and approval has been received from the Owner.
- B. Provide all necessary instruments and personnel for the tests. If, in the opinion of the Architect/Engineer, the results of such tests show that the Work has not complied with the requirements of the Contract Documents, make all additions or changes necessary to put the system in proper working condition and pay all expenses for all subsequent tests which are

necessary to determine whether the Work is satisfactory. Any additional work or subsequent tests shall be carried out at the convenience of the Architect/Engineer.

- C. Test all packaged equipment in strict accordance with the equipment manufacturer's requirements.
- D. Perform any and all other tests that may be required by the local municipality or other governing body, board or agency having jurisdiction.
- E. Perform testing, adjusting, and balancing after leakage and pressure tests on air distribution systems have been satisfactorily completed.
- F. Actuate all safety devices in a manner that clearly demonstrates their workability and operation.
- G. Cut insulation and ductwork for installation of test probes to the minimum extent necessary to allow adequate performance of test procedure.
- H. Perform tests and compile test data for all air systems.
- I. Include a schematic diagram locating the air inlets, outlets, fans, equipment, dampers and regulating devices for air systems.
- J. All instruments used shall be provided by the entity performing the Work of this Section, and shall be accurately calibrated and maintained in good working order.
- K. Air Systems
 - 1. Perform the testing, adjusting and balancing of air systems in accordance with the detailed procedures outlined in the referenced standards; including but not be limited to the following:
 - 2. Test, record and adjust fan rpm to meet design CFM requirements.
 - 3. Test and record motor full load amperes.
 - 4. Make a pitot tube traverse of main ducts and obtain design flow rate at fans.
 - 5. Test and record system static pressure, velocity pressure and total pressure.
 - 6. Test and adjust system for design air flow rate.
 - 7. Test and adjust system for minimum and maximum design flow rates.
 - 8. Test and record fan leaving air temperatures.
 - 9. Adjust all ducts to proper design flow rate.
 - 10. Test and adjust each grille.
 - 11. Identify each grille as to location and area on the schematic diagram.
 - 12. Identify and list in the final report size, type and manufacturer of grilles and all tested equipment. Use manufacturer's data on all equipment to make required calculations for testing, adjusting and balancing. Include design required velocity and test resultant velocity, required flow rate and test resultant flow rate after adjustment as part of readings and tests of grilles.
 - 13. Permanently mark all dampers after air balance is complete so that they can be restored to their correct position, if disturbed later.
 - 14. Seal openings in ductwork for pitot tube insertion with snap-in plugs after air balance is complete.

END OF SECTION 230594

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. This section describes the insulation, jackets and accessories for piping as scheduled in Part 3 of this Section and as shown on the Drawings.

1.02 RELATED REQUIREMENTS

- A. Section 079201 - Non Fire Rated Sleeves and Seals
- B. Section 232300 - Refrigerant Piping

1.03 REFERENCES

- A. National Fire Protection Association (NFPA):
 - 1. NFPA 255 - Surface Burning Characteristics of Building Materials.
- B. Energy Conservation Code of New York State - 2020
- C. Mechanical Code of New York State - 2020
- D. Greenguard
- E. Underwriters Laboratories, Inc. (UL):
 - 1. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials.
- F. American Society for Testing and Materials (ASTM):
 - 1. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
 - 2. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 - 3. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
 - 4. ASTM C335 - Standard Test Method for Steady-State Heat Transfer Properties of Horizontal Pipe Insulation.
 - 5. ASTM C518 - Standard Test Method for Steady-State Heat Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
 - 6. ASTM C534 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
 - 7. ASTM C585 - Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing.
 - 8. ASTM C921 - Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
 - 9. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation
 - 10. ASTM D1056 - Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber.
 - 11. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 12. ASTM E96 - Standard Test Method for Water Vapor Transmission of Materials.

1.04 DEFINITIONS

- A. Greenguard: Greenguard Environmental Institute

- B. IAQ: Indoor Air Quality
- C. EPA: Environmental Protection Agency
- D. WHO: World Health Organization
- E. SSL: Self-Sealing Lap
- F. PVC: Polyvinyl Chloride
- G. FRP: Fiberglass Reinforced Plastic
- H. Cold Service Piping/ Surfaces: Pipes or surfaces where the normal operating temperature is 60 degrees F or lower.
- I. Hot Service Piping/ Surfaces: Pipes or surfaces where the normal operating temperature is 105 degrees F or higher.

1.05 SUBMITTALS

- A. Product data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
- B. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.06 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Manufacturer: Company specializing in manufacturing products specified with minimum 3 years documented experience.
 - 2. Installer: Company specializing in performing the Work of this Section with minimum 3 years documented experience.
- B. Materials:
 - 1. Flame spread/smoke developed rating of 25/50 or less in accordance with ASTM E84, NFPA 255 and UL 723.
 - 2. Insulation for duct, pipe and equipment for above grade exposed to weather outside building shall be certified as being self-extinguishing for 1" thickness in less than 53 seconds when tested in accordance with ASTM D1692.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.
- B. Follow manufacturer's recommended storage and handling practices.

1.08 ENVIRONMENTAL REQUIREMENTS

- A. Maintain ambient conditions required by manufacturers of each product (tapes, adhesives, mastics, cements, insulation, etc.).
- B. Maintain temperature before, during, and after installation for a minimum of 24 hours.

- C. Mold: Carefully inspect any insulation that has been exposed to water. If it shows any sign of mold growth remove it from the Site. If the material is wet but shows no sign of mold, dry rapidly and thoroughly. If it shows signs of facing degradation from wetting remove it from the Site.

PART 2 - PRODUCTS

2.01 ELASTOMERIC INSULATION

- A. Approved Manufacturers:
 - 1. Armacell LLC
 - 2. K-Flex USA, Inc.
- B. Flexible, tubular (Type 1) or sheet/roll form (Type 2) closed-cell elastomeric insulation complying with ASTM C534 <<Grade 1 - Standard (temperature range -297°F to 220°F); use molded tubular material wherever possible.

2.02 ELASTOMERIC INSULATION ACCESSORIES

- A. Adhesives:
 - 1. Air dried, waterproof vapor barrier contact adhesive, compatible with insulation for joining of seams and butt joints.
- B. Finishes:
 - 1. Provide a weather and UV resistant protective finish for outdoor applications in accordance with the manufacturer's recommendations.

2.03 HIGH DENSITY JACKETED INSULATION INSERTS FOR HANGERS AND SUPPORTS

- A. For Use with Flexible Elastomeric Foam Insulation: Hardwood dowels and blocks, length or thickness equal to insulation thickness, other dimensions as specified or required.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that all piping is tested and approved prior to insulation installation.
- B. Verify that all surfaces are clean, dry and without foreign material before applying insulation materials.

3.02 INSTALLATION (GENERAL)

- A. Install all materials using skilled labor regularly engaged in this type of work. Install all materials in strict accordance with manufacturer's recommendations, building codes, and industry standards.
- B. Locate insulation and cover seams in the least visible location. Extend all surface finishes in such a manner as to protect all raw edges, ends and surfaces of insulation.
- C. On cold surfaces where a vapor retarder must be maintained, apply insulation with a continuous, unbroken moisture and vapor seal. Insulate and vapor seal all hangers, supports, anchors, or other projections secured to cold surfaces to prevent condensation.
- D. Insulated pipes conveying fluids below ambient temperature; insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

- E. For hot piping conveying fluids <<140°F>> or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
- F. For hot piping conveying fluids over <<140°F>>, insulate flanges and unions at equipment.
- G. Maintain continuous pipe insulation through walls, ceiling or floor openings, or sleeves except where firestop or firesafing materials are required.
- H. Install insulation neatly, accurately and without voids, in accordance with manufacturer's instructions and NIAC National Commercial and Industrial Insulation Standards.
- I. Insulate fittings, valves and flanges using premolded covers with precut insulation inserts.
- J. Insulate piping using insulation of type and thickness scheduled in this Section.
- K. Install metal shields between hangers or supports and the piping insulation. Install rigid insulation inserts as required between the pipe and the insulation shields. Fabricate inserts to be of equal thickness to the adjacent insulation and vapor seal as required. Insulation inserts shall be no less than the following lengths:

1½" to 2½" IPS	10" long
3" to 6" IPS	12" long
8" to 10" IPS	16" long
12" and over IPS	22" long

- L. Pipe exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor) to be finished with PVC jacket and fitting covers, aluminum jacket, or stainless steel jacket.

3.03 INSTALLATION (ELASTOMERIC)

- A. Piping:
 1. Install pipe insulation by slitting tubular sections and applying onto piping or tubing. Alternately, slide unslit sections over the open ends of piping or tubing. Adhere and seal all seams and butt joints using adhesive.
 2. Push insulation onto the pipe, never pull. Stretching of insulation may result in open seams and joints.
 3. Tape the ends of the tubing before slipping the insulation over the new pipes to prevent dust from entering the pipe.
 4. Clean cut all edges. Do not leave rough or jagged edges of the insulation. Use proper tools such as sharp non-serrated knives.
 5. On cold piping, adhere insulation directly to the piping at the high end of the run using a two-inch strip of adhesive on the inner diameter of the insulation and on the pipe. Coat all exposed end cuts of the insulation with adhesive. Adhere all penetrations through the insulation and termination to the substrate to prevent condensation migration.
 6. Use sheet insulation on all pipes larger than 6-inch diameter. Do not stretch insulation around the pipe. On pipes larger than 12-inch diameter, adhere insulation directly to the pipe on the lower 1/3 of the pipe. On pipes greater than 24-inch diameter, completely adhere insulation.
 7. Stagger seams when applying multiple layers of insulation.
- B. Valves, Flanges and Fittings:

1. Insulate all fittings with the same insulation thickness as the adjacent piping. Adhere all seams and mitered joints with adhesive. Sleeve screwed fittings and adhere with a minimum 1" overlap onto the adjacent insulation.
2. Insulate valves, flanges, strainers using donuts covered with sheet or oversized tubular insulation.

C. Hangers:

1. Support piping system using high density inserts with sufficient compressive strength. Apply elastomeric foam insulation with the same or greater thickness than the pipe insulation to pipe supports. Seal all joints with adhesive.
2. Standard and split hangers - Insulate piping supported by ring hangers with the same insulation thickness as the adjacent pipe. Seal all seams and butt joints with adhesive. Sleeve ring hangers using oversized tubular insulation. On cold piping, extend insulation up the hanger rod a distance equal to four times the insulation thickness. Insulation tape may be used to a thickness equal to the adjacent insulation thickness.
3. Clevis hangers or other pipe support systems - Install saddles under all insulated lines at unistrut clamps, clevis hangers, or locations where insulation may be compressed due to the weight of the pipe. Insert and adhere wooden dowels or blocks of a thickness equal to the insulation to the insulation between the pipe and the saddle.
4. Pre-insulated pipe hangers can be used to prevent compression of insulation at standard split, clevis hangers or other pipe support systems. Adhere a pair of non-skid pads to the clamps to minimize the movement. In addition, to prevent loosening of the clamps, use an antivibratory fastener, such as a nylon-locking nut.

D. Exterior Applications:

1. Paint all outdoor exposed piping with two coats of UV resistant finish. Prior to applying the finish, wipe the insulation with denatured alcohol. Do not tint the finish.
2. Locate seams for all outdoor exposed piping on the lower half of the pipe.

3.04 PIPING INSULATION MATERIAL SCHEDULE

SYSTEM OR SERVICE	LOCATION	INSULATION TYPE	JACKET
CONDENSATE DRAINS	INSIDE	ELASTOMERIC	
HVAC REFRIGERANT LINES	INSIDE	ELASTOMERIC	
HVAC REFRIGERANT LINES	OUTSIDE	ELASTOMERIC	EXTERIOR COATING

3.05 MINIMUM PIPING INSULATION THICKNESS (IN.)

FLUID OPERATING TEMP. RANGE (°F)	SYSTEMS IN TEMP. RANGE (°F)	INSULATION CONDUCTIVITY		NOMINAL PIPE OR TUBE SIZE (IN.)				
		CONDUCTIVITY BTU*IN./(H*SQ. FT.*°F)	MEAN RATING TEMP (°F)	<1	1 TO < 1- 1/2	1-1/2 TO < 4	4 TO < 8	=8
> 350		0.32-0.34	250	4.5	5.0	5.0	5.0	5.0
251-350		0.29-0.32	200	3.0	4.0	4.5	4.5	4.5
201-250		0.27-0.30	150	2.5	2.5	2.5	3.0	3.0
141-200	REFR	0.25-0.29	125	1.5	1.5	2.0	2.0	2.0
105-140		0.21-0.28	100	1.0	1.0	1.5	1.5	1.5
40-60	COND	0.21-0.27	75	0.5	0.5	1.0	1.0	1.0
< 40		0.20-0.26	50	0.5	1.0	1.0	1.0	1.5

END OF SECTION 230700

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. This section describes the insulation, jackets and insulating accessories for sheet metal ductwork as scheduled in Part 3 of this Section and as shown on the Drawings.

1.02 REFERENCES

- A. National Fire Protection Association (NFPA):
 - 1. NFPA 255 - Surface Burning Characteristics of Building Materials.
- B. New York:
 - 1. Mechanical Code of New York State - 2020
 - 2. Energy Conservation Construction Code - 2020
- C. Greenguard
- D. Sheet Metal and Air Conditioning Contractors National Association (SMACNA):
- E. SMACNA - HVAC Duct Construction Standards - Metal and Flexible.
- F. Underwriters Laboratories, Inc. (UL):
 - 1. UL 723 - Surface Burning Characteristics of Building Materials.
- G. American Society for Testing and Materials (ASTM):
 - 1. ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.
 - 2. ASTM C177 - Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
 - 3. ASTM C518 - Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
 - 4. ASTM C553 - Mineral Fiber Blanket and Felt Insulation.
 - 5. ASTM C612 - Specification for Mineral Fiber Block and Board Thermal Insulation.
 - 6. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel
 - 7. ASTM C921 - Properties of Jacketing Materials for Thermal Insulation.
 - 8. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation
 - 9. ASTM D1056 - Flexible Cellular Materials - Sponge or Expanded Rubber.
 - 10. ASTM E84 - Surface Burning Characteristics of Building Materials.
 - 11. ASTM E96 - Water Vapor Transmission of Materials.

1.03 DEFINITIONS

- A. Greenguard: Greenguard Environmental Institute
- B. IAQ: Indoor Air Quality
- C. EPA: Environmental Protection Agency
- D. WHO: World Health Organization
- E. ASJ: All Service Jacket
- F. SSL: Self-Sealing Lap

- G. FSK: Foil-Scrim-Kraft; jacketing
- H. PSK: Poly-Scrim-Kraft; jacketing
- I. PVC: Polyvinyl Chloride
- J. FRP: Fiberglass Reinforced Plastic
- K. Cold Piping/Ductwork/Surfaces: Pipes or surfaces where the normal operating temperature is 60 degrees F or lower.

1.04 SUBMITTALS

- A. Product data: To include product description, manufacturer's installation instructions, types and recommended thicknesses for each application, and location of materials.
- B. Provide samples and mock-ups of systems as required.

1.05 ENVIRONMENTAL REQUIREMENTS

- A. Maintain ambient conditions required by manufacturers of tapes, adhesives, mastics, cements, and insulation materials.
- B. Follow manufacturer's recommended handling practices.
- C. Supply fiberglass products that assure excellent IAQ (Indoor Air Quality) performance through Greenguard Certification.
- D. Mold: Carefully inspect any insulation that has been exposed to water. If it shows any sign of mold growth remove it from the Site. If the material is wet but shows no sign of mold, dry rapidly and thoroughly. If it shows signs of facing degradation from wetting remove it from the Site. Discard air handling insulation used in the air stream if exposed to water.

1.06 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Manufacturer: Company specializing in manufacturing Products specified with minimum 3 years documented experience.
 - 2. Installer: Company specializing in performing the Work of this Section with minimum 3 years documented experience.
- B. Materials:
 - 1. Flame spread/smoke developed rating of 25/50 or less in accordance with ASTM E84, NFPA 255 and UL 723.
 - 2. Certify insulation for duct, pipe and equipment for above grade exposed to weather outside building as being self-extinguishing for 1" thickness in less than 53 seconds when tested in accordance with ASTM D1692.

PART 2 - PRODUCTS

2.01 FIBERGLASS RIGID BOARD

- A. Rigid Fiber Glass Board insulation meeting ASTM C612 Type IA and IB.
- B. Mean temperature by ASTM C177 and a maximum service temperature of 450° F.

- C. Factory Applied Vapor Retarder Jacket: ASJ conforming to ASTM C1136 Type I, or FSK or PSK conforming to ASTM C1136 Type II.
- D. Density:
 - 1. Concealed areas: Minimum 3 PCF
 - 2. Exposed areas: Minimum 6 PCF
- E. Approved Products:
 - 1. Insulation Board by Knauf

2.02 FIBERGLASS INSULATION ACCESSORIES

- A. Aluminum Jacket - 0.016-inch (0.406 mm) thick in smooth, corrugated, or embossed finish with factory applied moisture barrier. Overlap 2-inch (50 mm) minimum.
- B. Laminated Self-Adhesive Water and Weather Seals - apply per manufacturers' recommendations.
- C. Tapes - Vapor barrier type, self-sealing, non-corrosive, fire-retardant. Approved Manufacturer: Compac Corporation
- D. Adhesives - Approved Manufacturer: Foster
- E. Mastic - Approved Manufacturer: Foster
- F. Vapor Barrier Coating - Approved Manufacturer: Foster

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that all ductwork is tested and approved prior to insulation installation.
- B. Verify that all surfaces are clean, dry and without foreign material before applying insulation materials.

3.02 DUCTWORK REQUIRING INSULATION

- A. Insulate Ductwork as specified in the DUCTWORK INSULATION SCHEDULE.
 - 1. Insulate any additional ductwork or plenums indicated to be insulated on the Drawings.

3.03 INSTALLATION (GENERAL)

- A. Install all materials using skilled labor regularly engaged in this type of work. Install all materials in strict accordance with manufacturer's recommendations, building codes, and industry standards.
- B. Locate insulation and cover seams in the least visible location. Extend all surface finishes in such a manner as to protect all raw edges, ends and surfaces of insulation.
- C. On cold surfaces where a vapor retarder must be maintained, apply insulation with a continuous, unbroken moisture and vapor seal. Insulate and vapor seal all hangers, supports, anchors, or other projections secured to cold surfaces to prevent condensation.
- D. Install insulation neatly, accurately and without voids, in accordance with manufacturer's instructions and NIAC National Commercial and Industrial Insulation Standards.

- E. Install ductwork hanger supports on the outside of the insulation. Where vertical ducts are supported to the building structure, insulate the ductwork supports to prevent condensation.
- F. Insulate ductwork using insulation of the type and thickness scheduled at the end of this Section.
- G. If specified insulation board thickness does not cover ductwork standing seams and reinforcing angles, insulate them by adhering a grooved strip of fiberglass board with a thickness at least 1 ½ inches greater than the height of the seam or angle covered over the standing seam or angle.

3.04 FIBERGLASS BOARD INSULATION

- A. Fit insulation by scoring, cutting and mitering to fit the contour of the ductwork.
- B. Attach insulation to ductwork in thickness scheduled by brushing adhesive uniformly on all sides of ductwork covering 100 percent of ductwork surface. Press insulation into place, making complete contact with adhesive. Butt edges of insulation board tightly together without gaps.
- C. Additionally, hold insulation in place by impaling on pins welded to all four sides of the ductwork. Locate and weld pins a minimum 12 inch on center with a minimum of 2 rows per side of duct and no less than 3 inches from the edges of the ductwork. Secure insulation to pins with 1 inch diameter hold-down washers. As an alternate to welded pins, provide "Gripnail" mechanical surface fasteners by Gripnail Corporation using pneumatic hammer designed for this work.
- D. Seal all joints, seams, breaks, and punctures in facing with adhesive and cover with 3 inch wide sealing tape. Flash supports with vapor barrier coating.

3.05 DUCTWORK INSULATION SCHEDULE

- A. Fiber Glass Insulation Schedule:

Ductwork System	Type	Minimum R-Value
Supply Ductwork Located Indoors	Fiberglass Rigid Board	6
Exhaust Ductwork Located Indoors	Uninsulated	NA
Stainless Steel Supply and Exhaust Rooftop Ductwork	Uninsulated	NA

END OF SECTION 230719

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Gas detection system with hydrogen sulfide (H₂S) sensor, natural gas (methane - CH₄) sensor, alarms and relays.

1.02 SUBMITTALS

- A. Submit product data on control panel and sensors including power requirements, wiring diagrams, dimension drawings, installation and operation manuals.

1.03 QUALITY ASSURANCE

- A. The manufacturer must be capable of supplying all equipment used to check or calibrate the monitor units.
- B. The manufacturer must be capable of providing on-site service with factory-trained personnel.
- C. The manufacturer must be capable of providing on-site training for owner/operator.
- D. The manufacturer must be capable of providing replacement parts within 24 hours.

1.04 WARRANTY

- A. The transmitter shall be warranted for 2 years.
- B. Infrared sensor electronics shall be warranted for 5 years.

PART 2 - PRODUCTS

2.01 GAS DETECTION SYSTEM

- A. General
 - 1. The gas monitor shall continuously measure and display the concentrations of up to two sensors.
 - 2. The monitor shall be TG5000 Gas Monitor by MSA or approved equal.
 - 3. The Gas Monitor shall be contained in a plastic, general-purpose enclosure.
- B. Monitor Requirements
 - 1. After wiring of the product, monitor set-up and start-up shall not require that the enclosure be opened during this process.
 - 2. The monitor shall be factory-calibrated and ready for out-of-box use. Only a gas check shall be required to ensure proper operation.
 - 3. The monitor output signal capacity shall provide the following outputs:
 - a. Single or Two-point monitors shall offer 4-20mA output per sensor.
 - b. HART output over the 4-20mA shall be standard on the product allowing for interrogation and diagnostics.
 - 4. Monitor shall be able to operate between 14°F to 104°F.
- C. Monitor Display
 - 1. A local scrolling OLED display shall indicate the gas type being monitored and the concentration of gas present. The display shall alternate between the sensors.
 - 2. The monitor display shall indicate all diagnostic checks and fault conditions with a scrolling message detailing the condition. Error codes shall not be used.

3. The monitor shall display two levels of alarm (warning and alarm). Alarm levels shall be adjustable by means of a touch screen. This readout shall be an OLED display showing gas concentration and gas being detected, as well as bright status LEDs.
 4. Monitor Touchscreen shall provide capability to setup and calibrate monitor. Touchscreen shall provide capability to locally acknowledge/reset latched alarms.
- D. Smart Sensor Technology
1. Sensors shall be contained in sensor modules externally mounted to the main enclosure. All toxic and oxygen sensor modules shall be replaceable without the need for tools and while the unit is under power.
 2. Sensor modules shall contain all relevant sensor information, including the sensor manufacturer part number within the module.
 3. The sensor module shall store all calibration data, enabling offsite calibration and field-installation without requiring re-calibration. The sensor module shall not require a battery or power source to store this data.
 4. The electrochemical sensors shall not require the periodic addition of reagents.
 5. Sensors shall have optional diffusion supervision technology enabling sensor to automatically warn users when an electrochemical sensor inlet becomes blocked and unable to detect gas.
- E. Multi-Sensing Capabilities
1. The monitor shall operate up to two sensors at one time.
 2. Combinations of electrochemical, catalytic, and infrared sensing technologies shall be available, as called for on the Drawings.
 3. The sensor units shall be able to remotely located from a monitor/readout unit by up to 328 feet (100m).
 4. Remote Stainless steel enclosures shall be provided for all gases, including combustible gases.
 5. For remote sensors, a mounting bracket shall be included to facilitate mounting of the remote sensors.
- F. Non-Intrusive Calibration Capability
1. All monitors shall be calibrated without opening any enclosures.
 2. Calibration shall be achieved via touchscreen on front of monitor.
- G. LED/Relay
1. The monitor shall have LEDs viewable from 50 feet, minimum.
 2. The transmitter shall have three common relays. Relays shall be rated at five amps @ 30VDC, five amps @ 220VAC, single-pole double-throw (SPDT) and consist of two relays for alarm levels and one relay for fault. The relays are used to activate optional strobe(s). Four additional relays shall be available. 2 relays shall be dedicated to activating horn reset function. Two 6 amp double-pole double-throw (DPDT) relays are to be available to trigger remote devices configurable by customer.
- H. Options
1. Integral power supply/transformer shall allow for use with field-provided 120V power.
 2. Integral 95dB audible alarm with silence push button.
 3. A stainless steel mounting bracket capable of supporting transmitter shall be provided.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Instillation height for the hydrogen sulfide (H₂S) sensor shall be approximately 2ft. to 3ft. from the basement/lower level floor.

- B. Installation height for the natural gas (methane - CH₄) sensor shall be on or near the ceiling, and/or as shown on the Drawings.
- C. The Contractor shall provide all wiring, conduit and interconnection required for installation. All wiring shall be done in EMT.

3.02 EXECUTION

- A. System relays shall be normally energized in non-gas-alarm state so they act in fail-safe operation.
- B. Upon detection of 10 ppm H₂S in air, or 10% LEL Methane (CH₄), the relays shall de-energize for use as shown on the HVAC control diagrams.
- C. Upon detection of 20 ppm H₂S in air, or 20% LEL Methane (CH₄), the relays shall remain de-energized and the gas monitor's integral audible/visual alarms shall activate.
- D. The system audible alarm shall be capable of being silenced from the front panel push button.

END OF SECTION 230910

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. The work specified as part of this Section consists of the integration of equipment controls supplied as part of manufactured items, materials and equipment required by the Drawings and under Divisions 23 and 26 to achieve operational and coordinated Sequences of Operation as Specified. Work shall include management of the system start up and operational check out, coordination of functions of controllers supplied as part of equipment packages, interconnection of systems, provision and installation of all accessory devices required for complete system operation including devices not provided as part of equipment, coordination of start up and testing and demonstration of the operation of Sequences of Operation to the Owner and his representatives.

1.02 RELATED SECTIONS

- A. The General Conditions of the Contract, Supplementary Conditions, and General Requirements are a part of these Specifications and shall be used in conjunction with this Section as a part of the Contract Documents. Consult them for further instructions pertaining to this work. The Contractor is bound by the provisions of Division 00 and Division 01.
- B. The following Sections constitute related work:
 - 1. Section 230010 - General Mechanical Requirements
 - 2. Section 230910 - Gas Detection System
 - 3. Equipment and Systems specified under Division 23
 - 4. Division 26

1.03 QUALITY ASSURANCE

- A. System Installer Qualifications
 - 1. The Integrator shall have a minimum of five years experience in the integration of systems of a similar nature to those of this Project.
 - 2. The Integrator shall have an office within 50 miles of the project site and provide 24-hour response in the event of a customer call.
- B. Codes and Standards: Meet requirements of all applicable standards and codes, except when more detailed or stringent requirements are indicated by the Contract Documents, including requirements of this Section.
 - 1. Underwriters Laboratories: Products shall be UL-916-PAZX listed.
 - 2. National Electrical Code - NFPA 70.
- C. All products used in this installation shall be new, currently under manufacture, and shall have been applied in similar installations for a minimum of 2 years. This installation shall not be used as a test site for any new products unless explicitly approved by the Owner's representative in writing prior to bid date. Spare parts shall be available for at least 5 years after completion of this Contract.

1.04 SUBMITTALS

- A. Submit at the time of bid the name and qualifications of the firm that will be responsible for the Integration function along with the qualifications of the specific personnel proposed. The Owner and Architect/Engineer may choose to interview the personnel proposed for the project.
- B. Contractor shall provide shop drawings and manufacturer's standard specification data sheets on all materials and hardware to be provided. No work may begin on any segment of this

project until the Architect/Engineer and Owner have reviewed submittals for conformity with the Drawings and Specifications. All shop drawings shall be provided to the Owner electronically as .dwg or .dxf file formats.

- C. Submit a written sequence of operation for each system indicating which functions are to be controlled by controls provided as part of manufactured equipment and which functions will be under control of devices provided as part of this Section.
- D. Submit interconnecting wiring diagrams for all systems. These diagrams may rely on diagrams for controls of manufactured equipment provided that the interface points are clearly identified and copies of the manufactured item's control diagrams are submitted for information as part of the submittal package.
- E. Submit any additional information or data which is deemed necessary to determine compliance with these specifications or which is deemed valuable in documenting the system to be installed.
- F. Submit the following within 30 days of contract award:
 - 1. A work plan and schedule for the start up and check out of all systems including time requirements and resources required from all Sub-Contractors involved.
 - 2. A complete list of equipment to be used indicating quantity, manufacturer and model number.
 - 3. Provide manufacturers cut sheets for major system components. When manufacturer's cut sheets apply to a product series rather than a specific product, the data specifically applicable to the project shall be highlighted or clearly indicated by other means. Each submitted piece of literature and drawings shall clearly reference the specification and/or drawing that the submittal is being submitted to cover.
 - 4. Review of the submittals by the Architect/Engineer shall not relieve the Contractor from the responsibility of providing fully operational systems.

1.05 WARRANTY

- A. Warrant all work as follows:
 - 1. Labor & materials for control system specified shall be warranted free from defects for a period of twelve (12) months after final completion acceptance by the Owner. Control System failures during the warranty period shall be adjusted, repaired, or replaced at no charge or reduction in service to the Owner. The Contractor shall respond to the Owner's request for warranty service within 24 hours during customary business hours.
 - 2. At the end of the final start-up/testing, if equipment and systems are operating in a manner satisfactory to the Owner and Architect/Engineer, the Owner shall sign certificates certifying that the control system's operation has been tested and accepted in accordance with the terms of this Specification. The date of Owner's acceptance shall be the start of warranty.

PART 2 - PRODUCTS

2.01 STANDARD OF QUALITY AND PERFORMANCE

- A. Products specified are not intended to form a complete scope of supply. They are intended to set a level of quality for items that the Contractor may need to supply to implement a complete Sequence of Operation. Products of a comparable quality and performance may be submitted for approval by the Architect/Engineer.

2.02 FLOW SWITCHES

- A. Flow switches shall be dual temperature sensor probe type sensor for flow/no-flow switching.

- B. Flow switches shall have no moving parts.
- C. Set Point range shall be:
 - 1. 0.02 - 0.8 feet per second for liquids
 - 2. 0.5 - 140 feet per second for air/gas
- D. Flow switch enclosures shall be explosion proof.
- E. Sensor head shall be type 316L Stainless Steel capable of operating to 4000 PSIG and in temperature range of -50 to 350°F.
- F. Voltage shall be 120V, 24V, or 12V based on specific application shown on the Drawings and Diagrams.
- G. Flow switches shall be FX Series by Ameritrol, Inc. or equivalent.

2.03 OUTDOOR AIR TEMPERATURE SWITCH

- A. Outdoor air switch shall consist of sensor probe element and switching relay.
- B. Device shall be UL listed.
- C. Relay shall be SPDT output for open/close on temperature rise.
- D. Device shall operate on 24V power.
- E. Device shall be by Honeywell, Johnson Controls, or equivalent.

2.04 OCCUPANCY SENSOR

- A. Occupancy sensor shall cover minimum 1,000 square feet of floor area when mounted at suggested mounting height.
- B. Device shall be UL listed.
- C. Relay shall be SPDT output for open/close on detection of occupancy. Relay shall be normally powered (unoccupied) and shall lose power upon detection of occupancy for fail-safe operation.
- D. Device shall be within NEMA-4X enclosure.
- E. Device shall operate on 24V power.

2.05 RELAYS

- A. Control relays shall be UL listed plug-in type with dust cover. Contact rating, configuration, and coil voltage suitable for application.
- B. Time delay relays shall be UL listed solid-state plug-in type with adjustable time delay. Delay shall be adjustable plus or minus 200% (minimum) from set-point shown on plans. Contact rating, configuration, and coil voltage suitable for application. Provide NEMA 1 Type enclosure when not installed in local control panel.

2.06 TRANSFORMERS AND POWER SUPPLIES

- A. Control transformers shall be UL listed, Class 2 current-limiting type, or shall be furnished with over-current protection in both primary and secondary circuits for Class 2 service.

- B. Unit output shall match the required output current and voltage requirements. Current output shall allow for a 50% safety factor. Output ripple shall be 3.0 mV maximum Peak-to-Peak. Regulation shall be 0.10% line and load combined, with 50 microsecond response time for 50% load changes. Unit shall have built-in over-voltage protection.
- C. Unit shall operate between 0 degrees C and 50 degrees C.
- D. Unit shall be UL recognized.

2.07 LOCAL CONTROL PANELS

- A. All indoor control cabinets shall be fully enclosed NEMA 1 or NEMA 4X rating as called for on the Drawings. Provide cabinet with hinged door, key-lock latch, and removable sub-panels. A single key shall be common to all field panels and sub-panels.
- B. Interconnections between internal and face-mounted devices pre-wired with color-coded stranded conductors neatly installed in plastic troughs and/or tie-wrapped. Terminals for field connections shall be UL listed for 600-volt service, individually identified per control/interlock drawings, with adequate clearance for field wiring. Control terminations for field connection shall be individually identified per control drawings.
- C. Provide on/off power switch with over-current protection to each local panel.

PART 3 - EXECUTION

3.01 GENERAL WORKMANSHIP

- A. Install equipment, piping, wiring/conduit parallel to building lines (i.e. horizontal, vertical, and parallel to walls) wherever possible.
- B. Provide sufficient slack and flexible connections to allow for vibration of piping and equipment.
- C. Install all equipment in readily accessible location as defined by Chapter 1 Article 100 part A of the NEC. Control panels shall be attached to structural walls unless mounted in equipment enclosure specifically designed for that purpose. Panels shall be mounted to allow for unobstructed access for service.
- D. Verify integrity of all wiring to ensure continuity and freedom from shorts and grounds.
- E. All equipment, installation, and wiring shall comply with acceptable industry specifications and standards for performance, reliability, and compatibility and be executed in strict adherence to local codes and standard practices.

3.02 WIRING

- A. All control and interlock wiring shall comply with the national and local electrical codes and Division 26 of these Specifications. Where the requirements of this Section differ with those in Division 26, the requirements of this Section shall take precedence.
- B. Do not install Class 2 wiring in conduit containing Class 1 wiring. Do not use boxes and panels containing high voltage for low voltage wiring except for the purpose of interfacing the two (e.g. relays and transformers).
- C. Control wiring located in a plenum space that is not installed in a conduit shall be plenum rated.

- D. All wire-to-device connections shall be made at a terminal block or terminal strip. All wire-to wire connections shall be at a terminal blocks, or with a crimped connector. All wiring within enclosures shall be neatly bundled and anchored to permit access and prevent restriction to devices and terminals.
- E. Maximum allowable voltage for control wiring shall be 120V. Provide and install step down transformers.
- F. All wiring shall be installed as continuous lengths, where possible. Any required splices shall be made only within an approved junction box or other approved protective device.
- G. Maintain fire rating at all penetrations in accordance with other Sections of this Specification and local codes.
- H. Size of conduit and size and type of wire shall be the design responsibility of the Contractor, in keeping with the manufacturer's recommendations and the NEC.
- I. Locate control and status relays in designated enclosures only. These relays may also be located within packaged equipment control panel enclosures. These relays shall not be located within Class 1 starter enclosures.
- J. Follow manufacturer's installation recommendations for all communication and network cabling. Network or communication cabling shall be run separately from other wiring.
- K. Adhere to Division 26 requirements for installation of raceway.
- L. Maintain an updated (as-built) wiring diagram with terminations identified at the job site.
- M. Flexible metal conduits and liquid-tight, flexible metal conduits shall not exceed 3feet in length and shall be supported at each end. Flexible metal conduit less than 1/2" electrical trade size shall not be used. In areas exposed to moisture liquid tight, flexible metal conduits shall be used.

3.03 INSTALLATION OF SENSORS

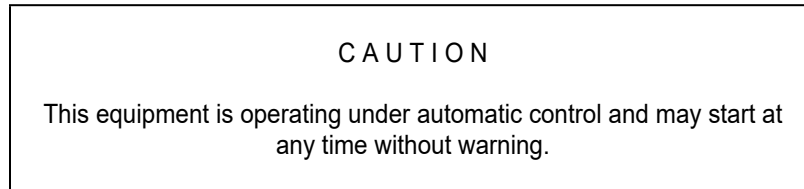
- A. Install sensors in accordance with the manufacturer's recommendations.
- B. Mount sensors rigidly and adequate for the environment within which the sensor operates.
- C. All wires attached to sensors shall be air sealed in their conduits or in the wall to stop air transmitted from other areas affecting sensor readings.
- D. Wiring for space sensors shall be concealed in building walls. EMT conduit is acceptable within mechanical and service rooms.
- E. Install outdoor air temperature sensors on north wall complete with sun shield at designated location.

3.04 FLOW SWITCH INSTALLATION

- A. Install in accordance with manufacturers' instructions.
- B. Assure correct flow direction and alignment.

3.05 WARNING LABELS

- A. Affix plastic labels on each starter and equipment automatically controlled. Label shall indicate the following:



3.06 IDENTIFICATION OF HARDWARE AND WIRING

- A. All wiring and cabling, including that within factory-fabricated panels, shall be labeled at each end within 2 inches of termination with a cable identifier and other descriptive information.
- B. Permanently label or code each point of field terminal strips to show the instrument or item served.
- C. Identify control panels with minimum 1-cm letters on laminated plastic nameplates.
- D. Identify all other control components with permanent labels. Identifiers shall match record documents. All plug-in components shall be labeled such that removal of the component does not remove the label.

3.07 CLEANING

- A. The Contractor shall clean up all debris resulting from his or her activities daily. The contractor shall remove all cartons, containers, crates, etc. under his control as soon as their contents have been removed. Waste shall be collected and placed in a location designated by the Construction Manager or General Contractor.
- B. At the completion of work in any area, the Contractor shall clean all of his/her work, equipment, etc., making it free from dust, dirt and debris, etc.
- C. At the completion of work, all equipment furnished under this Section shall be checked for paint damage, and any factory finished paint that has been damaged shall be repaired to match the adjacent areas. Any metal cabinet or enclosure that has been deformed shall be replaced with new material and repainted to match the adjacent areas.

3.08 PROTECTION

- A. The Contractor shall protect all work and material from damage by his/her work or workers, and shall be liable for all damage thus caused.
- B. The Contractor shall be responsible for his/her work and equipment until finally inspected, tested, and accepted. The Contractor shall protect his/her work against theft or damage, and shall carefully store material and equipment received on site that is not immediately installed. The Contractor shall close all open ends of work with temporary covers or plugs during storage and construction to prevent entry of foreign objects.

3.09 FIELD QUALITY CONTROL

- A. All work, materials and equipment shall comply with the rules and regulations of applicable local, state, and federal codes and ordinances as identified in Part 1 of this Section.
- B. Contractor shall continually monitor the field installation for code compliance and quality of workmanship. All visible piping and or wiring runs shall be installed parallel to building lines and properly supported.
- C. Contractor shall arrange for field inspections by local and/or state authorities having jurisdiction over the work.

3.10 ACCEPTANCE

- A. The control systems will not be accepted as meeting the requirements of completion until all tests described in this Specification have been performed to the satisfaction of both the Engineer and Owner.
- B. The full range of operation for all Sequences of Operation shall be demonstrated. Where sequences are dependent on season or outside conditions these conditions may be simulated for the purpose of demonstration if approved by both the Architect/Engineer and the Owner. If simulations cannot be acceptably created the Contractor shall perform the demonstration during the proper period.
- C. Any tests that cannot be performed due to circumstances beyond the control of the Contractor may be exempt from the Completion requirements if stated as such in writing by the Owner's representative. Such tests shall then be performed as part of the warranty.

END OF SECTION 230991

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. The Work specified as part of this Section consists of the work required to achieve operational and coordinated Sequences of Operation as described. Work includes coordination of functions of controllers supplied as part of equipment packages, interconnection of systems, provision and installation of all accessory devices required for complete system operation including devices not provided as part of equipment, coordination of start up and testing and demonstration of the operation of Sequences of Operation to the Owner and the Owner's representatives.
- B. The control system operation of all equipment shall be subject to the operational modes, conditions and logic described in this Section and the controlled equipment manufacturer's recommendations.
- C. Training of the Owner's personnel in the operation, trouble shooting, adjustment and repair of all system controls.

1.02 RELATED SECTIONS AND WORK

- A. Section 230991 - Instrumentation and Control Integration
- B. Division 26
- C. Control diagrams on Drawing M500

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 SEQUENCE OF OPERATION - ELECTRIC UNIT HEATERS

- A. General:
 - 1. This Sequence of Operation shall separately apply to the following units:
 - a. EUH-1
 - b. EUH-2
 - c. EUH-3
 - d. EUH-4
 - 2. The unit heater shall be provided with a wired, wall mounted thermostat.
- B. Heating:
 - 1. The heating set point temperature shall be 55°F (adj.). When the space temperature falls below the set point temperature, the unit heater shall turn on in order to maintain the set point temperature.

3.02 SEQUENCE OF OPERATION - EXHAUST AND SUPPLY FANS

- A. General:
 - 1. This Sequence of Operation shall apply to the following interlocked system:
 - a. Supply fan - SF-1
 - b. Exhaust fan - EF-1
 - c. Fan control panel - FCP-1

- d. Gas monitors - GM-1 and GM-2
 - 2. The fans (SF-1 and EF-1) shall each be provided with an integral controller/transformer with the following features:
 - a. Digital display with buttons
 - b. Two (2) separate control inputs with separately programmable speeds
 - 3. The system shall be provided with the following devices, interlocked with the fan control panel (FCP-1) as shown on the control diagram:
 - a. Occupancy sensors (x2)
 - b. Outdoor air temperature sensor
- B. Low Speed Operation:
- 1. The fan control panel (FCP-1) shall send an enable signal to the fan controllers' low speed inputs to operate the fans (SF-1 and EF-1) in low speed upon the following conditions:
 - a. Outdoor air temperature is 50°F or less;
 - b. AND the occupancy sensors are not detecting space occupancy;
 - c. AND the gas monitors are not detecting gas.
- C. High Speed Operation:
- 1. The fan control panel (FCP-1) shall send an enable signal to the fan controllers' high speed inputs to operate the fans (SF-1 and EF-1) in high speed upon the following conditions:
 - a. Outdoor air temperature is greater than 50°F;
 - b. OR the occupancy sensors are detecting space occupancy;
 - c. OR the gas monitors are detecting gas.

3.03 SEQUENCE OF OPERATION - GAS DETECTION SYSTEM

- A. General:
- 1. This Sequence of Operation shall separately apply to the following units:
 - a. Gas monitor - GM-1
 - b. Gas monitor - GM-2
 - 2. The gas monitors (GM-1 and GM-2) shall include integral alarm LED's and audible horn alarms.
 - 3. Gas monitor (GM-1) shall be provided with a methane sensor.
 - 4. Gas monitor (GM-2) shall be provided with a methane sensor and a hydrogen sulfide sensor.
 - 5. Gas monitors (GM-1 and GM-2) shall include relays for interlock with external devices (fan control panel (FCP-1)).
 - a. Relays shall be configured such that the contacts open upon loss of power to the relay coil (fail open).
- B. Gas Detection:
- 1. Upon detection of 10% LEL (adj.) of methane or 9 ppm (adj.) of hydrogen sulfide, the gas monitor's integral low alarm LED shall illuminate, and the low alarm relay shall de-energize to force the fans (SF-1 and EF-1) into high speed as shown on the control diagram.
 - 2. Upon detection of 20% LEL (adj.) of methane or 12 ppm (adj.) of hydrogen sulfide, the gas monitor's integral high alarm LED shall illuminate, the gas monitor's integral alarm horn shall activate, and the low alarm relay shall remain de-energized so the fans (SF-1 and EF-1) remain in high speed.
 - 3. The system shall remain in the low or high alarm state until the gas levels drop below the alarm thresholds.

3.04 SEQUENCE OF OPERATION - VARIABLE REFRIGERANT FLOW (VRF) SYSTEM**A. General:**

1. This Sequence of Operation shall apply to the following interlocked system:
 - a. Indoor cassette unit - AC-1A
 - b. Indoor cassette unit - AC-1B
 - c. Outdoor heat pump unit - HP-1
2. The system shall be provided with a wired, wall mounted, digital programmable thermostat with both heating and cooling modes and auto-changeover between heating and cooling mode.

B. Heating:

1. The heating set point temperature shall be 55°F (adj.). When the space temperature falls below the set point temperature, the system shall turn on in order to maintain the set point temperature.

C. Cooling:

1. The cooling set point temperature shall be 85°F (adj.). When the space temperature rises above the set point temperature, the system shall turn on in order to maintain the set point temperature.

3.05 SEQUENCE OF OPERATION - AIRFLOW MONITORING PANEL

- A. The airflow monitoring panel (AMP-1) shall monitor the supply and exhaust airflow via the airflow switches (AFS-S-1 and AFS-E-1) and shall generate alarms as shown on the floor plans and control diagrams.

END OF SECTION 230993

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Condensate Drain Piping

1.02 RELATED SECTIONS

- A. Section 230555 - Mechanical System Identification
- B. Section 230700 - Piping Insulation

1.03 REFERENCES

- A. Section 014500 - Quality Control: Requirements for references and standards.
- B. ASTM D 1784 - Rigid Vinyl Compounds.
- C. ASTM D 1785 - PVC Plastic Pipe, Schedule 40
- D. ASTM D 2466 - PVC Plastic Fittings, Schedule 40
- E. ASTM D 2665 - PVC Drain, Waste, and Vent Pipe and Fittings
- F. ASTM D 2564 - Solvent Cements for PVC Pipe and Fittings
- G. ASTM D 2321 - Underground Installation of Thermoplastic Pipe (non-pressure applications)
- H. ASTM F 1668 - Procedures for Buried Plastic Pipe
- I. ASTM F 1866 - Fabricated PVC DWV Fittings
- J. NSF Standard 14 - Plastic Piping Components and Related Materials.
- K. NSF Standard 61 - Drinking Water System Components - Health Effects.

1.04 SUBMITTALS FOR REVIEW

- A. Section 013300 - Submittals: Procedures for submittals.
- B. Product Data: Provide data on pipe materials, pipe fittings, and accessories. Provide manufacturers catalog information.

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with State of New York and Town code.
- B. Identify pipe with marking including size, ASTM material classification and ASTM specification.

1.06 REGULATORY REQUIREMENTS

- A. Perform Work in accordance with the State of New York and the Town code.

1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Section 016500 – Product Delivery, Storage, and Handling: Transport, handle, store, and protect products.
- B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 - PRODUCTS

2.01 PVC SCHEDULE 40 SOLID WALL PIPE AND PVC DWV FITTING SYSTEM.

- A. Pipe and fittings shall be manufactured from virgin rigid PVC (polyvinyl chloride) vinyl compounds with a Cell Class of 12454 per ASTM D 1784.
- B. PVC Schedule 40 pipe shall be iron pipe size (IPS) conforming to ASTM D 1785 and ASTM D 2665.
- C. Injection molded PVC DWV fittings shall conform to ASTM D 2665. Fabricated PVC DWV fittings shall conform to ASTM F 1866.
- D. Pipe and fittings shall be manufactured as a system and be the product of one manufacturer.
- E. Pipe and fittings shall conform to National Sanitation Foundation (NSF) Standard 14.
- F. Testing with or transport/storage of compressed air or gas in PVC pipe or fittings shall not be permitted.
- G. Buried pipe shall be installed in accordance with ASTM D 2321 and ASTM F 1668.
- H. Solvent cement joints shall be made in a two step process with primer manufactured for thermoplastic piping systems and solvent cement conforming to ASTM D 2564.
- I. Primer shall conform to ASTM F 656.
- J. The system shall be protected from chemical agents, fire stopping materials, thread sealant, plasticized vinyl products, or other aggressive chemical agents not compatible with PVC compounds.
- K. The system is intended for non-pressure drainage applications where the temperature will not exceed 140°F.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Section 013100 - Project Management and Coordination: Verification of existing conditions before starting work.

3.02 PREPARATION

- A. Ream pipe and tube ends. Remove burrs.

- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions and the requirements of the Plumbing Code of New York State.
- B. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls. Effect changes in size with reducing fittings.
- C. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- D. Group piping whenever practical at common elevations.
- E. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to fittings.
- F. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- G. Sleeve pipes passing through partitions, walls and floors.
- H. Identify piping under provisions of Section 230555.

3.04 APPLICATION

- A. Install unions downstream at equipment or apparatus connections.

3.05 ERECTION TOLERANCES

- A. Section 014500 - Quality Control
- B. Establish invert elevations, slopes for drainage to ¼ inch per foot minimum. Maintain gradients.

3.06 FIELD QUALITY CONTROL

- A. Drainage System: Test plug all system openings with the exception of the system's highest point. Fill system with water to the point of overflow and subject the highest point to 10-foot head of water. The system shall be considered tight if the pressure is held for not less than 30 minutes without signs of leakage.

END OF SECTION 232001

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Requirements of the following Division 23 Sections apply to this section:
 - 1. Section 230010 - General Mechanical Requirements.
 - 2. Section 230555 - Mechanical System Identification
 - 3. Section 230700 - Pipe Insulation

1.02 SUMMARY

- A. This Section includes refrigerant piping used for air conditioning applications. This Section includes:
 - 1. Piping, tubing, fittings, and specialties.
 - 2. Special duty valves.
 - 3. Refrigerants.
- B. Products installed but not furnished under this Section include pre-charged tubing, refrigerant specialties, and refrigerant accessories furnished as an integral part of or separately with packaged air conditioning equipment.

1.03 SUBMITTALS

- A. Product data for the following products:
 - 1. Each type of valve specified.
 - 2. Each type of refrigerant piping specialty specified.
- B. Shop Drawings showing layout of refrigerant piping, specialties, and fittings including, but not necessarily limited to, pipe and tube sizes, valve arrangements and locations, slopes of horizontal runs, wall and floor penetrations, and equipment connection details. Show interface and spatial relationship between piping and proximity to equipment.
- C. Brazer's Certificates signed by Contractor certifying that brazers comply with requirements specified under "Quality Assurance" below.
- D. Maintenance data for refrigerant valves and piping specialties, for inclusion in Operating and Maintenance Manual specified in Division 01 and Division 23.

1.04 QUALITY ASSURANCE

- A. Qualify brazing processes and brazing operators in accordance with ASME "Boiler and Pressure Vessel Code," Section IX, "Welding and Brazing Qualifications".
- B. Regulatory Requirements: Comply with provisions of the following codes:
 - 1. ANSI B31.5: ASME Code for Pressure Piping - Refrigerant Piping.
 - 2. ANSI/ASHRAE Standard 15: Safety Code for Mechanical Refrigeration.
- C. Mechanical Code of New York State

1.05 SEQUENCING AND SCHEDULING

- A. Coordinate the installation of roof piping supports, and roof penetrations.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the Work include, but are not limited to, the following:
- B. Refrigerant Valves and Specialties:
 - 1. Alco Controls Div, Emerson Electric
 - 2. Danfoss Electronics, Inc
 - 3. EATON Corporation, Control Div
 - 4. Henry Valve Company
 - 5. Parker-Hannifin Corporation, Refrigeration and Air Conditioning Division
 - 6. Sporlan Valve Company

2.02 PIPE AND TUBING MATERIALS

- A. General: Refer to Part 3, Article "PIPE APPLICATIONS" for identification of systems where the below specified pipe and fitting materials are used.
- B. Copper Tubing: ASTM B 280, Type ACR, hard-drawn straight lengths, and soft-annealed coils, seamless copper tubing. Tubing shall be factory cleaned, ready for installation, and have ends capped to protect cleanliness of pipe interiors prior to shipping.
- C. Copper Tubing: ASTM B 88, Type L, hard-drawn straight lengths, and soft-annealed coils, seamless copper tubing.

2.03 FITTINGS

- A. Wrought-Copper Fittings: ANSI B16.22, streamlined pattern for hard drawn and soft copper.

2.04 JOINING MATERIALS

- A. Brazing Filler Metals: AWS A5.8, Classification BAg-1 (Silver)

2.05 VALVES

- A. General: Complete valve assembly shall be UL-listed and designed to conform to ARI 760.
- B. Globe: 450 psig maximum operating pressure, 275 deg. F maximum operating temperature; cast bronze body, with cast bronze or forged brass wing cap and bolted bonnet; replaceable resilient seat disc; plated steel stem. Valve shall be capable of being repacked under pressure. Valve shall be straight through or angle pattern, with solder-end connections.
- C. Check Valves - Smaller Than 7/8 inch: 500 psig maximum operating pressure, 300 deg. F maximum operating temperature; cast brass body, with removable piston, Teflon seat, and stainless steel spring; straight through globe design. Valve shall be straight through pattern, with solder-end connections.
- D. Check Valves - 7/8 inch and Larger: 450 psig maximum operating pressure, 300 deg. F maximum operating temperature; cast bronze body, with cast bronze or forged brass bolted bonnet; floating piston with mechanically retained Teflon seat disc. Valve shall be straight through or angle pattern, with solder-end connections.
- E. Solenoid Valves: 250 deg. F temperature rating, 400 psig working pressure; forged brass, with Teflon valve seat, two-way straight through pattern, and solder end connections. Provide

manual operator to open valve. Furnish complete with NEMA 1 solenoid enclosure with 1/2 inch conduit adapter, and 24 volt, 60 Hz. normally closed holding coil.

- F. Hot Gas Bypass Valve: adjustable type, sized to provide capacity reduction beyond the last step of compressor unloading; and wrought copper fittings for solder end connections.

2.06 REFRIGERANT PIPING SPECIALTIES

- A. General: Complete refrigerant piping specialty assembly shall be UL-listed and designed to conform to ARI 760.
- B. Strainers: 500 psig maximum working pressure; forged brass body with monel 80-mesh screen, and screwed cleanout plug; Y-pattern, with solder end connections.
- C. Moisture/liquid Indicators: 500 psig maximum operation pressure, 200 deg. F maximum operating temperature; forged brass body, with replaceable polished optical viewing window, and solder end connections.
- D. Filter-driers: 500 psig maximum operation pressure; steel shell, flange ring, and spring, ductile iron cover plate with steel capscrews, and wrought copper fittings for solder end connections. Furnish complete with replaceable filter-drier core kit, including gaskets. Standard capacity desiccant sieves to provide micron filtration.
- E. Flanged Unions: 400 psig maximum working pressure, 330 deg. F maximum operating temperature; two brass tailpiece adapters for solder end connections to copper tubing; flanges for 7/8 inch through 1-5/8 inch unions shall be forged steel, and for 2-1/8 inch through 3-1/8 inch shall be ductile iron; four plated steel bolts, with silicon bronze nuts and fiber gasket. Flanges and bolts shall have factory-applied rust-resistant coating.
- F. Flexible Connectors: 500 psig maximum operating pressure; seamless tin bronze or stainless steel core, high tensile bronze braid covering, solder connections, and synthetic covering; dehydrated, pressure tested, minimum 7 inch in length.

2.07 REFRIGERANT

- A. Refrigerant No. 410A, in accordance with ASHRAE Standard 34.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine rough-in for refrigerant piping systems to verify actual locations of piping connections prior to installation.

3.02 PIPE APPLICATIONS

- A. Use Type L, or Type ACR drawn copper tubing with wrought copper fittings and brazed joints above ground, within building. Use Type K, annealed temper copper tubing for 2 inch and smaller without joints, below ground and within slabs. Mechanical fittings (crimp or flair) are not permitted.
- B. Install annealed temper tubing in pipe duct. Vent pipe duct to the outside.
- C. If other than Type ACR tubing is used, clean and protect inside of tubing as specified in Article "CLEANING" below.

3.03 PIPING INSTALLATIONS

- A. General: Install refrigerant piping in accordance with ASHRAE Standard 15 - "The Safety Code for Mechanical Refrigeration."
- B. Install piping in as short and direct arrangement as possible to minimize pressure drop.
- C. Install piping for minimum number of joints using as few elbows and other fitting as possible.
- D. Arrange piping to allow normal inspection and servicing of compressor and other equipment. Install valves and specialties in accessible locations to allow for servicing and inspection.
- E. Provide adequate clearance between pipe and adjacent walls and hanger, or between pipes for insulation installation. Use sleeves through floors, walls, or ceilings, sized to permit installation of full thickness insulation.
- F. Insulate suction lines. Liquid line are not required to be insulated, except where they are installed adjacent and clamped to suction lines, where both liquid and suction lines shall be insulated as a unit.
- G. Do not install insulation until system testing has been completed and all leaks have been eliminated.
- H. Install branch tie-in lines to parallel compressors equal length, and pipe identically and symmetrically.
- I. Install copper tubing in rigid or flexible conduit in locations where copper tubing will be exposed to mechanical injury.
- J. Slope refrigerant piping as follows:
 - 1. Install horizontal hot gas discharge piping with 1/2" per 10 feet downward slope away from the compressor.
 - 2. Install horizontal suction lines with 1/2 inch per 10 feet downward slope to the compressor, with no long traps or dead ends which may cause oil to separate from the suction gas and return to the compressor in damaging slugs.
 - 3. Liquid lines may be installed level.
- K. Install traps and double risers where indicated, and where required to entrain oil in vertical runs.
- L. Use fittings for all changes in direction and all branch connections.
- M. Install exposed piping at right angles or parallel to building walls. Diagonal runs are not permitted, unless expressly indicated.
- N. Install piping free of sags or bends and with ample space between piping to permit proper insulation applications.
- O. Conceal all pipe installations in walls, pipe chases, utility spaces, above ceilings, below grade or floors, unless indicated to be exposed to view.
- P. Install piping tight to slabs, beams, joists, columns, walls, and other permanent elements of the building. Provide space to permit insulation applications, with 1 inch clearance outside the insulation. Allow sufficient space above removable ceiling panels to allow for panel removal.
- Q. Locate groups of pipe parallel to each other, spaced to permit applying insulation and servicing of valves.

- R. Exterior Wall Penetrations: Seal pipe penetrations through exterior walls using sleeves and mechanical sleeve seals. Pipe sleeves smaller than 6 inch shall be steel; pipe sleeves 6 inch and larger shall be sheet metal.
- S. Fire Barrier Penetrations: Where pipes pass through fire rated walls, partitions, ceilings, and floors, maintain the fire rated integrity. Refer to Division 7 for special sealers and materials.
- T. Make reductions in pipe sizes using eccentric reducer fittings installed with the level side down.
- U. Install strainers immediately ahead of each expansion valve, solenoid valve, hot gas bypass valve, compressor suction valve, and as required to protect refrigerant piping system components.
- V. Install moisture/liquid indicators in liquid lines between filter/driers and thermostatic expansion valves and in liquid line to receiver.
- W. Install moisture/liquid indicators in lines larger than 2-1/8 inch OD, using a bypass line.
- X. Install unions to allow removal of solenoid valves, pressure regulating valves, expansion valves, and at connections to compressors and evaporators.
- Y. Install flexible connectors at the inlet and discharge connection of compressors.

3.04 HANGERS AND SUPPORTS

- A. General: Hanger, supports, and anchors are specified in Division 23 Section "PIPE HANGERS AND SUPPORTS." Conform to the table below for maximum spacing of supports:
- B. Install the following pipe attachments:
 - 1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet in length.
- C. Support horizontal copper tubing in accordance with MSS SP-69 Tables 3 and 4, excerpts of which follow below:

NOMINAL PIPE SIZE (Inches)	ROD DIAMETER (Inches)	MAXIMUM SPACING (Feet)
1/2 to 3/4	3/8	5
1	3/8	6
1-1/4	3/8	6
1-1/2	3/8	8
2	3/8	8

- D. Support vertical runs at each floor.

3.05 PIPE JOINT CONSTRUCTION

- A. Brazed Joints: Comply with the procedures contained in the AWS "Brazing Manual."
- B. WARNING: Some filler metals contain compounds which produce highly toxic fumes when heated. Avoid breathing fumes. Provide adequate ventilation.
- C. CAUTION: When solenoid valves are being installed, remove the coil to prevent damage. When sight glasses are being installed, remove the glass. Remove stems, seats, and packing

of valves, and accessible internal parts of refrigerant specialties before brazing. Do not apply heat near the bulb of the expansion valve.

- D. Fill the pipe and fittings during brazing, with an inert gas (i.e., nitrogen or carbon dioxide) to prevent formation of scale.
- E. Heat joints using oxy-acetylene torch. Heat to proper and uniform brazing temperature.

3.06 VALVE INSTALLATIONS

- A. General: Install refrigerant valves where indicated, and in accordance with manufacturer's instructions.
- B. Install globe valves on each side of strainers and driers, in liquid and suction lines at evaporators, and elsewhere as indicated.
- C. Install a full sized, 3-valve bypass around each drier.
- D. Install solenoid valves ahead of each expansion valve and hot-gas bypass valve. Install solenoid valves in horizontal lines with coil at the top.
- E. Electrical wiring for solenoid valves is specified in Division 26. Coordinate electrical requirements and connections.
- F. Thermostatic expansion valves may be mounted in any position, as close as possible to the evaporator.
- G. Where refrigerant distributors are used, mount the distributor directly on the expansion valve outlet.
- H. Install the valve in such a location so that the diaphragm case is warmer than the bulb.
- I. Secure the bulb to a clean, straight, horizontal section of the suction line using two bulb straps. Do not mount bulb in a trap or at the bottom of the line.
- J. Where external equalizer lines are required make the connection where it will clearly reflect the pressure existing in the suction line at the bulb location.
- K. Install pressure regulating and relieving valves as required by ASHRAE Standard 15.

3.07 EQUIPMENT CONNECTIONS

- A. The Drawings indicate the general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow servicing and maintenance.

3.08 FIELD QUALITY CONTROL

- A. Inspect, test, and perform corrective action of refrigerant piping in accordance with ASME Code B31.5, Chapter VI.
- B. Repair leaking joints using new materials, and retest for leaks.

3.09 CLEANING

- A. Before installation of copper tubing other than Type ACR tubing, clean the tubing and fitting using following cleaning procedure:
 - 1. Remove coarse particles of dirt and dust by drawing a clean, lintless cloth through the tubing by means of a wire or an electrician's tape.
 - 2. Draw a clean, lintless cloth saturated with trichloroethylene through the tube or pipe. Continue this procedure until cloth is not discolored by dirt.
 - 3. Draw a clean, lintless cloth, saturated with compressor oil, squeezed dry, through the tube or pipe to remove remaining lint. Inspect tube or pipe visually for remaining dirt and lint.
 - 4. Finally, draw a clean, dry, lintless cloth through the tube or pipe.

3.10 ADJUSTING AND CLEANING

- A. Verify actual evaporator applications and operating conditions, and adjust thermostatic expansion valve to obtain proper evaporator superheat requirements.
- B. Clean and inspect refrigerant piping systems in accordance with requirements of Division-23 General Mechanical Requirements
- C. Adjust controls and safeties. Replace damaged or malfunctioning controls and equipment with new materials and products.

3.11 COMMISSIONING

- A. Charge system using the following procedure:
 - 1. Install core in filter dryer after leak test but before evacuation.
 - 2. Evacuate refrigerant system with vacuum pump; until temperature of 35 deg F is indicated on vacuum dehydration indicator.
 - 3. During evacuation, apply heat to pockets, elbows, and low spots in piping.
 - 4. Maintain vacuum on system for minimum of 5 hours after closing valve between vacuum pump and system.
 - 5. Break vacuum with refrigerant gas, allow pressure to build up to 2 psi.
 - 6. Complete charging of system, using new filter dryer core in charging line. Provide full operating charge.
 - 7. Train Owner's maintenance personnel on procedures and schedules related to start-up and shut-down, troubleshooting, servicing, and preventative maintenance of refrigerant piping valves and refrigerant piping specialties.
- B. Review data in Operating and Maintenance Manuals. Refer to Division 01 section "Project Closeout."
- C. Schedule training with Owner with at least 7 days advance notice.

END OF SECTION 232300

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. This Section describes the metal ductwork for HVAC duct systems in accordance with SMACNA Duct Construction Standards, except as otherwise specified.
- B. The construction material for each ductwork system shall be as listed in the "Ductwork Material Schedule" at the end of this Section.
- C. This Section also describes the fittings, hangers and supports, manual volume dampers and sealants for each ductwork system as required.

1.02 RELATED WORK

- A. Section 230594 - Balancing of Air Systems

1.03 REFERENCES

- A. ASHRAE - Handbook Fundamentals; Latest Edition.
- B. SMACNA - HVAC Duct Construction Standards Metal And Flexible (latest issue)
- C. ASTM B 209 - Specifications for Aluminum and Aluminum-Alloy Sheet and Plate.
- D. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.
- E. New York State Mechanical Code.

1.04 REGULATORY REQUIREMENTS

- A. Construct ductwork to NFPA 90A and New York State Mechanical Code standards.

1.05 SUBMITTALS

- A. Ductwork shop drawings for approval:
 - 1. Coordinate layout duct drawings that differ from ductwork shown on the Drawings.
 - 2. The review of deviations will be for pressure drop only. The review will not address clearances or accessibility to maintain or balance the air systems. No dimensional or coordination check of the shop drawings will be made. The Contractor has the sole responsibility to review the Drawings, coordinate ductwork fabrication, and provide clearances and access for installation, maintenance and balancing of this work, and work of other trades. Unless specifically dimensioned, Drawings indicate approximate locations only. The Contractor has the sole responsibility to locate and route the ductwork.
 - 3. Deviations such as changing direction or transforming or dividing ductwork must maintain ductwork cross-sectional area and not exceed transformation taper of 15 degrees.
 - 4. Plans and section showing all equipment and accessories.
 - 5. Minimum 3/8 in. scale, double line, showing sizes, transverse joints, transitions, elevations, clearances and accessories; sections where required.
- B. Shop details and catalog cuts of:
 - 1. Ductwork construction, including gauge and bracing schedule
 - 2. Supports
 - 3. Dampers
 - 4. Turning vanes

- 5. Flexible connections
- 6. Other accessories

1.06 QUALITY ASSURANCE

- A. Construct all ductwork in accordance with referenced SMACNA Standards, except as otherwise stated. Ductwork pressure classifications shall be in accordance with referenced SMACNA Standards, except as otherwise specified.
- B. Construction pressure classification of ductwork are shown on the Drawings. If not shown, the pressure classification shall be greater than or equal to the maximum operating static pressure (minimum 2" w.c. pressure classification).
- C. All ductwork shall be free from pulsation, chatter, vibration and objectionable noise. If any of these defects appear after a system is in operation, correct by removing and replacing, or reinforcing the ductwork, at no additional cost to the Owner.

PART 2 - PRODUCTS

2.01 STAINLESS STEEL RECTANGULAR DUCTS AND FITTINGS

- A. Construct ducts of stainless sheet steel, AISI Type 304, and in accordance with the latest SMACNA HVAC Duct Construction Standards Metal And Flexible and pressure classifications as stated on the Drawings (minimum 2" w.c. pressure classification).
- B. No ducts shall be less than No. 20 U.S. Gauge.
- C. Use stainless steel fasteners and reinforcing members.
- D. Piping, conduit and structure shall not penetrate ductwork. Where this condition cannot be avoided and with the written permission of the Architect/Engineer, follow SMACNA HVAC Duct Construction Standards Metal and Flexible, except that sides of transition sections shall slope a maximum of 15 degrees.
- E. Provide 90-degree full-radius elbows with a centerline radius 1.5 times the duct width in the plane of the bend.
- F. For elbows with centerline radius less than 1.5 times the width of the duct in the plane of the bend, provide turning vanes.
- G. Provide square throat elbows with manufactured turning vanes.
- H. All dissimilar metals shall be connected with flanged joints made up with fiber or neoprene gaskets to prevent contact between dissimilar metals. Flanges shall be fastened with bolts protected by ferrules and washers made of the same materials as the gaskets.
- I. For split fittings, the split shall be proportional to the air flow. Construct per SMACNA HVAC Duct Construction Standards- Metal and Flexible.
- J. Transitions and Offsets shall follow SMACNA HVAC Duct Construction Standards Metal and Flexible, except that sides of transitions shall slope a maximum of 15 degrees.
- K. All branch take-offs perpendicular to the main shall be a 45 degree entry.
- L. Longitudinal seams shall be of the Pittsburgh Lock type outlined in the SMACNA HVAC Duct Construction Standards Metal and Flexible.

- M. Duct transverse joints shall be selected and used consistent with the static pressure class, applicable sealing requirements, materials involved, duct support intervals and other provisions for proper assembly of ductwork outlined in the SMACNA HVAC Duct Construction Standards - Metal and Flexible. Transverse joints T-25a, T-25b (Ductmate) shall only be used. Metal clips will only be allowed (NO PVC). Ductmate shall not be used for the following (use transverse joints T-15 through T-24 in these cases):
1. The Ductmate '45' system shall not be used for applications with duct gauges heavier than 10 or lighter than 22.
 2. The Ductmate '35' system shall not be used for applications with duct gauges heavier than 16 GA. or lighter than 26 GA.
 3. The Ductmate '25' system shall not be used for application with duct gauges heavier than 20 GA. or lighter than 26 GA.

2.02 TURNING VANES

- A. Manufactured with same material as ductwork that it is installed in and to the same pressure classification as ductwork that they are installed in.
- B. Provide turning vanes in all square duct elbows and as noted on the Drawings.
- C. Vanes shall be single thickness Small Vane as detailed in SMACNA HVAC Duct Construction Standards Metal and Flexible.
- D. Where a rectangular duct changes in size at a square-throat elbow fitting, use single thickness turning vanes with trailing edge extensions aligned with the sides of the duct.

2.03 MANUAL VOLUME DAMPER

- A. Fabricate in accordance with SMACNA Duct Construction Standards Metal And Flexible, and as indicated.
- B. Fabricate single blade dampers for duct sizes up to 6 inches in height.
- C. Fabricate multi-blade damper of opposed blade pattern with maximum blade sizes of 4 inches for ducts above 6 inches in height. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
- D. Except in round ductwork 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.
- E. Provide locking, indicating quadrant regulators on single and multi-blade dampers. Where rod lengths exceed 30 inches, provide regulator at both ends.
- F. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.
- G. Volume damper shall be provided at each duct branch and also where shown on the Drawings. Volume dampers must be installed at each branch even if they are not shown on the Drawing.
- H. Approved Manufacturers:
1. Ruskin Mfr. Co.
 2. Arrow Damper & Louver.
 3. Imperial Damper Co.

2.04 DUCT TEST HOLES

- A. Cut or drill temporary test holes in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.
- B. Permanent test holes shall be factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.05 DUCT HANGERS AND SUPPORTS

- A. Provide trapeze, strap or angle iron hangers meeting SMACNA HVAC Duct Construction Standards Metal and Flexible.
- B. Materials of hangers, supports and fasteners shall conform to the manufacturer's load ratings.
- C. Hangers, supports, upper attachments and inserts shall be stainless steel.
- D. Fasteners for HVAC duct systems shall be stainless steel.
- E. Secure ductwork hangers attached to concrete structures and slabs with embedded inserts, anchor bolts or concrete fasteners. A safety factor of 5 should be used in selection of all inserts and expansion bolts (if applicable safety factor shall be determined by analysis of seismic loads and the greater safety factor shall be used).
- F. Provide hangers and supports not more than 12 inches from each face of a horizontal elbow.

2.06 SEALANTS

- A. Where ducts are not continuously welded or soldered, provide sealants and gaskets as required to meet the specified duct leakage allowance.
- B. Provide Gaskets, Sealers, Mastics and Tapes as manufactured by Ductmate.

2.07 STANDARD FLEXIBLE CONNECTIONS

- A. Provide fabric flexible duct connections.
- B. Fabric shall be UL approved, fire-retardant, closely-woven glass, double coated with neoprene, and a minimum of 4 inches wide.
- C. Shall be installed at duct connections to all ceiling hung fans and where vibration will be transmitted through ductwork.
- D. Approved Manufacturers:
 - 1. "Ventglas" by Vent Fabrics, Inc.

PART 3 - EXECUTION

3.01 INSTALLATION - GENERAL

- A. Install ductwork in accordance with applicable SMACNA Duct Construction Standards Metal And Flexible and approved submittals, and as shown on the Drawings. Duct sizes shown are inside clear dimensions. Where internal duct liners are used, duct sizes shown are inside clear of liner. For ductwork located outside, provide reinforcing sufficient to support wind and snow loads.

- B. The Drawings indicate general locations of ducts. Make additional offsets or changes in direction as required at no additional cost to the Owner.
- C. Wherever ductwork is divided, maintain the cross-sectional area.
- D. Do not exceed 15-degree taper when constructing duct transitions.
- E. Close the open ends of ducts during construction to prevent debris and dirt from entering.
- F. Secure casings and plenums to curbs according to the requirements of the SMACNA HVAC Duct Construction Standards Metal and Flexible.
- G. Make changes in direction with long radius bends.
- H. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- I. Patch and repair all wall penetrations.

3.02 FITTING INSTALLATION

- A. Use minimum of four sheet metal screws per joint.
- B. Apply approved sealant on duct-to-duct joint before assembly. Apply additional sealant after assembly to make joint airtight.

3.03 HANGER AND SUPPORT INSTALLATION

- A. Support ductwork hung from building structure using trapeze, strap or angle iron hangers conforming to SMACNA HVAC Duct Construction Standards Metal and Flexible. Provide supplemental structural steel to span joists where required.
- B. Do not support ductwork from furring, hung ceilings, metal floor deck, metal roof deck or from another duct or pipe.
- C. Do not hang lighting fixtures or piping from ductwork.
- D. Do not use perforated band iron.
- E. Support ductwork at each change in direction.
- F. Where duct connects to or terminates at masonry openings or at floors where concrete curbs are not used, provide a continuous 1 ½ inch by 1 ½ inch by 3/16 inch galvanized steel angle support around the ductwork. Bolt and seal the supports to the building construction using expansion bolts and caulking compound. Seal shall be watertight at floor or wall and duct such that a spill will not pass down through the opening.
- G. Fasten plenums and casings connected to concrete curbs using continuous 1 ½ inch by 1 ½ inch by ¼ inch galvanized steel angle support. Set the angle support in a continuous bead of caulking compound and anchor it to the curb with 3/8 inch diameter anchors on 16 inch centers. Terminate sheet metal at curb and bolt to angle support. Seal sheet metal to curb with a continuous bead of caulking.

3.04 SEALING

- A. Where ductwork is not continuously welded, soldered or gasketed, make seams and joints airtight with sealants.
- B. Install the sealants in accordance with the sealant manufacturer's instructions and recommendations.
- C. Seal all ductwork seams, joints, fastener penetrations and fittings connections with sealants in accordance with SMACNA Seal Classifications as required by SMACNA Duct Pressure Classification. All ductwork, regardless of pressure classification, shall have a minimum Seal Class B.
- D. Completely fill all voids when liquid sealing ductwork. Several applications may be necessary to fill voids caused by shrinkage or runout of sealant.

3.05 DUCTWORK AND EQUIPMENT LEAK TESTING

- A. Leak test each ductwork system within ten working days of ductwork installation and before ductwork is insulated and concealed.
- B. All HVAC ductwork shall be tested. Follow general procedures and use apparatus as outlined in the SMACNA HVAC Air Duct Leakage Test Manual.
- C. Test all ductwork at 100 percent of the pressure classifications indicated.
- D. Air testing during erection shall include separate leakage air tests of air riser, horizontal distribution system, and, after all ductwork is installed and the central stations apparatus is erected, leakage testing of the whole system.
- E. Use Appendix C in the SMACNA HVAC Air Duct Leakage Test Manual to determine allowable leakage rates for each duct section tested.
- F. All devices, including access doors, airflow measuring devices, sound attenuators, damper casings, sensors, test ports, etc. that are furnished and/or installed in duct systems shall be included as part of the duct system leakage allowance. All joints shall be inspected and checked for audible leakage, repaired, if necessary, and retested. Duct leakage shall be limited to the following:

Average Size of Run Diameter or Equivalent	*A/100 ft. Run
12 inches or less	10
20 inches or less	15
30 inches or less	25
40 inches or less	30
50 inches or less	30
* (A) = Permissible loss in cfm	

- G. Total system leakage shall not exceed 10 percent of the scheduled design capacity of the system when tested as per SMACNA testing methods.

3.06 DUCTWORK MATERIAL SCHEDULE

AIR SYSTEM	DUCTWORK MATERIAL

AIR SYSTEM	DUCTWORK MATERIAL
Supply & Exhaust Ductwork	Type 304 Stainless Steel

END OF SECTION 233113

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Provide supply and exhaust fans, as specified herein, with accessories and of sizes and capacities as noted here-in, and as scheduled and in locations shown on drawings.
- B. Products listed in Part 2 of this Section include:
 - 1. Utility Set Fans

1.02 REFERENCE CODES AND STANDARDS

- A. AMCA 99 - Standards Handbook
- B. AMCA 210 - Laboratory Methods of Testing Fans for Rating
- C. AMCA 300 - Reverberant Room Method for Sound Testing of Fans
- D. ASHRAE Handbook, HVAC Applications Volume "Sound and Vibration Control"
- E. UL listed and labeled.

1.03 SUBMITTALS

- A. Shop Drawings - Show fan layout, housing, materials, gauges, dimensions, weights and installation details
- B. Product data - Manufacturer's fan performance (data includes cfm, rpm, bhp, motor nameplate data, tip speed, outlet velocity and static pressure) and sound performance (data includes sound power level ratings by octave bands) as tested in accordance with AMCA Standards 210 and 300.
- C. Fan performance curves - Submit curves for all fans with system performance shown, and for plus or minus 10 percent and plus or minus 20 percent change in fan rpm. Curves shall include plotted rpm, horsepower, cfm, static pressure, and fan surge line and operating point.
- D. Certified AMCA Ratings - Submit ratings for air and sound performance.
- E. UL Listing - Submit listing if specified.

1.04 QUALITY ASSURANCE

- A. Factory balance each fan statically and dynamically, test run before shipment, and key fan wheel to fan shaft. Fans shall operate quietly and without pulsation or vibration. Conduct sound power level tests for each type fan at the factory in accordance with AMCA 300.
- B. Fans shall operate in the stable range of their performance curves.
- C. The fan external static pressures shown in the schedules are those required by the ductwork and apparatus, and do not include the internal and intake fan losses, inlet vanes, outlet velocity heads, or drive losses. Additional pressures should be added/accounted for by fan vendor.
- D. Factory performance test each fan assembled in or as part of apparatus specified to be performance tested. Test shall display scheduled performance characteristics, using certified, calibrated testing instruments provided by the manufacturer of the apparatus.

- E. All fan performance ratings shall be based up on factory tests performed in accordance with AMCA 210 and 300. One fan of each type specified shall have actual factory performance tests performed prior to shipment. All fans shall be certified by AMCA and carry its seal.

1.05 WARRANTY

- A. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under Contract Documents.
 - 1. Equipment shall be warranted to be free from defects in material and workmanship for a period of one (1) year from the date of shipment.
 - 2. Motors shall be warranted by the motor manufacturer for a period of one (1) year after shipment from the fan manufacturer.

PART 2 - PRODUCTS

2.01 DIRECT DRIVE CENTRIFUGAL UTILITY SET FANS

- A. General Description
 - 1. Fans shall be model USF single width fans as manufactured by Greenheck or approved equal.
 - a. Equivalents include:
 - 1) Hartzell
 - 2) New York Blower Co.
 - 2. Fan arrangement shall be as shown on Drawings.
 - 3. Each fan shall bear a permanently affixed manufacturer's engraved metal nameplate containing the model number and individual serial number.
- B. Housing
 - 1. Fan housing shall be aerodynamically designed with high-efficiency inlet, engineered to reduce incoming air turbulence.
 - 2. Fan shall be of airtight construction with the scroll panel material formed and embedded into the side panels. All interior and exterior surface untreated steel shall be coated with a high-performance powder coating.
 - 3. Housing and bearing support shall be constructed of bolted framework.
- C. Wheel
 - 1. The fan wheel shall be of the single width backward inclined centrifugal type.
 - 2. Fan Wheel shall be statically and dynamically balanced to balance grade G6.3 per ANSI S2.19.
 - 3. The wheel and fan inlet shall be carefully matched and shall have precise running tolerances for maximum performance and operating efficiency.
- D. Motors and Drive
 - 1. Motors shall be open type enclosure and electronic commutation type motor (ECM) specifically designed for fan applications.
 - 2. Motors shall be permanently lubricated, heavy duty ball bearing type to match with the fan load and pre-wired to the specific voltage and phase.
 - 3. Internal motor circuitry shall convert AC power supplied to the fan to DC power to operate the motor.
 - 4. Motor shall be speed controllable down to 20% of full speed (80% turndown). Speed control type shall be as called for on the Schedules. Motor shall be a minimum of 85% efficient at all speeds.
- E. Options/Accessories

1. All options and accessories shall be as called for on the equipment schedules.

PART 3 - EXECUTION

3.01 GENERAL

- A. Install fans, including all necessary structural supports and bracing as scheduled and located on the contract drawings, and in accordance with manufacturer's instructions and approved submittals.
- B. Connect duct to fans to allow for straight and smooth air flow.
- C. Provide flexible connections (minimum of 4") between fan and duct.
- D. Install fan level: +/- 5 degrees vertical. Final installation shall be free of all leaks from both fan and associated ductwork.

3.02 START-UP, TESTING, DEMONSTRATION

- A. Start-up fans after checkout to ensure proper alignment and phased electrical connections.
- B. Test fans individually and as part of system. Ensure proper interlock with control system.
- C. Provide all associated start-up and testing reports.
- D. Demonstrate operation to Owner and instruct maintenance personnel in operation of equipment.

END OF SECTION 233416

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. This Section describes the air terminals as specified herein, with capacities, distribution patterns and connection sizes as scheduled on the Drawings.
- B. Products listed in Part 2 of this Section include:
 - 1. Grilles and Registers.

1.02 RELATED WORK

- A. Section 233113: Sheet Metal Work

1.03 REFERENCES

- A. ADC 1062 GRD - Test Code for Grilles, Registers and Diffusers
- B. ASHRAE 70 - Method of Testing for Rating the Airflow Performance of Outlets and Inlets.
- C. ASHRAE 113 - Method of Testing Room Air Diffusion
- D. ASTM C423 - Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
- E. ARI 880 - Air Terminals
- F. ARI 885 - Procedure for Estimating Occupied Space Sound Levels in the Application of Air Terminals and Air Outlets.
- G. NFPA 90A - Installation of Air Conditioning and Ventilation Systems
- H. SMACNA - HVAC Duct Construction Standards - Metal and Flexible.
- I. Mechanical Code of New York State

1.04 QUALITY ASSURANCE

- A. Air Terminals will not be accepted until acoustical test results have been submitted and approved.

1.05 SUBMITTALS

- A. Product data - Submit catalog cuts and installation instructions for all products specified, including standard color samples.
- B. Submit published manufacturer's performance data for all of the different types of diffusers, registers and grilles, based on testing in accordance with ASHRAE Standard 70, latest edition.
- C. Performance data - For each size and type of air terminal , submit the following:
 - 1. Inlet static pressure in inches w.g.
 - 2. Maximum and minimum airflow in cfm.
 - 3. Throw in feet at maximum cfm (and 25 percent of cfm) for terminal velocities of 50 and 100 fpm.

4. Noise Criteria (NC) curve at maximum air terminal cfm rating with blades in full-open and closed positions.

PART 2 - PRODUCTS

2.01 EXHAUST GRILLES

- A. Furnish and install exhaust grilles of the type and size as shown on the Drawings. Grilles shall have 45 degree deflection fixed blades and frames that have reinforced mitered corners.
- B. Provide an opposed blade damper operable from the face of the grille.
- C. Manufacture grilles with trim to allow for mounting directly on ductwork.
- D. Units shall be constructed of stainless steel.
- E. Manufacturer: Nailor Industries Inc, Model Series 6745H-O or approved equal.
 1. Equivalents include:
 - a. Titus
 - b. Price
- F. Coordinate color with Owner.

2.02 SUPPLY GRILLES

- A. Furnish and install double deflection supply grilles of the type and size as shown on the Drawings. Grilles shall have a dual set of streamlined shaped, roll-formed blades that are adjustable and spaced on $\frac{3}{4}$ " centers, and frame with reinforced mitered corners.
- B. Provide an opposed blade damper operable from the face of the grille
- C. Manufacture grilles with trim to allow for mounting directly on ductwork.
- D. Units shall be constructed of stainless steel.
- E. Manufacturer: Nailor Industries Inc., Model Series 67DH-O or approved equal.
 1. Equivalents include:
 - a. Titus
 - b. Price
- F. Coordinate color with Owner.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install grilles and registers in locations shown on the Drawings.
- B. Install in accordance with manufacturer's published recommendations as well as applicable sections of SMACNA manual and as specified in this Section.

END OF SECTION 233713

PART 1 - GENERAL

1.01 SYSTEM DESCRIPTION

- A. The Heat pump system shall be an electronic split system with variable speed compressor technology. The system shall consist of an outdoor heat pump, one or more indoor units, and one or more wired wall mounted controllers, as called for on the Drawings.

1.02 QUALITY ASSURANCE

- A. The units shall be tested by a Nationally Recognized Testing Laboratory (NRTL) and shall bear the ETL label.
- B. All wiring shall be in accordance with the National Electrical Code (N.E.C.).
- C. The units shall be rated in accordance with Air-conditioning Refrigeration Institute's (ARI) Standard 210 and bear the ARI Certification label.
- D. The units shall be manufactured in a facility registered to ISO 9001 and ISO 14001.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Unit shall be stored and handled according to the manufacturer's recommendations.

1.04 WARRANTY

- A. Limited Warranty Period
 - 1. The Part(s) of a qualified System, including the compressor, shall be warranted for a period (the "Standard Parts Warranty Period") ending on the earlier to occur of one (1) year after the date of original installation, or eighteen (18) months from the date of manufacture.
 - 2. The Compressor shall be warranted for an additional six (6) year period after the end of the applicable Standard Part Warranty Period (the "Compressor Warranty Period").

1.05 SUBMITTALS

- A. Submit manufacturer's product data including capacity of unit, electrical requirements, airflow, sound pressure data, indoor and outdoor unit measurements, weight, control schematics, and wiring diagrams.

PART 2 - PRODUCTS

2.01 CEILING CASSETTE - 4 WAY

- A. General
 - 1. Unit shall be Multi V series by LG or approved equal.
 - a. Equivalents include:
 - 1) Mitsubishi
 - 2) Daikan
 - 2. Unit shall be factory assembled, wired, piped and run tested.
 - 3. Unit shall be designed to be installed for indoor application.
 - 4. Unit shall be designed to mount recessed in the ceiling and shall have a surface mounted concentric grille on the bottom of the unit.
- B. Casing/Panel

1. Unit case shall be manufactured using galvanized steel plate.
 2. The unit shall be provided with an off-white Acrylonitrile Butadiene Styrene (ABS) polymeric resin architectural grille.
 3. The grille shall have a tapered trim edge, and a hinged, spring clip (screw-less) return air filter-grille door.
 4. Unit shall be provided with metal ears designed to support the unit weight on four corners.
 5. Ears shall have pre-punched holes designed to accept field supplied all thread rod hangers.
- C. Cabinet Assembly
1. Unit shall have four supply air outlets and one return air inlet.
 2. The supply air outlet shall be through four-directional slot diffusers each equipped with independent oscillating motorized guide vane designed to change the airflow direction.
 3. The grille shall have a discharge range of motion of 40° in an up/down direction with capabilities of locking the vanes.
 4. The unit shall have a guide vane algorithm designed to sequentially change the predominant discharge airflow direction in counterclockwise pattern.
 5. Guide vanes shall provide airflow in all directions.
 6. Unit shall be equipped with factory installed temperature thermistors for
 - a. Return air
 - b. Refrigerant entering coil
 - c. Refrigerant leaving coil
 7. Unit shall have a factory assembled, piped, and wired electronic expansion valve (EEV) for refrigerant control.
 8. Unit shall have a built-in control panel to communicate with the outdoor unit.
 9. The unit shall have provision for fresh air ventilation through a knock-out on the cabinet.
 10. Unit shall have the following functions as standard
 - a. Self-diagnostic function
 - b. Auto restart function
 - c. Auto changeover function
 - d. Fan speed control
 - e. Leak detection
 - f. Hot Start
- D. Fan Assembly
1. The unit shall have a single direct driven turbo fan.
 2. The fan shall be made of high strength ABS HT-700 polymeric resin.
 3. The fan impeller shall be statically and dynamically balanced.
 4. The fan motor shall be Brushless Digitally controlled (BLDC) with permanently lubricated and sealed ball bearings.
 5. The fan motor shall include thermal, overcurrent, and low RPM protection.
 6. The fan/motor assembly shall be mounted on vibration attenuating rubber grommets.
 7. The fan speed shall be controlled using microprocessor based direct digitally controlled algorithm.
 8. In cooling mode, the indoor fan shall have the following settings: Low, Med, High, Power Cool, and Auto.
 9. In heating mode, the indoor fan shall have the following settings: Low, Med, High, and Auto.
 10. The Auto fan setting shall adjust the fan speed to most effectively achieve the set-point.
 11. Unit shall have factory installed motorized louvers to provide flow of air in up and down direction for uniform airflow.
- E. Filter Assembly
1. The return air inlet shall have a factory supplied removable, washable filter.

2. The filter access shall be from the bottom of the unit.

F. Coil Assembly

1. Unit shall have a factory built coil comprised of aluminum fins mechanically bonded on copper tubing.
2. Unit shall have a factory supplied condensate drain pan below the coil.
3. Unit shall have an installed and wired condensate drain pump capable of providing minimum 27 inch lift from bottom surface of the unit.
4. The drain pump shall have a safety switch to shut off the unit if condensate rises too high in the drain pan.
5. Unit shall have provision of 45° flare refrigerant pipe connections.
6. The coil shall be factory pressure tested at a minimum of 551 psig.
7. All refrigerant piping from outdoor unit to indoor unit shall be field insulated.

G. Microprocessor Control

1. The unit shall have a factory installed microprocessor controller capable of performing functions necessary to operate the system.
2. The unit shall be able to communicate with the outdoor unit using a field supplied minimum of 14 AWG, 4 conductor, stranded, shielded or unshielded power/communication cable. If shielded, it must be grounded to chassis at ODU only.
3. Group control shall be available to allow multiple indoor units to operate from a single controller, or allow connection of more than one controller to an indoor unit.
4. The unit controls shall operate the indoor unit using one of the five operating modes:
 - a. Auto changeover
 - b. Heating
 - c. Cooling
 - d. Dry
 - e. Fan only

H. Electrical

1. The unit electrical power shall be 208-230/1/60 (V/Ph/Hz), Amps as noted on the equipment schedules.
2. The unit shall be capable of operating within voltage limits of +/- 10% of the rated voltage.

I. Controls

1. The indoor unit shall be supplied with a programmable, wired controller.

2.02 OUTDOOR UNIT

A. General

1. Unit shall be Multi V Heat Pump by LG or approved equal.
 - a. Equivalents include:
 - 1) Mitsubishi
 - 2) Daikan
2. The air-conditioning system shall use R410A refrigerant.
3. All refrigerant piping from outdoor unit to indoor unit shall be field insulated.
4. Factory installed microprocessor controls in the outdoor unit and indoor unit shall perform functions to efficiently operate the single zone system and communicate via minimum 14 AWG, 4 conductor, stranded, shielded or unshielded power/communication cable. If shielded, it must be grounded to chassis at ODU only.
5. The outdoor unit shall be internally assembled, wired and piped from the factory.
6. The factory assembled system shall have the outdoor unit fitted with refrigerant strainer, check valves, oil separator, accumulator, 4-way reversing valve, electronic expansion valve, high side and low side refrigerant charging ports, and a service port.

- B. Piping capabilities
 - 1. The outdoor unit shall be capable of operating at an elevation of 98.4 feet above or below the indoor unit.
 - 2. The outdoor unit shall be capable of operating with up to 246 feet of total equivalent refrigerant piping length.
- C. Defrost Operations
 - 1. The outdoor unit shall be capable of auto defrost operation to melt accumulated ice off the outdoor unit heat exchanger. The defrost cycle control shall be based on outdoor ambient temperatures and outdoor unit heat exchanger temperatures.
 - 2. Unit shall include base pan heater.
- D. Oil Management
 - 1. The outdoor unit shall have an oil injection mechanism to ensure a consistent film of oil on all moving compressor parts at low speed.
 - 2. The outdoor unit shall have an oil separator to separate oil mixed with the refrigerant gas during compression and return oil to the compressor.
- E. Cabinet
 - 1. The outdoor unit cabinet shall be made of pre-coated metal (PCM).
 - 2. The front/side panels of the outdoor unit shall be removable type for access to internal components.
 - 3. Outdoor unit cabinet shall be tested in accordance with ASTM B-117 salt spray test procedure for a minimum of 1000 hours.
- F. Fan Assembly
 - 1. Outdoor unit shall be equipped with direct drive variable speed propeller fan(s) with BLDC motors with a horizontal air discharge.
 - 2. The fan blades shall be made of Acrylonitrile Butadiene Styrene (ABS) material.
 - 3. The fan(s) shall be equipped with permanently lubricated bearings.
 - 4. The fan motor(s) shall have variable speed to a maximum of 950 RPM.
 - 5. The fan(s) shall have a raised guard to help prevent contact with moving parts.
- G. Outdoor Coil
 - 1. The outdoor unit shall have a factory built coil comprised of aluminum fins mechanically bonded on copper tubing.
 - 2. The aluminum fins shall have factory applied corrosion resistant GoldFin™ material.
 - 3. Coil coating shall be tested in accordance with ASTM B-117 salt spray test procedure for a minimum of 1000 hours.
 - 4. The outdoor unit coil shall be factory tested to a pressure of 600 psig.
 - 5. The coil for each outdoor unit shall have a minimum of 14 Fins per Inch (FPI).
 - 6. The coil for each outdoor unit shall have a 2 row heat exchanger.
 - 7. The outdoor unit cabinet shall have a coil guard.
- H. Compressor
 - 1. The outdoor unit shall be equipped with one hermetically sealed, digitally controlled, inverter driven scroll compressor.
 - 2. The inverter driven, digitally controlled compressor shall be capable of operating in a frequency range from 20 Hz to 100 Hz with control in 1 Hz increments.
 - 3. The compressor shall be mounted on vibration attenuating rubber grommets.
 - 4. The compressor shall use a factory charge of Polyvinyl Ether (PVE) oil.
 - 5. The compressor bearing(s) shall have Teflon™ coating.
 - 6. The compressor shall be equipped with over-current protection.
- I. Sound Levels

1. The outdoor unit shall have sound levels not exceeding 54 dB(A) tested in an anechoic chamber under ISO 3745 standard.
- J. Sensors
1. The outdoor unit shall have
 - a. Suction temperature sensor
 - b. Discharge temperature sensor
 - c. High pressure sensor
 - d. Low Pressure sensor
 - e. Outdoor temperature sensor
 - f. Outdoor unit heat exchanger temperature sensor

PART 3 - EXECUTION

3.01 GENERAL

- A. Install all equipment and controls in accordance with manufacturer's installation instructions.
- B. Install refrigerant piping as per manufacturer's instructions.
- C. Install the drain line. Pitch drain line in the direction of flow.
- D. Install new filter on indoor unit.
- E. Clean all equipment after installation.

END OF SECTION 238126

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Washdown Corrosion Resistant Electric Unit Heaters.

1.02 REFERENCES

- A. Electric unit heaters shall meet the requirements of the National Electric Code (NEC) and shall be UL listed.

1.03 SUBMITTALS

- A. Submit under provisions of Section 013300 - SUBMITTALS.
- B. Submit manufacturer's product data and installation instructions to Engineer.
- C. Submittal data shall include capacity and size of each heater and wiring instructions.

PART 2 - PRODUCTS

2.01 WASHDOWN CORROSION RESISTANT ELECTRIC UNIT HEATERS

- A. Electric unit heater shall be Model HD3D as manufactured by Chromalox or approved equal.
 - 1. Equivalents include:
 - a. Qmark
 - b. Stelpro
- B. Heaters capacities and electrical characteristics shall be as called for on the equipment schedules. Heaters shall be forced fan hose-down corrosion resistant type.
- C. The heating elements shall be type 316 stainless steel of finned tubular construction with stainless steel fittings.
- D. The motor shall be UL listed, totally enclosed with permanently lubricated ball bearings, designed to resist moisture and corrosion, fitted with an epoxy coated fan blade and factory wired to NEMA 4X stainless steel enclosure.
- E. Heating elements and motor shall be enclosed in a round heavy 20 gauge stainless steel shroud, with stainless steel louvered outlet grille and plated rear grille.
- F. Each unit shall be provided with a NEMA 4X enclosure to house element terminals and following controls:
 - 1. Automatic reset overtemperature outlet,
 - 2. Fan delay relay,
 - 3. Heater contactor
 - 4. Motor contactor
 - 5. Terminal block for field wiring by the Contractor.
- G. Supports: Factory provided swivel bracket suitable for wall mounting.
- H. All options and accessories shall be as called for on the equipment schedules.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install unit in accordance with manufacturer's published installation instructions.
- B. Do not install unit heaters closer than 12 inches to combustible materials in any direction, unless more stringent requirement is given in manufacturer's instructions.

END OF SECTION 238239

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Excavation and backfill for electrical work.
- B. Demolition of existing electrical systems.
- C. Secondary power wiring and distribution system.
- D. Lighting, including lamps.
- E. Wiring devices.
- F. Motor Control Centers.
- G. Distribution panels and switches.
- H. Instrumentation and Controls.

1.02 RELATED WORK

- A. Foundations and pads required for equipment furnished under this division of specifications.
- B. Field painting, except such painting as is required to maintain shop coat painting and factory finish painting.
- C. Flashing and sealing of conduits through outside walls.
- D. Cutting and patching for electrical work, except for errors and omissions under this Division.

1.03 QUALITY ASSURANCE

- A. It is understood that the rights and benefits given the Owner by the guarantees found in the technical specifications are in addition to and not in derogation of any rights or benefits found in the special and general provisions of the contract.
- B. Electrical equipment provided under this Division shall be turned over in operating condition. Instruction on further operation and maintenance shall be included in the operating and maintenance instructions.

1.04 REFERENCES

- A. Perform work in accordance with standards listed below. Where these specifications are more stringent, they take precedence. In case of conflict, obtain a decision from the Engineer.
 - 1. NFPA-70: National Electrical Code
 - 2. NFPA-101: Life Safety Code
 - 3. New York State Energy Code
 - 4. New York State Building Code
 - 5. Applicable New York State Administrative Code
 - 6. Applicable Town Ordinances.
 - 7. Electric utility rules and regulations.

1.05 PERMITS AND FEES

- A. The Contractor shall obtain and pay for all permits, construction charges, fees, licenses, certificates, inspections and other use charges required in connection with the work.
- B. Such permits include, but are not limited to:
 - 1. Transportation and disposal of debris.
 - 2. Electrical Inspectors, Inc., or a pre-approved electrical inspection agency.
 - 3. Road opening permits.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- A. All materials and equipment used in carrying out these specifications shall have UL listing and label. Specifications and drawings indicate name, type, or catalog numbers of materials and equipment to be used as standards. Proposals shall be based on these standards. Contractor may use materials and equipment equivalent to those specified, subject to Engineer's approval.

PART 3 - EXECUTION

3.01 COORDINATION

- A. Carefully examine specifications, drawings and project site to be thoroughly familiar with items which require electrical connections and coordination. Electrical drawings are diagrammatic and shall not be scaled for exact sizes.
- B. Notify other Contractors of any deviations or special conditions necessary for the installation of work. Interferences between work of various contractors to be resolved prior to installation. Work installed not in compliance with specifications and drawings and without properly checking and coordinating as specified above shall, if necessary, be removed and properly reinstalled without additional cost to the Owner. Engineer to be mediating authority in all disputes arising on project.
- C. Equipment shall be installed in accordance with manufacturer's recommendation. Where conflicts occur between contract documents and these recommendations, a clarification shall be requested of the Engineer for decision before proceeding with such work.
- D. Insofar as it is possible to determine in advance, advise masonry tradesmen to leave proper chases and openings. Place all outlets, anchors, sleeves, and supports prior to pouring concrete or installation of masonry work. Should the Contractor neglect doing this, any cutting and/or patching required to be done is at this Contractor's expense.

3.02 CUTTING AND PATCHING

- A. Repair or replace routine damage caused by cutting in performance of work under this Division.
- B. Correct unnecessary damage caused due to installation of electrical work, brought about through carelessness or lack of coordination.
- C. Holes cut through floor slabs to be core drilled with drill designed for this purpose. All openings, sleeves, and holes in slabs to be properly sealed, fire proofed and waterproofed.
- D. Repairs to be performed with materials which match existing materials and to be installed in accordance with appropriate sections of these specifications.

3.03 TESTS

- A. On completion of work, installation shall be completely operational and entirely free from ground, short circuits, and open circuits. Perform a thorough operational test in presence of the Engineer. Balance all circuits so that feeders to panels are not more than 10% out of balance between phases with all available load energized and operating. Furnish all labor, materials and instruments for above tests.
- B. Furnish Engineer with a copy of such tests including identification of each circuit and readings recorded, also the main service ground resistance test as described in Section 260526 of these specifications. Test information to include ampere readings of all panels and major circuit breakers, isolation resistance reading of motors and transformers.

3.04 IDENTIFICATION OF EQUIPMENT

- A. Properly identify the following:
 - 1. Motor Control Centers including all individual devices.
 - 2. Distribution panels.
 - 3. Disconnect switches.
 - 4. Relays.
 - 5. Pilot lights and control switches.
- B. Use permanently attached black phenolic plates with 1/4-inch white engraved lettering on the face of each, attached with two sheet metal screws.
- C. Panelboard identification plates shall indicate panel by name.

3.05 INSTALLATION

- A. The Contractor shall carefully move and replace existing equipment, appliances and all related items, as required to conduct proposed work.
- B. Install and conduct all work per applicable NEC, State and local codes.

END OF SECTION 260000

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Electrical demolition.

1.02 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Shop Drawings: Indicate demolition and removal sequence and location of salvageable items; location and construction of temporary work.

1.03 REGULATORY REQUIREMENTS

- A. Conform to applicable code for demolition work, safety of structure and dust control.
- B. Obtain required permits from authorities.
- C. Notify affected utility companies before starting work and comply with their requirements.
- D. Do not close or obstruct egress width to exits.
- E. Do not turn off electric equipment without authorization from Owner.
- F. Conform to procedures applicable when discovering hazardous or contaminated materials.
- G. Obtain a utilities mark-out of all buried underground utilities for telephone, electric, gas, sewer and water, including all customer owned utilities.

1.04 SCHEDULING

- A. Schedule Work to coincide with new construction.

PART 2 - PRODUCTS

2.01 NOT USED.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify field circuiting arrangements at all Buildings.
- B. Verify that abandoned wiring and equipment serve only abandoned facilities.
- C. Demolition drawings are based on visual field observation. Report discrepancies to the Engineer before disturbing existing installation.
- D. Beginning of demolition means installer accepts existing condition.

3.02 PREPARATION

- A. Coordinate utility service outages with Utility Company.

- B. Provide power, wiring and connections to maintain all existing power, control and telemetry systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.

3.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

- A. Remove, relocate, and extend existing installations to accommodate new construction, as indicated on drawings.
- B. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
- C. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets which are not removed.
- D. Repair adjacent construction and finishes damaged during demolition and extension work.
- E. Provide caps and filler plates/plugs for all openings in equipment and enclosures after removal of conduits.
- F. Maintain access to existing electrical installations which remain active. Modify installation or provide access panel as appropriate.
- G. Remove demolished materials from site as work progresses.
- H. Completely remove and dispose of all electrical power, control, and telemetry feeds including conduits, conductors, boxes and supports not scheduled to remain after new construction is tested and operational.
- I. Where existing devices and equipment are called to be removed, Contractor shall maintain circuit continuity to all existing devices and equipment remaining on that circuit. Contractor shall provide all required conduit, conductors and boxes as required.

3.04 CLEANING AND REPAIR

- A. Clean and repair existing materials and equipment which remain or are to be reused.
- B. Remove temporary work.

END OF SECTION 260010

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Wires and cables.
- B. In general, the wires and cables included under this Section shall include, but not be limited to, the following:
 - 1. 600V power and control cable
 - 2. Instrumentation wires
 - 3. Communication cables
- C. All conductors to be continuous from origin to panel or equipment termination without splices.

1.02 REFERENCES

- A. ANSI/NFPA 70 - National Electric Code.
- B. NECA Standard of Installations.

1.03 SUBMITTALS

- A. Submit product data under provisions of Section 013300.

1.04 QUALITY ASSURANCE

- A. Products used in the work of this Section shall be produced by manufacturers regularly engaged in the manufacturing, installing and servicing of similar items with a history of successful production acceptable to the Engineer as specified herein and in accordance with the General Conditions.
- B. Contractor shall submit the following information pertaining to the manufacturer(s):
 - 1. Complete literature, performance, and technical data describing the proposed equipment and listing of items made by the manufacturer.
 - 2. Location of closest service office from which this equipment shall be serviced.
 - 3. Location of closest parts inventory for item installation.

1.05 COORDINATION

- A. Coordination:
 - 1. Coordinate wire and cable required with the equipment being furnished by others for the satisfactory operation of the equipment or system.
 - 2. Review installation procedures under other sections and contracts and coordinate them with the work specified herein.
 - 3. Notify other prime contractors in advance of the installation of the work included to provide them with sufficient time for installation and coordination of interrelated items that are included in their contracts and that must be installed in conjunction with the work included in this Section.

1.06 PROJECT CONDITIONS

- A. Verify that embedded conduit, in masonry and concrete, is installed as shown on the Drawings prior to the work being enclosed by others.
- B. The Contractor shall be present at all concrete pours made by the General Contractor.

- C. Conductor sizes are based on copper at 75°C.
- D. Wire and cable routing shown on Drawings is approximate unless dimensioned or specifically called for such as where conduit is to be embedded in concrete or masonry. Route wire and cable as required to meet project conditions and shall be routed above ceilings, directly under joists, in pipe trenches, where available, and in masonry. Where exposed conduit is permitted, it shall be run to maximize wall space.
- E. Field verify destination location to determine cable routing.
- F. Where wire and cable routing is not shown for proposed destination, determine exact routing and lengths required. Routing shall be reviewed with the Engineer.

PART 2 - PRODUCTS

2.01 CONDUCTORS

- A. Install products in accordance with manufacturer's recommendations.
- B. Single copper conductors with 600-volt insulation.
- C. Minimum size of feeder conductors and grounds shall be No. 12 AWG.
- D. Insulation: No. 12 AWG and No. 10 AWG, provide ANSI/NFPA 70, Type THWN-2 for interior circuits and type XHHW-2 for exterior circuits. Exterior circuits shall be considered circuits where any portion of the circuit is run exterior of the building, in which case the entire length of the circuit shall be continuous wire of Type XHHW-2.
- E. Use solid conductor for feeder and branch circuits, 10 AWG and smaller.
- F. All conductors shall include complete set of manufacturer's markings for insulation and conductor size.
- G. Manufacturers shall be SOUTHWIRE, PRYSMIAN GROUP, OKONITE, or approved equal.
- H. Provide white colored neutral conductors; provide black, color coded phase conductors; provide green colored ground conductors.

2.02 300 VOLT INSTRUMENTATION SIGNAL CABLE - FOR INDOOR USE

- A. Indoor Application:
 - 1. The 300-volt instrumentation signal cable for indoor use shall consist of single or multiple twisted pairs or triads of coated, stranded copper conductors with polyvinyl chloride (PVC) insulation and nylon jacket. Each individual pair or triad of wires shall have an aluminum/polyester tape shield with a tinned copper drain wire. For multiple pair or triad cables, an overall aluminum/polyester tape shield with a tinned copper drain wire shall enclose the individual wire assemblies. The overall jacket shall be PVC. Cables shall have a 105°C rating.
 - 2. The conductors shall be annealed, tin-coated copper with Class B stranding per ASTM B8. Minimum size conductor shall be AWG No. 16.
 - 3. The insulation shall be PVC. The insulation thickness shall be 15 mils.
 - 4. Individual Conductor Insulation: The jacket over each individual wire shall be nylon and shall have a thickness of 4 mils.
 - 5. The shield for each individual pair or triad shall be an aluminum/polyester tape. The shield shall be 1.35 mils thick and shall be overlapped to provide 100% coverage. The shield shall also contain a 7-strand tinned copper drain wire which shall be a maximum of

two sizes smaller than the conductors. All individual shields shall be completely isolated from each other.

6. The overall shield for multiple pair or triad cables shall be an aluminum/polyester tape. The shield shall be 2.35 mils thick and shall be overlapped to provide 100% coverage. The shield shall also contain a 7-strand tinned copper drain wire which shall be the same size as the conductors.
7. The overall jacket shall be PVC and shall meet the requirements of UL 13.
8. The jacket thickness shall be as follows:

Wire Size	No. of Pairs	No. of Triads	Jacket Thickness
16 AWG	1	-	35 Mils
16 AWG	2,4	-	50 Mils
16 AWG	8,10,12	-	60 Mils
16 AWG	-	1	35 Mils
16 AWG	-	2,4	50 Mils
16 AWG	-	8	60 Mils
16 AWG	-	12	70 Mils

9. Manufacturers and their products shall be equal to:
 - a. BELDEN
 - b. OKONITE
 - c. SOUTHWIRE
 - d. PRYSMIAN GROUP
 - e. Or approved equal

B. Outdoor Use in Conduits:

1. The 300-volt instrumentation signal cable for outdoor use in conduits shall consist of single or multiple twisted pairs or triads of coated, stranded copper conductors with polyvinyl chloride (PVC) insulation and nylon jacket. Each individual pair or triad of wires shall have an aluminum/polyester tape shield with a tinned copper drain wire. For multiple pair or triad cables, an overall aluminum/polyester tape shield with a tinned copper drain wire shall enclose the individual wire assemblies. The overall jacket shall be chlorinated polyethylene (CPE). Cables shall have a 105°C rating.
2. The conductors shall be annealed, tin-coated copper with Class B stranding per ASTM B8. Minimum size conductor shall be AWG No. 16.
3. The insulation shall be PVC. The insulation thickness shall be 15 mils.
4. The jacket over each individual wire shall be nylon and shall have a thickness of 4 mils.
5. The shield for each individual pair or triad shall be an aluminum/polyester tape. The shield shall be 1.35 mils thick and shall be overlapped to provide 100% coverage. The shield shall also contain a 7-strand tinned copper drain wire which shall be a maximum of two sizes smaller than the conductors. All individual shields shall be completely isolated from each other.
6. The overall shield for multiple pair or triad cables shall be an aluminum/polyester tape. The shield shall be 2.35 mils thick and shall be overlapped to provide 100% coverage. The shield shall also contain a 7-strand tinned copper drain wire which shall be the same size as the conductors.
7. The overall jacket shall be CPE and shall meet the requirements of UL 13.
8. The jacket thickness shall be as follows:

Wire Size	No. of Pairs	No. of Triads	Jacket Thickness
16 AWG	1	-	35 Mils
16 AWG	2,4	-	50 Mils
16 AWG	8,10,12	-	60 Mils
16 AWG	-	1	35 Mils

Wire Size	No. of Pairs	No. of Triads	Jacket Thickness
16 AWG	-	2,4	50 Mils
16 AWG	-	8	60 Mils
16 AWG	-	12	70 Mils

9. Manufacturers and their products shall be as follows:
- BELDEN
 - OKONITE
 - SOUTHWIRE
 - PRYSMIAN GROUP
 - Or approved equal

2.03 4-PAIR CATEGORY 6 UNSHIELDED TWISTED PAIR CABLE

- A. Manufacturers: Subject to compliance with project requirements, manufacturers offering Products which may be incorporated in the Work include the following:
- Belden Corporation, Carmel, IN (800) 246-2673.
 - Avaya, Basking Ridge, NJ (800) 344-02232.
 - Berk-Tek, Incorporated, New Holland, PA (800) 237-5835.
 - CommScope, Hickory, NC (800) 982-1708.
 - Draka Comteq, Franklin, MA (888) 541-7100.
 - General Cable, Highland Heights, KY (800) 424-5666.
 - Mohawk/CDT Leominster, MA (978) 537 9961.
 - NORDX/CDT, Worcester, MA (800) 331-0779.
 - Superior Essex, Atlanta, GA. (800) 685-4887.
 - Tyco Electronics, Harrisburg, PA (800) 522-6752.
- B. Conductors: 4 twisted pair - 24 AWG, solid copper w/ RJ-45 connector ends
- Individually insulated plenum rated conductors under common plenum rated sheath unless entire cable is installed within conduit/EMT or if area where cable is installed is not considered a return air plenum according to any applicable codes.
 - Complies with individual characteristics established in ANSI/TIA/EIA-568-B, and all addendums for Category 6 cable performance specification.
 - Overall Nominal Diameter: .365 x .165 in.
 - Nominal Impedance: 100 ohms plus or minus 15 percent.
 - Certified capable of performing to minimum 350 MHz.
- C. Mechanical Characteristics
- Operating temperature: -20°C to +80°C
 - Bulk cable weight: 29 lbs./1000 ft.
 - Maximum recommended pulling tension: 45 lbs.
 - Minimum bend radius: 1 in.
- D. Flame test: UL1666 Riser
- E. Electrical Characteristics:
- Nom. Mutual Capacitance @ 1 KHz 15.0 pF/ft
 - Maximum Capacitance Unbalance (pF/100 m) 49.2 pF/100 m
 - Nominal Velocity of Propagation 70 %
 - Maximum Delay (ns/100 m) 510 @ 100MHz ns/100 m
 - Maximum Delay Skew (ns/100m) 25 ns/100 m
 - Maximum Conductor DC Resistance @ 20 Deg. C 9 Ohms/100 m
 - Maximum DCR Unbalance @ 20 Deg. C 3 %
 - Max. Operating Voltage - UL 300 V RMS

2.04 MECHANICAL CONNECTORS

- A. Conductor tapping connectors shall be BURNDY Servit split bolt, Series KS and KS3, or approved equal.
- B. Split bolt connectors shall use BURNDY Type SC Servit cover on indoor applications.
- C. Terminal lugs shall be BURNDY Universal Terminal Series. Terminal lugs shall be sized for proper ampacity and proper number of conductor holes. Each conductor shall occupy only one hole on a terminal lug.
- D. Conductor tapping connectors for multiple conductors shall be BURNDY Series V-Tap with V-Tap covers, and V-Blok mounting platforms.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. General:
 - 1. Make terminations in accordance with cable manufacturers instructions for the particular type of wire and cable.
 - 2. Splices are not allowed in the underground duct and manhole systems. If splices are required, the Contractor shall obtain approval in writing from the Engineer prior to splicing.
 - 3. All splices shall be in made in terminal boxes.
- B. Wire and Cable Sizes: The sizes of wire and cable shall be as shown on the Contract Drawings, or if not shown, as approved by the Engineer. Minimum size wire shall be No. 12 AWG for all power, lighting and receptacle circuits. Wires for control circuits shall be No. 14 AWG minimum. Wire for instrumentation circuits shall not be smaller than No. 16 AWG. If due to field routing the voltage drop exceeds 2.5%, the size of conductors shall be increased such that 2.5% is the maximum voltage drop incurred.
- C. Number of Wires: The number of wires indicated on the Contract Drawings for the various control, indications, and metering circuits were determined for general schemes of control and for particular indication and metering systems. Coordinate wiring schemes with equipment schematics.
- D. Wiring Identification: All wiring shall have a unique wire number and be labeled at both ends. Wire numbers shall correspond with the equipment terminal wire numbers. Where no wire numbers are indicated, the Contractor shall assign wire numbers. Wire numbers shall not be duplicated.
- E. Cable Identification Tags: The Contractor shall furnish all labor and materials and affix in a permanent way to each cable in manholes, cable compartments and vaults, junction boxes, pull boxes and points of termination, a laminated plastic tag, bearing clearly printed, the cable number indicated on the Contract Drawings or some other approved identification number or symbol. All cables shall be temporarily tagged with its full ID number immediately after it has been pulled.
- F. Wiring Supplies: Only electrical wiring supplies manufactured under high standards of production and meeting the approval of the Engineer shall be used. Friction tape shall be in accordance with ASTM D69.
- G. Training of Cable: Furnish all labor and material required to train cables around cable vaults within buildings and in manholes in any outdoor underground duct system. Sufficient length of cable shall be provided in each manhole and vault so that the cable can be trained and racked

in an approved manner. In training or racking, the radius of bend of any cable shall be not less than the manufacturer's recommendation. All manhole cables shall be arc and fireproofed.

H. Connections at Control Panels, Limit Switches and Similar Devices:

1. Where stranded wires are terminated at panels, and/or devices connections shall be made by solderless lug, crimp type ferrule or solder dipped.
2. Where enclosure sizes and sizes of terminals at limit switches, solenoid valves, float switches, pressure switches, temperature switches, and other devices make 7-strand, No. 12 AWG, wire terminations impractical, the Contractor shall terminate external circuits in an adjacent junction box of proper size and shall install No. 14 AWG stranded wires to the junction box in a conduit.

I. Pulling Temperature: Cable shall not be flexed or pulled when the temperature of the insulation or of the jacket is such that damage will occur due to low temperature embrittlement. When cable will be pulled with an ambient temperature within a three day period prior to pulling of 40°F or lower, cable reels shall be stored during the three day period prior to pulling in a protected storage with an ambient temperature not lower than 55 degrees F and pulling shall be completed during the work day for which the cable is removed from the protected storage.

J. Color Coding:

1. Conductor jacket shall be color coded as follows:

AC POWER

480V/277 Volt 3 phase	208Y/120 Volt 3 phase (NEC)
Phase A Brown	Phase A Black
Phase B Orange	Phase B Red
Phase C Yellow	Phase C Blue
Neutral White	Neutral White
Ground Green	Ground Green

2. Control (Per ICEA Method 1, K-2):

WIRE NUMBER	COLOR
1	Black
2	Red
3	Blue
4	Orange
5	Yellow
6	Brown
7	Red With Black
8	Blue With Black
9	Orange With Black
10	Yellow With Black
11	Brown With Black
12	Black With Red
13	Blue With Red

WIRE NUMBER	COLOR
14	Orange With Red
15	Yellow With Red
16	Brown With Red
17	Black With Blue
18	Red With Blue
19	Orange With Blue

3. Instrumentation Signal
 - a. Pairs - Black and White
 - b. Triads - Black, Red and White
 4. Equipment Ground - GREEN
- K. Instrumentation Cable Installation:
1. Where instrumentation cables are installed in panels, etc., arrange wiring to provide maximum clearance between cables and other conductors. Instrumentation cables shall not be installed in same bundle with conductors of other circuits.
 2. Grounding of cable shield shall be accomplished at one point only, unless otherwise required by instrumentation systems manufacturer.
 3. Special instrument cable shall be as specified or recommended by the vendor of the equipment or instruments requiring such wiring. Installation, storage, terminations, etc., shall be per manufacturer's recommendations.

3.02 IDENTIFICATION

- A. Identify wire and cable under provisions of Section 260553.
- B. Identify each conductor with its circuit number.

3.03 FIELD QUALITY CONTROL

- A. Perform field inspection and testing under provisions of Section 014500.
- B. Inspect wire and cable for physical damage and proper connection.
- C. Measure tightness of bolted connections and compare torque measurements with manufacturer's recommended values.
- D. Field Testing:
 1. Wires and cables shall be tested before being connected to motors, devices or terminal blocks.
 2. If tests reveal defects or deficiencies, the Contractor shall make the necessary repairs or shall replace the cable as directed by the Engineer, without additional cost to the Owner.
 3. All tests shall be made by and at the expense of the Contractor who shall supply all testing equipment.
- E. Continuity Tests: All cables, wires and shields shall be tested for continuity. Testing for continuity shall be by test light or buzzer.
- F. Insulation-Resistance Tests:
 1. 600V power and control cables and wires shall be tested for their insulation-resistance values. Test shall utilize a megohmmeter with applied voltage to be 1000VDC for one (1) minute. Insulation-resistance test shall be performed on each conductor with all other conductors grounded. The resistance value shall be 20 megohms or greater.

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (CONTRACT E)**H2M**

2. 300V instrumentation signal cable shall be tested from conductor to conductor, conductor to ground, and conductor to shield using a digital volt-ohm meter. The resistance value shall be 10 megohms or greater.

END OF SECTION 260519

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Grounding electrodes and conductors.
- B. Equipment grounding conductors.
- C. Bonding.

1.02 REFERENCES

- A. ANSI/NFPA 70 - National Electric Code.

1.03 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc.

PART 2 - PRODUCTS

2.01 COMPONENTS

- A. Ground clamps:
 - 1. OZ ELECTRICAL MANUFACTURING COMPANY, Type "CG" for connection to water main piping and Type "GC" for connection to ground rod; with cable installed parallel or 90 degrees to pipe/rod under separate clamp.
 - 2. Or equal by STEEL CITY or APPLETON
- B. Raceways, conductors, outlet boxes, pull and junction boxes to be furnished in accordance with applicable sections of these specifications.
- C. Rod Electrode: Solid Copper, 3/4-inch diameter, 10 feet long.
- D. Wire: Copper, sized to meet NFPA 70 requirements.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. General:
 - 1. Clean all conductive surfaces on equipment to be grounded, to assure good electrical continuity.
 - 2. Effectively bond all grounding conductors to grounding rod electrodes, equipment enclosures and ground busses.
 - 3. Locate all grounding attachments away from areas subject to physical damage. Provide protective covering as required.
 - 4. Building steel shall be bonded to ground bus on main service with a conductor the same size as in B.1 below.
- B. Feeder/Branch Circuits:
 - 1. All circuits shall have a separate green grounding conductor in conduit sized in accordance with NFPA 70. Minimum size of conductor shall be No. 12 AWG.

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS (CONTRACT E) **H2M**

2. Flexible conduit will not be approved as achieving continuity of ground. All flexible conduit to have a jumper wire sized to ampacity of branch breaker and to be connected to conduit system on both ends; this applies to fixtures, motors, controls, etc.
- C. Transformers:
1. Transformers shall be grounded and grounding conductors and conduits sized in accordance with NFPA 70.

3.02 TEST

- A. Test ground on main service. Ground system resistance shall be no greater than 10 ohms using test equipment similar to a "Biddle" test. Test data to be submitted to the Engineer for approval and such approved test data to become a part of the Record Documents.

END OF SECTION 260526

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. System of supporting devices and hangers for support or bracing for conduit, electrical equipment, safety switches, fixtures, panelboards, outlet boxes, junction boxes and cabinets.

1.02 REFERENCES

- A. ANSI/NFPA 70 - National Electric Code.

1.03 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc.

PART 2 - PRODUCTS

2.01 EQUIPMENT REQUIREMENTS

- A. Provide appropriate corrosion-resistant supporting devices and hangers for electrical equipment, as manufactured by ERICO PRODUCTS, INC., CADDY FASTENERS, STEEL CITY, MINERALLAC or equivalent.
 - 1. "Z" purlin clips.
 - 2. Conduit clips.
 - 3. Beam clamps (universal and vertical flange).
 - 4. Beam clamps (set screw type).
 - 5. Combination push-in conduit clips.
 - 6. Combination conduit hanger clamps.
 - 7. Flexible conduit clips.
 - 8. Special combination conduit clips.
 - 9. One hole steel straps.
 - 10. Conduit hangers.
- B. Provide materials, sizes and types of anchors, fasteners and supports to carry the loads of equipment, wire in conduit and conduit.

2.02 CHANNEL SUPPORT SYSTEM

- A. Channel systems and supports shall be manufactured by KINDORF/THOMAS & BETTS, or approved equal.
- B. Channels shall be 1-1/2" x 1-1/2".
- C. Channels and all associated accessories and bolts shall be hot dipped galvanized.
- D. Channels shall have 9/16" bolt holes on 1-1/2" centers.
- E. Provide end caps for all channels.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Secure conduits to within 3 feet of each outlet box, junction box, cabinet, fitting, etc., and at intervals not to exceed 10 feet in accordance with currently effective edition of the National Electric Code.
- B. In seismic zones, support conduits 1 inch and smaller at 6 foot intervals.
- C. Install clamps secured to structure for feeder and other conduits routed against structure. Use drop rods and hangers to support conduits run apart from the structure.
- D. Provide and install suitable angle iron, channel iron or steel metal framing with accessories to support or brace electrical equipment including safety switches, fixtures, panelboards, etc.
- E. Paint all supporting metal not otherwise protected, with rust inhibiting primer and then with a finish coat if appropriate to match the surrounding metal surfaces. Prepainted or galvanized support material is not required to be painted or repainted.
- F. Do not use chains, perforated iron, baling wire or tie wire for supporting conduit runs. Use of clips to support conduit to top of t-bar ceiling grid will not be permit-~~ted~~.
- G. Obtain permission from Engineer before drilling or cutting structural members.
- H. Install surface mounted cabinets and panelboards with a minimum of four anchors.
- I. Do not fasten supports to pipes, ducts, mechanical equipment and conduit.
- J. Install products in accordance with manufacturer's instructions.

END OF SECTION 260529

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Conduit system with associated couplings, connectors and fittings. Conduits to be mechanically and electrically continuous from outlet to outlet and from outlets to cabinets, pull or junction boxes.
 - 1. Conduit Use - Rigid Galvanized Conduit:
 - a. All interior and exterior circuits where PVC coated rigid galvanized conduit is not required.
 - 2. Conduit Use - PVC coated rigid galvanized conduit.
 - a. All circuits exposed on process tankage.
 - b. All circuits exposed in thickener room.
 - c. All penetrations entering / exiting concrete slabs.
 - d. All Class I, Group D locations.
 - 3. Conduit Use - Flexible Liquid-tight Metal Conduit:
 - a. Connecting motors, generators and other equipment subject to vibration, maximum length - 3 feet.
 - b. Passing through building expansion joints.
- B. Device Boxes: Provide each fixture switch, receptacle and other wiring device with a box of appropriate size and depth for its particular location use unless indicated otherwise.
- C. Pull boxes, junction boxes and wire troughs

1.02 REFERENCES

- A. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.
- B. ANSI/NFPA 70 - National Electric Code.
- C. NECA Standard of Installation.
- D. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
- E. ANSI/NEMA OS1 - Sheet-steel outlet boxes, device boxes, covers and box supports.
- F. NEMA 250 - Enclosures for electrical equipment (1000 volts maximum).

1.03 SUBMITTALS

- A. Submit product data under provisions of Section 013300.
- B. Working Drawings:
 - 1. Prior to equipment submission, submit a list of proposed manufacturers with the products they produce proposed for the contract.
 - 2. Manufacturer's catalog cuts for the conduit, boxes, fittings and supports proposed for use.
 - 3. Construction details of conduit racks and other conduit support systems with seismic restraint details and calculations signed by a licensed Engineer.
 - 4. Scaled working drawings showing proposed routing of all conduits, inclusive of conduits routed above grade on exterior support structures, embedded in structural concrete and conduits directly buried in earth. Drawings shall show locations of pull and junction boxes and all penetrations in walls and floor slabs.

1.04 REGULATORY REQUIREMENTS

- A. Furnish products listed and classified by Underwriters Laboratories, Inc.
- B. Conform to requirements of ANSI/NFPA 70.

1.05 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 017839.
- B. Accurately record actual routing of all conduits.

1.06 FIELD SAMPLES

- A. Provide under provisions of Section 014500.
- B. Provide field sample of conduit two each at 2 feet in length.
- C. Provide field sample of expansion/deflection fitting, two each.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, protect, and handle products in accordance with manufacturers' recommendations.
- B. Accept conduit on site. Inspect for damage.
- C. Protect conduit from corrosion and entrance of debris by storing abovegrade. Provide appropriate covering.

1.08 PROJECT CONDITIONS

- A. Verify all conduit routings by field measurements.
- B. Verify routing and termination locations of conduit prior to rough-in.
- C. Conduit routing is shown on Drawings in approximate locations unless dimensioned. Route as required to complete wiring system. Provide all required sweeps, boxes and fittings.

PART 2 - PRODUCTS**2.01 RIGID GALVANIZED CONDUIT**

- A. Rigid conduit shall be hot dipped, galvanized, or electro-galvanized steel by Wheatland, Triangle, Republic or approved equal.
- B. Associated couplings, connectors and fittings shall be as manufactured by THOMAS & BETTS CORP., O.Z. GEDNEY CO., EFCOR or approved equal. Catalog numbers used below are those of THOMAS & BETTS CORP. based on 3/4-inch size and are considered standards by which equivalents are to be judged.
- C. ERICKSON couplings, Series 676 or approved equal, shall be used where neither length of conduit can be rotated.
- D. Conduit connectors shall be threaded type. Set screw and compression type connections ARE NOT acceptable.

- E. Sealing fitting locknuts shall be Series 142SL.
- F. Steel or malleable iron insulated bullet hub, Series 370-379, complete with sealing "O" ring. DO NOT use "die cast" material.
- G. Entrance ells shall be Series 1491 or approved equal.
- H. Combination coupling shall be Series 531 for connecting rigid galvanized conduit to electrical metallic tubing.

2.02 PVC COATED METAL CONDUIT

- A. PVC Coated Metal Conduit shall be PLASTI-BOND RED by Robroy Industries or equal.
- B. Description: NEMA RN 1; galvanized rigid steel conduit with external PVC coating, 40 mil thick and red urethane internal coating.
- C. Fittings and Conduit Bodies: ANSI/NEMA FB 1; galvanized steel fittings with external PVC coating and red urethane internal coating to match conduit shall be provided in all spaces where PVC coated metal conduit is installed.
- D. Junction and Pull Boxes: Galvanized steel boxes with external PVC coating and red urethane internal coating to match conduit shall be provided in all spaces where PVC coated metal conduit is installed.
- E. Conduit Supporting Hardware: Galvanized steel hardware with external PVC coating and red urethane internal coating to match conduit shall be provided in all spaces where PVC coated metal conduit is installed.

2.03 HAZARDOUS LOCATION SEALING HUB

- A. Hazardous location sealing hubs shall be O-Z/GEDNEY EYH, EYH-SG or approved equal.
- B. Contractor shall provide hazardous sealing fittings of different types and configurations to facilitate the installation as manufactured by O-Z/GEDNEY or approved equal.
- C. Sealing compound and fiber shall be O-Z/GEDNEY type EYC and EYF.

2.04 FLEXIBLE LIQUID-TIGHT METAL CONDUITS AND FITTINGS

- A. Liquid-tight flexible metal conduit shall be ANACONDA or approved equal.
- B. Description: Interlocked steel construction with PVC jacket.
- C. Provide flexible liquid-tight conduits and fittings as manufactured by THOMAS & BETTS CORP., O.Z. GEDNEY CO. or approved equal. Catalog numbers used below are those of the THOMAS & BETTS CORP., based on 3/4" size and are to be considered as standards by which equivalents are to be judged. All conduit shall be liquid-tight flexible type, UL type UA, or suitable for exposure to continuous or intermittent moisture.
- D. Flexible liquid-tight connectors shall be Series 5333 or approved equal.

2.05 HAZARDOUS LOCATION FITTINGS CLASS I, DIV. I

- A. Conduit Unions: Class 1, Div. 1 Types UNF and UNY as manufactured by O-Z/Gedney or approved equal.

- B. Sealing Fittings: Class 1, Div. 1 types EYA and EYAM as manufactured by O-Z or approved equal.
- C. Sealing Hub: Class 1, Div. 1 type EYHSG with Sealing Gasket and Locknut as manufactured by O-Z/Gedney or approved equal.
- D. Explosion proof sealing compound systems for fittings and hubs shall consist of a fiber material (to form a dam for the sealing material) and the sealing compound itself. Both the fiber and sealing compound shall be rated for use in the classified area and shall be compatible with the fitting or hub being sealed.
 - 1. Manufacturers and their particular products shall be as follows:
 - a. Appleton Electric Co., "Kwiko Sealing Cement & Fiber Filler"
 - b. Crouse-Hinds, "Chico A Sealing Compound & Chico X Fiber"
 - c. O-Z/Gedney, "Type EYC and Type EYF"
- E. Conduit Fittings:
 - 1. Conduit fittings shall be furnished and installed as required and shall include Conduit fittings shall be furnished and installed as required and shall include bushings, etc. All fittings shall be steel with zinc electroplate finish or malleable iron with zinc electroplate finish. All fittings shall have insulated throats (where applicable).
 - 2. Conduit fittings shall be manufactured by the following: Appleton Electric Company, Crouse-Hinds, O-Z/Gedney
- F. Expansion couplings for use in conduit runs shall be the expansion/deflection type. Expansion couplings shall have iron or bronze ends, neoprene sleeves, stainless steel bands and tinned flexible copper braid bonding jumper. Couplings shall be watertight, corrosion resistant and concrete tight.
 - 1. Manufacturers and their particular products shall be as follows: Appleton Electric Company; "Type DF", Crouse-Hinds; "Type XD", O-Z/Gedney; "Type DX".
 - 2. For explosive areas, expansion unions shall be utilized. Expansion unions shall be steel with zinc electroplate finish and have copper or bronze grounding spring or jumper.
 - a. Manufacturers and their particular products shall be as follows:
 - 1) Appleton Electric Company; "Type UN"
 - 2) Crouse-Hinds; "Type UN"
 - 3) O-Z/Gedney; "Type UN"
- G. Grounding Bushings: Grounding bushings shall be insulated, shall be constructed of malleable iron or steel with zinc plated finish, and shall have a tin plated copper saddle. Insulating material shall have a 150E rating. Grounding bushing shall be O-Z/Gedney, "Type BLG", or approved equal.
- H. Liquid-tight Fittings: Liquid-tight fittings shall be furnished and installed wherever liquid-tight conduit is used. Liquid-tight fittings shall be constructed of steel or malleable iron. Fittings shall be zinc coated. Fittings shall be liquid, rain and oil tight. Sealing rings shall be neoprene. All throats shall be insulated. Liquid-tight fittings shall be Appleton Electric Company, "Type ST"; O-Z/Gedney "Type 4Q", or approved equal.
- I. Explosion-Proof Fittings: Explosion-proof fittings shall be constructed as described above except fittings shall be listed for use in classified areas.
 - 1. Manufacturers and their particular products shall be as follows:
 - a. Appleton Electric Co., "Types BR, EC, EL, ES, EX, EY, and PLG"
 - b. Crouse-Hinds, "Types EC, EL, ES, EY, PLG and RE"
 - c. O-Z/Gedney, "Types EC, EL, EY, PLG, RB and RE"

- d. The above products are meant as a guide and products from the above manufacturers not specifically mentioned do not exclude their use, if they comply with these specifications.
- J. PVC Coated Fittings: PVC coated fittings shall be as described in the paragraphs above except the fittings shall be PVC coated.
- K. Conductive Compound: Conductive compound shall be a grease metallic type and shall be Thomas & Betts, "KOPR-SHIELD", or equal.
- L. Conduit Bodies:
 - 1. Conduit bodies shall be cast type with threaded hubs and shall be made of copper-free aluminum or malleable iron. Copper-free aluminum bodies shall have an aluminum enamel finish. Malleable iron bodies shall have a zinc electroplate and aluminum enamel finish. Finishes shall be applied after all machining has been completed.
 - 2. Conduit body covers shall be of the same material and finish as the conduit body. All screws shall be stainless steel. All covers shall come with rubber or neoprene gaskets.
 - 3. Manufacturers and their particular products shall be as follows:
 - a. Appleton Electric Company; "Form 35 and Form 85"
 - b. Crouse-Hinds; "Mark 9"
 - c. O-Z/Gedney; "Malleable iron/copper-free aluminum conduit bodies"
- M. Mogul Conduit Bodies:
 - 1. All conduit bodies 2" and larger and where physically necessary, shall be of the "mogul" type. Mogul type conduit bodies shall conform to the specifications above as to materials, finish, covers, etc.
 - 2. Manufacturers and their particular products shall be as follows:
 - a. Appleton Electric Company; "Mogul Unilets"
 - b. Crouse-Hinds; "Mogul Conduit Outlet Bodies"
- N. Explosion-Proof Conduit Bodies:
 - 1. Explosion-proof conduit bodies shall be constructed as indicated, except the conduit bodies shall be listed for use in the particular classified area.
 - 2. Manufacturers and their particular products shall be as follows:
 - a. Appleton Electric Company; "CPU, ELB, ER, GU and GR Series"
 - b. Crouse-Hinds; "CPS, EAB, GU and OE Series"
 - c. O-Z/Gedney; "GU and LBH Series"
 - d. The above products are meant as a guide and products from the above manufacturers not specifically mentioned do not exclude their use, if they comply with these specifications.

2.06 OUTLET AND DEVICE BOXES

- A. Acceptable Manufacturers: Raco, General Electric or approved equal.
- B. Sheet Metal Outlet Boxes - All concealed boxes shall be NEMA OSI, galvanized steel:
 - 1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported. Provide 1/2" male fixture stubs where required.
- C. Concrete Ceiling Boxes: Concrete type.
- D. Cast Boxes: All exposed surface mounted boxes shall be NEMA FB1, Type FD, cast ferrous alloy. Provide gasketed cover by box manufacturer.

2.07 PULL BOXES

- A. All pull boxes used for this project shall be minimum LIPA B-3-6 or specifically approved equal for all customer installed power and control circuits.
- B. Provide H-20 Cast-Iron Traffic Load Cover. Cover shall have 3" high logo "Electric".

2.08 JUNCTION BOXES

- A. Acceptable Manufacturers: RACO, GENERAL ELECTRIC or approved equal.
- B. Sheet metal boxes: NEMA OS1, galvanized steel.
- C. Covers: Galvanized steel.

2.09 WIRE TROUGH

- A. Wireways shall be manufactured by Square D, Class 526, rain tight trough or approved equal.
- B. Wireway shall be completely enclosed with removable covers.
- C. Construction: 16 Gauge Galvanized Steel. 8-inch and 12-inch wire trough shall be 14-gauge galvanized steel.
- D. Finish: ANSI-49 epoxy paint applied by cathodic electro-deposition paint process over a corrosion resistant phosphate preparation.
- E. UL listed.

2.10 EXTERIOR WIRE TROUGH

- A. Wireways shall be manufactured by SQUARE D, Class 526, rain tight.
- B. Wireway shall be completely enclosed with removable covers.
- C. Construction: Wireway shall be constructed of Type 304 stainless and shall have stainless steel screw clamps, and oil resistant gaskets.
- D. All hardware, bolts, brackets, and supports shall be constructed of Type 304 stainless steel.

2.11 ELECTRICALLY CONDUCTIVE CORROSION-RESISTANT THREAD COMPOUND

- A. KOPR-SHIELD or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION OF CONDUITS

- A. Minimum size of conduits shall be 3/4-inch.
- B. Minimum conduit depth shall be 24" below grade, measured to the top of the conduit on exterior underground installations.
- C. Conduit joints shall be cut square, threaded, reamed smooth, and drawn up tight so conduit ends will butt in couplings, connectors and fittings.

- D. All threaded conduits and fittings shall have KOPR-SHIELD compound applied to all threads prior to assembly.
- E. Make bends or offsets with standard ells or field bends with an approved bender.
- F. Run concealed conduits in direct line with long sweep bends or offsets. Run exposed conduits parallel to and at right angles to building lines. Group multiple conduit runs in banks.
- G. Secure conduits to all boxes and cabinets with double locknuts and bushings so system will be electrically continuous from service to all outlets.
- H. Install conduit in accordance with NECA Standard of Installation.
- I. Cap ends of conduits to prevent entrance of water and other foreign material during construction.
- J. Complete all conduit systems before pulling conductors.
- K. Support conduits under provisions of Section 260529.
- L. Provide approved expansion joints or fittings and bonding jumpers where conduits in concrete pass through building expansion joints.
- M. Provide cable supports in conduits rising vertically in accordance with the National Electric Code, Article 300-19.
- N. Provide No. 12 AWG copper pull wires or nylon cord in all empty conduits. Steel wire not acceptable as pull wire.
- O. Install conduit to preserve fire resistance rating of partitions and other elements.
- P. Ground and bond conduit under provisions of Section 260526.
- Q. Where neither length of conduit can be rotated, ERICKSON couplings Series 676 shall be used.
- R. In areas where enclosed and gasketed fixtures and weatherproof devices are specified, where rigid conduit enters a sheet metal enclosure, junction box and outlet box, and not terminated in a threaded hub, a steel, or malleable iron nylon insulated bullet hub, complete with recessed sealing "O" ring, shall be used, Series 370-379 . DO NOT use die cast material.
- S. Conduits shall not be installed within concrete slabs unless specifically noted in contract documents; no exceptions.
- T. Where conduits running overhead pass through building expansion joints, install flexible liquid tight conduit of same size with sufficient slack to allow conduits on either side of expansion joint to move a minimum of 3-inches in any direction. Provide supports as required on each side of expansion joint, all in accordance with seismic requirements of specific area.
- U. Failure to route conduit through building without interfering with other equipment and construction shall not constitute a reason for an extra charge. Equipment, conduit and fixtures shall fit into available spaces in building and shall not be introduced into building at such times and manner as to cause damage to structure. Equipment requiring servicing shall be readily accessible.
- V. Arrange supports to prevent misalignment during wiring installation.

- W. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
- X. Group related conduits; support using conduit rack. Construct rack using steel channel; provide space on each for 25 percent additional conduits.
- Y. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.
- Z. Do not attach conduit to ceiling support wires.
- AA. Arrange conduit to maintain headroom and present neat appearance.
- AB. Route exposed conduit parallel and perpendicular to walls.
- AC. Route conduit installed above accessible ceilings parallel and perpendicular to walls.
- AD. Route conduit in and under slab from point-to-point.
- AE. Do not cross conduits in slab.
- AF. Maintain adequate clearance between conduit and piping.
- AG. Maintain 12-inch clearance between conduit and surfaces with temperatures exceeding 104°F (40°C).
- AH. Bring conduit to shoulder of fittings; fasten securely.
- AI. Use conduit hubs with sealing locknuts to fasten conduit in damp and wet locations.
- AJ. Install no more than equivalent of three 90-degree bends on interior locations between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use factory elbows for bends in metal conduit larger than 2-inch size.
- AK. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.
- AL. Do not use dissimilar strap or clamp supports. Provide dielectric tape, fittings, straps, and bushings where dissimilar metals are used.
- AM. Where fittings for liquid-tight flexible conduit are brought into an enclosure with a knockout, a gasket assembly, consisting of one piece "O" ring, with a Buna-R sealing material, Series 5200, shall be installed on outside of box. Fittings shall be made of either steel or malleable iron only, and shall have insulated throats or insulated bushings.
- AN. A copper ground wire sized in accordance with NEC shall be installed on the inside of the conduit as a jumper around flexible conduit to assure a continuity of ground.
- AO. Install a copper jumper across all flexible conduit including lighting fixtures, controls and other utilization equipment.
- AP. Install liquid-tight flexible conduit in such a manner as to prevent liquids from running on surface toward fittings.
- AQ. Allow sufficient slack conduit to reduce the effect of vibration.
- AR. Complete all conduit systems before pulling the conductors.

AS. Support in accordance with requirements of National Electric Code.

3.02 INSTALLATION OF BOXES

- A. Install boxes concealed in finished walls.
- B. Locate boxes to prevent moisture from entering or accumulating within them.
- C. Support boxes independently of conduit, as required by the National Electric Code.
- D. Provide 4" x 1-1/2" octagonal, 4" x 1-1/2" square or 4" x 2-1/8" square ceiling outlet boxes.
- E. All boxes, conduit bodies, and handholes shall be installed in a manner which meets the accessible and readily accessible requirements of the NEC, including in building with suspended ceilings and hold down clips.
- F. Where required to hang a specific fixture, provide a fixture stud of the no-bolt, self-locking type on ceiling outlets.
- G. Provide 2-1/2" x 3-3/4" one gang masonry boxes for switches and receptacles installed concealed in concrete block walls. For increased cubic capacity, provide 3-1/2" x 3-3/4" one gang masonry boxes. Where more than two conduits enter the box from one direction, provide 4" square boxes with square cut device covers not less than 1" deep specifically designed for this purpose. Use round edge plaster rings only if the block walls are to be plastered. Use sectional or gang-type outlet boxes only in drywall construction.
- H. Provide 4-11/16" square outlet boxes with square cut device corners for block walls or round edge plaster rings for plastered walls for telephone outlets. Single gang device boxes are not acceptable.
- I. Provide fittings with threaded hubs for screw connections and with the proper type covers for switches and receptacles served by exposed conduit. Use pressed steel outlet only for ceiling fixture outlets.
- J. Provide condulets with threaded hubs and covers and with proper configurations for all changes of direction of exposed conduits. Standard conduit ells may be used if they do not interfere or damage or mar the appearance of the installation.
- K. Use boxes of sufficient cubic capacity to accommodate the number of conductors to be installed, in accordance with the National Electric Code.
- L. Effectively close unused openings in boxes with metal plugs or plates.
- M. Set boxes so that front edges are flush with finished surfaces.
- N. Support boxes from structural members with approved braces.
- O. Install blank device plates on outlet boxes left for future use.
- P. Provide bushings in holes through which cords or conductors pass.
- Q. Install boxes so that the covers will be accessible at all times.
- R. Electrical boxes may be installed in vertical fire resistive assemblies classified as fire/smoke and smoke partitions without affecting the fire classification, provided such openings occur on one side only in each framing space and that openings do not exceed 16 square inches. All

clearance between such boxes and the gypsum board shall be completely filled with joint compound or approved fire-resistive compound. The wall shall be built around outlet boxes larger than 16 square inches so as not to interfere with the wall rating.

3.03 INSTALLATION OF PULL BOXES, JUNCTION BOXES AND WIRE TROUGHS

- A. Provide junction boxes as shown on Drawings and otherwise where required, sized according to number of conductors in box or type of service to be provided. Minimum junction box size 4-inch square and 2-1/8-inches deep. Provide screw covers for junction boxes.
- B. Install boxes in conduit runs wherever necessary to avoid long runs or too many bends. Do not exceed 100-foot runs without pull boxes. Install pull boxes at all 90-degree bends.
- C. Rigidly secure boxes to walls or ceilings. Conduit runs will not be considered adequate support.
- D. Install boxes with covers in accessible locations. Size boxes in accordance with the National Electric Code.
- E. Do not install pull boxes or junction boxes for joint use of line voltage and signal or low voltage controls unless all conductors are insulated for the highest voltage being used in the same box.
- F. Coordinate installation of exterior pull boxes with General contractor to establish elevations of finished grades and pavements. All castings shall have chimney adjustment of + 6".

3.04 CONDUIT LOCATIONS

- A. Contractor shall not route conduits over pump motors, roof hatches and trolley beams which would prevent removal of pump motors.

END OF SECTION 260533

PART 1 - GENERAL**1.01 SECTION INCLUDES**

- A. Nameplates and labels.
- B. Wire and cable markers.
- C. Conduit markers.

1.02 REFERENCES

- A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.03 SUBMITTALS

- A. Submit under provisions of Section 013300 - SUBMITTALS.
- B. Product Data: Provide catalog data for nameplates, labels and markers.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Underwriters Laboratories, Inc. Include instructions for storage, handling, protection, examination, preparation and installation of product.

1.04 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

PART 2 - PRODUCTS**2.01 NAMEPLATES AND LABELS**

- A. Nameplates: Engraved three-layer laminated plastic, white letters on black background.
- B. Locations:
 - 1. Motor Control Centers.
 - 2. Distribution panelboards.
 - 3. All control switches and pilot light devices.
- C. Letter Size:
 - 1. Use 1/4 inch (6 mm) letters for identifying all control pilot lights.
- D. Labels: Embossed adhesive tape, with 3/16" (5mm) white letters on black background. Use for identifying existing equipment, distribution panels, switchboards, disconnect switches, and individual electrical devices.

2.02 WIRE MARKERS

- A. Manufacturers:
 - 1. 3M ELECTRICAL SPECIALTY DIV., Product Scotch Code.
 - 2. THOMAS & BETTS CORP., Product E-Z Code.

3. Substitutions shall be permitted only after receiving written approval from the Engineer.
- B. Description: Epoxy film tape type wire markers.
- C. Locations: Each conductor at panelboards, auxiliary gutters, pull boxes, outlet and junction boxes, circuit breakers and each load connection.
- D. Legend:
 1. Power and Lighting Circuits: Branch circuit or feeder number indicated on drawings.
 2. Control Circuits: Control wire number indicated on interconnection diagrams on drawings.

2.03 CONDUIT MARKERS

- A. Manufacturers:
 1. THOMAS & BETTS CORP.
 2. Substitutions shall be permitted only after receiving written approval from the Engineer.
- B. Description: Self-sticking vinyl; black letters on orange background.
- C. Location: Furnish markers for each conduit longer than 6 feet (1.8 m).
- D. Spacing: 20 feet (6 m) on center.

2.04 UNDERGROUND WARNING TAPE

- A. Manufacturers:
 1. THOMAS & BETTS CORP., Model NAF-0700.
 2. Substitutions shall be permitted only after receiving written approval from the Engineer.
- B. Description: 6 inch (150 mm) wide plastic tape, detectable type, colored red with suitable warning legend describing buried electrical lines.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Degrease and clean surfaces to receive nameplates and labels.

3.02 APPLICATION

- A. Install nameplate and label parallel to equipment lines.
- B. Secure nameplate to equipment front using screws, rivets or adhesive.
- C. Secure nameplate to inside surface of door on panelboard that is recessed in finished locations.
- D. Apply conduit markers at 20 foot (6 m) intervals.
- E. Identify underground conduits using underground warning tape. Install one tape per trench at 3 inches (75 mm) below finished grade.

3.03 ELECTRICAL EQUIPMENT IDENTIFICATION

- A. The Contractor shall identify all existing circuits in existing distribution panels, switchboards and disconnect switches to remain.

- B. Label all circuits identifying the load served including all individual circuit breakers.
- C. Label all new circuit breakers and switches used for new feeder and branch circuits.
- D. Contractor shall furnish a minimum of 5 custom engrave three-layer laminated plastic labels with up to 20 words per label as directed by the engineer/owner in addition to the required labels for all pilot devices, switches, controls and timers.

END OF SECTION 260553

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Dry type transformers.

1.02 REFERENCES

- A. ANSI/NFPA 70 - National Electric Code.
- B. NEMA ST20 - Dry Type Transformers for General Applications.

1.03 SUBMITTALS

- A. Submit product data under provisions of Section 013300.
- B. Provide outline and support point dimensions of enclosures and accessories, unit weight, voltage, KVA and impedance ratings and characteristics, tap configurations, insulation system type and rated temperature rise.

1.04 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Dry type transformers shall be manufactured by General Electric Type QL.
- B. Approved equal.

2.02 EQUIPMENT REQUIREMENTS

- A. Three-phase and Single-phase general purpose dry type transformers be self-cooled, with ratings (KVA) as indicated on the drawings.
- B. Shall meet or exceed DOE 2016 efficiency requirements.
- C. Copper windings.
- D. Sound levels not to exceed the following:
 - 1. 0-9 KVA: 40 db.
 - 2. 10-50 KVA: 45 db.
 - 3. 51-150 KVA: 50 db.
 - 4. 151-300 KVA: 55 db.
 - 5. 301-500 KVA: 60 db.
 - 6. 501-700 KVA: 62 db.
- E. Three-phase transformers rated above 15 KVA to be insulated with UL listed Class 220 rated materials; and have a maximum average full load temperature rise of 115 degrees C.

- F. Transformers to have voltage ratios as indicated on drawings. Transformers between 15 KVA and 300 KVA to be provided with six 2-1/2% full capacity taps, two above and four below primary rated voltage.
- G. Nameplate: Include transformer connection data.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install transformers in accordance with manufacturer's recommendations.
- B. Provide both primary and secondary protection as shown on drawings.
- C. Set transformer plumb and level.
- D. Provide grounding and bonding in accordance with provisions of Section 260526.

3.02 FIELD QUALITY CONTROL

- A. Check for damage and tight connections prior to energizing transformer.
- B. Measure primary and secondary voltage and make appropriate tap adjustments.

END OF SECTION 262200

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Distribution panelboards.

1.02 REFERENCES

- A. ANSI/NFPA 70 - National Electric Code.
- B. NECA Standard of Installation.
- C. NEMA AB1 - Molded Case Circuit Breakers.
- D. NEMA PB1 - Panelboards.
- E. NEMA PB1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.
- F. NEMA ICS2 - Industrial Control Devices, Controllers and Assemblies.
- G. NEMA KS1 - Enclosed Switches.

1.03 SUBMITTALS

- A. Submit product data under provisions of Section 013300.
- B. Indicate outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, and circuit breaker arrangement and sizes.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. New Panelboards
 - 1. Panelboards shall be manufactured by Siemens.
 - 2. Approved equal.

2.02 PANELBOARD REQUIREMENTS

- A. Provide panelboards of circuit breaker, dead-front safety type, UL labeled, and meeting all applicable requirements of the National Electrical Manufacturers Association.
- B. Provide panelboards with lugs (both main lugs and branch circuit lugs) suitable and UL approved for both aluminum and copper conductors.
- C. Provide electrically isolated neutral bars.
- D. Provide separate ground bars complete with lugs or connectors on bar.
- E. Provide key operated door and door lock. Door shall prevent access to operate circuit breakers.
- F. Provide panelboards with sequence phased bus bars or distributed phase bussing for voltage and phase as indicated on drawings.

- G. Refer to drawings for numbers of branch circuits, their ratings, number of poles, arrangements, etc.
- H. Provide typed circuit directory cards.
- I. Provide front filler plates for unused breaker knockouts.
- J. Refer to drawings for Ratings and Features.
- K. All bus bars, including ground bars shall be tin-plated copper.
- L. All circuit breakers shall be bolt-on type.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Ground separate ground bars to panel boxes and to the main service entrance ground bus with a code-sized grounding conductor installed in the same conduit as the phase and neutral conductors under provisions of Section 260526.
- B. Install all circuits using a common neutral bus bay in accordance with the National Electric Code. Balance all circuits to achieve not greater than 7% unbalanced neutral current in panel feeders.
- C. Provide six circuit breaker handle lock-on devices for each lighting and miscellaneous power panelboard for installation by the contractor on circuits as directed by the Engineer to prevent unauthorized personnel from turning off circuits to controls, unit heaters, autodial alarm system, etc. Provide spare lock-on devices over to the Engineer.
- D. Install panelboards in accordance with NEMA PB 1.1.
- E. Install panelboards plumb.
- F. Height: 6 feet (2 m) to top of panel board.
- G. Provide typed circuit directory for each branch circuit panelboard. Handwritten circuit directory cards will not be accepted. Revise directory to reflect circuiting changes required to balance phase loads.
- H. Provide a typed circuit directory in accordance with NEC sections 110.22 and 408.4. Circuits shall be labeled with detailed information describing the switches function and equipment location.
- I. For all existing circuits terminated to a new panelboard, contractor shall trace out and update the circuit directory in accordance with NEC sections 110.22 and 408.4. Include all costs for this work in base bid.
- J. Revise directory to reflect circuiting changes required to balance phase loads.
- K. Provide engraved plastic nameplates under the provisions of Section 260553.

3.02 FIELD QUALITY CONTROL

- A. Maintain proper phasing for multi-wire branch circuits.

- B. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers, fusible switches, and fuses.

END OF SECTION 262400

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Switches, receptacles, thermostats, device plates and other wiring devices as indicated on Drawings.

1.02 REFERENCES

- A. ANSI/NFPA 70 - National Electric Code.
- B. NEMA WD1 - General Purpose Wiring Devices.

1.03 SUBMITTALS

- A. Submit product data under provisions of Section 013300.
- B. Provide manufacturer's catalog information showing dimensions, colors and configuration.

1.04 REGULATORY REQUIREMENTS

- A. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

PART 2 - PRODUCTS

2.01 SWITCHES

- A. Manufacturers: HUBBELL, BRYANT, GENERAL ELECTRIC.
- B. Single pole, 20 amp, 120/277 VAC, NEMA WD-1, heavy duty, UL20.
- C. Device Plate: Stainless steel.

2.02 RECEPTACLES

- A. Manufacturers: HUBBELL, BRYANT, GENERAL ELECTRIC.
- B. 20 amp, 125 VAC, NEMA WD-1, heavy duty.
- C. 20 amp, 125 VAC, NEMA WD-1, heavy duty, ground fault circuit interrupter.
- D. Duplex type.
- E. Device Plate: Stainless steel.
- F. Tamper-Resistant Receptacles: All receptacles in areas specified below shall be listed tamper-resistant receptacles:
 - 1. Dwelling units
 - 2. Guest rooms and guest suites of hotels and motels
 - 3. Child care facilities
 - 4. Preschools and elementary education facilities
 - 5. Business offices, corridors, waiting rooms and the like in clinics, medical and dental offices and outpatient facilities
 - 6. Public assembly occupancies

- 7. Dormitories
- 8. All areas required by NFPA 70 NEC

2.03 MANUAL MOTOR RATED THERMAL SWITCH

- A. Acceptable Manufacturers: SQUARE D, Class 2510, Type KG1A, Type KG2C (3-pole, 600V) or approved equal.
- B. Contractor shall coordinate voltage, phase and current rating with equipment.

2.04 CONTACTORS

- A. Manufacturers: Square D, Model No. LO1000V02.
- B. 4 pole, 30 amp, open type contactor.
- C. Electrically held coil, 120VAC.
- D. Quantity required: Two (2)

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Mounting:
 - 1. Mount all switches 46-inches above finished floor to center line of switch unless noted otherwise.
 - 2. Mount all receptacles 18-inches above finished floor to center line of receptacle unless noted otherwise.
 - 3. Install switches with OFF position down.
- B. Polarity: Properly wire all receptacles so that the hot wire, the neutral wire and the ground wire connect to the proper terminal on all receptacles.
- C. Grounding: Install all devices in boxes specified under Section 260533 and install a No. 12 green ground wire from device grounding terminal to the outlet box in accordance with the National Electric Code.
- D. Install device plates on switch, receptacle and blank outlets in full contact with wall surface.

3.02 FIELD QUALITY CONTROL

- A. Inspect each wiring device for defects.
- B. Operate each wall switch with circuit energized and verify proper operation.
- C. Verify that each receptacle device is energized.
- D. Test each receptacle device for proper polarity.
- E. Test each GFCI receptacle device for proper operation.

END OF SECTION 262726

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Disconnect switches.

1.02 REFERENCES

- A. NEMA KS-1 - Enclosed Switches.
- B. FS W-S 865 - Switch, Box (Enclosed), Surface Mounted.
- C. NEMA AB1 - Molded Case Circuit Breakers.

1.03 SUBMITTALS

- A. Submit product data under provisions of Section 013300.
- B. Include outlet drawings with dimensions and equipment ratings for voltage, capacity, horsepower and short circuit current ratings.

1.04 RELATED SECTION

- A. Section 260553 - Identification for Electrical Systems.

1.05 COORDINATION

- A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.01 DISCONNECT SWITCHES

- A. Disconnect switches shall be GENERAL ELECTRIC, heavy-duty Type TH or approved equal.
- B. 75°C conductor ratings.
- C. Ratings: 600VAC
- D. Quick-break, quick-make, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.
- E. Suitable for use as service entrance equipment.
- F. UL listed for Class R 200,000 RMS amps, symmetrical IC.
- G. Enclosures: Refer to drawings.

2.02 EXTRA MATERIALS

- A. Provide one complete set based on number of poles of spare fuses for each fused disconnect switch. Provide to Owner.

PART 3 - EXECUTION**3.01 INSTALLATION REQUIREMENTS**

- A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- B. Temporary Lifting Provisions: Removed temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- C. Provide switches/enclosed circuit breakers at locations as indicated on drawings.
- D. Refer to disconnect switch schedule on drawings for ampacity ratings, fuse sizes, number of poles and enclosure ratings.
- E. Install engraved nameplates on each switch and enclosed circuit breaker identifying the following:
 - 1. Switch designated.
 - 2. Load served.
 - 3. Power origination.

3.02 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.
- B. Set field-adjustable circuit breaker trip ranges.

END OF SECTION 262816

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Motor control centers.

1.02 SUBMITTALS

- A. Submit product data under provisions of Section 013300.
- B. Include electrical ratings, dimensions, mounting, material, running overcurrent protection, branch circuit overcurrent protection, wiring diagrams and accessories.
- C. Provide detailed control drawings on 24" x 36" blueprints for all motor controls which shall include all interface wiring between motor controls and instrumentation drawings as described in Section 265012 - Description of Controls. Provide point to point wiring diagrams showing interface between motor controls and instrumentation drawings.
- D. Provide detailed scaled 1/2" = 1'-0" drawings of motor control center including instrumentation and control drawings on 24" x 36" blueprints for floor plans showing MCC layout, locations and clearances.
- E. Provide detailed scaled 3/4" = 1'-0" elevation drawings of motor control center including instrumentation and controls. Elevation drawings shall show all switches, pilot lights, timers, keypads, timers and meters including scaled locations of all knockouts and cutouts on exterior of enclosures for review and approved by Engineer.
- F. Provide detailed scaled 3/4" = 1'-0" elevation drawings of motor control center including instrumentation and controls for interior mounting of all equipment. Drawings shall show sealed locations of all drives, starters, contactors, relays, protective devices, circuit breakers, fuses, wiring, timers, terminal blocks and cable connection points.
- G. Provide catalog cuts for each device including pilot lights, switches, timers, breakers, fuses, meters, protective devices, etc.

1.03 REFERENCES

- A. National Electrical Manufacturers Association (NEMA) - No. ICS-1, General Standards for Industrial Control and Systems; No. ICS-2, Industrial Control Devices, Controllers and Assemblies; No. ICS-6, Enclosures for Industrial Control and Systems.
- B. ANSI/NFPA 70 - National Electrical Code.
- C. ASTM D 178 - Specification for Rubber Insulating Matting.
- D. Underwriters Laboratories, Inc. (UL) - No. 845, Motor Control Centers, Electric.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. SIEMENS: Tiastar.
- B. Specifically Approved Equal. Substitute manufacturers shall be responsible to fit MCC line-up as detailed on drawings to the exact dimensions detailed on the drawings. Motor Control

Center manufacturer shall provide applicable U.L. labeling for all sections shown on drawings and for complete installation of all equipment specified to be packaged into the Motor Control Center. All equipment specified to be installed in Motor Control Center shall be factory installed by Motor Control manufacturer. No exceptions.

2.02 MOTOR CONTROL CENTERS

- A. Motor control centers shall be in accordance with UL, NEMA, NEC and as shown on the Drawings.
- B. Motor control center shall be same manufacturer for motor controls and all instrumentation and control cubicles.
- C. Motor control centers and instrumentation & control cubicles shall have NEMA 12 enclosures.
- D. Motor control centers shall be 3-phase, 4-wire.
- E. Motor control center is based on SIEMENS system Tiastar dimensions. Contractor shall be responsible to meet dimension requirements if substitution is proposed.
- F. Motor control centers shall be complete, floor mounted, metal enclosed, grounded, indoor type. The motor control centers shall be NEMA Standard, Class 11, Type C except where other NEMA Standard classes and types are shown on the Drawings.
- G. Ratings shall be 65,000 AIC for all motor control centers.
- H. Shall conform to the arrangements and details of the Drawings and to the spaces designated for installation. All MCC door enclosures shall open 90° with all accessories mounted. All doors shall be hinged left hand side.
- I. All MCC doors shall be removable with a wiring plug harness for quick removal of doors with disconnecting wire terminations.
- J. Design the centers to withstand the mechanical stresses caused by rough handling during shipment in addition to the electrical and mechanical stresses which will occur during operation of the centers.
- K. Coordinate components of the centers and their arrangements electrically and mechanically. The components and the control wiring shall conform to the approved shop drawings as furnished for the various applicable electrical and mechanical sections of the specifications.
- L. Assemble, connect and wire the centers at the factory in accordance with the NEMA Standard class and type for each of the centers.
- M. Thoroughly clean, phosphatize and paint the metal surfaces at the factory with primer and baked enamel or lacquer finishes.
- N. Shall have the following features:
 - 1. Standard Vertical Sections:
 - a. Approximately 90 inches high, front and rear line-up, fabricated by a single manufacturer.
 - b. Rugged steel assemblies with bracing, reinforcing gussets and jig-welding to assure rectangular rigidity. The sections shall be completely metal-enclosed, including their bottoms.
 - c. Steel shall not be less than code gauge, leveled.
 - d. Bolts, nuts and washers shall be rustproof metal.

- e. Spaces within the sections shall be suitable and adequate.
 - f. Mount the sections on adequate structural steel supports at the factory, front and rear, for the full length of each center. Install the centers so the supports will rest on top of the concrete floor surfaces except where concrete pads are indicated. Anchor the centers with bolts, not less than 1/2-inch diameter.
 - g. Each present and future motor controller shall have an individual door with hinges and latches.
 - h. End panels shall be screw-removable to facilitate future additions.
 - i. Removable panels shall have screws which remain in the panels when the panels are removed. Screws shall be received by self-aligning, self-retaining nuts attached within the assemblies.
 - j. Isolated vertical full height wiring troughs.
2. Completely equipped spaces for future motor controllers, circuit breakers and switches.
3. Motor Controllers:
- a. Stab-on type except for large ratings which require bolted connections.
 - b. Shall conform to the applicable requirements in Section 262913. Include built-in H-O-A selector switches and red and green pilot lights.
 - c. Products of a single manufacturer, SIEMENS, or approved equal.
 - d. Interchangeable for the same ratings in all of the motor control centers being installed for this contract.
 - e. Disconnecting contact devices:
 - 1) Silver plated copper, full-floating, self-aligning, self-coupling, designed for cleaning action during engaging and disengaging movements.
 - 2) Adequate flexibility between the stationary and movable components.
 - 3) Adequate pressure maintained on the contacts.
 - f. Doors mechanically interlocked to prevent their opening unless the disconnect is opened. Incorporate "defeater" mechanisms for inspection by qualified personnel.
 - g. External operating handles with lock-open pad-locking provisions and ON and OFF position indicators.
4. Identify each motor controller, circuit breaker and switch with a separate nameplate of laminated black phenolic resin with white core and engraved lettering not less than 3/16-inch high. Identify each motor by its number or other designation and indicate function fulfilled by the motor. Identify pilot light with ON and OFF designation.
5. Line Monitoring Devices:
- a. The motor control center shall be equipped with a three phase monitoring relay to interlock each starter upon phase failure, phase loss or phase reversal. The phase monitor shall be manufactured by SIEMENS, Class 47.
 - b. A separate line voltage monitor shall be included in the motor control center for each motor to interlock motor when either undervoltage, overvoltage phase loss or phase reversal occurs.
- O. Test the motor control centers at the factory to assure that the centers do not have any defects.
- P. Electrical Matting: Dielectric strength 30,000 volts, 2 feet wide, 1/4 inch thick corrugated ASTM D 178 Type 2, Class II.
- Q. All circuit breakers shall be rated 65,000 AIC. AIC based on stand alone ratings. Manufacturers rating using combined systems ratings to use lower AIC rated breakers is not acceptable.
- R. Main Protective Device - Siemens WL Insulated Case Breaker, Fixed Mount Main (**For breaker 1200A and above**)
- 1. Circuit breakers shall comply with the requirements of UL. Breakers shall be three-pole, 100% rated type or approved equal.

- a. Circuit breaker element shall have spring charged/discharged indicators and circuit breaker open or closed and ready to close indicators all of which shall be visible to the operator with the compartment door closed.
 - b. Provide interlocks to prevent racking the circuit breaker unless the breaker is open.
2. Ratings: Interrupting up to 100 kA at 480V without fuses. Short time current ratings for each circuit breaker shall be as indicated on the drawings or data tables. Circuit breakers shall be 600-volt class.
3. Operating Mechanism: Mechanically and electrically trip-free, stored-energy operating mechanism with the following features:
 - a. Normal Closing Speed: independent of both control and operator.
4. Each low voltage circuit breaker shall be equipped with self-powered, microprocessor-based trip-device to sense overload and short circuit conditions. The device shall measure true RMS current. The tripping system shall consist of high accuracy (<1%) Rogowski coil sensors on each phase, a release mechanism and the following features:
 - a. Field Installable and interchangeable front mounted trip units. Trip units can be upgraded for future expansion in functionality, such as communication.
 - b. Functions: Long time, short time and extended instantaneous protection function (EIP) shall be provided to allow the breaker to be applied at the withstand rating of the breaker with minus 0% tolerance so that there is no instantaneous override whatsoever. This feature shall furthermore allow the circuit breaker to be applied up to the full instantaneous rating of the breaker on systems where the available fault current exceeds the breakers withstand rating. Each shall have an adjustable pick-up setting. In addition, long time and short time bands shall each have adjustable time delay. Short time function shall include a switchable I²t ramp.
 - c. A software program shall be made available free of charge to support system coordination studies. The software will allow time current curves to be generated for the chosen settings.
 - d. Individual LED's shall indicate an overcurrent, short circuit or ground fault trip condition.
 - e. Time-current characteristics shall be field adjustable locally or optionally remotely via a bus system Ethernet.
 - f. Current Adjustability shall be accomplished by use of dial settings and rating plugs on trip units. The rating plug shall be front mounted and upgradeable. Upgrades to the rating plugs shall not require changes to the CT.
 - g. Pickup Points: 10 Long Time Settings.
 - h. Field Installable Ground-fault protection with at least three time-delay bands and an adjustable current pickup and an I²t ramp. Arrange to provide protection for four-wire service.
 - i. Field Installable Communications and metering functions shall be provided per schedule.
 - j. A LCD display shall be available to simplify settings & viewing data locally.
 - k. The option to remotely switch protection settings shall be provided whenever a generator is part of the power distribution system.
 - l. Field installable configurable [analog], [digital] output relays shall be available to connect directly to the trip unit.
 - m. Waveform capture and display shall be accomplished on the trip units LCD display.
5. Terminal Block Connections, shall be front mounted and utilize Screw Type Terminals.
6. Control Switch: One for each electrically operated circuit breaker.
7. Undervoltage Trip - field installable: Adjustable time-delay.
8. Indicating Lights: To indicate circuit breaker is open or closed, for electrically operated circuit breakers.
9. Accessories shall be front mounted.
10. Portable lifting yoke for drawout circuit breakers.
11. Field interchangeable accessories shall include CT's, trip units, racking mechanism and all internal & external accessories.

12. The main breaker shall have a Dynamic Arc Flash Sentry. The main breaker shall have a dual protective setting capability with graphic waveform display, similar to the Siemens WL breakers ETU776 trip unit. The main breaker will allow the installer to set two different trip curves into one breaker. One curve will be set for standard operating mode and the second curve, with instantaneous protection shall be set for arc flash mode. The switchboard shall be outfitted with a 24 VDC power supply, CubicleBus digital input module, annunciator panel with flashing light and a UPS power supply. The arc flash mode shall be actuated by a keyed. The breakers with frames rated 1200 amps or higher shall be equipped with Dynamic Arc Flash Sentry to comply with NEC 2014 240.87.
- S. Pilot Lights shall be LED type with push-to-test capabilities. No incandescent pilot lights shall be permitted.
- T. Push buttons and selector switches shall be 30.5 mm heavy duty oiltight.

2.03 POWER MONITOR

- A. Manufacturer: ACCUENERGY
 1. Model No: ACUVIM II Series.
 2. 480 volt.
- B. Quantity: One (1) required, 480V, 3 phase 4w.
- C. Provide current and potential transformers for all three phases and neutral for digital ammeters/voltmeters.
- D. The power monitor shall incorporate a vacuum display and keypad to allow the user to read the following parameters:
 1. Voltage V1, V2, V3.
 2. Current I1, I2, I3, In, Iavg.
 3. Power P1, P2, P3, Psum.
 4. Reactive Power Q1, Q2, Q3, Qsum.
 5. Apparent Power S1, S2, S3, Ssum.
 6. Frequency.
 7. Power Factor.
 8. Energy.
 9. Reactive Energy.
 10. Apparent Energy.
 11. Demand.
 12. Load Features.
 13. Four Quadrant Powers.
 14. Power Quality.
 15. Voltage Harmonics.
 16. Current Harmonics.
 17. Voltage Crest Factor.
 18. Current K Factor.
 19. Voltage Unbalance Factor.
 20. Current Unbalance Factor.
 21. Max/Min Statistics with Time Stamps.
- E. Power monitor shall have the following features:
 1. Alarms
 2. I/O Option Module
 3. Anti-tampering Seal
 4. Data Logging (8mb)

5. Automatic Frequency adaption.
 6. Power Quality Event Logging.
 7. Communication
 - a. Modbus RTU Protocol and DNP 3.0 via RS485
 - b. Ethernet (Modbus TCP, HTTP, SMTP, SNTP)
 - c. Profibus DP
 - d. BACnet IP, BACnet MS/TP
 - e. Dual RS485 Communication Ports
 8. 0.2% accuracy.
- F. Power monitors shall be factory installed on the Switchboard enclosure doors as indicated on drawings.
1. The power monitor shall be installed in ATS cabinet on the load side and shall monitor Utility power only.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install in accordance with NEC and manufacturer's instructions, and as shown on the Drawings.
- B. Install electrical matting to extend 24 inches beyond end of motor control center. Cut matting clear of obstructions.
- C. Install clear lexan window to allow visual indication of surge protection status.

END OF SECTION 262915

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Variable frequency controller.

1.02 SUBMITTALS

- A. Submit product data under provisions of Section 013300.
- B. Shop Drawings: Include front and side views of enclosures with overall dimensions and weights shown; conduit entrance locations and requirements; and nameplate legends.
- C. Product Data: Provide catalog sheets showing voltage, controller size, ratings and size of switching and overcurrent protective devices, short circuit ratings, dimensions, and enclosure details.
- D. Test Reports: Indicate field test and inspection procedures and test results.
- E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.
- F. Manufacturer's Field Reports: Indicate start-up inspection findings.
- G. Manufacturer's recommended spare parts list.

1.03 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70.
- B. Furnish products listed and tested by Underwriters Laboratories, Inc. as suitable for purposes specified indicated.

1.04 EXTRA MATERIALS

- A. Provide two of each fuse size and type.
- B. Provide one complete set of spare logic boards for each system provided.

PART 2 - PRODUCT

2.01 MANUFACTURERS

- A. Yaskawa IQPump.
- B. Approved equal.

2.02 DESCRIPTION

- A. Provide enclosed variable frequency controllers suitable for operating the indicated loads. Conform to requirements of NEMA ICS 3.1.
- B. Minimum efficiency at full load: 98 percent.

2.03 ENVIRONMENT RATINGS

- A. Operating Ambient: 0 degrees C to 40 degrees C.
- B. Relative Humidity: 5 to 95% non-condensing, all power ratings.
- C. Altitude: 3,300 feet (1,000 meters) maximum without derating.
- D. Vibration: 0.006 inches (0.152 mm) displacement, 1G peak.
- E. Shock: 15G peak for 11ms duration (+-1.0 ms).

2.04 INPUT POWER RATINGS

- A. Voltage: 460V AC +/-10%
- B. Frequency: 48 to 62 Hz
- C. Phase: 3-phase
- D. Motor Horsepower: Refer to drawings for H.P. sizes
- E. Line Transient Protection: Line transients up to 5,000 volts peak. 320 Joules phase-to-phase 380 Joules phase-to-ground.
- F. Logic Power Ride-Thru: 2 seconds or longer -- subject to the integrity of user supplied external circuits.
- G. Drive Characteristics: Drive shall use isolated gate bi-polar technology.
- H. Control Logic Noise Immunity: Showering arc transients from 350 to 2,000 volts peak.
- I. Voltage: **Drive Rating BOO3-B200**
0 to applied input voltage, 230V AC, maximum output voltage cannot exceed applied input voltage.
- J. Frequency Range: 0 to 250 Hz with local programmable minimum and maximum limits
- K. Frequency Resolution: **Digital**
Preset speeds (serial interface or pulse train input) to 0.005 Hz of set frequency within the minimum and maximum limits.
Analog
Equal divisions between minimum and maximum limits to the nearest 0.005 Hz as a function of signal type.

Local speed pot, 1003 divisions.
Remote speed pot, 633 divisions.
4 to 20 mA input (TB2, Terminals 4 and 6), 726 divisions.
- L. Frequency Regulation: Digital Frequency Source: 0.0013% of set frequency, 0 to 40°C temperature range.
- M. Volts-per-Hertz: Fully programmable - Minimum 1 to 14.3 V/Hz through local programming.
- N. Intermittent Overload Capability: Programmable MOPC from 50 to 150% of rated output current for up to 1 minute maximum.
- O. Carrier Frequency: Carrier frequency shall be adjustable up to 15 KHz. No exceptions.

2.05 DRIVE ACCESSORIES

- A. Display: Provide integral digital display to indicate output voltage, output frequency, and output current. Display shall be flush mounted on VFD enclosure door.

- B. Elapsed Time Meter: Non-resettable 6 digit.
- C. Input Signal: - 20 mA DC.
- D. Disconnecting Means: Include integral circuit breaker on the line side of each controller.
- E. One (1) 0 to 30 mA D.C. ammeter to monitor 4-20 mA input signal from PID controller. (3-1/2" square minimum).
- F. Hand-Off-Automatic Selector Switch.
- G. Drive-Bypass Selector Switch
- H. Ten (10) turn speed control pot.
- I. Isolation contactor (NEMA Rated).
- J. Output/Bypass contactors (NEMA Rated).
- K. Start Delay Timer: Eagle Cycle-Flex.
- L. Auxiliary NO and NC contacts.
- M. Three (3) programmable preset speeds to be initiated through contact closure.
- N. Lightning/surge arrestor with individual line to line and individual line to ground protection. Clamping voltage levels shall be specifically sized for the applied system voltage.
- O. Provide solid state overload relay on load size of bypass contactor and thermal overload relay on load side of output contactor as manufactured by SIEMENS.
- P. Fast-acting fuses on load side of main circuit breaker sized in accordance with manufacturers recommendations.
- Q. Isolated 4-20 mA input for follower signal input.
- R. Smart Keypad: Key pad shall have 1K memory for downloading information to any drive. Removable flush mounted on enclosure door.
- S. 4-20 mA scaled output proportional to drive speed. Input to PLC.
- T. Drive shall have three inputs for preset speeds initiated by remote contacts.
- U. Drive shall have speed contacts to close when speed is reached and be input to the PLC.
- V. Drive shall have fault and not in Auto Contacts and shall be input to the PLC.
- W. Provide 3-5% Line/Input Reactor for all VFDs specified.
- X. For VFDs located 100 feet or greater from the motor they are controlling, Contractor shall provide an appropriate 3-5% Load/Output Reactor, DV/Dt Filter, or Sine Wave Filter as recommended by the manufacturer. Refer to drawings for applicability.

2.06 VARIABLE SPEED DRIVE SYSTEM

- A. The variable speed drive system shall include a diode bridge converter, filter network and a transistorized inverter section. Base driver signals used to control firing of the power transistors shall be designed with optically-coupled-isolators for optimum drive protection. The output must be sinusoidal wave, pulse width modulated, voltage wave form for reduced harmonic heating in the motor. The systems shall include all the necessary control circuits, synchronizing the equipment and protective devices as required by design. The drive unit shall be able to withstand a phase-to-phase and a phase-to-ground short without damage to the drive unit. The systems protection as a minimum shall provide the following:

Current Limit:	115% of rated current
Overcurrent:	180% of rated output current IET (trip fault)
Shortcircuit:	Phase-to-phase (trip fault)
Overvoltage:	High D.C. bus voltage (trip fault)
Undervoltage:	20% below line voltage (trip fault)
Momentary Power Failure:	30 to 500 milliseconds
Burn-out:	D.C. bus fuse protection or 3 phase input fusing
Terminal Strip for Remote Alarms:	Fault contact (Form C)
Digital Indication Individual Fault Condition:	Overcurrent of a transistor. Output overcurrent or shortcircuit. Overcurrent while running. Thermal overload. Overvoltage of the D.C. bus due to regeneration. Overvoltage of the D.C. bus due to high line voltage. Overtemperature of the enclosure. Ground fault.
LED Indication:	D.C. bus capacitor charge
Stall Protection:	Prevents current limit activation during overload condition to prevent stall
Ground Fault:	Detects output shortcircuit due to a ground (trip fault)
Voltage Limit:	Prevents the overvoltage of the D.C. bus during deceleration
Accel & Decel Time:	Fully programmable.

The control shall contain system adjustments. The adjustments shall be by potentiometers. The potentiometer shall be accessible through the front portal door on the unit which prevents exposure to lethal voltage to the operator.

The system parameters shall be shown on the digital display meter before, during and after the adjustment. The digital display shall indicate the actual setting of the adjustment, not percentage of setting. The following adjustment shall be provided:

Acceleration:	0.1 to 60 seconds
Deceleration:	0.1 to 60 seconds
Upper Frequency Limit:	0 to 80 Hz
Lower Frequency Limit:	0 to 80 Hz
Auto Reference Bias:	0 to 80 Hz
Auto Reference Gain:	0 to 80 Hz

The unit shall be self-protecting to prevent any misadjustments by the operator. The upper limit cannot be set below the lower limit, and will signal the operator of this misadjustment.

2.07 DESIGN

- A. Employ microprocessor based inverter logic isolated from power circuits.
- B. Employ IGBT inverter system.
- C. Adjustable carrier frequency up to 15 KHz.
- D. Employ switching power supply operating off DC link.
- E. Design for ability to operate controller with motor disconnected from output.
- F. Design to attempt five automatic restarts following fault condition before locking out and requiring manual restart.
- G. In the event of sustained power loss, the control shall shut down safely without component failure. In the event of momentary power loss, the control shall shut down safely without component failure. Upon return to power the system shall automatically return to normal operation, being able to restart into a rotating motor, regaining positive speed control without power failure.

2.08 FABRICATION

- A. Wiring Terminations: Match conductor materials and sizes indicated.
- B. Enclosure: NEMA 250, Type 1.
- C. Finish: Manufacturer's standard enamel.

2.09 SOURCE QUALITY CONTROL

- A. Inspect and production-test each product specified in this section.
- B. Test shall include simulated operation.
- C. Notify engineer at least five (5) days prior to test. Owner or Engineer may witness test.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Controllers shall be factory installed in Motor Control Center by same manufacturer of Motor Control Center.
- B. Install controller in accordance with manufacturer's written instructions and NEMA ICS 3.1.

- C. Tighten accessible connections and mechanical fasteners after placing controller.
- D. Install fuses in fusible switches.
- E. Select and install overload heater elements in controllers to match installed motor characteristics.
- F. Provide engraved plastic nameplates under the provisions of Section 260553.
- G. Provide neatly typed label inside each motor controller door identifying motor served, nameplate horsepower, full, load amperes, code letter, service factor, and voltage/phase rating.

3.02 ADJUSTING

- A. Make final adjustments to installed drive to assure proper operation of system. Obtain performance requirements from installer of driven loads.

3.03 DEMONSTRATION

- A. Demonstrate operation of controllers in automatic and manual modes.
- B. Provide the services of the manufacturer's trained personnel to completely check the VFD system installations and adjust the drive for operation. An additional period shall be included for trained personnel at the time of acceptance and field tests. A minimum amount of six days and three trips shall be required for this work.
- C. Manufacturer's trained personnel, after initial field startup shall remove all logic PC boards for the pump program logic and install and adjust a spare set of PC boards. These boards shall remain in the drives and the initial boards shall be provided as spares.
- D. Service Contract - Provide a one-year service contract for the pump control system. Service contract shall include the services of a manufacturer trained engineer to provide preventive maintenance service and calibration of the equipment. At least four routine service trips shall be made as scheduled by Owner. In addition, whenever trouble occurs with the system, a serviceman shall come and repair/replace defective parts at no additional cost. All parts required for repair shall be included at no additional cost. This service contract shall take effect one year after acceptance of the equipment and after the one-year guarantee period has lapsed.

END OF SECTION 262923

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Interior and exterior luminaires and accessories.
- B. Emergency lighting and units.

1.02 REFERENCES

- A. ANSI C82.1 - Ballasts for Fluorescent Lamps - Specifications.
- B. NEMA WD 6 - Wiring Devices - Dimensional Requirements.
- C. NFPA 70 - National Electric Code.
- D. NFPA 101 - Life Safety Code.
- E. LM-79-08, IESNA Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products
- F. LM-80-08, IESNA Approved Method for Measuring Lumen Maintenance of LED Light Sources

1.03 SUBMITTALS

- A. Submit product data under provisions of Section 013300.
- B. Shop Drawings: Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
- C. Product Data: Provide dimensions, ratings, performance data and installation instructions.
- D. Submit manufacturer's installation instructions. Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation and installation of Product.
- E. All foot candle calculations and photometrics must be provided with substitute products. Photometrics shall include a room by room analysis showing walls, room names and room numbers. Calculation points shall be 2 feet on center, measured at 30" above the floor. Maintained foot candle levels shall meet or exceed those listed in Section 2.03B of this specification. On each drawing, provide a table showing the Room Name, Room Number, Maximum Light Level, Minimum Light Level, Average Light Level, Min:Max Ratio and, IES File Model Number.
- F. All substitute LED light fixtures and LED retrofit lighting kits must be Design Lights Consortium (DLC) qualified.
- G. All substitute LED replacement lamps must be listed by Energy Star as Certified Light Bulbs.

1.04 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc.

1.05 EXTRA PRODUCTS

- A. Section 017800 - Closeout Submittals.
- B. LED Fixtures: At completion of installation, deliver to Owner.
 - 1. Five (5%) percent of additional fixtures for each type specified on the light fixture schedule with a minimum of one (1) fixture.

PART 2 - PRODUCTS

2.01 LIGHTING UNITS

- A. Refer to lighting fixture schedule on drawings for fixture manufacturer, catalog number, and fixture description.
- B. Provide electronic energy saving ballasts. Where dimming is shown on drawings, provide dimmable type ballasts.
- C. All fixtures equipped with emergency battery packs shall have test light and switch accessible and visible from the room floor.

2.02 LIGHTING FIXTURE NOTES

- A. MOUNTING: Electrical Contractor is responsible for reviewing all mounting arrangements prior to ordering any products. Electrical Contractor is responsible for ordering all of the proper fixtures, mounting hardware and miscellaneous fasteners to complete project. Fixtures to be secured to the structure from a minimum of two points, at opposing ends of the fixture when ceiling recessed or surface mounted. Four points shall be secured where necessary for the fixture to be parallel and tight to underside of ceiling. All recessed fixtures to fit tight to ceiling to eliminate all light leaks. Trim kits, when not secured internally to fixture, shall be secured to structure at a minimum of two points.
- B. MOUNTING: Prior to submitting and ordering any light fixture, Contractor is responsible for verifying adequate mounting clearances for all light fixtures that are to be recessed into a grid type ceiling. Where new ceilings are to be installed, contractor shall coordinate with ceiling installers for exact mounting heights and required mounting spaces.
- C. FINISHES: All exposed portions (permanent or adjustable) of fixtures to be finished by the manufacturer in a finish as specified.
- D. Fixtures shall come pre-assembled and complete with all sockets (incandescent to be spring supported), lamp ends, ballasts, transformers, fixture ends, trim rings, plates, and low density mounting kits (as required) for a complete installation.
- E. LENSES:
 - 1. Fluorescent - Minimum 0.125" thick and to be virgin acrylic.
 - 2. Low voltage - Tempered glass, to enclose lamp.
- F. LAMPS: Sylvania, Phillips or General Electric, as selected by the Electrical Contractor. Note, all lamps for one project to be furnished by the same manufacturer unless otherwise specified. At the end of the project, the Electrical Contractor shall turn over to the Owner one lamp envelope from each type installed. The Contractor shall be responsible for replacing all lamps which burn out during construction and up to ninety (90) days after Owner occupancy of the building.

- G. VOLTAGE: As noted on the lighting fixture schedule. Contractor is responsible for field verifying available voltage(s) and ordering fixtures, ballasts, and transformers accordingly.
- H. ORDERING: It is solely the responsibility of the Contractor to order fixtures, lamps, mounting brackets and accessories so that the fixtures will be installed and operating upon Owner Occupancy opening. Contractor is responsible for all delays because of his/her lack of effort to order the products in a timely manner.
- I. SHIPPING: The light fixture manufacturer shall mark the fixture type as indicated on the contract drawings and/or shop drawings on the respective carton when shipping luminaries. The Contractor shall be responsible for checking each carton immediately upon receipt for verification that fixtures are undamaged and no contents are missing. All discrepancies must be reported to shipper and manufacturer immediately; otherwise the Contractor shall be responsible for items which are lacking or damaged.

2.03 WARRANTY

- A. All light fixtures shall have a 5-year manufacturer's warranty. Warranty shall begin on date of substantial completion.

2.04 SUBSTITUTIONS

- A. ADD STANDARD LIGHT LEVELS IF NEEDED.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install fixtures in accordance with manufacturer's instructions.
- B. Mount fixtures in locations as shown on drawings and as called for in schedule on electrical drawings. Determine type of ceiling to be installed in each space from drawings and schedules and furnish fixtures suitable for the exact type.
- C. Joints in fixture wiring shall be made using wire nuts, pre-insulated Scotch locks, or other approved mechanical means of connection.
- D. Adjustable type fixtures shall be adjusted by the Contractor to illuminate intended area to satisfaction of the Engineer.
- E. Surface fixtures in or on plastered or drywall ceilings shall be supported from pieces of support channel spanning across main support channels and shall not depend on ceilings for support.
- F. Coordinate fixture locations to clear diffusers, ductwork, piping, etc.
- G. Maintain integrity of enclosures on all enclosed and gasketed fixtures. Minimize number of enclosure penetrations and make such penetrations water and dust tight with appropriate gasketing and fittings.
- H. Fixtures are to fit tight against construction to eliminate light leaks.
- I. Support recessed fixtures 2 foot x 2 foot and larger using a minimum of four independent wire hangers, one on each corner, of same gauge as ceiling suspension system supported from building structure independent of ceiling framing. Install earthquake clips to secure recessed grid-suspended luminaries in place.

- J. Wall-mounted fixtures shall be mounted plumb with building lines and installed with proper box and cover hardware.
- K. Surface-mounted fixtures are to cover mounting hardware. Use a canopy that is no longer than the length and width of the fixture and at a height that is no higher than required to mount the fixture absolutely vertical. Fixtures shall be plumb and shall align with building lines and with each other. Support surface mounted luminaires on grid ceiling directly from building structure. Secure to prevent movement.
- L. Stem-mounted fixtures are to be mounted to be absolutely vertical or horizontal. Install suspended luminaires using pendants supported from swivel hangers or in accordance with details shown in drawings. Provide pendant length required to suspend luminaire at indicated height. Support stem-mounted fixtures directly from the building structure.
- M. Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating. In fire rated ceilings, recessed luminaires must carry one-hour UL fire rating classification.
- N. Install all accessories specified with each fixture. Install recessed luminaires to permit removal from below.
- O. Bond products and metal accessories to branch circuit equipment grounding conductor.
- P. At completion of installation and before turning over to owner, clean and remove all dirt and smudges from all lighting fixtures including lenses, louvers and reflectors.
- Q. Relamp lamps and replaced LED luminaires that have failed at completion of project.

END OF SECTION 265000

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Remove and dispose of surface debris as required.
- B. Remove and dispose of paving, sidewalk, curbs, etc.
- C. Clear site or designated areas of the site of plant life and grass as required, and dispose of as required.
- D. Remove and dispose of trees and shrubs as required.
- E. Remove and dispose of stumps and root system of trees and shrubs as required.
- F. Removal and storage of topsoil.

1.02 RELATED SECTIONS

- A. Section 312316 - Excavation.
- B. Section 329119.13 - Topsoil Placement and Grading: Placement of stored topsoil.

1.03 REGULATORY REQUIREMENTS

- A. Conform to applicable local code(s) for disposal of debris.
- B. Burning of materials on site is prohibited.
- C. Coordinate clearing work with utility companies.

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 PREPARATION

- A. Verify existing conditions.
- B. Identify existing plant life designated to be removed. Verify with Owner and Engineer prior to removal.
- C. Verify limits of clearing.

3.02 PROTECTION

- A. Locate, identify and protect utilities that are to remain from damage.
- B. Protect trees, plant growth and features designated to remain as final landscaping.
- C. Protect benchmarks and existing structures from damage or displacement. Any damage to existing structures is to be promptly repaired at no additional cost to the Owner.

3.03 APPLICATION

- A. Clear areas required for access to site and execution of work.
- B. Remove paving, curbs, debris and sidewalks as required.
- C. Remove trees and shrubs designated to be removed. Remove stumps, main root ball, surface rock and perishable debris.
- D. Clear undergrowth and dead wood without disturbing subsoil.
- E. Remove paving, debris, rock and extracted plant life from site and dispose of in accordance with State and local ordinances.
- F. Excavate topsoil from areas to be further excavated, re-landscaped or regraded. Do not excavate wet topsoil.
- G. Stockpile topsoil in area designated on site to a height not exceeding 8 feet. Protect from erosion. Remove excess topsoil not being reused from site. Do not remove any topsoil from the site prior to obtaining the approval of the Engineer.

END OF SECTION 311110

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Removal and storage of subsoil.
- B. Cutting, grading, filling and rough contouring the site prior to placement of topsoil or pavement base for final grading.

1.02 RELATED SECTIONS

- A. Section 311100 - Site Clearing.
- B. Section 312316 - Excavation - Removal of Unsuitable Soils.
- C. Section 312323.13 - Backfilling - Replacement of Unsuitable Soils.

1.03 REFERENCES

- A. ANSI/ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb. Rammer and 18 inch Drop.

1.04 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Sieve Analysis: Submit a sieve analysis of all types of fill material to be used.

1.05 PROJECT RECORD DOCUMENTS

- A. Accurately record actual locations of utilities remaining, by horizontal dimensions, elevations or inverts, and slope gradients.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Subsoil: Reused excavated material, graded, free of lumps, rocks and gravel larger than 3 inches in size, debris and contaminants.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify site conditions.
- B. Verify that survey benchmark and intended elevations for the work are as indicated.

3.02 PREPARATION

- A. Identify required lines, levels, contours and datum.
- B. Identify known underground, aboveground and aerial utilities. Stake and flag locations.
- C. Coordinate the removal or relocation of utilities with the necessary utility companies.

- D. Protect above and below-grade utilities that are to remain.
- E. Protect plant life, lawns, rock outcropping and other features remaining as a portion of final landscaping.
- F. Protect benchmarks, existing structures, fences, sidewalks, paving and curbs from excavation equipment and vehicular traffic.

3.03 APPLICATION

- A. Excavate subsoil from areas to be further excavated or regraded. Do not excavate wet subsoil.
- B. Stockpile in area designated on site. Remove excess subsoil not being reused from site.
- C. Stockpile subsoil to a height not exceeding 8 feet. Cover to protect from erosion.
- D. When excavation through roots is necessary, perform work by hand and cut roots with sharp axe.
- E. Fill areas to contours and elevations with unfrozen subsoil material with allowances made for topsoil, aggregate base course or paving.
- F. Place and compact subsoil fill material in 12 inch lifts (compacted thickness). Compact to 92 percent maximum dry density in accordance with ANSI/ASTM D1557.
- G. Maintain optimum moisture content of fill materials to attain required compaction density.
- H. Make grade changes gradual. Blend slope into level areas.
- I. Remove surplus fill materials from site.

3.04 TOLERANCES

- A. Maximum Variation From Top Surface of Subgrade: 1 inch.

3.05 FIELD QUALITY CONTROL

- A. Perform field inspection and testing under provisions of Section 014500.
- B. Perform tests and analysis of fill material in accordance with ANSI/ASTM D1557.
- C. Perform compaction tests at a rate of one for every 10 cubic yards of material placed.

END OF SECTION 312213

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Excavation for foundations.
- B. Excavation for slabs-on-grade, paving and landscaping.
- C. Excavation for site structures.

1.02 RELATED SECTIONS

- A. Section 312316.13 - Trenching
- B. Section 312323.13 - Backfilling
- C. Section 315000 - Excavation Support and Protection

1.03 QUALITY ASSURANCE

- A. Do not excavate wet or frozen materials without written approval from the Engineer.
- B. If excavation exceeds a depth of four feet (1.2 m), place temporary sheeting. Refer to Section 315000.
- C. Provide safety barricades around all open excavations as specified in Division 01 sections.

1.04 FIELD MEASUREMENTS

- A. Verify that survey benchmark and intended elevations for the work are as indicated.

1.05 COORDINATION

- A. Coordinate excavation with installation of sheeting and pile work (if required).

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 PREPARATION

- A. Comply with the requirements contained in Section 312316.13 - Trenching regarding the location, verification, and mapping of underground utilities (pipelines, water, gas, electrical conduit, electricity, etc.) prior to starting any excavation required under this project.
- B. Identify required lines, levels, contours, and datum.
- C. Identify known underground, above ground and aerial utilities. Stake and flag locations.
- D. Notify utility company to remove or relocate utilities, if required.
- E. Protect above and below grade utilities that are to remain.

- F. Protect plant life, lawns and other features remaining as a portion of final landscaping.
- G. Protect benchmarks, existing structures, fences, sidewalks, paving and curbs from excavation equipment and vehicular traffic.
- H. Notify the Engineer prior to commencement of excavation.

3.02 EXCAVATION

- A. Underpin adjacent structures that may be damaged by excavation work, including utilities and pipe chases.
- B. Excavate for structures, building foundations, slabs-on-grade, paving, drainage or sanitary structures, sidewalks, landscaping to the limits as indicated on the plans and extend a sufficient distance from walls, piers, footings and curbs to provide adequate clearances for construction operations, including sheeting and bracing, if required, and for inspection purposes.
- C. Trim approximately the last four (4) inches of excavation subgrade in earth with a smooth edged bucket or by hand just prior to placement of concrete or concrete reinforcement.
- D. Machine slope banks to angle of repose or less, until shored.
- E. Excavation cut not to interfere with normal 45 degree bearing splay of foundations.
- F. Grade top perimeter of excavation to prevent surface water from draining into excavation.
- G. Hand trim excavation. Remove loose matter.
- H. Remove lumped subsoil, boulders, and rock.
- I. Notify Engineer of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.
- J. Stockpile excavated material in area designated on site.

3.03 FIELD QUALITY CONTROL

- A. Field inspection will be performed under provisions of Section 014500.
- B. Provide for visual inspection of bearing surfaces.

3.04 PROTECTION

- A. Protect work under provisions of Section 015000.
- B. Protect excavations by methods required to prevent cave-in or loose soil from falling into excavation.
- C. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

3.05 DISPOSAL OF MATERIALS

- A. All suitable excavated material shall be utilized for backfill and embankment or for Owner selected stockpiling. Stockpile on-site or transport suitable material off site and bring back when conditions allow the stockpiling or filling operations to begin.

- B. All excess suitable excavated material shall become the property of the Contractor and be disposed of by the Contractor in accordance with governing regulations and laws. The cost for hauling and disposal of excess suitable excavated material shall be included in the price as bid.
- C. All unsuitable excavated material that cannot be used for backfill shall become the property of the Contractor and be hauled and disposed of off-site in accordance with governing regulations and laws. The cost for hauling and disposal of unsuitable material shall be included in the price as bid.

3.06 MATERIALS

- A. Remove unsuitable materials in excavations, which are incapable of supporting structures, as determined by an independent soil-testing laboratory, to the extent and depth directed by the Engineer. Refill and compact the excavation with Type C - Sand fill as defined in Section 312323.13. If required and directed by the Engineer, import Type C - Sand. The trucking and material costs associated with the import of Type C material will be paid for as "Extra Work" in accordance with the provisions contained in the Contract. The equipment cost used to offload and place imported material shall be included in the price as bid. The cost for filling and compacting the imported material shall also be included in the price as bid.

END OF SECTION 312316

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. The work of this Section also includes backfilling and compaction requirements, excavation for trenches for below grade piping and utilities.

1.02 RELATED SECTIONS

- A. Section 023000 - Subsurface Investigation
- B. Section 315000 - Excavation Support and Protection
- C. Section 312213 - Rough Grading
- D. Section 312316 - Excavation

1.03 REFERENCES

- A. ANSI/ASTM C136 - Method for Sieve Analysis of Fine and Coarse Aggregates.
- B. ANSI/ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb. (4.54 kg) Rammer and 18-inch (457 mm) Drop.
- C. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

1.04 SUBMITTALS

- A. Sieve analysis for imported bedding material.
- B. Utility mapping drawings.

1.05 QUALITY ASSURANCE

- A. Do not excavate wet or frozen materials without written approval from the Engineer.
- B. Do not backfill over or with wet or frozen materials.
- C. When an excavation exceeds a depth of 4 feet (1.2 m), the Contractor shall place temporary sheeting. Comply with the requirements contained in Section 315000 and all OSHA standards.
- D. Field quality control laboratory tests will be paid for out of the cash allowance for testing services. Coordination with the testing lab shall be the Contractor's responsibility and be included in the price as bid.

1.06 FIELD MEASUREMENTS

- A. Verify that survey benchmark and elevations for the work are as shown on plans.

1.07 COORDINATION

- A. Coordinate all the work under the provisions of Section 013100.

- B. Coordinate and make all arrangements to have the testing laboratory present so that tests can be made. The Engineer may stop trenching operations until such time as the testing laboratory is on-site to make tests or take required samples.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Bedding: Natural river or bank sand; washed; free of silt, clay, loam, friable or soluble materials, or organic matter; graded in accordance with ANSI/ASTM C136; within the following limits:

<u>Sieve Size</u>	<u>Percent Passing</u>
No. 4 (4.75 mm)	100
No. 16 (1.18 mm)	10-100
No. 50 (0.30 mm)	5-90
No. 100 (0.15 mm)	4-30
No. 200 (0.075 mm)	0-1

- B. Type A - Gravel Fill: Refer to Section 312323.13 for gradation requirements.
- C. Subsoil: Reused, excavated material, graded, free of lumps, rocks and gravel larger than 3 inches (75 mm) in size, debris and contaminants.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that existing site conditions are suitable for trenching operations to take place in that existing structures, piping, and utilities have been located as not being in conflict with the new work.
- B. Verify, with the Engineer, that excavated material is acceptable for fill. If directed by the Engineer, send soil samples to the testing laboratory to determine its ability to support intended loads.
- C. Test piping prior to backfilling in accordance with the requirements contained in Section 017550.
- D. Do not backfill any item until the Engineer has fully inspected the work. Expose the work that was not inspected by the Engineer, when so directed by the Engineer.

3.02 PREPARATION

- A. Identify and confirm the location of all underground piping shown on the Contract Drawings prior to excavating for pipe or structures. Dig test holes and employ the underground utility mapping company to determine the existence and location of underground utilities prior to starting any underground work.
- B. Identify required lines, levels, contours, and datum.
- C. Maintain and protect existing utilities remaining which pass through the work area.
- D. Protect plant life, lawns, rock outcropping, and other features remaining as a portion of final landscaping.

- E. Protect benchmarks, existing structures, fences, sidewalks, paving, and curbs from excavation equipment and vehicular traffic. Any item damaged by the Contractor shall be promptly repaired at the Contractor's expense.
- F. Protect above and below grade utilities that are to remain.
- G. Excavate unsuitable material in accordance with the requirements contained in Section 312316 and import suitable material.

3.03 EXCAVATION

- A. Excavate subsoil required for piping.
- B. Excavate trenches to the dimensions shown on the plans, or if not shown, to the dimensions required to properly install the work.
- C. Excavation shall not interfere with normal 45 degree bearing splay of foundations.
- D. Hand trim excavation. Hand trim for bell and spigot pipe joints, if necessary. Remove loose matter.
- E. Remove lumped subsoil, boulders, and rock.
- F. For trenches made in solid rock, excavate to a depth of 1 foot (300 mm) below the proposed pipe invert.
- G. Stockpile excavated material in area designated on site and remove excess as specified in Section 312316.
- H. Install sheeting if trench depth exceeds 4 feet (1.2 m). Refer to Section 315000.

3.04 INSTALLATION - BEDDING

- A. Support pipe and conduit during placement and compaction of bedding fill.
- B. For trenches made in solid rock, place an additional 1-foot (300 mm) of bedding under pipe or conduit.
- C. Place bedding to the dimensions and limits as shown on the plans.
- D. Place bedding material against and to 1 foot (300 mm) over the top of the pipe or conduit in 6 inch (150 mm) compacted layers.
- E. Compact bedding material to 95 percent maximum dry density in accordance with ANSI/ASTM D1557 or ASTM D2922. Maintain optimum moisture content to attain required density.
- F. Place bedding simultaneously on both sides of the pipe or conduit.

3.05 BACKFILLING

- A. Backfill trenches to contours and elevations with unfrozen materials.
- B. Backfill to the dimensions and limits shown on the plans.
- C. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.

- D. Place and compact material in continuous layers not exceeding 6 inches (150 mm) compacted depth.
- E. Employ a placement method that does not disturb or damage conduit or pipe.
- F. Compact backfilled materials to 95 percent of maximum dry density in accordance with ANSI/ASTM D1557 or ASTM D2922. Maintain optimum moisture content to attain required density.
- G. Import suitable material as specified in Section 312323.13 if directed by the Engineer.

3.06 TOLERANCES

- A. Maximum variation from top surface of backfilling under paved areas: 1/4 inch (13 mm).
- B. Maximum variation from top surface of general backfilling: 1 inch (25 mm).

3.07 FIELD QUALITY CONTROL

- A. Perform testing under provisions of Section 014500.
- B. Perform tests and analysis of fill material will be performed in accordance with ANSI/ASTM D1557 or ASTM D2922.
- C. If tests indicate work does not meet specified requirements, remove work, replace and re- test at no cost to Owner.
- D. Unless additional testing is required by the Engineer, compaction tests shall be taken every 100 feet (30 m), at the springline of the pipe and every 2 vertical feet (610 mm) of backfill.

END OF SECTION 312316.13

PART -1 GENERAL

1.01 SECTION INCLUDES

- A. Site structure backfilling to sub-grade elevations.
- B. Site filling and backfilling.
- C. Consolidation and compaction.
- D. Fill for over-excavation.
- E. Environmental testing.

1.02 RELATED SECTIONS

- A. Section 312316 - Excavation.
- B. Section 312213 - Rough Grading.

1.03 REFERENCES

- A. ANSI/ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb. Rammer and 18-inch Drop.
- B. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes.

1.04 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Material Source: Submit name of imported material suppliers.
- C. Provide a letter certifying that each type of imported fill material has been provided by a NYSDEC certified clean fill source or has been tested in accordance with NYSDEC Unrestricted Soil Use Guidelines as defined in Subpart 375-6 Remedial Program Soil Cleanup Objectives.
- D. Test Reports: Submit sieve analysis and test results from NYSDEC Unrestricted Soil Use Guidelines for each type of imported fill to be used.

1.05 PROJECT CLOSEOUT SUBMITTALS

- A. Submit under provisions of Section 017200.
- B. Provide documentation on the contractor's letterhead certifying that all fill material utilized for this project came from approved sources and met the requirements of the NYSDEC Unrestricted Program Soil Use Guidelines.

PART 2 - PRODUCTS

2.01 IMPORTED FILL SOURCE

- A. All imported fill materials shall be provided by a NYSDEC certified clean fill source or meet the requirements of NYSDEC Unrestricted Soil Use Guidelines as defined in Subpart 375-6: Remedial Program Soil Cleanup Objectives.
- B. Test samples of imported fill in accordance with the following table:

Recommended Number of Soil Samples for Imported Soil			
Contaminant	VOC's	SVOC's, Inorganics & PCB's/Pesticides	
Soil Quantity (cubic yards)	Discrete Samples	Composite	Discreet Samples/Composit e
0-50	1	1	3-5 discrete samples from different locations in the fill being provided will comprise a composite sample for analysis
50-100	2	1	
100-200	3	1	
200-300	4	1	
300-400	4	2	
400-500	5	2	
500-800	6	2	
800-1000	7	2	
>1000	Add an additional 2 VOC and 1 composite for each additional 1000 cubic yards or consult with DER		

- C. Provide materials from the same source throughout the work. Change of source requires approval from the Engineer.

2.02 FILL MATERIALS

- A. Coarse Aggregate: Angular crushed or natural stone; washed, free of shale, clay, friable material, sand and debris; graded in accordance with ASTM D2487 Group Symbol GW or GP within the following limits
- | | |
|---------------|-----------------|
| 1. Sieve Size | Percent Passing |
| a. 1 1/2 inch | 100 |
| b. 1 inch | 90 - 100 |
| c. 1/2 inch | 0 - 15 |
| d. No. 200 | 0 - 1 |
- B. Pea Gravel: Natural stone; washed, free of clay, shale, organic matter; graded in accordance with ASTM D2487 Group Symbol GC or GM, within the following limits:
- Minimum Size: 1/4 inch.
 - Maximum Size: 5/8 inch.

- C. Sand: Natural river or bank sand; washed, free of silt, clay, loam, friable or soluble materials, or organic matter; graded in accordance with ASTM D2487 Group Symbol SW or SP, within the following limits:
- | | |
|---------------|-----------------|
| 1. Sieve Size | Percent Passing |
| a. No. 4 | 100 |
| b. No. 14 | 0 - 100 |
| c. No. 50 | 5 - 90 |
| d. No. 100 | 4 - 30 |
| e. No. 200 | 0 |
- D. Subsoil: Reused, excavated material, graded, free of lumps, rocks and gravel larger than 3 inches in size, debris and contaminants; no more than 15% passing the No. 200 sieve; no more than 30% retained on the $\frac{3}{4}$ " sieve.
- E. Drywell Collar Material: Clean sand and gravel containing less than 15% fine sand, silt and clay. Silt and clay fractions are not to exceed 5%. Native material may be reused if it meets this requirement.
- F. New York State Department of Transportation No. 2 Stone

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions and substrate.
- B. Verify fill materials to be reused are acceptable.
- C. Verify items to be buried during backfilling process have been inspected prior to backfilling.

3.02 PREPARATION

- A. Compact subgrade to 92 percent maximum dry density in accordance with ANSI/ASTM D1557.
- B. Cut out soft areas of subgrade not capable of in situ compaction. Backfill with sand or subsoil and compact to density equal to or greater than requirements for subsequent backfill material.

3.03 BACKFILLING

- A. Backfill areas to contours and elevations with unfrozen materials.
- B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy materials.
- C. Place and compact fill material in 12 inch lifts (compacted thickness). Compact to 92 percent maximum dry density in accordance with ANSI/ASTM D1557.
- D. Employ a placement method that does not disturb or damage structures or other items against which material is backfilled.
- E. Backfill against supported structures. Do not backfill against unsupported structures.
- F. Backfill simultaneously on each side of structure.
- G. Make grade changes gradual. Blend slope into level areas.

- H. Remove surplus backfill materials from site.
- I. Leave fill material stockpile areas completely free of excess fill materials.

3.04 TOLERANCES

- A. Maximum Variation From Top Surface of Backfilling Under Paved Areas: 1/4 inch.
- B. Maximum Variation From Top Surface of General Backfilling: 1 inch.

3.05 FIELD QUALITY CONTROL

- A. Perform field inspection and testing under provisions of Section 014500.
- B. Perform field tests and analysis of fill material in accordance with ANSI/ASTM D1557.
- C. If tests indicate work does not meet specified requirements, remove work, replace and retest at no cost to Owner.
- D. Unless additional testing is required by the Engineer, compaction tests shall be taken at the following rates:
 - 1. Pavement Subgrade: One test per 5,000 square feet of subgrade immediately prior to placing subbase.

END OF SECTION 312323.13

PART 1 - GENERAL**1.01 SECTION INCLUDES**

- A. Section includes wood and steel sheeting, sheeting box, and steel H-Section (soldier) piles, and lagging. The method of sheeting shall be at the sole discretion of the Contractor.
- B. The cost to install, remove, and/or leave sheeting in place shall be included in the bid price.
- C. Erosion control methods shall be in place prior to beginning the installation of sheeting.

1.02 RELATED SECTIONS

- A. Section 312316 - Excavation
- B. Section 312316.13 - Trenching
- C. Section 312323.16 - Backfilling

1.03 REFERENCES

- A. Comply with Occupational Safety and Health Standards - Excavations; Final Rule (29 CFR Part 1926) - OSHA Standards.

1.04 SUBMITTALS

- A. Provide details of proposed sheeting for information only.
- B. Design and supporting calculations shall be prepared by or under the supervision of a Professional Engineer licensed in the State of New York. These documents shall bear the seal and signature of the professional engineer.

1.05 QUALITY ASSURANCE

- A. Perform all work of this Section in accordance with OSHA Standards.
- B. Sheeting shall be installed by persons regularly engaged in sheeting installation and who have a minimum of five (5) years of experience with the type of system being installed.
- C. Sheeting shall be installed under the direct supervision of the professional engineer who designed the sheeting system. This does not require the professional engineer to be present during all phases of its installation, but does require him/her to inspect the work as the work progresses on a part time basis sufficient to adequately certify the system. He/she shall certify, in writing, that sheeting was installed in accordance with the supporting calculations and that the installer complied with recognized procedures, methods, and techniques.
- D. The Engineer shall withhold partial payment for that portion of the sheeting work until the certification has been provided for record purposes only. An amount equal to 15% of the scheduled value will be withheld.

1.06 COORDINATION

- A. Coordinate work under provisions of Section 013100.
- B. Coordinate work with all other Sections requiring temporary sheeting and bracing.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Wood Sheeting: Hardwood species of size and dimensions capable of being driven to the required depths and capable of supporting excavation sides and soil pressures when braced; free from wormholes, wind shakes, loose knots, decayed or unsound portions or defects which would impair its strength or tightness; 3 inches thick minimum.
- B. Steel Sheeting: Corrugated "Z" shape cross-section; of size and dimensions capable of being driven to the required depths and capable of supporting excavation sides and soil pressures when braced; structurally sound; special shapes for corner construction and transition points.
- C. Sheeting Boxes: Steel, of size and dimensions capable of supporting excavation sides and soil pressures; structurally sound.
- D. Structural Steel: ASTM A36.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that the installation of the sheeting will not fall within the restricted boundary line as may be delineated on the Contract Drawings.
- B. Verify that the existing soil substrate, site conditions, and elevations are as indicated on the plans.
- C. Verify proposed locations of excavations are as indicated on the plans.

3.02 PREPARATION

- A. Excavate to a depth no greater than 4 feet from existing grade.
- B. Assemble and drive the sheeting in accordance with shop drawings prepared by the Contractor's engineer.

3.03 INSTALLATION - SHEETING

- A. Drive sheeting in place to thoroughly support both sides of the excavation using a sheeting hammer. Use a steam or pneumatic hammer for steel sheeting.
- B. Water jetting of sheeting will not be permitted. Do not loosen adjacent ground that might result in collapse.
- C. Install wales and braces or shores tight and in accordance with shop drawings.

3.04 INSTALLATION - SHEETING BOX

- A. Place box in trench utilizing a means that will not damage structural integrity of the box.
- B. Excavate ahead of the sheeting box only enough to advance the sheeting box and only immediately prior to moving the sheeting box.
- C. Backfill on both sides of the sheeting box as it is moved.

3.05 REMOVAL OF SHEETING

- A. Remove sheeting only as backfilling progresses.
- B. Carefully remove sheeting such that compacted backfill is not displaced. Add additional backfill to the areas vacated by the sheeting.
- C. All sheeting shall be removed from the site once its use is no longer required.
- D. The Contractor may request permission to leave sheeting or bracing in place. The Engineer may grant permission on the condition that the cost of sheeting and bracing is borne by the Contractor.
- E. Sheeting to be left in place, where shown on plans, shall be cut and removed to a minimum depth of 5 feet (1.2 m) below finished grade elevation. Where additional depth of sheeting removal is need to facilitate contract work in advance of establishing finished grade, the sheeting will be cut and removed to that required additional depth as approved by the Engineer. Cost of sheeting and bracing to be left in place shall be borne by the Contractor.

END OF SECTION 315000

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Recycled concrete aggregate base course.

1.02 RELATED SECTIONS

- A. Section 312323.13 – Backfilling.
- B. Section 312333 – Trenching.

1.03 REFERENCES

- A. ANSI/ASTM C88 - Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate.
- B. ANSI/ASTM C136 - Sieve Analysis of Fine and Coarse Aggregates.
- C. ANSI/ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb Rammer and 18-inch Drop.
- D. ASTM D4318 - Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

1.04 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Test Reports: Submit a sieve analysis for the aggregate base course used.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle products to the site under provisions of Section 016500.
- B. Do not handle aggregate in any manner which will cause segregation of large or fine particles.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Aggregate Base Course: At least 95% by weight, of angular, crushed, recycled concrete; free of organic matter and deleterious material; graded in accordance with ANSI/ASTM C136 within the following limits:

1. Sieve Size	Percent Passing
2. 2 inches	90-100
3. 1/4 inch	30-65
4. No. 40	5-40
5. No. 200	0-10
- B. The material may contain up to 5% by weight of asphalt and/or brick.
- C. Material retained on the 1/2 inch sieve is coarse aggregate.

- D. Coarse aggregate shall not have more than 10 percent by weight of flat or elongated pieces. A flat or elongated piece is defined as being three times greater in the largest dimension as compared to its least dimension.
- E. The portion of the aggregate base course which passes the No. 40 screen shall have a plasticity index of one as tested in accordance with ASTM D4318.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions and substrate.
- B. Verify elevations of subgrade are as indicated on the plans.
- C. Verify that subgrade is properly compacted and ready to receive work of this section.
- D. Beginning work of this section means acceptance of existing conditions.

3.02 PREPARATION

- A. Fine grade and compact subgrade to 95 percent maximum dry density in accordance with ANSI/ASTM D1557.

3.03 AGGREGATE PLACEMENT

- A. Spread course aggregate over prepared subgrade to a total compacted thickness as indicated on the plans.
- B. Place aggregate in 3 inch layers and compact by roller.
- C. Level and contour surfaces to elevations and gradients indicated.
- D. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.
- E. Compact placed aggregate materials to achieve 95% maximum dry density in accordance with ANSI/ASTM D1557. Maintain optimum moisture content to attain required density.
- F. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.
- G. Use mechanical vibrating tamping in areas inaccessible to compaction equipment.
- H. New pavement must be placed on the properly compacted aggregate base course within 24 hours of final compaction. If aggregate base course is left open for more than 24 hours, re-compact and retest in accordance with ANSI/ASTM D1557.

3.04 TOLERANCES

- A. Maximum Variation From Flatness: 1/4 inch measured with 10 foot straight edge.
- B. Maximum Variation From Scheduled Compacted Thickness: 1/4 inch.
- C. Maximum Variation from True Elevation: 1/4 inch.

3.05 FIELD QUALITY CONTROL

- A. Perform field inspection and testing under provisions of Section 014500.
- B. Perform compaction testing in accordance with ANSI/ASTM D1557.
- C. If tests indicate work does not meet specified requirements, remove work, replace and retest at no cost to Owner.
- D. Frequency of Tests: One test per 500 sq ft. immediately prior to paving.

END OF SECTION 321123.16

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Asphaltic concrete paving; wearing, binder or base course.

1.02 RELATED SECTIONS

- A. Section 321123.16 - Recycled Concrete Aggregate Base Course.

1.03 REFERENCES

- A. AI MS-2 - Mix Design Methods for Asphalt Concrete and Other Hot Mix Types.
- B. AI MS-8 - Asphalt Paving Manual.
- C. ASTM D242 - Mineral Filler for Bituminous Paving Mixtures.
- D. ASTM D546 - Test Method for Sieve Analysis of Mineral Filler for Road and Paving Materials.

1.04 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Supplier: Submit name of asphalt supplier to be used on the project prior to placement of any asphalt on the project.
- C. Design Data: Submit asphalt mix design for each asphalt type to be used.
- D. Testing Firm: Submit name of testing firm to be performing tests on asphalt pavement.

1.05 QUALITY ASSURANCE

- A. Obtain materials from the same supplier throughout the duration of the project.
- B. Do not alter from mix design requirements.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle products to the site under provisions of Section 016500.
- B. Deliver asphalt in sealed, metal containers covered with suitable material to protect the asphalt from the elements.
- C. Lightly lubricate the inside surface of the container with a thin oil or soap solution before loading asphalt.
- D. All containers must be cleaned of all foreign materials prior to loading.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Do not place asphalt when base surface temperature is less than 40 degrees F, or if surface is wet or frozen.
- B. Do not place asphalt when precipitation is occurring.

PART 2 - PRODUCTS

2.01 2.01 - MATERIALS

- A. Asphalt Cement: AC-20; homogeneous, and shall not foam when heated to 347 degrees F.
- B. Fine Aggregate: Material passing the 1/8 inch sieve; natural sand of hard, strong, durable particles which are free from coatings or injurious amounts of clay, loam or other deleterious substances.
- C. Coarse Aggregate: Material retained on the 1/8 inch sieve; crushed stone or gravel; clean, durable, sharp angled fragments of rock of uniform quality.
- D. Mineral Filler: ASTM D242, finely ground particles of limestone, hydrated lime or other mineral dust, free of foreign matter; 100 percent shall pass the No. 30 sieve; a minimum of 85 percent shall pass the No. 80 sieve; and a minimum of 65 percent shall pass the No. 200 sieve as measured in accordance with ASTM D546.

2.02 2.02 - EQUIPMENT

- A. Rollers: Minimum weight of 10 tons; equipped with lubricating devices for the roller wheels.
- B. Pavers: Equipped with a vibratory device.

2.03 2.03 - ACCESSORIES

- A. Tack Coat: Homogeneous, medium curing, liquid asphalt.
- B. Wheel Lubricant: Oil-water mixture containing maximum 10 percent lubricating oil.

2.04 2.04 - MIXES

- A. Use dry material to avoid foaming. Mix uniformly.
- B. Base Course: NYSDOT Type 1; 4.0 to 6.0 percent of asphalt cement by weight in mixture in accordance with the following gradation:

SIEVE SIZE	PERCENT PASSING
2 INCHES	100
1 ½ INCHES	90-100
1 INCH	78-95
½ INCH	57-84
¼ INCH	40-72
1/8 INCH	26-57
NO. 20	12-36
NO. 40	8-25
NO. 80	4-16
NO. 200	2-8

- A. Binder Course: NYSDOT Type 3; 4.5 to 6.5 percent of asphalt cement by weight in mixture in accordance with the following gradation:

Sieve Size	Percent Passing

1-1/2 inches	100
1 inch	95-100
1/2 inch	70-90
1/4 inch	48-74
1/8 inch	32-62
No. 20	15-39
No. 40	8-27
No. 80	4-16
No. 200	2-8

- B. Wearing Course: NYSDOT Type 6; 5.8 to 7.0 percent of asphalt cement by weight in mixture in accordance with the following gradation:

Sieve Size	Percent Passing
1 inch	100
1/2 inch	95-100
1/4 inch	65-85
1/8 inch	36-65
No. 20	15-39
No. 40	8-27
No. 80	4-16
No. 200	3-6

2.05 SOURCE QUALITY CONTROL

- A. Obtain asphalt materials from same source throughout the project.
- B. Provide asphalt in accordance with the approved mix design for each type of asphalt.
- C. Test samples in accordance with AI MS-2.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions and substrate.
- B. Verify that compacted subbase is dry and ready to receive work of this section.
- C. Verify gradients and elevations of base are correct.
- D. Verify that all castings are properly installed and are at the correct elevations.
- E. Beginning of installation means installer accepts existing conditions.

3.02 PREPARATION

- A. Apply tack coat at uniform rate of 0.03 to 0.07 gal/sq. yd. to contact surfaces of castings, curbs, gutters and any asphalt or concrete material.
- B. Do not apply tack coat to wet or frozen surfaces.

- C. Coat top surfaces of castings with oil to prevent bond with asphalt pavement.

3.03 INSTALLATION

- A. Install work in accordance with AI MS-8.
- B. Maintain asphalt temperature between 250 and 325 degrees F during placement.
- C. Place asphalt within 24 hours of applying tack coat.
- D. Place asphalt to compacted thicknesses as identified on plans. If a multiple course pavement is to be used, place top course within 24 hours of placing bottom course. If more than 24 hours elapse, a tack coat will be required to be placed over the entire surface of the bottom course prior to any additional paving.
- E. Utilize the vibratory device on the paver at all times.
- F. Compact pavement by rolling. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.
- G. Compact pavement to a minimum of 94% maximum density.
- H. Develop rolling with consecutive passes to achieve even and smooth finish, without roller marks.
- I. Seal all joints between new pavement and existing pavement with asphalt cement.

3.04 TOLERANCES

- A. Maximum Variation From Flatness: 1/8 inch measured with 10 foot straight edge.
- B. Maximum Variation From Scheduled Compacted Thickness: 1/8 inch.
- C. Maximum Variation from True Elevation: 1/4 inch.

3.05 FIELD QUALITY CONTROL

- A. Perform field inspection and testing under provisions of Section 014500.
- B. Take samples and perform tests in accordance with AI MS-2.
- C. Test are to include percent compaction, gradation and asphalt content.
- D. Provide an asphalt thermometer for determining the asphalt temperature during paving operations.
- E. Frequency of Tests: One test for every 1,000 square feet of each pavement course.

3.06 PROTECTION

- A. Protect finished work under provisions of Section 015000.
- B. Immediately after placement, protect pavement from mechanical injury until project is accepted by the Owner.

END OF SECTION 321216

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Concrete parking areas and roads.
- B. Formwork.

1.02 RELATED SECTIONS

- A. Section 312213 - Rough Grading.
- B. Section 321123.16 – Recycled Concrete Aggregate Base Course.

1.03 REFERENCES

- A. ACI 301 - Structural Concrete for Buildings.
- B. ANSI/ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.
- C. ANSI/ASTM D1751 - Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction.
- D. ASTM A615 - Deformed and Plain Billet-Steel for Concrete Reinforcement.
- E. ASTM C33 - Concrete Aggregates.
- F. ASTM C94 - Ready Mix Concrete.
- G. ASTM C150 - Portland Cement
- H. ASTM C260 - Air-Entraining Admixtures for Concrete.
- I. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.
- J. ASTM C494 - Chemical Admixtures for Concrete.

1.04 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Product Data: Provide data on joint filler, admixtures and curing compounds.
- C. Supplier: Submit name of concrete supplier prior to the placement of any concrete on the project.
- D. Design Data: Provide a design mix for each type of concrete used on the project.
- E. Certificates: Submit receipts of all concrete deliveries indicating source, date, contractor, amount of concrete, concrete strength, truck number and time load was batched.

1.05 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 017839.

- B. Accurately record locations of each day's concrete pour.

1.06 QUALITY ASSURANCE

- A. Perform work in accordance with ACI 301.
- B. Obtain concrete only from approved suppliers and maintain same source throughout duration of the project.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle products to the site under provisions of Section 016500.
- B. Deliver concrete in accordance with ASTM C94, Alternative No. 2.
- C. Place all concrete within 90 minutes of time load was batched.

1.08 ENVIRONMENTAL REQUIREMENTS

- A. Do not place concrete when base surface temperature is less than 40 degrees F, or if surface is wet or frozen.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Cement: ASTM C150 Air Entraining - Type IA Portland type, gray color.
- B. Aggregates: ASTM C33.
- C. Water: Potable, not detrimental to concrete.
- D. Reinforcing Bars: ASTM A615; 60 ksi yield grade; deformed billet steel bars; uncoated finish.
- E. Dowels: ASTM A615; 60 ksi yield grade, plain steel, uncoated finish.
- F. Welded Steel Wire Fabric: Plain type, ANSI/ASTM A185; in flat sheets; uncoated finish.

2.02 ACCESSORIES

- A. Steel Forms: Minimum 16 gauge thick, stiffened to support weight of concrete with a minimum deflection.
- B. Plywood Forms: Douglas Fir species; solid one side grade; sound, undamaged sheets.
- C. Joint Filler: ANSI/ASTM D1751; 1/2 inch thick.
- D. Air Entrainment Admixture: ASTM C260.
- E. Chemical Admixture: ASTM C494, type as required.
- F. Curing Compound: ASTM C309, Type 2, Class A.
- G. Form Release Agent: Colorless material which will not stain concrete or absorb moisture.
- H. Joint Sealant: ASTM C920, Type M, Grade P; SL-2 by Sonneborn or equal.

2.03 MIXES

- A. Concrete shall be mixed and prepared in accordance with the approved mix design and ASTM C94, Alternative No. 2.
- B. The mix design shall be such that the concrete shall attain the following characteristics:
 - 1. Compressive Strength (28 days): 4,000 psi.
 - 2. Slump: 2-1/2 to 3-1/2 inches.
 - 3. Air Entrainment: 6%±1%.
- C. Use chemical admixtures only when approved by Engineer. Use of admixtures will not relax placement requirements.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions and substrate.
- B. Verify compacted granular subbase has been properly placed and is ready to receive work of this section.
- C. Verify gradients and elevations of base are correct.
- D. Beginning of installation means installer accepts existing conditions.

3.02 PREPARATION

- A. Moisten base to a minimum depth of 1/2 inch to minimize absorption of water from fresh concrete.
- B. Coat surfaces of manhole and catch basin frames with oil to prevent bond with concrete pavement.
- C. Notify Engineer minimum 24 hours prior to commencement of concreting operations.
- D. Place and secure forms to correct location, dimension, and profile.
- E. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

3.03 INSTALLATION

- A. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.
- B. Place dowels to achieve pavement and curb alignment as detailed on the plans.
- C. Place reinforcement as indicated on the plans. Interrupt reinforcement at expansion joints.
- D. Provide doweled joints with one end of dowel greased or set in capped sleeve to allow longitudinal movement.
- E. Place concrete in accordance with ACI 301.
- F. Ensure reinforcement, inserts, embedded parts and formed joints are not disturbed during concrete placement.

- G. Place concrete continuously between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.
- H. Vibrate concrete adjacent to forms.
- I. Place concrete to pattern indicated on the plans.
- J. Place expansion and contraction joints as indicated on the plans.
- K. Place joint filler between paving components and building or other appurtenances.
- L. Provide keyed joints as indicated.
- M. Saw cut contraction joints 3/16 inch wide at an optimum time after finishing at the locations shown on the plans. Cut 1/3 into depth of slab.
- N. Apply a light broom finish perpendicular to vehicular traffic.
- O. Place curing compound on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.

3.04 FIELD QUALITY CONTROL

- A. Perform field inspection and testing under provisions of Section 014500.
- B. Take six concrete test cylinders for every 50 cu. yds. or fraction thereof of each class of concrete placed each day.
- C. Cure test cylinders on site under same conditions as concrete they represent.
- D. Take one slump test for each set of test cylinders taken. Concrete not meeting slump requirements will be rejected.
- E. Concrete represented by cylinders that do not meet required strength will be removed and replaced at no additional cost to the Owner.

3.05 PROTECTION

- A. Protect finished work under provisions of Section 015000.
- B. Immediately after placement, protect pavement from premature drying, excessive temperatures and mechanical injury.
- C. Protect pavement from damage until project is accepted by the Owner.

END OF SECTION 321313.26

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Reinforced concrete curb.
- B. Formwork.

1.02 RELATED SECTIONS

- A. Section 312213 - Rough Grading.

1.03 REFERENCES

- A. ACI 301 - Structural Concrete for Buildings.
- B. ANSI/ASTM D1751 - Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction.
- C. ASTM A615 - Deformed and Plain Billet Steel for Concrete Reinforcement.
- D. ASTM C33 - Concrete Aggregates.
- E. ASTM C94 - Ready Mix Concrete.
- F. ASTM C150 - Portland Cement
- G. ASTM C260 - Air-Entraining Admixtures for Concrete.
- H. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.
- I. ASTM C494 - Chemical Admixtures for Concrete.

1.04 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Product Data: Provide data on joint filler, admixtures and curing compounds.
- C. Supplier: Submit name of concrete supplier prior to the placement of any concrete on the project.
- D. Design Data: Provide a design mix for concrete to be used on the project.
- E. Certificates: Submit receipts of all concrete deliveries, indicating source, date, contractor, amount of concrete, concrete strength, truck number and time truck load was batched.
- F. Testing Firm: Submit name of testing firm to be performing tests on concrete.

1.05 PROJECT RECORD DOCUMENTS

- A. Accurately record locations of each day's concrete pours.

1.06 QUALITY ASSURANCE

- A. Perform work in accordance with ACI 301.
- B. Obtain concrete only from approved suppliers and maintain the same source throughout the project.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver concrete in accordance with ASTM C94, Alternative No. 2.
- B. Place all concrete within 90 minutes of time load was batched.

1.08 ENVIRONMENTAL REQUIREMENTS

- A. Do not place concrete when base surface temperature is less than 40 degrees, or if surface is wet or frozen.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Cement: ASTM C150, Type 1 Portland, gray color.
- B. Aggregates: ASTM C33.
- C. Water: Potable and not detrimental to concrete.
- D. Reinforcement: ANSI A615 steel; 60 ksi yield grade; deformed billet steel bars; epoxy finish.
- E. Dowels: ASTM A615 steel; 60 ksi yield grade; plain steel, epoxy finish.

2.02 ACCESSORIES

- A. Steel Forms: Minimum 16 gauge thick, stiffened to support weight of concrete with a minimum deflection.
- B. Wood Forms: Douglas Fir species; solid, sound, undamaged sheets; minimum 2 inches (50 mm) thick.
- C. Joint Filler: ANSI/ASTM D1751; 1/2 inch thick.
- D. Air Entraining Admixture: ASTM C260.
- E. Chemical Admixture: ASTM C494, type as required.
- F. Curing Compound: ASTM C309, Type 1, Class A.
- G. Form Release Agent: Colorless material which will not stain concrete or absorb moisture.
- H. Joint Sealant: ASTM C920, Type S, Grade NS; NP-1 by Sonneborn or equal.

2.03 MIXES

- A. Concrete shall be mixed and prepared in accordance with the approved mix design and ASTM C94, Alternative No. 2.

- B. The mix shall be such that the concrete shall attain the following characteristics:
 - 1. Compressive Strength (28 days): 4,000 psi.
 - 2. Slump: 2½ to 3½ inches.
 - 3. Air Entrainment: 6% ±1%.
- C. Use chemical admixtures only when approved by the Engineer. Use of admixtures will not relax placement requirements.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions and substrate.
- B. Verify datum and all elevations are as indicated on the plans.
- C. Verify compacted granular subbase has been properly prepared and is ready to receive work of this section.
- D. Beginning of installation means installer accepts existing conditions.

3.02 PREPARATION

- A. Excavate to the required depth and compact surface.
- B. Place and secure forms to correct location, dimension and profile.
- C. Assemble formwork to permit easy stripping and dismantling without damaging concrete.
- D. Moisten base to a minimum depth of 1/2 inch to minimize absorption of water from fresh concrete.
- E. Coat forms with form release agent.

3.03 INSTALLATION

- A. Place joint filler vertical in position and at equal spaces not exceeding 20 feet. Secure to formwork during concrete placement.
- B. Place dowels through joint filler as indicated on the plans. One end of dowel is to be greased or set in a capped sleeve to allow longitudinal movement.
- C. Place reinforcement as indicated on the plans. Interrupt at expansion joints.
- D. Place concrete in accordance with ACI 301.
- E. Ensure reinforcement, dowels, joint filler or forms are not disturbed during concrete placement.
- F. Place concrete continuously between construction joints. Do not break or interrupt successive pours such that cold joints occur.
- G. Vibrate concrete adjacent to forms.
- H. After concrete sets, but prior to curing, remove front forms without damaging concrete and apply a light broom finish to the top and face of the curb.

- I. Place curing compound on exposed surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.

3.04 FIELD QUALITY CONTROL

- A. Field inspection and testing shall be performed under provisions of Section 014500.
- B. Take six concrete test cylinders for every 50 cu. yds. or fraction thereof of concrete placed each day.
- C. Cure test cylinders on site under same conditions as curb.
- D. Take one slump test for each set of cylinders taken.
- E. Concrete not meeting slump requirements will be rejected.
- F. Concrete represented by cylinders which do not meet required strength will be removed and replaced at no additional cost to the Owner.

3.05 PROTECTION

- A. Protect finished work under provisions of Section 015000.
- B. Immediately after placement, protect curb from premature drying, excessive temperatures, rain and mechanical injury.
- C. Protect curb from damage until project is accepted by the Owner.

END OF SECTION 321613

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Bollards.
- B. Footings and foundations.

1.02 REFERENCES

- A. ASTM A36 - Structural Steel.
- B. ASTM C33 - Concrete Aggregates.
- C. ASTM C150 - Portland Cement.
- D. ASTM C260 - Air-Entraining Admixtures for Concrete.
- E. ASTM C330 - Lightweight Aggregates for Structural Concrete.

1.03 SUBMITTALS FOR REVIEW

- A. Section 013300 - Submittals

PART 2 - PRODUCTS

2.01 MATERIALS

- A. ASTM A36 structural steel tubing.

2.02 BOLLARDS

- A. Formed Steel Tubes: 1/4" thick, 6" diameter galvanized steel, concrete filled, painted yellow.
- B. Quantity: As indicated on plans.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install units in accordance with manufacturer's instructions, without damage. Replace or repair damaged units.
- B. Install units in alignment with adjacent work.
- C. Install bollards in footings. Bollards shall be installed in locations as per PSEGLI requirements or in locations as directed by Engineer.

END OF SECTION 323000

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. PVC coated fence framework, fabric and accessories.
- B. Excavation for post bases; concrete foundation for posts and center drop for gates.
- C. Manual swing gates and related hardware.

1.02 RELATED SECTIONS

- A. Section 312316 - Excavation: Excavation for fence posts.

1.03 REFERENCES

- A. ANSI/ASTM A123 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- B. ANSI/ASTM F567 - Installation of Chain Link Fence.
- C. ASTM A121 - Zinc-Coated (Galvanized) Steel Barbed Wire.
- D. ASTM A392 - Zinc-Coated Steel Chain Link Fence Fabric.
- E. ASTM C150 - Portland Cement.
- F. ASTM F668 - Standard Specification for Polyvinyl Chloride (PVC) and Other Organic Polymer-Coated Steel Chain Link Fence Fabric.
- G. ASTM F900 - Industrial and Commercial Swing Gates.
- H. ASTM F1043 - Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework.

1.04 SYSTEM DESCRIPTION

- A. Fence Height: As indicated on plans.
- B. Line Post Spacing: As indicated on plans. If not indicated, intervals shall not exceed 10 feet.

1.05 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Product Data: Provide data on fabric, posts, accessories, fittings and hardware.
- C. Manufacturer's Installation Instructions: Indicate installation requirements and post foundation anchor bolt templates.

1.06 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 017839.
- B. Accurately record actual locations of property perimeter posts relative to property lines and easements.

1.07 QUALITY ASSURANCE

- A. Perform work in accordance with ANSI/ASTM F567.
- B. Maintain one copy of document on site.

1.08 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum 3 years documented experience.

1.09 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on the plans.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. ANCHOR FENCE, INC.
- B. AMERICAN FENCE CORPORATION.
- C. Substitutions shall be permitted only after receiving written approval from the Engineer.

2.02 MATERIALS

- A. Fence Framing: ASTM F1043; SS40 steel pipe, standard weight, one piece without joints.
- B. Fabric Wire: ASTM A392; Zinc-coated No. 9 steel core wire fabric with 2 inch squares, knuckled all sides.
- C. Gate Framing: ASTM F900; SS40 steel pipe, standard weight, one piece without joints.
- D. Barbed Wire: ASTM A121; Galvanized steel, 12 gage thick wire, 3 strands, 4 points at 5 inches on center.
- E. Concrete: ASTM C150, Type 1; minimum 4,000 psi strength at 28 days; 3 inch slump; 5 to 7 percent air entrainment.
- F. Tension Wire: 7 gauge thick steel, single strand.
- G. Tie Wire: Aluminum alloy steel wire.

2.03 ACCESSORIES

- A. Caps: Cast steel galvanized or malleable iron galvanized; sized to post diameter, set screw retainer.
- B. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners and fittings; galvanized steel.
- C. Extension Arms: Cast steel galvanized to accommodate 3 strands of barbed wire, single arm, sloped to 45 degrees.
- D. Gate Hardware: Fork latch with gravity drop; center gate stop and drop rod; two 180 degree gate hinges per leaf and hardware for padlock.

- E. Diagonal Truss Rod with Turnbuckle: ASTM A153 galvanized steel.
- F. Grounding Rod: ANSI/ASTM A123 steel rod.
- G. Privacy Slats: AsHigh density polyethylene with ultraviolet inhibitors and locking slats.

2.04 FINISHES

- A. Framework: Galvanized to ANSI/ASTM A123; 1.8 oz/sq ft coating with a 10-15 mil supplemental PVC powder coating in accordance with ASTM F1043.
- B. Fabric and Tension Wire: Galvanized to ANSI/ASTM A123; 0.3 oz/sq ft coating with a 7-12 mil supplemental PVC coating in accordance with ASTM F668.
- C. Fittings and Accessories: Galvanized to 1.2 oz/sq ft coating with a 10-15 mil supplemental PVC powder coating in accordance with ASTM F1043.
- D. Color: Selected by Owner.

PART 3 - PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install framework, fabric, accessories and gates in accordance with ANSI/ASTM F567 and manufacturer's instructions.
- B. Set all posts plumb in concrete footings with top of footing 2 inches above finish grade. Slope top of concrete for water runoff.
- C. Brace each gate and corner post to adjacent line post with horizontal center brace rail and diagonal truss rods. Install brace rail, one bay from end and gate posts.
- D. Install diagonal truss rod from the center of the gate or corner post to the bottom of the adjacent line post.
- E. Provide top rail through line post tops and splice with 6 inch long rail sleeves.
- F. Install brace rail on corner gate leaves.
- G. Stretch fabric between terminal posts or at intervals of 100 feet maximum, whichever is less.
- H. Position bottom of fabric 2 inches above finished grade.
- I. Fasten fabric to top and bottom rail, line posts, braces, and bottom tension wire with tie wire at maximum 15 inches on centers.
- J. Attach fabric to end, corner and gate posts with tension bars and tension bar clips.
- K. Install bottom tension wire stretched taut between terminal posts.
- L. Do not swing gate from building wall; provide gate posts.
- M. Install gate with fabric and barbed wire overhang to match fence. Install 3 hinges per leaf, latch, catches and drop bolt.

- N. Install concrete center drop to footing depth and drop rod retainers at center of double gate openings.
- O. Install 8 foot grounding rod to fence post.

3.02 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch.
- B. Maximum Offset From True Position: 1 inch.
- C. Components shall not infringe adjacent property lines.

END OF SECTION 323113.13

PART 1 - GENERAL**1.01 SECTION INCLUDES**

- A. Finish grade subsoil.
- B. Place, level and compact topsoil.

1.02 RELATED SECTIONS

- A. A. Section 329219.16 – HydroSeeding.

1.03 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle products to the site under provisions of Section 016500.
- B. Deliver topsoil to the site in uncontaminated containers.
- C. Do not stockpile topsoil over a height of 8 feet.
- D. Cover stockpiled topsoil to protect from precipitation, erosion and contamination.

1.04 ENVIRONMENTAL REQUIREMENTS

- A. Do not place wet or frozen topsoil.
- B. Do not place topsoil on wet or frozen ground or when precipitation is occurring.

1.05 COORDINATION

- A. Coordinate work under provisions of Section 013100.
- B. Coordinate with all adjacent work and work within areas to receive topsoil.
- C. Coordinate the storage of topsoil under provisions of Section 311100 with the placement of topsoil in this section.

PART 2 - PRODUCTS**2.01 MATERIALS**

- A. Topsoil: Fertile, agricultural soil, typical for locality, capable of sustaining vigorous plant growth, taken from drained site; friable loam; free of subsoil, clay or impurities, plants, weeds, roots, grass, stone and foreign matter; acidity range (pH) of 5.8 to 6.5; containing a minimum of 2.75 percent and a maximum of 25 percent organic matter. Topsoil may be reused from on-site if it meets these requirements.

PART 3 - EXECUTION**3.01 EXAMINATION**

- A. Verify existing substrate and conditions.
- B. Verify site conditions and note irregularities affecting work of this section.

- C. Beginning work of this section means acceptance of existing conditions.

3.02 PREPARATION

- A. Prepare subsoil in accordance with Section 312213.
- B. Eliminate uneven areas and low spots. Remove and dispose of debris, roots, branches and stones in excess of 1/2 inch in size. Remove and dispose of subsoil contaminated with petroleum products.
- C. Scarify subsoil to depth of 3 inches where topsoil is scheduled to be placed. Scarify in areas where equipment used for hauling and spreading topsoil has compacted subsoil.

3.03 INSTALLATION

- A. Place topsoil in areas where seeding, sodding or planting is scheduled or where shown on the plans.
- B. Place topsoil to the depths as indicated on the plans.
- C. Use topsoil in relatively dry state. Place during dry weather.
- D. Fine grade topsoil eliminating rough or low areas. Maintain levels, profiles and contours of subgrade.
- E. Remove and dispose stone, roots, grass, weeds, debris and foreign material while spreading.
- F. Manually spread topsoil around trees, plants and building to prevent damage.
- G. Lightly roll placed topsoil.
- H. Remove surplus subsoil and topsoil from site. Do not remove surplus topsoil from the site prior to obtaining approval of the Engineer.
- I. Leave stockpile area and site clean and raked, ready to receive landscaping.

3.04 TOLERANCES

- A. Maximum Variation from Proposed Elevation: 1/2 inch.

3.05 PROTECTION

- A. Protect finished work under provisions of Section 016500.
- B. Protect landscaping and other features remaining as final work.
- C. Protect existing structures, fences, roads, sidewalks, paving and curbs. Any damage caused by the Contractor to any of these items shall be repaired promptly by the Contractor at no additional cost to the Owner.

END OF SECTION 329119.13

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Seeding.
- B. Mulch, fertilizer, hydromulch and other accessories.
- C. Maintenance.

1.02 RELATED SECTIONS

- A. Section 329119.13 - Topsoil Placement and Grading.

1.03 REFERENCES

- A. FS O-F-241 - Fertilizers, Mixed, Commercial.

1.04 DEFINITIONS

- A. Weeds: Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel and Brome Grass.

1.05 SUBMITTALS

- A. Submit under provisions of Section 013000.
- B. Product Data: Provide data on seed mixtures, fertilizer and lime.
- C. Certificates: Provide certificates indicating that all fertilizer, pesticides and herbicides comply with all applicable regulatory agency requirements.

1.06 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Section 017000.
- B. Maintenance Data: Include maintenance instructions, cutting method and maximum grass height; types, application frequency, and recommended coverage of fertilizer.

1.07 QUALITY ASSURANCE

- A. Seed: Provide seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging.

1.08 REGULATORY REQUIREMENTS

- A. Comply with applicable regulatory agencies for fertilizer, pesticide and herbicide composition.
- B. All fertilizer, pesticides and herbicides to be used shall comply with all applicable regulatory agency requirements.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Section 016000.
- B. Deliver grass seed mixture in original sealed containers. Seed in damaged packaging is not acceptable.
- C. Deliver fertilizer in waterproof bags showing weight, chemical analysis and name of manufacturer.
- D. Deliver Hydromulch in UV and weather resistant bags, showing weight, chemical analysis and name of manufacturer.

1.10 ENVIRONMENTAL REQUIREMENTS

- A. Do not sow immediately following rain, during windy periods or if ground is frozen.
- B. Do not sow when the ambient temperature is expected to drop below 40 degrees F or rise above 90 degrees F during the time in which the seed will establish itself.
- C. Planting Season: April 1st through May 15th or September 1st through October 15th.

1.11 COORDINATION

- A. Coordinate work under provisions of Section 013100.
- B. Coordinate with grading and placement of topsoil.
- C. Coordinate with installation of underground sprinkler system piping and watering heads.

1.12 WARRANTY

- A. Provide a one-year warranty under provisions of Section 017000.
- B. Include coverage for one continuous growing season; reseed areas of dead or unhealthy grass at no additional cost to the Owner.

1.13 MAINTENANCE SERVICE

- A. Maintain seeded areas immediately after placement until grass is well established and exhibits a vigorous growing condition, as determined by at least two cuttings, or until the job is accepted by the Owner, whichever occurs last.

PART 2 - PRODUCTS**2.01 MATERIALS**

- A. Seed: Dry, fresh, re-cleaned seed of the latest crops and of the following proportions:

- 1. Mix A:

Grass Type	% of Mixture	Min. % Germination
Kentucky 31 Fescue	50	90
NK 100 Perennial Rye	25	85
Penn Lawn Fescue	25	90

- 1. Mix B:

Grass Type	% of Mixture	Min. % Germination
Merion Bluegrass	50	80
Penn Lawn Fescue	30	90
NK 106 Hybrid Rye	20	85

2.02 ACCESSORIES

- A. Mulching Material: Hemlock species wood cellulose fiber, dust form, free of growth or germination inhibiting ingredients.
- B. Fertilizer: FS O-F-241, Type I, Grade A; recommended for grass, with fifty percent of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil, to the following proportions: Nitrogen 10 percent, phosphoric acid 6 percent, soluble potash 4 percent.
- C. Limestone: Ground dolomitic limestone containing a minimum of 90 percent calcium and magnesium carbonates. One hundred percent (100%) shall pass a No. 10 mesh screen and a minimum of 70 percent shall pass a No. 100 mesh screen.
- D. Hydromulch: 84 percent Mechanically processed straw, 15 percent Mechanically processed reclaimed cotton plant material and 1 percent of tackifier, activators and additives; minimum of 90 percent organic material; moisture content of 12 percent, total carbon to nitrogen ratio, 40:1. Color to be natural green.
- E. Peat Moss: Shredded, loose, sphagnum moss; free of lumps, roots, inorganic material or acidic materials; minimum of 90 percent organic material measured by oven dry weight; pH range of 4 to 5 percent; moisture content of 30 percent; with moisture absorptive capacity of 450 to 500 percent.
- F. Water: Clean, fresh and free of substances or matter which could inhibit vigorous growth of grass.
- G. Stakes: Softwood lumber, chisel pointed.
- H. String: Inorganic fiber.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify existing substrate and site conditions.
- B. Verify that prepared soil base is ready to receive the work of this section.
- C. Beginning of installation means installer accepts existing conditions.

3.02 PREPARATION

- A. Area to be seeded shall be cultivated with a scarifier to a depth of 4 inches. All stones, sticks and debris one inch and larger shall be removed. Area shall be smoothly graded to proper elevations.

3.03 APPLICATION

- A. Fill tank of mechanically agitated hydroseeding machine with sufficient water to suspend seed and fertilizers.
- B. Add water slowly while adding hydromulch. See manufacturer's recommendations to determine the proper application rate.
- C. Agitate for a minimum of ten minutes after adding the last amount of water and hydromulch.
- D. Apply hydromulch with a hydraulic seeder at a rate of 46 lbs per 1000 sq ft. Apply in a uniform layer from 2 opposing directions to ensure complete soil coverage.
- E. Do not hydroseed areas in excess of that which can be mulched on same day.
- F. Apply water with a fine spray immediately after each area has been mulched. Saturate to 4 inches of soil. Discontinue watering if washing begins to occur.
- G. Clean all surfaces which have received hydroseeding overspray.
- H. Identify seeded areas with stakes and string around area periphery. Set string height to 24 inches. Space stakes at 8 feet on center.

3.04 MAINTENANCE

- A. Maintain grass until job is accepted by the Owner or until the grass exhibits a vigorous growing condition, as determined by at least 2 cuttings, whichever occurs last.
- B. Mow grass at regular intervals to maintain at a maximum height of 2-1/2 inches. Do not cut more than 1/3 of grass blade at any one mowing.
- C. Neatly trim edges and hand clip where necessary.
- D. Immediately remove clippings after mowing and trimming.
- E. Water to prevent grass and soil from drying out.
- F. Immediately reseed areas which show bare spots.

3.05 PROTECTION

- A. Protect finished work under provisions of Section 015000.
- B. Protect seeded areas with warning signs during maintenance period.

END OF SECTION 329219.16

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Preparing valves or sanitary structures for casting rim adjustment.
- B. Adjusting drainage or sanitary castings to grade.
- C. Castings.

1.02 RELATED SECTIONS

- A. Section 321216 - Asphaltic Concrete Paving: Placing an asphalt overlay and surface restoration around structure.

1.03 REFERENCES

- A. ASTM A48 - Gray Iron Castings.
- B. ASTM C55 - Concrete Building Brick.
- C. ASTM C270 - Mortar for Unit Masonry.

1.04 SUBMITTALS

- A. Product Data: Provide data on extension rings and frames.

1.05 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on the plans.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Frames: ASTM A48 Class 30B Gray Iron manufactured by CAMPBELL FOUNDRY COMPANY, NEENAH FOUNDRY COMPANY or specifically approved equal.
- B. Mortar: ASTM C270, Type N.
- C. Brick: ASTM C55, Grade S-1.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify site conditions and condition of structure.
- B. Verify elevations as indicated on the plans.

3.02 PREPARATION

- A. Excavate and remove material as required to perform work of this section.

3.03 RAISE CASTING TO GRADE USING BRICK AND MORTAR

- A. Excavate existing asphalt and subgrade around casting as required.
- B. Remove casting.
- C. Remove any existing brick and mortar which is loose, broken, deteriorated or otherwise unsound or unable to support the casting and imposed loads.
- D. Place new brick and mortar as required to attain the proposed rim elevation.
- E. Maximum distance between brick surfaces to be 1 inch.
- F. Place a 1 inch mortar bed between brick and castings and reinstall casting.
- G. Ensure casting does not rock. Adjust brick as required.

3.04 LOWER CASTING TO GRADE

- A. Excavate existing asphalt and subgrade around casting as required.
- B. Remove casting.
- C. Remove any existing brick and mortar as required to lower casting to grade or is loose, broken, deteriorated or otherwise unsound or unable to support the casting and imposed loads.
- D. If required, chip existing drainage structure with a 40 lb. hammer.
- E. Create flat sound surface with brick and mortar to support the casting.
- F. Maximum distance between brick surfaces to be 1 inch.
- G. Place a 1 inch mortar bed between brick and casting and reinstall casting.

3.05 TOLERANCES

- A. Maximum variation from proposed elevation: 1/4 inch.

3.06 DJUSTING

- A. Adjust materials as required to achieve tolerance.
- B. Replace frame, covers or gratings damaged during the work under this contract.

END OF SECTION 330513.13

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Concrete Manholes.
- B. Cast iron frames and covers
- C. Non-shrink grout

1.02 RELATED SECTIONS

- A. Section 312316.13 - Trenching
- B. Section 312323.13 - Backfilling
- C. Section 315000 - Excavation Support and Protection

1.03 REFERENCES

- A. ASTM C 443 - Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
- B. ASTM C 478 - Specification for Precast Reinforced Concrete Manhole Sections
- C. ASTM C 497 - Test Methods for Concrete Pipe, Manhole Sections, or Tile
- D. ASTM C 877 - Specification for External Sealing Bands for Concrete Pipe, Manholes and Precast Box Sections
- E. ASTM C 923 - Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals
- F. ASTM C 990 - Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
- G. ASTM C 1244 - Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill
- H. AASHTO M 199M/M 199-05 - Precast Reinforced Concrete Manhole Sections
- I. AASHTO T 280 - Concrete Pipe, Manhole Sections, or Tile
- J. ASTM C32 – Sewer and Manhole Brick (Made from Clay or Shale).

1.04 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Precast Concrete Structures: Indicate structure dimensions, sleeve locations and size, concrete strength and location and size of reinforcement.
- C. Provide manufactures data on concrete accessories.
- D. Submit the following related to design mixes:
 - 1. Name, address, and telephone number of Contractor's laboratory.

2. Mix proportions.
3. Source of cement, type, brand and certified copies of mill reports, including physical and chemical analysis.
4. Source of fine aggregates and results of tests made in accordance with ASTM C33 and ASTM C40.
5. Source of coarse aggregates and results of tests made in accordance with ASTM C33.
6. For each mix proposed, make and cure four (4) standard 6-inch concrete test specimens in the lab in accordance with ASTM C192. Furnish compression test results made in accordance with ASTM C39. Break two (2) cylinders at seven (7) days and two (2) at 28 days.
7. If the concrete is intended to be pumped, design mix accordingly and submit certification that it has been tested for pumping.
8. The Engineer may approve the use of previously established design mixes if all test results, made within the last six (6) months by a recognized testing laboratory, are positive and provide sufficient evidence of full compliance with this specification. If the Engineer determines that insufficient documentation and test results exist, he may request additional testing or he may request a new design mix with complete test results.
9. If the adopted mix fails to produce concrete meeting the requirements for strength and placeability, the Engineer may order additional cement or adjustments to mix proportions.

1.05 COORDINATION

- A. Coordinate placement of sleeves for penetrations.
- B. Coordinate with piping installation.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Do not excavate or backfill during inclement weather or when precipitation is occurring.
- B. Do not backfill over or with wet or frozen materials.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. OLD CASTLE
- B. LONG ISLAND PRECAST, INC.
- C. COASTAL PIPELINE PRODUCTS CORP.

2.02 MATERIALS

- A. Manhole Frame and Cover: ASTM A-48 cast iron construction, manufactured by Campbell Foundry Company or approved equal, with date of cast on underside of cover, "SEWER" inscription on cover, painted with one coat asphaltum. Pattern No. 1041-195. Frame and cover shall be manufactured in the U.S.A.
- B. Non-Shrink Grout:
 1. Cement-Based Grout: Premeasured and prepackaged materials supplied by the manufacturer, requiring only the addition of water. The manufacturer's instructions must be printed on the outside of each bag.
 2. Water: Potable, not detrimental to concrete.
 3. Use the minimum water necessary for proper installation.
 4. Grout Characteristics:

- a. Non-Shrink: No shrinkage (0.0%) and a maximum 4.0% expansion when tested in accordance with ASTM C-827. No shrinkage (0.0%) and a maximum of 0.2% expansion in the hardened state when tested in accordance with CRD-C-621.
 - b. Compressive Strength: A minimum 28-day compressive strength of 5,000 psi when tested in accordance with ASTM C-109.
 - c. Setting Time: A minimum initial set time of 60 minutes when tested in accordance with ASTM C-191.
 - d. Composition: Shall not contain metallic particles such as aluminum powders, iron filings, or expansive cement.
- C. Manhole Steps: Copolymer polypropylene plastic steel reinforced manhole steps, M.A. INDUSTRIES, Model PS2-PF, set into manhole wall.
- D. Precast Reinforced Concrete Manhole Sections: ASTM C478, cylindrical shape.
- E. Brick Units: ASTM C32, Grade MS, solid, shale red brick - moisture-controlled, normal weight.
- F. Mortar: A 1:1:5 ratio of Portland cement, masonry cement and sand, respectively.

2.03 ACCESSORIES

- A. Pipe Connectors: Elastomeric PVC with Series 300 stainless steel bands by FERNCO, Davison, MI.
- B. Flexible Pipe to Manhole Connector: NPC, INC. KOR-N-SEAL I which meets or exceeds the requirements of ASTM C923. Installation band to secure to opening in manhole wall and pipe clamp shall be Series 304 stainless steel. Connector to be toggle style, wedge style not acceptable.

2.04 SOURCE QUALITY CONTROL

- A. Notify Engineer at least 48 hours before pouring precast concrete sections.
- B. Mark precast concrete structures in accordance with ASTM C478.
- C. Age precast concrete structures at least two weeks before shipment.
- D. Testing and analysis of concrete shall be performed under the requirements in Section 014500.
- E. The testing laboratory shall take cylinders and perform slump and air entrainment tests in accordance with ACI 301 and Section 014500.

PART 3 - EXECUTION

3.01 ERECTION OF CONCRETE STRUCTURES

- A. Determine required inside diameter of each wall opening, in accordance with manufacturer's recommendation, to assure a water-tight joint, for openings which accommodate penetration seals.
- B. Place concrete in accordance with ACI 304.
- C. Fabricate concrete reinforcing in accordance with CRSI 63.
- D. Ensure reinforcement, sleeves and embedded parts are not disturbed during concrete placement.

- E. Provide continuous flexible bentonite waterstop at tongue and groove joints. Install waterstop in accordance with manufacturer's installation instructions.
- F. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures and mechanical injury.

3.02 EXAMINATION

- A. Verify that excavation is ready to receive work and excavations, dimensions and elevations are as indicated on drawings.

3.03 PREPARATION

- A. Hand trim excavations to required elevations. Correct over excavation with Type C fill, as defined in Section 312323.13.
- B. Remove large stones or other hard matter which could damage pipe or impede consistent backfilling or compaction.

3.04 INSTALLATION

- A. Form bottom of excavation clean and smooth to correct elevation.
- B. Install precast concrete base, shaft and slab top plumb and level.
- C. Establish elevations and pipe inverts for inlets and outlets as indicated.
- D. Adjust lock joint flexible sleeve and install non-shrink grout to provide water-tight pipe penetration.

3.05 SITE TOLERANCES

- A. Maximum variation from proposed top of structure elevation: 1/4 inch.

3.06 FIELD QUALITY CONTROL

- A. Perform field inspection and testing under Section 014500.
- B. Request inspection prior to and immediately after placing backfill.
- C. Perform compaction testing in accordance with Section 014500.
 - 1. If tests indicate Work does not meet specified requirements, remove work, replace and retest at no cost to Owner.

3.07 PROTECTION

- A. Protect structures and appurtenances from damage or displacement until Project is accepted by Owner.

END OF SECTION 330561

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Corrugated polyethylene pipe.
- B. Fittings and accessories.

1.02 RELATED SECTIONS

- A. Section 312333 - Trenching

1.03 REFERENCES

- A. ASTM D2321 - Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications.
- B. ASTM F405 - Corrugated Polyethylene (PE) Tubing and Fittings.
- C. ASTM F667 - Large Diameter Corrugated Polyethylene Tubing and Fittings.

1.04 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Product Data: Provide data on pipe, fittings and accessories.
- C. Manufacturer's Instructions: Indicate special procedures and conditions required to install products specified.

1.05 PROJECT RECORD DOCUMENTS

- A. Accurately record actual locations of pipe runs, connections and invert elevations.
- B. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.06 REGULATORY REQUIREMENTS

- A. Conform to applicable codes for materials and installation of the work of this section.
- B. Install pipe in accordance with ASTM D2321.

1.07 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on the plans and as required by the manufacturer.

1.08 COORDINATION

- A. Coordinate pipe installation with the trenching.

PART 2 - PRODUCTS

2.01 COMPONENTS

- A. Corrugated Polyethylene Pipe: ASTM F405 or ASTM F667 corrugated polyethylene; N-12 manufactured by ADVANCED DRAINAGE SYSTEMS, INC. or specifically approved equal.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions and substrate.
- B. Verify that trench cut is ready to receive work and excavations, dimensions and elevations are as indicated on the plans.

3.02 PREPARATION

- A. Remove large stones or other hard matter which could damage piping or impede consistent backfilling or compaction.
- B. Excavate under provisions of Section 312316.

3.03 INSTALLATION

- A. Install pipe and accessories in accordance with manufacturer's instructions and approved shop drawings.
- B. Lift or roll pipe into position. Do not drop or drag pipe over prepared bedding.
- C. Shore pipe to required position; retain in place until after compaction of adjacent fills. Ensure pipe remains in correct position and to required slope.
- D. Lay pipe to slope gradients noted on the plans, with maximum variation from true slope of 1/8 inch in 10 feet.
- E. Backfill under provisions of Section 312323.13.

3.04 TOLERANCES

- A. Maximum Variation from Intended Invert Elevation: 1/2 inch.
- B. Maximum Offset of Pipe from True Alignment: 1 inch.

3.05 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Section 014500.
- B. Request inspection prior to and immediately after placing aggregate cover over pipe.

3.06 PROTECTION

- A. Protect pipe from damage or displacement until backfilling operation is in progress.

END OF SECTION 334116

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. PVC pipe for drainage and sanitary.
- B. Fittings and accessories.

1.02 RELATED SECTIONS

- A. Section 312333 - Trenching
- B. Section 312323.13 - Backfilling

1.03 REFERENCES

- A. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and other Gravity Flow Applications.
- B. ASTM D2729 - Polyvinyl Chloride (PVC) Sewer Pipe and Fittings.
- C. ASTM D2855 - Recommended Practice for Making Solvent-Cemented Joints with Polyvinyl Chloride (PVC) Pipe and Fittings.
- D. ASTM D3034 - Standard Specification for Type PDM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings.
- E. ASTM D3212 - Standard Specifications for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.

1.04 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Product Data: Provide data on pipe, fittings, accessories and marking tape.

1.05 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 017839.
- B. Accurately record actual locations of pipe runs, connections and invert elevations.
- C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.06 REGULATORY REQUIREMENTS

- A. Conform to applicable codes for materials and installation of the work of this section.

1.07 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on the plans and as required by the manufacturer.

1.08 COORDINATION

- A. Coordinate pipe installation with trenching and installation of drainage structures.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. PVC Pipe: CERTAINTEED, JM, CARLON.
- B. Joint Lubricant: Manufacturer's standard.

2.02 MATERIALS

- A. PVC - ANSI/ASTM D3034, Type PSM, Polyvinyl Chloride (PVC) material; inside nominal diameter as indicated, integral bell and spigot end joints, class DR 18 or SDR 35 as indicated on plans. Joints meet or exceed ASTM D3212.

2.03 ACCESSORIES

- A. Marking Tape - Solid plastic tape with a minimum total thickness of 4.5 mil. Tape resilient to alkalis, acids, and other destructive elements; of sufficient strength that layers cannot be separated by hand or by exposure to boiling water for a period of three hours. Green in color, minimum 3" wide with the words "Caution - Sanitary Sewer" repeated every 16-36 inches, conforming to AWPA uniform color code.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions and substrate.
- B. Verify that trench cut is ready to receive work and excavations, dimensions and elevations are as indicated on the plans.
- C. Inspect all pipe and fittings before installation. Remove defective pipe from site.

3.02 PREPARATION

- A. Remove large stones or other hard matter which could damage piping or impede consistent backfilling or compaction.
- B. Excavate under provisions of Section 312316. Excavate sufficient clearance at each bell or coupling to allow uniform bearing along the pipe barrel.

3.03 INSTALLATION

- A. Install pipe and accessories in accordance with ASTM D2321.
- B. Lift or roll pipe into position. Do not drop or drag pipe over prepared bedding.
- C. Shore pipe to required position; retain in place until after compaction of adjacent fills. Ensure pipe remains in correct position and to required slope.
- D. Lay pipe to slope gradients noted on the plans, with maximum variation from true slope of 1/8 inch in 10 feet.

- E. Repair surface damage to any pipe protective coating in accordance with manufacturer's recommendations.
- F. Backfill under provisions of Section 312323.13.
- G. After partially backfilling, install marking tape 18 to 24 inches above crown of pipe.
- H. Construct cleanouts at locations shown and as detailed on the drawings. Use PVC wyes, bends and pipe as appropriate. Extend cleanout pipe to grade and terminate with plug.

3.04 TOLERANCES

- A. Maximum Variation from Intended Invert Elevation: 1/2 inch.
- B. Maximum Offset of Pipe from True Alignment: 1 inch.

3.05 FIELD QUALITY CONTROL

- A. Perform field inspection under provisions of Section 014500.
- B. Request inspection prior to and immediately after placing aggregate cover over pipe.

3.06 PROTECTION

- A. Protect finished work under provisions of Section 015000.
- B. Protect pipe from damage or displacement until backfilling operation is in progress.

END OF SECTION 334123

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Precast concrete catch basins and field inlets.
- B. Castings.
- C. Filter Insert

1.02 RELATED SECTIONS

- A. Section 312316 - Excavation.
- B. Section 312323.13 - Backfilling.
- C. Section 334211 - Stormwater Gravity Piping
- D. Section 334126 - Ductile Iron Pipe.

1.03 REFERENCES

- A. ASTM A48 - Gray Iron Castings.
- B. ASTM A615 - Deformed and Plain Billet Steel Bars for Concrete Reinforcement.
- C. ASTM C55 - Concrete Building Brick.
- D. ASTM C150 - Portland Cement.

1.04 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Shop Drawings: Indicate dimensions and details of catch basins and castings.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle products to the site under provisions of Section 016500.
- B. Store products on firm and level ground.
- C. Handle products in such a manner which will not induce unnecessary stresses, cause cracks to occur or damage the product in any way.
- D. Any cracked or otherwise defective materials will be rejected.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Do not mix or place mortar if ambient temperature is below 40 degrees F.

1.07 COORDINATION

- A. Coordinate work under provisions of Section 013100.

- B. Coordinate with excavation, backfilling, installation of piping and all other work.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. OLD CASTLE PRECAST, INC.
- B. SUFFOLK COUNTY PRECAST CORP.
- C. COASTAL PIPELINE PRODUCTS CORP.
- D. Substitutions shall be permitted only after receiving written approval from the Engineer.

2.02 MATERIALS

- A. Catch Basin and Field Inlet Sections: Reinforced precast concrete, lipped male/female joint, of the following materials:
 - 1. Concrete: ASTM C150 normal Portland cement, Type 1; minimum 4,000 psi strength at 28 days.
 - 2. Reinforcement: ASTM A615 reinforcing bars.
 - 3. Castings: ASTM A48, Class 30B, cast iron construction, machined flat bearing surface, non-rocking; removable grate, capable of supporting the AASHTO HS-20-44 highway loading; free from blowholes, shrinkage, distortion, cracks or other defects; smooth and of uniform quality; size and pattern as indicated on the plans, manufactured by CAMPBELL FOUNDRY COMPANY or specifically approved equal.

2.03 ACCESSORIES

- A. Brick: ASTM C55, Grade N, Type I - Moisture Controlled; normal weight; nominal modular size as required.
- B. Mortar: A 1:1:5 ratio of Portland cement, masonry cement and sand, respectively. Add water as required to create a workable consistency.
- C. Catch Basin Steps: Cast iron rungs; pattern number 2589 as manufactured by CAMPBELL FOUNDRY COMPANY; pattern number R-1980-C as manufactured by NEENAH FOUNDRY COMPANY, or specifically approved equal.
- D. Concrete for Formed Invert: ASTM C150 Portland cement type I, cast in place; 3,000 psi minimum strength at 28 days; dimensions as indicated on the plans.
- E. Catch Basin Filter Insert: Fabco Stormbasin filter insert and manufactured by Fabco Industries, Inc.

2.04 FABRICATION

- A. Fabricate and reinforce catch basin to the dimensions as indicated on the plans.
- B. Pipe Entry: Provide openings as required.
- C. Steps: Set or drilled and grouted in the catch basin wall at 12 inches on center vertically.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify existing grades are as indicated on the plans.
- B. Verify items provided by other sections of work are properly sized and located.
- C. Verify that rough openings for piping are as required.

3.02 INSTALLATION

- A. Form bottom of excavation clean and smooth to correct elevation. Compact bottom of the excavation to a minimum of 95 percent of maximum dry density.
- B. Place catch basin, secure and level, to the proper elevation. Utilize a placement method which will not damage or crack the catch basin.
- C. Place catch basin sections plumb and level, trim to correct elevations.
- D. Cut and fit for pipe. Seal openings in wall around pipe with brick and mortar. Establish elevations and pipe inverts for inlets and outlets as indicated on the plans. Trowel surfaces smooth.
- E. When indicated on the plans, place concrete in base of catch basin as required to form invert to the dimensions indicated on the plans. Trowel smooth.
- F. Set slab top on catch basin in a 1 inch mortar bed.
- G. Mount casting in a 1 inch mortar bed over access opening. Install firm, level and to the required elevation.
- H. If required to achieve proper elevation of casting, adjust with brick and mortar. A maximum height of 5 inches is permitted between the catch basin and the base of the casting. Maintain a maximum of 1 inch thickness of mortar between all bricks.

3.03 TOLERANCES

- A. Maximum Variation from Proposed Rim Elevation: 1/4 inch.
- B. Maximum Variation from Proposed Location: 1/2 inch.

3.04 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Section 014500.
- B. Request inspection prior to backfilling around structure and prior to surface restoration.

3.05 PROTECTION

- A. Protect finished work under provisions of Section 015000.
- B. Protect catch basin from damage or displacement until project is accepted by the Owner.

END OF SECTION 334413.13

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Precast solid and leaching rings.
- B. Bottom footing and top section.
- C. Castings.

1.02 RELATED SECTIONS

- A. Section 312316 - Excavation.
- B. Section 312323.13 - Backfilling.

1.03 REFERENCES

- A. ASTM A48 - Gray Iron Castings.
- B. ASTM A185 - Steel Welded Wire, Fabric, Plain, for Concrete Reinforcement.
- C. ASTM A615 - Deformed and Plain Billet - Steel Bars for Concrete Reinforcement.
- D. ASTM C55 - Concrete Building Brick.

1.04 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Shop Drawings: Indicate dimensions and details for solid rings, leaching rings, top sections and castings.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle products under provisions of Section 016500.
- B. Store products on firm, level ground.
- C. Handle products in a manner which will not induce unnecessary stresses, cause cracks to occur or damage the product in any way.
- D. Any cracked or otherwise defective materials will be rejected.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Do not mix or place mortar if ambient temperature is below 40 degrees F.

1.07 COORDINATION

- A. Coordinate with installation of piping and all other work.

PART 2 - PRODUCTS**2.01 MANUFACTURERS**

- A. OLDCASTLE PRECAST, INC.
- B. COASTAL PIPELINE PRODUCTS CORP.
- C. Substitutions shall be permitted only after receiving written approval from the Engineer.

2.02 COMPONENTS

- A. Rings, Tops and Footings: Reinforced precast concrete of the following materials:
 - 1. Concrete: ASTM C150 normal Portland cement Type I; minimum 4,000 psi strength at 28 days.
 - 2. Reinforcement: ASTM A615 reinforcing bars and ASTM A185 welded wire fabric.
- B. Castings: ASTM A48, Class 30B, cast iron construction, machined flat bearing surface; non-rocking, removable grate, capable of supporting the AASHTO HS-20-44 highway loading; free from blowholes, shrinkage, distortion, cracks or other defects; smooth and of uniform quality; size and pattern as indicated on the plans; manufactured by CAMPBELL FOUNDRY COMPANY or specifically approved equal.

2.03 ACCESSORIES

- A. Concrete Brick: ASTM C55, Grade N, Type I - Moisture Controlled; normal weight; nominal modular size as required.
- B. Mortar: A 1:1:5 ratio of Portland cement, masonry cement and sand, respectively. Add water as required to create a workable consistency.
- C. Filter Fabric: Non-woven, needle-punched geotextile; 140N manufactured by MIRAFI or equal.

2.04 FABRICATION

- A. Fabricate and reinforce all sections to the dimensions as indicated on the plans.
- B. Pipe Entry: Provide openings as required.

PART 3 - EXECUTION**3.01 EXAMINATION**

- A. Verify existing site conditions.
- B. Verify existing grades are as indicated on the plans.
- C. Verify items provided by other sections of work are properly sized and located.
- D. Verify that rough openings for piping are as required.

3.02 INSTALLATION

- A. Form bottom of excavation clean and smooth to correct elevation. Compact bottom of the excavation to a minimum of 95 percent of maximum dry density.

- B. Place structure on firm, level gravel surface.
- C. Place rings and top piece concentrically over footing. Utilize a placement method which will not damage or crack the structure. Wrap leaching rings for drainage structures with filter fabric.
- D. Place sections plumb and level, trim to the correct elevations.
- E. Cut and fit for pipe. Seal openings in wall around pipe with brick and mortar. Establish elevations and pipe inverts for inlets and outlets as indicated on the plans. Trowel surfaces smooth.
- F. Mount casting in a 1 inch mortar bed over access opening in slab or dome top. Install firm, level and to the required elevation.
- G. If required to achieve proper elevation of casting, adjust with brick and mortar. A height of 6-12 inches is permitted between the slab or dome top and the base of the casting. Maximum distance between brick surfaces is to be 1 inch.
- H. Backfill in annulus surrounding the leaching pool with Type C fill. Refer to Section 312323.13.

3.03 TOLERANCES

- A. Maximum Lateral Variation From Proposed Location: 1/2 inch.
- B. Maximum Variation From Proposed Rim Elevation: 1/4 inch.

3.04 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Section 014500.
- B. Request inspection prior to backfilling around structure and prior to surface restoration.

3.05 PROTECTION

- A. Protect finished work under provisions of Section 015000.
- B. Protect structure from damage and displacement until project is accepted by the Owner.

END OF SECTION 334923

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Pipe penetration seals.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Thunderline Corp
- B. PSI Products
- C. Approved equal

2.02 MATERIALS

- A. Seals shall be modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and wall opening. Links shall be loosely assembled with bolts to form a continuous rubber belt around the pipe with a pressure plate under each bolt head and nut.
- B. After the seal assembly is positioned in the sleeve, tightening of the bolts shall cause the rubber sealing elements to expand and provide a watertight seal between the pipe and wall opening under 40 feet of head. Seal shall be suitable for a temperature range of -40°F to 250°F and submergence in groundwater.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Determine the required inside diameter of each individual wall opening or sleeve. The inside diameter of each wall opening shall be sized as recommended by the manufacturer to fit the pipe and pipe penetration seal to assure a watertight joint. Sizing for correct pipe penetration seal model and number of links per seal may be obtained through manufacturer's catalog. If pipe outer diameter is nonstandard due to coating or insulation, consult manufacturer for engineering assistance and recommendation before proceeding with wall opening detail.

3.02 INSTALLATION

- A. Install and tighten seal to provide a watertight pipe penetration in accordance with manufacturer's instructions.

END OF SECTION 402325

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Butterfly valves
- B. Plug valves
- C. Butterfly and plug valve worm gear actuators
- D. Butterfly and plug valve electronic valve actuators
- E. Buried gate valves
- F. Buried ball valves
- G. Swing Check Valves
- H. Ball Check Valves
- I. Accessories

1.02 GENERAL INFORMATION

- A. All valves installed in pipelines where the pipe is specified or shown to be any grade or diameter of stainless steel, regardless of end connection style, shall also be stainless steel.
- B. All valves installed in pipelines where the pipe is specified or shown to be any diameter of ductile iron, regardless of end connection style, shall be cast iron body style valve.
- C. For the purposes of this specification, large diameter piping shall be considered pipe with a diameter equal to or greater than 3 inches nominal diameter.

1.03 RELATED SECTIONS

- A. Section 016500 – Product Delivery, Storage and Handling
- B. Section 220529 – Hangers and Supports for Plumbing Piping and Equipment
- C. Section 402336 – Air and Water Process Piping
- D. Section 467325 – Autothermal Thermophilic Aerobic Digestion System

1.04 REFERENCES

- A. ANSI/AWWA C111- Rubber Gasket Joints for Ductile Iron and Grey Iron Pressure Pipe and Fittings.
- B. ANSI/AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids.
- C. ANSI/AWWA C500 - Gate Valves, 3 inch (75 mm) through 12 inch (305 mm) NPS, for Water and Sewage Systems.
- D. ANSI/AWWA C504 - Rubber - Seated Butterfly Valves.

- E. AWWA C507 – Ball Valves, 6 in. through 48 in.
- F. AWWA C508 - Swing - Check Valves for Water Works Service, 2 in. through 24 in.
- G. AWWA C509 – Resilient Seated Gate Valves for Water Supply
- H. AWWA C540 – Power Actuating Devices for Valves and Service Gates
- I. ANSI/AWWA C600 - Installation of Ductile Iron Water Mains and Appurtenances.
- J. AWWA C606 – Grooved and Shouldered Joints
- K. ANSI/AWWA C800 - Underground Service Line Valves and Fittings.
- L. ASTM A351 – Austenitic Gray Iron Castings
- M. ASTM A436 – Austenitic Gray Iron Castings
- N. ASTM A744 – Specifications for Castings, Iron-Chromium-Nickel, Corrosion Resistant for Severe Service
- O. ASTM A743 – Castings, Iron Chromium, Iron-Chromium-Nickel, Corrosion Resistant for General Application
- P. ASTM A126 – Gray Iron Castings for Valves, Flanges and Pipe Fittings

1.05 SUBMITTALS

- A. The Contractor shall submit separate valve schedules for each valve type (or style) that shall form the index of the shop drawing submittal. Each valve schedule shall provide the following information in tabular form and the Engineer reserves the right not to review the submittal until such time as all of the specified information is provided without claims for delay:
 - 1. Shop drawing reference number
 - 2. Manufacturer's valve tag designation
 - 3. Abbreviated process piping application as shown on Contract Drawing PD-1, if shown.
 - 4. Quantity
 - 5. Diameter
 - 6. End connection
 - 7. Packing
 - 8. Actuator type
 - 9. Accessories
 - 10. List of AWWA, ANSI, and ASTM applicable standards
 - 11. Body material
 - 12. Stem material
 - 13. Gasket material to be used with the valve (if applicable)
- B. The remaining shop drawing submittal package shall include the following and be submitted in accordance with the requirements contained in Section 013300:
 - 1. Dimensional prints valves and actuators.
 - 2. Valve specifications including materials of construction and features of design.
 - 3. Shop drawings for extension rods and guides indicating diameter, length, and material.
 - 4. Drawings for installation and support of guides.
 - 5. Catalog cuts and dimensional data for floor stands.
 - 6. Catalog cuts for valve boxes with cover casting indicated.
 - 7. Painting system catalog cuts.

- C. Installation, operations and maintenance instructions for each type valve prepared in accordance with the requirements contained in Section 017823.
- D. Product Data: Provide data on pipe materials, pipe fitting, valves and accessories.
- E. A Warranty Certificate as specified herein shall be provided from each valve manufacturer.

1.06 PROJECT RECORD DOCUMENTS

- A. Submit product data under provisions of Section 017839 - Project Record Documents.
- B. Accurately record actual locations of piping mains, valves, connections, and invert elevations.

1.07 QUALITY ASSURANCE

- A. Perform work in accordance with the local utility company requirements.
- B. Valves: Manufacturer's name and pressure rating marked on valve body.
- C. Affidavit of Compliance: The Contractor shall have the manufacturer provide an affidavit directly to the Engineer that all valves supplied on this project comply with all applicable provisions of AWWA Specification C509, and that each valve was subjected to and passed the 500 psi hydrostatic test without leakage. No final payment for valves will be made until this Affidavit of Compliance is received by the Engineer.
- D. All brass valves and fittings installed on a potable water supply line shall be made of "low-lead" materials and have a maximum lead content of 0.25 percent by weight. All low lead brass fittings shall be stamped or embossed with a mark indicating that the product is manufactured from low-lead alloys.

1.08 FIELD SERVICES

- A. Supply and credit to the Owner the costs for field services as specified in Section 017500 - Starting and Adjusting.
- B. The following field services shall be provided as a minimum in accordance with the requirements contained in Section 017500 - Starting and Adjusting:
 - 1. One (1) day totaling one (1) trip by each valve manufacturer for providing installation instruction to the Contractor. The Contractor shall be responsible for all costs associated with having the manufacturer present should the Contractor require more days of installation instruction.
 - a. One (1) day totaling one (1) trip by each valve manufacturer to field check the completed installation and verify proper operation during normal plant operating conditions.

1.09 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Sections 016100 - Basic Product Requirements and 016500 - Product Delivery, Storage and Handling.
- B. Deliver and store valves in shipping containers with labeling in place.
- C. Completely follow the manufacturer's recommended short and long term storage procedures. Partial payment requests for valves delivered to the site, but not yet installed, will not be processed if valve deliveries and storage requirements of the manufacturer are not followed.

- D. Deliver and store valves in shipping containers with labeling in place until the time that the valve is to be installed.

1.10 WARRANTY

- A. The manufacturer shall guarantee all valve components to be free from defects in design, materials and workmanship for a period of one (1) year commencing on the date the valve was placed into permanent and consistent operation.
- B. During the guarantee period, if any part or equipment component is defective or fails to perform when operating at design conditions and if the equipment has been installed and is being operated and maintained in accordance with the written instructions provided by the manufacturer, the manufacturer shall repair or exchange at the discretion of the Owner such defective part(s) free of any and all charges. The manufacturer will be responsible for the cost of labor and all other expenses resulting from the repair or replacement of the defective part(s) and from installation of part(s) furnished by this Warranty.

PART 2 - PRODUCTS

2.01 BUTTERFLY VALVES

- A. Exposed and Buried Flanged Valve Construction – Cast Iron Body:
 - 1. Flanged end butterfly valves - 2-1/2 inch and larger shall be of the EPDM-seated, tight closing type, with cast body and disc, and 150 psi working pressure. Valves shall conform to the requirements specified in AWWA C504 Standard for Rubber-Seated Butterfly Valves.
 - 2. Valve body shall be cast iron per ASTM A-126, Class B, with integrally cast hubs for shaft bearing housing, and 125 pound flanged ends faced and drilled in accordance with ANSI B16.1, Standard for Cast Iron Flanges.
 - 3. Valve disc shall be symmetrical about the shaft axis with no external ribs, cast of alloy cast iron per Military Specification MIL 6-858a, Class I. Valve shaft shall be of a solid one-piece design of center less ground 18-8 stainless steel or high strength steel (70,000 psi) completely isolated from line fluid. Disc movement shall be 90 degrees open to closed.
 - 4. The valve shall be field repairable and may be disassembled in the field for seat replacement. Rubber seats mounted on the disc shall be clamped thereon. Rubber seats mounted on valve bodies shall be cemented and clamped, bonded or vulcanized to the valve body. Rubber seats shall be made of EPDM material.
 - 5. Taper pins, lock washers and nuts shall be 18-8 stainless steel. Valve seat shall be of molded natural rubber, recess mounted, bonded and mechanically secured to the valve body or disc. Seat shall provide leak free shutoff at 150-psi differential. Sleeve type bearings of self-lubricating material shall be installed in the hubs of the valve body, designed for maximum load of 2,500 psi or one-fifth the compressive strength of the material, whichever is highest.
 - 6. A shaft seal shall be provided in the valve body hub where the shaft extends through it. The one-piece cast gland follower studs and nuts shall be bronze. Packing shall be self-adjusting split "V" type, or triple "O" ring.
- B. Grooved Valve Construction – Cast Iron Body:
 - 1. Grooved end valves shall be provided in conformance with pipe and coupling specified in specification section 402336 – Air and Water Process Piping.
 - 2. Grooved end butterfly valves - 2-1/2 inch and larger shall be of the EPDM-seated, tight closing type, with cast body and disc, and 175 psi working pressure. Valves shall conform to the requirements specified in AWWA C504 Standard for Rubber-Seated Butterfly Valves.
 - 3. Valve body shall be ductile iron per ASTM A-536.

4. Valve disc shall be narrow profile type and offset about the shaft. Disc shall ride on stainless steel upper and lower stems. Valve disc shall be of ductile iron construction, black PPS coated. Disc movement shall be 90 degrees open to closed.
- C. Manual Valve Operators
1. Manual operators shall be of the worm and gear type and shall be self-locking. The gear operators shall be permanently lubricated, totally enclosed, with adjustable stops for the open and closed position, and valve disc position indicator. The operator shall be designed so that a pull of not more than 80 pounds will produce an output torque sufficient to operate the valve under actual line pressures and velocities.
 2. Valves shall be equipped with hand wheels and position indicators.
- D. All wetted parts shall be 304 stainless steel.
- E. Manufacturers: Dezurik, Crane or Victaulic

2.02 PLUG VALVES

- A. Exposed and Buried Valves – Flanged / Mechanical Joint Ends:
1. Valves shall be of the non-lubricated eccentric type equipped with resilient faced, balanced plugs and shall be furnished with end connections as specified below.
 2. Port area for valves less than 6-inch diameter shall be at least 80% of full pipe area. Port areas of 6 inch and larger valves shall be at least 100% of full pipe area.
 3. Valve bodies shall be of ASTM A126, Class B, and cast iron. All exposed nuts, bolts, springs, washers, etc., shall be stainless steel. Resilient plug facings shall be of Nitrile Butadiene suitable for use with septic sewage (hydrogen sulfide).
 4. Valves shall be furnished with corrosive resistant seats. Seats in 3-inch diameter and larger valves shall have a welded-in overlay of high nickel content on all surfaces containing the plug face.
 5. Valves shall be furnished with replaceable, permanently lubricated, stainless steel sleeve-type bearings in the upper and lower journals.
 6. Valve pressure ratings shall be as follows and shall be established by hydrostatic tests as specified by ANSI Standard B16.1. Pressure ratings shall be 175 psi for valves through 12-inch diameter, 150 psi for valves in sizes 14 inch through 36-inch diameter. Valves shall provide drip-tight shutoff up to the full pressure ratings. Valves shall be capable of providing drip-tight shutoff up to the full valve rating with pressure in either direction.
 7. Valve shaft seals, bearings and seats shall comply with applicable portions of AWWA C504 and C507.
 8. Valve actuator shall operate valve at a pressure differential up to 50 psi.
 9. Buried: Mechanical Joint, gear actuator and enclosure for buried installation.
 10. Exposed: Flanged joint, gear actuator with handwheel.
 11. Manufacturer: Dezurik, Clow or approved equal.
- B. Exposed Valves – Grooved Ends:
1. Circular port area shall allow for pigging of lines. Port areas of 6 inch and larger valves shall be at least 100% of full pipe area.
 2. Valve bodies shall be of AWWA C-606 and C509 cast iron, coated with alkyd enamel. All exposed nuts, bolts, springs, washers, etc., shall be stainless steel. Eccentric resilient plug facings shall be of Nitrile Butadiene suitable for use with septic sewage (hydrogen sulfide).
 3. Valves shall be furnished with corrosive resistant seats. Seats in 3-inch diameter and larger valves shall have a welded-in overlay of high nickel content on all surfaces containing the plug face.
 4. Valves shall be furnished with replaceable, permanently lubricated, stainless steel sleeve-type bearings in the upper and lower journals.

5. Valve pressure ratings shall be as follows and shall be established by hydrostatic tests as specified by ANSI Standard B16.1. Pressure ratings shall be 175 psi for valves through 12-inch diameter, 150 psi for valves in sizes 14 inch through 18-inch diameter. Valves shall provide drip-tight shutoff up to the full pressure ratings. Valves shall be capable of providing drip-tight shutoff up to the full valve rating with pressure in either direction.
 6. Exposed valves by Victaulic with grooved ends: 6-inch diameter and larger, with gear operator with handwheel. Valve actuator shall operate valve at a pressure differential up to 50 psi. Smaller than 6" diameter shall be provided with handle operator and required stem extension unless stated otherwise.
- C. Submerged Service:
1. All plug valves located below water level shall be furnished with a side mounted gear actuator, floor stand extension rod, manufacturer's stainless steel valve stem guide, and floor stand.
 2. Extension rods: Type 304 stainless steel
 3. Manufacturer: Dezurik, Clow or approved equal.

2.03 BURIED SERVICE BALL VALVES (UNDER 4" DIAMETER)

- A. Curb, straight meter and service ball valves shall have "low-lead" ASTM B62 Alloy C83600 bronze body, stem, cap and ball conforming to ANSI/AWWA C800 standard for underground service line valves.
- B. All types and sizes of valves shall seal full rated pressure in either direction and have a 300 psig water pressure rating and 180 F temperature rating, Valves shall be two directional flow type valves.
- C. Ball coating shall be PTFE. Stem O-ring shall be ASTM D2000 EPDM rubber. Molded rubbers seater ASTM D2000 Nitrile (Buna-N) rubber.
- D. MUELLER COMPANY 300™ or approved equal.

2.04 BUTTERFLY AND PLUG VALVE - WORM GEAR OPERATORS

- A. Worm gear operators shall be required on all exposed valves that are 6" nominal size and larger and shall be self-locking as noted on the contract plans. Valves less than 6" nominal diameter shall be provided with lever type manual operators unless otherwise indicated. All operators shall be provided with memory stops. The gear operators shall be permanently lubricated, totally enclosed, with adjustable stops for the open and closed position, and valve disc position indicator. The operator shall be designed so that a pull of not more than 80 pounds will produce an output torque sufficient to operate the valve under actual line pressures and velocities.
- B. Valves shall be equipped with hand wheels and position indicators.
- C. Valves installed six (6) feet above finished floor or higher shall be provided with chainwheel operators and stainless steel chain.
- D. Actuators shall be manufactured by the valve manufacturer.

2.05 VALVE BOXES

- A. Acceptable Manufacturers are Mueller Company, Clow Valve Company, American Flow Control or A.Y. McDonald.
- B. All buried plug and gate valves shall be provided with a 2-inch square nut.

- C. Valve boxes shall be provided for all buried valves. Valve boxes shall be assembled unit composed of the valve box, extension stem, and a self-centering alignment ring. All moving parts of the extension stem shall be enclosed in a housing to prevent contact with the soil. Valve box assemblies shall be adjustable to accommodate variable trench depths.
- D. The entire assembly shall be made of minimum 1/4-inch heavy wall high-density polyethylene. All components shall be joined with a permanent locking design. The valve box section shall be adaptable to fit inside a standard valve box upper section.
- E. The stem assembly shall be of a telescoping design that allows for variable adjustment length. The material shall be galvanized steel square tubing. The stem assembly shall have a built-in device that keeps the stem assembly from disengaging at its fully extended length. The extension stem shall be torque tested to 1,000 foot-pounds.
- F. All valve boxes shall come complete with a 2-inch high top extension for final adjustment prior to paving/grading.
- G. Cover: Cast in the cover the word, "REUSE WATER", "POTABLE WATER" or "SEWAGE", as applicable.
- H. Handles: Furnish one operator handle for each buried valve at 42 inches above top of box.
- I. Where existing valve boxes are being used, provide a retrofit valve box insert.

2.06 SWING CHECK VALVE

- A. Manufacturers: GA Industries, Inc. Figure 250-DS, Clow or approved equal.
- B. The air-cushioned swing check valve shall have a heavy duty body, shall be constructed of high-strength cast iron conforming to ASTM A126 Class B with integral flanges, faced and drilled per ANSI B16.1 Class 125 and be suitable for horizontal installation.
- C. The valve body shall be the full waterway type, designed to provide a net flow area not less than the nominal inlet pipe size when swung open no more than 25 degrees. The valve shall have a replaceable 316 stainless steel body seat.
- D. Valve disc shall be cast iron and faced with a renewable resilient seat ring of rubber or other suitable material, held in place by a follower ring and stainless steel screws.
- E. The disc arm shall be ductile iron or steel, suspended from and keyed to an austenitic stainless steel shaft which is completely above the waterway and supported at each end by heavy bronze bushings. The shaft shall rotate freely without the need for external lubrication. The shaft shall be sealed where it passes through the body by means of a stuffing box and adjustable packing. Simple O-ring shaft seals are not acceptable.
- F. The valve shall be supplied with an outside lever and adjustable counterweight to initiate valve closure. Final closure shall be dampened by means of a single, side-mounted bronze air-cushion assembly directly mounted to the valve body on machined pads. The amount of cushioning shall be easily adjustable without the need for pre-charged air chambers. Commercial air cylinders which pivot and/or are attached with fabricated brackets are not acceptable.
- G. The valve shall swing open smoothly at pump start and close quickly and quietly upon pump shutdown to prevent flow reversal. When closed, the valve shall seat drop tight.

2.07 BALL CHECK VALVE

- A. Check valves furnished under this Section shall be HDL type 5087 by Flygt or equal as follows:
 - 1. Body: Nodular cast iron, type GGG40
 - 2. Flanged Drilling: ANSI B16.1, Class 125, Flat Faced
 - 3. Ball: Hollow metal core with vulcanized Nitrile rubber covering.
- B. The nominal size of the valve shall match the discharge size of the pump's base elbow.

2.08 ACCESSORIES

- A. Provide worm gear operators on all exposed valves that are 6-inch nominal size and larger. Operator shall be self-locking. Provide valves less than 6-inch nominal diameter with lever type manual operators unless otherwise indicated. Provided all operators with memory stops. The gear operators shall be permanently lubricated, totally enclosed, with adjustable stops for the open and closed position, and valve disc position indicator. The operator shall be designed so that a pull of not more than 80 pounds will produce an output torque sufficient to operate the valve under actual line pressures and velocities.
- B. Provide valves installed six (6) feet above finished floor or higher with chainwheel operators and stainless steel chain.
- C. Actuators shall be furnished by the valve manufacturer.
- D. Electric Valve Actuators
 - 1. Manufacturers: AUMA motor operator, Model SQXX.1 Auma Matic for 3" valves and larger.
 - 2. Electric Valve Actuator operator shall conform to AWWA C504 and AWWA C540. Valve shall be electric motor actuated. The electric motor operator shall be designed to move the valve from fully open position to fully closed when electrical power is applied, and hold the valve in any intermediate position between full open and fully closed without creeping or fluttering. Valve, reducer, electric motor operator and accessories shall be furnished complete, ready for installation, from a single manufacturer. Electric motor enclosure shall meet NEMA 4 construction.
 - 3. Electrical control housing shall be heavy cast aluminum and fully gasketed to meet NEMA 4, watertight construction.
 - 4. Heavy duty motor shall operate from 120 VAC (nominal) single phase input source. Thermal cut-out switches shall be provided in case of motor overload. Internal heaters shall be provided to prevent damage from condensation within housing.
 - 5. Gears and gear shafts shall be alloy steel and heat treated for hardness. All shafts shall mount in friction reducing bearings. Gear box housing shall be grease filled and sealed. No lubrication shall be required for the life of the unit.
 - 6. Two (2) internal limit switches shall be preset at the factory and furnished for each extremity of valve disc travel. Adjustment of each limit switch within one-half degree of disc travel shall be possible. Two (2) additional external limit switches shall be furnished for signal or auxiliary control for both open and closed valve positions. Manual operation shall be available and shall be accomplished by means of a shaft, equipped with a flat wrench that extends through a sealed opening in the housing. A hand wheel for manual operation shall be supplied.
 - 7. For each motorized butterfly valve, provide automatic and local valve controls which will include an open-close-automatic remote selector switch and timer that will open the valve and then close the valve as directed. Two (2) indicator lights shall be provided to indicate the OPEN (green) and CLOSED (red) positions.
 - 8. Provide position indication by means of an indicator dial in full step at all items with valve travel during both powered and manual operation.

9. Provide manual valve operator wheel.

PART 3 - EXECUTION

3.01 GENERAL

- A. Valves and valve accessories shall be installed by workers thoroughly experienced in such work and all valve work shall be properly supported and aligned and present a neat and workmanlike appearance.

3.02 INSTALLATION

- A. All valves and valve accessories shall be installed by workers thoroughly experienced in such work and all valve work shall be properly supported and aligned and present a neat and workmanlike appearance. All other required temporary or permanent supports for the valves shall be included in this contract to the approval of the Engineer.
- B. Set valves in a plumb or level position, as applicable.
- C. Install check valves for proper direction of flow. Adjust cushion chamber check valve to prevent water hammer at service conditions.
- D. Assemble flanged joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly with a torque wrench.

3.03 PREPARATION

- A. Remove scale and dirt, on inside and outside, before assembly. Inspection, Handling and Storage:
 1. Valves and boxes found to be either defective or damaged shall be rejected and immediately removed from the job site.
 2. Handling - Valves and boxes shall be loaded and unloaded by lifting with hoists or skidding under control with ropes in order to avoid shock or damage. Valves and boxes shall not be dropped.
 3. Storage - Valves, floor stands, joint accessories and valve boxes, if stored, shall be kept safe from damage. The interior of the valve and the joint accessories shall be kept free from dirt or foreign matter at all times.
- B. Ream pipe and tube ends and remove burrs.
- C. Perform operating tests on valves as per the manufacturers recommendations as may to determine they are in satisfactory operating condition and do not leak. All valves upon completion of the work shall be checked to determine they are in an open position, unless otherwise indicated.

3.04 FIELD QUALITY CONTROL

- A. Leakage testing shall be in accordance with ANSI/AWWA C600.
- B. If tests indicate work does not meet specified requirements, remove work, replace and retest at no cost to Owner.

END OF SECTION 402326

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, and equipment necessary to furnish and install air and water process piping under pressure.
- B. Work includes exposed and underground piping as shown on the Drawings.
- C. BID NOTES (Grooved Piping Option):
 - 1. Included in the as-bid price, and at the Contractor's option, groove ended pipe and fittings may be used in lieu of flanged pipe and fittings in locations where ductile iron pipe is indicated on the Drawings or in lieu of butt-welded fittings for areas where stainless steel pipe is indicated on the Drawings, with the following provisions or except as stated herein.
 - 2. Equipment with flanged outlets and inlets, pumps, constant head boxes, valves, flow meters, and other in-line process equipment, shown on the Drawings as flanged, shall remain flanged.
 - 3. Provide and install flanged by groove ended pipe adapters for all plug, check, and butterfly valves to mate groove ended joints to flanged fittings and equipment. Groove ended valves will be permitted on this project.
 - 4. Provide a flanged by groove ended spool piece to make joints for equipment, pumps, constant head boxes, flow meters, and other in-line equipment. Spool pieces shall be at least equal to five (5) times the pipe diameter. Adapters will not be permitted in this instance.
 - 5. Where the specifications call for flanged pipe as being packaged with system equipment, this pipe shall remain as flanged.
 - 6. Groove ended stainless steel fittings will be permitted for use on compressed air lines unless otherwise noted on the Drawings. All buried and exposed stainless steel piping shall be butt-welded.
 - 7. Joint restraint using rodding, specified on the Drawings, need not be provided for groove ended pipe and fittings.
 - 8. Concrete thrust blocking, pipe restraining fittings and support piers, where shown for exposed pipe, shall be installed for either piping system.
 - 9. All costs associated with installing piping shall be included in the bid price.

1.02 REFERENCES

- A. ANSI B16.1 - Cast Iron Pipe Flanges and Flanged Fittings.
- B. ANSI B36.19M – Stainless Steel Pipe
- C. ANSI/AWWA C104 - Cement-Mortar Lining for Ductile Iron Pipe and Fittings for Water.
- D. ANSI/AWWA C110 - Ductile-Iron and Gray-Iron Fittings, 3 in. through 48 in., for Water and Other Liquids.
- E. ANSI/AWWA - C115/A21.15 - American National Standard for Flanged Ductile Iron Pipe with Threaded Flanges.
- F. ANSI/AWWA C150/A21.50 - American National Standard for Thickness Design of Ductile Iron Pipe.
- G. ANSI/AWWA C600-93 - Installation of Ductile Iron Water Mains and Appurtenances.

- H. ANSI B18.2.1 - Square and Hex Bolts and Screws Inch Series Including Hex Cap Screws and Lag Screws.
- I. ANSI B18.2.2 - Square and Hex Nuts (Inch Series).
- J. ASTM A307 - Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
- K. AWWA C606-87 – Grooved and Shouldered Joints.
- L. AWS D10.4 – Recommended Practices for Welding Austenitic Chromium Nickel Stainless Steel Piping
- M. ASTM A312/A312M – Seamless and Welded Austenitic Stainless Pipes

1.03 SUBMITTALS

- A. Submit information in accordance with Section 013300.
- B. Prepare a schedule for each service classification specified herein listing the pipe, fitting, lining, coating and joint type proposed for the project.
- C. Provide data on pipe material, coatings, linings, pipe fittings, dimensions and accessories. Provide manufacturer's catalog information.
- D. Piping shop drawings shall be provided. Field measurement then fabrication of pipe will not be permitted. All exposed pipe shall be delivered to the site cut to exact layout dimensions.
- E. Manufacturer's installation instructions for each pipe type.
- F. Foundry Records and Tests for ductile iron pipe: Written transcripts of the test results shall be delivered directly to the Engineer within one week of the shipment of pipe with the date of the tests as close to the date of manufacture as practical. For ductile iron pipe, written transcripts shall be furnished directly to the Engineer in accordance with applicable sections of AWWA C151 and ANSI A21.51:
 - Transcripts & Certification: 51-5.2
 - Group Tests Required: Hydrostatic Test (51-9)
Tensile Test (51-12.1)
Impact Test (51-12.2)
 - Low Temperature Impact Test (51-13)
 - Number of Specific Group Tests
Required in Addition to General
Certification: One (1) per pipe size per 2,000 linear feet of pipe.
- G. Certifications for stainless steel piping specified in the following documents:
 - 1. ASTM A403, paragraph 14.1
 - 2. ASTM A774, paragraph 14.1
 - 3. ASTM A778, paragraph 14.1
 - 4. ASTM A409, paragraph 17.1
- H. Names and qualification records of proposed welders.
- I. Other data necessary to show conformance of the stainless steel piping system to these specifications.

1.04 QUALITY ASSURANCE

- A. All piping manufacturers shall meet ISO 9001:2000.
- B. Ductile iron pipe manufacturer shall be a member of the Ductile Iron Pipe Research Association.
- C. Ductile iron pipe shall be marked with the manufacturer's name, classification, or nominal thickness and "DI" or "Ductile Iron".
- D. Stainless steel pipe shall be marked with manufacturer's name, gauge, or nominal thickness and heat rating.
- E. All shop fabricated stainless steel pipe and fittings shall be furnished by a single manufacturer who is experienced and qualified in the manufacture and fabrication of the items to be furnished.
- F. The pipe and fittings shall be shop-fabricated and field-installed in accordance with common industry wide practices and methods and shall comply with these specifications.
- G. Only weld procedures which have been qualified under ASME Section IX and only welders who have successfully completed performance qualification tests per ASME Section IX on these qualified procedures shall be utilized.
- H. The stainless steel piping supplier and the Contractor shall use extreme care to avoid the contact of any ferrous materials with the stainless steel piping during manufacturing, fabricating, handling, and installation stages.
- I. All saws, drills, files, and wire brushes shall be used for stainless steel piping only. Pipe storage and fabrication racks shall be nonferrous, stainless steel, or rubber-lined.
- J. Nylon slings or straps shall be used for handling stainless steel piping. After installation, the Contractor shall wash and rinse all foreign matter from the piping surface.
- K. All welded joints shall be treated with a pickling solution, brushed with stainless steel wire brushes, and rinsed clean. If rusting of embedded iron occurs, the Contractor shall pickle the affected surface with Oakite Deoxidizer SS, or equal, scrub with stainless steel brushes, and rinse clean.
- L. Factory testing of stainless steel piping shall conform to the requirements of ASTM A312, ASTM A409 HT-0, or ASTM A778, depending on the size and type of stainless steel pipe provided.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, protect, and handle products in accordance with manufacturer's instructions.
- B. Fabricated piping shall have openings plugged and flanges secured for storage or transport after fabrication.
- C. Fabricated piping shall be piece-marked with identifying numbers or codes which correspond to the Contractor's layout and installation drawings. The marks shall be located on the spools at opposite ends and 180° (degrees) apart.
- D. Pipe spools shall be loaded, blocked, and lagged as necessary to ensure protection from damage during shipping.

- E. Stainless steel pipe and fittings shall be stored per manufacturer's recommendation.
- F. Dents, gouges, and scratches in stainless steel pipe and fittings are not acceptable and are reason for rejecting pipe and fittings.
- G. Protect products from entry of foreign materials.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Do not install piping when bedding is wet or frozen.

PART 2 - PRODUCTS

2.01 DUCTILE IRON PIPE AND FITTINGS – BURIED AND EXPOSED

- A. Ductile iron pipe shall be centrifugally cast with primary graphite in nodular form or spherulitic and conform to AWWA C151.
 - 1. All buried and exposed (dry and submerged service) shall be thickness Class 53.
 - 2. Grooved end ductile iron pipe shall conform to AWWA C606-87 and be manufactured to rigid groove dimensions.
 - 3. All buried and exposed ductile iron pipe and fittings shall be cement lined in accordance with AWWA C104 for liquid carrying service, double thickness, minimum 3/16" for pipe and standard thickness for fittings. Air piping shall be unlined.
 - 4. All buried ductile iron pipe and fittings shall be provided with bituminous seal coat in accordance with AWWA C106, inside and out.
 - 5. All exposed (dry and immersion service) ductile iron pipe shall be provided with an interior seal coat in accordance with AWWA C106. The exterior of all exposed ductile iron pipe shall be factory primed using a high solids epoxy system with a shop coat thickness of 3.0-8.0 mils DFT. The primer shall be manufactured by Tnemec Company or equal and be red oxide in color. Field paint exposed ductile iron pipe (dry and immersion service) as specified in Section 099100.
- B. Fittings: Comply with AWWA C110 for center-to-center end dimensions.
 - 1. Buried: All buried fittings and buried valve joints shall be mechanically restrained and be provided with thrust blocking as detailed on the Drawings. Mechanical joint restraint shall be incorporated into the design of the follower gland. The restraining mechanism shall consist of individually actuated wedges. The joint restraint ring shall be made of 60-42-10 ductile iron conforming to ASTM A536-84. The restraint shall be series 1100 Megalug by Ebba Iron or equal.
 - 2. Exposed:
 - a. Ductile iron flanged fittings shall match those of Class 125 flanges in accordance with ANSI B16.1 with 1/8-inch full-face plain rubber SBR (Styrene Butadiene Copolymer) gaskets for sewage and water service.
 - b. Ductile iron grooved fittings shall comply with AWWA C606 rigid radius grooving dimensions. Fittings shall be ductile conforming to ASTM A-536.
- C. Joints:
 - 1. Exposed Piping:
 - a. Flanged: shall be as specified above for fittings.
 - b. Grooved: shall be Victaulic Style 31 or equal, cast of ductile iron conforming to ASTM A-536 with alkyd-phenolic primer coating with a synthetic rubber gasket suitable for the intended service. Gasket shall be specially compounded to conform to ductile iron pipe surfaces with a short center leg that shall bridge the pipe ends offering an initial seal on the leading edge of the pipe ends.

2. Buried Piping: AWWA C111 push on joint with stainless steel locking segments vulcanized into rubber ring gasket, Flex-Ring ® by American Ductile Iron Pipe or FieldLok ® by U.S. Pipe or equal.
- D. Exposed and Buried Service Bolts and Nuts: Nuts and bolts shall be alloy steel conforming to the physical properties of ASTM A563. Bolts shall conform to ANSI B18.2.1. Nuts shall conform to ANSI B18.2.2. Bolts and nuts for grooved pipe shall be heat-treated plated carbon steel, track head, conforming to the physical properties of ASTM A183. Paint exposed and buried bolts and nuts in accordance with Section 099100.
- E. Submerged Service Bolts and Nuts: Type 304 stainless steel conforming to ASTM A-193. All piping bolts and nuts located in any tank, vault, well, chamber, or any other structure that treats, stores or conveys water or sewage shall be considered a submerged (immersion) service even if it is not physically located below the water level. The Contractor shall not paint these nuts and bolts. Mask the exposed threads prior to pipe painting. All bolts and nuts in any process tank, regardless if it is located above water level shall meet the requirements of this paragraph.
- F. Lubricant for Joints: Shall have no deteriorating effects on gasket or pipe material and shall be supplied by the pipe manufacturer or joint manufacturer in sufficient quantity.
- G. Manufacturer: American Ductile Iron Pipe, U.S. Pipe & Foundry Co. or equal.
- H. Flanged Adapters: Dismantling joint Smith Blair, Inc., Model 975 or equal for plain end steel or cast iron pipe with all bolts, rings, gaskets and accessories.
- I. Couplings: Smith Blair, Inc., Model 411 or equal for plain end steel or cast iron pipe with all bolts, rings, gaskets and accessories.
- J. Restrained Joint Fittings: Ford Meter Box Co., Inc., UNI-FLANGE "BlockBuster" series 13100, 1400 & 1500 for PVC, ductile iron and steel piping.

2.02 STAINLESS STEEL PIPE AND FITTINGS – BURIED AND EXPOSED

- A. Stainless steel pipe shall be Type 304L stainless steel, with 2D finish in compliance with AISI 304L and ASTM A240. Pipe shall be manufactured to nominal pipe sizes as listed in ANSI B36.19 and shall have nominal wall thicknesses corresponding to schedule 10 for above grade and schedule 40 for below grade. Only extra-low carbon (ELC) materials with 0.030% maximum carbon shall be used.
- B. All connections shall be welded in compliance with AWS D10.4, except as otherwise shown on Drawings.
- C. Fittings:
 1. Unless otherwise specified, stainless steel fittings 3-inch and larger: butt weld type manufactured in accordance with ASTM A774 of the same material and in the same thicknesses as the pipe. Long radius elbows less than 24-inches in diameter shall be smooth flow. All short radius, special radius, reducing, and long radius elbows 24-inches and greater in diameter shall be of mitered construction. Reducers shall be straight tapered cone type. Tees, crosses, laterals, and wyes shall be shop-fabricated from pipe.
 2. Flanged fittings: match those of Class 125 flanges in accordance with ANSI B16.1.
 3. Gaskets: EPDM (Ethylene Propylene Diene Monomer) with a temperature capability of 250 deg. F.
 - a. For air piping, gaskets shall be Viton with temperature capability of 350 deg. F.
 4. Bolts nuts and washers for stainless steel flange assemblies: Type 316 stainless steel with bolts and nuts conforming to ASTM A193 Grade B8M.

- D. Pipe support systems: include all hangers, rods, structural attachments, and other components of support systems for stainless steel pipe shall be of the same materials as the pipe.
- E. Finishing: After all shop operations have been completed, pipe and fittings shall be pickled and passivated in the manufacturer's plant, and scrubbed and washed until discoloration and possible iron picked up from manufacturing process are removed. The standard finish for 16-gauge through 8-gauge material shall be No. 1 or 2B per ASTM A480; 3/16-inch and heavier plate material shall be No. 1-mil finish or better per ASTM A480.

PART 3 - EXECUTION

3.01 BURIED PIPE INSTALLATION – GENERAL

- A. Install pipe in accordance with the manufacturer's written instructions and in accordance with applicable AWWA and ANSI standards.
- B. Comply with the excavation, backfill, compaction, and dewatering requirements contained in Division 2 and Division 31 of these specifications for installation of buried pipe.
- C. Keep buried piping clean as it is being installed by plugging the open end. Do not allow foreign material, such as soil and groundwater, from entering the pipe. If directed by the Engineer, the Contractor shall water flush installed pipe to remove foreign material. Water used to flush pipe shall be trucked to the site by the Contractor. Use of site water will not be allowed. The Owner will not pay for water usage in this regard.
- D. Maintain the excavation free of water during the progress of the work. No pipes shall be installed in water nor shall any joints be made in water. All slides or cave-ins of trenches or cuts shall be remedied prior to the work continuing.
- E. Commence pipe laying at the lowest point, with the bell or socket end pointing in the direction of flow.
- F. Use the manufacturer's approved equipment for cutting pipe to length.
- G. Thoroughly clean pipe and fitting interiors, joint surfaces, and gaskets prior to them being placed in the trench for installation. Maintain all materials clean during the prosecution of the work.
- H. Carefully lower pipes and fittings into the trench using industry recognized rigging standards and techniques. Every joint shall be made in the trench.
- I. All adjustments to the line and grade of pipe laid in earth foundation shall be done by scraping away or filling in the earth under the barrel of the pipe, and not by blocking or wedging. Where the excavation has been carried too deep, but not in excess of six (6) inches, the Contractor may replace with suitable material and mechanically compact to provide a firm foundation. Wherever, the excavations have been carried to a depth in excess of six (6) inches, the Engineer may order stone or gravel refill without additional compensation. In all cases, the trench under the joint shall be excavated to permit an even bearing for the barrel of the pipe.
- J. When unsuitable materials are encountered, the Engineer may direct the Contractor to continue the excavation below the required elevation and the trench filled with suitable material. This work will be paid for as "Extra Work".
- K. Stainless steel pipe cutting, threading and jointing shall conform to the requirements of ANSI B31.1. All pipe threads shall be lubricated with Teflon tape.

- L. Form and place concrete for thrust blocks at each tee, plug or bend which is deflecting $22\frac{1}{2}^\circ$ or more. Place blocking so pipe and joint fittings will be accessible for repair. The minimum square foot bearing area of the blocking on solid ground shall be as indicated in the following table:

Pipe Size	Dead End or Tee	90 Bend	45 Bend	22 1/2 Bend
4 inch	1	1 - 1/2	3/4	1/2
6 inch	2	3	2	1
8 inch	4	5 - 1/2	3	1 - 1/2
10 inch	6	9 - 1/2	4 - 1/2	2 - 1/2
12 inch	9	12	6 - 1/2	3 - 1/2
14 inch	15	22	12	6

3.02 STAINLESS STEEL PIPE INSTALLATION – GENERAL

- A. Piping with wall thickness up to 11-gauge (0.120-inch): welded with the TIG (GTAW) process. Unless otherwise specified, heavier walls shall be properly beveled and have a root pass with the TIG (GTAW) process followed by subsequent passes with the TIG (GTAW), MIG (GMAW), or Metallic Arc (SMAW) process. Filler wire of ELC grades only shall be added to all welds to provide a cross section at the weld equal to or greater than the parent metal. Weld deposit shall be smooth and evenly distributed and have a crown of no more than 1/16-inch on the I.D. and 3/32-inch on the O.D. of the piping. Concavity, undercut, cracks, or crevices shall not be allowed. Butt welds shall have full penetration to the interior surface, and inert gas shielding shall be provided to the interior and exterior of the joint. Excessive weld deposits, slag, spatter, and projections shall be removed by grinding. Welds on gasket surfaces shall be ground smooth.
- B. Field welding; minimized to the greatest extent possible by prefabrication of pipe systems at the factory. Pipe butt welds may be performed at the job site providing the butt welds are performed only with an inert gas shielded process and that other applicable specified welding requirements are rigidly adhered to. All residue, oxide, and heat stain is to be removed from any type of field weld and the affected adjacent areas by the use of stainless steel wire brushes. The field weld shall then be cleaned with an agent such as Eutectic Company's "Eucleen" or equal followed by complete removal of the agent.
- C. Preparation of surfaces to be welded shall be free from mill scale, slag, grease, oil, paint, rust, and other foreign material.
- D. Joints to be welded shall be wire-brushed with stainless steel wire brushes and precisely fitted before welding.
- E. Welding shall be done only when the surfaces are completely free of any moisture. Welding of the pipe shall not be done during periods of high winds or rain unless the areas being welded are properly shielded.
- F. Nicks, gouges, notches, and depressions in the base metal in the area of the joint shall be repaired before the joint weld is made. Tack welds, clips, and other attachments shall be removed and defects repaired, except where the tack welds occur within the weld area and these tack welds do not exceed the size of the completed weld. Cracked tack welds shall be removed. Areas to be repaired shall be ground to clean metal and then repaired by building up with weld metal. The repaired areas shall be ground smooth to form a plane surface with the base metal.
- G. Welds with cracks, slag inclusions, porosity, undercutting, incomplete penetration, or which are otherwise deficient in quality or made contrary to any provisions of these specifications shall be

removed by chipping or grinding throughout their depth to clean base metal. Calking or peening of welds to correct defects shall not be done. Welds found deficient in dimension but not in quality shall be enlarged by additional welding after thoroughly cleaning the surface of previously deposited metal and the adjoining plate. Weld deposits, slag, weld spatter, and projections into the interior of the pipe shall be removed by grinding.

3.03 BURIED PIPE/FITTING INSTALLATION – MECHANICAL/RESTRAINED JOINT

- A. Comply with the manufacturer's written instructions for installing ductile iron pipe, fittings and retainer.
- B. Clean the socket and plain end. All surfaces with which the gasket comes in contact shall be thoroughly wired brushed just prior to assembly. All loose rust, mud, frozen material, sand, gravel, and other foreign material shall be removed.
- C. Wipe the gasket clean and install the gasket. Take care that no gasket loops or bulges protrude into the path of the entering pipe spigot. In temperatures below 32 degrees F, warm gaskets before installation.
- D. Using a clean brush, apply a liberal amount of lubricant completely over the end of the pipe, the spigot radius, and the outer surface of the pipe up to the assembly stripe. Also, apply lubricant completely over the exposed surface of the gasket.
- E. Install the bevel end of the pipe into the socket. Take care that the plain end is centrally located in the socket and push the pipe home. The joint deflection may then be set.
- F. When tightening bolts on mechanical joint fittings, the gland shall be brought up to the fitting flange evenly, maintaining approximately the same distance between the gland and the face of the flange at all points around. This shall be done by partially tightening the bottom bolt first then the top bolt, next the bolts at either side, and last the remaining bolts. Repeat this process until the proper joint tightness is achieved and the nut is sheared off. Overstressing the bolts to compensate for the poor installation will not be permitted.
- G. Complete the installation by applying a single coat of bitumastic to the entire surface of the retainer.

3.04 EXPOSED PIPING

- A. Flanged: Clean face of flange of all sand, grease, grit or other foreign matter. Center gasket before assembling joints. After alignment has been completed insert bolts and hand tighten nuts. Keep gap between flanges approximately uniform while tightening. Tighten bolts to required torque in several steps, alternating from one side to the other.
- B. Grooved:
 - 1. Pipe ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove for proper gasket sealing.
 - 2. A thin uniform coat of lubricant, provided by the joint manufacturer, shall be applied to the gasket, coupling or housing using a clean brush.
 - 3. The gasket and coupling housing shall be installed as contained in the manufacturer's written instructions.
- C. Install flanged adapters and couplings in accordance with manufacturer's installation instructions.

3.05 RECHECKING AND REPAIRING

- A. Pressure test all exposed and underground pipe in accordance with the requirements contained in Division 1. Before piping is concealed, recheck for leaks.
- B. Rework or replace defective and leaking joints, and joints that are otherwise unsatisfactory. Peening, caulking and doping are not permitted.

3.06 FIELD QUALITY CONTROL

- A. Conduct pressure testing in accordance with AWWA C600 and Division 1 requirements.
- B. Blow out all dirt, debris and foreign material in all aeration process piping before placing the aeration system diffusers on-line. Do not use water to flush out material. The use of the supplied air compressors may be used if approved by the Engineer.

END OF SECTION 402336

PART 1 - GENERAL

1.01 SUMMARY

- A. Electromagnetic Flow Meter
- B. Digital recorder.

1.02 REFERENCES:

- A. NFPA 70 - National Electric Code
- B. National Electrical Manufacturers Association
- C. Institute of Electrical and Electronic Engineers
- D. NEMA ICS 1 - General Standards for Industrial Control and Systems.
- E. NEMA ICS 2 - Standards for Industrial Control Devices, Controllers and Assemblies
- F. NEMA ICS 3 - Industrial Systems
- G. NEMA ICS 6 - Enclosures for Industrial Controls and Systems

1.03 QUALITY ASSURANCE

- A. The instrumentation equipment specified herein shall be furnished by one single supplier for each process area. This requires the supplier to be responsible for the coordination, design, fabrication, assembly, delivery, testing and proper sustained automatic operation of the entire system, but does not require that all system equipment and accessories be the products of one single manufacturer.
- B. Consideration will only be given to manufacturers who can demonstrate that their system complies with these specifications having had successful and documented experience of the size, quality, performance, and reliability to that specified, and who can successfully demonstrate these criteria.

1.04 WARRANTY

- A. Provide warranty for the instrumentation equipment.
- B. The manufacturer shall guarantee all instrumentation specified to be furnished by this Section to be free from defects in design, materials and workmanship for a period of two (2) years commencing on the date the system was placed in permanent and consistent operation.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Comply with the requirements contained in Section 016500 - Product Delivery, Storage and Handling.

1.06 FIELD SERVICES

- A. Supply and credit to the Owner field services as specified in Section 017500 - Starting and Adjusting

- B. Provide the following field services by the pump and control panel manufacturer as a minimum:
 - 1. One (1) day to check the installation, make all necessary adjustments, and otherwise place the system into permanent operation as specified in Division 01 Section "Demonstration and Training". As part of startup activities, the representative shall check the terminal connections and the specific work of the prime electrical contractor. Before substantial completion, provide operation and maintenance instruction to the Owner.

1.07 SUBMITTALS

- A. Comply with the requirements contained in Section 013300 - Submittals.
- B. Submit the following:
- C. Technical descriptive data for each equipment item showing model number(s), sizes, capacities, weights, voltage information, and other similar information. Catalog cuts are acceptable if they contain the necessary information.
 - 1. Schematic wiring diagrams.
 - 2. Interconnection wiring diagrams between primary elements/transmitters and recorder.
 - 3. Loop diagrams and loop descriptions prepared in accordance with ISA standards.
 - 4. Storage, handling and installation instructions for all system equipment.
 - 5. Warranty Certificates.
- D. Operations and Maintenance Manual prepared in accordance with the requirements contained in Section 017823 - Operating and Maintenance Data

1.08 SERVICE CONDITIONS

- A. All components of the system shall be designed for continuous duty.
- B. Provisions shall be made for adjustments or replacement of all parts. Corresponding parts of multiple units shall be interchangeable.

PART 2 - PRODUCTS

2.01 ELECTROMAGNETIC FLOWMETER

- A. The magnetic flow meter shall be the Electromagnetic Flowmeter WaterMaster by ABB Instrumentation or approved equal.
- B. Continuous zero stability shall be an inherent characteristic of the flow meter system. The system shall cancel out interference voltages, thus eliminating the zero-drift by loading the magnetic coils with a pulsed direct current (DC).
- C. Measurement shall not be affected by alternating current (AC) line interference voltages, stratified flow, changes in liquid electrical conductivity (down to 5 micromhos/cm), or non-homogeneity of the fluids electrical conductivity. Zero point shall be stable even with partially fouled electrodes.
- D. The flow meter shall meet the following requirements:
 - 1. General
 - a. Function: Measure, indicate, and transmit the process flow in a full pipe. Meter must be a full bore meter with the magnetic field traversing the entire cross-section of the flow tube. Insertion magmeters or multiple single point probes inserted into a spool piece are not acceptable.
 - b. Type: Magnetic flowmeter, operating based on Faraday's law, using a pulsed dc type coil excitation with high impedance electrodes.

- c. Parts: Flow tube, transmitter, interconnection cables.
- 2. Performance
 - a. Range: 1500 to 1
 - b. Accuracy: Accuracy shall be +/- 0.4 % of rate for all flow rates greater than 1.9 feet per second
 - c. Repeatability: $\pm 0.05\%$ or $\pm 0.0008\text{ft/s}$, whichever is greater.
 - d. Calibration shall be per compliance with OIML R49 Type P recommendation.
 - e. Flow range: 0 gpm to 250 gpm
- 3. Process Connection
 - a. Meter Size: 4-inch diameter
 - b. Connection type: Flanged: ASME Class 150
 - c. Flange material: Carbon steel
 - d. Pressure Rating: Meter system shall be fully rated to the same design pressure as the flanges.
- 4. Flow Tube
 - a. Meter Tube Material: 304 stainless steel
 - b. Liner Material: Teflon or chlorobutyl rubber, suitable for wastewater sludge containing 1% solids and replaceable without disturbing the field coils.
 - c. Electrode Type: Conical self-cleaning electrodes
 - d. Electrode Material: 316 stainless steel
 - e. Enclosure Classification: NEMA 4X, Explosion Proof for Class 1, Div. 2, Group D locations
 - f. Housing Material: Epoxy Coated Carbon Steel
 - g. Grounding: Grounding rings or grounding electrodes shall be provided per manufacturer's recommendation
 - h. Submergence: Continuous to 30 feet and direct burial 3 to 16 feet (IP68/NEMA6P)
 - i. Sensors in all sizes shall be provided with full bore design to reduce pressure loss.
- 5. Transmitter
 - a. Power: 85 to 265 VAC or 11 to 24 VAC
 - b. Display: Three line back-lit graphical display with capacitive keys; allows for external configuration without removing covers and compromising the integrity of environmental classifications.
 - c. Bi-directional flow: Forward and reverse flow indication; total and rate 2x10-digit user configurable display.
 - d. Totalizers: Three 9 digit totalizers for forward, reverse and net
 - e. Enclosure: Transmitter made of Aluminum
 - f. "Through The Glass Control" with capacitive keys (no push button key pad)
 - g. HART protocol standard Optional Modbus and Profibus available when noted.
 - h. Integral Transmitter rotatable up to 270 degrees without tools
 - i. IP 67 Nema 4X
 - j. Calibration shall be in accordance with OIML R49 Type P standards
 - k. Type "P" continuous self-checking capabilities (not just on start-up)
 - l. Redundant data storage in sensor and transmitter with continuous replication of calibration factors, meter size, serial numbers, and site-specific settings.
 - m. Infrared service port for meter configuration and diagnostic interrogation. Shall have capability to connect to laptop. Shall be able to configure as keypad image, Hart or HyperTerminal. Shall be able to perform remote trouble shooting from remote location with computer laptop packages such as PC anywhere.
 - n. Cable: Meter shall only require one cable and conduit between sensor and transmitter. Cable and termination strips shall be color coded to allow for easy installation.
- 6. Calibration
 - a. Test Mode: Provide the ability to verify the accuracy of the unit and the integrity of the current loop without any external equipment.

- b. Meter calibration shall be in accordance with OIML R49 Type P, self-calibration requirements.
- c. Meter must be able to periodically generate simulated signals that verify that the output is within predefined limits.
- d. Coil inductance and resistance along with electrode voltage and impedance must be verifiable through diagnostic functionality
- e. Warnings and Alarms: Shall be classified to NAMUR NE 107 standards. Meter must have ability to display severity of warning with "maintenance, check-function, failure and out of spec" warning indications.
- f. Alarm priorities shall be classified as: "None; Maintenance; Out-of-Spec; Function check; and Error."
- g. The quantity of occurrences, total time duration of the alarm occurrences, and time since last occurrence.
- h. All replacement transmitters shall be interchangeable without need for programming sensor calibration factors, meter size, site information, and serial numbers
- i. In situ Calibration Verification: This system shall be used to verify in a quantifiable manner the meter's current conditions versus the meters condition when originally manufactured. This calibration verification of the meter shall be performed without need for physical access to the meter flow tube. Method must be able to print out hard copy of verification and diagnostic reports.
- j. Meters to be designed, manufactured, and calibrated in an ISO9001, UKAS/NAMAS, NIST, or NATA certified or traceable facility. Flow facility must be certified by volume or weight certified provers. Facility must have the capability to hold the flow rate at the specified calibration points for a minimum of five minutes to allow stabilization for flow and repeatability point checks.

2.02 DIGITAL RECORDERS

- A. Video chart recorders shall be ABB model SM500F or approved equal.
 - 1. General:
 - a. Function: Indicates and records process inputs, alarms, and totalizers
 - b. Type: Microprocessor based videographic recorder
 - c. Enclosure: NEMA-4X facia. Thin film transistor (TFT), active-matrix, color, liquid crystal display (LCD) with built-in backlight. Lockable media door and tamperproof seal. Enclosure equipped with hardware suitable for panel mounting.
 - d. Voltage Requirements: 85 to 265 V max. AC, 50/60 Hz, optional 10V to 36V DC
 - 2. Performance:
 - a. Display Range: -999 to 9999
 - b. Input Accuracy: mV 0.1%, mA 0.2%, V 0.2%, resistance 0.1%, THC 0.1%, RTD 0.1%
 - c. Environmental Limits: 14 to 122 deg F, 5 to 95 RH (non-condensing)
 - d. EMC and Safety: IEC61326, EN61010-1, UL 1010, CSA 1010 (pending), Pollution Category 2, Overvoltage Class III on mains, Overvoltage Class II on inputs and outputs
 - 3. Display:
 - a. Display: "High Brightness, High Color" color TFT passive matrix 76800 pixel liquid crystal display. Display shall be capable of simultaneously displaying up to 4 channels, 2 totalizers per channel (8 onscreen) and 4 alarms per channel (16 onscreen).
 - b. View: A 5.7 in. color TFT display with digital indication, vertical trending with digital indication, horizontal trending with digital indication, digital indicator, process, or horizontal and vertical bargraphs.
 - 4. Inputs:

- a. Analog: Universal Programmable between 0 to 150 mV, 0 to 25 V, 0 to 50 mA, 0 to 10k-ohms (high resistance), 0 to 550 ohms (low resistance), Thermocouple Types B, E, J, K, N, R, S, T, and Pt100 RTD.
 - b. Digital: 5V TTL or volt-free (dry-contact), 250 ms minimum pulse. 500 VDC isolation between modules.
5. Outputs:
- a. Analog: Programmable from 0 to 20 mA with a maximum load of 750 ohms. Module isolation is 500V between other I/O.
 - b. Digital: 6 per board, 2 boards max. Closed switch contact or 0V = active signal. Digital 5V output. Module isolation is 500V between other I/O.
 - c. Relay: 3 or 6 relays per board, 2 boards max. Rated at 250 VAC, 5 amp, or 30 VDC, 5 amp, single-pole changeover relay.
 - d. Transmitter Power Supply: Standard 24V at 22 mA. Optional power supplies 24V at 45 mA. (two transmitter load). 2 power supplies per board. Maximum 2 boards per recorder for a total of 8 additional transmitter loads.
 - e. Totalizer Counter: 1 totalizer count pulse for each whole number count. Output is active for 100ms. Can be used on digital or relay output.
6. Software:
- a. System: A Windows CE operating system with the ability to view data as a Circular chart, vertical trending, horizontal trending, digital indicator, process, or both vertical and horizontal bargraphs.
 - b. Math: Optional 8 math blocks and optional 8 logic equations. Math functions to allow calculations for standard, trigonometric, logarithmic, and relative humidity calculations. Logic functions to allow OR, AND, NOR, XOR, NAND, NOT operators.
 - c. Totalizers: 72 Totalizers (2 per input channel) to count up or down, start and stop and provide selectable preset or predetermined (starting or finishing) points. Starting, stopping and resetting of the totalizer are done through the front face, remote input device or logic equation.
 - d. Archive: A real time clock and timer options allow the unit to be set up in real time stamps on all data recorded. Totalizer, alarm event and audit logs viewable from display as well as logged to removable media
 - e. Removable media: Removable media card to allow export of data to database program.
 - f. Configuration: Recorder configuration is programmable from front panel tactile membrane keys. Configuration may be locked out via front door keylock or internal security link and allow up to 15 unique users with individual password logins. Inputs, input ranges, engineering units, totalizers, alarms, alarm types, retransmission, chart speed, and relay assignments are all end-user programmable. Configuration is stored internally and may be exported via media port.
 - g. Serial Communication: Data can read/write via standard serial communications (MODBUS TCP) to be viewed on display or remotely.

PART 3 - EXECUTION

3.01 GENERAL

- A. Install system components in accordance with the written instructions provided by the component manufacturer. All components shall be fully tested and verified for service by the manufacturer. Each manufacturer shall provide a MSR as specified in Section 017500 - Starting and Adjusting. An amount equal to 0.50% of the scheduled value for the work of this Section will be retained until all reports has been furnished.

3.02 FACTORY TESTING

- A. All components shall be fully tested and verified for service by the manufacturer.

3.03 INSTALLATION

- A. All products shall be installed in accordance with the manufacturer's written instructions. Perform all other work to make products ready for final connection to all field wiring.

END OF SECTION 407100

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Safety equipment and supplies associated with use of calcium hypochlorite, lime, sodium hydroxide and sequestering agent.

1.02 REFERENCES

- A. ANSI Z87.1.

1.03 SUBMITTALS

- A. Submit product data under provisions of Section 013300.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. NEW PIG CORP., TIPTON, PA.
- B. Or approved equal.

2.02 MATERIALS

- A. HAZ-MAT Spill Kit:
 - 1. Polyethylene Bucket
 - 2. Polypropylene Socks
 - 3. Polypropylene Mats
 - 4. Order No. 64CRSC
 - 5. Quantity: Two (2)
- B. Face Shield:
 - 1. Ratchet Adjustment System
 - 2. Polycarbonate Face Shield
 - 3. Compliance with ANSI Z87.1
 - 4. Order Nos. GLS204 , GLS204-0002
 - 5. Quantity: Two (2)
- C. Splash Goggles:
 - 1. Polycarbonate Lense
 - 2. Indirect Vent
 - 3. Fog Free
 - 4. Compliance with ANSI Z87.1
 - 5. Order No. GLS310
 - 6. Quantity: Two (2)
- D. Nitrile Apron:
 - 1. Heavy-duty
 - 2. Nitrile - Cotton Blend
 - 3. Adjustable Neckstrap & Waist Ties
 - 4. Size: 35" x 45"
 - 5. Color: White
 - 6. Order No. WPL795

7. Quantity: Two (2)

E. Chem. Resistant Gloves:

1. Multi-layer Construction w/ Knit Liner
2. PVA & Neoprene Material Construction
3. Puncture, Tear, Abrasion Resistant
4. Length: 14.5"-inches
5. Size: Large
6. Order No. GLV950
7. Quantity: Two (2) pair

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install one set of complete equipment as indicated in 2.02 A-E to Owner at location indicated by the Engineer.

END OF SECTION 416719

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Progressing Cavity Pumps shall be furnished and installed under Contract P and wired by Contract E.

1.02 RELATED SECTIONS

- A. Section 013300 - Submittals
- B. Section 099100 - Painting
- C. Section 036000 - Grouting
- D. Section 467324 - Autothermal Thermophilic Aerobic Digestion System

1.03 DESIGN REQUIREMENTS

- A. The Contract Drawings have been prepared based on the installation of two (2) new progressive cavity pumps manufactured by Netzsch Pumps USA. If other manufacturer's or an equal manufacturer's equipment is submitted which requires an arrangement differing from that shown on the plans or if the details of design and construction are different from those specified, the equipment will be considered as a substitution and the Contractor will be required to prepare and submit for review the necessary design calculations along with the necessary structural, electrical, instrumentation, mechanical and architectural drawing revisions to the layout(s) indicated on the Contract Drawings in accordance with Section 012500 - Product Substitution Procedures.

1.04 QUALITY ASSURANCE

- A. The pumps and accessories specified herein shall be furnished by one single supplier (Manufacturer). This requires the supplier to be responsible for the development, design, fabrication, assembly, delivery, and proper sustained automatic operation of the pumping system, but does not require that all system equipment and accessories be the products of one single manufacturer.
- B. Consideration will only be given to suppliers who can demonstrate that their equipment complies with these Specifications having had successful and documented experience of the size, quality, performance and reliability to that specified, and who can successfully demonstrate this criteria to the Engineer.
- C. The system shall be designed, furnished, and installed to achieve the conditions of service specified herein.
- D. The supplier shall have at least ten (10) years of experience in the design and manufacturing of raw sewage, non-clog pumps.
- E. The supplier shall have at least ten (10) years of experience in the design and manufacturing of raw sewage.

1.05 SUBMITTALS

- A. Submittals are required after award of the contract and prior to equipment construction. The contractor shall submit per Section 013300 within 60 days after award, the following:

1. Performance curves
 2. Complete specifications for each part to assure compliance with these specifications, exceptions to be clearly highlighted. Exceptions not documented will result in disqualification.
 3. Construction drawings showing complete dimensions, anchor bolts locations, and flange details
 4. Weights
 5. Warranty
- B. Submittals required after construction and prior to shipment
1. Factory data test
 2. Six bound copies of operation and maintenance manuals, each copy to include:
 - a. Sections drawings
 - b. Parts list with recommended spare parts
 - c. Operation instructions
 - d. Maintenance instructions

1.06 WARRANTY

- A. The pump manufacturer shall guarantee the complete pumping assemblies for a period of 60 months after acceptance or 66 months after shipment, whichever occurs first. The warranty as specified here shall cover all defective parts, material, and workmanship.
- B. The responsible manufacturer shall replace all items deemed by the manufacturer to be defective without cost to the owner.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Sludge pumps shall be progressing cavity Moineau principle type suitable for pumping sludge as indicated below:
1. Solids content between 2-6%.
 2. The progressing pump should meet the following performance parameters:
 - a. Flow: 100 GPM
 - b. Discharge Pressure: 17.35 PSI
 - c. Maximum RPM: 350 RPM
 - d. Minimum Horsepower: 7.5 HP
 - e. Manufacturers: NETZSCH Pumps & Systems or approved equal
 - f. Flange Size: 4" 125# FF ANSI for Housing Connection
 - g. FLang Size: 3" 125# FF ANSI for End Connection

PART 3 - EXECUTION

3.01 TESTING – PUMP AND MOTOR

- A. All complete pumping units (this includes pump, motor, and drive) will be tested on water as a complete unit at the manufacturer's plant before shipment. The testing shall be a complete non-witnessed performance test and is to include head and capacity, brake horsepower, and efficiency to prove that the pumps to be shipped conform to the requirements to the specification.
- B. The contractor, acting under the instructions of the pump supplier's field representative shall perform a functional field test of all the equipment to prove to the engineer that all components

of the system are properly installed and that all equipment will perform in accordance with this specification.

3.02 PUMP CONSTRUCTION

A. Pump Suction and Discharge Casing

1. The pump casing shall be designed for the type of service specified and shall be of sufficient strength, weight, and metal thickness to ensure long life, accurate alignment, and reliable operation. The suction casing shall be constructed of close-grained cast iron and have two clean out ports. Stamped or formed metal is not acceptable.
2. The casing shall have connections for vents, drains, and gauges. A min of 3 connections to allow for rotation of housing as needed.
3. The suction and discharge connections shall be ANSI/B16.1 flanges sized for the pump specified. The discharge flange shall have a vent/gauge connection that can be rotated in 90 increments. The discharge support feet shall be separate from the discharge flange.
4. The pump shall be supplied with adequate NPT connections for stuffing box drainage, pump drainage, flushing, and gauge connections.
5. The drain port shall be at the lowest point in the housing to ensure it completely drains regardless of the orientation of the housing.
6. Provide 2 square hand-hole side plates on each side of the pump, 180° apart, large enough to permit easy inspection of the drive shaft joint and mechanical seal and servicing of the pump.
7. There shall be a top inspection cover integral to the design to allow for inspection of rotor joint and clean out of the suction body. The body shall maintain and contain remaining pump components and structural integrity of the pump. Split casings are not acceptable.
8. Pump suction housing shall have a minimum of two support feet to support potential pipe stress and ensure proper reassembly during maintenance.

B. Stator

1. The pump's stator shall be formed from a single piece Buna-n rubber. Split stators or stators that are pieced together are not acceptable due to the potential leakage.
2. The stator housing shall be a two-piece extruded aluminum shell. By removing the shell it shall significantly remove the normal compressive forces to allow easy removal of the stator rubber from the rotor.
3. The stator rubber shall be independent of the metal casing so it can be properly disposed without the metal shell.
4. The stator rubber shall be made with injection cores down the length to ensure proper filling and density (durometer) of the rubber. This will allow proper and even compress across the entire stator and ensure there are no knit lines causing a potential leak where the rubber comes together.
5. The stator rubber shall be made and blended by the pump manufacture specifically designed for PC pumps. Rubber not made and blended by the manufacturer shall not be accepted. In addition, the pump manufacturer shall mold/inject the stators in-house. Stators made by vendors or outsourced are not acceptable.
6. The stator shall be affixed to the suction casing by the use of four (4) thru-bolts for easy removal and replacement. The threaded rods shall exceed the length of the stator. Stators shall not be affixed to the suction casing by threaded connections, by snap rings, or stator side walls. The suction edge of the stator shall be chamfered to allow for unrestricted flow into the pumping elements.
7. The sealing ends shall be integral to the stator sleeve at the suction and discharge to prevent leakage. The use of separate O-rings or flat rings for stator sealing shall not be allowed.
8. Stator designs that limit nominal pump pressure capability to less than 90 PSI shall not be acceptable.

9. The removal of the rotor and stator (together as one assembly) shall not require any disconnection of the suction or discharge piping. Pump shall be Full Service In Place. Deviations or special adaptors are not allowed.
10. Stator removal from the pump shall not require any special tools or small pieces that could be lost.

C. Rotor

1. The rotor shall be precision machined from alloy steel AISI 4140 and then covered with heavy layers of hard chrome plating.
2. The removal of the rotor shall not require any disconnection of the suction or discharge piping. Pump shall be Full Service In Place. Deviations or special adaptors are not allowed
3. Rotor rotation shall be counter-clockwise, to the left if looking from the drive end.
4. The rotor shall be longer than the stator when assembled to ensure maximum usage and complete sealing line of the stator from both ends. Rotors shorter or that does not extend out the end of the stator when assembled are not acceptable.
5. The removal of the rotor shall not require any disconnection of the suction or discharge piping. Deviations or special adaptors are not allowed. The disconnection of the rotor shall be achieved by the removal of a single bolt. Multiple bolts, snap rings, sleeves, clips, wedges, or disconnection of the joint are not acceptable.
6. Removal of the stator shall include the rotor joint for complete inspection.
7. Access to rotor disconnection area shall have a minimum of 2" of accessibility from all angles to allow for easy servicing.

D. Universal Joint

1. The rotor shall be connected to the drive shaft by means of a connecting rod with high strength, shock resistant universal joints. The universal joints shall be a sealed gear type, lubricated by oil. Pin joints are not acceptable.
2. The double sealed gear-type universal joints shall be factory lubricated with oil and completely sealed from the abrasive fluid being pumps.

E. Drive Train

1. The rotor shall be driven by means of a heavy duty sealed drivetrain. The rotor shall be joined to the drive shaft by means of a connecting rod with sealed gear-type universal joints at each end.
2. The connecting rod shall be two-piece design to allow for the rotor and stator to be removed from the suction housing. Disassembly of a joint is not acceptable.
3. The joint seal shall not employ sacrificial parts such as clamp bands and shall not require special tools to assemble.
4. To optimize seal and gear joint life, the connecting rod shall be of sufficient length to maintain its operating angle within 1 degree. Flexshafts, Cardin joints, single sealed gear joints, and pin joints are not acceptable.

F. Shaft seal

1. Mechanical seals shall have an encapsulated type 316 stainless steel springs with Silicon carbide rotating face, Silicon carbide stationary face, and Viton bellows. Mechanical seals that have exposed spring designs are not acceptable for risk of allowing solids to be trapped in the springs.
2. The mechanical seal shall be inside mounted, located inside the pump suction housing with ample open area around the seal and not in a dead-end enclosed housing where solids could accumulate.

G. Pump Drive Shaft

1. The drive shaft shall be of the solid drive shaft design in order to avoid clogging and/or trapping of solids, which could either interrupt the movement of the connecting rod or

disturb the seal of the rear joint. Maximum shaft deflection under normal operating conditions shall not exceed 0.002". Hollow or telescoping designed drive shafts are not acceptable.

2. The drive shaft shall be solid mounted in two ball or tapered roller bearings. The Anti-Friction Bearing Manufacturer's Association minimum B-10 life expectancy of the bearings shall be in excess of 100,000 hours at the maximum operating conditions of this Specification.
3. The universal joint head shall be removable from the drive shaft to allow access to the stuffing box or mechanical seal without disturbing the drive end of the pump.
4. Coupling
5. A flexible, forged steel coupling of an approved type for connecting the pump, reducer and motor. Provide couplings of the proper size to transmit the power required to drive the pump under all conditions of operation.

3.03 DESIGN FEATURES

A. Pump Performance

1. The suction body of the pump shall be oversized at the entrance of the rotor and stator pumping elements to allow the free flow of high solids materials. The rotor joint head shall be set back from the stator and the leading edge of the stator shall be chamfered so not to restrict the flow into the pumping elements. If the pump does not incorporate the aforementioned features, the use of a rag deflector shall be required.

3.04 DRIVE FEATURES

A. Motor features

1. The 7.5HP, 350RMP 230-460/3/60 motor shall be adequately sized to withstand the loads during starting and pump operation. The motor to be TEFC, Premium Efficient with class F insulation, 1.15 service factor. If the pump is to be controlled by a Variable Frequency Drive, then the motor must be Inverter Duty, suitable for a (X:1) constant torque turndown ratio. The motor is to be manufactured by Nord Drivesystems or approved equal.

B. Gear Reducer Features

1. The gear reducer shall be parallel in-line helical reducer with a 1.4 service factor. The gear case is to be single piece SAE 35 gray cast iron or corrosion resistant aluminum alloy with internal reinforcements for strength rigidity. This design eliminates oil leakage, oil contamination, and gear set misalignment problems common to drives with bolt-on output cover or flanges.

END OF SECTION 432357

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Double Disc Sludge Pumps shall be furnished and installed under Contract P and wired by Contract E.

1.02 RELATED SECTIONS

- A. Section 013300 - Submittals
- B. Section 099100 - Painting
- C. Section 036000 - Grouting
- D. Section 407000 - Instrumentation for Process Systems
- E. Section 467324 - Autothermal Thermophilic Aerobic Digestion

1.03 DESIGN REQUIREMENTS

- A. The Contract Drawings have been prepared based on the installation of two (2) new double disc pumps manufactured by Penn Vally Pump Company. If other manufacturer's or an equal manufacturer's equipment is submitted which requires an arrangement differing from that shown on the plans or if the details of design and construction are different from those specified, the equipment will be considered as a substitution and the Contractor will be required to prepare and submit for review the necessary design calculations along with the necessary structural, electrical, instrumentation, mechanical and architectural drawing revisions to the layout(s) indicated on the Contract Drawings in accordance with Section 012500 - Product Substitution Procedures.

1.04 QUALITY ASSURANCE

- A. The pumps and accessories specified herein shall be furnished by one single supplier (Manufacturer). This requires the supplier to be responsible for the development, design, fabrication, assembly, delivery, and proper sustained automatic operation of the pumping system, but does not require that all system equipment and accessories be the products of one single manufacturer.
- B. Consideration will only be given to suppliers who can demonstrate that their equipment complies with these Specifications having had successful and documented experience of the size, quality, performance and reliability to that specified, and who can successfully demonstrate this criteria to the Engineer.
- C. The system shall be designed, furnished, and installed to achieve the conditions of service specified herein.
- D. The supplier shall have at least ten (10) years of experience in the design and manufacturing of raw sewage, non-clog pumps.
- E. The supplier shall have at least ten (10) years of experience in the design and manufacturing of raw sewage.

1.05 SYSTEM DESCRIPTION

- A. Pumps shall be complete pump unit consisting of pump, v-belt drive arrangement, and motor all completely assembled on fabricated stainless-steel base and shall conform to the pump requirement described herein.
- B. Pumps shall be seal-less design, no stuffing box or mechanical seals, no seal water required.
- C. Pumps shall be capable of passing up to 2-inch solids and line size semi-solids.
- D. Pumps shall incorporate a Maintain-in-Place hinged design that allows the pump to be serviced and discs replaced without removal of the pump or disturbing the suction and discharge piping.
- E. Pumps shall be self-priming with high suction lift capability.
- F. Pumps shall be capable of operating dry for an indefinite period without damage.
- G. Pumps shall not have internal check valves for operation.

1.06 SUBMITTALS

- A. Submit in accordance with the requirements in Section 013300 - Submittals.
- B. Submit the following information for each pump:
 - 1. Shop Drawings: Complete assembly, foundation, and installation drawings, together with detailed specifications and data covering materials used, drive unit, parts, devices, and other accessories forming a part of the equipment furnished shall be submitted in accordance with the submittals section. The data and specifications for each shall include detailed information on the pump to include:
 - a. Pump
 - 1) Manufacturer
 - 2) Type and model
 - 3) RPM at rated condition
 - 4) Size of suction and discharge flanges
 - 5) Complete performance curves
 - 6) Net weight of pump and baseplate
 - 7) Base and anchor bolt details
 - 8) Data on pressure sensor and switch assemblies
 - b. Motor
 - 1) Manufacturer
 - 2) Type, model, and enclosure
 - 3) Rated size of motor, HP, and service factor
 - 4) Temperature rise
 - 5) Insulation rating
 - 6) Full load rotative speed
 - 7) Net weight
 - 8) Efficiency at full, $\frac{3}{4}$, and $\frac{1}{2}$ load
 - 9) Full load current
 - 10) Locked rotor current
 - 11) Overall dimensions and base details
 - 12) Power factor at no load and at full load
 - 2. Catalog cuts and dimensional data, including electrical information, for all system components.
 - 3. Storage, handling and installation instructions.
 - 4. Warranty Certificate in the form specified herein.

5. Manufacturer Startup Reports (MSR's) as specified in Section 017500 for the system.
- C. Submit an operation and maintenance manual in accordance with the requirements in Section 017823.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, protect, and handle products under provisions in Section 016000.

1.08 WARRANTY

- A. Provide a Warranty Certificate from the manufacturer typed on company letterhead and signed by an authorized officer of the manufacturer. The certificate shall be witnessed by a notary public in the state in which the company headquarters is located. The Warranty Certificate shall be submitted, verbatim and without exception, as follows:
 1. (Name of manufacturer) guarantees all components of the system to be free from defects in design, materials and workmanship for a period of two (2) years commencing on the date the system was permanently placed on-line, and the mechanical equipment functions without flaw. During the guarantee period, if any part or equipment component is defective or fails to perform when operating at design conditions and if the equipment has been installed and is being operated and maintained in accordance with the written instructions we provided, then we shall repair in place such defective part (s). The replacement or repair of parts normally consumed in service shall include lubrication. Only lubrication shall be considered as part of routine maintenance and upkeep and shall not be considered eligible for exchange free of charge under this Warranty. Agreed upon this ____ (date) ____ day by ____ (name of authorized agent) ____ of ____ (name of manufacturer) ____, who, by signing this document, affirms that he/she is legally authorized to submit this warranty on behalf of the Manufacturer. ____ (authorized signature) ____ (date) ____ (notary) ____

1.09 FIELD SERVICES

- A. Supply and credit to the Owner field services as specified in Section 014500 - Quality Control.
- B. Provide the following minimum field services in accordance with the requirements contained in Section 017500 - Starting and Adjusting:
- C. One (1) day totaling one (1) trip, once the system has been installed to check the completed installation, make all necessary adjustments and otherwise place the system into permanent operation as specified in Section 017500 - Starting and Adjusting. During trip, provide operation and maintenance instruction to the Owner. A complete review of the operations and maintenance manual shall be presented at this time. Coordinate all startup activities. The electrical work shall be verified by the representative.

1.10 EXTRA MATERIALS

- A. Two (2) Discs per pump
- B. Two (2) Trunnions per pump
- C. One (1) Complete set of gaskets per pump
- D. One (1) Clack valve per pump
- E. One (1) set of V-belts per pump

- F. Universal, adjustable tool to aid in disc removal.

PART 2 - PRODUCTS

2.01 MANUFACTURER

- A. Penn Valley Pump Company, Inc, Model 6DDSX76 or approved equal.

2.02 MANUFACTURED UNITS

- A. Each pump shall be a simplex heavy duty, free disc style positive displacement type, with Class 30 Cast Iron Housings and neoprene elastomers. Duplex pumping arrangements shall not be acceptable. The pump shall consist of three (3) housings horizontally split to allow access to the internal components. The discharge housing shall contain the mounting lugs and be bolted directly to the mounting frame. The discharge, intermediate and suction housings shall incorporate an integral hinge arrangement that allows the suction and intermediate housings to be lowered and removed. The hinges shall be connected to each other with a quick release ball detent pin allowing for easy pin removal.
- B. Pumps shall be capable of providing a flow range up to 425 gallons per minute and 0.76 gallons per revolution when operating at 22 feet head and 6% solids concentration. The pumps shall be capable of self-priming up to 14-inches Hg and 25-inches Hg when fully primed.
- C. The pumping action shall be achieved by two (2) free floating reciprocating discs attached to high tensile aluminum connecting rods driven by a rotating eccentric shaft. Each disc shall be mounted to the connecting rod by a stub shaft constructed of hardened high tensile 400 series stainless steel. The discs shall be of integral design and constructed of high tensile neoprene with multiple layers of fabric for longevity and strength. Pump designs that use a captive diaphragm with metal plate shall not be acceptable. The suction and discharge discs shall be universal and interchangeable with each other to increase the commonality of spare parts and eliminate confusion. The reciprocating action of the discs shall also perform the duty of valves.
- D. Sealing of the pump fluid chamber shall be achieved by flexible trunnions. The trunnion seal shall not be designed to provide any pumping action. The trunnion construction shall be of fabric-reinforced neoprene and shall be capable of withstanding pressures from 0 to 110 PSI on an intermittent basis. Maximum operating pressure is 140 feet TDH.
- E. The swan neck entry port to the suction housing shall be a two (2) piece design allowing for mounting of the suction connection in 90-degree increments and easy access for clack replacement. The upper swan neck shall be provided with a 3-inch NPT connection to allow mounting of the suction pulsation dampener if required. The opening shall be a full 6-inch diameter with a minimum opening of 28.26 square inches to minimize debris buildup and blockages. The seating surface for the clack valve shall be machined on the mounting face of the swan neck. The clack valve shall be integrally mounted to the swan neck to facilitate access and replacement. The clack valve shall be manufactured of neoprene construction with multiple layers of fabric encapsulating a rigid core. The clack valve shall incorporate an integral O-ring seal for positive sealing.
- F. The bearing drive assembly shall consist of two (2) aluminum modular pedestals designed to provide accurate bearing alignment, superior bearing loading and ease of assembly. The drive shaft shall be a minimum 1-15/16" diameter and capable of withstanding a dead head situation. The shaft shall be constructed of hardened 400 series high-tensile stainless steel and shall be mounted on four (4) self-aligning, sealed bearings. The eccentric cams shall be constructed of high tensile, cast bronze alloy and shall be pinned to the shaft by spirol drive pins to allow for the absorption of reciprocating loads generated by the pumping action. Pump drive assemblies shall not utilize keyways and setscrews. All drive bearings must be completely sealed with no

provisions for scheduled grease lubrication. No grease fittings shall be supplied for the bearings.

- G. The pump shall be driven through a V-belt and drive assembly consisting of a 2 or 3 groove Type B arrangement. The pulley ratio's shall be sized to provide the maximum pump speed of 150 RPM and to provide the required torque generated between the pump and motor.
- H. Pump shall be provided with OSHA approved guards and covers. The V-belt drive cover and pump drive assembly cover shall be manufactured from 304 stainless steel.
- I. Each pump and V-Belt assembly shall be mounted on a common 304 stainless steel sub-base. Base design shall have raised cross-members on the suction and discharge end to allow for complete wash-out and draining without trapping liquid. Each sub-base shall be manufactured from 2-1/2" 304 stainless steel square tubing. Base shall be sufficient gusseted, reinforced and braced to withstand all shock loads and resist all wearing and buckling during pump operation. Tubing ends shall be capped with black plastic plugs for neat appearance.
- J. Pulsation dampeners shall be provided on the suction and discharge lines. The dampeners shall be 6-inch ASA 150 lb flanged units and the main tube shall be 8-inch diameter SCH 40 carbon steel pipe with fully welded end caps. The suction dampener shall mount directly to the suction swan neck through the 3" NPT connection. The discharge dampener shall be a separate piece with 6-inch ASA 150# flanged connections. The dampeners shall be pressure tested to 60 psi for leaks. Each dampener shall be provided with a 1-inch half coupling located at the top. This connection shall be suitable for the vacuum and pressure switch assembly. Each dampener shall be supplied with a 1 1/2" NPT coupling and plug in the bottom to act as a drain/sample port. Bladder type and three-piece assemblies using connecting rods and gasket shall not be acceptable.
- K. The 7.5HP, 1160RPM 230-460/3/60 motor shall be adequately sized to withstand the loads during starting and pump operation. Motor shall be severe duty, premium efficient, inverter ready per NEMA STD MG1 Part 31.4.4.2 with epoxy coated cast iron frame or equal. Motor mount shall be piggy-back.
- L. The pump manufacturer shall provide a suction vacuum sensor and gauge assembly to mount on the suction pulsation dampener. The sensor shall be a PVP420, Red Valve 42/742 or equal 1-inch NPT isolation pressure sensor with SS316 body and EPDM elastomeric sensing tube. The process pressure is sensed through the 360-degree elastomeric tube and glycerin transfers pressure to the gauge. The gauge and shall be attached to the sensor with SS316 fittings. The gauge be 4-inch diameter stainless steel with 30 inches Hg – 30 psi scale range. The units shall be capable of being cleaned in place by simply using the process pressure through a SS316 isolation valve mounted to the top of the sensor. The opposite end of the valve shall be fitted with a universal, quick acting coupling, suitable for compressed air. This valve connection shall be suitable to charge the dampener with compressed air.
- M. The pump manufacturer shall provide a discharge pressure sensor and switch assembly to mount on the discharge pulsation dampener. The sensor shall be a PVP420, Red Valve 42/742 or equal 1-inch NPT isolation pressure sensor with SS316 body and EPDM elastomeric sensing tube. The process pressure is sensed through the 360- degree elastomeric tube and glycerin transfers pressure to the gauge and switch. The gauge and switch shall be attached to the sensor with SS316 fittings. The discharge assembly shall be fitted with a 4-inch stainless steel 0 -100 psi pressure gauge and shall be fitted with Ashcroft NEMA 4X adjustable switch preset at 30 psi. The units shall be capable of being cleaned in place by simply using the process pressure through a SS316 isolation valve mounted to the top of the sensor. The opposite end of the valve shall be fitted with a universal, quick acting coupling, suitable for compressed air. This valve connection shall be suitable to charge the dampener with compressed air.

- N. All cast iron and carbon steel components shall be finished with manufacturers standard industrial grade primer 2 – 3 mils DFT suitable for multiple top-coat finishes. The top-coat shall be industrial enamel 2 – 3 mils DFT.
- O. All stainless steel and aluminum surfaces will remain unpainted. All weld splatter shall be removed and all welds ground smooth for a neat appearance.

2.03 SOURCE QUALITY CONTROL

- A. Factory test for leaks and function before shipping.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install products in accordance with the manufacturer's recommendations.
- B. Provide Type 304 stainless steel adhesive anchors to secure pump to floor. Install stainless steel anchor bolts in accordance with certified prints furnished by the manufacturer.
- C. Brace piping at suction and discharge connections to withstand all shock loads and vibration.

3.02 FIELD QUALITY CONTROL

- A. Prior to field testing the equipment, manufacturer shall certify in writing that the installation is approved. Provide the services of a manufacturer's representative to check installation and initial startup and to instruct Owner on operation and maintenance of equipment.
- B. Give each pump a running test in the presence of Owner and Engineer demonstrating its ability to operate without vibration or overheating and deliver its rated capacity under specified conditions. Specifically, the following items shall be measured at five (5) points over the entire operating range:
 - 1. Discharge Head
 - 2. Suction Head
 - 3. Capacity
 - 4. Pump Speed
 - 5. Amperage draw
- C. Record operating voltage and amperage of motor during normal operation. The representative shall record this information on the manufacturer's startup report (MSR).
- D. Correct all defects or replace defective equipment, revealed and noted during tests. Make necessary adjustments at the time of tests at the expense of contractor. Repeat tests, if necessary to obtain results acceptable to Engineer.
- E. Submit the MSR for each pump startup for record purposes. Record the model number, serial number, and nameplate data on MSR. Separate MSR's shall be provided for each system.

END OF SECTION 432379

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Rotary Drum Screen shall be furnished and installed under Contract G and wired by Contract E.
- B. Fully automatic, self-cleaning, dual drive septage receiving unit and its associated motor controllers. Equipment shall be installed as shown on the plans, as specified herein, as recommended by the supplier and in compliance with all local, state and federal codes and regulations.
- C. All labor, material and equipment costs associated with the installation of the specified scavenger sludge equipment shall be included under Bid Item No. 3.

1.02 DESIGN REQUIREMENTS

- A. The Contract Drawings have been prepared based on the installation of one (1) new septage receiving unit manufactured by SAVECO. If other manufacturer's or an equal manufacturer's equipment is submitted which requires an arrangement differing from that shown on the plans or if the details of design and construction are different from those specified, the equipment will be considered as a substitution and the Contractor will be required to prepare and submit for review the necessary design calculations along with the necessary structural, electrical, instrumentation, mechanical and architectural drawing revisions to the layout(s) indicated on the Contract Drawings in accordance with Section 012500 - Product Substitution Procedures.

1.03 QUALITY ASSURANCE

- A. The entire septage receiving unit shall be designed, coordinated and supplied by one manufacturer. The unit shall be supplied in one piece requiring no field assembly. The sludge receiving system manufacturer shall take sole responsibility for the unit supplied.
- B. One manufacturer will be responsible for the supply of the proprietary dual drive septage receiving system as specified herein. The equipment manufacturer will have no less than five (5) years' experience in the design and manufacturing of the sludge receiving system with at least twenty (20) installations. No deviations from this specification and system design shall be accepted.
- C. Any manufacturer, other than named, must successfully pilot at the installation site.
- D. The septage receiving unit will be fully assembled and shop tested to confirm fit and function of the unit. A certificate of the shop test shall be supplied with the shipping documents.
- E. The septage receiving unit will be shipped to the site fully assembled, some ancillary components may be removed to prevent damage during shipment.

1.04 REFERENCES

- A. The septage receiving unit and motor controllers shall, as applicable, meet the requirements of the following industry standards:
 - 1. AISI (American Iron and Steel Institute)
 - 2. ABMA (American Bearing Manufacturers Association)
 - 3. AGMA (American Gear Manufacturers Association)
 - 4. NEMA (National Electrical Manufacturer's Association)
 - 5. NFPA (National Fire Protection Association)
 - 6. ASTM (American Society for Testing and Materials)

7. AWS (American Welding Society Code)
8. ASME (American Society of Mechanical Engineers)
9. NEC (National Electrical Code)
10. UL (Underwriters Laboratory Standards)

1.05 SUBMITTALS

- A. The Manufacturer shall furnish the required number of submittals (and an electronic version if required) within 4-6 weeks of receipt of the order to verify compliance with the specification. The submittals shall include:
- B. Technical information:
 1. Shop drawings, manufacturer's installation drawing and wiring and schematic drawings.
 2. Motor performance data and features.
 3. Gear reducer data including service, efficiency, torque rating and materials of construction.
- C. Operation & Maintenance Manuals
 1. Equipment Operating instructions
 2. Equipment weights and lifting instructions
 3. Installation instructions
 4. Maintenance schedules
 5. Recommended lubricants
 6. Recommended spare parts including wear items
 7. Long-term and short-term storage instructions
- D. Equipment information:
 1. Brochures and other descriptive literature
 2. Installation reference list
 3. Manufacturer's Warranty

1.06 WARRANTY

- A. Provide a warranty certificate typed on manufacturers letterhead and signed by an officer of the manufacturer. The certificate shall be witnessed by a notary public in the state in which the company headquarters is located.
- B. In addition, the manufacturer shall guarantee all components of the equipment specified to be furnished under this Section to be free from defects in design, materials and workmanship for a period of one (5) years commencing on the date of the Manufacturer's Startup Report. That being the day that the pump was placed into permanent, automatic, and consistent, fault free operation.
- C. During the guarantee period, if any part or equipment component is defective or fails to perform when operating at design conditions and if the equipment has been installed and is being operated and maintained in accordance with the written instructions provided by the manufacturer(s), the supplier shall repair or exchange, at the discretion of the Owner, such defective part(s) free of any and all charges including freight. The cost of labor and all other expenses resulting from the repair or replacement of the defective part(s) and from installation of part(s) furnished by this Warranty shall be borne solely by the supplier.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. SAVI Beast Septage Station, Model VFA-800-DM shall be as supplied by SAVÉCO North America, Inc or approved equal.

2.02 PERFORMANCE REQUIREMENTS

CONDITIONS	UNIT
NUMBER OF UNITS	ONE (1)
INFLUENT TYPE	MUNICIPAL SEPTAGE
INFLUENT SOLIDS CONCENTRATION (MG/L)	2-3%
PEAK FLOW PER SCREEN (GPM)	450
PERFORATION SIZE (MM)	6
DRUM BASKET NOMINAL DIAMETER (INCHES)	30
INLET CONNECTION	4-INCH FLANGED
OUTLET CONNECTION	8-INCH FLANGED
DISCHARGE HEIGHT FROM OPERATING ELEVATION (FEET)	4.9
DRUM INSTALLATION ANGLE	25°
DRUM MOTOR HP	1.5
SCREW MOTOR HP	2.0

2.03 UTILITY REQUIREMENTS/ENVIRONMENTAL CONDITIONS

CONDITIONS	UNIT
HIGH PRESSURE SPRAY WASH WATER (GPM/PSI)	40 @ 40-60
POWER SUPPLY (V/P/HZ)	480/3/60
INSTALLATION LOCATION (INDOOR/OUTDOOR)	TBD
NFPA CLASSIFICATION REQUIREMENT	NON-HAZARDOUS
CONTROL PANEL LOCATION (INDOOR/OUTDOOR)	TBD
CONTROL PANEL NFPA CLASSIFICATION REQUIREMENT	NON-HAZARDOUS

2.04 DESIGN REQUIREMENTS

A. General

- Equipment provided shall be a fully automatic, self-cleaning, septage receiving unit incorporating a perforated plate rotating drum screen and an integral screenings washing, conveying and dewatering/compacting system contained within a stainless steel tank. The tank mounted rotating drum screen unit will be provided with an angle-of-inclination of 25° from horizontal.
- Each rotating drum screen unit shall be provided with a rotating screen basket, exterior basket cleaning spray bar(s), exterior basket cleaning brush, concentric transport screw with integral screenings washing, dewatering and screenings compaction zone.
- Fabricate all parts and assemblies from type 304 stainless steel unless otherwise noted.

B. Rotating Drum Screen Basket

- The Drum Screen Basket shall be designed and built to withstand the maximum possible static hydraulic forces exerted on the screen by the liquid flow. Structural and functional parts shall be sized to prevent deflections or vibrations that may impair the screening, conveying, washing and compacting operations.

2. The drum screen basket shall be mounted at the drive end using a large diameter, single row, heavy duty industrial bearing assembly with integral ring gear comprising part of the drive system. The bearing assembly shall have a built in grease fitting.
 3. The drum screen basket shall be of a cylindrical shape with perforations around the entire basket.
 4. The drum screen basket shall be perforated plate with maximum openings of 6 mm. Bar screens, wire mesh or wedge wire, or stationary screens of any type will not be acceptable screen media.
 5. The drum screen basket shall have angled lifting vanes to retain loose solids during rotation and lift them up and into the screw auger trough. Helical shaped vanes which can tumble screenings rather than lift screenings shall not be accepted.
 6. The screenings collection trough shall extend beyond the screen opening at the influent end to maximize solids capture and reduce screenings recycle.
 7. The drum screen shall have no support arms on the influent side of the screen basket to snag and accumulate long stringy solids. Screens with influent side support arms will not be accepted.
 8. The drum screen basket shall be provided with a seal system incorporating an HDPE seal.
- C. Drum Screen Basket Cleaning Brush and Spray Bar(s)
1. The exterior of the rotating drum screen basket assembly shall be cleaned by a high pressure stainless steel spray bar and a stainless steel backed polypropylene brush. The drum screen basket shall continuously rotate in one direction during the cleaning cycle and pass through the topmost portion where it is cleaned by the spray bar and brush.
 2. The exterior cleaning brush shall be mounted on a holding device which keeps the brush in constant contact with the screen basket and can be adjusted to compensate for brush wear.
- D. Screenings Transport Screw and Dewatering Zone
1. The screenings transport screw shall be constructed of an epoxy coated high strength alloy steel for maximum torsion resistance in the screw. The screw shall be near-white blasted, primed with an inorganic zinc primer and coated with a 2 part epoxy.
 2. The screenings collection trough shall be attached to the screenings transport tube by a drum support flange. The screw drive assembly shall be attached via a drive support flange welded to the upper end of the screenings transport tube.
 3. The concentric transport/dewatering screw shall be designed to transport and dewater the screened material. The unit shall be provided with screw flights of constant pitch approaching the compaction zone to prevent clogging in the compaction zone. Designs incorporating a decreasing pitch screw will not be accepted.
 4. The screenings transport screw shall be supported by a sealed, self-lubricating lower bronze bushing. The lower bushing shall be designed such that it does not take any thrust load from the transport screw. Designs requiring bearings of any type or externally lubricated bushing(s) or water injection into the housing shall not be accepted.
 5. The compaction zone shall be integral to the transport screw and compaction tube. The compaction zone shall be designed to form a screenings plug and return water released from the screened material back to the tank through circular holes that are machined into the screenings compaction tube.
 6. The compaction zone housing shall be fabricated entirely of stainless steel. The lower body shall be a welded construction with a minimum of 10 mm end plates for maximum torsion resistance. The bottom of the compaction zone shall be curved to promote maximum cleaning and minimum depositing of materials. Units utilizing a fiberglass reinforced compaction zone housing will not be accepted.
 7. The compaction zone shall be furnished with a latched, hinged access cover with a gasket. The access cover shall incorporate a motor cut-out switch to prevent operation of

the unit with the access cover open. Units which require the use of any tools to gain access to the compaction zone will not be accepted.

E. Spray Wash Systems

1. Drum and flush spray systems shall each be furnished with an automatically controlled electrically actuated full port stainless steel ball valve, stainless steel piping and fittings, flexible reinforced hoses and spray nozzles.
2. Compaction zone spray system shall be furnished with a control solenoid valve, stainless steel piping and fittings, flexible reinforced hoses and spray system.
3. A drum wash system shall be located over the rotating perforated drum which utilizes a spray bar(s) with adequate spray nozzles to ensure a consistent spray pattern over the entire length of the drum.
4. A screenings spray wash system shall be located in the lower section of the transport tube to break up and return organic materials to the flow stream and to ensure maximum screenings washing.
5. A compaction zone wash system shall be provided which periodically cleans the compaction and dewatering zone via a stainless steel wash system located in the uppermost end of the compaction/dewatering chamber. The header shall be designed to completely wash the full surface of the transport tube drainage area.
6. The Septage Receiving Unit shall be supplied with an integrated booster pump in order to provide the recommended pressure and flow of wash water to the unit. During construction, the pressure and flow of the existing water line will be verified in order to provide a properly sized booster pump.

F. Screen Tank

1. The septage receiving unit shall be supplied with a two-stage stainless steel tank. The bottom of the influent section of the tank shall be sloped toward the screen to eliminate sedimentation. The inlet section shall be sized to match the inlet shape of the drum to prevent a wall for solids to dam and collect. Units with rectangular tanks which encourage sedimentation shall not be accepted.
2. The second stage tank shall house the rotating drum screen unit.
3. The inlet stage of the tank shall be provided with a flush wash system.

G. Drive Units

1. The septage receiving unit shall be a dual drive system which allows the drum and screw to be driven independently to optimize solids removal.
2. Gear reducers shall be a helical gear type as manufactured by NORD or approved equal. Provide a cast iron frame; design in accordance with AGMA recommendations for wastewater service.
3. Transport screw shall be directly driven by a flange mounted gear reducer.
4. The transport screw gear reducer shall be bolted to a machined flange welded to the upper end of the transport tube.
5. The rotating screen drum basket shall be driven by a flange mounted gear reducer using a spur gear and bull gear assembly.
6. Gear reducers shall be driven by 240/480V, 3 ph, 60 hz motors rated for the installation environment location. Motor horsepower shall be as noted in Paragraph 2.04.
7. Chain drives, belt drives, friction drives, or hydraulic drives will not be accepted.
8. Designs incorporating a separate upper bearing for the transport screw will not be accepted.

H. Drum Retraction

1. The complete screen assembly must be able to be retracted away from the front seal plate to allow for replacement of the seal without pivoting the screen or requiring lifting devices such as cranes or come along hoists.

2. Units that require pivoting of the screen for seal replacement shall be required to provide a complete workable lifting system.
- I. Pivot Assembly
 1. The complete screen assembly must be able to pivot out of the tank without requiring the removal of the drive unit, screw or drum. Units that require disassembly of the unit shall not be allowed.
 - J. Open Gearing Automatic Grease Lubrication System
 1. The perforated drum drive system will be provided with a factory mounted automatic grease lubrication system that will spray a precise amount of lubricant directly to the loaded profiles of the drive gear teeth.
 2. The automatic grease system shall be air driven and controlled from the control panel to signal the pump to supply the open gear lubricant to a positive-displacement metering valve. The metered lubricant is sent to a spray manifold where the open gear lubricant is directed to a set of nozzles. The pressurized air (80-120 psi – provided by others) blows the open gear lubricant out of the nozzle and onto the open gearing. After a predetermined amount of open gear lubricant is dispensed, both the air system and the pump shut off until the next lubrication cycle.
 3. System will consist of a ½ gallon grease reservoir, two (2) air regulators, a 3-way 120-volt NEMA 4X brass body solenoid valve, dual feed positive-displacement metering valve with flexible nozzles and necessary tubing and fittings.
 - K. Heat Tracing / Freeze Protection
 1. The wash water lines shall be fitted with 120V, single phase, 60 Hz flexible self-regulating heat tracing wire and covered with a transport tube custom fitted insulation blanket.
 2. Compaction zone with heat pad and with custom stainless steel cover.
 3. Transition between influent tank and main tank shall be heated with two (2) heat pads, insulation and protective 304 stainless covers.
 4. Wiring from the wash water heat trace cables shall terminate in a factory mounted junction box for field connection by others.
 5. The control panel shall include integrated heat trace circuits rated for the appropriate wattage as determined by the manufacturer.
 6. GFCI circuit breaker added to control panel to power the heat tracing circuit.
 7. One (1) ambient temperature thermostat shall be provided to control power to the heat trace cable. The thermostat shall be 120 Volt, single phase, 60 Hz with a NEMA 4X housing. The temperature set point shall be selectable by an adjustable dial.

2.05 ELECTRICAL CONTROLS AND DEVICES – CONTROL PANEL

- A. Control Panel: 480 volt primary control panel shall be provided with a type 304, stainless steel, NEMA 4X enclosure. Panel shall be suitable for wall mounting with the following electrical components to provide proper operation of the equipment
 1. Main disconnect with through door interlock handle
 2. Step down control transformer
 3. Branch circuit protection
 4. Motor starter, soft start w/ overload (drum motor)
 5. Motor starter, reversing w/ overload (screw motor)
 6. Emergency stop pushbutton
 7. Hand-Off-Auto selector switches for drum and screw drive
 8. Open-Close-Auto switches for screen drum and tank flush wash water electrically actuated ball valves
 9. Open-Close-Auto switch for compaction zone wash water solenoid valve
 10. Load monitors shall provide overload protection for drum and screw by sensing motor power factor

11. Hour meter for each motor
 12. Control power on, run and fault indicating lights
 13. Alarm reset pushbutton
 14. Allen-Bradley Micro850 with Ethernet and required IO
 15. Operator Interface Unit, Allen Bradley PanelView 800 with 4 inch screen
 16. Run and alarm auxiliary contacts for use by the customer
 17. Intrinsically safe relay for level sensor
 18. Panel Heater, with Thermostat
 19. UL508A
- B. Motor Cut-out Switch: One (1) interlock switch suitable for the area classification shall be factory mounted to the compaction/discharge zone access door. Interlock switch shall prevent operation of the screen while the door is open.
- C. Electrically Actuated Ball Valves: Provide two (2) electrically actuated full port 316 stainless steel ball valve to control flow to the drum spray wash and tank flush assemblies. The full port ball valve shall be 2-piece body, threaded ends, cast body from CF8M, 316 stainless steel, ball and stem from 316 stainless steel, and RTFE seats. Each valve shall be controlled by a NEMA 4X electric actuator with a housing from cast aluminum with thermally bonded polyester power coating, stainless steel output shaft, stainless steel fasteners, 120 volt, single phase, 60 Hz, two SPDT limit switches, and visual indication on valve position.
- D. Solenoid Valve: Provide one (1) NEMA 4X solenoid valve to control flow to the compaction zone spray wash assembly. Valve shall have a brass body. Valve shall be 120 volt, single phase, 60 Hz.
- E. Level Control: Provide one (1) non-contacting radar transmitter for operation of the unit by screen start level and high level. Unit shall not be affected by FOG, debris or foam. The radar unit shall provide a 4-20mA level signal and be rated for installation in a Class 1, Div. 1/Div. 2 area when using an intrinsically safe circuit. The sensor shall be supplied with 33 feet of integral cable.
- F. Inlet Pinch Valve
1. One (1) 4-inch inlet pinch-type valve for controlling flow into the unit. Pinch valve to be Red Valve Type A, full port design with cast iron body, ANSI Class 125/150 flanges and Buna-N elastomers. One (1) ½-inch 3-way brass body solenoid valve to control pinch valve operation, suitable for 120 VAC operation with electrical rating as noted in Paragraph 2.04. (Shipped loose)

PART 3 - EXECUTION

3.01 PREPARATION

- A. An adequate concrete equipment pad shall be provided (by others) for installation of the septage receiving station and ancillary equipment.

3.02 INSTALLATION

- A. The installation is the responsibility of the Contractor. Complete installation procedures are included in the O&M manual shipped with the unit.

3.03 START UP/TRAINING/FIELD QUALITY CONTROL

- A. The initial start-up of the equipment will be performed by an authorized representative. The representative will verify the proper operation and installation and provide training to the equipment operators. One (1) trip for a total of two (2) days is allotted.

3.04 ADJUSTING AND CLEANING

- A. Information on minor periodic adjustments and cleaning is contained in the Operating and Maintenance Manual.

---END OF SECTION--- 462113

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Scavenger Sludge Thickener shall be furnished and installed under Contract G and wired by Contract E.
- B. The equipment shall include a center drive unit and torque control, walkway and platform with handrail, stationary influent pipe, center feedwell, rotating drive shaft, rake arms with segmented blades, anchor bolts, scum skimmer, scum box, effluent weir, scum baffle, and all other appurtenances required or shown on the drawings.
- C. All labor, material and equipment costs associated with the installation of the specified scavenger sludge equipment shall be included under Bid Item No. 2.

1.02 DESIGN REQUIREMENTS

- A. The Contract Drawings have been prepared based on the installation of one (1) new sludge thickener manufactured by WesTech. If other manufacturer's or an equal manufacturer's equipment is submitted which requires an arrangement differing from that shown on the plans or if the details of design and construction are different from those specified, the equipment will be considered as a substitution and the Contractor will be required to prepare and submit for review the necessary design calculations along with the necessary structural, electrical, instrumentation, mechanical and architectural drawing revisions to the layout(s) indicated on the Contract Drawings in accordance with Section 012500 - Product Substitution Procedures.

1.03 QUALITY ASSURANCE

- A. The equipment supplier shall have at least 15 years experience in the design, application, and supply of circular thickeners in water or wastewater treatment plants, and shall submit a list of not less than 25 operating installations as evidence of meeting the experience requirement.
- B. To show evidence of being able to provide the quality of equipment and services described in this specification, the equipment supplier shall submit their ANAB-accredited ISO 9001 quality system certification. AIAO-BAR accredited systems are not a recognized equivalent and are therefore specifically prohibited. The quality procedures shall provide for a means of qualifying all sub-vendors and shall specify that the fabrication facility is a critical vendor and shall require inspection. The quality system shall be audited on-site by a third-party independent registrar at least annually. Certification shall remain in effect throughout the project start-up. Mechanism shall be manufactured according to requirements of Machinery Directive 98/37/EC.
- C. The equipment specified herein shall be factory assembled as far as practical to verify that all mating parts can be field assembled. All mating parts shall be trial fit and match-marked. The manufacturer shall submit certification of shop trial assembly and photographs of assembly before shipment. The customer and installing contractor shall be given the opportunity to witness the shop assembly.
- D. Shop inspection shall be performed by a qualified inspector and certified by the manufacturer. The inspection shall be documented and all deficiencies noted, corrected, re-inspected and final completion formally authorized. Final shipment authorization shall be by the manufacturer to ensure completion of all fabrication, assembly, and inspection requirements. Inspection records and evidence of inspector qualification shall be submitted to the owner upon request.

1.04 DESIGN CRITERIA

- A. Influent flow rates per thickener (gpm)
 - 1. Design (avg. flow): 50
 - 2. Maximum: 162
- B. Solids loading (lbs/ft²-day):
 - 1. Design: 6
 - 2. Maximum: 12
- C. Tank diameter (ft): 24
- D. Side water depth (ft): 10
- E. Freeboard (ft): 3
- F. Bottom of slope (in/ft): 2.75/12
- G. Drive shaft diameter (in): 6
- H. Scum box width (ft): 3
- I. Motor HP: 1
- J. Torque (ft-lbs)
 - 1. Design Running: 8,000
 - 2. Momentary peak: 16,000
- K. Ball race diameter (in):

1.05 WARRANTY

- A. A written supplier's warranty shall be provided for the equipment specified in this section. The warranty shall be for a minimum period of five (5) years from start-up or 66 months from time of equipment shipment, whichever comes first. Such warranty shall cover all defects or failures of materials or workmanship which occur as the result of normal operation and service except for normal wear parts (i.e. squeegees, skimmer wipers, etc.).

1.06 SUBMITTALS

- A. Two copies of all materials required to establish compliance with these specifications shall be submitted for review. Submittals shall include at least the following:
 - 1. Certified general arrangement drawings showing all important details and materials of construction, dimensions, loads on supporting structures, and anchor bolt locations.
 - 2. Descriptive literature, bulletins, and/or catalogs of the equipment.
 - 3. Complete data on motors and speed reducers.
 - 4. Wiring diagrams and electrical schematics for all control equipment to be furnished.
 - 5. Calculations documenting the AGMA rating of the drive unit and life of the main bearing, prepared and signed by a registered professional engineer.
 - 6. Complete descriptive information and electrical schematic for the torque overload device.
 - 7. Complete sludge transport calculations substantiating the rake blade design, rake tip speed, and floor slope.

PART 2 PRODUCTS

2.01 GENERAL DESIGN

A. Description

1. The thickener mechanism shall be of the center drive type, mounted on a walkway which spans the tank and bears on the wall at each end. Flow shall enter the feedwell through an influent pipe. The thickener shall be designed to remove settled sludge from the bottom of the tank and floating scum from around the periphery of the tank.
 - a. The thickener shall perform the following integrated functions:
 - 1) Dissipate energy and control localized currents.
 - 2) Separate solids from the clear liquid.
 - 3) Evenly withdraw the clear liquid.
 - 4) Transport and thicken settled sludge.
 - 5) Remove scum from the thickener surface.

B. Materials

1. All structural steel shall conform to AISC – Steel Construction Manual latest edition. All steel plates shall conform to ASTM A36. All structural steel shape series of M, MT, S, ST, C, MC, L shall conform to ASTM A36. Structural steel shapes W, WT, HP shall conform to ASTM A992/A572. All pipes shall be ASTM A53, Grade B. All square and rectangular tubing shall be ASTM A500, Grade B, unless otherwise noted. Steel members in contact with liquids, either continuously or intermittently, shall have a minimum thickness of 1/4 inch unless otherwise noted. All aluminum shall be type 5052, 6061, 6063, or 2014 alloy unless noted. All stainless steel shall be type 304/304L unless noted.

C. Fabrication

1. Shop fabrication and welding of structural members shall be in accordance with the latest edition of the "Structural Welding Code", AWS D1.1, (AWS D1.2-Aluminum, AWS D1.6-Stainless Steel), of the American Welding Society. All welded connections shall develop the full strength of the connected elements and all joined or lapped surfaces shall be completely seal welded with a minimum 3/16" fillet weld. Intermittent welding shall not be allowed, except on non-ferrous metals.

D. Edge Grinding

1. Sharp projections of cut or sheared edges of ferrous metals shall be ground to a radius by multiple passes of a power grinder as required to ensure satisfactory coating adhesion.

E. Shop Surface Preparation/Coating

1. All iron and steel surfaces, except the drive unit, shall be field cleaned and painted by the contractor to ensure paint compatibility and assign unit responsibility for the coating system. The drive unit shall be coated with the supplier's standard enamel paint system.

F. Structural Design

1. All steel design shall be in accordance with the AISC Manual of Steel Construction, latest edition and the International Building Code (IBC), latest edition.

2.02 DRIVE UNIT

A. Design Parameters (D25)

1. The drive unit shall be designed and manufactured by the thickener equipment supplier to ensure unit responsibility. The drive unit shall be designed for the torque values previously listed. It shall turn the mechanism at the design collector tip speed. The drive main bearing shall be designed for the total rotating mechanism loads with a minimum L-10 life of 50 years or 438,000 hours. The drive unit shall be capable of producing and

withstanding the previously listed momentary peak torque while starting. The drive main gear shall be designed to a minimum AGMA 6 rating when rated in accordance with the latest AGMA standard. Gear teeth shall be designed for proper load distribution and sharing. Stub tooth design and surface hardening of the main gear shall not be allowed. The main bearing shall be capable of withstanding the listed overturning moment without the aid of any underwater guides or bearings to ensure correct tooth contact for AGMA rating of the main gear.

B. Physical Characteristics

1. The drive unit shall consist of a motor, secondary speed reducer, and support base. The drive shall be mounted on the walkway and support the entire rotating load of the mechanism. All speed reducers shall be fully enclosed and running in oil or grease. Support base for the drive shall be of welded steel to assure rigidity. Lubricant and dust seals shall be provided. Lubrication fittings shall be readily accessible.

C. Overload Protection

1. An overload device shall be provided in a stainless steel, weatherproof enclosure. The device shall be actuated by torque generated from the main drive, which shall operate two independently adjustable switches (the alarm switch at 100 percent of design running torque and the motor cutout switch at 120 percent of design running torque). Devices that require the worm to float and measure the thrust of the worm gear shall not be acceptable. These two switches shall be factory adjusted to accurately calibrate the alarm torque value and the overload position. A visual torque indicator shall be provided and oriented so that it may be read from the walkway. It shall be calibrated from 0 to 160 percent of design running torque.

D. Speed Reducing Unit

1. The speed reducing unit shall consist of cycloidal, helical, or planetary speed reducers directly connected to a motor without the use of chains or v belts.
2. The main ring gear of cycloidal drives shall be made of high carbon chromium bearing steel and be fixed to the drive casing. An eccentric bearing on the high speed shaft shall roll cycloidal discs of the same material around the internal circumference of this main ring gear. The lobes of the cycloid disc shall engage successively with pins in the fixed ring gear. The movement of the cycloid discs shall be transmitted then by pins to the low speed shaft. Speed reducer efficiency shall be a minimum of 90% per reduction stage.
3. Speed reducer helical or planetary gearing shall be manufactured to AGMA standards and shall provide at least 95% power transmission efficiency per stage. The speed reducer shall have a minimum service factor of 1.25 based on the output torque rating of the drive.
4. The reducers shall be fitted with radial and thrust bearings of proper size for all mechanism loads and be oil or grease lubricated. As a safety feature, the speed reducer shall be back driveable to release any stored energy as the result of an over torque condition.

E. Motor

1. The motor shall be a squirrel cage, induction type, TEFC, ball bearing heavy duty unit of ample power for starting and operating the mechanism without overload, with a minimum service factor of 1.15.

2.03 WALKWAY AND PLATFORM

A. Walkway

1. One (1) 36 inch wide walkway and platform with handrails shall be supported by the tank wall at its outer ends, and shall be designed to safely withstand a live load of 50 pounds per square foot. Deflection shall not exceed $L/360$ when both the dead load and live loads are applied. It shall consist of two trusses or beams with 1-1/4 inch aluminum I-bar grating between the trusses or beams. The walkway shall be diagonally braced against lateral

movement, and provided with handrails 42 inches high, of double-row 1-1/2 inch diameter horizontal aluminum pipe, and 4 inch high kickplates on both sides. Walkway trusses may serve as the handrail if the top chord is 3 feet-6 inches above the walking surface.

- a. Stainless steel bearing plates, UHMW-PE slide plates, and anchor bolts for the wall support shall be provided by the equipment supplier and installed by the contractor. Bearing plate dimensions and anchor bolt diameter, length, quantity, and arrangement shall be per the equipment supplier. The contractor shall block out or otherwise modify the tank or support structure to accommodate walkway and supports, if required.

B. Center Drive Platform

1. A center drive platform shall be provided which allows 24 inches clearance outside the center drive components. It shall consist of 1/4 inch aluminum checkered plate with necessary stiffeners and supports, resting on the drive unit and center column, and provided with connections to the walkway. The entire platform shall be surrounded by handrails 42 inches high of double-row 1-1/2 inch diameter horizontal aluminum pipe with 4 inch high kickplates.

2.04 INFLUENT AND SLUDGE REMOVAL

A. Rotating Center Drive Shaft and Cone Scraper

1. A rotating steel drive shaft of 1/4" minimum wall thickness shall be provided. The shaft shall be suspended vertically from and receive its rotational power from the center drive unit mounted on the operating platform. The shaft shall extend down to a sludge cone in the center of the tank floor.
 - a. The shaft shall have a steel cone scraper attached to its lower end to prevent deposit of solids in the sludge cone.
 - b. The shaft shall be provided with connections for the two sludge rake arms and feedwell supports. The shaft shall be bolted to the drive unit which shall rotate the shaft with the attached arms and feedwell. The shaft and each arm shall be designed to withstand 150 percent of the design running torque of the drive without over stressing the members. Loading to develop the torque shall be considered as uniform loads applied to each arm individually.
 - c. The rotating shaft shall have adequate structural strength to support the entire rotating mechanism, including rake arms, cone scraper, scum scraper and support, scum skimmer, and feedwell. Design shall accommodate dead load plus live load and torque with an adequate factor of safety to eliminate deflection or vibration.

B. Feedwell

1. The flocculating feedwell shall be designed to diffuse the liquid into the tank without disturbance or formation of velocity currents. Baffled openings shall be provided near the water surface to allow scum to exit the feedwell.
 - a. The supports for the feedwell shall be located above the liquid extending from the shaft. No feedwell support or feedwell spliced connection shall be contained within the annular space formed between the feedwell and center shaft. The depth of the feedwell shall be such as to provide proper detention time and an exit velocity at maximum flow that will not scour the settled sludge. The diameter, depth, detention time, and exit velocities shall match the process application calculations as evidenced by the required successful operating installations.
 - b. The feedwell shall be made of not less than 3/16 inch thick steel plate with necessary stiffening angles.

C. Influent Pipe

1. A steel influent pipe shall be provided for delivering influent into the feedwell. The pipe shall discharge vertically into feedwell and be supported from the tank wall.

D. Sludge Rake Arms

1. T Sludge Rake Arms: The mechanism shall include two sludge rake arms of steel truss or channel construction with steel scraper blades and adjustable stainless steel squeegees. Squeegees shall be fastened to the rake blades with stainless steel fasteners. The blades shall be properly sized to insure complete raking of the bottom twice per revolution. The blades shall rake the heavy sludge to a center sludge cone. The arms shall be adjustable at the shaft to assure an even grout thickness over the tank bottom.
2. Vertical pickets of structural steel angle shall be attached to the rake arms on 2'-0" centers.

2.05 SCUM REMOVAL**A. General**

1. The thickener manufacturer shall furnish one (1) skimming device as part of each thickener mechanism. Each skimming mechanism shall be arranged to sweep the surface of the sedimentation compartment, automatically removing scum and floating material to a scum box at the periphery of the tank.

B. Skimmer Construction

1. The rotating scum skimmer shall include a horizontal steel plate skimmer blade supported by vertical steel members extending up from the rake arms. The blade shall extend from a point 6 inches away from the influent feedwell to the hinged scum skimmer assembly at the tank periphery.

C. Scum Skimmer Assembly

1. A hinged scum skimmer assembly shall be mounted on the outer end of the skimmer blade. The hinged scum skimmer assembly shall be designed to form a pocket for trapping the scum. The hinged arrangement shall insure continual contact and proper alignment between wiper blade, scum baffle, and ramp as the blade travels up the scum box ramp. The wiper blade shall have a wearing strip on its outer end which contacts the scum baffle and a neoprene strip on its lower and inner edge. The neoprene wipers shall be a minimum 1/4 inch thickness. The scum is trapped as the wiper blade meets the ramp and is raised up the ramp to be deposited into the scum trough for disposal.

D. Scum Box

1. The scum box shall be of the size specified, supported from the tank wall and connected to the scum withdrawal piping. It shall be made of 1/4 inch thick welded steel plate. The box shall have a scum trough, vertical steel sides, and a sloping approach ramp that extends from 1-1/2 inches above water level to 5-1/2 inches below. A similar ramp shall be provided at the opposite end to allow the skimmer blade to lower back to the operating position. A flexible connector shall be provided for connection to the contractor supplied scum withdrawal piping in the tank wall.

E. Scum Flushing Valve

1. A valve shall be attached to the scum box which automatically opens and allows clarified liquid into the scum box to flush out solids. The valve shall actuate at every pass of the scum skimmer over the scum box, allowing sufficient delay after deposit of the solids before flushing begins. Delay and flush duration shall be adjustable. The opening and closing of the scum flushing valve shall be one smooth continuous movement. The valve shall provide 2 to 5 gallons of flush water per each pass of the skimmer assembly.

F. Scum Baffle

1. The baffle shall consist of 1/4 inch thick x 12 inches deep fiberglass sections. In the area of the scum box the scum baffle shall extend to 24 inches starting approximately 6 feet before and ending 2 feet after the scum box. The baffle sections shall be curved and

fastened to the launder wall with adjustable FRP support brackets, stainless steel fasteners, and anchor bolts.

2.06 EFFLUENT REMOVAL

- A. Launder
 - 1. A rectangular effluent launder shall be provided around the perimeter of the tank. The launder shall be formed as part of the concrete wall. A drop-out box shall be provided in the bottom of the launder at one point for collection and discharge of the clarified effluent.
- B. Weir
 - 1. An adjustable weir shall be provided around the periphery of the tank at the water surface for removal of clarified effluent.
 - a. The weir shall consist of 1/4 inch thick x 9 inches deep fiberglass sections with 2-1/2 inch deep 90 degree v-notches at 6 inch intervals. The weir sections shall be curved and fastened to the launder wall with special large washers, anchor bolts, and hex nuts to allow vertical adjustment.

2.07 ELECTRICAL

- A. The equipment supplier shall furnish all electrical items specifically called for in this specification section. The contractor shall supply and install all other electrical items required to place the equipment into service.
- B. The contractor shall supply and install all field wiring required including but not limited to proper size wire, conduit, fittings, and supports.

2.08 ANCHORAGE AND FASTENERS

- A. Anchor Bolts
 - 1. All anchor bolts shall be a minimum of 1/2 inch diameter and made of type 304 stainless steel. The equipment supplier shall furnish all anchor bolts, nuts, and washers required for the equipment.
- B. Fasteners
 - 1. All structural fasteners shall be a minimum of 1/2 inch diameter and made of type 304 stainless steel. The equipment supplier shall furnish all fasteners required for the assembly of the equipment.

PART 3 INSTALLATION

3.01 GENERAL

- A. The equipment shall be installed properly to provide a complete working system. Installation shall follow the supplier's recommendations.

3.02 MANUALS

- A. The equipment supplier shall furnish an electronic copy of the operation and maintenance manual, which will be retained at the installation site to assist plant operators. The manual shall include the supplier's erection and assembly recommendations and a complete list of recommended spare parts.

3.03 FIELD SERVICE

- A. The equipment supplier shall provide the service of a qualified representative for one trip and one day per mechanism to inspect the mechanism installation, assist in start-up, and instruct plant personnel in the proper operation and maintenance of the mechanism.

3.04 FIELD TESTING

- A. Torque Tests
 - 1. The entire sludge collector mechanism shall be statically load tested by loading the rake arm with 150 percent of the specified design running torque. The test shall verify the torque overload control device settings for alarm and motor cutout. One truss arm shall be anchored and the load measured to demonstrate the rake arms', cage's, and drive unit's ability to withstand the specified torque. Sketches and calculations shall be submitted illustrating how the torque will be applied prior to the test taking place.
- B. Operation Tests
 - 1. The contractor shall operate the mechanism in a dry tank for a minimum of 4 continuous hours before flow is allowed to enter the system. There shall be no binding, jerky, or unusual motion exhibited during this run in period. Motor amperage shall be checked at least hourly for any unusual or higher than normal figures. After the unit has successfully passed this initial test, flow shall be introduced into the tank and the same 4 hour observation test run. If the unit should fail under any of these conditions, the test shall be halted and the problem corrected. If, after several attempts, the unit does not successfully pass the field test, the faulty portion of the equipment shall be repaired or replaced and the test re-run.

– END OF SECTION – 467113

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. This section includes the equipment and installation of all equipment, controls, and necessary appurtenances for the solids digestion system. The work includes one (1) automatic thermophilic aerobic digestion reactor (ATAD), one (1) storage/nitrification/denitrification reactor (SNDR) and one (1) biofiltration odor control system. The supplier shall provide the necessary process equipment and instrumentation. The contractor shall provide the general hardware, piping, pipe supports, and electrical equipment as specified within the contract drawings. Installation shall be performed by the contractor or contractor's representative in accordance with the contract documents.
- B. The system shall come complete, and without restricting the generality of the following, shall consist of:
 - 1. Spare Parts and Miscellaneous Equipment specified herein this document.
 - 2. Assembly hardware as specified herein or as shown and/or implied on the Contract Drawings
 - 3. Various supports, guiderails and associated hardware as detailed and/or otherwise implied on the Contract Drawings.
- C. The Biosolids Master Control Panel "MCP" and all associated motors and control instruments shall be supplied as work of this Section for installation by the Plumbing Contractor and wiring by the Electrical Contractor. Refer to Section 016500 - Product Delivery, Storage and Handling for work involved with the supply and turnover of MCP.

1.02 RELATED SECTIONS

- A. Section 013100 – Project Management and Coordination
- B. Section 013300 - Submittals
- C. Section 014500 – Quality Control
- D. Section 16500 – Product Delivery, Storage and Handling
- E. Section 017500 – Starting and Adjusting
- F. Section 017820 – Operating and Maintenance Data
- G. Section 402326 – Hydraulic Valves and Valve Accessories
- H. Section 402336 – Air and Water Process Piping
- I. Section 407000 - Instrumentation for Process Systems
- J. Section 432357 - Progressing Cavity Pumps

1.03 DESIGN REQUIREMENTS

- A. The Contract Drawings have been prepared based on the installation of the solids digestion system equipment specified in this section and manufactured by Thermal Process Systems. If other listed manufacturer's or equal manufacturer's equipment is submitted which requires an arrangement differing from that shown on the plans or if the details of design and construction are different from those specified, the equipment will be considered as a substitution and the

Contractor will be required to prepare and submit for review the necessary design calculations along with the necessary structural, electrical, instrumentation, mechanical and architectural drawing revisions to the layout(s) indicated on the Contract Plans in accordance with the Quality Assurance paragraph of this specification section.

- B. Equipment furnished as work of this Section shall be as specified herein or as shown on the Contract Drawings.
- C. All adhesive anchors, stud anchors, and expansion bolts necessary to anchor equipment supplied by the Autothermal Thermophilic Aerobic Digestion equipment manufacturer to concrete or another rigid surface shall be furnished by the Autothermal Thermophilic Aerobic Digestion manufacturer and installed by the Plumbing Contractor and be as shown on the Autothermal Thermophilic Aerobic Digestion detail sheets or as specified elsewhere.
- D. Intermediate supports for Autothermal Thermophilic Aerobic Digestion equipment, except valve, mixer, blower, and pump lift rail extensions, shall be fabricated by the Autothermal Thermophilic Aerobic Digestion manufacturer for installation by the Contractor as shown on the Drawings.
- E. Electrical power conductors, control, float, etc. cables that are factory attached to Autothermal Thermophilic Aerobic Digestion equipment and devices shall be brought to the top of the tank wall/cover and temporarily secured by the Plumbing Contractor. Electrical installation and connections, including junction boxes and local disconnect switches, shall be the responsibility of the Electrical Contractor.
- F. The Electrical Contractor shall be responsible for the installation of the local transmitters for primary level elements and analytical probes for frame mounting and electrical connections.
- G. Refer to the Mechanical Drawings for additional scope of work requirements.

1.04 QUALITY ASSURANCE

- A. The system shall be furnished by one single Supplier (MBR Manufacturer). This requires the Supplier to be responsible for the development, design, fabrication, assembly, delivery and proper sustained automatic operation of all system equipment in order to achieve the effluent water quality specified herein, but does not require that all system equipment and accessories be the products of one single manufacturer. The equipment shall be manufactured by Thermal Process Systems, or equal.
- B. The Contractor and Supplier shall consult and cooperate to achieve this end.
- C. The Supplier shall have a minimum of five (5) installations operating within North America.
- D. The Supplier shall have a combined ThermAer operational experience of greater than twenty (20) years.
- E. The brand name products specified were chosen based on past performance, compatibility and testing and constitute a standard for quality and performance for the specific purpose for which they are intended. Products other than that specified will be considered for use under the provisions set forth as follows:
 - 1. The named products constitute the "Base Bid" system. All bidders are advised to provide "Base Bid" pricing since the magnitude of the expenses involved with engineering redesign or modifications may be difficult to determine during the bidding period. Refer to Section 012500 - Product Substitution Procedures regarding product substitutions.
 - 2. If alternate equipment is proposed, the Supplier shall prepare and submit to the Engineer three (3) copies of the "Evaluation Documentation" as listed below. The information shall be in a form that is neat, clear, precise, legible and computer drafted and prepared so as

to allow the Engineer to evaluate the proposed equipment. The "Evaluation Documentation" shall be hand delivered directly to the Engineer at least twenty (20) calendar days prior to the date set for the bid opening. The pre-bid "Evaluation Documentation" shall consist of the following:

- a. A Process Diagram showing reactor size, pipe names, flow directions, pipe and valve sizes, chemical injection points (if any), and location of every system component.
 - b. Instrumentation Diagram showing loop names and loop descriptions.
 - c. Process calculations showing unit sizing, mass balance, hydraulic flow rates, and chemical feed rates (if any).
 - d. Descriptive technical information for the proposed product(s) highlighted to show the differences between the proposed unit(s) and the specified unit(s). Descriptive technical information shall include model numbers, type, sizes, weights, performance data, and materials of construction. Include all major electrical devices mounted inside the System Control Panel.
 - e. List of facilities showing facility name, active contact name and telephone number, years in service, design conditions and parameters and design engineer's name and current telephone number of the company.
 - f. Equipment cuts showing dimensional data for all system components.
 - g. Cross sections of the system and media support method.
3. The Supplier shall state if he/she is in compliance with each and all Sections of the Specifications. Any variance from the specified equipment shall be listed and a description of each variance must be in letter form. Facsimile transmissions will not be accepted.
 4. Failure to submit the above listed information twenty (20) calendar days prior to the date set for the bid opening shall be cause for non-evaluation and the product will not be considered for the project.
- F. The Engineer will issue an addendum of approved products prior to the date set for the bid opening. The Engineer's determination regarding the product's acceptance shall be final.
- G. The acceptance of products prior to the bid date does not relieve the Contractor of his/her responsibility regarding the performance or ability to meet the requirements of the Contract Documents.
- H. After Contract execution, the Contractor shall submit shop drawings of the system as specified herein and in compliance with the requirements contained in Section 013300 - Submittals. The Contractor shall remain fully responsible for all design revisions, including but not limited to, the following: structural, mechanical, electrical, and instrumentation because of utilization of substitute equipment. Refer to Section 012500 - Product Substitution Procedures for costs associated with redesigns and/or modifications caused by the use of a substitute product offered by the Contractor.
- I. All costs, including engineering, and legal costs, associated with accommodating alternate equipment shall be borne by the Contractor.

1.05 SYSTEM DESCRIPTION

- A. The system furnished under this section shall include the equipment for one (1) automatic thermophilic aerobic digestion reactor (ATAD), one (1) storage/nitrification/denitrification reactor (SNDR) and one (1) biofiltration odor control system as specified below and shown on the Drawings.
- B. The system shall be designed to operate with the ATAD reactor as an independent system or in series with the SNDR system.

- C. The system shall have three selectable modes of operation: A HAND, OFF, and AUTO switch is located on the VFD or "bucket" of each piece of equipment.
- D. The system shall have the operational ability to vary the liquid depth without interruption of the aeration and jet motive mixing capability.
- E. The system shall be designed to match the oxygen supply and mixing intensity to the oxygen demand, as required maintaining the optimal range of process temperatures and oxidation-reduction potential (ORP).
- F. The system will also include appropriately sized and PLC controlled aeration supply systems such that odor is not a nuisance during ATAD and SNDR operation.

1.06 DESIGN CRITERIA

- A. The Solids Treatment System shall be designed based on the following range of solids source characteristics:

Thickened WAS average daily loading	8,400 lbs/day
TS (%):/ range	6.0% Average (Range 4% – 7 %)
VS Loading (lbs/day)	6,300 lbs/day
Site Elevation (ft. above sea level):	≈ 20.5 ft.

- B. Required performance at above design influent characteristics:
 - 1. Given initial start-up sludge quantities and characteristics as described in Paragraph A above, design system to produce:
 - a. Consistent operating temperatures =50° C as a weekly average.
 - b. Average VS reduction 55% computed as a weekly moving average.
 - c. TS reduction =40% as a weekly average.
 - d. Class 'A' Biosolids, as defined in 40 CFR Part 503.
 - 2. Given inlet H2S concentration to Solids Handling Biofilter as described in Paragraph A above, design Biofilter system to remove:
 - a. Remove 99% of inlet hydrogen sulfide or maximum outlet concentration of 1 ppm.
 - b. Remove 95% of inlet mercaptans or maximum outlet concentration of 1 ppm.

1.07 SUBMITTALS

- A. Submit in accordance with the requirements in Section 013300 – Submittals.
- B. All materials required to establish compliance with these specifications shall include the following:
 - 1. Certified general arrangement drawings showing all important details and materials of construction, dimensions, loads on supporting structures, and anchor bolt locations.
 - 2. Descriptive literature, bulletins, and/or catalogs of the equipment.
 - 3. Complete data on motors and speed reducers.
 - 4. Wiring diagrams and electrical schematics for all control equipment to be furnished.
 - 5. Calculations documenting the system capability to operate within the specified design parameters.
 - 6. Complete descriptive information and electrical schematic for process controls.
 - 7. Complete sludge transport calculations substantiating the rake blade design, rake tip speed, and floor slope.

- C. In addition to the requirements for the plant's O&M Manual, specified elsewhere, the manufacturer shall provide one (1) copy of electronic format of information for the Owner to utilize in operation and maintenance of the ATAD, SNDR and biofiltration systems. Physical copies will be available upon request at the Buyer's expense.
- D. The O&M Manual shall include the following information for the System:
 - 1. Warranty
 - 2. Process Guarantee
 - 3. Operations recommendations regarding the process
 - 4. Installation recommendations
 - 5. Maintenance requirements/schedule
 - 6. Equipment drawings
 - 7. Equipment technical data

1.08 DELIVERY, STORAGE AND HANDLING

- A. The Supplier will recommend packing and preparation for shipment and handling.
- B. Storage and protection will be as recommended by the Supplier.
- C. Ship each component in as few parts as possible.

1.09 PROCESS & EQUIPMENT WARRANTY

- A. The Autothermal Thermophilic Aerobic Digestion Manufacturer shall provide a Process and Equipment Warranty Certificate typed on company letterhead and signed by an authorized officer of the company. A notary public in the state in which the company headquarters is located shall witness the signing of the certificate. The certificate shall be submitted, verbatim and without exception, as follows:

"Assuming the system equipment and the process is being operated in accordance with the written operating instructions contained in the operations and maintenance manual provided by (Autothermal Thermophilic Aerobic Digestion Manufacturer) and the influent design concentrations are as specified herein, including any addendums thereto, (Autothermal Thermophilic Aerobic Digestion Manufacturer) guarantees that the Autothermal Thermophilic Aerobic Digestion process will produce a Class A Biosolids waste product.

This guarantee shall be in effect if:

- 1. The Autothermal Thermophilic Aerobic Digestion influent sludge does not fall outside of the required solids concentration range that would not be conducive to the digestion process.
- 2. The Autothermal Thermophilic Aerobic Digestion Manufacturer equipment furnished and installed by (name of contractor who purchased the equipment for the project) has been paid in full in accordance with the terms of the contract.
- 3. The Owner agrees to provide at least 3 months of operating data related to the Autothermal Thermophilic Aerobic Digestion Manufacturer system as defined in (Autothermal Thermophilic Aerobic Digestion Manufacturer's) process manual within ten (10) days of a process problem being noticed. At the discretion of the Owner, monthly operating reports will be emailed to (Autothermal Thermophilic Aerobic Digestion Manufacturer) for the purpose of (Autothermal Thermophilic Aerobic Digestion Manufacturer) being kept fully aware of the operation of the Autothermal Thermophilic Aerobic Digestion Manufacturer process. (Autothermal Thermophilic Aerobic Digestion Manufacturer) agrees to provide free telephone process consultation services for as long as the Riverhead Sewer District Treatment Facility uses the equipment furnished under this warranty.

4. The maximum total volume received by the Autothermal Thermophilic Aerobic Digestion process over any 24 hr period does not exceed 18,600 gallons of thickened sludge.
5. The equipment is installed, operated and maintained in full accordance with instructions provided by (Autothermal Thermophilic Aerobic Digestion Manufacturer) in the Operation and Maintenance Manual.
6. Should an inability to produce the guaranteed results be related to a deficiency or failure in key system components that have not been supplied by Autothermal Thermophilic Aerobic Digestion Manufacturer, this guarantee shall be considered void. Key components are comprised of all equipment, engineering and plant operations necessary to produce a fully functional system. Key components include, but are not limited to: tanks, valves, mixers, aeration equipment, blowers, instrumentation, chemical feed equipment, and control systems.

The process warranty portion of this certificate shall remain in continuous full effect for 36 months from the date that design process parameters such as Class A Biosolids have been achieved. In the event that Class A Biosolids production was fully achieved for the 36-month period following, then the terms of the warranty shall be satisfied. However, if Class A Biosolids production was not achieved then the warranty period shall be extended to a period of time equal to the period that Class A Biosolids were not produced.

In no event will the Manufacturer's liability exceed 100% of the purchase order amount, including any change orders, provided by (name of contractor who purchased the equipment for the project).

If the system fails to achieve the desired Class A Biosolids product, and conditions 1 thru 6 listed above are satisfied, then (Autothermal Thermophilic Aerobic Digestion Manufacturer) will modify, supplement, and/or replace the system equipment by paying all costs associated with the removal of the old equipment, sludge hauling expenses, and the installation and startup of the new system equipment at no charge to the Owner including all engineering and Riverhead administrative and legal costs.

In addition, the Autothermal Thermophilic Aerobic Digestion Manufacturer shall guarantee all mechanical and electrical components of the system to be free from defects in design, materials and workmanship for a period of two (2) years commencing on the date that an acceptably treated batch is first generated or 36 months from shipment whichever occurs first.

During the guarantee period, if any part or equipment component is defective or fails to perform when operating at design conditions and if the equipment has been installed and is being operated and maintained in accordance with the written instructions provided, then the (Autothermal Thermophilic Aerobic Digestion Manufacturer) shall repair or exchange such defective part (s).

The replacement or repair of parts normally consumed in service shall include pilot light bulbs, chart paper, chemicals and lubricants. These parts only shall be considered as part of routine maintenance and upkeep and shall not be considered eligible for exchange free of charge under this Warranty.

Agreed upon this _____ day
(date)

by _____ of
(name of authorized agent)

_____, who,

(name of supplier)

by signing this document, affirms that I am legally authorized to submit this warranty on behalf of
(Autothermal Thermophilic Aerobic Digestion Manufacturer).

AUTHORIZED SIGNATURE

DATE

NOTARY

DATE

1.10 SPARE PARTS

- A. Two (2) ORP/pH Probe
- B. Four (4) Blower Filters one for each blower
- C. One (1) 60 HP Motor
- D. One (1) 40 HP Motor
- E. One (1) 10 HP Motor
- F. One (1) 15 HP Submersible Pump
- G. Six (6) set of spare belts for each pump and blower size.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Number of Systems
 - 1. One (1) Automatic Thermophilic Aerobic Digester Reactor (ATAD) System
 - 2. One (1) Storage/Nitrification/Denitrification Reactor (SNDR) System
 - 3. One (1) Biofiltration Odor Control System
- B. Acceptable Manufacturers
 - 1. Thermal Process Systems or approved equal.
- C. Scope of Supply
 - 1. Below is a table of equipment specifically supplied by the Supplier. All other components required to ensure a complete installation shall be supplied by the Contractor.

ITEM	DESCRIPTION	QTY	Equipment Tag / Comments
ATAD Reactor	Jet Motive Horizontal end suction centrifugal Pump Trillium SFI16-Z 60 HP	1	One (1) per ATAD Reactor

SECTION 467324 - AUTOTHERMAL THERMOPHILIC AEROBIC DIGESTION SYSTEM
(CONTRACT P)

H2M

	Foam Control Horizontal end suction centrifugal Pump Trillium SFF10-T 40 HP	1	One (1) per ATAD Reactor
	Sample Tap Assembly	1	One (1) per ATAD Reactor
	Drain Valve Assembly	2	One (1) per pump
	Expansion Joints	4	Two (2) per pump
	Air Release Valve Assembly	2	One (1) per pump
ATAD In-Basin Piping	16 IN FRP Jet Manifold with 10 bi-directional nozzles	1	One (1) per ATAD Reactor
	2.5 IN FRP Downcomers (In Basin)	8	Eight (8) per ATAD Reactor
	16 IN SS Motive Pump Suction Bell	1	One (1) per ATAD Reactor
	12 IN SS Motive Pump Suction Bell	1	One (1) per ATAD Reactor
	6 IN SS Transfer Pump Suction Bell	1	One (1) per ATAD Reactor
	16 IN FRP Jet Main Header Pipe (In Basin)	1	One (1) per ATAD Reactor
	Tank Interior Piping and Supports for FRP Air and Liquid Pipe	1 Set	One (1) set per ATAD Reactor
ATAD Foam Control	14 IN Splash Cone Assembly	3	Three (3) per ATAD Reactor
ThermAer Blowers	PD Packaged Blower Kaeser CBS 121L 15 HP	2	Two (2) per ATAD Reactor
	Anti-Siphon Valve	1	One (1) per ATAD Reactor
SNDR Reactor	Mixer/Aerator HCMA/2500-28-15 HP	1	One (1) per SNDR Reactor
	Foam Control Submersible Pump NP 3153.660 15 HP	1	One (1) per SNDR Reactor
	Sample Tap Assembly	1	One (1) per SNDR Reactor
	Air Release Valve Assembly	1	One (1) per pump
SNDR In-Basin Piping	6 IN SST Transfer Suction Bell	1	One (1) per SNDR Reactor
	Tank Interior Piping and Supports for FRP Air and Liquid Piping	1 Set	One (1) per SNDR Reactor
SNDR Foam Control	14 IN Splash Cone Assembly	2	One (1) per SNDR Reactor
SNDR Blower	PD Packaged Blower Kaeser CBS 121L 15 HP	1	One (1) per SNDR Reactor
SNDR Accessories	Anti-Siphon Valve	1	One (1) per SNDR Reactor
	24 IN x 24 IN Deck mounted dilution damper with actuator	1	One (1) per SNDR Reactor
Spare Blower	PD Packaged Blower Kaeser CBS 121L 15 HP	1	One (1) Installed Spare
Inlet Air Filter	10" Intake Filter	1	One (1) Per Blower System
Transfer Pumps	Horizontal PD Pump Netzsch XB-3 10 HP	2	

SECTION 467324 - AUTOTHERMAL THERMOPHILIC AEROBIC DIGESTION SYSTEM
(CONTRACT P)

H2M

	Drain Valve Assembly	2	One (1) per Transfer Pump
	Expansion Joints	4	Two (2) per Transfer Pump
	Air Release Valve (Intra- Process Control)	1	
Transfer	6 IN Actuated Plug Valve	2	
Isolation Valves			
Transfer	6 IN Actuated Plug Valve	2	
Suction Valves			
Feed Valves	6 IN Actuated Plug Valve	1	
Heat Exchanger	Tube in Tube Heat exchanger.	1	
Heat	4 IN Actuated Plug Valve	1	
Exchanger			
Accessories			
Control Panel	Master Control Panel with AB ControlLogix	1	MCP- ATAD
UPS	Battery Backup System	1	MCP- ATAD -UPS
	All Equipment	1	
Biofilter	Biofilter Fan 15"-15 HP	2	
	Water Panel	1	
	Biofilter Cover	1	
	Plenum	1	
	Biofilter Media	1	
	Scrubber Nozzles	4	
	Soaker Nozzles	9	
	12" Butterfly Dampers	3	
	20" Butterfly Damper	1	
	Pressure Transmitters Assemblies with sanitary clamp and ball valve	4	Two (2) per ATAD Pump
ATAD	Temp/ORP/pH Probe	1	One (1) per ATAD Reactor
Instrumentation	Pressure Liquid Level Sensor	1	One (1) per ATAD Reactor
	Foam Level Radar Sensor	1	One (1) per ATAD Reactor
	Vacuum Gauge	1	One (1) per ATAD Reactor
	Feed Flow Meter	1	
	Local Instrument Panel	1	One (1) per ATAD Reactor
	Pressure Transmitters Assemblies with sanitary clamp and ball valve	1	One (1) per SNDR Pump
SNDR	ORP/Temp/pH Probe	1	One (1) per SNDR Reactor
Instruments and	Pressure Liquid Level Sensor	1	One (1) per SNDR Reactor
Accessories	Foam Level Radar Sensor	1	One (1) per SNDR Reactor
	Vacuum Gauge	1	One (1) per SNDR Reactor
	Local Instrument Panel	1	One (1) per SNDR Reactor
Transfer Pump and	Pressure Transmitter	4	Two (2) per Transfer Pump
Heat Exchanger	Assemblies with diaphragm seal and ball valve		
Instrumentation	4" Flow Meter	2	
	Temperature Gauge	4	
	Pressure Gauge	4	

	Local Instrument Panel	1
Biofilter Instruments	Pressure Gauge	1
	Temperature Probe upstream of biofilter	1
	Temperature Probe after biofilter	1
	Vacuum Gauge	1
	NPW Flow Meter and Transmitter	1
	Local Instrument Panel	1
Blower Instruments	Pressure Gauges	4
	Internal to Blower Enclosure	
	Temperature Gauge	4
	Internal to Blower Enclosure	
MCC	60 HP ATAD Jet Pump VFD	1
	40 HP ATAD Foam Pump VFD	1
	15 HP SNDR Mixer VFD	1
	15 HP SNDR Foam Pump VFD	1
	10 HP Transfer Pump VFD	2
	15 HP Blower VFD	4
	15 HP Offgas Fan VFD	2
Miscellaneous	Spare Belt Sets	6
	Spare Blower Filter	4
	Spare ORP/pH Probe	2
	Spare 60 HP Motor	1
	Spare 40 HP Motor	1
	Spare 10 HP Motor	1
	Spare 15 HP Submersible Pump	1

2.02 AERATION SYSTEMS

- A. The ATAD system reactor aeration equipment shall consist of one submerged jet manifold per reactor provided with in-basin liquid and air distribution piping and flush-out system per reactor.
 1. Liquid recirculation shall be provided by an external dry pit centrifugal pump for each jet header system.
 2. Two PD blowers shall be provided for the airflow header system.
 3. The supplier shall supply all in-basin liquid piping, all in-basin air piping, and necessary supports.
 4. One PD blower shall be provided for as a common spare for the ATADs and SNDRs.
- B. The SNDR aeration equipment shall consist of one submerged hyperbolic mixer/aerator provide with in-basin air distribution piping.
 1. Liquid mixing shall be provided by an internal hyperbolic mixer.
 2. One PD blower shall be provided for the SNDR airflow header system.
 3. The supplier shall supply all in-basin liquid piping, all in-basin air piping, and necessary supports.
 4. One PD blower shall be provided for as a common spare for the ATADs and SNDRs.
- C. ATAD Jet Aeration Performance
 1. The jet aeration system shall be designed to transfer sufficient oxygen to meet a total average actual oxygen requirement (AOR) of 363 lbs./hr. during the initial feed and subsequent burn mode of operation and an AOR of 78 lbs./hr. during the react mode.

2. The jet aeration system shall be designed to provide a completely mixed reactor.
- D. SNDR Jet Aeration Performance
1. The aeration system shall be designed to transfer sufficient oxygen to meet a total average actual oxygen requirement (AOR) of 31 lbs./hr throughout the entire SNDR system.
 2. The jet aeration system shall be designed to provide a completely mixed reactor.
- E. Jet Aeration Manifold
1. The ATAD aeration manifold shall be comprised of integrally fabricated liquid headers equipped with 10 jet nozzles on the in-basin header, and 3 nozzles on the cover.
 2. Jet nozzles shall be mounted equidistance on each jet manifold header.
 3. ATAD tank air shall enter each air header through 2 ½ -inch flanged connections in the tank covers.
 4. Recirculated liquid for the ATAD reactor shall enter the liquid header through a 16-inch flanged connection as shown on the Drawings.
 5. Liquid headers shall be cylindrical, internally smooth, and free from protrusions that might collect stringy material.
 6. The ATAD in-basin air headers shall be cylindrical and run above and perpendicular to the liquid header.
 7. In-basin air piping connects to contractor supplied penetrations into reactor.
 8. Liquid header in the ATAD tank and the air header piping in both the ATAD and SNDR shall be fabricated of corrosion resistant, machine filament wound, fiberglass reinforced thermosetting resin pipe conforming to ANSI-ASTM D-2996-88 and rated at 75 psi operating service.
 9. Pipe, fittings and air feeds shall be fabricated utilizing Dow Derakane 411 vinyl ester resin, or equal.
- F. Jet Nozzle
1. Each jet aeration nozzle, TPS Model TP4, shall consist of an inner liquid nozzle fabricated from Kynar and outer air/liquid discharge nozzle fabricated from fiberglass reinforced plastic using Silicon Carbide.
 2. Each outer nozzle shall be lined with integral 10-20 mil nexus veil and silica carbide for added abrasion resistance. Nozzles not using an abrasion resistant liner are not acceptable.
 3. The nozzles shall be of constantly decreasing cross sectional area so as to increase the velocity of the air/liquid mixture originating from the liquid nozzle and the air chamber.
 4. The outlets of both the inner and outer nozzles shall be circular and shall be capable of passing a 2.2-inch spherical solid and be free from all protrusions that may collect stringy material. Inner nozzles having smaller solids passing capabilities will not be allowed.
 5. The secondary, air-liquid nozzle shall have a circular orifice having a diameter of from 1.3 - 1.9 times the liquid nozzle outside diameter.
- G. Mixer
1. Each mix/aerator assembly shall be hyperboloid impeller type mixer/aerator with a dry installed heavy duty gear drive and a separate ring sparger to provide supplemental air. The mixer/aerators shall be designed to provide complete suspension of solids in the tank, to re-suspend heavy material on the tank bottom and to re-entrain foam from the surface. The shear ribs in the mixer body shall be capable of dispersing the air into fine bubbles while handling solids, fibrous materials, and heavy sludge. The shear ribs will be an integral part of the mixer body for smooth mixing flow acceleration and to minimize catch points for rags and debris.
 2. Mixer/aerators shall be designed as a vertical shaft mixer/aerator, with a dry installed motor. The mixer/aerator shall not generate any upward forces on the bridge construction.

3. The mixer/aerator shall have a steady stationary flow directed downward parallel to the mixer/aerator shaft, the highest speeds and turbulent fluctuations shall be produced in the bottom area. On the water surface little or no surface turbulences or separation vortex shall appear.
4. Shaft: Stainless steel of sufficient wall thickness to operate under the design conditions without warping, twisting, or any damage to proper mixer operation.
5. Mixer body: The hyperboloid mixer body shall be fluid-mechanical optimized. The transport ribs which accelerate the flow are integrated in the mixer body, the stainless steel shear ribs which ensure the dispersing of the air into fine bubbles are fixed to the bottom side of the mixer body. The mixer body shall be made FRP composite and coated with a gel coat with a polished finished surface and anti-abrasion coating.
6. Ring Sparger: The ring sparger shall be dimensioned on a maximum airflow of 300 scfm, shall be non-clogging and made of HDPE or 316 stainless steel, the ring sparger will end 5 ft from the center of the mixer/aerator with a 6" flange. The mounting hardware and chemical anchors shall be provided by the manufacturer.

H. Distribution Piping

1. The ATAD supplier shall provide all the air and liquid distribution piping within the basin as part of the jet system.
2. Drilling flanges (150 lb) shall be furnished for the ATAD Supplier/Contractor interfaces at the reactor roof and wall. The Contractor shall furnish and install the wall/roof penetration, wall collar, gaskets, fasteners, and flanges, as shown on the Drawings.
3. Liquid distribution pipe at the connection point shall be 16" for the ATAD and connect to the in-basin flange located at the tank wall penetration pipe, as shown on the Drawings.
4. Liquid distribution pipe for the suction of the pumps at the connection point shall be 16" for the ATAD Jet Pump, 12" for the ATAD Foam Pump and connect to the in-basin flange located at the tank wall penetration pipe, as shown on the Drawings.
5. All pipe and fittings shall conform to ANSI/ASTM D-2996-88, be machine filament wound, be fiberglass reinforced thermosetting resin pipe rated at 75 psi service, and be fabricated utilizing Dow Derakane 411 vinyl ester resin, or equal.
6. All distribution piping and manifold sections shall be field connected by 150 lb. flange-by-flange sets or FRP field wrap joints.

I. Pipe Supports and Hardware

1. The ATAD supplier shall provide all the necessary supports for the in-basin aeration systems, air and liquid piping for both reactors.
2. All submerged supports and connection hardware shall be constructed of 304 SS.
3. All liquid manifold supports shall consist of a contoured saddle and Schedule 40 leg assembly welded to a supporting base.
4. The Contractor shall supply all field welds required on the liquid and air piping, supports, manifold supports as shown on the drawings.
5. Air down comer supports shall consist of a contoured saddle and Schedule 40 leg assembly welded to a supporting base.
6. All support bases shall be anchored with 4-anchor bolts, grouted or cast in place, as required.
7. A contoured clamp shall hold the piping to the saddle using four threaded cap screws with lock washers. The saddle and clamp shall be provided with rubber pads to prevent abrasion.
8. Support clamps, connection hardware and anchor bolts shall be Type SS-304 stainless steel or better. Minimum service factor of the support system shall be 10:1 under a worst-case scenario.

2.03 FOAM CONTROL EQUIPMENT

A. Splash Cone

1. The Contractor shall supply the 14" connection through the cover of the tank.
2. The Contractor shall supply spool piece and flanged 90-degree elbow to connect splash cone to distribution piping and to allow removal of splash cone.
3. Each splash cone will connect to the liquid distribution piping through a 14" x 6" flanged connection to allow removal of the splash cone assembly.
4. Splash Nozzle
 - a. The Splash Nozzle shall be fabricated from UHMW PE.
 - b. The nozzles shall be of constantly decreasing cross sectional area so as to increase the velocity of the air/liquid mixture originating from the liquid nozzle and the air chamber.
 - c. The outlets of the nozzles shall be circular and shall be capable of passing a 3-inch spherical solid and be free from all protrusions that may collect stringy material.
5. The Splash cone shall be fabricated from 3/4" stainless steel rod and a solid stainless steel cone.
6. The stainless steel rods and cone shall be heat treated.

2.04 CENTRIFUGAL PUMPS

- A. Pumps shall be supplied by the ATAD supplier.
- B. Design
 1. The pump shall be capable of transferring thermophilically aerobically digested or ATAD biosolids having temperatures from 50° F. to 160° F. and Total Solids (TS) concentrations between 1% and 4%.
 2. The basic design shall be a single passage, clog free pump, utilizing a screw flow impeller. The overall pump design shall combine high efficiency, low required NPSH, a large solid passage, and the ability to handle rags or other fibrous material without plugging.
 3. The hydraulic design of the impeller shall combine the action of a positive displacement screw with the action of a single vane centrifugal impeller to provide a single, non-bifurcated flowstream with only gradual changes in flow direction.
 - a. The leading edge of the impeller vane shall blend into the impeller body in such a way that any rag or other fibrous material caught on the leading edge and folded over both sides of the vane will be unfolded and released as the textile follows the flowstream through the pump.
 - b. The impeller flange or impeller shall contain a spiral groove on the rear face so that any solids in the pumped media are discharged from the space between the backplate and the rear of the impeller.
 4. In order to maintain optimum running clearances along the entire length of the impeller to maintain design hydraulic efficiencies, the geometry of the impeller and suction liner shall be conical, so any axial adjustment of the impeller will cause the clearance between the impeller and suction piece to change uniformly along the entire length of the impeller. Designs incorporating curved, or combination curved/conical impeller and suction piece are not acceptable because in such designs clearances cannot be adjusted uniformly over the full length of the impeller.
 5. Suction and discharge flanges shall be drilled to meet ANSI 125 lb. bolting.
- C. Materials of Construction
 1. The pump volute, backplate, and impeller flange shall be of close-grained cast iron, ASTM A 48.
 2. Replaceable suction liner shall be made of materials of ASTM A 532 High Chrome Iron, minimum 450 Brinell hardness.
 - a. For E and F size pumps with a regulable liner, the suction piece shall be externally adjustable to compensate for wear by means of three stainless steel regulating

screws so that the necessary running clearances between the liner and impeller can be maintained for optimum hydraulic efficiency.

- b. For D size pumps with a shimmed liner, the suction piece or impeller shall be externally adjustable to compensate for wear by means of shims so that the necessary running clearances between the liner and impeller can be maintained for optimum hydraulic efficiency.
 3. Impeller material of construction shall be ASTM A 532 High Chrome Iron, minimum 450 Brinell hardness. All impellers shall be dynamically balanced.
- D. Bearing Housing
1. The bearing housing shall be of cast iron, ASTM A48 and shall be of the back pull out design so that the bearing housing and impeller can be removed without disconnecting the casing from the suction and discharge piping.
 2. The shaft shall be AISI 1045 steel and provided with suitable bearings capable of taking all mechanical and hydraulic loads. Unless otherwise specified, bearings shall provide a minimum B10 bearing life of 50,000 hours without credit for hydraulic balancing by pump-out vanes, grooves, or wear rings.
 3. The stuffing box shall be isolated from contaminants in the pumped media by pump-out grooves machined into the impeller back shroud and into the volute backplate, to prevent debris from reaching the shaft seal.
- E. Shaft Sealing
1. Tandem mechanical seal arrangement requiring no external flush. Shaft sealing shall be independently mounted, tandem mechanical seals contained in an oil chamber that is formed as an intrinsic part of the bearing frame and allows the seals to be completely submerged in and lubricated by the oil bath. Externally-mounted oil reservoirs are not acceptable.
 - a. The mechanical seal nearest the bearing shall utilize carbon/ceramic face, and shall isolate the seal cooling oil from the bearing frame. When mounted in a vertical configuration, this shall allow the pump to operate continuously when submerged within 4" of the upper bearing cap.
 - b. To prevent fouling from hair and other fibers, the mechanical seal nearest the impeller shall shield the stainless steel spring which loads the seal face from the pumped fluid. The seal faces shall be a solid tungsten carbide rotating face running against a solid silicon carbide stationary face. Seals with both faces of similar materials, or seals with bonded, soldered, or converted face surfaces are not equal or acceptable.
 - c. The mechanical seal nearest the impeller shall be contained in a seal chamber formed by the impeller flange and a recess cast into the bearing frame. To prevent debris from entering the chamber and to prolong the mechanical seal life, a flush port shall be provided so that an optional external water flush can be supplied directly into the seal chamber.
 - d. "Back to back" mounted double mechanical seals are not acceptable unless the contractor provides an approved seal pressurization system that guarantees the fluid between the seals is always pressurized to at least 1-1/2 times the maximum shut-off head of the pump
 - e. Seals requiring a water flush may be furnished in lieu of the non-flushed seal, provided the contractor furnishes, at no extra charge, all of the external auxiliary equipment necessary for the flushing system, including, but not limited to: stainless steel tubing, pressure gauge, flowmeter, shutoff and water supply isolation system, pressure regulator, and throttling valve.
- F. Mounting
1. Horizontal mounting with V-belt drive between pump and motor.

- a. The pump manufacturer shall provide a common pump and motor base constructed of a minimum of 3/8 inch thick fabricated steel, suitably reinforced to support the full weight of the motor, pump, belt drive and guard.
- b. The pump manufacturer shall furnish and mount a separate, adjustable motor base so that the motor can be easily moved for V-belt tensioning and adjustment.
- c. The pump manufacturer shall furnish and install belts and sheaves to drive the pump at the speed necessary to meet the rated conditions.
- d. An approved fiberglass or thermoplastic belt guard shall be provided to safely enclose the belt drive. If metal guards are furnished, they shall be of 316 stainless steel construction with expanded metal viewing ports to allow for inspection of the belt drive while the pump is in operation.

G. Drive Unit

1. The pump motors shall be the horizontal type with normal starting torque and low starting current characteristics.
2. The motors shall be premium efficiency, 3-Phase, 60 Hz, 460 V.
3. The motors shall not be overloaded at the design condition.
4. The motors shall have copper windings and be premium efficiency suitable for variable frequency drive.

H. ATAD Jet Motive Pump

1. Liquid recirculation shall be provided to the ATAD jet manifold by one 60 H.P., horizontal, mixed flow, end suction centrifugal pump. The pump shall be manufactured by Trillium, or approved equal, and sized to deliver 5,000 GPM @ 32 ft. TDH.
2. The pump shall be shipped with a tandem mechanical seal.

I. ATAD Foam Pump

1. Liquid recirculation shall be provided to the ThermAer splash cones by one 40 H.P., horizontal, mixed flow, end suction centrifugal pump. The pump shall be manufactured by Trillium, or approved equal, and sized to deliver 3,000 GPM @ 34 ft. TDH.
2. The pump shall be shipped with a tandem mechanical seal.

J. Pump Accessories

1. Pressure Gauge Assemblies
 - a. The ATAD supplier shall supply two pressure gauge assemblies for each pump.
 - b. The assemblies shall be installed between the process isolation valves on the tank and pump.
 - c. The pressure gauge valve assembly shall be comprised of the following components: 1-1"x4" nipple, 1-1" ball valve, 1-1"x close nipple.
 - d. The pressure gauge shall have a digital display and constructed of stainless steel. The gauges shall be -14.5-0-30 PSI on all jet pumps.
 - e. The diaphragm seal shall be constructed of 304 stainless steel with a 1.5" Tri-clamp process connection.
 - f. The valve shall be constructed of 304 stainless steel.
 - g. The contractor shall supply a 1" threaded connection on the suction and discharge of the piping to the pump to accommodate the pressure gauge assembly.
2. Drain Valve Assemblies
 - a. The ATAD supplier shall supply one drain valve assembly on each pump suction supplied by the ATAD supplier.
 - b. The assemblies shall be installed between the process isolation valve on the tank and the pump.
 - c. The drain valve assembly shall be comprised of the following components: 1- 1"x4" nipple, 1-1" ball valve.
 - d. The valve shall be constructed of 304 stainless steel.
3. Sample Tags

- a. The ATAD supplier shall supply one sample tap assembly for each ATAD and SNDR tank.
- b. The sample tap sludge assembly shall be comprised of the following components: 3-2" ball valves. The Contractor shall be responsible for the 2" 304 stainless steel interconnecting piping from the jet pump suction to the jet pump discharge.
- c. The valves shall be constructed of 304 stainless steel.
- d. The contractor shall be responsible for all drain piping.

2.05 SUBMERSIBLE PUMPS

- A. Pumps shall be supplied by the ATAD supplier.
- B. Design
 1. The pump shall be capable of transferring thermophilically aerobically digested or SNDR biosolids having temperatures from 50° F. to 104° F. and Total Solids (TS) concentrations between 1% and 4%.
 2. The basic design shall have a semi open multi vane self-cleaning impeller designed to transport wastewater with fibrous materials and municipal sludge with up to 8% DS.
 3. The impeller shall be wear resistant and made of high chromium cast iron with at least 24% chrome against sand and grit which is expected to enter the pump. Impellers that have surface hardening (by thermal, coating, etc.) will not be allowed.
- C. Materials of Construction
 1. Pump housing: ASTM A-48, Class 35B
 2. Impeller and insert ring: A 532 Alloy III A (25% Chrome)
 3. Cooling jacket: Stainless steel AISI 316
 4. Stator housing: ASTM A-48, Class 35B
 5. Shaft: ASTM A479 S43100-T
 6. Shaft seal: Pump side – Corrosion resistant Tungsten carbide WCCR
 7. Shaft seal: Motor side – Corrosion resistant Tungsten carbide WCCR
- D. Bearing Housing
 1. The pump shaft shall rotate on two bearings. Motor bearings shall be permanently grease lubricated and have a nominal L10 lifetime of 50,000 hours. The upper bearing shall be a single deep groove ball bearing. The lower bearing shall be a two-row angular contact bearing to compensate for axial thrust and radial forces. Single row lower bearings are not acceptable.
- E. Shaft Sealing
 1. Each pump shall be provided with a positively driven dual, tandem mechanical shaft seal system consisting of two seal sets, each having an independent spring. The lower primary seal, located between the pump and seal chamber, shall contain one stationary and one positively driven rotating corrosion and abrasion resistant tungsten-carbide ring. The upper secondary seal, located between the seal chamber and the seal inspection chamber shall be a leakage-free seal. The upper seal shall contain one stationary and one positively driven rotating corrosion and abrasion resistant tungsten-carbide seal ring. The rotating seal ring shall have small back-swept grooves laser inscribed upon its face to act as a pump as it rotates, returning any fluid that should enter the dry motor chamber back into the lubricant chamber. All seal rings shall be individual solid sintered rings. Each seal interface shall be held in place by its own spring system. The seals shall not depend upon direction of rotation for sealing. Mounting of the lower seal on the impeller hub is not acceptable. Shaft seals without positively driven rotating members or conventional double mechanical seals containing either a common single or double spring acting between the upper and lower seal faces are not acceptable. The seal springs shall be isolated from the pumped media to prevent materials from packing around them, limiting their performance.

Any leakage passing the sealing shall not pass the bearings. Before it reaches the bearings, the liquid shall create an alarm via the floating leakage sensor.

F. Drive Unit

1. The pump motor shall be the submersible type with normal starting torque and low starting current characteristics.
2. The motors shall be premium efficiency, 3-Phase, 60 Hz, 460 V.
3. The motors shall not be overloaded at the design condition.

G. SNDR Foam Pump

1. Liquid recirculation shall be provided to the SNDR splash cones by one 15 H.P., submersible pump. The pump shall be manufactured by Flygt, or approved equal, and sized to deliver 1,700 GPM @ 25 ft. TDH.
2. The pump shall be shipped with a tandem mechanical seal.

H. Pump Accessories

1. Pressure Gauge Assemblies
 - a. The ATAD supplier shall supply one pressure gauge assembly for each pump.
 - b. The assemblies shall be installed on discharge piping.
 - c. The pressure gauge valve assembly shall be comprised of the following components: 1-1"x4" nipple, 1-1" ball valve, 1-1"x close nipple.
 - d. The pressure gauge shall have a digital display and constructed of stainless steel. The gauges shall be -14.5-0-30 PSI on all jet pumps.
 - e. The diaphragm seal shall be constructed of 304 stainless steel with a 1.5" Tri-clamp process connection.
 - f. The valve shall be constructed of 304 stainless steel.
 - g. The contractor shall supply a 1" threaded connection on the discharge piping to the pump to accommodate the pressure gauge assembly.
2. Sample Tags
 - a. The ATAD supplier shall supply one sample tap assembly for each ATAD and SNDR tank.
 - b. The sample tap sludge assembly shall be comprised of the following components: 3-2" ball valves. The Contractor shall be responsible for the 2" 304 stainless steel interconnecting piping from the jet pump suction to the jet pump discharge.
 - c. The valves shall be constructed of 304 stainless steel.
 - d. The contractor shall be responsible for all drain piping.

2.06 ROTARY LOBE PUMPS

A. Pumps shall be supplied by the ATAD supplier.

B. Design

1. The pump shall be capable of transferring thermophilically aerobically digested or ATAD biosolids having temperatures from 50° F. to 160° F. and Total Solids (TS) concentrations between 1% and 4%.
2. The basic design shall be a single passage, clog free pump, utilizing a rotary lobe. The overall pump design shall combine high efficiency, low required NPSH, a large solid passage, and the ability to handle rags or other fibrous material without plugging.
3. Suction and discharge flanges shall be drilled to meet ANSI 125 lb. bolting.

C. Materials of Construction

1. The pump housing shall be constructed of cast iron GG25. Suction and discharge ports shall be 150 lb. ANSI flanged.

D. Bearing

1. Each shaft shall be supported by heavy-duty cylindrical and roller bearings. Synchronization of shafts shall be done by hardened and ground high precision timing gears.
 2. The bearings must be housed in the gearbox and positioned either side of the timing gears in order to give the best shaft support.
 3. The bearings and timing gears shall be well lubricated by oil contained the gearbox lubrication reservoir.
- E. Shaft Sealing
1. Each pump shall be supplied with mechanical shaft seals. Shaft seals must be of heavy duty simple and robust design in order to allow high operation safety and easy servicing. The rotating and static seal faces must be abrasive resistant silicon carbide to silicon carbide seal surfaces, elastomer in NBR quality. Each shaft seal must have flushing connections for grease, oil or water lubrication. Shaft seals must be front loading seals and internal mounted. Designs requiring the removal of the rotor case for seal replacement will not be acceptable.
- F. Mounting
1. Factory mount pump and motor, coupled together, on a common groutable steel base, properly braced to form a rigid support for the entire unit. Factory align the units on the base prior to shipment (final alignment to be performed in field following base grouting and piping connections).
- G. Drive Unit
1. The pump and motors shall be the horizontal type with normal starting torque and low starting current characteristics.
 2. The motors shall be premium efficiency, 3-Phase, 60 Hz, 460 V.
 3. The motors shall not be overloaded at the design condition.
 4. The motors shall have copper windings and be premium efficiency suitable for variable frequency drive.
- H. Transfer Pump
1. Liquid recirculation shall be provided to the ATAD splash cones by one 40 H.P., horizontal, mixed flow, end suction centrifugal pump. The pump shall be manufactured by Netzsch, or approved equal, and sized to deliver 200 GPM @ 21.6 PSI
- I. Pump Accessories
1. Pressure Gauge Assemblies
 - a. The ATAD supplier shall supply two pressure gauge assemblies for each pump.
 - b. The assemblies shall be installed between the process isolation valves on the tank and pump.
 - c. The pressure gauge valve assembly shall be comprised of the following components: 1-1"x4" nipple, 1-1" ball valve, 1-1"x close nipple.
 - d. The pressure gauge shall have a digital display and constructed of stainless steel. The gauges shall be -14.5-0-30 PSI on all jet pumps.
 - e. The diaphragm seal shall be constructed of 304 stainless steel with a 1.5" Tri-clamp process connection.
 - f. The valve shall be constructed of 304 stainless steel.
 - g. The contractor shall supply a 1" threaded connection on the suction and discharge of the piping to the pump to accommodate the pressure gauge assembly.
 2. Drain Valve Assemblies
 - a. The ATAD supplier shall supply one drain valve assembly on each pump suction supplied by the ATAD supplier.
 - b. The assemblies shall be installed between the process isolation valve on the tank and the pump.

- c. The drain valve assembly shall be comprised of the following components: 1- 1"x4" nipple, 1-1" ball valve.
- d. The valve shall be constructed of 304 stainless steel.

2.07 BLOWERS

A. Operating Conditions

- 1. Name: ATAD Process Blower
 - a. Quantity 2 Operating, 1 Common Spare
 - b. Discharge Pressure 8.5 PSI
 - c. Horsepower 15
 - d. Max. Brake Horsepower 12.7
 - e. Volume, SCFM 300
 - f. Elevation 108'
 - g. Inlet Air Temperature 100°F
 - h. Blower RPM 9,048
 - i. Blower Model Number CBS 121L
- 2. Name: SNDR Process Blower
 - a. Quantity 1 Operating
 - b. Discharge Pressure 8.5 PSI
 - c. Horsepower 15
 - d. Max. Brake Horsepower 12.7
 - e. Volume, SCFM 300
 - f. Elevation 108'
 - g. Inlet Air Temperature 100°F
 - h. Blower RPM 9,048
 - i. Blower Model Number CBS 121L

B. Manufacturer

- 1. Aeration blowers shall be rotary lobe type and shall be manufactured by Kaeser Compressors or approved equal.

C. Blowers

- 1. The casing shall be made of high strength, close grained, cast iron, and shall be adequately ribbed to prevent casing deflection and facilitate cooling. Casing shall be of EN GJL-200 material.
- 2. The rotors shall have the energy-efficient Screw Profile for the maximum degree of delivery. The rotors shall be machined with precision tolerance to ensure consistent rotor clearance and stable volumetric efficiency. The rotor assemblies shall be statically and dynamically balanced to ISO standard 1940/1- Q2.5 (turbine rotor). The primary rotor shall be machined out of a one-piece casting made of EN GJL-250 material.
- 3. The rotor timing gears shall be precision machined from case hardened, ground alloy steel to quality standard 5f 21. Each timing gear shall be straight cut, beveled, and precision ground to eliminate axial bearing loads and ensure long life as well as quiet operation.
- 4. All four rotor shaft support locations shall incorporate large, heavy-duty, full complement, cylindrical roller bearings with PEEK cages to absorb the radial gas forces which affect the rotors and change continuously. An additional gear side ball bearing set loaded for axial forces only. The bearings minimum acceptable L10 design life shall be as follows; At least 100,000 hours at design conditions.
- 5. Both the gear-end and the drive-end of the blowers shall be oil splash lubricated via a disc slinger for minimal maintenance and long service life.

D. Drive System and Motor

1. Motor shall be designed, manufactured, and tested in accordance with the latest revised editions of NEMA MG-1, IEC, DIN, ISO, IEEE, ANSI, and AFBMMA standards as applicable and shall be capable of continuous operation.
 2. Motor to be supplied, mounted and aligned by the blower package manufacturer.
 3. Each blower shall be driven by an inverter duty rated premium efficiency, continuous duty, TEFC, 460 Volt, 3 Phase, 60 Hertz alternating current, squirrel cage induction motor. The motor shall be NEMA B design, rated for the nameplate horsepower specified in above. The motor shall be rated for full load operation in 40 degree C ambient temperature and shall have a 1.15 service factor above nameplate rating. The motor shall be suitable for continuous operation at a turn down of 3:1. The motor shall be provided with Class F insulation.
- E. Blower System Accessories
1. Anti-Siphon Check Valve Assembly
 - a. The ATAD supplier shall supply one check valve assembly per reactor to prevent reactor contents backflow into the blowers in the event of a power failure.
 - b. The assembly shall be installed at the highest elevation of the blower discharge piping and designed to break a liquid siphon or reverse flow by allowing air into the system as shown on the drawings.
 - c. The check valve assembly shall be comprised of the following components: 1- 2" nipple, 2-2" ninety-degree elbows, and one check valve. All piping shall be schedule 40, 304 stainless steel.
 - d. The check valve shall be a 2" stainless steel elastomer hinged threaded check valve as manufactured by Techno or approved equal.
 - e. The Contractor shall supply a 2" threaded connection on the top of the air piping at the highest elevation of the pipe.
 - f. The Contractor shall supply access to the anti-Siphon check valve assembly
 2. Orifice Plate
 - a. The ATAD supplier shall supply one orifice plate for each air downcomer on the ATAD reactor to allow for even airflow across the header.
 - b. The orifice plate will be constructed from ¼" 304 SS plate and be sized to match a 2 ½" flange.

2.08 TUBE AND TUBE BIOSOLIDS HEAT EXCHANGERS

- A. Provide one heat exchanger unit to provide cooling of the digester biosolids. The heat exchanger unit shall be made up of 1 chamber with 16 tubes each.
- B. The unit shall be completely shop assembled prior to delivery.
- C. Each Exchanger chamber shall consist of a series of 3" ID Schedule 5 stainless steel pipe biosolids tubes concentrically placed within 4" ID Schedule 10 stainless steel pipe water tubes. The tubes shall be joined by Victaulic fittings. The biosolids and water tubes shall be independently removable.
- D. The biosolids tube end castings shall be removable to permit tube inspection without having to drain the jacket water. All biosolids passageways shall be designed to pass 2.5" spheres.
- E. Each Chamber shall have inlet and outlet connections and shall have 2-3" connections for biosolids piping and 4-4" connections for jacket water piping. In addition, these connections shall have 3/4" NPT connections for attachment of biosolids and water inlet and outlet thermometers. The connection to the process piping shall be 150 lb stainless flanges.

- F. Biosolids recirculation shall be provided by the transfer pumps for the heat exchanger unit. Sludge recycle rates shall be approximately 200 GPM per chamber or 200 GPM per unit. Each chamber shall have a head loss less than 20 ft.
- G. The water supply shall be provided by the plant NPW system. Water flow rates shall be approximately 200 GPM per chamber or 200 GPM per unit. Each heat exchanger unit shall have a head loss less than 30 ft.

2.09 BIOFILTER SYSTEM

- A. General
 - 1. The system shall be designed to remove 99% of the incoming hydrogen sulfide or achieve an outlet concentration of less than 1 ppm.
 - 2. The system shall be designed to remove 95% mercaptans or achieve an outlet concentration of less than 1 ppm.
- B. Ammonia Scrubber
 - 1. The primary humidification/scrubber unit serves three main purposes:
 - a. The unit shall flush out the majority of the influent particulate and soluble constituents from the influent foul air stream.
 - b. The unit shall control the foul air temperature to assure the conditions within the media are conducive to biological activity.
 - c. The unit shall supply a source of humidity to raise the foul air as close to 100% relative humidity as possible.
 - 2. The scrubber shall be constructed of concrete.
 - 3. Each scrubber shall have a minimum of 4 spray nozzles evenly spaced throughout the scrubber to ensure the air is in contact with water at all times.
 - 4. Spraying Systems Company or equal shall manufacture the spray nozzles.
 - a. The spray nozzles shall provide a consistent pressure drop and liquid flow to evenly distribute and atomize the scrubbing liquor spray and prevent foul air from short-circuiting.
 - b. The spray nozzle arrangement shall have the capability to deliver 32 gpm at 40 PSI of scrubbing liquor.
 - 5. The Contractor shall supply all schedule 40 PVC drain line from the scrubber and biofilter.
 - 6. The Contractor shall supply drain traps as shown on the Drawings.
- C. Biofilter
 - 1. The biofilter shall consist of a concrete tank, a plenum, a drain/sample port, a flow distribution baffle and approximately eight feet of media.
 - 2. The Contractor shall retrofit the existing 30' Ø tank.
 - 3. The Contractor shall supply and install a 12" trap drain as shown on the Contract Drawings.
 - 4. The ATAD supplier shall provide an air distribution plenum to support the biofilter media.
 - 5. The biofilter shall have a minimum of 9 spray nozzles evenly spaced throughout the biofilter to ensure the media bed can be saturated when required.
 - 6. The ATAD supplier shall provide the biofilter plenum and support legs.
 - a. It shall be compression molded from U.V. stabilized, 35 mesh, LLD polyethylene powder with a density of 0.932 to 0.939 (ASTM D-1693).
 - b. The biofilter plenum shall be designed to support a live load of 750 lbs./sf.
 - c. The airflow capacity through the floor emitters shall be a minimum of 5 scfm/sf. @ 0.2" W.C.
 - d. Interlocking panels shall seal the plenum from short-circuiting. The panels have orifices specifically designed to evenly balance airflow across the entire plenum surface.

- e. The biofilter plenum shall serve as a divider between the air distribution and the media. The plenum seal shall be established by placing solid sections of polyethylene around the perimeter of the active biofilter plenum.
 - 7. The biofilter media is a propriety mix and can only be supplied by Thermal Process Systems or approved equal.
 - 8. The ATAD supplier shall provide a redistribution baffle that is secured to the tank wall as shown in the drawings.
 - 9. The ATAD supplier shall provide the air-flow control dampers as shown in the drawings.
 - a. Size, connection, Stainless Steel.
 - b. 24"x24" Actuated Dilution Damper
- D. Biofilter Cover Aluminum: The biofilter supplier shall provide aluminum cover for the biofilter as specified below. Cover shall meet the following criteria:
- 1. Clear span length as noted on the Construction Drawings.
 - 2. Width as noted on the Contract Drawings.
 - 3. Distributed Design Live Load and Deflection: All structural components shall be designed to support the dead weight of the structure, plus a live load of 50 pounds per square foot of surface.
 - 4. The maximum deflection of any component under this load shall not exceed L/240 of the span of that component. In no event shall the dead load deflection exceed the rise of any component in order to avoid surface ponding.
 - 5. Concentrated Live Load: The structural components shall be designed to support a 400-pound load on a 6-inch by 6-inch area located anywhere on the surface of the structure without permanently deforming the tested area.
 - 6. Design Stresses: All allowable design stresses in structural aluminum shall be in accordance with the "Specifications for Aluminum Structures" for building-type structures by the Aluminum Association.
 - 7. Skid Resistance: The cover shall possess an integral non-skid surface. The aluminum-decking surface of the structure shall be Hallsten's Deck Slat, which is ribbed to provide an aggressively nonskid surface. The edges of adjacent deck slats shall double interlock so that the slats shall act together. The decking surface shall be manufactured from 6061-T6 alloy. The Manufacturer of the nonskid surface shall demonstrate in writing satisfactory performance for a minimum period of 10 years in the wastewater industry for the intended purpose.
 - 8. Chemical Resistance: Panels shall be fabricated entirely of 6061-T6 corrosion resistant aluminum extrusions. Every panel to beam connection shall be chemical resistant that will not weaken or corrode and will interlock. A mechanical and replaceable Santoprene seal shall isolate the cover perimeter from the concrete wall. No foam tape or caulk shall be allowed.
 - 9. Configuration: The aluminum cover shall be composed of panels and beams or trusses. All panels shall interlock with the adjoining beam or truss without the use of threaded fasteners. The weight of an individual panel shall not exceed 150 pounds. Each removable panel shall be easy to remove and the lifting force required shall not exceed the dead weight of the panel.
 - 10. Materials:
 - a. Aluminum: All aluminum used in the fabrication of the cover shall be alloy 6061 T-6.
 - b. All plate shall be alloy 6061-T6. Material shall be new and of first quality.
 - 11. Welding Electrodes: Welding shall be with electrodes of an alloy, which shall produce welds with strength and corrosion resistant characteristic compatible to the base metal.
 - 12. Fasteners: All fasteners between aluminum components shall be stainless steel or structural plastic. Fasteners between any galvanized steel components shall be hot-dipped galvanized or stainless steel. Aluminum shall be isolated from carbon steel by means of a stainless steel spacer or an elastomeric isolator or a thermoplastic powder coating. All panels and beams shall be joined with quickly removable interlocking plastic pins, which shall be removable without the use of tools.

13. Steel Accessories: Any carbon steel component shall be hot-dipped galvanized with a minimum of 2 ounces of zinc per square foot of steel surface.
14. Seals: A mechanical and replaceable Santoprene seal shall isolate the cover perimeter from the concrete wall. No foam tape or caulk shall be allowed.
15. Access Hatch Panels: Access to any location under the cover shall be gained through integral gear hinged access hatches or approved equal. The access hatch panels shall have the identical properties as the rest of the aluminum cover including loads, deflection and slip resistance specifications. Minimum size of access doors shall be 4 feet by 4 feet. The access-hinged panels shall be full panel width. Hinged panel components to include hinges, decking and lifting handles shall be extruded 6061-T6. While in the closed position the hatches shall be completely flush therefore posing no tripping hazard. In the open position the panel shall lie flat on the cover and will not need a hold open device.
16. Handles: Handles shall be an integral flush mounted aluminum and incorporated into the non-skid deck slat.

E. Biofilter System Fan

1. The belt drive in-line centrifugal fan shall be 15" diameter. Wheel type shall be a single thickness airfoil blade. The fan shall have non-overloading horsepower characteristics. The fan shall be packaged, completely assembled and ready to install. The discharge stack cap will be provided loose for field installation.
2. The fan housing shall be a heavy gauge commercial quality 304 stainless steel. The housing and wheel shall be continuously welded in compliance with AWS D1.1 standard. The wheels shall be commercial quality 304 stainless steel. The wheel shall be mounted to the shaft with a split taper bushing. The motor shall be mounted on a continuously welded motor base supported by four adjustable riser assemblies.
3. Fan shaft shall be fabricated of ground and polished 304 stainless steel. Bearings shall be located in an enclosed drive compartment and shall be heavy duty, self-aligning, with extended lube tubes for continuous service with a minimum of 50,000 hours L-10 life. V-Belt drives shall be sized for continuous service.
4. The fan assembly shall be dynamically balanced at the factory prior to shipment. Fan shall be balanced to the American National standards Institute, Std. S2.19-1989 "Balanced Quality of Rotating Rigid Bodies", Grade G6.3. Fan performance shall be based on tested at an AMCA accredited test laboratory in accordance with AMCA standard 210 for air performance and AMCA standard for sound.
5. Minimum Equipment Provided
 - a. 15" diameter 304 stainless steel backward curved centrifugal fan
 - b. 15 HP 1800 RPM Inverter Duty motor.
 - c. Motor Cover manufactured from 304 Stainless Steel.
 - d. High Plum Induced Draft Exhaust Stack manufactured from 304 Stainless Steel.
 - e. Motor Base, Riser, Studs and Hard manufactured from 304 Stainless Steel.
6. Performance
 - a. 5,000 SCFM @ 9" W.G.

2.10 INSTRUMENTS

A. Liquid Monitoring

1. A pressure transducer level transmitter shall continuously monitor the liquid level in the ATAD and SNDR.
2. Endress & Hauser or equal shall manufacture the instruments.
3. The Contractor shall provide a 4" stainless steel flange through the sidewall of each tank.
4. The contractor shall supply a 4" plug valve.
5. The units will be supplied with a local read out to be mounted inside the equipment building.
6. The transmitter shall measure from 0 – 33 feet of water, operate from 0°C - 125°C and have an accuracy of + 0.25%.

7. The Contractor shall provide supply electrical Beldon 8760 2-wire, 16-gauge cables.
 8. The transmitters will provide 4-20 mA DC signals.
 9. The unit is loop powered from the ATAD Suppliers control panel.
- B. Foam Level Monitoring
1. The non-contact radar device continuously monitors the foam level in both reactors.
 2. Endress & Hauser or equal shall manufacture the instruments.
 3. The Contractor shall provide a 10" stainless steel flange on each tank cover for each unit.
 4. The units will be supplied with a local read out to be mounted on the unit.
 5. The transmitter shall measure from 0 - 66 feet, operate from 0°C - 200°C.
 6. The Contractor shall supply electrical Beldon 8760 2-wire, 16-gauge cables.
 7. The transmitter will provide a 4-20 mA DC signal.
 8. The unit is loop powered from the ATAD Suppliers control panel.
- C. Retractable ORP Sensors/pH Sensors
1. Endress + Hauser CPA450 or equal shall manufacture the sensors.
 2. The sensors shall be retractable under pressure so that maintenance and inspection can be conducted without shutdown of the process.
 3. A 316 SS ball valve assembly shall be included with each sensor.
 4. The sensors shall be 21" stainless steel tube.
 5. The ORP sensors shall provide a measurement range of -1500 to 1500 mV with a temperature range of 5°-275° F.
 6. The sensors shall be installed in the suction piping of the jet motive pumps.
 7. The Contractor shall supply a 1-1/2" NPT threaded pipe connection for each unit.
 8. The ATAD supplier shall provide a local read out that consists of one analyzer for each reactor.
 9. The analyzer shall be enclosure mounted.
 10. The analyzers shall each have a 5.7" x 5.7" x 7.6", NEMA 4X enclosure.
 11. The analyzers front panels shall include a membrane keyboard and user selectable security.
 12. The power supply shall be 115VAC, 60 Hz.
 13. Each sensor shall be connected to the analyzer with a flexible cable to permit removal of the sensor from the pipeline.
 14. The display shall be a dual display pH and ORP.
 15. The outputs shall be provided from each transmitter. Both shall be 4-20mA with HART.
 16. The ORP transmitter shall measure over the range of +/- 1500 mV.
 17. The pH transmitter shall measure over the range of 0 to 14.
- D. Temperature Sensors
1. The sensor continuously monitors the air temperature in the biofilter.
 2. Endress + Hauser or equal shall manufacture the instruments.
 3. The Contractor shall supply a 1/2" NPT threaded pipe connection on off gas piping.
 4. The units will be supplied with a local read out to be mounted on the unit.
 5. The transmitter shall measure from -58°F - 393°F.
 6. The Contractor shall supply electrical Beldon 8760 2-wire, 16-gauge cables.
 7. The transmitter will provide a 4-20 mA DC signal with HART.
 8. The unit is loop powered from the ATAD Suppliers control panel.
- E. Flow Meters
1. A 3" flow meter shall be located in feed line as shown on the drawings.
 2. The 3" flow meter shall measure flows ranging from 0 gpm to 500 gpm.
 3. A 4" flow meter shall be located in transfer line and NPW line as shown on the drawings.
 4. The 4" flow meter shall measure flows ranging from 0 gpm to 1100 gpm.
 5. Endress & Hauser (or equal) shall manufacture the flow tubes and transmitters.

6. The meter shall have a Type 304 stainless steel or better flow tube; carbon steel flanges, welded steel housing and are painted with polyurethane.
7. The flow meter's wetted components shall include a teflon (PTFE) lining and Type 316 SS electrodes.
8. All magnetic flow meters shall send 4-20 mA dc signals to transmitter.
9. The transmitters shall be mounted on the wall near to the flow tube.
10. Each transmitter shall have a local operator interface that performs all the functions necessary for programming the transmitter.
11. The power supply to the transmitter shall require a power supply of 120 Vac.

F. Vacuum Gauge

1. The sensor continuously monitors the air pressure of the system.
2. Endress & Hauser or equal shall manufacture the instruments.
3. The Contractor shall supply a 2" flanged connection for each unit.
4. The units will be supplied with a local read out to be mounted on the unit.
5. The sensor range shall be 1.5 psig.
6. The Contractor shall supply electrical Beldon 8760 2-wire, 16-gauge cables.
7. The transmitter will provide a 4-20 mA DC signal.
8. The unit is loop powered from the ATAD Suppliers control panel.

G. Pressure Gauge

1. The sensor continuously monitors the pressure of each pump.
2. Allen Bradley or equal shall manufacture the instruments.
3. The Contractor shall supply a 1/2" threaded connection for each unit.
4. The units will be supplied with a local read out to be mounted on the unit.
5. The sensor range shall be -15 to 30 psig.
6. The Contractor shall supply electrical Beldon 8770 3-wire, 16-gauge cables.
7. The transmitter will provide a 4-20 mA DC signal.
8. The unit is loop powered from the pump VFD.

2.11 CONTROL PANEL

- A. The control system shall be used to control all ATAD and SNDR reactors. The operations described hereinafter are intended to identify minimum acceptable hardware.
- B. The control panel shall be NEMA 1X painted mild steel.
- C. The control system shall consist of an Allen Bradley ControlLogix PLC (or equal), and communications software.
 1. The power supply, CPU, memory, I/O and communications shall be contained in a single housing. The power supply shall be AB 1756-PA72.
 2. Communications ports shall be provided for simple connectivity to computers, MMI, printers and instrumentation.
 3. These ports shall be addressed via Ethernet or the approved communication of the plant. The Ethernet card shall be AB1756-EN2T. No additional fiber optic communication shall be acceptable in the cabinet.
 4. Programs stored in battery or capacitor-backed RAM can now be backed up in safe and secure, resident EEPROM.
 5. The CPU shall be configured to have integral 24 VDC power supply, 2.5-5 ms per K logic scan, Time-of-day clock, and 9 models. The CPU shall be model AB 1756-L73.
 6. Non-volatile memory shall be provided via an EEPROM card.
 7. High-speed peer-to-peer communications shall be available, without impacting the logic program or logic scan.
 8. All digital inputs shall have dual level terminal blocks model AB 1492-JD3 wired to a digital input card model AB 1756-IA16.

9. All digital outputs shall have a terminal block isolation relay model AB 700-HLT1L1x wired to a digital output card model AB 1756-OA16. Each isolation relay is single pole rated for 6 amps.
 10. All analog inputs shall have a tri level grounding terminal block model AB 1492-JDB3P wired to an analog input card model AB 1756-IF8H.
 11. All analog outputs shall have a tri level grounding terminal block model AB 1492-JDB3p wired to an analog output card model AB 1756-OF8.
 12. All wiring shall be color coded to decipher what power is used. 120 VAC wiring shall be red #16 MTW, 24 VDC shall be blue #16 MTW.
- D. Human Machine Interface (HMI) shall consist of an Allen Bradley PanelView Plus 7 1250 (or equal) on all major control areas.
1. Shall be a touch screen.
 2. The Control System shall include data acquisition capable of developing graphics and displaying alarms.
 3. The program shall allow for "point-click-connect" configuration.
 4. It shall be possible to make configuration revisions with the process on-line.
 5. The communications driver shall support Allen Bradley (or equal).
- E. Uninterrupted Power Supply
1. The UPS shall be able to maintain power to the control system during short duration power spikes to keep the process on-line.
 2. The UPS shall be manufactured by Allen-Bradley and be model 1609-D600N, 120 VAC UPS.
- F. Motor Control
1. Control of all VFDs connected to the ATAD and SNDR system shall be completed over Ethernet/IP. Control of all motor starters and soft starters shall be completed with 120 VAC control wiring.
- G. Remote Connection
1. The PLC, PanelView Plus 7 and Data Logger shall have access to an internet connection for remote connection and debugging of the system.
 2. The owner or contractor shall provide an internet connection for remote access to the panel from a remote location.
 3. Startup, testing, and inspection of any equipment shall not begin until the internet connection has been installed and verified to be working.
 4. The internet connection will remain in service until all process guarantee criteria have been completed.

2.12 CONTROLS DESCRIPTION

- A. ATAD Primary Control with ORP
1. An ORP probe shall be utilized for the ATAD reactor to measure the oxidation-reduction potential. This process is US patent protected # 5,948,261 and #6,203,701 and can only be supplied by Thermal Process Systems (or equal).
 2. The ORP probe shall continuously send a signal to the process controller for primary control of the process.
 3. The speed of the pumps and blowers is adjusted based upon real time conditions in the reactor.
 4. The minimum pump and blower speed shall be set to provide standard jet nozzle mixing requirements.
 5. The maximum speed shall also be programmable but will typically be limited by the sheave size on the pump and blower as to operate at 100% design capacity.

- B. SNDR Primary Control with pH
 1. A pH probe shall be utilized for the SNDR.
 2. The pH probe shall continuously send a signal to the process controller for primary control of the process.
 3. The setting of the blower is adjusted based upon real time conditions in the reactor to promote nitrification/denitrification.
 4. The minimum mixer and blower speed shall be set to provide standard liquid mixing requirements.
 5. The maximum speed shall also be programmable but will typically be limited by the gearbox and sheave sizing on the mixer and blower as to operate at 100% design capacity.
- C. SNDR Control with ORP
 1. An ORP probe shall be utilized for each SNDR tank to measure the oxidation-reduction potential.
 2. The ORP probe shall continuously send a signal to the process controller for control of the process.
 3. The speed of the mixer and blower is adjusted based upon real time conditions in the reactor to promote nitrification.
 4. The minimum mixer and blower speed shall be set to not go below standard liquid mixing requirements.
 5. The maximum speed shall also be programmable but will typically be limited by the gearbox and sheave sizing on the mixer and blower as to operate at 100% design capacity.
- D. SNDR Secondary Control with Temperature
 1. A temperature probe shall be utilized for the SNDR to measure the reactor content temperature.
 2. One RTD shall be utilized for the SNDR.
 3. The RTD shall continuously send a signal to the process controller for secondary control of the process.
 4. A preset minimum and maximum operating temperature shall be programmed into the controller.
 5. In the event of a low temperature level an alarm shall be activated.
 6. The Temperature control shall be disabled during all transfers from the ATAD.
- E. Liquid Level Monitoring
 1. A pressure transducer mounted in each reactor shall continuously monitor the liquid level in feet of liquid depth.
 2. The instrument is mounted in the tank side wall near the bottom of the reactor contents.
 3. The primary function is to measure the reactor contents volume for process monitoring and the HRT calculation.
- F. Foam Level Monitoring
 1. A non-contact radar device continuously monitors the foam level in each reactor and measures the top of the foam level in feet from the tank floor.
 2. The unit is mounted in the reactor cover and sends a radar wave that senses the dissolved solids in the foam as a change in density of the foam and returns to the device determining the foam layer elevation.
 3. In the event of a high foam level an alarm shall be activated, and the program will automatically go into the preprogrammed foam override.
 4. The foam override provides a preset minimum aeration setpoint to systematically control foam and meet the oxygen demand. The system will reduce the blower speed to assure the foam does not overflow.

5. Once the system has recovered from the foam upset condition, normal ORP control will resume.
- G. Actuated Valves
 1. The PLC is programmed to allow remote operation of the actuated valves in the scope as supplied by the ATAD supplier.
 2. The valves shall be able to be independently opened and closed.
- H. Operator Interference
 1. A panel View Plus 1250 (or equal) touch screen shall provide the operator with all of the above-mentioned process steps and monitoring information. The typical on-screen displays shall include:
 - a. Temperature
 - b. ORP
 - c. PH
 - d. HRT
 - e. Pump Speed On/Off, percent operation
 - f. Blower Speed On/Off, percent operation
 - g. Liquid Level
 - h. Foam Level
 - i. Valve Positions Open/Close
 - j. All process equipment can be operated manually from this screen.
 - k. Recent feed/waste history
- I. Monitor the Run Status of Equipment
 1. The PLC shall monitor the run status of every pump, blower and fan in the scope.
 2. The PLC shall allow turning on and off every pump, blower and fan in the scope.
 3. The PLC shall allow speed adjustment of every pump, blower and fan in the scope.

2.13 PLUG VALVES

- A. The contractor shall supply plug valves and actuators as specified and shown on the Drawings.
- B. Plug valves shall meet the requirements of specification Section 402326 – Hydraulic Valves and Valve Accessories.

2.14 AUTOMATIC VALVE ACTUATORS

- A. Open/Close Actuators
 1. The ATAD system supplier shall supply all motorized automatic valve actuators as specified and shown on the Drawings.
 2. The actuators shall be provided with a contact when the valve is Open.
 3. The actuators shall be provided with a contact when the valve is closed.
 4. The actuators shall be provided with a contact when the valve is placed in remote position.
 5. The actuators shall be provided with a contact when actuator has faulted.
 6. The actuator shall accept independent signals to both open and close the valve remotely.
- B. Modulating Actuators
 1. The actuators shall be provided with a contact when the valve is placed in the Remote position.
 2. The actuators shall be provided with a contact when actuator has faulted.
 3. The actuator shall be provided with an actual position 4-20 mA signal output.
 4. The actuator shall be provided to accept a 4-20 mA command position signal.

2.15 GATE VALVES

- A. The contractor shall supply gate valves on the jet aeration system as shown on the Drawings.
- B. Gate valves shall meet the requirements of specification Section 402326 – Hydraulic Valves and Valve Accessories.

2.16 BALL VALVES

- A. The contractor shall supply ball valves as shown on the Drawings.
- B. Ball valves shall meet the requirements of specification Section 402326 – Hydraulic Valves and Valve Accessories.

2.17 VEE-BALL VALVES

- A. The contractor shall supply vee-ball valves as shown on the Drawings.
- B. Ball valves shall meet the requirements of specification Section 402326 – Hydraulic Valves and Valve Accessories.

2.18 BUTTERFLY VALVES

- A. The contractor shall supply butterfly valves as shown on the Drawings.
- B. Butterfly valves shall meet the requirements of specification Section 402326 – Hydraulic Valves and Valve Accessories.

2.19 OUT OF BASIN LIQUID PIPING, SUPPORTS AND ACCESSORIES

- A. The contractor shall supply all out of basin liquid piping and it shall be constructed of Schedule 10-304 stainless steel or better.
- B. All pipe, gaskets and accessories shall be capable of withstanding continuous exposure to 70°C, 1500 mg/L ammonium and pH between 5 and 9.
- C. The Contractor shall supply all insulation on all out-of-basin jet motive pump piping and foam control piping on the ATAD reactor.
- D. The Contractor shall supply all pipe supports. Location and spacing of the supports shall be the responsibility of the contractor.
- E. All pipe connections to pump flanges shall be properly supported to remove all weight from the pump flange.
- F. Installation of the pipe in reference to pipe diameter, long radius elbows and fittings shall be installed with strict accordance to the ATAD supplier drawings.
- G. The top of the jet motive pumps pipe shall be on a horizontal elevation to assure that no air pockets can form.
- H. Pressure gauge couplings and pressure gauges shall be supplied on the discharge pipe and shall be isolated from the jet motive pump with 316 stainless steel ball valves.

- I. One inch and a half-threaded coupling is required to insert an ORP probe on the suction pipe of each Jet Motive Pump. Location of these couples will be detailed on the ATAD supplier drawings.
- J. ORP and pH probe units shall be installed at a 30° angle as measured from the top of the horizontal of the inlet suction side of the pump.
- K. A one (1) inch, 316SS ball valve shall be provided in the suction piping (on the lower side) to drain suction piping for emergency maintenance of the ORP probe or pump.

2.20 OUT OF BASIN AIR PIPING, SUPPORTS AND ACCESSORIES

- A. The contractor shall supply all out of basin liquid piping and it shall be constructed of Schedule 10-304 stainless steel or better.
- B. The Contractor shall supply all insulation shown on the drawings.
- C. The Contractor shall insulate all process ATAD, SNDR and Blower piping to a minimum insulation of R-10 with insulation suitable for exterior conditions and high humidity exposure.
- D. The Contractor shall supply all pipe supports. Location and spacing of the supports shall be the responsibility of the contractor.
- E. All pipe connections to pump flanges shall be properly supported to remove all weight from the pump flange.

2.21 ANCHOR BOLTS

- A. The contractor shall supply all anchor bolts of sufficient size and quantity for mounting of all equipment and piping associated with the ATAD system that is located outside the basin.
- B. The anchor bolts shall be two-part stud and capsule system or equal.
- C. The epoxy anchor shall consist of a sealed glass capsule containing pre-measured amounts of a polyester resin, quarts sand aggregate, and a hardener contained in a separate vial within the capsule.
- D. Anchors shall be rated to withstand 180° F. (82° C).
- E. Each anchor bolt shall be supplied with a stud, flat washer, lock washer, and nut of Type 18-8 stainless steel.

2.22 EXPANSION JOINTS

- A. The ATAD supplier shall supply expansion boots and all pump flanges, and they shall be Proco Model 240AV-NN or equal.
- B. The expansion joints shall be spool type with either EPDM or butyl single arch high-pressure design.
- C. The boots shall be full port with no internal intrusions with ANSI 150# galvanized rings.
- D. They shall be mounted directly to the suction and discharge jet pump flanges, as shown.

PART 3 - PRODUCTS

3.01 PREPARATION

- A. The Contractor shall verify that the field conditions are acceptable, and the facilities are ready to receive work.
- B. The Contractor shall remove all construction debris from the interior of the reactor.
- C. The Contractor shall not apply any coating or material to the wall without written approval of the supplier and the engineer.
- D. The Contractor shall verify items provided by other sections of work are properly sized and located.
- E. The Contractor shall verify that the beginning of installation means the installer accepts existing conditions.

3.02 FIELD QUALITY CONTROL

- A. Installation shall be in strict accordance with the supplier's instructions and recommendations (unless otherwise instructed by the Owner or Engineer with written notification to the supplier).
- B. After completion of tank installation, the reactors shall be filled with water to the operating water level by the Contractor and allowed to stand for a period of not less than 48 hours.
 - 1. The contractor shall repair all leaks.
 - 2. After repair, the tank shall be retested for an additional 24 hours.
- C. The Contractor shall hydrostatically test all piping and valves.
 - 1. The Contractor shall repair leaks or indications of leaks.
 - 2. After repair, the piping shall be retested.
- D. Start-Up
 - 1. Only screened sludge is allowed to be introduced to the ATAD Unit.
 - 2. A qualified representative of both the Supplier and Contractor shall perform preliminary field-testing, inspection, and checkout of the entire ATAD system, following installation.
 - 3. Sufficient tests shall be conducted to demonstrate that all system components are fully operational.
 - a. Control and instrumentation components have been calibrated and properly adjusted.
 - b. All connecting piping is leak proof and properly anchored.
 - c. Entire system is ready for continuous safe operation.
 - 4. The purpose of the checkout shall be to ensure that each individual system component.
 - a. Has been correctly installed.
 - b. Shall operate fully in the manner intended.
 - c. Is ready to perform its function as part of an integrated system when placed in continuous operation.
 - 5. When all preceding equipment tests have been satisfactorily performed, when thickened sludge is available and can be suitably handled through the ATAD system, and when so authorized by the Engineer, the ATAD system shall be started.
 - a. The Supplier shall supply the services of system-trained personnel for a minimum of three days, in not more than 1 trip to assist with the start-up of the system.
 - b. The Supplier's representative shall train the Owner's operating personnel during the start-up period.
 - c. Start-up operations shall be continued until it is satisfactorily demonstrated that the equipment is suitable for continuous on-line service.

E. Performance Testing

1. Owner shall conduct performance testing for the duration of the process guarantee, as described above.
2. Performance testing shall be scheduled to begin no longer than one month after the ATAD system is operated in accordance with the supplier's recommendations.
3. The system shall be operated in accordance with the recommendations of the ATAD supplier during the performance testing.
4. A minimum of 10 biosolid samples for pathogen reduction and 10 biosolid samples for the vector attraction criteria shall be taken and tested by the Owner during the 30-day period; this, and additional testing as required, will be used to determine compliance with the performance criteria.
5. The average results of the test data will be used to determine compliance.
6. All analytical work shall be the responsibility of the Owner.
7. All analytical data shall be sent to the Owner, Engineer, and supplier within seven days of completion.
8. The Engineer shall render an opinion at completion of performance testing regarding pass/fail of the test relative to performing the above.
9. Failure shall result in remedy by supplier and other repercussions described above.
10. Retesting, as necessary, shall be by Owner.
11. Upon successfully completing the performance requirements as described above for a period of 14 consecutive days, final payment shall be made to the Supplier.

3.03 FIELD SERVICE

- A. The ATAD supplier shall provide an installation dry check consisting of:
1. Two trips for 16 man-days each trip.
 2. A qualified service engineer shall carry out all services.
 3. Written service reports of each service phase shall be distributed to the Engineer and Owner.
 4. Start-up.
- B. The ATAD supplier shall provide follow-up operator training, within one month of initial start-up, consisting of:
1. One trip for 2 man-days
 2. Operator Instruction
 3. Troubleshooting as required

END OF SECTION 467324