

PROJECT MANUAL

**ORANGE COUNTY COMMUNITY COLLEGE
MIDDLETOWN CAMPUS**

**115 South Street
Middletown, NY 10940**

**Orange Hall Theater
HVAC Unit Replacement
ITB-OCCC-2023-20**

CONTRACT-ALL WORK HEREIN

DATE: October 14, 2022

**ENGINEERING CONSULTANT
FELLENZER ENGINEERING, LLP
22 MULBERRY STREET
MIDDLETOWN, NY 10940
Ph: (845) 343-1481
Fax: (845) 343-4986
FE Project No. 22-230**



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INVITATION TO BID

Sealed bids will be received by Orange County Community College for the following contract:

ORANGE COUNTY COMMUNITY COLLEGE
ORANGE HALL THEATER
HVAC UNIT REPLACEMENT
22 GRANDVIEW AVENUE – RECEIVING – HORTON HALL
MIDDLETOWN, NY 10940 ITB-OCCC-2023-20

PRE-BID MEETING: OCT. 27, 2022 at 11:00 AM,
Orange Hall, 22 Grandview Ave, Middletown NY 10940

Sealed bids will be received until 2:30 PM Friday, November 10, 2022, by Orange County Community College (OWNER) at the PURCHASING DEPARTMENT in ORANGE HALL ROOM 203 (OH203), 22 GRANDVIEW AVENUE, Middletown, NY 10940; Bids must be delivered to an individual in the Business Office. Bids will be publicly opened and read aloud at the PURCHASING DEPT (OH203). Late bids will not be accepted.

Plans, Specifications and Contract Documents for the proposed work are on file and publicly exhibited at Fellenzer Engineering, LLP, 22 Mulberry Street, Middletown, NY 10940. The said plans and specifications may be obtained from Fellenzer Engineering, LLP, 22 Mulberry Street, Middletown, NY 10940 at the above address, in person or by mail beginning Friday, October 14, 2022. The Contractors shall leave their names and correct mailing addresses upon receipt of the plans and specifications.

1. Copies of the Bidding Documents may be obtained free of charge at the Purchasing Department in Orange Hall, Room 203, Middletown Campus.
2. Partial sets will not be issued.
3. Send a certified check or money order for \$50.00 if we need to mail bid documents payable to **Orange County Community College**, and mail to: SUNY Orange, attn.: Purchasing OH 203, 22 Grandview Avenue, Middletown NY 10940.

Each bid from a Contractor must be accompanied by a bid bond or certified check, payable to the OWNER, in the amount of ten-percent (10%) of the total amount of the bid as security therefore.

Insurance is required as stated in the bid specification(s).

All bids shall be submitted subject to the following conditions in addition to the specifics in the bid specification:

1. All bid envelopes must be marked "ITB-OCCC-2023-20 ORANGE HALL THEATER HVAC UNIT REPLACEMENT, Bid Opens: NOVEMBER 10, 2022 AT 2:30 PM".
2. The OWNER reserves the right to reject any or all bids and re-advertise for new bids.
3. All bidders shall submit proof of responsibility, as required by the OWNER.
4. Each bid must contain the certificate of non-collusive bidding required by Section 103 -d of the General Municipal Law, relating to non-collusion (Schedule 4 hereto).
5. No bids shall be withdrawn for a period of sixty (60) days after the receipt thereof, without the consent of the College.
6. The bidder shall make allowance in his bid for any price increase in labor and materials. Requisitions for work and/or material shall be at the price bid with no additional charges for

Orange County Community College – Middletown Campus
Orange Hall Theater HVAC Unit Replacement, OCCC Project # OCCC-2023-20
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such increases.

7. All questions must be submitted in writing at Fellenzer Engineering LLP by Monday, October 31st, 2022 to Fellenzer Engineering LLP, 22 Mulberry Street, Middletown, NY 10940

Agnes Wagner, Comptroller
SUNY Orange
October 11, 2022

INFORMATION FOR BIDDERS

PREPARATION OF BIDS

Each bid or proposal must be typewritten or written in ink on the forms hereto annexed and signed by the bidder. The blank places in the proposal must be filled in as noted and no change shall be made in the phraseology of the proposal or in the items mentioned therein.

Each proposal shall specify the correct gross sum in the manner hereafter described, for which the work will be performed according to the plans and specifications, together with a Lump Sum Bid and/or Unit Price Bid for each of the separate items as called for in the proposal.

EXAMINATION OF PROPOSED CONTRACT

Prior to bid submittal, the prospective bidder shall read and examine with care the Contract Documents (as defined in Article II of the General Conditions), and must, before bidding but no later than ten (10) days prior to bid opening, request of the Engineer in writing an interpretation or correction of every ambiguity, inconsistency, omission or error in the Contract Documents which a reasonably prudent bidder should discover. The bidder's failure to make said request shall constitute a waiver of the right to make any claim whatsoever, including without limitation claims for injunctive relief, damages or rescission by reason of any alleged ambiguity, inconsistency, omission or error in the Contract Documents. The Engineer shall issue in writing by mail to each person or entity of record having submitted the required deposit for Contract Documents its interpretation or correction, as well as any additional contract provisions the Engineer may deem necessary, and shall further post a copy of same at the places where the Contract Documents are kept available for inspection. Upon mailing and posting such interpretation, correction or additional contract provisions shall become a part of the Contract Documents and shall be binding on all bidders. Bidders are on notice that only the Owner's written interpretation or correction shall be valid and binding, and bidders shall not rely on any oral interpretation or correction, for which the Engineer shall not be responsible.

PRE-BID INVESTIGATION

Prior to bid submittal, bidders shall view and investigate the site of the proposed construction work and adjacent area, and it shall be conclusively presumed that each bidder has full knowledge of all conditions on or around the site which may affect in any way the performance of the work to be done under this Contract. The Owner makes no warranties or representations whatsoever with respect to site conditions.

CHANGED SUBSURFACE CONDITIONS

The Owner makes no warranties or representations whatsoever with respect to subsurface conditions. Boring logs, reports and studies, if any, regarding subsurface conditions which may be supplied by the Owner or Engineer are approximate guidelines only, and supplied if at all solely as a convenience to the bidder, who shall not rely thereon and who is responsible for conducting its own investigations. In the event the Contractor encounters during the performance of its work subsurface conditions at the site materially different from those shown in the Contract Drawings or Specifications and which could not reasonably have been anticipated by the Contractor and which will materially affect the cost of the work to be performed under the Contract, the Contractor shall promptly inform the Engineer in writing of such unanticipated conditions. The Engineer shall promptly investigate the conditions. If the Engineer determines that the conditions are materially different and could not have

been reasonably anticipated by the Contractor, the Contract may be modified with the Owner's written approval and an appropriate change order issued.

SUBMITTAL OF BIDS

Bids accompanied by a certified check or bid bond must be submitted in a sealed, opaque envelope and appropriately marked with the name of the bidder, project and addressed to the Board advertising for bids, but otherwise unmarked.

BID SECURITY

Each bid or estimate must be accompanied by a certified check or satisfactory Bid Bond in the amount stated in the "Invitation To Bid", which shall be considered as a guaranty that the bidder will execute the Contract and comply with all the statutory provisions thereof within ten (10) days after the Contract form has been delivered to the Contractor by the Owner.

If the successful bidder fails to execute and return the Contract together with the required bonds within ten (10) days as aforesaid, the amount of the Bid Bond and Certified Check made by him shall be forfeited and retained by the Owner as liquidated damages for such failure; but if the Bidder executes the Contract and furnishes required bonds as aforesaid, the amount of the Bid Bond or Certified Check shall be returned to the bidder.

INFORMAL BIDS

Bids that are illegible or that contain omissions, erasures, alterations, additions, or items not called for in the itemized proposal, or that contain irregularities of any kind, may be rejected as informal.

Any bid may also be deemed informal which does not contain prices set opposite each of the items for which there is a quantity exhibited in the itemized proposal or which shall, in any manner, fail to conform to the conditions of the published notice inviting proposals. The lump sum bid and/or unit prices and gross sum bid as called for in the Proposal shall be indicated in words and by figures.

The Owner reserves the right to waive any informalities in or reject all bids submitted, or to accept the bid and award the Contract to the lowest responsible bidder therefore, as provided by law.

BASIS OF AWARD - COMPARISONS OF BIDS

The Contract shall be awarded, if at all, to the lowest responsible bidder. In the case of Lump Sum Contracts, the lowest responsible bid shall be determined by a comparison of the lump sum prices bid, adjusted for alternate prices bid, if any. In the case of Unit Price Contracts, the lowest responsible bidder shall be determined by a comparison of the total, gross price for which the entire work will be performed, arrived at by computing the sum of the estimated quantities specified in the bid at their stated unit prices, as called for in the proposal and in conformity with the specifications.

ERRORS IN BID

In the event that the amount shown in words and its equivalent in figures do not agree, the written words shall be considered binding.

In the event that the total, gross price set forth in the bid does not agree with the total of all the unit prices as computed from the estimated quantities, the total amount of said unit prices so computed shall be controlling and binding.

UNBALANCED BID

The Owner reserves the right to reject any bid in which the unit prices appear, in the judgment of the Engineer, to constitute an unbalanced, impracticable or unreasonable bid for such work.

APPROXIMATE QUANTITIES

Bidders are advised that the estimate of quantities of the various items of work and materials is approximate only, and is given solely for use as a uniform basis for the comparison of bids and shall not be made the basis of any claim against the Owner. Bidders are responsible for satisfying themselves by personal examination of the site, the work proposed, and the contract documents including the specifications and drawings, and by their own judgment as to the quantities and character of the work to be done, and by such other means as a reasonably prudent bidder would deem necessary, as to the actual conditions and requirements of the work, and shall make their bids accordingly, it being understood that the Contractor will be paid only for the actual quantity of each item of work done at the price specified in the bid proposal.

The Contractor shall assert no claim against the Owner on account of any variation between the estimated quantities and the actual quantities as measured when the work is complete, or on account of any mistake, misunderstanding or misconception as to the nature, location or amount of work to be performed by the Contractor under this Contract.

WORK INCLUDED IN BID PRICE

The lump sum price or, as the case may be, the gross sum price on a unit price contract, shall include all the labor and materials required for the entire completion of the contract work by the Contractor. The price as bid shall include without limitation the restoration, to no less than their original condition existing streets, sidewalks, lawns, driveways, terraces, and all other areas disturbed or damaged by the Contractor during the performance of the contract work.

OFFER OF SURETY

Attention is called to the Offer of Surety and Certificate of Surety in the form annexed hereto as Schedule "2" following the Form of Proposal which must be filled in by all bidders and submitted with their bid.

SECURITY FOR FAITHFUL PERFORMANCE

Simultaneously with its delivery of the executed agreement, the successful bidder must deliver to the Owner an executed bond in the amount of 100 percent of the accepted bid, as security for the faithful performance of its Contract, an executed bond in the amount of 100 percent of the accepted bid, as security for the payment of all persons performing labor, or furnishing materials in connection therewith, prepared on the forms of Performance Bond and Labor and Material Payment Bond attached

hereto as Schedule "7", and having as surety thereon, such surety company or companies as are acceptable to and approved by the Owner, and as are authorized to transact business in this State.

MAINTENANCE BOND

The Contractor shall, upon final completion and together with the submittal of its requisition for final payment, submit an executed Maintenance Bond in the amount of ten percent (10%) of the Final Contract Price for a period of two (2) years following the date of Final Completion, in the form annexed hereto under Schedule "7".

QUALIFICATION OF BIDDERS

Annexed hereto as Schedule "3" is a form entitled "Qualification of Bidder", which the Contractor must complete and submit with the Proposal, setting forth its qualifications, financial references and references with regard to work of the same type as in this Contract performed by the bidder to completion within the last five (5) years. All bidders shall furthermore furnish a recent certified financial statement promptly at the Owner's request.

The Owner shall have the right to take such steps as it deems necessary to determine the ability of the bidder to perform its obligations under the Contract, and the bidder shall furnish the Owner all such additional information and data for this purpose as the Owner may request. The right is reserved by the Owner to reject any bid, where such requested information has not been provided by the bidder, or the bidder does not satisfy the Owner that the bidder is qualified to properly carry out the terms of the Contract.

LABOR PREFERENCE AND WAGE RATES

The successful bidder shall employ local labor, insofar as the same may be reasonably available. Attention of the Contractor is called to the requirements and obligations of Article XXV of the General Conditions relating to labor law requirements and prevailing wage rates, which are set forth in Appendix A to the General Conditions.

INSURANCE

The successful bidder shall procure and maintain in full force and effect the insurance specified in Article XXIV of the General Conditions.

CERTIFICATE OF NON-COLLUSIVE BIDDING

Each bidder shall submit the certificate of non-collusive bidding annexed hereto as Schedule 4.

TIME OF COMPLETION

The rate of progress of the work shall be such that the entire work covered under NOTICE TO PROCEED for this Contract shall be fully completed within 60 consecutive calendar days after issuance of the NOTICE TO PROCEED.

LIQUIDATED DAMAGES

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Orange Hall Theater HVAC Unit Replacement, OCCC Project # OCCC-2023-20
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The bidder agrees to pay as liquidated damages, the sum of \$500.00 for each consecutive calendar day beyond the time allowed as specified in the NOTICE TO PROCEED thereafter, and as further provided in Article XXII of the General Conditions.

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Orange Hall Theater HVAC Unit Replacement, OCCC Project # OCCC-2023-20
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BID PROPOSAL FOR:

ORANGE COUNTY COMMUNITY COLLEGE

**ORANGE HALL THEATER HVAC UNIT REPLACEMENT
ITB-OCCC-2023-20
115 SOUTH STREET
MIDDLETOWN, NY 10940**

Date_____

Project No._____

Proposal of _____
(hereinafter called "Bidder") organized and existing under the laws of the State of _____
To the _____ (hereinafter called "Owner")

Gentlemen:

The Bidder, in compliance with your invitation for bids for:

Orange Hall Theater HVAC Unit Replacement

having examined the plans and specifications with related documents ("Contract Documents") and the site of the proposed work, and being familiar with all of the conditions surrounding the construction of the proposed project including the availability of materials and labor, hereby proposes to furnish all labor, materials, and supplies, and to construct the project in accordance with the Contract Documents, within the time set forth therein, and at the prices stated below. These prices are to cover all expenses incurred in performing the work required under the Contract Documents, of which this proposal is a part.

The Bidder hereby agrees to commence construction work on this Contract within ten days after the execution of the Contract unless a later starting date is specified, by the Engineer, in the written "Notice to Proceed".

The rate of progress of the work shall be as specified in the Information for Bidders.

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PROPOSAL

ORANGE COUNTY COMMUNITY COLLEGE

**ORANGE HALL THEATHER HVAC UNIT REPLACEMENT
ITB-OCCC-2023-20
115 SOUTH STREET
MIDDLETOWN, NY 10940**

BID PROPOSAL

The undersigned Bidder agrees to perform all the work described in the specifications and shown on the Drawings for the Bid Prices shown below:

TOTAL BID PRICE (Includes all contract work):

_____ Dollars (\$_____).

The amount shall be shown in both words and figures. In case of discrepancy, the amount shown in words will govern.

SEQUENCE OF OPERATION

Contractor shall proceed with project based on owner occupancy schedule at time of project kickoff meeting.

SALES TAX EXEMPTION (If Applicable)

State and local sales taxes on construction materials required for construction shall not be included in the bid.

The OWNER is exempt from payment of State and Compensating Use Taxes of the State of New York on all materials sold to it, used on, or for the project pursuant to the provisions of the Contract Documents.

The purchase by subcontractors of materials to be furnished pursuant to the provisions of the Contract shall be a purchase for resale to the Contractor (either directly or through other subcontractors) and hence exempt from sales tax, regardless of the terms of the Contract between the prime contractor and the subcontractor.

PROPOSAL

The Bidder further agrees to pay, as liquidated damages, for each consecutive calendar day thereafter, the amount specified in the Information for Bidders.

Name of Bidder

By: _____
Title

Address

City, State, Zip

Telephone Number

ADDENDA

The Bidder acknowledges the receipt of the following Addenda, but he agrees that he is bound by all Addenda whether or not listed herein:

ADDENDUM NUMBERS AND DATES

Number 1	Dated _____
Number 2	Dated _____
Number 3	Dated _____
Number 4	Dated _____

Signature _____
Bidder, Title

TITLE TO MATERIALS

Title to all materials furnished by the undersigned Contractor to the OWNER, pursuant to the provisions of the Contract, shall immediately vest in the OWNER upon payment by the OWNER for such materials irrespective of whether such materials are installed or incorporated in the project. Such materials shall then become the sole property of the OWNER subject to the right of the OWNER and the Engineer to reject the same, within a reasonable period, for failure to conform to the standards or specifications of the Contract Documents or the purchase orders.

Notwithstanding such transfer of title, the Contractor shall have the sole continuing responsibility to install such materials, protect them, maintain them in proper condition, and forthwith repair, replace and make good any damage thereto, without cost to the Owner until such time as the work covered by this Contract is fully accepted by the Owner and the two year Guarantee period set forth in Article XX of the General

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Conditions has expired. Such transfer of title shall in no way effect any of the Contractor's obligations under the Contract. In the event that, after title has passed to the Owner, any of such materials are rejected as being defective or otherwise unsatisfactory within the two-year Guarantee Period, the Contractor shall then replace said defective or unsatisfactory materials with other acceptable materials at no additional cost to the Owner. The Owner shall not be responsible for materials lost, stolen or damaged.

Pursuant to the foregoing Information for Bidders, attached hereto is a certified check or bid bond for the sum of 5% of the total amount of the bid submitted, as well as a fully executed offer of surety.

In the event this proposal is accepted by the official Board and the undersigned fails to execute the Contract and furnish a satisfactory bond as required in the foregoing Information for Bidders within ten (10) days, from the date of notification of the awarding of the Contract, then the said Board, may, at its option, determine that the undersigned has abandoned the Contract, and thereupon this proposal shall be null and void, and the certified check or bid bond accompanying this proposal shall be forfeited to and become the property of the Owner as liquidated damages for such failures or neglect; otherwise, such check or bid bond shall be returned to the undersigned.

The word "Bidder" as used in this proposal is to be understood to include the individual, firm or corporation making this proposal. In case a firm shall be the Bidder, it is understood that all statements herein contained shall apply to the firm and each member thereof.

The following are the first and last names of the Bidder, if an individual, and in the case of a corporation, the names of the president, treasurer and manager, or if a partnership, the names of each general partner.

<u>NAME</u>	<u>ADDRESS</u>	<u>SOCIAL SECURITY NO.</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Signature:_____

Name and Business

Address of Bidder:

Employer's Identification No.

Dated:_____

IF THE BIDDER IS A CORPORATION, FILL OUT THE FOLLOWING:

Resolved that _____

be authorized to sign and submit the bid or proposal of this

corporation for the following project:

and to include in such bid or proposal the certificate as to non-collusion required by Section 103-d of the General

Municipal Law as the act and deed of such corporation and for any inaccuracies or misstatements in such certificate, this corporate bidder shall be liable under the penalties of perjury.

The foregoing is a true and correct copy of the resolution

adopted by _____

corporation at a meeting of its Board of Directors held on the

_____ day of _____, 2021.

Secretary

CORPORATION SEAL

Bidder

Dated: _____

SCHEDULE 1

BID BOND

KNOW ALL MEN BY THESE PRESENTS, THAT _____

(Here insert the name and address of the Contractor)

as Principal, hereinafter called the Principal, and _____

(Here insert the name and address of the Surety)

as Surety, hereinafter called the Surety, are held and firmly bound unto _____

(Here insert the name and address of the Owner)

as Obligee, hereinafter called the Owner, in the amount of _____

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

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

NOW, THEREFORE,

- (a) If said Bid shall be rejected, or
- (b) If said Bid shall be accepted and the Principal shall execute and deliver a contract Agreement as stipulated in the INFORMATION FOR BIDDERS attached hereto, then this obligation shall be void, otherwise the same shall remain in force and effect; it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

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

IN WITNESS WHEREOF, the Principal and Surety have executed this instrument, by a duly authorized person or officer in the case of a corporation, under their several seals on the date indicated below.

Signed and sealed this _____ day of _____, 2022.

Principal SEAL

Title

ATTEST: _____
Witness

Surety SEAL

Title

ATTEST: _____
Witness

SCHEDULE 2

OFFER OF SURETY

In the event the above proposal is accepted and the undersigned is awarded the Contract for the work, the undersigned offers as surety for provision of a faithful performance bond, and a labor and materials bond, the following surety:

Surety Company

Signed: _____
Bidder

CERTIFICATE OF SURETY, to be signed by a duly authorized official, agent, or attorney of the Surety Company.

In the event that the above proposal is accepted and the Contract for the work is awarded to said

Name of Bidder

the _____
Surety Company

will execute the Surety Bonds as hereinbefore provided.

Signed: _____
Authorized Official, Agent, or
Attorney

Date: _____

SCHEDULE 3

QUALIFICATION OF BIDDER:

State the name, address and phone number of each project owner, Owner's representative whether engineer or architect, or contractor as the case may be, for whom work has been performed within the last five (5) years; the name and address of the project and contract designation; and the nature, location and date of the work performed.

FINANCIAL REFERENCES:

Name	Address	Telephone No.	Relationship to Bidder

SCHEDULE 4

NON-COLLUSIVE BIDDING CERTIFICATE

Pursuant to General Municipal Law § 103-d, the undersigned Bidder and each person signing on behalf of Bidder, and in the case of a joint bid, each party thereto, certifies as to its own organization under penalty of perjury that to the best of their knowledge and belief:

(1) The prices in this bid have been arrived at independently without collusion, consultation, communication, or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other bidder or with any competitor;

(2) Unless otherwise required by law, the prices which have been quoted in this bid have not been knowingly disclosed by the bidder, and will not knowingly be disclosed by the Bidder prior to opening, directly, to any other bidder or to any competitor; and

(3) No attempt has been made or will be made by the Bidder to induce any other person, partnership or corporation to submit or not to submit a bid for the purpose of restricting competition.

Name of Bidder

By:_____

Address

ACCEPTED:_____

(Date) _____

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**SCHEDULE 5
NOTICE OF AWARD**

TO: _____

PROJECT DESCRIPTION: Orange Hall Theater HVAC Unit Replacement

Total Bid

The OWNER has considered the BID submitted by you for the above described WORK in response to its INVITATION TO BID dated Friday, October 14, 2022.

You are hereby notified that your BID has been accepted for the amount of \$ _____.

You are required by the Information for Bidders to execute the CONTRACT and furnish the required CONTRACTOR'S Performance Bond and Labor and Material Bond within ten (10) days from the receipt of this NOTICE OF AWARD.

If you fail to execute said CONTRACT and to furnish said BONDS within said specified period of time, said OWNER will be entitled to consider all your rights arising out of the OWNER's acceptance of your BID as abandoned and as a forfeiture of your BID BOND. The OWNER will be entitled to such other rights as may be granted by law.

1. You, as the low bidder, are also required to return an acknowledged copy of this NOTICE OF AWARD to ORANGE COUNTY COMMUNITY COLLEGE within ten (10) calendar days of the date of this Notice by certified mail, return receipt requested.
2. The Contract Signing has been scheduled for the _____ day of _____, 2022, at _____
(prevailing local time) at _____

NOTICE OF AWARD, dated this _____ day of _____, 2022.

By: _____

ACCEPTANCE OF NOTICE OF AWARD
is hereby acknowledged

Title

this the _____ day of _____, 2022.

By: _____

Title: _____

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NOA-1

SCHEDULE 6

NOTICE TO PROCEED

TO: _____

PROJECT DESCRIPTION: Orange Hall Theater HVAC Unit Replacement

You are hereby notified to commence work in accordance with the above referenced CONTRACT dated _____, 2022 within ten calendar days of _____, 2022 and that you are to fully complete the CONTRACT by August 17, 2023.

You, as the CONTRACTOR, are required to return an acknowledged copy of the NOTICE TO PROCEED to the ENGINEER within ten (10) calendar days of the date of this Notice by certified mail, return receipt requested.

NOTICE TO PROCEED dated this ____ day of _____, 2022.

By: _____

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE TO
PROCEED is hereby acknowledged

By: _____

Title: _____

Date: _____

SUNY Orange - Middletown Campus
Orange Hall HVAC Unit Replacement, OCCC Project # OCCC-2023-20
FE Project # 22-230

SCHEDULE 7

FORM OF BONDS

ACKNOWLEDGEMENT OF SURETY

STATE OF _____)
) SS:
COUNTY OF _____)

On this _____ day of _____, 2022,
before me personally came and appeared _____
_____ to be known, who, being by me duly sworn, did depose and say that he (she)
resides at _____, that he (she) is the _____ of _____
_____ the corporation described in and which executed the foregoing
instrument; that he (she) knows the seal of said corporation; that one of the seals affixed to said
instrument is such seal; that it was so affixed by order of the Directors of said corporation; and that he
(she) signed his (her) name thereto by like order.

Notary Public (SURETY SEAL)

MAINTENANCE BOND

KNOW ALL MEN BY THESE PRESENTS, THAT WE, _____ of
_____ (hereinafter called the Principal), as Principal, and _____

(Here insert the name and address of the Surety)
authorized to become Surety in the State of _____ (hereinafter called the Surety) as
Surety, are held and firmly bound unto _____
(hereinafter called the Owner) in the penal sum of _____ Dollars
(\$_____) to which payment well and truly to be made we do bind ourselves, our and each of our
heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the said Principal entered into a contract with the Owner dated _____
for _____ in accordance with the drawings and specifications prepared by
_____, which contract is by reference made a part hereof,
and is hereafter referred to as the Contract.

WHEREAS, said Contract, in General Conditions Article XX, provides that the Principal will furnish
a Bond conditioned to guarantee for the period of two years following final acceptance of the Work by the
Owner, or two years following completion of any corrective action as defined therein, as the case may be,
against all defects in workmanship and materials which may become apparent during said Guarantee Period;

NOW, THEREFORE, THE CONDITIONS OF THIS OBLIGATION ARE SUCH that, the Principal
shall indemnify the Owner for all loss and damage that the Owner may sustain by reason of any defective
materials or workmanship which become apparent during the Guarantee Period, and if the Principal so
performs, then this obligation shall be void, but otherwise to remain in full force and effect.

IN WITNESS WHEREOF, the Principal and Surety have executed this instrument, by a duly
authorized person or officer in the case of a corporation, under their several seals on the date indicated below:

Signed and sealed this _____ day of _____, 2022.

Principal

Title

CORPORATION SEAL

ATTEST: _____
Witness

Surety

Title

SURETY SEAL

ATTEST: _____
Witness

LABOR AND MATERIAL PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS, THAT _____

(Here insert the name and address of the Contractor)

as Principal, hereinafter called the Principal, and _____

(Here insert the name and address of the Surety)

as Surety, hereinafter called the Surety, are held and firmly bound unto _____

(Here insert the name and address of the Owner)

as Obligee, hereinafter called the Owner, for the use and benefit of the claimants as herein below defined, in the

amount of _____ Dollars (\$_____)

for the payment whereof Principal and Surety bind themselves, their heirs, executors, administrators, successors
and assigns jointly and severally, firmly by these present.

WHEREAS, Principal has by written agreement, dated _____, 2022, entered into a contract
with the Owner for _____ in accordance with the drawings and specifications
prepared by _____ which contract is
by reference made a part hereof, and is hereinafter referred to as the Contract.

NOW, THEREFORE, the conditions of this obligation are such that if the Principal, or its
representatives or assigns and other subcontractors to whom Work under this Contract is sublet and its or their
successors and assigns shall promptly pay or cause to be paid all lawful claims for:

1. Wages and compensation for labor performed and services rendered by all persons engaged in the prosecution of the Work under said Contract; and any amendment or extension thereof or addition thereto, whether such persons be agents, servants or employees of the Principal or of any such subcontractor, including all persons so engaged who perform the work of laborers or mechanics at or in the vicinity of the site of the Project regardless of any contractual relationship between the Principal or such subcontractors, or its or their successors or assigns, on the one hand and such laborers or mechanics on the other, but not including office employees not regularly stationed at the site of the project; and

2. Materials and supplies (whether incorporated in the permanent structure or not), as well as utilities, power, heat, electricity, fuels, oils, implements or machinery furnished, used or consumed by said Principal or any subcontractor at or in the vicinity of the site of the Project in the prosecution of the Work under said Contract and any amendment or extension thereof or addition thereto; then this obligation shall be void; otherwise to remain in full force and effect.

3. This bond is subject to the following additional conditions, limitations and agreements:

(a) The Principal and Surety agree that the bond shall be for the benefit of any material man or laborer having a just claim, as well as the Owner itself.

(b) All persons who have performed labor, rendered services or furnished materials and supplies, as aforesaid, shall have a direct right of action against the Principal and its or their successors and assigns, and the Surety herein, or against either or both or any of them and their successors and assigns. Such persons may sue in their own name, and may prosecute the suit to judgment and execution without the necessity of joining with any other person as party plaintiff.

(c) The Principal and Surety agree that neither of them will hold the Owner liable for any judgment for damages or for costs or otherwise, obtained by either or both of them against a laborer or material man in a suit brought by either a laborer or material man under this bond for moneys allegedly due for performing work or furnishing material.

In no event shall the Surety, or its successor or assigns, be liable for a greater sum than the

penalty of this bond or be subject to any suit, action or proceeding hereon that is instituted by any person, firm, or corporation hereunder later than two years after the complete performance of said Contract and final settlement thereof.

(d) Notwithstanding any of the foregoing limitations herein, this bond shall secure the prompt payment or discharge otherwise of any claim filed with the provisions of the Labor or Lien Law of the State of New York, governing liens on account of public improvements, notice of which is given by the Obligee to the Surety within thirty (30) days after the filing thereof with the Obligee, addressed to the Surety at its regular place of business.

4. The Principal, for itself and its successors and assigns, and the Surety, for itself and its successors and assigns, do hereby expressly waive any objection that might be interposed as to the right of the Owner to require a bond containing the foregoing provisions, and they do hereby further expressly waive any defense which they or either of them might interpose to an action brought hereon by any person, firm or corporation, including subcontractors, material men and third persons, for work, labor, services, supplies or material performed, rendered, or furnished as aforesaid upon the ground that there is no law authorizing the Owner to require the foregoing provisions to be placed in this bond.

5. And the Surety, for value received, for itself and its successors and assigns, hereby stipulates and agrees that the obligation of said Surety, and its bonds shall be in no way impaired or affected by any extension of time, modification, omission, addition, or change in or of the said Contract or the work to be performed hereunder, or by any payment hereunder before the time required therein, or by any waiver of any provisions thereof, or by any assignment, subletting or other transfer thereof or of any part thereof, or of any Work to be performed, or any moneys due or to become due hereunder and said Surety does hereby waive notice of any and all of such extensions, modifications, omissions, additions, changes, payments, waivers, assignments, subcontracts and transfers, and hereby expressly stipulates and agrees that any and all things done and omitted to be done by and in relation to assignees, Subcontractors, and other transferees shall have the same effect as to said Surety as though done or omitted to be done by or in relation to said Principal.

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Orange Hall Theater HVAC Unit Replacement, OCCC Project # OCCC-2023-20
FE Project # 22-230

IN WITNESS WHEREOF, the Principal and Surety have executed this instrument, by a duly authorized person or officer in the case of a corporation, under their several seals on the date indicated below:

Signed and sealed this _____ day of _____, 2022.

Principal

CORPORATION SEAL

Title

ATTEST: _____
Witness

Surety

SURETY SEAL

Title

ATTEST: _____
Witness

SUNY Orange - Middletown Campus
Orange Hall Theater HVAC Unit Replacement, OCCC Project # OCCC-2023-20
FE Project # 22-230

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS, THAT _____

(Here insert the name and address of the Contractor)

as Principal, hereinafter called the Principal, and _____

(Here insert the name and address of the Surety)

as Surety, hereinafter called the Surety, are held and firmly bound unto _____

(Here insert the name and address of the Owner)

as Obligee, hereinafter called the Owner, in the amount of _____

_____ Dollars (\$ _____) for

the payment whereof Principal and Surety bind themselves, their heirs, executors, administrators, successors
and assigns, jointly and severally, firmly by these presents.

WHEREAS, Principal has by written agreement dated _____, 2022 entered into a contract
with the Owner for _____

in accordance with the drawings and specifications prepared by _____

which contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

NOW, THEREFORE, the conditions of this obligation are such that if the Principal, or its representatives or assigns, shall well and faithfully perform the said Contract and all modifications, amendments, additions and alterations thereto that may hereafter be made, according to its terms and its true intent and meaning, including repair and/or replacement of defective work and guarantees of maintenance for the periods stated in the Contract, and shall fully indemnify and save harmless the Owner from all cost and damage which it may suffer by reason of failure so to do, and shall fully reimburse and repay for all outlay and expense which the Owner may incur in making good any such default, and shall protect the said Owner against, and pay any and all amounts, damages, costs and judgments which may or shall be recovered against said Owner or its officers or agents of which the said Owner may be called upon to pay to any person or corporation by reason of any damages arising or growing out of the doing of said Work, or the repair or maintenance thereof, or the manner of doing the same, or the neglect of the said Principal, or its agents or servants, or the improper performance of the said Work by the said Principal, or its agents or servants, or the infringement of any patent or patent rights by reason of the use of any materials furnished or work done as aforesaid or otherwise, then this obligation shall be null and void, otherwise to remain in full force and effect.

The Surety, for value received, hereby stipulates and agrees, if requested to do so by the Owner, to fully perform and complete the Work to be performed under the Contract, pursuant to the terms, conditions, covenants thereof, if for any cause, the Principal fails or neglects to so fully perform and complete such Work. The Surety further agrees to commence such work to completion within thirty (30) days after written notice thereof from the Owner and to complete such Work within such time as the Owner may fix.

The Surety, for value received, for itself and its successors and assigns, hereby stipulates and agrees that the obligation of said Surety and its bond shall be in no way impaired or affected by any extension of time, modification, omission, addition, or change in or to the said Contract or the Work to be performed there under, or by any payment there under before the time required therein, or by any waiver of any provisions thereof, or by any assignment, subletting or other transfer thereof or of any Work to be performed or any moneys due or to become due there under; and said Surety does hereby waive notice of any and all of such extensions,

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FE Project # 22-230

modifications, omissions, additions, changes, payments, waivers, assignments, subcontracts and transfers, and hereby expressly stipulates and agrees that any and all things done and omitted to be done by and in relation to assignees, subcontractors, and other transferees shall have the same effect as to said Surety as though done or omitted to be done by or in relation to said Principal.

No right of action shall accrue on this bond to or for the use of any person or corporation other than the Owner named herein or the assigns or successors of the Owner.

IN WITNESS WHEREOF, the Principal and Surety have executed this instrument, by a duly authorized person or officer in the case of a corporation, under their several seals on the date indicated below.

Signed and sealed this _____ day of _____, 2022.

Principal SEAL

Title

ATTEST:_____
Witness

Surety SEAL

Title

ATTEST:_____
Witness

SUNY Orange - Middletown Campus
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PB-3

AGREEMENT

This Agreement is entered into this _____ day of _____, 2022 in the City of Middletown, County of Orange, New York, by and between the Orange County Community College (hereinafter called the "OWNER"), whose address is 115 South Street, Middletown, N.Y. 10940, and _____, as Contractor, by _____ whose address is _____

(hereinafter called the "Contractor") in consideration of the covenants, promises and agreements contained herein.

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APPENDIX A

Prevailing Wage Rates



Kathy Hochul, Governor

Roberta Reardon, Commissioner

SUNY Orange

Eric Fellenzer, Project Manager
22 Mulberry Street
Middletown NY 10940

Schedule Year 2022 through 2023
Date Requested 10/04/2022
PRC# 2022011285

Location Orange Hall Theater
Project ID# ITB-OCCC-2023-20
Project Type Orange Hall Theater HVAC Unit Replacement.

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 2022 through June 2023. 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 12240

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.

There are very few exceptions to this rule. Complete information regarding these exceptions is available on the ["Request for a dispensation to work overtime" form \(PW30\)](#) and ["4 Day / 10 Hour Work Schedule" form \(PW 30.1\)](#).

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 form 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 12240; 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 12240 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

SUNY Orange

Eric Fellenzer, Project Manager
22 Mulberry Street
Middletown NY 10940

Schedule Year 2022 through 2023
Date Requested 10/04/2022
PRC# 2022011285

Location Orange Hall Theater
Project ID# ITB-OCCC-2023-20
Project Type Orange Hall Theater HVAC Unit Replacement.

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 12240

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 12240

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.

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/public-work-and-prevailing-wage>

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) 568-5156		

* 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 12240

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

Orange County General Construction

Boilermaker

10/01/2022

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: 07/01/2022

Boilermaker	\$ 63.38
Repairs & Renovations	63.38

SUPPLEMENTAL BENEFITS

Per Hour:

Boilermaker	32% of hourly
Repair \$ Renovations	Wage Paid
	+ \$ 25.38

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 (D, O) on OVERTIME PAGE

Repairs & Renovation see (B,E,Q)

HOLIDAY

Paid: See (8, 16, 23, 24) on HOLIDAY PAGE

Overtime: See (5, 6, 8, 11, 12, 15, 16, 22, 23, 24, 25) on HOLIDAY PAGE

NOTE: *Employee must work in pay week to receive Holiday Pay.

**Employee gets 4 times the hourly wage rate for working Labor Day.

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)	32% of Hourly
	Wage Paid Plus
	Amount Below

1st Term	\$ 19.41
2nd Term	20.26
3rd Term	21.11
4th Term	21.96
5th Term	22.82
6th Term	23.68
7th Term	24.52

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

4-5

Carpenter

10/01/2022

JOB DESCRIPTION Carpenter

DISTRICT 8

ENTIRE COUNTIES

Dutchess, Orange

WAGES

Per hour: 07/01/2022

Building:	
Millwright	\$ 45.50
	+ 8.17*

*This portion is not subject to overtime premiums

SUPPLEMENTAL BENEFITS

Per hour:

Journeyman \$ 33.51

OVERTIME PAY

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

HOLIDAY

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

Paid: See (5,6,11,13,16,18,19,25) for 1st & 2nd yr.Apprentices

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

REGISTERED APPRENTICES

Wages per hour:

One (1) year terms:

1st	2nd	3rd	4th
\$27.76	\$30.09	\$34.42	\$43.08
+ 4.27*	+ 5.06*	+ 5.81*	+ 7.31*

*This portion is not subject to overtime premiums

Supplemental benefits per hour:

1st	2nd	3rd	4th
\$22.00	\$23.79	\$25.90	\$28.63

8-740.2

Carpenter

10/01/2022

JOB DESCRIPTION Carpenter

DISTRICT 8

ENTIRE COUNTIES

Dutchess

PARTIAL COUNTIES

Orange: : The territory west demarcated by a line drawn from the Bear Mountain Bridge continuing east to the Bear Mountain Circle. The territory south demarcated by a line continuing north on 9W to the town of Cornwall where County Road 107 (also known as Quaker Rd) crosses under 9W to the centerline of Route 32, The territories south and east heading north on Route 32 to Orrs Mills Rd, then west on Orrs Mills Rd to Route 94, continue west and south on Route 94 to the Town of Chester, to the intersection of Kings Highway, continue south on Kings Highway to Bellvale Rd, west on Bellvale Rd to Bellvale Lakes Rd, then south on Bellvale Lakes Rd to Kain Rd, southeast on Kain Rd to Route 17A, then north and southeast along Route 17A to Route 210, then follow Route 210 to NJ Border.

WAGES

Per hour: 07/01/2022

Carpet/Resilient

Floor Coverer \$ 34.45
+ 3.25*

*This portion is not subject to overtime premiums

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

SUPPLEMENTAL BENEFITS

Per hour:

\$ 28.33

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
\$15.25	\$18.37	\$23.09	\$27.73
+ 2.48*	+ 2.48*	+ 2.48*	+ 2.48*

*This portion is not subject to overtime premiums

Supplemental Benefits per hour - All apprentice terms:

\$ 20.55

8-2287D&O

Carpenter

10/01/2022

JOB DESCRIPTION Carpenter

DISTRICT 8

ENTIRE COUNTIES

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

WAGES

Per Hour: 07/01/2022

Marine Construction:

Marine Diver \$ 73.03
+ 9.54*

Marine Tender \$ 62.11
+ 9.54*

*This portion is not subject to overtime premiums

SUPPLEMENTAL BENEFITS

Per Hour:

Journeyworker \$ 44.54

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	\$ 24.60 + 5.05*
2nd year	30.20 + 5.05*
3rd year	38.58 + 5.05*
4th year	56.97 + 5.05*

*This portion is not subject to overtime premiums

Supplemental Benefits

Per Hour:

All terms \$ 31.03

8-1456MC

Carpenter

10/01/2022

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:	07/01/2022	10/18/2022
Core Drilling:		
Driller	\$ 42.27 + 2.30*	\$ 43.38 + 2.50*
Driller Helper	33.47 + 2.30*	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	\$ 28.30	\$ 28.85
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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-Core Driller

Carpenter - Building / Heavy&Highway

10/01/2022

JOB DESCRIPTION Carpenter - Building / Heavy&Highway

DISTRICT 2

ENTIRE COUNTIES

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

PARTIAL COUNTIES

Orange: The area lying on Northern side of Orange County demarcated by a line drawn from the Bear Mountain Bridge continuing west to the Bear Mountain Circle, continue North on 9W to the town of Cornwall where County Road 107 (also known as Quaker Rd) crosses under 9W, then east on County Road 107 to Route 32, then north on Route 32 to Orrs Mills Rd, then west on Orrs Mills Rd to Route 94, continue west and south on Route 94 to the Town of Chester, to the intersection of Kings Highway, continue south on Kings Highway to Bellvale Rd, west on Bellvale Rd to Bellvale Lakes Rd, then south on Bellvale Lakes Rd to Kain Rd, southeast on Kain Rd to Route 17A, then north and southeast along Route 17A to Route 210, then follow Route 210 to NJ Border.

WAGES

Wages per hour:	07/01/2022	07/01/2023 Additional	07/01/2024 Additional
Carpenter - ONLY for Artificial Turf/Synthetic Sport Surface	\$ 33.08	\$ 2.25*	\$2.25*

*To be allocated at a later date

Note - Does not include the operation of equipment. Please see Operating Engineers rates.

SUPPLEMENTAL BENEFITS

Per hour:

Journeyman	\$ 25.45
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OVERTIME PAY

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

HOLIDAY

Paid: See (5) on HOLIDAY PAGE

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

Notes:

When a holiday falls upon a Saturday, it shall be observed on the preceding Friday. When a holiday falls upon a Sunday, it shall be observed on the following Monday.

An employee taking an unexcused day off the regularly scheduled day before or after a paid Holiday shall not receive Holiday pay.

REGISTERED APPRENTICES

Wages per hour (1300 hour terms at the following percentage of Journeyman's wage):

1st	2nd	3rd	4th
65%	70%	75%	80%

Supplemental Benefits per hour:

1st term	\$ 16.97
2nd term	17.41
3rd term	19.40
4th term	19.84

2-42AtSS

Carpenter - Building / Heavy&Highway

10/01/2022

JOB DESCRIPTION Carpenter - Building / Heavy&Highway

DISTRICT 11

ENTIRE COUNTIES

Columbia, Dutchess, Orange, Sullivan, Ulster

WAGES

WAGES (per hour)

Applies to Carpenter (Building/Heavy & Highway/Tunnel), Dockbuilder, Piledriver, Dive Tender, and Diver (Dry):

	07/01/2022	07/01/2023 Additional	07/01/2024 Additional	07/01/2025 Additional
Base Wage	\$ 34.68 + 4.80*	\$ 2.10**	\$ 2.16**	\$ 2.23**
Applies to Diver (Wet):				
Base Wage	\$ 50.00 + 4.80*	2.10**	2.16**	2.23**

*For all hours paid straight or premium.

**To be allocated at a later date.

SHIFT DIFFERENTIAL: When mandated by a Government Agency irregular or off shift can be worked. The Carpenter shall receive an additional fifteen percent (15%) of the base wage.

SUPPLEMENTAL BENEFITS

Per hour:

Journeyworker \$ 30.41

OVERTIME PAY

See (B, E, Q) on OVERTIME PAGE

HOLIDAY

BUILDING:

Paid: See (1) on HOLIDAY PAGE.

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

- Holidays that fall on Sunday will be observed Monday.

HEAVY&HIGHWAY/TUNNEL:

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

Overtime: See (5, 6) on HOLIDAY PAGE

- Holidays that fall on Sunday will be observed Monday

- Must be employed during the five (5) work days immediately preceding a holiday or during the five (5) work days following the paid holiday to receive holiday pay

- If Employee is entitled to a paid holiday, the Employee is paid the Holiday wage and supplemental benefits whether they work or not. If Employee works the Holiday, the Employee will receive holiday pay (including supplemental benefits), plus the applicable premium wage for working the Holiday. If Employee works in excess of 8 hours on Holiday, then benefits will be paid for any hours in excess of 8 hours.

REGISTERED APPRENTICES

1 Year terms at the following wage rates.

	1st	2nd	3rd	4th	5th
07/01/2022	\$ 17.34 +2.57*	\$ 20.81 +2.57*	\$ 22.54 +2.57*	\$ 24.28 +2.57*	\$ 27.74 +2.57*

*For all hours paid straight or premium

SUPPLEMENTAL BENEFITS per hour:

Apprentices (all terms)

07/01/2022 \$ 16.33

11-279.2B/H&H

Carpenter - Floor Coverer

10/01/2022

JOB DESCRIPTION Carpenter - Floor Coverer

DISTRICT 11

ENTIRE COUNTIES

Columbia, Sullivan, Ulster

PARTIAL COUNTIES

Orange: The area lying on Northern side of Orange County demarcated by a line drawn from the Bear Mountain Bridge continuing west to the Bear Mountain Circle, continue North on 9W to the town of Cornwall where County Road 107 (also known as Quaker Rd) crosses under 9W, then east on County Road 107 to Route 32, then north on Route 32 to Orrs Mills Rd, then west on Orrs Mills Rd to Route 94, continue west and south on Route 94 to the Town of Chester, to the intersection of Kings Highway, continue south on Kings Highway to Bellvale Rd, west on Bellvale Rd to Bellvale Lakes Rd, then south on Bellvale Lakes Rd to Kain Rd, southeast on Kain Rd to Route 17A, then north and southeast along Route 17A to Route 210, then follow Route 210 to NJ Border.

WAGES

WAGES:(per hour)

	07/01/2022	07/01/2023	07/01/2024
		Additional	Additional
Carpet/Resilient Floor Coverer	\$ 34.68 +4.80*	\$ 2.10**	\$ 2.16**

* For all hours paid straight or premium

** To be allocated at a later date.

SHIFT DIFFERENTIAL: When mandated by a Government Agency irregular or off shift can be worked. The Carpenter shall receive an additional fifteen (15) percent of wage plus applicable benefits.

SUPPLEMENTAL BENEFITS

Per hour:

Journey worker \$ 30.41

OVERTIME PAY

See (B, E, Q) on OVERTIME PAGE

HOLIDAY

BUILDING:

Paid: See (1) on HOLIDAY PAGE.

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

- Holidays that fall on Sunday will be observed Monday.

HEAVY&HIGHWAY/TUNNEL:

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

Overtime: See (5, 6) on HOLIDAY PAGE

- Holidays that fall on Sunday will be observed Monday

- Must be employed during the five (5) work days immediately preceding a holiday or during the five (5) work days following the paid holiday to receive holiday pay

- If Employee is entitled to a paid holiday, the Employee is paid the Holiday wage and supplemental benefits whether they work or not. If Employee works the Holiday, the Employee will receive holiday pay (including supplemental benefits), plus the applicable premium wage for working the Holiday. If Employee works in excess of 8 hours on Holiday, then benefits will be paid for any hours in excess of 8 hours.

REGISTERED APPRENTICES

1 Year terms at the following wage rates.

1st	2nd	3rd	4th	5th
\$ 17.34	\$ 20.81	\$ 22.54	\$ 24.28	\$ 27.74
+2.57*	+2.57*	+2.57*	+2.57*	+2.57*

*For all hours paid straight or premium

SUPPLEMENTAL BENEFITS per hour:

All terms \$ 16.33

11-279.2Floor

Electrician

10/01/2022

JOB DESCRIPTION Electrician

DISTRICT 11

ENTIRE COUNTIES

Orange, Putnam, Rockland

PARTIAL COUNTIES

Dutchess: Towns of Fishkill, East Fishkill, and Beacon.

WAGES

Per hour:

	07/01/2022	04/01/2023	04/01/2024
Electrician Wireman/Technician	\$ 48.00	\$ 49.50	\$ 50.50
	+9.00*	+ 9.00*	+ 9.50*

SHIFT DIFFERENTIAL: On Public Work in New York State when shift work is mandated either in the job specifications or by the contracting agency, the following rates apply when shift is worked:

Between 4:30pm & 12:30am	\$ 56.32	\$ 58.08	\$ 59.30
	+ 9.00*	+ 9.00*	+ 9.50*
Between 12:30am & 8:30am	\$ 63.09	\$65.06	\$66.35
	+ 9.00*	+ 9.00*	+ 9.50*

*For all hours paid straight or premium, not to be included in 3% calculation for supplemental benefits.

NOTE ADDITIONAL AMOUNTS PAID FOR THE FOLLOWING WORK LISTED BELOW (subject to overtime premiums):

- On jobs where employees are required to work from boatswain chairs, swinging scaffolds, etc., forty (40) feet or more above the ground, or under compressed air, using Scottair packs, or gas masks, they shall receive an additional \$2.00 per hour above the regular straight time rate.
- Journeyman Wireman working in Shafts, Tunnels or on Barges: \$5.00 above the Journeyman Wireman rate of pay
- Journeyman Wireman when performing welding or cable splicing: \$3.00 above the Journeyman Wireman rate of pay
- Journeyman Wireman required to have a NYS Asbestos Certificate: \$3.00 above the Journeyman Wireman rate of pay
- Journeyman Wireman required to have a CDL: \$3.00 above the Journeyman Wireman rate of pay.

SUPPLEMENTAL BENEFITS

Per hour:	07/01/2022	04/01/2023	04/01/2024
Journeyman	\$ 27.68 plus	\$ 28.68 plus	\$ 29.68 plus
	3% of straight	3% of straight	3% of straight
	or premium wage	or premium wage	or premium wage

OVERTIME PAY

See (B, E, Q) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 13, 15, 16, 25) on HOLIDAY PAGE

When the holiday falls on a Saturday it is observed the Friday before. When the holiday falls on a Sunday it is observed on the Monday after.

REGISTERED APPRENTICES

WAGES:

(1)year terms at the following rates

07/01/2022	1st	2nd	3rd	4th	5th	6th
1st Shift	\$ 13.80	\$ 18.40	\$ 23.00	\$ 27.60	\$ 32.20	\$ 34.50
	+1.00*	+1.00*	+1.50*	+2.00*	+2.50*	+2.50*
2nd Shift	16.19	21.59	26.99	32.38	37.78	40.48
	+1.00*	+1.00*	+1.50*	+2.00*	+2.50*	+2.50*
3rd Shift	18.14	24.18	30.23	36.28	42.32	45.35
	+1.00*	+1.00*	+1.50*	+2.00*	+2.50*	+2.50*
04/01/2023	1st	2nd	3rd	4th	5th	6th
1st Shift	\$ 14.25	\$ 19.00	\$ 23.75	\$ 28.50	\$ 33.25	\$ 35.63
	+1.00*	+1.00*	+1.50*	+2.00*	+2.50*	+2.50*
2nd Shift	16.72	22.29	27.87	33.44	39.01	41.80
	+1.00*	+1.00*	+1.50*	+2.00*	+2.50*	+2.50*
3rd Shift	18.73	24.97	31.22	37.46	43.70	46.83
	+1.00*	+1.00*	+1.50*	+2.00*	+2.50*	+2.50*
04/01/2024	1st	2nd	3rd	4th	5th	6th
1st Shift	\$ 14.55	\$ 19.40	\$ 24.25	\$ 29.10	\$ 33.95	\$ 36.38
	+1.00*	+1.00*	+1.50*	+2.00*	+2.50*	+2.50*

2nd Shift	17.08	22.77	28.47	34.16	39.85	42.70
	+1.00*	+1.00*	+1.50*	+2.00*	+2.50*	+2.50*
3rd Shift	19.12	25.49	31.87	38.24	44.61	47.80
	+1.00*	+1.00*	+1.50*	+2.00*	+2.50*	+2.50*
09/01/2024	1st	2nd	3rd	4th	5th	6th
1st Shift	\$ 14.55	\$ 19.40	\$ 24.25	\$ 29.10	\$ 33.95	\$ 36.38
	+0.50*	+1.00*	+1.00*	+2.00*	+2.50*	+2.50*
2nd Shift	17.08	22.77	28.47	34.16	39.85	42.70
	+0.50*	+1.00*	+1.00*	+2.00*	+2.50*	+2.50*
3rd Shift	19.12	25.49	31.87	38.24	44.61	47.80
	+0.50*	+1.00*	+1.00*	+2.00*	+2.50*	+2.50*

*For all hours paid straight or premium, not to be included in 3% calculation for supplemental benefits.

SUPPLEMENTAL BENEFITS per hour:

07/01/2022

1st term	\$ 15.31 plus 3% of straight or premium wage
2nd term	\$ 15.81 plus 3% of straight or premium wage
3rd term	\$ 17.31 plus 3% of straight or premium wage
4th term	\$ 18.31 plus 3% of straight or premium wage
5th term	\$ 19.81 plus 3% of straight or premium wage
6th term	\$ 19.81 plus 3% of straight or premium wage

09/01/2022

1st term	\$ 16.28 plus 3% of straight or premium wage
2nd term	\$ 16.28 plus 3% of straight or premium wage
3rd term	\$ 18.28 plus 3% of straight or premium wage
4th term	\$ 18.78 plus 3% of straight or premium wage
5th term	\$ 20.28 plus 3% of straight or premium wage
6th term	\$ 20.28 plus 3% of straight or premium wage

09/01/2024

1st term	\$ 16.28 plus 3% of straight or premium wage
2nd term	\$ 17.78 plus 3% of straight or premium wage
3rd term	\$ 18.78 plus 3% of straight or premium wage
4th term	\$ 19.78 plus 3% of straight or premium wage
5th term	\$ 21.28 plus 3% of straight or premium wage
6th term	\$ 21.28 plus 3% of straight or premium wage

11-363/1

Elevator Constructor

10/01/2022

JOB DESCRIPTION Elevator Constructor

DISTRICT 1

ENTIRE COUNTIES

Columbia, Dutchess, Greene, Orange, Putnam, Sullivan, Ulster

PARTIAL COUNTIES

Delaware: Towns of Andes, Bovina, Colchester, Davenport, Delhi, Harpersfield, Hemdon, Kortright, Meredith, Middletown, Roxbury, Hancock & Stamford

Rockland: Only the Township of Stony Point.

Westchester: Only the Townships of Bedford, Lewisboro, Cortland, Mt. Kisco, North Salem, Pound Ridge, Somers and Yorktown.

WAGES

Per Hour	07/01/2022	01/01/2023
Mechanic	\$ 64.63	\$ 67.35
Helper	70% of Mechanic Wage Rate	70% of Mechanic Wage Rate

Four (4), ten (10) hour days may be worked for New Construction and Modernization Work at straight time during a week, Monday thru Thursday or Tuesday thru Friday.

***Four (4), ten (10) hour days are not permitted for Contract Work/Repair Work

NOTE - In order to use the '4 Day/10 Hour Work Schedule' as your normal schedule, you must submit an 'Employer Registration for Use of 4 Day/10 Hour Work Schedule', form PW30.1; and there must be a dispensation of hours in place on the project. If the PW30.1 is not submitted you may be liable for overtime payments for work over 8 hours per day.

SUPPLEMENTAL BENEFITS

Per hour

	07/01/2022	01/01/2023
Journey person/Helper	\$ 36.885*	\$ 37.335*

(*)Plus 6% of regular hourly if less than 5 years of service. Plus 8% of regular hourly rate if more than 5 years of service.

OVERTIME PAY

See (D, O) on OVERTIME PAGE

HOLIDAY

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

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

Note: When a paid holiday falls on Saturday, it shall be observed on Friday. When a paid holiday falls on Sunday, it shall be observed on Monday.

REGISTERED APPRENTICES

Wages per hour:

0-6 mo*	6-12 mo	2nd yr	3rd yr	4th yr
50 %	55 %	65 %	70 %	80 %

(*)Plus 6% of the hourly rate, no additional supplemental benefits.

Supplemental Benefits per hour worked:

Same as Journey person/Helper

1-138

Glazier

10/01/2022

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:	7/01/2022	11/01/2022
		Additional
Glazier	\$ 59.59	\$ 1.25
*Scaffolding	61.55	
Glass Tinting & Window Film	30.11	
**Repair & Maintenance	30.11	

*Scaffolding includes swing scaffold, mechanical equipment, scissor jacks, man lifts, booms & buckets 24' or more, but not pipe scaffolding.

**Repair & Maintenance- All repair & maintenance work on a particular building whenever performed, where the total cumulative contract value is under \$148,837. All Glass tinting, window film, regardless of material or intended use, and all affixing of decals to windows or glass.

SUPPLEMENTAL BENEFITS

Per hour:	7/01/2022
Journey worker	\$ 37.55
Glass tinting & Window Film	22.01
Repair & Maintenance	22.01

OVERTIME PAY

See (B,H,V) on OVERTIME PAGE.

For 'Repair & Maintenance' and 'Glass Tinting & Window Film' 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' and 'Glass Tinting & Window Film' Only

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:

	7/01/2022	11/01/2022
1st term	\$ 21.15	TBD
2nd term	29.07	
3rd term	35.20	
4th term	47.38	

Supplemental Benefits:

(Per hour)

1st term	\$ 17.15
2nd term	24.42
3rd term	27.06
4th term	32.15

8-1087 (DC9 NYC)

Insulator - Heat & Frost

10/01/2022

JOB DESCRIPTION Insulator - Heat & Frost

DISTRICT 8

ENTIRE COUNTIES

Dutchess, Orange, Putnam, Rockland, Westchester

WAGES

Per hour:	07/01/2022	05/31/2023
Insulator	\$ 58.25	+ \$ 2.00
Discomfort & Additional Training**	61.30	+ \$ 2.00
Fire Stop Work*	31.15	+ \$ 2.00

* Applies on all exclusive Fire Stop Work (When contract is for Fire Stop work only). No apprentices on these contracts only.

**Applies to work requiring: garb or equipment worn against the body not customarily worn by insulators; psychological evaluation; special training, including but not limited to "Yellow Badge" radiation training

Note: Additional \$0.50 per hour for work 30 feet or more above floor or ground level.

SUPPLEMENTAL BENEFITS

Per hour:

Journeyworker	\$ 36.10
Discomfort & Additional Training	38.09
Fire Stop Work:	
Journeyworker	18.41

OVERTIME PAY

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

HOLIDAY

Paid: See (1) on HOLIDAY PAGE

Note: Last working day preceding Christmas and New Years day, workers shall work no later than 12:00 noon and shall receive 8 hrs pay.

Overtime: See (2*, 4, 6, 16, 25) on HOLIDAY PAGE.

*Note: Labor Day triple time if worked.

REGISTERED APPRENTICES

(1) year terms:

Insulator Apprentices:

1st	2nd	3rd	4th
\$ 31.15	\$ 36.56	\$ 41.98	\$ 47.41

Discomfort & Additional Training Apprentices:

1st	2nd	3rd	4th
\$ 32.67	\$ 38.39	\$ 44.12	\$ 49.85

Supplemental Benefits paid per hour:

Insulator Apprentices:

1st term	\$ 18.41
2nd term	21.94
3rd term	25.48
4th term	29.03

Discomfort & Additional Training Apprentices:

1st term	\$ 19.41
2nd term	23.14
3rd term	26.88
4th term	30.62

8-91

Ironworker

10/01/2022

JOB DESCRIPTION Ironworker

DISTRICT 11

ENTIRE COUNTIES

Dutchess, Orange, Putnam, Rockland, Sullivan, Ulster

WAGES

Per hour:

	07/01/2022	07/01/2023 Additional
Structural	\$ 51.38	\$ 2.34*
Reinforcing*	51.38	2.34*
Ornamental	51.38	2.34*
Chain Link Fence	51.38	2.34*

* To be allocated at a later date.

NOTE: For Reinforcing classification ONLY, Ironworker 4-46Reinf rates apply in Rockland County's southern section (south of Convent Road and east of Blue Hills Road).

On Government Mandated Irregular Work Days or Shift Work, the following wage will be paid:

1st Shift	\$ 51.38
2nd Shift	65.79
3rd Shift	70.59

**Note- Any shift that works past 12:00 midnight shall receive the 3rd shift differential.

SUPPLEMENTAL BENEFITS

Per hour:

Journeyman	\$ 42.71
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OVERTIME PAY

See (B1, Q, V) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE

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

If a holiday falls on Saturday, it will be observed Friday. If a holiday falls on Sunday, it will be observed Monday.

REGISTERED APPRENTICES

Wages:

(1) year terms at the following wage:

	1st yr	2nd yr	3rd yr	4th yr
1st Shift	\$ 25.69	\$ 30.83	\$ 35.97	\$ 41.10
2nd Shift	35.34	41.44	47.53	53.61
3rd Shift	38.56	44.97	51.38	57.77

Supplemental Benefits per hour:

1st year	\$ 36.71
2nd year	37.91
3rd year	39.11
4th year	40.31

11-417

Laborer - Building

10/01/2022

JOB DESCRIPTION Laborer - Building

DISTRICT 11

ENTIRE COUNTIES

Orange, Sullivan, Ulster

PARTIAL COUNTIES

Delaware: Only the Townships of Andes, Bovina, Davenport, Delhi, Franklin, Hamden, Harpersfield, Kortright, Meredith, Middletown, Roxbury, and Stamford.

Greene: Only the Township of Catskill.

WAGES

GENERAL LABORER: flag person, portable generator tender, portable pump tender, temporary heat tender, chipping hammer, acoustic pump, mixer, concrete laborer, demolition, demo saw, general cleanup, landscaping, mason tender, jackhammer, pavement breaker, pressure blasting, signalperson, buggies, wrecking, chain saw, vacuums, cutting torch, discharge pipe, mega mixer, pump crete machine.

INTERMEDIATE LABORER: excavation, grading, backfilling, tampers, walk behind roller, when OSHA or contractor requires negative respirator.

PREMIUM LABORER: Environmental work, asbestos abatement, toxic and hazardous abatement, lead abatement work, mold remediation and biohazards.

WAGES:(per hour)

07/01/2022

General	\$ 40.40
Intermediate	42.30
Premium	45.30

These rates will cover all work within five feet of the building foundation line.

Shift Differential: On all Governmental mandated irregular or off shift work, an additional 25% of wage is required. The 25% shift differential will be paid on public works contract for shifts or irregular workdays outside the normal working hours for 2nd and 3rd shifts or irregular work day or when mandated or required by state, federal, county, local or other governmental agency contracts.

SUPPLEMENTAL BENEFITS

Per hour:

Journeyman	\$ 31.65
Shift	38.61

OVERTIME PAY

See (B, E, E5, Q) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE

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

Holidays that fall on Saturday shall be observed on Friday, when holidays fall on Sunday they shall be observed on Monday.

REGISTERED APPRENTICES

1000 hour terms at the following wage rates:

1st term	\$ 22.22
2nd term	26.26
3rd term	30.30
4th term	34.34

Supplemental Benefits per hour:

Apprentices	\$ 27.03
Shift	32.71

11-17.BA

Laborer - Heavy&Highway

10/01/2022

JOB DESCRIPTION Laborer - Heavy&Highway

DISTRICT 11

ENTIRE COUNTIES

Orange, Sullivan, Ulster

PARTIAL COUNTIES

Delaware: Only the Townships of Andes, Bovina, Middletown, Roxbury, Franklin, Hamden, Stamford, Delhi, Kortright, Harpersfield, Meredith, and Davenport.

Greene: Only the Township of Catskill.

WAGES

CLASS 1: Flagperson, gateperson.

CLASS 2: General laborer, chuck tender, nipper, powder carrier, magazine tender, concrete men, vibrator men, mason tender, mortar men, traffic control, custodial work, temporary heat, pump men, pit men, dump men, asphalt men, joint setter, signalman, pipe men, riprap, dry stone layers, jack hammer, bush hammer, pavement breaker, men on mulching & seeding machines, all seeding & sod laying, landscape work, walk behind self-propelled power saws, grinder, walk behind rollers and tampers of all types, burner men, filling and wiring of baskets for gabion walls, chain saw operator, railroad track laborers, power buggy, plaster & acoustic pump, power brush cutter, retention liners, walk behind surface planer, chipping hammer, manhole, catch basin or inlet installing, mortar mixer, laser men. *Micropaving and crack sealing.

CLASS 3: Asbestos, toxic, bio remediation and phyto-remediation, lead or hazardous materials abatement when certification or license is required, Drilling Equipment Only Where a Separate Air Compressor Unit Supplies Power.

CLASS 4: Asphalt screedman, blaster, all laborers involved in pipejacking and boring operations not exceeding more than 10 feet into pipe, boring or drilled area.

WAGES: (per hour)	07/01/2022	06/01/2023	06/01/2024 Additional
Class 1	\$ 39.05	\$ 40.80	\$ 2.65**
Class 2	43.30	44.80	2.35**
Class 3	47.75	49.40	2.45**
Class 4	52.90	54.70	2.20**

* When laborers are performing micro paving, crack sealing or slurry application when not part of asphalt prep operations laborers shall receive an additional \$2.50 per hour over rate.

**To be allocated at a later date.

SHIFT DIFFERENTIAL: Night work and irregular shift require 20% increase on wages for all Government mandated night and irregular shift work.

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.
NOTE - In order to use the '4 Day/10 Hour Work schedule', as your normal schedule, you must submit an 'Employer Registration for Use of 4 Day/10 Hour Work Schedule,' form PW30.1; and there must be a dispensation of hours in place on the project. If the PW30.1 is not submitted you may be liable for overtime payments for work over 8 hours per day.

SUPPLEMENTAL BENEFITS

Per hour:		
Journeyman	\$ 31.53	\$ 32.28
Shift	37.09	37.96

OVERTIME PAY

See (B, E, P, *R, **S, ***T, X) on OVERTIME PAGE

*For Mon-Fri Holidays, Double Benefits to be paid for all hours worked.

**For Saturday Holidays, Two and one Half Benefits for all hours worked.

***For Sunday Holidays, Triple Benefits for all hours worked.

HOLIDAY

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

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

To be eligible for a paid holiday, an employee must work at least two (2) days in the calendar week or payroll week in which the holiday falls.

REGISTERED APPRENTICES

(1000) hour terms at the following wages.

	07/01/2022
1st term	\$ 22.22
2nd term	26.26
3rd term	30.30
4th term	34.34

Supplemental Benefits per hour:

All Terms Regular	\$ 27.03
All Terms Shift Rate	31.57

11-17.1H/H

Laborer - Tunnel

10/01/2022

JOB DESCRIPTION Laborer - Tunnel

DISTRICT 11

ENTIRE COUNTIES

Columbia, Dutchess, Greene, Orange, Otsego, Putnam, Rockland, Sullivan, Ulster, Westchester

PARTIAL COUNTIES

Chenango: Townships of Columbus, Sherburne and New Berlin.

Delaware: Townships of Andes, Bovina, Middletown, Roxbury, Franklin, Hamden, Stamford, Delhi, Kortright, Harpersfield, Merideth and Davenport.

WAGES

Class 1: All support laborers/sandhogs working above the shaft or tunnel.

Class 2: All laborers/sandhogs working in the shaft or tunnel.

Class 4: Safety Miners

Class 5: Site work related to Shaft/Tunnel

WAGES: (per hour)

	07/01/2022
Class 1	\$ 53.45
Class 2	55.60
Class 4	62.00
Class 5	44.80

Toxic and hazardous waste, lead abatement and asbestos abatement work will be paid an additional \$ 3.00 an hour.

SHIFT DIFFERENTIAL...On all Government mandated irregular shift work:

- Employee shall be paid at time and one half the regular rate Monday through Friday.
- Saturday shall be paid at 1.65 times the regular rate.
- Sunday shall be paid at 2.15 times the regular rate.

SUPPLEMENTAL BENEFITS

Per hour:

Benefit 1	\$ 34.45
Benefit 2	51.60
Benefit 3	68.75

Benefit 1 applies to straight time hours, paid holidays not worked.

Benefit 2 applies to over 8 hours in a day (M-F), irregular shift work hours worked, and Saturday hours worked.

Benefit 3 applies to Sunday and Holiday hours worked.

OVERTIME PAY

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

HOLIDAY

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

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

When a recognized Holidays falls on Saturday or Sunday, holidays falling on Saturday shall be recognized or observed on Friday and holidays falling on Sunday shall be recognized or observed on Monday. Employees ordered to work on the Saturday or Sunday of the holiday or on the recognized or the observed Friday or Monday for those holidays falling on Saturday or Sunday shall receive double time the established rate and benefits for the holiday.

REGISTERED APPRENTICES

FOR APPRENTICE RATES, refer to the appropriate Laborer Heavy & Highway wage rate contained in the wage schedule for the County and location where the work is to be performed.

11-17/60/235/754Tun

Lineman Electrician

10/01/2022

JOB DESCRIPTION Lineman Electrician

DISTRICT 6

ENTIRE COUNTIES

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

WAGES

A Lineman/Technician shall perform all overhead aerial work. A Lineman/Technician on the ground will install all electrical panels, connect all grounds, install and connect all electrical conductors, assembly of all electrical materials, conduit, pipe, or raceway; placing of fish wire; pulling of cables, wires or fiber optic cable through such raceways; splicing of conductors; dismantling of such structures, lines or equipment.

A Groundman/Truck Driver shall: Build and set concrete forms, handle steel mesh, set footer cages, transport concrete in a wheelbarrow, hand or machine concrete vibrator, finish concrete footers, mix mortar, grout pole bases, cover and maintain footers while curing in cold weather, operate jack hammer, operate hand pavement breaker, tamper, concrete and other motorized saws, as a drill helper, operate and maintain generators, water pumps, chainsaws, sand blasting, operate mulching and seeding machine, air tools, electric tools, gas tools, load and unload materials, hand shovel and/or broom, prepare and pour mastic and other fillers, assist digger operator/equipment operator in ground excavation and restoration, landscape work and painting. Only when assisting a lineman technician, a groundman/truck driver may assist in installing conduit, pipe, cables and equipment.

NOTE: Includes Teledata Work within ten (10) feet of High Voltage Transmission Lines. Also includes digging of holes for poles, anchors, footer, and foundations for electrical equipment.

Below rates applicable on all overhead and underground distribution and maintenance work, and all overhead and underground transmission line work and the installation of fiber optic cable where no other construction trades are or have been involved. (Ref #14.01.01)

Per hour:	07/01/2022	05/01/2023	05/06/2024
Lineman, Technician	\$ 56.00	\$ 57.40	\$ 58.90
Crane, Crawler Backhoe	56.00	57.40	58.90
Welder, Cable Splicer	56.00	57.40	58.90
Digging Mach. Operator	50.40	51.66	53.01
Tractor Trailer Driver	47.60	48.79	50.07
Groundman, Truck Driver	44.80	45.92	47.12
Equipment Mechanic	44.80	45.92	47.12
Flagman	33.60	34.44	35.34

Additional \$1.00 per hour for entire crew when a helicopter is used.

Below rates applicable on all electrical sub-stations, switching structures, fiber optic cable and all other work not defined as "Utility outside electrical work". (Ref #14.02.01-A)

Lineman, Technician	\$ 56.00	\$ 57.40	\$ 58.90
Crane, Crawler Backhoe	56.00	57.40	58.90
Cable Splicer	61.60	63.14	64.79
Certified Welder -			
Pipe Type Cable	58.80	60.27	61.85
Digging Mach. Operator	50.40	51.66	53.01
Tractor Trailer Driver	47.60	48.79	50.07
Groundman, Truck Driver	44.80	45.92	47.12
Equipment Mechanic	44.80	45.92	47.12
Flagman	33.60	34.44	35.34

Additional \$1.00 per hour for entire crew when a helicopter is used.

Below rates apply on switching structures, maintenance projects, railroad catenary install/maintenance third rail installation, bonding of rails and pipe type cable and installation of fiber optic cable. (Ref #14.02.01-B)

Lineman, Tech, Welder	\$ 57.32	\$ 58.72	\$ 60.22
Crane, Crawler Backhoe	57.32	58.72	60.22
Cable Splicer	63.05	64.59	66.24
Certified Welder -			
Pipe Type Cable	60.19	61.66	63.23
Digging Mach. Operator	51.59	52.85	54.20
Tractor Trailer Driver	48.72	49.91	51.19
Groundman, Truck Driver	45.86	46.98	48.18
Equipment Mechanic	45.86	46.98	48.18
Flagman	34.39	35.23	36.13

Additional \$1.00 per hour for entire crew when a helicopter is used.

Below rates applicable on all overhead and underground transmission line work & fiber optic cable where other construction trades are or have been involved. This applies to transmission line work only, not other construction. (Ref #14.03.01)

Lineman, Tech, Welder	\$ 58.51	\$ 59.91	\$ 61.41
Crane, Crawler Backhoe	58.51	59.91	61.41
Cable Splicer	58.51	59.91	61.41
Digging Mach. Operator	52.66	53.92	55.27
Tractor Trailer Driver	49.73	50.92	52.20

Groundman, Truck Driver	46.81	47.93	49.13
Equipment Mechanic	46.81	47.93	49.13
Flagman	35.11	35.95	36.85

Additional \$1.00 per hour for entire crew when a helicopter is used.

NOTE: THE FOLLOWING RATES WILL APPLY ON ALL CONTRACTING AGENCY MANDATED MULTIPLE SHIFTS OF AT LEAST FIVE (5) DAYS DURATION WORKED BETWEEN THE HOURS LISTED BELOW:

1ST SHIFT	8:00 AM to 4:30 PM REGULAR RATE
2ND SHIFT	4:30 PM to 1:00 AM REGULAR RATE PLUS 17.3 %
3RD SHIFT	12:30 AM to 9:00 AM REGULAR RATE PLUS 31.4 %

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.

NOTE - In order to use the '4 Day/10 Hour Work schedule', as your normal schedule, you must submit an 'Employer Registration for Use of 4 Day/10 Hour Work Schedule,' form PW30.1; and there must be a dispensation of hours in place on the project. If the PW30.1 is not submitted you may be liable for overtime payments for work over 8 hours per day.

SUPPLEMENTAL BENEFITS

Per hour worked (but also required on non-worked holidays):

	07/01/2022	05/01/2023	05/06/2024
Journeyman	\$ 25.90 *plus 7% of the hourly wage paid	\$ 26.40 *plus 7% of the hourly wage paid	\$ 26.90 *plus 7% of the hourly wage paid
Journeyman Lineman or Equipment Operators with Crane License	\$ 27.90 *plus 7% of the hourly wage paid	\$ 29.40 *plus 7% of the hourly wage paid	\$ 30.90 *plus 7% of the hourly wage paid

*The 7% is based on the hourly wage paid, straight time or premium time.

OVERTIME PAY

See (B, E, Q,) on OVERTIME PAGE. *Note* Double time for all emergency work designated by the Dept. of Jurisdiction.

NOTE: WAGE CAP - Double the straight time hourly base wage shall be the maximum hourly wage compensation for any hour worked. Contractor is still responsible to pay the hourly benefit amount for each hour worked.

HOLIDAY

Paid	See (5, 6, 8, 13, 25) on HOLIDAY PAGE plus Governor of NYS Election Day.
Overtime	See (5, 6, 8, 13, 25) on HOLIDAY PAGE plus Governor of NYS Election Day.

NOTE: All paid holidays falling on Saturday shall be observed on the preceding Friday. All paid holidays falling on Sunday shall be observed on the following Monday. Supplements for holidays paid at straight time.

REGISTERED APPRENTICES

WAGES per hour: 1000 hour terms at the following percentage of the applicable Journeyman Lineman wage.

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

SUPPLEMENTAL BENEFITS per hour:

	07/01/2022	05/01/2023	05/06/2024
	\$ 25.90 *plus 7% of the hourly wage paid	\$ 26.40 *plus 7% of the hourly wage paid	\$ 26.90 *plus 7% of the hourly wage paid

*The 7% is based on the hourly wage paid, straight time or premium time.

6-1249a

Lineman Electrician - Teledata

10/01/2022

JOB DESCRIPTION Lineman Electrician - Teledata
ENTIRE COUNTIES

DISTRICT 6

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

WAGES

Per hour:

For outside work, stopping at first point of attachment (demarcation).

	07/01/2022	01/01/2023	01/01/2024	01/01/2025
Cable Splicer	\$ 36.28	\$ 37.73	\$ 39.24	\$ 40.81
Installer, Repairman	\$ 34.43	\$ 35.81	\$ 37.24	\$ 38.73
Teledata Lineman	\$ 34.43	\$ 35.81	\$ 37.24	\$ 38.73
Tech., Equip. Operator	\$ 34.43	\$ 35.81	\$ 37.24	\$ 38.73
Groundman	\$ 18.25	\$ 18.98	\$ 19.74	\$ 20.53

NOTE: EXCLUDES Teledata work within ten (10) feet of High Voltage (600 volts and over) transmission lines. For this work please see LINEMAN.

NOTE: THE FOLLOWING RATES WILL APPLY ON ALL CONTRACTING AGENCY MANDATED MULTIPLE SHIFTS OF AT LEAST FIVE (5) DAYS DURATION WORKED:

1ST SHIFT	REGULAR RATE
2ND SHIFT	REGULAR RATE PLUS 10%
3RD SHIFT	REGULAR RATE PLUS 15%

SUPPLEMENTAL BENEFITS

Per hour:	07/01/2022	01/01/2023	01/01/2024	01/01/2025
Journeyman	\$ 5.14 *plus 3% of the hourly wage paid	\$ 5.14 *plus 3% of the hourly wage paid	\$ 5.14 *plus 3% of the hourly wage paid	\$ 5.14 *plus 3% of the hourly wage paid

*The 3% is based on the hourly wage paid, straight time rate or premium rate.

OVERTIME PAY

See (B, E, Q) on OVERTIME PAGE

NOTE: WAGE CAP - Double the straight time hourly base wage shall be the maximum hourly wage compensation for any hour worked. Contractor is still responsible to pay the hourly benefit amount for each hour worked.

HOLIDAY

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

6-1249LT - Teledata

Lineman Electrician - Traffic Signal, Lighting	10/01/2022
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JOB DESCRIPTION Lineman Electrician - Traffic Signal, Lighting

DISTRICT 6

ENTIRE COUNTIES

Columbia, Dutchess, Orange, Putnam, Rockland, Ulster

WAGES

Lineman/Technician shall perform all overhead aerial work. A Lineman/Technician on the ground will install all electrical panels, connect all grounds, install and connect all electrical conductors which includes, but is not limited to road loop wires; conduit and plastic or other type pipes that carry conductors, flex cables and connectors, and to oversee the encasement or burial of such conduits or pipes.

A Groundman/Truck Driver shall: Build and set concrete forms, handle steel mesh, set footer cages, transport concrete in a wheelbarrow, hand or machine concrete vibrator, finish concrete footers, mix mortar, grout pole bases, cover and maintain footers while curing in cold weather, operate jack hammer, operate hand pavement breaker, tamper, concrete and other motorized saws, as a drill helper, operate and maintain generators, water pumps, chainsaws, sand blasting, operate mulching and seeding machine, air tools, electric tools, gas tools, load and unload materials, hand shovel and/or broom, prepare and pour mastic and other fillers, assist digger operator/equipment operator in ground excavation and restoration, landscape work and painting. Only when assisting a lineman technician, a groundman/truck driver may assist in installing conduit, pipe, cables and equipment.

A flagger's duties shall consist of traffic control only.
(Ref #14.01.02)

Per hour:	07/01/2022	05/01/2023	05/06/2024
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Lineman, Technician	\$ 49.47	\$ 50.60	\$ 51.82
Crane, Crawler Backhoe	49.47	50.60	51.82
Certified Welder	51.94	53.13	54.41
Digging Machine	44.52	45.54	46.64
Tractor Trailer Driver	42.05	43.01	44.05
Groundman, Truck Driver	39.58	40.48	41.46
Equipment Mechanic	39.58	40.48	41.46
Flagman	29.68	30.36	31.09

Above rates are applicable for installation, testing, operation, maintenance and repair on all Traffic Control (Signal) and Illumination (Lighting) projects, Traffic Monitoring Systems, and Road Weather Information Systems. Includes digging of holes for poles, anchors, footer foundations for electrical equipment; assembly of all electrical materials or raceway; placing of fish wire; pulling of cables, wires or fiber optic cable through such raceways; splicing of conductors; dismantling of such structures, lines or equipment.

NOTE: THE FOLLOWING RATES WILL APPLY ON ALL CONTRACTING AGENCY MANDATED MULTIPLE SHIFTS OF AT LEAST FIVE (5) DAYS DURATION WORKED BETWEEN THE HOURS LISTED BELOW:

1ST SHIFT	8:00 AM TO 4:30 PM REGULAR RATE
2ND SHIFT	4:30 PM TO 1:00 AM REGULAR RATE PLUS 17.3%
3RD SHIFT	12:30 AM TO 9:00 AM REGULAR RATE PLUS 31.4%

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.

NOTE - In order to use the '4 Day/10 Hour Work schedule', as your normal schedule, you must submit an 'Employer Registration for Use of 4 Day/10 Hour Work Schedule,' form PW30.1; and there must be a dispensation of hours in place on the project. If the PW30.1 is not submitted you may be liable for overtime payments for work over 8 hours per day.

SUPPLEMENTAL BENEFITS

Per hour worked (but also required on non-worked holidays):

	07/01/2022	05/01/2023	05/06/2024
Journeyman	\$ 25.90 *plus 7% of the hourly wage paid	\$ 26.40 *plus 7% of the hourly wage paid	\$ 26.90 *plus 7% of the hourly wage paid
Journeyman Lineman or Equipment Operators with Crane License	\$ 27.90 *plus 7% of the hourly wage paid	\$ 29.40 *plus 7% of the hourly wage paid	\$ 30.90 *plus 7% of the hourly wage paid

*The 7% is based on the hourly wage paid, straight time or premium time.

OVERTIME PAY

See (B, E, Q) on OVERTIME PAGE. *Note* Double time for all emergency work designated by the Dept. of Jurisdiction.

NOTE: WAGE CAP - Double the straight time hourly base wage shall be the maximum hourly wage compensation for any hour worked. Contractor is still responsible to pay the hourly benefit amount for each hour worked.

HOLIDAY

Paid: See (5, 6, 8, 13, 25) on HOLIDAY PAGE and Governor of NYS Election Day.

Overtime: See (5, 6, 8, 13, 25) on HOLIDAY PAGE and Governor of NYS Election Day.

NOTE: All paid holidays falling on Saturday shall be observed on the preceding Friday. All paid holidays falling on Sunday shall be observed on the following Monday. Supplements for holidays paid at straight time.

REGISTERED APPRENTICES

WAGES per hour: 1000 hour terms at the following percentage of the applicable Journeyman Lineman wage.

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

SUPPLEMENTAL BENEFITS per hour:

	07/01/2022	05/01/2023	05/06/2024
	\$ 25.90 *plus 7% of the hourly wage paid	\$ 26.40 *plus 7% of the hourly wage paid	\$ 26.90 *plus 7% of the hourly wage paid

*The 7% is based on the hourly wage paid, straight time or premium time.

6-1249aReg8LT

Lineman Electrician - Tree Trimmer**10/01/2022**

JOB DESCRIPTION Lineman Electrician - Tree Trimmer**DISTRICT 6****ENTIRE COUNTIES**

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

WAGES

Applies to line clearance, tree work and right-of-way preparation on all new or existing energized overhead or underground electrical, telephone and CATV lines. This also would include stump removal near underground energized electrical lines, including telephone and CATV lines.

Per hour:	07/01/2022	01/01/2023
Tree Trimmer	\$ 28.25	\$ 29.80
Equipment Operator	24.98	26.35
Equipment Mechanic	24.98	26.35
Truck Driver	20.80	21.94
Groundman	17.13	18.07
Flag person	13.20*	13.20*

*NOTE: Subject to change due to any minimum wage increases.

SUPPLEMENTAL BENEFITS

Per hour worked (but also required on non-worked holidays):

	07/01/2022	01/01/2023
Journeyman	\$ 10.23	\$ 10.48
	*plus 3% of the hourly wage paid	*plus 3% of the hourly wage paid

* The 3% is based on the hourly wage paid, straight time rate or premium rate.

OVERTIME PAY

See (B, E, Q) on OVERTIME PAGE

NOTE: WAGE CAP - Double the straight time hourly base wage shall be the maximum hourly wage compensation for any hour worked.

Contractor is still responsible to pay the hourly benefit amount for each hour worked.

HOLIDAY

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

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

NOTE: All paid holidays falling on a Saturday shall be observed on the preceding Friday.

All paid holidays falling on a Sunday shall be observed on the following Monday.

6-1249TT

Mason - Building**10/01/2022**

JOB DESCRIPTION Mason - Building**DISTRICT 11****ENTIRE COUNTIES**

Dutchess, Sullivan, Ulster

PARTIAL COUNTIES

Orange: Entire county except the Township of Tuxedo.

WAGES

Per hour:	07/01/2022	06/01/2023
Bricklayer	\$ 43.94	\$ 45.00
Cement Mason	43.94	45.00
Plasterer/Stone Mason	43.94	45.00
Pointer/Caulker	43.94	45.00

Additional \$1.00 per hour for power saw work

Additional \$0.50 per hour for swing scaffold or staging work

SHIFT WORK: When shift work or an irregular work day is mandated or required by state, federal, county, local or other governmental agency contracts, the following premiums apply:

- Irregular work day requires 15% premium
- Second shift an additional 15% of wage plus benefits to be paid
- Third shift an additional 25% of wage plus benefits to be paid

SUPPLEMENTAL BENEFITS

Per hour:

Journeyman \$ 36.44 \$ 37.39

OVERTIME PAY

Cement Mason See (B, E, Q, W) on OVERTIME PAGE.
All Others See (B, E, Q) on OVERTIME PAGE.

HOLIDAY

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

Whenever any of the above holidays fall on Sunday, they will be observed on Monday. Whenever any of the above holidays fall on Saturday, they will be observed on Friday.

REGISTERED APPRENTICES

Wages per hour:

750 hour terms at the following percentage of Journeyman's wage

1st	2nd	3rd	4th	5th	6th	7th	8th
50%	55%	60%	65%	70%	75%	80%	85%

Supplemental Benefits per hour

750 hour terms at the following percentage of journeyman supplements

1st	2nd	3rd	4th	5th	6th	7th	8th
50%	55%	60%	65%	70%	75%	80%	85%

Apprentices indentured before June 1st, 2011 receive full journeyman benefits

11-5du-b

Mason - Building 10/01/2022

JOB DESCRIPTION Mason - Building

DISTRICT 9

ENTIRE COUNTIES

Dutchess, Orange, Putnam, Sullivan, Ulster

WAGES

Per hour:

07/01/2022	12/05/2022	06/05/2023

Building:	Additional	Additional

Tile, Marble,& Terrazzo Mechanic/Setter	\$ 56.42	\$ 0.64	\$ 0.64

SUPPLEMENTAL BENEFITS

Per Hour:

Journeyworker: \$ 22.66*
+ \$7.67

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

OVERTIME PAY

See (B, E, Q) on OVERTIME PAGE

Double time rate applies after 10 hours

HOLIDAY

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

REGISTERED APPRENTICES

Wage per hour:

(Counties of Orange & Putnam)

750 hour terms at the following wage rate:

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
1-	751-	1501-	2251-	3001-	3751-	4501-	5251-	6001-	6751-
750	1500	2250	3000	3750	4500	5250	6000	6750	7500
\$21.23	\$26.11	\$33.26	\$38.14	\$41.67	\$45.04	\$48.60	\$53.47	\$56.25	\$60.33

Supplemental Benefits per hour:
(Counties of Orange & Putnam)

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
\$12.55*	\$12.55*	\$15.16*	\$15.16*	\$16.75*	\$18.30*	\$19.35*	\$19.40*	\$17.45*	\$22.80*
+\$0.69	+\$0.74	+\$0.84	+\$0.88	+\$1.28	+\$1.33	+\$1.70	+\$1.75	+\$5.90	+\$6.42

Wages per hour:
(Counties of Dutchess, Sullivan, Ulster)

750 hour terms at the following wage rate:

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
1-	751-	1501-	2251-	3001-	3751-	4501-	5251-	6001-	6751-
750	1500	2250	3000	3750	4500	5250	6000	6750	7500
\$19.83	\$23.92	\$25.89	\$29.98	\$32.74	\$36.32	\$39.61	\$42.71	\$44.31	\$47.73

Supplemental Benefits per hour:
(Counties of Dutchess, Sullivan, Ulster)

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
\$12.55*	\$12.55*	\$14.66*	\$14.66*	\$15.60*	\$16.16*	\$16.66*	\$17.66*	\$15.66*	\$20.41*
+\$0.65	+\$0.69	+\$0.74	+\$0.78	+\$1.15	+\$1.19	+\$1.53	+\$1.57	+\$6.09	+\$6.18

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

9-7/52B

Mason - Building	10/01/2022
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JOB DESCRIPTION Mason - Building

DISTRICT 9

ENTIRE COUNTIES

Dutchess, Orange, Putnam, Sullivan, Ulster

WAGES

Per hour: 07/01/2022 12/05/2022 06/05/2023

Building Additional Additional

Tile, Marble, &
Terrazzo Finisher \$ 46.38 \$ 0.55 \$ 0.54

SUPPLEMENTAL BENEFITS

Journeyworker:

Per Hour \$ 19.76*
+ \$7.54

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

OVERTIME PAY

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

Double time rate applies after 10 hours on Saturdays.

HOLIDAY

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

9-7/88B-tf

Mason - Building

10/01/2022

JOB DESCRIPTION Mason - Building

DISTRICT 11

ENTIRE COUNTIES

Putnam, Rockland, Westchester

PARTIAL COUNTIES

Orange: Only the Township of Tuxedo.

WAGES

Per hour:

	07/01/2022	06/01/2023
Bricklayer	\$ 44.79	\$ 45.89
Cement Mason	44.79	45.89
Plasterer/Stone Mason	44.79	45.89
Pointer/Caulker	44.79	45.89

Additional \$1.00 per hour for power saw work

Additional \$0.50 per hour for swing scaffold or staging work

SHIFT WORK: When shift work or an irregular work day is mandated or required by state, federal, county, local or other governmental agency contracts, the following premiums apply:

Irregular work day requires 15% premium

Second shift an additional 15% of wage plus benefits to be paid

Third shift an additional 25% of wage plus benefits to be paid

SUPPLEMENTAL BENEFITS

Per hour:

Journeyman	\$ 37.00	\$ 37.95
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OVERTIME PAY

OVERTIME:

Cement Mason See (B, E, Q, W) on OVERTIME PAGE.

All Others See (B, E, Q) on OVERTIME PAGE.

HOLIDAY

Paid: See (1) on HOLIDAY PAGE

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

Whenever any of the above holidays fall on Sunday, they will be observed on Monday. Whenever any of the above holidays fall on Saturday, they will be observed on Friday.

REGISTERED APPRENTICES

Wages per hour:

750 hour terms at the following percentage of Journeyman's wage

1st	2nd	3rd	4th	5th	6th	7th	8th
50%	55%	60%	65%	70%	75%	80%	85%

Supplemental Benefits per hour

750 hour terms at the following percentage of journeyman supplements

1st	2nd	3rd	4th	5th	6th	7th	8th
50%	55%	60%	65%	70%	75%	80%	85%

Apprentices indentured before June 1st, 2011 receive full journeyman benefits

11-5wp-b

Mason - Building

10/01/2022

JOB DESCRIPTION Mason - Building

DISTRICT 9

ENTIRE COUNTIES

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

WAGES

Wages: 07/01/2022

Marble Cutters & Setters \$ 62.17

SUPPLEMENTAL BENEFITS

Per Hour:

Journeyworker \$ 38.27

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:

750 hour terms at the following wage.

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	6001-6751	6751-7500
\$ 24.88	\$ 27.97	\$ 31.08	\$ 34.17	\$ 37.29	\$ 40.39	\$ 43.51	\$ 46.61	\$ 52.82	\$ 59.05

Supplemental Benefits per hour:

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
\$ 20.55	\$ 22.04	\$ 23.52	\$ 25.01	\$ 26.47	\$ 27.96	\$ 29.42	\$ 30.91	\$ 33.86	\$ 36.81
									9-7/4

Mason - Heavy&Highway

10/01/2022

JOB DESCRIPTION Mason - Heavy&Highway

DISTRICT 11

ENTIRE COUNTIES

Dutchess, Sullivan, Ulster

PARTIAL COUNTIES

Orange: Entire county except the Township of Tuxedo.

WAGES

Per hour:

07/01/2022 06/01/2023

Bricklayer	\$ 44.44	\$ 45.50
Cement Mason	44.44	45.50
Marble/Stone Mason	44.44	45.50
Plasterer	44.44	45.50
Pointer/Caulker	44.44	45.50

Additional \$1.00 per hour for power saw work

Additional \$0.50 per hour for swing scaffold or staging work

SHIFT WORK: When shift work or an irregular work day is mandated or required by state, federal, county, local or other governmental contracts, the following rates apply:

Irregular work day requires 15% premium

Second shift an additional 15% of wage plus benefits to be paid

Third shift an additional 25% of wage plus benefits to be paid

SUPPLEMENTAL BENEFITS

Per hour:

Journeyman \$ 36.44 \$ 37.39

OVERTIME PAY

Cement Mason See (B, E, Q, W)

All Others See (B, E, Q)

HOLIDAY

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

- Whenever any of the above holidays fall on Sunday, they will be observed on Monday. Whenever any of the above holidays fall on Saturday, they will be observed on Friday.
- Supplemental Benefits are not paid for paid Holiday
- If Holiday is worked, Supplemental Benefits are paid for hours worked.
- Whenever an Employee works within three (3) calendar days before a holiday, the Employee shall be paid for the Holiday.

REGISTERED APPRENTICES

Wages per hour:

750 hour terms at the following percentage of Journeyman's wage

1st	2nd	3rd	4th	5th	6th	7th	8th
50%	55%	60%	65%	70%	75%	80%	85%

Supplemental Benefits per hour

750 hour terms at the following percentage of journeyman supplements

1st	2nd	3rd	4th	5th	6th	7th	8th
50%	55%	60%	65%	70%	75%	80%	85%

Apprentices indentured before June 1st, 2011 receive full journeyman benefits

11-5du-H/H

Mason - Heavy&Highway

10/01/2022

JOB DESCRIPTION Mason - Heavy&Highway

DISTRICT 11

ENTIRE COUNTIES

Putnam, Rockland, Westchester

PARTIAL COUNTIES

Orange: Only the Township of Tuxedo.

WAGES

Per hour:

	07/01/2022	06/01/2023
Bricklayer	\$ 45.29	\$ 46.39
Cement Mason	45.29	46.39
Marble/Stone Mason	45.29	46.39
Plasterer	45.29	46.39
Pointer/Caulker	45.29	46.39

Additional \$1.00 per hour for power saw work

Additional \$0.50 per hour for swing scaffold or staging work

SHIFT WORK: When shift work or an irregular work day is mandated or required by state, federal, county, local or other governmental contracts, the following rates apply:

Irregular work day requires 15% premium

Second shift an additional 15% of wage plus benefits to be paid

Third shift an additional 25% of wage plus benefits to be paid

SUPPLEMENTAL BENEFITS

Per hour:

Journeyman	\$ 37.00	\$ 37.95
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OVERTIME PAY

Cement Mason See (B, E, Q, W)

All Others See (B, E, Q,)

HOLIDAY

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

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

- Whenever any of the above holidays fall on Sunday, they will be observed on Monday. Whenever any of the above holidays fall on Saturday, they will be observed on Friday.
- Supplemental Benefits are not paid for paid Holiday
- If Holiday is worked, Supplemental Benefits are paid for hours worked.
- Whenever an Employee works within three (3) calendar days before a holiday, the Employee shall be paid for the Holiday.

REGISTERED APPRENTICES

Wages per hour:

750 hour terms at the following percentage of Journeyman's wage

1st	2nd	3rd	4th	5th	6th	7th	8th
50%	55%	60%	65%	70%	75%	80%	85%

Supplemental Benefits per hour

750 hour terms at the following percentage of journeyman supplements

1st	2nd	3rd	4th	5th	6th	7th	8th
50%	55%	60%	65%	70%	75%	80%	85%

Apprentices indentured before June 1st, 2011 receive full journeyman benefits

11-5WP-H/H

Operating Engineer - Building / Heavy&Highway**10/01/2022**

JOB DESCRIPTION Operating Engineer - Building / Heavy&Highway

DISTRICT 11

ENTIRE COUNTIES

Delaware, Orange, Rockland, Sullivan, Ulster

WAGES

CLASS A5: Cranes, Derricks and Pile Drivers 100 tons or more and Tower Cranes, with 140ft boom and over.

CLASS A4: Cranes, Derricks and Pile Drivers 100 tons or more and Tower Cranes, with 100ft to 139ft boom.

CLASS A3: Cranes, Derricks and Pile Drivers 100 tons or more and Tower Cranes with a boom under 100ft.

CLASS A2: Cranes, Derricks and Pile Drivers less than 100 tons with 140ft boom and over.

CLASS A1: Cranes, Derricks and Pile Drivers less than 100 tons with a 100ft to 139ft boom.

CLASS A: Cranes, Derricks and Pile Drivers less than 100 tons with a boom under 100ft.; Autograde Combination Subgrader, Base Material Spreader and Base Trimmer (CMI and Similar Types); Autograde Pavement profiler (CMI and Similar Types); Autograde Pavement Profiler and Recycle type (CMI and Similar Type); Autograde Placer-Trimmed-Spreader Comb. (CMI & Similar types); Autograde Slipform Paver (CMI & Similar Types); Central Power Plants (all types); Chief of Party; Concrete Paving Machines; Drill (Bauer, AMI and Similar Types); Drillmaster, Quarrymaster (Down the Hole Drill), Rotary Drill, Self-Propelled Hydraulic Drill, Self-Powered Drill; Draglines; Elevator Graders; Excavator; Front End Loaders (5 yds. and over); Gradalls; Grader-Rago; Helicopters (Co-Pilot); Helicopters (Communications Engineer); Juntann Pile Driver; Locomotive (Large); Mucking Machines; Pavement & Concrete Breaker, i.e., Superhammer & Hoe Ram; Roadway Surface Grinder; Prentice Truck; Scooper (Loader and Shovel); Shovels; Tree Chopper with Boom; Trench Machines (Cable Plow); Tunnel Boring Machine; Vacuum Truck

CLASS B: "A" Frame; Backhoe (Combination); Boom Attachment on Loaders (Rate based on size of Bucket) not applicable to Pipehook; Boring and Drilling Machines; Brush Chopper, Shredder and Tree Shredder, Tree Shearer; Bulldozer (Fine Grade); Cableways; Carryalls; Concrete Pump; Concrete Pumping System, Pump Concrete and Similar Types; Conveyors (125 ft. and over); Drill Doctor (duties incl. Dust Collector Maintenance); Front End Loaders (2 yds. but less than 5 yds.); Graders (Finish); Groove Cutting Machine (Ride on Type); Heater Planer; Hoists (all type Hoists, shall also include Steam, Gas, Diesel, Electric, Air Hydraulic, Single and Double Drum, Concrete, Brick Shaft Caisson, Snorkel Roof, and/or any other Similar Type Hoisting Machines, portable or stationary, except Chicago Boom Type); Long Boom Rate to be applied if Hoist is "Outside Material Tower Hoist"; Hydraulic Cranes-10 tons and under; Hydraulic Dredge; Hydro-Axe; Hydro Blaster; Jacks-Screw Air Hydraulic Power Operated Unit or Console Type (not hand Jack or Pile Load Test Type); Log Skidder; Pans; Pavers (all) concrete; Plate and Frame Filter Press; Pumpcrete Machines, Squeezecrete & Concrete Pumping (regardless of size); Scrapers; Side Booms; "Straddle"Carrier-Ross and similar types; Winch Trucks (Hoisting); Whip Hammer

CLASS C: Asphalt Curbing Machine; Asphalt Plant Engineer; Asphalt Spreader; Autograde Tube Finisher and Texturing Machine (CMI & Similar types); Autograde Curecrete Machine (CMI & Similar Types); Autograde Curb Trimmer & Sidewalk, Shoulder, Slipform (CMI & Similar Types); Bar Bending Machines (Power); Batchers, Batching Plant and Crusher on Site; Belt Conveyor Systems; Boom Type Skimmer Machines; Bridge Deck Finisher; Bulldozer(except fine grade); Car Dumpers (Railroad); Compressor and Blower Type Units (used independently or mounted on dual purpose Trucks, on Job Site or in conjunction with jobsite, in Loading and Unloading of Concrete, Cement, Fly Ash, Instantcrete, or Similar Type Materials); Compressors (2 or 3 in Battery); Concrete Finishing Machines; Concrete cleaning decontamination machine operator; Concrete Saws and Cutters (Ride-on type); Concrete Spreaders (Hetzl, Rexomatic and Similar Types); Concrete Vibrators; Conveyors (under 125 feet); Crushing Machines; Directional Boring Machines; Ditching Machine-small (Ditch-witch, Vermeer, or Similar type); Dope Pots (Mechanical with or without pump); Dumpsters; Elevator; Fireman; Fork Lifts (Economobile, Lull and Similar Types of Equipment); Front End Loaders (1 yd. and over but under 2 yds.); Generators (2 or 3 in Battery); Giraffe Grinders; Grout Pump; Gunnite Machines (excluding nozzle); Hammer Vibrator (in conjunction with Generator); Heavy Equipment Robotics Operator Technician; Hoists-Roof, Tugger, Aerial Platform Hoist & House Cars; Hoppers; Hopper Doors (power operated); Hydro Blaster; Hydraulic Jacking Trailer; Ladders (motorized); Laddervator; Locomotive-dinky type; Maintenance -Utility Man; Master Environmental Maintenance Technician; Mechanics; Mixers (Excepting Paving Mixers); Motor Patrols; Pavement Breakers (small self propelled ride on type-also maintains compressor hydraulic unit); Pavement Breaker-truck mounted; Pipe Bending Machine (Power); Pitch Pump; Plaster Pump (regardless of size); Post Hole Digger (Post Pounder & Auger); Rod Bending Machines (Power); Roller-Black Top; Scales (Power); Seaman pulverizing mixer; Shoulder widener; Silos; Skidsteer (all attachments); Skimmer Machines (boom-type); Steel Cutting Machine (service & maintain); Tam Rock Drill; Tractors; Transfer Machine; Captain (Power Boats); Tug Master (powerboats); Ultra High Pressure Waterjet Cutting Tool System operator/maintenance technician; Vacuum Blasting Machine; Vibrating Plants (used in conjunction with unloading); Welder and Repair Mechanics

CLASS D: Brooms and Sweepers; Chippers; Compressor (single); Concrete Spreaders (small type); Conveyor Loaders (not including Elevator Graders); Engines-large diesel (1620 HP) and Staging Pump; Farm Tractors; Fertilizing Equipment (Operation & Maintenance of); Fine Grade Machine (small type); Form Line Graders (small type); Front End Loader (under 1 yard); Generator (single); Grease, Gas, Fuel and Oil supply trucks; Heaters (Nelson or other type incl. Propane, Natural Gas or Flowtype Units); Lights, Portable Generating Light Plants; Mixers (Concrete, small); Mulching Equipment (Operation and Maintenance of); Pumps (2 or less than 4 inch suction); Pumps (4 inch suction and over incl. submersible pumps); Pumps (Diesel Engine and Hydraulic-immaterial of power); Road Finishing Machines (small type); Rollers-grade, fill or stone base; Seeding Equip. (Operation and Maintenance of); Sprinkler & Water Pump Trucks (used on jobsite or in conjunction with jobsite); Steam Jennies and Boilers-irrespective of use; Stone Spreader; Tamping Machines, Vibrating Ride-on; Temporary Heating Plant (Nelson or other type, incl. Propane, Natural Gas or Flow Type Units); Water & Sprinkler Trucks (used on or in conjunction with jobsite); Welding Machines (Gas, Diesel, and/or Electric Converters of any type, single, two, or three in a battery); Wellpoint Systems (including installation by Bull Gang and Maintenance of)

CLASS E: Assistant Engineer/Oiler; Drillers Helper; Maintenance Apprentice (Deck Hand); Maintenance Apprentice (Oiler); Mechanics' Helper; Tire Repair and Maintenance; Transit/Instrument Man

WAGES:(per hour)

07/01/2022

Class A5	\$ 63.72 plus 3.00*
Class A4	62.72 plus 3.00*
Class A3	61.72 plus 3.00*
Class A2	59.22 plus 3.00*
Class A1	58.22 plus 3.00*
Class A	57.22 plus 3.00*
Class B	55.63 plus 3.00*
Class C	53.72 plus 3.00*
Class D	52.09 plus 3.00*
Class E	50.38 plus 3.00*
Safety Engineer	57.96 plus 3.00*

Helicopter:

Pilot/Engineer	59.04 plus 3.00*
Co Pilot	57.22 plus 3.00*
Communications Engineer	57.22 plus 3.00*

Surveying:

Chief of Party	57.22 plus 3.00*
Transit/Instrument Man	50.38 plus 3.00*
Rod/Chainman	47.80 plus 3.00*
Additional \$0.75 for Survey work Tunnel under compressed air.	
Additional \$0.50 for Hydrographic work.	

*The \$3.00 is added to the Class Base Wage for all hours worked. Additionally, the \$3.00 is subject to the V-Code listed on the OVERTIME CODE Sheet.

****Outside Material Hoist (Class B)** receives additional \$ 1.00 per hour on 110 feet up to 199 feet total height, \$ 2.00 per hour on 200 feet and over total height.

- **SHIFT WORK:** On all Government mandated irregular or off shift work, an additional 15% on straight time hours.

- On **HAZARDOUS WASTE REMOVAL** or **ASBESTOS REMOVAL** work, or any state or federally **DESIGNATED HAZARDOUS WASTE SITE**:

For projects bid on or before April 1, 2020...Where the Operating Engineer is in direct contact with hazardous material and when personal protective equipment is required for respiratory, skin and eye protection, the Operating Engineer shall receive the hourly wage plus an additional twenty percent (20%) of that wage for the entire shift.

For projects bid after April 1, 2020...On hazardous waste removal work of any kind, including state or federally designated site where the operating engineer is required to wear level A, B, or C personal protection the operating engineer shall receive an hourly wage rate of his regular hourly wage plus \$5.00 per hour. An operating engineer working at a hazardous waste removal project or site at a task requiring hazardous waste related certification, but who is not working in a zone requiring level A, B, or C personal protection, shall receive an hourly wage rate of his regular rate plus \$ 1.00 per hour. This shall also apply to sites where the level D personal protection is required.

SUPPLEMENTAL BENEFITS

Per hour:

Journeyman \$ 33.50

SHIFT WORK: On all Government mandated irregular or off shift work, an additional 15% on straight time hours.

OVERTIME PAY

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

*15% premium is also required on shift work benefits

HOLIDAY

Paid: See (5, 6, 10, 13, 15) on HOLIDAY PAGE

Overtime: See (5, 6, 10, 13, 15) on HOLIDAY PAGE

Holidays falling on Sunday will be celebrated on Monday.

REGISTERED APPRENTICES

(1) year terms at the following percentage of journeyman's wage:

1st year	60% of Class base wage plus \$3.00*
2nd year	70% of Class base wage plus \$3.00*
3rd year	80% of Class base wage plus \$3.00*
4th year	90% of Class base wage plus \$3.00*

*The \$3.00 is added to the Class Base Wage for all hours worked. Additionally, the \$3.00 is subject to the V-Code listed on the OVERTIME CODE Sheet.

Supplemental Benefits per hour:

Apprentices \$ 33.50

11-825

Operating Engineer - Marine Dredging

10/01/2022

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:	07/01/2022	10/01/2022
CLASS A1	\$ 42.66	\$ 43.94
Deck Captain, Leverman		
Mechanical Dredge Operator		
Licensed Tug Operator 1000HP or more.		
CLASS A2	38.02	39.16
Crane Operator (360 swing)		

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	36.89	38.00
CLASS B2 Certified Welder	34.73	35.77
CLASS C1 Drag Barge Operator, Steward, Mate, Assistant Fill Placer	33.78	34.79
CLASS C2 Boat Operator	32.69	33.67
CLASS D Shoreman, Deckhand, Oiler, Rodman, Scowman, Cook, Messman, Porter/Janitor	27.16	27.97

SUPPLEMENTAL BENEFITS

Per Hour:

THE FOLLOWING SUPPLEMENTAL BENEFITS APPLY TO ALL CATEGORIES

All Classes A & B	\$ 11.40 plus 6% of straight time wage, Overtime hours add \$ 0.63	\$ 11.85 plus 6% of straight time wage, Overtime hours add \$ 0.63
All Class C	\$ 11.10 plus 6% of straight time wage, Overtime hours add \$ 0.48	\$ 11.60 plus 6% of straight time wage, Overtime hours add \$ 0.50
All Class D	\$ 10.80 plus 6% of straight time wage, Overtime hours add \$ 0.33	\$ 11.35 plus 6% of straight time wage, Overtime hours add \$ 0.38

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 - Steel Erectors

10/01/2022

JOB DESCRIPTION Operating Engineer - Steel Erectors

DISTRICT 11

ENTIRE COUNTIES

Delaware, Orange, Rockland, Sullivan, Ulster

WAGES

CLASS A3: Cranes, Derricks and Pile Drivers 100 tons or more and Tower Cranes, with a 140 ft. boom and over.

CLASS A2: Cranes, Derricks and Pile Drivers 100 tons or more and Tower Cranes, with up to a 139 ft. boom and under.

CLASS A1: Cranes, Derricks and Pile Drivers less than 100 tons with a 140 ft. boom and over.

CLASS A: Cranes, Derricks and Pile Drivers less than 100 tons with up to a 139 ft. boom and under.

CLASS B: "A" Frame; Cherry Pickers(10 tons and under); Hoists (all type Hoists, shall also include Steam, Gas, Diesel, Electric, Air Hydraulic, Single and Double Drum, Concrete, Brick Shaft Caisson, Snorkel Roof, and/or any other Similar Type Hoisting Machines, portable or stationary, except Chicago Boom Type); Jacks-Screw Air Hydraulic Power Operated Unit or Console Type (not hand Jack or Pile Load Test Type); Side Booms; Straddle Carrier

CLASS C: Aerial Platform used as Hoist; Compressors (2 or 3 in Battery); Concrete cleaning/ decontamination machine operator; Directional Boring Machines; Elevator or House Cars; Conveyers and Tugger Hoists; Fireman; Fork Lifts; Generators (2 or 3 in Battery); Heavy Equipment Robotics Operator/Technician; Master Environmental Maintenance Technician; Maintenance -Utility Man; Rod Bending Machines (Power); Captain(powerboat); Tug Master; Ultra High Pressure Waterjet Cutting Tool System; Vacuum Blasting Machine; Welding Machines(gas or electric,2 or 3 in battery, including diesels); Transfer Machine; Apprentice Engineer/Oiler with either one compressor or one welding machine when used for decontamination and remediation

CLASS D: Compressor (single); Welding Machines (Gas, Diesel, and/or Electric Converters of any type); Welding System Multiple (Rectifier Transformer type)

CLASS E: Assistant Engineer/Oiler; Maintenance Apprentice (Deck Hand);Drillers Helper; Maintenance Apprentice (Oiler); Mechanics' Helper; Transit/Instrument Man

WAGES:(per hour)

07/01/2022

Class A3	\$ 65.74 plus 3.00*
Class A2	64.08 plus 3.00*
Class A1	61.24 plus 3.00*
Class A	59.58 plus 3.00*
Class B	56.79 plus 3.00*
Class C	54.13 plus 3.00*
Class D	52.60 plus 3.00*
Class E	50.84 plus 3.00*
Vacuum Truck	57.55 plus 3.00*
Safety Engineer	58.41 plus 3.00*

Helicopter:	
Pilot/Engineer	61.24 plus 3.00*
Co Pilot	60.85 plus 3.00*
Communications Engineer	60.85 plus 3.00*

Surveying:	
Chief of Party	57.55 plus 3.00*
Transit/Instrument man	50.84 plus 3.00*
Rod/Chainman	47.80 plus 3.00*
Additional \$0.75 for Survey work Tunnels under compressed air.	
Additional \$0.50 for Hydrographic work.	

*The \$3.00 is added to the Class Base Wage for all hours worked. Additionally, the \$3.00 is subject to the V-Code listed on the OVERTIME CODE Sheet.

- SHIFT WORK: On all Government mandated irregular or off shift work, an additional 15% on straight time hours.

- On HAZARDOUS WASTE REMOVAL or ASBESTOS REMOVAL work, or any state or federally DESIGNATED HAZARDOUS WASTE SITE:

For projects bid on or before April 1, 2020...Where the Operating Engineer is in direct contact with hazardous material and when personal protective equipment is required for respiratory, skin and eye protection, the Operating Engineer shall receive the hourly wage plus an additional twenty percent (20%) of that wage for the entire shift.

For projects bid after April 1, 2020...On hazardous waste removal work of any kind, including state or federally designated site where the operating engineer is required to wear level A, B, or C personal protection the operating engineer shall receive an hourly wage rate of his regular hourly wage plus \$5.00 per hour. An operating engineer working at a hazardous waste removal project or site at a task requiring hazardous waste related certification, but who is not working in a zone requiring level A, B, or C personal protection, shall receive an hourly wage rate of his regular rate plus \$ 1.00 per hour. This shall also apply to sites where the level D personal protection is required.

SUPPLEMENTAL BENEFITS

Per hour:

Journeyman \$ 33.50

OVERTIME PAY

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

*15% premium is also required on shift work benefits

HOLIDAY

Paid: See (5, 6, 10, 13, 15) on HOLIDAY PAGE

Overtime: See (5, 6, 10, 13, 15) on HOLIDAY PAGE

Holidays falling on Sunday will be celebrated on Monday.

REGISTERED APPRENTICES

(1) year terms at the following percentage of journeyman's wage.

1st year	60% of Class base wage plus \$3.00*
2nd year	70% of Class base wage plus \$3.00*
3rd year	80% of Class base wage plus \$3.00*
4th year	90% of Class base wage plus \$3.00*

*The \$3.00 is added to the Class Base Wage for all hours worked. Additionally, the \$3.00 is subject to the V-Code listed on the OVERTIME CODE Sheet.

Supplemental Benefits per hour:

Apprentices \$ 33.50

11-825SE

Painter

10/01/2022

JOB DESCRIPTION Painter

DISTRICT 1

ENTIRE COUNTIES

Columbia, Dutchess, Greene, Orange, Sullivan, Ulster

WAGES

Per hour

07/01/2022

Brush/Paper Hanger	\$ 37.09
Dry Wall Finisher	37.09
Lead Abatement	37.09
Sandblaster-Painter	37.09
Spray Rate	38.09

See Bridge Painting rates for the following work:

Structural Steel , all work performed on tanks, ALL BRIDGES, towers, smoke stacks, flag poles. Rate shall apply to all of said areas from the ground up.

SUPPLEMENTAL BENEFITS

Per hour

Journeyperson \$ 25.29

OVERTIME PAY

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

THE FOLLOWING RATES WILL APPLY ON ALL CONTRACTING AGENCY MANDATED SHIFT(S) OR SINGULAR IRREGULAR SHIFT OF AT LEAST A FIVE (5) DAY DURATION (MONDAY THROUGH FRIDAY), WHEN THE SHIFT STARTS BETWEEN THE HOURS LISTED BELOW:

4:00 PM to 6:30 AM REGULAR RATE PLUS 15%**

OVERTIME ON MULTIPLE SHIFT WORK AND SINGULAR IRREGULAR SHIFT THE SHIFT RATE IS THE BASE RATE

**SHIFT RATE STOPS AFTER 6:30AM

HOLIDAY

Paid: See (1) on HOLIDAY PAGE

Overtime: See (5, 6) on HOLIDAY PAGE

REGISTERED APPRENTICES

Wages per hour

Six (6) month terms at the following percentage of Journeyperson's wage

1st	2nd	3rd	4th	5th	6th
40%	50%	60%	70%	80%	90%

Supplemental Benefits per hour worked

1st term	\$ 10.99
All others	25.29

1-155

Painter - Bridge & Structural Steel

10/01/2022

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:	07/01/2022	10/01/2022
	\$ 53.00	\$ 54.50
	+ 9.63*	+ 10.10*

ADDITIONAL \$6.00 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:	\$ 10.90	\$ 11.78
	+ 30.60*	+ 30.75*

* 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	\$ 21.20	\$ 21.80
	+ 3.86	+ 4.04
2nd year	\$ 31.80	\$ 32.70
	+ 5.78	+ 6.06

3rd year	\$ 42.40 + 7.70	\$ 43.60 + 8.08
Supplemental Benefits - Per hour:		
1st year	\$.25 + 12.24	\$.25 + 12.34
2nd year	\$ 10.90 + 18.36	\$ 10.90 + 18.51
3rd year	\$ 10.90 + 24.48	\$ 10.90 + 24.68

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

8-DC-9/806/155-BrSS

Painter - Line Striping	10/01/2022
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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):	07/01/2022
Striping-Machine Operator*	\$ 31.53

Linerman Thermoplastic	38.34
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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.

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.

NOTE - In order to use the '4 Day/10 Hour Work Schedule,' as your normal schedule, you must submit an 'Employer Registration for Use of 4 Day/10 Hour Work Schedule,' form PW30.1; and there must be a dispensation of hours in place on the project. If the PW30.1 is not submitted you may be liable for overtime payments for work over 8 hours per day.

SUPPLEMENTAL BENEFITS

Per hour paid:

Journeyworker:	
Striping Machine Operator:	\$ 10.03
Linerman Thermoplastic:	10.03

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
2nd Term:	18.92
3rd Term:	25.22

Supplemental Benefits per hour:

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

8-1456-LS

Painter - Metal Polisher	10/01/2022
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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

	07/01/2022
Metal Polisher	\$ 37.78
Metal Polisher*	38.80
Metal Polisher**	41.78

*Note: Applies on New Construction & complete renovation

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

SUPPLEMENTAL BENEFITS

Per Hour:	07/01/2022
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Journeyworker:	
All classification	\$ 11.24

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:

	07/01/2022
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	\$ 7.99
2nd year	7.99
3rd year	7.99

8-8A/28A-MP

Plumber

10/01/2022

JOB DESCRIPTION Plumber

DISTRICT 11

ENTIRE COUNTIES

Orange, Rockland, Sullivan

PARTIAL COUNTIES

Ulster: Only the Townships of Plattekill, Marlboro, Wawarsing, and Shawangunk (except for Wallkill and Shawangunk Prisons).

WAGES

REFRIGERATION: For commercial and industrial refrigeration which means service, maintenance, and installation work where the combined compressor tonnage does not exceed 40 tons.

AIR CONDITIONING: Air conditioning to be installed that is water cooled shall not exceed 25 tons. This will include the piping of the component system and erection of water tower. Air conditioning that is air cooled shall not exceed 50 tons.

WAGES: (per hour)

	07/01/2022	05/01/2023	05/01/2024	05/01/2025
		Additional	Additional	Additional
Plumber	\$ 37.34	\$ 2.25*	\$ 2.25*	\$ 2.50*

*to be allocated at a later date

Star Certification: an additional \$ 1.00 per hour over scale will be paid to all those who have Star Certification.

Shift Differential: When mandated by the governmental agency, an additional 15% premium will be paid for irregular work day or for 2nd and 3rd shift.

SUPPLEMENTAL BENEFITS

Per hour:

Journeyman	\$ 35.07*
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*For overtime or shift differential work, \$0.10 is paid at straight time, the remaining balance is paid at the same premium as the wages.

OVERTIME PAY

See (B, G, P, *V) on OVERTIME PAGE

* A portion of the benefit amount is subject to the V code for overtime and shift differential work.

HOLIDAY

Paid: See (5, 6, 13, 15, 25) on HOLIDAY PAGE

Overtime: See (5, 6, 13, 15, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES

(1)year terms at the following wage.

	07/01/2022
1st term	\$ 16.81
2nd term	20.54
3rd term	24.28
4th term	28.01
5th term	31.74

Supplemental Benefits per hour:

Apprentices

1st term	\$ 15.86*
2nd term	19.36*
3rd term	22.85*
4th term	26.36*
5th term	29.85*

*For overtime or shift differential work, \$0.10 is paid at straight time, the remaining balance is paid at the same premium as the wages.

11-373 Refrig

Plumber

10/01/2022

JOB DESCRIPTION Plumber

DISTRICT 11

ENTIRE COUNTIES

Orange, Rockland, Sullivan

PARTIAL COUNTIES

Ulster: Only the Townships of Plattekill, Marlboro, Wawarsing, and Shawangunk (except for Wallkill and Shawangunk Prisons).

WAGES

WAGES:(per hour)	07/01/2022	05/01/2023	05/01/2024
		Additional	Additional
Plumber/Steamfitter	\$ 49.45	\$ 2.25*	\$ 2.25*

*to be allocated at a later date

Note: For all work 40-60 feet above ground add \$ 0.25 per hour, over 60 feet add \$ 0.50 per hour.

Shift Differential: When mandated by the governmental agency, an additional 15% premium will be paid for irregular work day or for 2nd and 3rd shift.

SUPPLEMENTAL BENEFITS

Per hour:

Journeyman \$ 43.07*

*For overtime or shift differential work, \$0.10 is paid at straight time, the remaining balance is paid at the same premium as the wages.

OVERTIME PAY

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

* A portion of the benefit amount is subject to the V code for overtime and shift differential work.

HOLIDAY

Paid: See (1) on HOLIDAY PAGE

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

When a holiday falls on a Saturday, the day prior shall be considered and recognized as the holiday. When a holiday falls on a Sunday, the day proceeding shall be considered and recognized as the holiday to be observed.

REGISTERED APPRENTICES

(1) year terms at the following wages.

07/01/2022

1st term	\$ 17.31
2nd term	22.26
3rd term	27.20
4th term	32.15
5th term	39.56

Supplemental Benefits per hour:

1st term	\$ 15.16*
2nd term	19.45*
3rd term	23.74*
4th term	28.04*
5th term	34.47*

*For overtime or shift differential work, \$0.10 is paid at straight time, the remaining balance is paid at the same premium as the wages.

11-373 SF

Roofer

10/01/2022

JOB DESCRIPTION Roofer

DISTRICT 9

ENTIRE COUNTIES

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

WAGES

Per Hour:	07/01/2022	05/01/2023
		Additional
Roofer/Waterproofer	\$ 45.25	\$ 2.00
	+ \$7.00*	

* This portion is not subjected to overtime premiums.

Note: Abatement/Removal of Asbestos containing roofs and roofing material is classified as Roofer.

SUPPLEMENTAL BENEFITS

Per Hour: \$ 30.62

OVERTIME PAY

See (B, H) on OVERTIME PAGE

Note: An observed holiday that falls on a Sunday will be observed the following Monday.

HOLIDAY

Paid: See (1) on HOLIDAY PAGE

Overtime: See (5, 6) on HOLIDAY PAGE

REGISTERED APPRENTICES

(1) year term

	1st	2nd	3rd	4th
	\$ 15.84	\$ 22.63	\$ 27.15	\$ 33.94
		+ 3.50*	+ 4.20*	+ 5.26*
Supplements:				
	1st	2nd	3rd	4th
	\$ 3.88	\$ 15.48	\$ 18.50	\$ 23.04

* This portion is not subjected to overtime premiums.

9-8R

Sheetmetal Worker

10/01/2022

JOB DESCRIPTION Sheetmetal Worker

DISTRICT 8

ENTIRE COUNTIES

Dutchess, Orange, Putnam, Rockland, Sullivan, Ulster, Westchester

WAGES

07/01/2022
SheetMetal Worker \$ 45.25
+ 3.52*

*This portion is not subject to overtime premiums.

SHIFT WORK

For all NYS D.O.T. and other Governmental mandated off-shift work:
10% increase for additional shifts for a minimum of five (5) days

SUPPLEMENTAL BENEFITS

Journeyworker \$ 45.20

OVERTIME PAY

OVERTIME: See (B, E, Q,) on OVERTIME PAGE.

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 15, 16, 23) on HOLIDAY PAGE

REGISTERED APPRENTICES

1st	2nd	3rd	4th	5th	6th	7th	8th
\$ 16.79	\$ 18.88	\$ 21.00	\$ 23.08	\$ 25.20	\$ 27.30	\$ 29.89	\$ 32.43
+ 1.41*	+ 1.58*	+ 1.76*	+ 1.94*	+ 2.11*	+ 2.29*	+ 2.46*	+ 2.64*

*This portion is not subject to overtime premiums.

Supplemental Benefits per hour:

Apprentices

1st term	\$ 19.37
2nd term	21.81
3rd term	24.21
4th term	26.65
5th term	29.06
6th term	31.48
7th term	33.42
8th term	35.40

8-38

Sprinkler Fitter

10/01/2022

JOB DESCRIPTION Sprinkler Fitter

DISTRICT 1

ENTIRE COUNTIES

Dutchess, Orange, Putnam, Rockland, Sullivan, Ulster, Westchester

WAGES

Per hour 07/01/2022

Sprinkler \$ 48.98
Fitter

SUPPLEMENTAL BENEFITS

Per hour

Journeyperson \$ 29.13

OVERTIME PAY

See (B, E, Q) on OVERTIME PAGE

HOLIDAY

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

Note: When a holiday falls on Sunday, the following Monday shall be considered a holiday and all work performed on either day shall be at the double time rate. When a holiday falls on Saturday, the preceding Friday shall be considered a holiday and all work performed on either day shall be at the double time rate.

REGISTERED APPRENTICES

Wages per hour

One Half Year terms at the following wage.

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
\$ 23.70	\$ 26.34	\$ 28.72	\$ 31.35	\$ 33.99	\$ 36.62	\$ 39.25	\$ 41.89	\$ 44.52	\$ 47.15

Supplemental Benefits per hour

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
\$ 8.37	\$ 8.37	\$ 19.76	\$ 19.76	\$ 20.01	\$ 20.01	\$ 20.01	\$ 20.01	\$ 20.01	\$ 20.01
									1-669.2

Teamster - Building / Heavy&Highway	10/01/2022
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JOB DESCRIPTION Teamster - Building / Heavy&Highway

DISTRICT 11

ENTIRE COUNTIES

Dutchess, Orange, Rockland, Sullivan, Ulster

WAGES

GROUP 1: LeTourneau Tractors, Double Barrel Euclids, Athney Wagons and similar equipment (except when hooked to scrapers), I-Beam and Pole Trailers, Tire Trucks, Tractor and Trailers with 5 axles and over, Articulated Back Dumps and Road Oil Distributors, Articulated Water Trucks and Fuel Trucks/Trailers, positions requiring a HAZMAT CDL endorsement.

GROUP 1A: Drivers on detachable Gooseneck Low Bed Trailers rated over 35 tons.

GROUP 2: All equipment 25 yards and up to and including 30 yard bodies and cable Dump Trailers and Powder and Dynamite Trucks.

GROUP 3: All Equipment up to and including 24-yard bodies, Mixer Trucks, Dump Crete Trucks and similar types of equipment, Fuel Trucks, Batch Trucks and all other Tractor Trailers, Hi-Rail Truck.

GROUP 4: Tri-Axles, Ten Wheelers, Grease Trucks, Tillerman, Pattern Trucks, Attenuator Trucks, Water Trucks, Bus.

GROUP 5: Straight Trucks.

GROUP 6: Pick-up Trucks for hauling materials and parts, and Escort Man over-the-road.

WAGES: (per hour)	07/01/2022	05/01/2023
GROUP 1	\$ 34.28	\$ 34.58
GROUP 1A	35.42	35.72
GROUP 2	33.72	34.02
GROUP 3	33.50	33.80
GROUP 4	33.39	33.69
GROUP 5	33.27	33.57
GROUP 6	33.27	33.57

NOTE ADDITIONAL PREMIUMS:

- On projects requiring an irregular shift a premium of 10% will be paid on wages. The premium will be paid for off-shift or irregular shift work when mandated by Governmental Agency.
- Employees engaged in hazardous/toxic waste removal, on a State or Federally designated hazardous/toxic waste site, where the employee comes in contact with hazardous/toxic waste material and when personal protective equipment is required for respiratory, skin, or eye protection, the employee shall receive an additional 20% premium above the hourly wage.

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.

NOTE - In order to use the '4 Day/10 Hour Work schedule', as your normal schedule, you must submit an 'Employer Registration for Use of 4 Day/10 Hour Work Schedule,' form PW30.1; and there must be a dispensation of hours in place on the project. If the PW30.1 is not submitted you may be liable for overtime payments for work over 8 hours per day.

SUPPLEMENTAL BENEFITS

Per hour:

First 40 hours	\$ 42.16	\$ 44.59
Over 40 hours	34.76	36.99

OVERTIME PAY

See (*B, E, **E2, ***P, X) on OVERTIME PAGE

*Holidays worked Monday through Friday receive Double Time (2x) after 8 hours.

**Makeup day limited to the employees who were working on the site that week.

***Sunday Holidays are paid at a rate of double time and one half (2.5x) for all hours worked.

HOLIDAY

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

- Any employee working two (2) days in any calendar week during which a holiday occurs shall receive a days pay for each holiday occurring during said week. This provision shall also apply if a holiday falls on a Saturday or Sunday.

*See OVERTIME PAY section for when additional premium is applicable on Holiday hours worked.

11-445B/HH

Teamster - Delivery - Building / Heavy&Highway**10/01/2022**

JOB DESCRIPTION Teamster - Delivery - Building / Heavy&Highway**DISTRICT** 11**ENTIRE COUNTIES**

Dutchess, Orange, Rockland, Sullivan, Ulster

WAGES

Group 1 Tractor Trailer Drivers
Group 2 Tri- Axle
Group 3 Senior Teamster

Wages:	07/01/2022	05/01/2023
Group 1	\$ 33.20	\$ 33.70
Group 2	29.20	29.70
Group 3	34.20	34.70

Hazardous/Toxic Waste Removal additional 20% when personal protective equipment is required

SUPPLEMENTAL BENEFITS

Per hour paid:

First 40 hours	\$ 31.50	\$ 32.30
Over 40 hours	0.00	0.00

OVERTIME PAY

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

HOLIDAY

Paid: See (5, 13, 15, 16, 20, 22, 25, 26) on HOLIDAY PAGE

Overtime: See (5, 13, 15, 16, 20, 22, 25, 26) on HOLIDAY PAGE

- Employee must work either the scheduled day of work before or the scheduled day of work after the holiday in the workweek.

- Any employee working one (1) day in the calendar week during which a holiday occurs shall receive a day's pay for each holiday occurring during said week. This provision shall also apply if a holiday falls on a Saturday.

- When any of the recognized holidays occur on Sunday and are celebrated any day before or after the holiday Sunday, such days shall be considered as the holiday and paid for as such.

11-445 B/HH Delivery

Welder**10/01/2022**

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 07/01/2022

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 12240

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
- ☐ Guards, Watchmen
☐ Janitors, Porters, Cleaners, Elevator Operators
☐ Moving furniture and equipment
☐ Trash and refuse removal
☐ Window cleaners
☐ Other (Describe)

9. Has this project been reviewed for compliance 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://applications.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 09/21/2022

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	*****6775	ADVENTURE MASONRY CORP.		1535 RICHMOND AVENUE STATEN ISLAND NY 10314	12/13/2017	12/13/2022
DOL	NYC		AGOSTINHO TOME		405 BARRETTO ST BRONX NY 10474	05/31/2018	05/31/2023
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		ANITA SALERNO		158 SOLAR ST SYRACUSE NY 13204	01/07/2019	01/07/2024
DOL	DOL		ANTONIO ESTIVEZ		442 ARMONK RD MOUNT KISCO NY 10549	06/12/2018	06/12/2023
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 CROPSY 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		BIAGIO CANTISANI			06/12/2018	06/12/2023
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		BRUCE P. NASH JR.		5841 BUTTERNUT ROAD EAST SYRACUSE NY 13057	09/12/2018	09/12/2023
DOL	DOL	*****0225	C&D LAFACE CONSTRUCTION, INC.		8531 OSWEGO RD BALDWINVILLE NY 13027	02/03/2020	01/09/2023
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

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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	DOL		CANTISANI & ASSOCIATES LTD		442 ARMONK RD MOUNT KISCO NY 10549	06/12/2018	06/12/2023
DOL	DOL		CANTISANI HOLDING LLC			06/12/2018	06/12/2023
DOL	DOL		CARMEN RACHETTA		8531 OSWEGO RD BALDWINVILLE NY 13027	02/03/2020	02/03/2025
DOL	DOL		CARMENA RACHETTA		8531 OSWEGO ROAD BALDWINVILLE NY 13027	02/03/2020	01/09/2023
DOL	DOL	*****3812	CARMODY "2" INC			06/12/2018	06/12/2023
DOL	DOL	*****1143	CARMODY BUILDING CORP	CARMODY CONTRACTIN G AND CARMODY CONTRACTIN G CORP.	442 ARMONK RD MOUNT KISCO NY 10549	06/12/2018	06/12/2023
DOL	DOL		CARMODY CONCRETE CORPORATION			06/12/2018	06/12/2023
DOL	DOL		CARMODY ENTERPRISES, LTD.		442 ARMONK RD MOUNT KISCO NY 10549	06/12/2018	06/12/2023
DOL	DOL		CARMODY INC		442 ARMONK RD MOUNT KISCO NY 10549	06/12/2018	06/12/2023
DOL	DOL	*****3812	CARMODY INDUSTRIES INC			06/12/2018	06/12/2023
DOL	DOL		CARMODY MAINTENANCE CORPORATION		442 ARMONK RD MOUNT KISCO NY 10549	06/12/2018	06/12/2023
DOL	DOL		CARMODY MASONRY CORP		442 ARMONK RD MOUNT KISCO NY 10549	06/12/2018	06/12/2023
DOL	AG	*****7247	CENTURY CONCRETE CORP		2375 RAYNOR ST RONKONKOMA NY 11779	08/04/2021	08/04/2026
DOL	AG		CESAR J. AGUDELO		81-06 34TH AVENUE APT. 6E JACKSON HEIGHTS NY 11372	02/07/2018	02/07/2023
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 J MAINI		19 CAITLIN AVE JAMESTOWN NY 14701	09/17/2018	09/17/2023
DOL	DOL		CHRISTOPHER PAPASTEFANOU A/K/A CHRIS PAPASTEFANOU		1445 COMMERCE AVE BRONX NY 10461	05/30/2019	05/30/2024
DOL	DOL	*****1927	CONSTRUCTION PARTS WAREHOUSE, INC.	CPW	5841 BUTTERNUT ROAD EAST SYRACUSE NY 13057	09/12/2018	09/12/2023
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	NYC		DALJIT KAUR BOPARAI		185-06 56TH AVE FRESH MEADOW NY 11365	10/17/2017	10/17/2022
DOL	DOL	*****7619	DANCO CONSTRUCTION UNLIMITED INC.		485 RAFT AVENUE HOLBROOK NY 11741	10/19/2021	10/19/2026
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	AG		DEBRA MARTINEZ		31 BAY ST BROOKLYN NY 11231	03/28/2018	03/28/2023
DOL	DOL		DELPHI PAINTING & DECORATING CO INC		1445 COMMERCE AVE BRONX NY 10461	05/30/2019	05/30/2024
DOL	DOL		DOMENICO LAFACE		8531 OSWEGO RD BALDWINVILLE NY 13027	02/03/2020	01/09/2023
DOL	DOL	*****5175	EAGLE MECHANICAL AND GENERAL CONSTRUCTION LLC		11371 RIDGE RD WOLCOTT NY 14590	02/03/2020	02/03/2025

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DOL	DOL		EAST COAST PAVING		2238 BAKER RD GILLET PA 16923	03/12/2018	03/12/2023
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	DOL		FRANK BENEDETTO		19 CATLIN AVE JAMESTOWN NY 14701	09/17/2018	09/17/2023
DOL	DOL	*****4722	FRANK BENEDETTO AND CHRISTOPHER J MAINI	B & M CONCRETE	19 CAITLIN AVE JAMESTOWN NY 14701	09/17/2018	09/17/2023
DOL	NYC		FRANK MAINI		1766 FRONT ST YORKTOWN HEIGHTS NY 10598	01/17/2018	01/17/2023
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	DOL		GIOVANNI LAFACE		8531 OSWEGO RD BALDWINVILLE NY 13027	02/03/2020	01/09/2023
DOL	NYC	*****3164	GLOBE GATES INC	GLOBAL OVERHEAD DOORS	405 BARRETTO ST BRONX NY 10474	05/31/2018	05/31/2023
DOL	NYC		GREAT ESTATE CONSTRUCTION, INC.		327 STAGG ST BROOKLYN NY 11206	10/10/2017	10/10/2022
DOL	DOL		GREGORY S. OLSON		P.O BOX 100 200 LATTA BROOK PARKHORSEHEADS NY 14845	03/08/2018	03/08/2023
DOL	DOL		HANS RATH		24 ELDOR AVENUE NEW CITY NY 10956	02/03/2020	02/03/2025
DOL	NYC	*****3228	HEIGHTS ELEVATOR CORP.		1766 FRONT ST YORKTOWN HEIGHTS NY 10598	01/17/2018	01/17/2023
DOL	DOL	*****5131	INTEGRITY MASONRY, INC.	M&R CONCRETE	722 8TH AVE WATERVLIET NY 12189	06/05/2018	06/05/2023
DOL	DOL		IRENE KASSELIS		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.A. HIRES CADWALLADER		P.O BOX 100 200 LATTA BROOK PARKHORSEHEADS NY 14845	03/08/2018	03/08/2023
DOL	DOL		JAMES C. DELGIACCO		722 8TH AVE WATERVLIET NY 12189	06/05/2018	06/05/2023
DOL	DOL		JAMES J. BAKER		7901 GEE ROAD CANASTOTA NY 13032	08/17/2021	08/17/2026
DOL	DOL		JAMES LIACONE		9365 WASHINGTON ST LOCKPORT IL 60441	07/23/2018	07/23/2023
DOL	DOL		JAMES RACHEL		9365 WASHINGTON ST LOCKPORT IL 60441	07/23/2018	07/23/2023
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	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	*****5368	JCH MASONRY & LANDSCAPING INC.		35 CLINTON AVE OSSINING NY 10562	09/12/2018	09/12/2023

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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	AG		JOHN ANTHONY MASSINO		36-49 204TH STREET BAYSIDE NY 11372	02/07/2018	02/07/2023
DOL	DOL		JOHN F. CADWALLADER		200 LATTA BROOK PARK HORSEHEADS NY 14845	03/08/2018	03/08/2023
DOL	DOL	*****4612	JOHN F. CADWALLADER, INC.	THE GLASS COMPANY	P.O BOX 100 200 LATTA BROOK PARKHORSEHEADS NY 14845	03/08/2018	03/08/2023
DOL	DOL		JOHN GOCEK		14B COMMERCIAL AVE ALBANY NY 12065	11/14/2019	11/14/2024
DOL	DOL		JOHN LUCIANO			05/14/2018	05/14/2023
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	AG	*****0600	JOHNCO CONTRACTING, INC.		36-49 204TH STREET BAYSIDE NY 11372	02/07/2018	02/07/2023
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		JOSE CHUCHUCA		35 CLINTON AVE OSSINING NY 10562	09/12/2018	09/12/2023
DOL	NYC		JOSEPH MARTINO		1535 RICHMOND AVENUE STATEN ISLAND NY 10314	12/13/2017	12/13/2022
DOL	DOL		JOY MARTIN		2404 DELAWARE AVE NIGARA FALLS NY 14305	09/12/2018	09/12/2023
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	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		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		KATIE BURDICK		2238 BAKER RD GILLET PA 16923	03/12/2018	03/12/2023
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	DOL	*****3490	L & M CONSTRUCTION/DRYWALL INC.		1079 YONKERS AVE YONKERS NY 10704	08/07/2018	08/07/2023
DOL	DA	*****8816	LAKE CONSTRUCTION AND DEVELOPMENT CORPORATION		150 KINGS STREET BROOKLYN NY 11231	08/19/1998	08/19/2998
DOL	DOL		LAVERN GLAVE		161 ROBYN RD MONROE NY 10950	01/30/2018	01/30/2023
DOL	AG	*****3291	LINTECH ELECTRIC, INC.		3006 TILDEN AVE BROOKLYN NY 11226	02/16/2022	02/16/2027
DOL	DA	*****4460	LONG ISLAND GLASS & STOREFRONTS, LLC		4 MANHASSET TRL RIDGE NY 11961	09/06/2018	09/06/2023
DOL	AG	*****4216	LOTUS-C CORP.		81-06 34TH AVENUE APT. 6EJACKSON HEIGHTS NY 11372	02/07/2018	02/07/2023
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

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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		MASONRY CONSTRUCTION, INC.		442 ARMONK RD MOUNT KISCO NY 10549	06/12/2018	06/12/2023
DOL	DOL	*****3333	MASONRY INDUSTRIES, INC.		442 ARMONK RD MOUNT KISCO NY 10549	06/12/2018	06/12/2023
DOL	NYC		MATINA KARAGIANNIS		97-18 50TH AVE CORONA NY 11368	04/19/2018	04/19/2023
DOL	DOL		MATTHEW P. KILGORE		4156 WILSON ROAD EAST TABERG NY 13471	03/26/2019	03/26/2024
DOL	DOL		MAURICE GAWENO		442 ARMONK RD MOUNT KISCO NY 10549	06/12/2018	06/12/2023
DOL	DOL		MICHAEL LENIHAN		1079 YONKERS AVE UNIT 4YONKERS NY 10704	08/07/2018	08/07/2023
DOL	AG		MICHAEL RIGLIETTI		31 BAY ST BROOKLYN NY 11231	03/28/2018	03/28/2023
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	AG		MSR ELECTRICAL CONSTRUCTION CORP.		31 BAY ST BROOKLYN NY 11231	03/28/2018	03/28/2023
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	DA	*****9786	NATIONAL INSULATION & GC CORP		180 MILLER PLACE HICKSVILLE NY 11801	12/12/2018	12/12/2023
DOL	DOL	*****3684	NATIONAL LAWN SPRINKLERS, INC.		645 N BROADWAY WHITE PLAINS NY 10603	05/14/2018	05/14/2023
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	09/29/2021	09/29/2026
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 CONSTRUCTION, INC.	444 SCHANTZ ROAD ALLENTOWN PA 18104	09/17/2020	09/17/2025
DOL	DOL	*****1845	OC ERECTERS, LLC A/K/A OC ERECTERS OF NY INC.		1207 SW 48TH TERRACE DEERFIELD BEACH FL 33442	01/16/2018	01/16/2023
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	*****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	01/30/2018	01/30/2023
DOL	DOL	*****2633	RAW POWER ELECTRIC CORP.		3 PARK CIRCLE MIDDLETOWN NY 10940	07/11/2022	07/11/2027
DOL	AG	*****7015	RCM PAINTING INC.		69-06 GRAND AVENUE 2ND FLOORMASPETH NY 11378	02/07/2018	02/07/2023
DOL	DA	*****7559	REGAL CONTRACTING INC.		24 WOODBINE AVE NORTHPORT NY 11768	10/01/2020	10/01/2025
DOL	DOL		REGINALD WARREN		161 ROBYN RD MONROE NY 10950	01/30/2018	01/30/2023

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DOL	DOL	*****9148	RICH T CONSTRUCTION		107 WILLOW WOOD LANE CAMILLUS NY 13031	11/13/2018	11/13/2023
DOL	DOL		RICHARD MACONE		8617 THIRD AVE BROOKLYN NY 11209	09/17/2018	09/17/2023
DOL	DOL		RICHARD REGGIO		1617 MAIN ST PEEKSKILL NY 10566	03/03/2020	03/03/2025
DOL	DOL	*****9148	RICHARD TIMIAN	RICH T CONSTRUCTI ON	108 LAMONT AVE SYRACUSE NY 13209	10/16/2018	10/16/2023
DOL	DOL		RICHARD TIMIAN JR.		108 LAMONT AVE SYRACUSE NY 13209	10/16/2018	10/16/2023
DOL	DOL		RICHARD TIMIAN JR.		108 LAMONT AVE SYRACUSE NY 13209	11/13/2018	11/13/2023
DOL	DOL		ROBBYE BISSESAAR		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		RODERICK PUGH		404 OAK ST SUITE 101SYRACUSE NY 13203	07/23/2018	07/23/2023
DOL	DOL	*****4880	RODERICK PUGH CONSTRUCTION INC.		404 OAK ST SUITE 101SYRACUSE NY 13203	07/23/2018	07/23/2023
DOL	DOL		ROMEO WARREN		161 ROBYN RD MONROE NY 10950	01/30/2018	01/30/2023
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		ROSEANNE CANTISANI			06/12/2018	06/12/2023
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	*****7730	S C MARTIN GROUP INC.		2404 DELAWARE AVE NIAGARA FALLS NY 14305	09/12/2018	09/12/2023
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 RD POMPEI 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	NYC		SANDEEP BOPARAI		185-06 56TH AVE FRESH MEADOW NY 11365	10/17/2017	10/17/2022
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	*****1961	SHANE BURDICK	CENTRAL TRAFFIC CONTROL, LLC.	2238 BAKER ROAD GILLET PA 16923	03/12/2018	03/12/2023
DOL	DOL		SHANE BURDICK		2238 BAKER ROAD GILLET PA 16923	03/12/2018	03/12/2023
DOL	DOL		SHANE NOLAN		9365 WASHINGTON ST LOCKPORT IL 60441	07/23/2018	07/23/2023
DOL	DOL		SHULEM LOWINGER		11 MOUNTAIN ROAD 28 VAN BUREN DRMONROE NY 10950	03/20/2019	03/20/2024

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DOL	DOL	*****0816	SOLAR ARRAY SOLUTIONS, LLC		9365 WASHINGTON ST LOCKPORT IL 60441	07/23/2018	07/23/2023
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	DOL	*****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		STEVEN MARTIN		2404 DELWARE AVE NIAGARA FALLS NY 14305	09/12/2018	09/12/2023
DOL	DOL	*****3800	SUBURBAN RESTORATION CO. INC.		5-10 BANTA PLACE FAIR LAWN PLACE NJ 07410	03/29/2021	03/29/2026
DOL	NYC	*****5863	SUKHMANY CONSTRUCTION, INC.		185-06 56TH AVE FRESH MEADOW NY 11365	10/17/2017	10/17/2022
DOL	DOL	*****1060	SUNN ENTERPRISES GROUP, LLC		370 W. PLEASANTVIEW AVE SUITE 2.329HACKENSACK NJ 07601	02/11/2019	02/11/2024
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		TALAILA OCAMPA		1207 SW 48TH TERRACE DEERFIELD BEACH FL 33442	01/16/2018	01/16/2023
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 CORPORATION	2610 SOUTH SALINA ST SUITE 14SYRACUSE NY 13205	12/04/2018	12/04/2023
DOL	DOL	*****5766	THE COKER CORPORATION	COKER CORPORATION	2610 SOUTH SALINA ST SUITE 14SYRACUSE NY 13205	09/17/2020	09/17/2025
DOL	DA	*****4106	TRIPLE H CONCRETE CORP		2375 RAYNOR STREET RONKONKOMA NY 11779	08/04/2021	08/04/2026
DOL	DOL	*****6392	V.M.K CORP.		8617 THIRD AVE BROOKLYN NY 11209	09/17/2018	09/17/2023
DOL	DOL	*****6418	VALHALLA CONSTRUCTION, LLC.		796 PHELEPS ROAD FRANKLIN LAKES NJ 07417	12/01/2020	12/01/2025
DOL	NYC	*****2426	VICKRAM MANGRU	VICK CONSTRUCTION	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 DOUGLSTON NY 11363	01/14/2019	01/14/2024
DOL	NYC		VIKTAR PATONICH		2630 CROPSEY AVE BROOKLYN NY 11214	10/30/2018	10/30/2023

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DOL	DOL		VIKTORIA RATH		24 ELDOR AVENUE NEW CITY NY 10956	02/03/2020	02/03/2025
DOL	NYC		VITO GARGANO		1535 RICHMOND AVE STATEN ISLAND NY 10314	12/13/2017	12/13/2022
DOL	NYC	*****3673	WALTERS AND WALTERS, INC.		465 EAST AND THIRD ST MT. VERNON NY 10550	09/09/2019	09/09/2024
DOL	DOL	*****3296	WESTERN NEW YORK CONTRACTORS, INC.		3841 LAYNARD COURT NEW PORT RICHEY FL 34652	07/09/2019	07/09/2024
DOL	DOL		WHITE PLAINS CARPENTRY CORP		442 ARMONK RD	06/12/2018	06/12/2023
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 CONTRACTIN G, INC.	54 PENTAQUIT AVE BAYSHORE NY 11706	01/19/2021	01/19/2026
DOL	DOL	*****4043	WINDSHIELD INSTALLATION NETWORK, INC.		200 LATTA BROOK PARK HORSEHEADS NY 14845	03/08/2018	03/08/2023
DOL	DOL	*****4730	XGD SYSTEMS, LLC	TDI GOLF	415 GLAGE AVE #302STUART FL 34994	10/31/2018	10/31/2023
DOL	NYC		ZAKIR NASEEM		30 MEADOW ST BROOKLYN NY 11206	10/10/2017	10/10/2022
DOL	NYC	*****8277	ZHN CONTRACTING CORP		30 MEADOW ST BROOKLYN NY 11206	10/10/2017	10/10/2022

GENERAL CONDITIONS

ARTICLE I

Statement of Performance and Compensation

1.1 The Contractor, at its own sole cost and expense, shall furnish all labor and services and all material and equipment necessary to perform the Contract Work and all work incidental thereto and shall perform all such work to completion in strict accordance with the Contract Documents as defined herein and subject to the satisfaction and approval of the Owner, within the time specified in the Information for Bidders, and further subject to all the covenants, agreements, promises, and conditions hereto.

1.2 The Owner shall pay and the Contractor shall accept, in full consideration of the Contractor's performance of the Contract, subject to additions and deductions as provided herein, the sum of _____.
(\$ _____).

ARTICLE II

Definitions

2.1 The Contract. The following shall be referred to as the "Contract Documents" and shall be deemed to be a part of this Contract:

- a. Invitation to bid and information for bidders;
- b. Proposal or bid;
- c. Qualification of Bidder;
- d. Notice of Intent to Award;
- e. Notice of Award;
- f. Notice to Proceed;

- g. General Conditions;
- h. Special Conditions;
- i. Specifications;
- j. Drawings;
- k. All Addenda issued by Owner;
- l. All provisions required by law to be deemed included in this Contract whether or not actually appearing therein;
- m. Performance and Payment Bonds.

2.2 "ADDENDUM" or "ADDENDA" shall mean those additional contract provisions issued in writing by the Owner prior to receipt of bids.

2.3 "CHANGE ORDER" shall mean those written orders, specified in Article IX, by which the Owner may order revisions, additions, or omissions to the Work.

2.4 "CONTRACT" shall mean the agreement between the parties as expressed in those Contract Documents referred to in Paragraph 2.1 of this Article.

2.5 "CONTRACT PRICE" shall mean the lump sum price, or gross price in the case of a unit price contract, provided in Article I for which Contractor agrees to perform the Work.

2.6 "CONTRACTOR" shall mean the party of the second part hereto, whether corporation, partnership, joint venture, or individual, or any combination thereof, and its, their or his or her successors, personal representatives, executors, administrators and assigns, and any person, firm or corporation who or which shall at any time be legally substituted in the place of the party of the second part under this Contract.

"OTHER CONTRACTORS" shall mean any contractor (other than the party of the second part or its sub-contractors) who has a contract with the Owner for work on or adjacent to the building or site of the work.

2.7 "CONTRACT DRAWINGS" shall mean only those drawings specifically entitled as such

and listed in the specifications or in any addenda, or any detailed drawings furnished by the Owner, pertaining or supplemental thereto.

2.8 "CONTRACT WORK" shall mean everything required to be furnished and done by the Contractor by any one or more of the parts of the Contract referred to in Paragraph 2.1 hereof, except Extra Work as hereinafter defined; it being understood that, in case of any inconsistency or ambiguity in or between any part or parts of this Contract, the Owner shall determine which shall prevail.

2.9 "DISPUTED WORK" shall mean work which the Contractor is ordered to perform, and which the Contractor claims should be considered Extra Work and not Contract Work and which the Owner claims is Contract Work.

2.10 "ENGINEER" shall mean the Engineer of the Owner duly designated by the Owner to be its representative at the site of the work, to administer the Contract and to exercise all the duties and rights to which the Engineer is entitled under the Contract and the Engineer's agreement with the Owner.

2.11 "EXCUSABLE DELAY" shall mean delay in the Contractor's performance of the Work which arises through no fault, error, act or omission of the Contractor.

2.12 "EXTRA WORK" shall mean work duly authorized other than that required by the Contract at the time of its execution.

2.13 "FINAL ACCEPTANCE" shall mean final acceptance of the work by the Owner, as evidenced by its authorized signature upon the Certificate of Final Completion, a copy of which shall be sent to the Contractor. Such acceptance shall be deemed to have taken place as of the date so stated in such Certificate.

2.14 "MATERIALMAN" shall mean any person, firm or corporation, other than employees of the Contractor, who or which contracts with the Contractor, or any Subcontractor, to fabricate or deliver, or who actually fabricates or delivers, plant, materials or equipment incorporated in the Work.

2.15 "MEANS AND METHODS OF CONSTRUCTION" shall mean the labor, materials, temporary structures, tools, plant, and construction equipment, and the manner and time of their use, necessary to accomplish the result intended by this Contract.

2.16 "PROJECT" shall mean the public improvement to which this Contract relates.

2.17 "SITE" or "PROJECT SITE" or "WORK SITE" shall mean the area upon or in which the Contractor's operations are carried on, and such other areas adjacent thereto as may be designated as such by the Engineer.

2.18 "SPECIFICATIONS" shall mean all of the directions, requirements and standards of performance applying to the work as hereinafter detailed and designated under the Contract Document entitled "Specifications".

2.19 "SUBCONTRACTOR" shall mean any person, firm or corporation, other than employees of the Contractor, who or which contracts with the Contractor or his Subcontractors to furnish, or actually furnishes labor, or labor and materials, or labor and equipment, at the site.

2.20 "WORK" shall mean everything required to be furnished and done by the Contractor under the Contract, and shall include both Contract Work and Extra Work.

ARTICLE III

The Work and Its Performance

3.1 Character of the Work. The Contractor agrees to perform and complete the Work in strict accordance with the Contract Documents, with the best modern practice, and with workmanship and materials of the highest quality so as to achieve the results intended by the Contract Documents and to the satisfaction of the Owner and the Engineer.

3.2 Contractor's Warranties. The Contractor warrants and represents that the Work shall satisfy

all the requirements of the Contract and shall conform strictly to the Contract Drawings and Specifications; be completed free from fault and defects; be of the highest quality and incorporate only new materials and equipment unless the Contract otherwise provides; be free of liens and encumbrances; be constructed in compliance with all applicable laws and insurance requirements; and be fit for the intended use and purpose.

The Contractor further warrants and represents that it has reviewed carefully the Contract Documents, and that the Contractor can perform the Contract Work for the Contract Price and can achieve Substantial Completion on or before the scheduled completion date as specified in the Information for Bidders.

3.3 Means and Methods of Construction. The Contractor shall, at its own expense, provide all labor, materials, apparatus, scaffolding, appliances, utensils, tools, machinery, transportation and cartage and whatever else may be required of every description necessary to perform and complete the Work, and shall be solely responsible for the same and for the safe, proper and lawful construction, maintenance and use thereof. Unless otherwise expressly provided in the Contract Drawings, Specifications or Addenda, the Contractor shall be responsible for choosing the means and methods of construction; subject, however, to the Engineer's right to reject means and methods proposed by the Contractor which:

- a. Will constitute or create a hazard to the work, or to persons or property; or
- b. will not produce finished work in accordance with the terms of the Contract.

The Engineer's acceptance of the Contractor's means and methods of construction, or the Engineer's failure to exercise its right to reject such means or methods, shall not relieve the Contractor of any of its obligations under the Contract; nor shall the exercise of such right to reject create any claim or cause of action for damages, which Contractor hereby expressly waives.

3.4 Shop Drawings. The Contractor shall submit on a timely basis all Shop Drawings and revisions thereto, as provided in the Special Conditions.

3.5 Utilities. The Contractor shall have sole responsibility for making all arrangements with

respective utilities for the relocation of utility lines and facilities or the interruption or resumption of service, as may be provided in the Special Conditions and Specifications, and waives all claims against the Owner, its employees, agents or representatives for damages relating to or arising therefrom.

3.6 Contractor's Familiarity with Site and Work Conditions. The Contractor represents that it has inspected and is familiar with the nature and location of the Project Site and all physical conditions relating to the Work, including without limitation utilities, location of utility lines, existing buildings and structures, roads, streets, access to and from the Project Site, topographical conditions, local climate and weather conditions, surface conditions, and normal and foreseeable soil, rock, water and subsurface conditions.

3.7 Unforeseeable Conditions. The Contractor shall be solely responsible for performing to completion all its Work notwithstanding the existence of any surface or subsurface conditions, whether foreseeable or unforeseeable. The Contractor shall perform under Change Order any Extra Work, pursuant to Article IX, required by reason of Unforeseeable Conditions and shall accept Extra Payment therefor, as the Contractor's total compensation for any and all losses, damages or expenses arising out of or relating to Unforeseeable Conditions. The Contractor shall give further written notice to the Engineer within three (3) days after discovery of any condition which the Contractor claims to be an Unforeseeable Condition. The Contractor waives and releases any right to Extra Payment relating to an Unforeseeable Condition if the Contractor fails to give such notice as provided.

3.8 Representative Detail. All specifications, notations, or details in the Contract specifically applicable to one or a number of similar situations, materials or processes, or shown as typical or representative, shall apply to all similar situations, materials, or processes, wherever appearing in the Work, unless the Contract clearly requires a contrary result. A typical or representative detail indicated on the Contract Drawings shall be the standard of workmanship and material in all corresponding parts of the

Work. Where necessary, and where inferable from the Contract Drawings and Specifications, the Contractor shall adapt such representative detail for all corresponding parts of the Work. All references in the Contract to materials, equipment, or facilities shall be construed to require the Contractor to furnish the same in accordance with the grades and/or standards indicated in the Contract. Where the Contract does not specify any explicit quality or standard for materials or workmanship, the Contractor shall use only workmanship and new materials of the best quality.

3.9 Measurements. The Contractor shall be responsible for all measurements required for execution of the Work to the exact position and elevation as required by the Contract. Before executing any work, Contractor shall verify all measurements by inspection or examination at the Site. Contractor acknowledges that the Contract Drawings do not necessarily show all variations in alignment, elevation, or dimension required to satisfy architectural and structural limitations; and Contractor assumes responsibility for the proper and correct construction.

3.10 Interpretation of Contract Documents. The Contractor shall submit to the Engineer, pursuant to Article XII, all issues, questions, and problems concerning the meaning and intent of the Contract, including issues resulting from inconsistencies between or among any documents forming part of the Contract. The Engineer's determination shall be conclusive, final and binding on the Contractor.

3.11 Permits. The Contractor shall secure all permits, licenses, and approvals required under the Contract or otherwise necessary for the proper performance and completion of the Work.

3.12 Specifications and Drawings. The Contract Specifications and Drawings and all other Contract Documents are intended to supplement each other, and together constitute one complimentary set of plans, so that any work exhibited in the one and not in the other shall be executed just as if it had been set forth in all, in order that the Work shall be completed in every respect according to the complete design or designs as decided and determined by the Engineer. Should anything be omitted from the Specifications or

Drawings which is necessary to a complete understanding of the Work, or should any error appear either in the various drawings furnished or in the work done by other Contractors affecting the Work covered hereby, the Contractor shall promptly notify the Engineer in writing, pursuant to Article XII within three (3) days of discovery of the error or omission. In the event of the Contractor's failure to do so, he shall make good any damage or defect in his work cause by reason of such error or omission and waives any claim for Extra Payment therefor.

3.13 Satisfaction of the Owner and Engineer. All work under this Contract shall be done to the satisfaction of the Owner and Engineer. The Engineer shall determine the quantity, quality, acceptability and fitness of the various items of work and materials to be furnished and paid for hereunder, and whether the Contractor has performed in accordance with the Specifications and Drawings. The Engineer may direct the Contractor to correct or remove such materials or work as in the Engineer's opinion are not in accordance with the Specifications or Drawings and to substitute therefore without delay other work and materials, and in such event the expense of doing so and of making the directed correction or substitution shall be borne solely and fully by the Contractor. The determination of the Engineer in all such matters shall be conclusive, final and binding upon the Contractor.

3.14 Contractor's Duty to Correct Defective Work. Upon notification from the Engineer, the Contractor shall, at its own cost, promptly correct any and all defects, including without limitation settlement, shrinkage, and nonconforming materials, in its Work or in that of any Subcontractor employed by the Contractor which occur due to the fault of the Contractor or its Subcontractors during the progress of the Work or which appear within twelve (12) months after the date of Final Acceptance. If, within ten (10) days after mailing of notice in writing to the Contractor or its agents of the occurrence or appearance of any such defect the Contractor has not corrected such defect, the Owner may correct such defect. In the event of an emergency where, in the opinion of the Engineer, delay could cause serious loss or damage to persons or

property, the Owner may correct such defect without advance notice. The Engineer shall determine the cost to the Owner of any defect corrected by the Owner, whose determination shall be conclusive, final and binding, and such cost shall be borne solely by the Contractor. All sums or expenses so incurred by the Owner shall be deducted or offset from money when due or thereafter due from the Owner to the Contractor.

3.15 Lines, Marks and Grades. The Contractor shall, at its own expense, promptly furnish all labor and materials necessary or proper for marking and preserving all lines, marks or grades that may be given to the Contractor by the Engineer. The Contractor shall carefully follow and preserve all the lines, marks and grades given by the Engineer, and shall notify the Engineer promptly whenever the Contractor will need lines, marks or grades other than those which have already been provided, and the Contractor shall not be entitled to any extension of time for delays occurring in the giving of any lines, marks or grades by the Engineer unless twenty-four hours notice in writing is given to the Engineer that additional lines, marks and grades as the case may be are needed. All Work shall conform to the lines and grades by the Engineer in accordance with the said plans, it being understood and agreed, however, that such lines and grades may be from time to time modified in the discretion of the Engineer.

3.16 Inspection. During the progress of the Work and up to the date of Final Acceptance, the Contractor shall at all times afford the Owner and its representatives access to its Work Site and every reasonable, safe and proper facility for inspecting all work done or being done at the Site, and also the manufacture or preparation of materials and equipment at the place of such manufacture or preparation. The Contractor shall also provide such access to representatives of the United States Environmental Protection Agency, the New York State Department of Environmental Conservation, and all other duly authorized governmental authorities. The Contractor's obligations hereunder shall include the uncovering or taking down of finished Work, and its restoration thereafter; provided, however, that the order to uncover, take

down and restore shall be in writing, and further provided that if work thus exposed proves satisfactory, such uncovering or taking down and restoration shall be considered an item of Extra Work to be paid for in accordance with the provisions of Article IX hereof.

3.17 Inspection and acceptance by the Owner, the Engineer or their representatives of finished Work or of Work being performed, or of materials and equipment at the place of manufacture, preparation or storage, shall not relieve the Contractor of its obligation to perform the Work in strict accordance with the Contract. Finished or unfinished Work found not to be in strict accordance with the Contract shall be replaced as directed by the Engineer at Contractor's sole cost, even though such work may have been previously accepted and paid for. Rejected work and materials shall be promptly taken down and removed from the Site, which must at all times be kept in a reasonably clean and neat condition.

3.18 Protection of Work and of Persons and Property. During performance and up to the date of Final Acceptance, the Contractor shall be under an absolute obligation to protect the unfinished Work as well as materials and equipment against any damage, loss or injury; and, in the event of such damage, loss or injury, he shall promptly replace or repair such Work, whichever the Engineer in its discretion shall determine to be preferable. The obligation to deliver finished Work in strict accordance with the Contract prior to Final Acceptance shall be absolute and shall not be affected by the Engineer's approval of or failure to prohibit means and methods of construction used by the Contractor. During performance and up to the date of Final Acceptance, the Contractor must take all reasonable precautions to protect persons and property of the Owner and of others from damage, loss or injury resulting from its or its Subcontractors' operations under this Contract. The Contractor's obligation to protect shall include the duty to provide, place and adequately maintain at or about the Site suitable and sufficient security guards, lights, barricades and enclosures necessary to ensure protection.

3.19 Contractor's Duty to Report. Within three days after written notice to the Contractor of the

occurrence of any loss, damage or injury to work, persons or property, the Contractor shall make a full and complete report in writing to the Engineer.

3.20 Indemnification. The Contractor agrees that, in the event that persons or property of the Owner or of others sustain loss, damage or injury, including death, resulting from the intentional, reckless or negligent acts of the Contractor, or its Subcontractors, in their performance of this Contract, or from its or their failure to comply with any of the provisions of this Contract or of law, the Contractor shall indemnify and hold the Owner and its representatives harmless from all legal expenses and attorneys' fees incurred, all claims and judgment for damages, and all other costs by reason thereof.

3.21 Project Meetings. The Contractor shall attend without exception all Project Meetings upon advance notice from the Owner or Engineer. A copy of the minutes of each meeting shall be sent to the Contractor, who shall promptly inform the Engineer or Owner, in writing, of all errors or omissions in the minutes. The Contractor's failure to do so shall constitute a conclusive and binding admission on the part of the Contractor that the information contained in the minutes is true, accurate and complete.

3.22 No Right of Action. The provisions of this Article shall not be deemed to create any right of action in favor of third parties against the Contractor, or against the Owner or its representatives.

Article IV

Provisions Relating to Time

4.1 Commencement and Prosecution of the Work. The Contractor must commence its Work within ten days after the date specified in the written Notice to Proceed signed by the Owner or Engineer. The time for performance of the Work under the Contract shall be computed from the 10th day after the date specified in such written Notice to Proceed. The Contractor agrees that time is of the essence of this Contract, and the Contractor shall therefore prosecute the Work diligently, using such means and methods of

construction as will assure its completion not later than the date specified therefor, or on the date to which the time for completion may be extended as provided herein.

4.2 Progress Schedule. To enable the Work to be planned and prosecuted in an orderly and expeditious manner, the Contractor, within 10 days after the award of this Contract, unless otherwise directed by the Engineer in writing, shall submit to the Engineer a proposed Progress Schedule, showing:

- a. The anticipated time of commencement and completion of each of the various items of Work to be performed under this Contract;
- b. The sequence of each of these items of Work and their inter-relationship with each other and with those of all other related contracts; and
- c. The estimated time required for fabrication or delivery of all materials and equipment required for the Work; and

4.3 The proposed progress schedule shall be revised as directed by the Engineer and shall be subject to the Engineer's satisfaction. The accepted Progress Schedule shall be strictly adhered to by the Contractor. If the Contractor fails to adhere to the accepted Progress Schedule, or to the Schedule as revised, the Contractor shall promptly adopt such other or additional means and methods of construction as will make up for the time lost and will assure completion in accordance with such Schedule. The Contractor's failure to provide Progress Schedules or requested revisions thereto, or to complete the Work in accordance therewith, shall constitute a material breach of this Contract.

4.4 The Contractor agrees that its submittal of Progress Schedules is for the Owner and Engineer's information, and the Engineer's acceptance of same shall not imply that the Engineer represents or warrants that the Contractor can complete the Work in accordance with the Progress Schedule. If at any time the Engineer determines in its sole discretion that the Contractor's Work is not progressing in accordance with the Progress Schedule or that the Work is likely to be delayed, the Engineer may give

written notice directing the Contractor to increase its manpower and amount or types of equipment, and to undertake additional work shifts. If the Engineer and the Contractor do not agree as to the cause or existence of the delay, or if the Contractor disputes the necessity of the Engineer's directive, the Contractor shall nonetheless comply with the Engineer's directive and shall perform in conformance therewith, subject to Article X (Disputed Work).

Article V

Cooperation with Other Prime Contractors

5.1 The Contractor acknowledges and agrees that the Owner may award contracts to other prime contractors for other portions and aspects of the Project. The Contractor agrees to cooperate fully and coordinate its Work with all other prime contractors in order to avoid disputes and delays, and to assure the timely progress of the Work and the work of all other prime contractors, and the proper, efficient, and expeditious completion of the Project.

5.2 The Contractor agrees to provide access to all other prime contractors to review documents in the Contractor's possession relating to the Work and to observe the Work as necessary or desirable in order to comply with the provisions and purpose of this Article.

5.3 The Contractor agrees to use its best efforts to organize and integrate its Work with the work of all other prime contractors and their subcontractors so as not to interfere with or delay the timely and proper performance of any other prime contractor's work. The Contractor agrees to commence the Work on the Commencement Date and to prosecute the Work with all possible speed so as to comply with the Progress Schedule; submit shop drawings promptly to the Engineer and to other prime contractors so as to cause no delay in the work of any other prime contractor; correct promptly all work which is incorrect or defective, or which does not conform to the Contract; review carefully in advance the progress schedule of

all other prime contractors and all Drawings and Specifications in the Contract of each other prime contractor, and all shop drawings, which may affect the work; allow all other prime contractors to review in advance all documents forming a part of the Contract, and all shop drawings, which may affect the work of such other prime contractors; to coordinate its Work carefully and to allow other prime contractors reasonable access to the Contractor's Site in order to coordinate the Work of all contractors; not to excavate, uncover, cut or alter the work of any other prime contractor unless so ordered by the Engineer; and notify promptly all other prime contractors and the Engineer of all problems which may cause obstruction, damage, or delay to either Contractor or other prime contractors and to cooperate with the other prime contractors to mitigate the effects of the problem.

5.4 The Contractor agrees that the Owner does not guarantee that the Contractor or any other prime contractor will perform its Work in a responsible, efficient or timely fashion; and that the Contractor shall have no recourse or claim whatsoever against the Owner for any loss or damages resulting from any acts or omissions of any other prime contractor, and the Contractor hereby waives any such recourse or claim against the Owner, including damages for delay.

Article VI

Subcontractors

6.1 Submittal. The Contractor shall, with its bid proposal, and prior to entering into any Subcontract, submit to the Engineer, with respect to each proposed Subcontractor, the name and address of the Subcontractor; a description of the work to be performed or materials or equipment supplied by the Subcontractor; a description of the Subcontractor's past experience in performing similar work; a statement that the Subcontractor has sufficient capacity and financial resources to perform and complete its Subcontract; and any other information as to Subcontractor's fitness and responsibility as the Owner or Engineer may request.

6.2 Acceptance. The Engineer shall inform the Contractor prior to execution of the Contract whether the proposed Subcontractor is acceptable. The Engineer's acceptance shall not be construed as any representation or warranty with respect to the Subcontractor's qualifications and fitness or ability to perform the work. The Contractor shall assert no claim for loss or damages by reason of the Engineer's rejection of a proposed Subcontractor. Nothing contained in this Contract shall create any relationship of contract or agency between the Owner and Subcontractor.

6.3 Contractor's Responsibility for Subcontractor. The Contractor shall have full responsibility for all work performed by all its Subcontractors and for all acts and omissions of all its Subcontractors and its Subcontractors' employees.

6.4 Subcontracts. All Subcontracts shall be in writing and an executed copy furnished promptly to the Engineer upon request. The Contractor, prior to entering into each Subcontract, shall inform the Subcontractor in detail of all requirements under this Contract relating to the Subcontractor's Work. All Subcontracts shall provide expressly that such Subcontract is subject to all the requirements of this Contract and that all work under the Subcontract shall comply with all the requirements of this Contract. The Contractor's execution of a Subcontract shall constitute a representation to the Owner that the Contractor has informed the Subcontractor in detail of all requirements under this Contract relating to the Subcontractor's work.

Article VII

Contractor's Representatives

7.1 Designated Representatives. The Contractor shall, upon execution of the Contract, designate in writing one or more persons who shall have full authority to act on behalf of the Contractor with respect to this Contract and to bind the Contractor, and at least one of whom shall be available at all

times during the Contractor's performance of its Work. The Contractor may change the designated representatives upon advance written notice to the Owner.

7.2 Site Representative. The Contractor shall maintain on site at all times during the performance of its Work a superintendent who shall have full authority to make all decisions with respect to the Work, attend job meetings and represent the Contractor in coordinating its Work with other prime contractors.

Article VIII

Payment to Contractor

8.1 Detailed Schedule. For each Lump Sum item bid, prior to the submittal of its first progress payment requisition and as a condition to payment, the Contractor shall submit to the Engineer a Detailed Schedule setting forth a breakdown of the contract price for all the labor and materials to be furnished. The Detailed Schedule shall set forth the quantity and price of each lump sum item of the Work, and shall list the quantity and price as to labor and materials separately. The Detailed Schedule shall be revised promptly by the Contractor upon the Engineer's request and to the satisfaction of the Engineer, and shall not be changed following acceptance except with the Engineer's authorization.

8.2 Progress Payments. Payments for work performed and materials supplied up to the date of Substantial Completion shall only be made pursuant to Requisitions for Payment on forms provided by the Owner, signed by the Contractor and approved by the Engineer. Such Requisitions may be submitted no more than once each month for work and materials actually furnished during the period commencing on the last date covered by the Contractor's last prior Requisition and ending on the date specified in the current Requisition.

8.3 Contents of Requisitions. Each Requisition shall have annexed the Detailed Schedule,

annotated to reflect all lump sum items of Work actually completed to date. Each Requisition shall set forth separately the quantity and price of all labor and materials furnished and incorporated in the Project during the current requisition period, the percentage of the Work actually completed to date, and the quantity and price of all approved Extra Work, clearly designated as such. The Contractor shall also furnish with each Requisition all documents reasonably requested by the Engineer, including without limitation bills of lading or sale and proof of amounts paid or owing to Subcontractors. Each Requisition shall constitute a representation by the Contractor that the work and materials reflected therein have been actually furnished; that the quantities and prices therefore are true and accurate; and that the Contractor has no knowledge of any mechanics', material men's, laborers' or vendors' liens having been filed against the Project or the funds appropriated therefore. Each Requisition shall further constitute a waiver and release of any and all liens by the Contractor for all work and materials furnished through the last day of the last prior Requisition for which payment has been made by the Owner.

8.4 Unincorporated Material. The Owner may, but is not obligated to, approve payment for material which has been fabricated and stored, or undelivered on condition that the Contractor shall have furnished to the Engineer all documents the Owner may require, such as bills of lading or sale and evidence of appropriate insurance coverage.

8.5 Retainage. The Owner shall be entitled to retain out of any amount approved for payment up to five percent (5%) of such amount until the Contractor shall have achieved Substantial Completion, as set forth in Article XVII. The Owner shall in addition be entitled to retain an amount necessary, in the Owner's opinion, to satisfy all claims, liens or judgments against the Contractor which have not been discharged. The amounts retained pursuant to this Paragraph 8.5 are in addition to amounts which the Owner may retain or withhold pursuant to other Articles of this Contract, including Article XIII (Default), Article XIX (Final Completion), Article XX (Maintenance and Guarantee), and Article XXII (Liquidated

Damages).

8.6 Disapproval and Withholding of Payment. The Engineer may disapprove and withhold any payment or portion thereof to the extent that, in the Engineer's opinion: the Requisition or any annexed documents are incorrect or incomplete; the Work or materials described in such Requisition or in any previous Requisition does not comply with the Specifications and Drawings or was not furnished as stated; a lien against the Project or funds appropriated therefore has been filed relating to the Contractor's Work or materials furnished; a claim has been asserted against the Owner for which the Contractor has agreed to indemnify the Owner pursuant to Article III, Paragraph 3.30; any amounts are due and owing from the Contractor to any Subcontractor or employee pursuant to the labor or lien laws; or the Owner has determined the Contractor to be in default pursuant to Article XIII. The Engineer shall notify the Contractor in writing if the Engineer disapproves all or part of a Requisition and the reasons therefor. The Contractor agrees to perform immediately all corrective action required by the Engineer and shall continue to perform the Work without delay in accordance with the Contract.

Article IX

Change Orders, Omitted Work and Extra Work

9.1 Owner's Right to Issue Change Orders. The Contractor agrees that the Owner reserves the right to issue written Change Orders at any time and for any reason whatsoever to revise the Specifications and Drawings, add Extra Work, or omit Work or portions thereof, or which may change the nature, scope, quantity, area, sequence, grade, or size of the Work, whenever in the Owner's opinion it shall be necessary or in its best interests to do so. No Work shall be omitted, and no Extra Work added, except pursuant to a written Change Order approved by the Owner and signed by the Engineer, and the Contractor shall not

perform any Extra Work without such Change Order. The Contractor shall not be entitled to any Extra Payment for any Extra Work to the extent such Extra Work is, in the opinion of the Engineer, required due to the Contractor's fault, error, omission, negligence or delay.

9.2 Reduction in Contract Price. The Contract Price shall be reduced to the extent that any Change Order, whether for omitted Work or otherwise, results in a decrease in the Contractor's cost to perform the work involved, as determined by the Engineer based on the estimated costs of: a) necessary materials; b) necessary direct labor; c) required insurance; d) operation, maintenance and rental of necessary plant and equipment; plus e) ten percent (10%) of the total of items (a) through (d) as compensation for all overhead and administration costs; plus f) ten percent (10%) of the total of items (a) through (e) as compensation for profit. The parties agree that all rental costs of plant and equipment shall be based on the most recent New York State Department of Transportation index or comparable index, in the Engineer's discretion.

9.3 Extra Payment. If the Owner requires Extra Work involving items of work for which unit prices or lump sum amounts are specified in the Contract, the Extra Payment shall be determined by the Engineer in accordance with such unit prices or lump sum amounts. In the event any Extra Work or materials are required by the Owner involving items of work or materials for which prices are not specified in the Contract, the Owner may request the Contractor in writing to submit a proposed quotation for such work or materials on either a lump-sum, unit price, or time and materials basis, in the Owner's discretion. The Contractor shall submit within ten (10) days of the request a written quotation which shall set forth in detail the Contractor's estimated costs, overhead and profit. The quotation shall constitute the Contractor's offer to the Owner to perform such Extra Work at the price quoted, and such offer shall be irrevocable for a period of sixty (60) days from date of receipt; thereafter, any revocation of the offer must be made to the

Owner in writing.

9.4 Inability to Agree on Price. If the Owner and the Contractor are not able to agree on the amount of Extra Payment for the proposed Extra Work, and the Owner exercises its right to issue a Change Order for such Extra Work, or if the Owner exercises its right to issue a Change Order for such Extra Work without requesting or receiving within the time required the Contractor's quotation, then the Contractor shall proceed immediately with the Extra Work, and any Extra Payment due the Contractor for such Extra Work shall be computed on a Time and Material basis, as provided in the following Paragraph 9.5.

9.5 Time and Material Basis. For all Extra Work performed by the Contractor on a Time and Material basis, the Owner shall pay, and the Contractor shall accept, the reasonable costs actually incurred by the Contractor to perform and complete such Extra Work, as determined by the Engineer based on the costs of: a) necessary materials; b) necessary direct labor; c) required insurance; d) operation, maintenance and rental of necessary plant and equipment; plus e) ten percent (10%) of the total of items (a) through (d) as compensation for all overhead and administration costs; plus f) ten percent (10%) of the total of Items (a) through (e) as compensation for profit. The parties agree that all rental costs of plant and equipment shall be based on the most recent New York State Department of Transportation index or comparable index, in the Engineer's discretion.

9.6 Extra Work Performed by Subcontractor. If a Subcontractor performs Extra Work on a lump-sum basis, the Contractor shall be paid the Subcontractor's lump-sum price plus five (5%) of such lump-sum price which shall be deemed to include the Contractor's profit and all costs and expenses, including without limitation, costs of superintendence, administration, insurance, and delay. If a Subcontractor performs Extra Work on a Time and Material basis, the Contractor shall be paid only the actual and reasonable cost of the subcontracted Extra Work, based on the criteria (a) through (f) listed in Paragraph 9.5 above, plus five percent (5%) of such actual and reasonable cost which shall be deemed to

include the Contractor's profit and all costs and expenses, including without limitation costs of overhead, superintendence, administration, insurance and delay.

9.7 Time and Material Statement. The Contractor understands and agrees that the timely submittal of Time and Material Statements is of utmost importance and is a condition precedent to asserting any claim for Extra Payment for Extra Work performed on a Time and Material basis. The Contractor shall deliver to the Engineer on each day during which Extra Work has been done on a Time and Material basis a signed, detailed statement in form acceptable to the Engineer setting forth, separately as to each such day, the following:

- a. the quantity, cost, and description of all materials furnished;
- b. the name of each worker and his or her social security number; number of hours worked; hourly rate of pay; the total wages, taxes, union and insurance assessments; his or her title or category; and description of work performed;
- c. each piece of equipment or machinery used; whether it is owned or rented and if rented, the rental cost; and all costs incurred, including without limitation costs of insurance, fuel, and necessary maintenance.

9.8 Failure to Deliver Time and Material Statements. The Contractor's failure to submit timely a signed and complete Time and Material Statement shall constitute a waiver of any right to Extra Payment to the extent that such Statement is not timely delivered or is incomplete. The Engineer, in its sole discretion, may accept an untimely or incomplete Statement but such acceptance shall not constitute any waiver of the Owner's right to strict enforcement of this provision or to disallow any claim for Extra Payment, and shall not relieve the Contractor of its obligation to comply with the provisions of this Article. The Contractor understands that the information contained in the Time and Material Statements is to enable the Owner to monitor and verify the Extra Work performed and shall not be binding on the Owner.

9.9 Acceptance of Extra Payment. The Contractor's acceptance of Extra Payment for any Extra Work shall constitute an unconditional waiver and general release of the Owner of all claims and causes of action with respect to such Extra Work, whether asserted by the Contractor or through the Contractor on behalf of others.

Article X

Disputed Work

10.1 Notice. In the event the Owner or Engineer directs the Contractor to perform Disputed Work, the Contractor shall promptly and expeditiously perform such Disputed Work to completion. As a condition precedent to asserting any claim for Extra Payment with respect to such Disputed Work, the Contractor shall give written notice to the Engineer, prior to the Contractor's commencement of the Disputed Work, that the Contractor is performing such Disputed Work under protest.

10.2 Contents of Notice. The Notice shall state that the Contractor claims the work is Disputed Work and that the Contractor shall perform such Disputed Work under protest. The Notice shall also set forth in detail a description of the Disputed Work, the number of workdays the Contractor estimates necessary to complete the Disputed Work, and the specific grounds upon which the Contractor claims the Disputed Work should be considered Extra Work. The Contractor's failure to give timely written notice as herein provided shall constitute a waiver of all claims relating to such Disputed Work.

10.3 Time and Material Statement for Disputed Work. As a further condition precedent to the right to claim Extra Payment for performing such Disputed Work, the Contractor shall submit to the Engineer a signed Time and Material Statement for Disputed Work setting forth the items required in Article IX, Paragraph 9.7, on each day during which the Disputed Work was performed. Upon completion of the Disputed Work, the Contractor shall submit a final Time and Material Statement for Disputed Work

on the Friday of the last week in which Disputed Work was performed, setting forth the total dollar amount the Contractor will claim as Extra Payment for labor and materials. The Contractor's failure to submit timely signed and complete Time and Materials Statements for Disputed Work shall constitute a waiver of all claims relating to such Disputed Work. The Engineer, in its sole discretion, may accept an untimely or incomplete Statement but such acceptance shall not constitute any waiver of the Owner's right to strict enforcement of this provision or to disallow any claim for Extra Payment, and shall not relieve the Contractor of its obligation to comply with the provisions of this Article. The Contractor understands that the information contained in the Time and Material Statements for Disputed Work is to enable the Owner to monitor and verify the Disputed Work performed and to evaluate the Contractor's claims and shall not be binding on the Owner.

Article XI

Suspension of Work

11.1 Notice to Suspend Work. The Owner shall have the right to order the Contractor, upon written notice, to stop or suspend its Work and Extra Work at any time and for any reason. The Notice to Suspend Work shall specify the date on which the Work and Extra Work shall stop and may set forth an estimated date of resumption or may provide that the Work shall be suspended until further notice. The Contractor shall resume its Work and Extra Work upon the Owner's written Notice to Resume Work. The Contractor waives all claims for loss or damage by reasons of such suspension, and agrees that its rights to an Extension of Time, as provided in Paragraph 11.2 of this Article, and to elect to terminate, as provided in Paragraph 11.3 of this Article, shall constitute the Contractor's sole remedies in the event of suspension of work.

11.2 Extension of Time. The Contractor shall receive an Extension of Time to complete the

Contract corresponding to the number of days the Work is suspended unless the Owner determines that the suspension was necessary by reason of the Contractor's delay, defective or incorrect Work, failure to place timely orders for materials, equipment, services or labor, or other failure to comply with the Contract.

11.3 Contractor's Election to Terminate. If, pursuant to a Notice to Suspend Work issued by the Owner, the Work is suspended for a period exceeding one hundred twenty (120) days or for a period exceeding in the aggregate one hundred eighty (180) cumulative days by reasons of two or more Notices to Suspend Work, the Contractor may elect to terminate the Contract by giving written notice to the Owner. The Contractor's right and obligation to perform the Work shall terminate upon the Owner's receipt of the Contractor's Notice of Election to Terminate. Following receipt of the Contractor's Notice of Election to Terminate, the Owner shall pay to the Contractor all sums unpaid and owing pursuant to duly submitted Requisitions less amounts retained or withheld pursuant to this Contract. The Contractor's Notice of Election to Terminate shall constitute a waiver and release of all claims and causes of action against the Owner and Engineer except for sums unpaid and owing pursuant to duly submitted Requisitions, sums retained or withheld pursuant to this Contract, and Extra Payment for alleged Disputed Work for which the required Notice and Time and Materials Statements for Disputed Work were duly submitted and which have not been the subject of a Final Determination by the Engineer as of the date of receipt of the Contractor's Notice of Election to Terminate.

11.4. Compliance with Article XV. The Contractor, upon giving Notice of Election to Terminate, shall comply with and perform the obligations provided in Article XV of this Contract.

Article XII

Interpretations and Disputes

12.1 In order to resolve disputes, avoid litigation, and promote the orderly and timely progress of

the Work, the Contractor and the Owner hereby authorize the Engineer to act as the arbiter and interpreter of the Contract and to determine all questions, whether of a legal or factual nature, arising thereunder, including without limitation:

- a. issues relating to the meaning, interpretation and scope of the Contract Drawings and Specifications and the other Contract Documents;
- b. issues relating to the performance, quantity, quality, acceptability, fitness and progress of the Work and compliance by the Contractor and its Subcontractors with the requirements of the Contract;
- c. issues relating to Change Orders, Extra Work and Disputed Work including without limitation:
 - whether any Disputed Work is Contract Work or Extra Work;
 - whether the Contractor is entitled to Extra Payment by reason of any Change Order and the amount of any such Extra Payment; and
 - (i) whether the Owner is entitled to a reduction in the Contract Price by reason of any Change Order, and the amount of such reduction in the Contract Price;
- d. issues relating to the Contractor's completion of the Work in accordance with the Contract and Final Punch List;
- e. issues relating to the suspension of the Work;
- f. issues relating to the termination of the Contractor.

12.2 Duty to Notify. In the event the Contractor believes that any discrepancy, inconsistency, error or omission exists under any of the Contract Documents, or if the Contractor disputes any written order or notice of the Engineer or Owner, the Contractor shall immediately inform the Engineer and shall

also submit to the Engineer a written notice of the dispute or a written request for interpretation, within three (3) days of the date the Contractor receives the order or notice in dispute or discovers or should have discovered the discrepancy, inconsistency, error or omission, as the case may be.

12.3 Contents of Notice. Each notice of dispute or request for interpretation must specify in reasonable detail:

- (a) the nature of the Contractor's dispute with a description of Disputed Work, if any, or the information or interpretation requested by the Contractor;
- (b) the date by which the Contractor requires a determination; and
- (c) the Contractor's proposal to resolve the problem or resolve the dispute.

The Contractor shall include with the Contractor's notice or request all documents and other information which the Contractor deems relevant. The Contractor shall furnish promptly any additional information which the Engineer requests in connection with any such matter. The Engineer may reject the Contractor's notice or request if, in the Engineer's judgment, such notice or request is not sufficiently detailed.

12.4 The Engineer shall review each matter submitted hereunder and deliver a Final Determination to the Contractor within thirty (30) days which sets forth the Engineer's reasons for such Final Determination and, if the Final Determination involves computation of a monetary amount, the method of such computation.

12.5 The Engineer's Final Determination shall be final, conclusive and binding.

12.6 The Contractor's failure to submit a matter in timely fashion to the Engineer under this Article shall be a waiver of any claim for Extra Payment, extension of time, and all loss or damage relating to the particular matter.

Article XIII

Default

- 13.1 Grounds for Default. The Owner may declare the Contractor to be in default of this Contract upon the occurrence of any of the following events:
- (a) The Contractor fails to commence Work on the Commencement Date, unless by reason of an Excusable Delay;
 - (b) The Contractor abandons the Work;
 - (c) The Contractor refuses to proceed with the Work when directed by the Engineer or the Owner;
 - (d) The Contractor reduces its work force to a number which, if maintained, would be insufficient, in the Engineer's opinion, to complete the Work in accordance with the Progress Schedule;
 - (e) The Contractor assigns this Contract, or Contractor's rights or obligations hereunder, except as permitted under Article XXVI hereof;
 - (f) The Contractor fails to obtain and maintain all required insurance;
 - (g) The Contractor has failed to propose Subcontractors on a timely basis or to award Subcontracts after approval;
 - (h) The Contractor has willfully or in bad faith violated any of the provisions of this Contract or has not been performing the Contract in accordance with its requirements; or
 - (i) The Work cannot be completed on or before the scheduled Completion Date, or revised Completion Date unless by reason of an Excusable Delay;
 - (j) The Contractor does not complete the Work on or before the scheduled Completion Date, unless by reason of an Excusable Delay;

- (k) Any lien is asserted against the Owner by any Subcontractor or Material man or others and not discharged, by bonding or otherwise, within thirty (30) days after written notice from the Owner to the Contractor;
- (l) The unpaid balance of the Contract Price is clearly insufficient, in the Engineer's opinion, to complete the Work or to pay all known liens;
- (m) The Contractor fails to perform or observe any other term, covenant, condition or provision of the Contract for three (3) days after receipt of written notice from the Engineer or the Owner specifying the nature of the Contractor's failure;
- (n) The Contractor consents to or suffers the appointment of a receiver of all or a material part of the Contractor's property or income; or admits in writing the Contractor's inability to pay debts as they become due; or makes a general assignment for the benefit of creditors; or files a voluntary petition in bankruptcy, or a petition seeking reorganization or an arrangement with creditors under any federal or state law relating to bankruptcy, reorganization, insolvency, readjustment of debt, dissolution or liquidation or similar relief or files an answer admitting the material allegations of a petition filed against Contractor in any proceeding under any such law; or is adjudicated insolvent or is subject to an involuntary petition in bankruptcy, and such adjudication or filing is not set aside or terminated within thirty (30) days;
- (o) An attachment is levied or a judgment is executed against all or any material part of the Contractor's property or income and the same is not discharged within thirty (30) days;
- (p) Any statement or representation of the Contractor in the Contract or in any

document submitted by the Contractor with respect to the Contractor, its officers, principal employees, its proposal, the Work, the Project, or the Contract was untrue or incorrect when made;

- (q) Any Work is attached, levied upon, seized in any legal proceedings, or held by virtue of any encumbrance;
- (r) The Contractor or its chairman or president, or any vice president, treasurer, or shareholder owing more than five percent (5%) of the Contractor's issued and outstanding capital stock, or the sole proprietor of the Contractor or any general partner or joint venturer of the Contractor or the chairman, president, any vice-president, treasurer or shareholder owing more than five percent (5%) of the issued and outstanding capital stock is finally determined to be guilty of a felony related or pertaining to the business activities of the Contractor; or
- (s) a duly convened governmental body determines the Contractor to be not responsible.

13.2 Upon the Owner's determination that the Contractor is in default, the Owner shall issue a written Notice of Default to the Contractor. The Notice of Default shall specify the date of the determination of Default and the grounds upon which such Default is based.

13.3 Pursuant to the Owner's determination of Default, the Owner may do any or all of the following, in any sequence, in the Owner's discretion upon three (3) days prior written notice to the Contractor (or without notice in case of emergency):

- (a) terminate the Contractor's right to perform all or any part of the Work to the extent specified by the Owner in such notice;
- (b) at the Contractor's sole expense, take all reasonable actions which the Owner

deems necessary or desirable to cure all or any portion of such Default. For this purpose, the Owner may:

- (i) take possession of and use to the extent permitted by law any or all materials, tools, plant, equipment, supplies and/or facilities used or to be used by Contractor for the Work;
- (ii) employ any contractor, architect, engineer, consultant, or other person on terms satisfactory to the Owner to advise and consult, or to furnish services, labor, materials, tools, plant, equipment, supplies, and/or facilities of any kind to complete the Work, to replace or repair any defective Work, or otherwise to cure such Default;
- (iii) repair or replace any other Work or part of the Project, or work of other prime contractors, damaged or removed by reason of Contractor's Default, or the curing and correction thereof;
- (iv) compel the Surety to perform Contractor's obligations under the Contract, upon giving thirty (30) days written notice to the Surety.

13.4 Upon a determination by the Owner that the Contractor is in Default, the Contractor shall be liable to the Owner for all loss, damages and expenses suffered, paid or incurred by the Owner relating to any and all action described in Paragraph 13.3 of this Article. Such loss, damages and expenses arising by reason of the Contractor's Default are referred to as "Default Expenses".

13.5 The Owner shall determine the amount of the Default Expenses from time to time and:

- (a) to the extent the Default Expenses exceed the portion of the Contract Price attributable to Work being performed by others under Paragraph 13.3 of this Article, such excess amount shall be deducted from any unpaid balance of the

Contract Price, and the Contractor shall pay the Owner, upon demand, any amount exceeding the unpaid balance of the Contract Price; and

- (b) upon Final Completion of the Work, but only to the extent the total Default Expenses and total amounts withheld pursuant to this Contract are less than the unpaid balance of the Contract Price, the Owner shall pay the Contractor any balance of the Contract Price still due and unpaid for Work actually performed by the Contractor, without interest, on condition the Contractor has complied with all requirements of Article XV and after audit by the Owner.

13.6 Continuing Liability. The Contractor and the Surety shall remain liable under the Contract and Bond whether or not the Owner terminates Contractor's right to perform all or any part of the Work.

13.7 If the Owner terminates the Contractor's right to perform the Contract and it is determined subsequently for any reason whatsoever that a Default did not occur or that the Contractor had cured such Default in a timely manner, then the Owner's termination of the Contractor's right to perform the Contract shall be deemed to have been an elective termination of the Contract pursuant to Article XIV.

13.8 The rights and remedies of the Owner under this Article are not intended to be exclusive. Each and every right and remedy shall be cumulative and shall be in addition to all other rights and remedies given the Owner under this Contract or available at law or in equity.

Article XIV

Elective Termination by the Owner

14.1 Notice of Termination. The Owner may terminate the Contractor's right and obligation to perform all or any portion of the Work, at any time and for any reason whatsoever, with or without cause, upon written Notice of Termination to the Contractor. Such Notice of Termination shall specify the effective date of such termination and the extent to which performance of the Work is terminated.

14.2 Payment in the Case of Termination. Following termination, the Owner shall pay the Contractor all unpaid balance due for Contract Work and Extra Work, less amounts retained and withheld, upon the condition that the Contractor has complied fully with all the requirements of Article XV and after audit by the Owner. The Contractor waives any and all claims for damages relating to or arising out of such termination.

14.3 Post-Termination. After the effective date of termination, the Owner may take all action necessary or desirable to complete the Work, including entering into contracts with other contractors, with or without public bidding to the extent allowed by law.

Article XV

Contractor's Obligations Upon Termination

- 15.1 Upon termination pursuant to Articles XIII or XIV, the Contractor shall promptly:
- a. Stop all Work on the date and to the extent directed by the Owner;
 - b. Take all action necessary to protect the Work and materials, equipment, and other property;
 - c. Deliver to the Engineer upon request copies of all Subcontracts, purchase orders, bills of lading and bills of sale of materials incorporated into the Project, fabricated or delivered;
 - d. Give written notice to the Contractor's sureties and insurers of the termination, with a copy of each such notice to the Owner;
 - e. Terminate all Subcontracts and purchase orders;
 - f. Transfer or assign to the Owner all legal right, title and interest in materials incorporated into the Project, fabricated or delivered and for which payment has been made by the Owner;

- g. Deliver to the Engineer all documents, including without limitation shop drawings, required to be furnished to the Owner pursuant to this Contract.

Article XVI

Delay

16.1 Extensions of Time. To the extent that the Contractor is prevented from performing the Work in a timely manner and as represented in the Progress Schedule through no fault of the Contractor and due to causes beyond the Contractor's reasonable control such as acts of God, unforeseeable conditions, utility failures, fire, flood, explosion, Owner delays, or delays caused by other prime contractors, the Contractor shall be entitled to an extension of the scheduled Completion Date equal to the actual time so lost on condition that Contractor complies fully with the provisions of this Article.

16.2 Requests for Extension of Time. As a condition to obtaining an Extension of Time, the Contractor shall give written notice to the Engineer within three (3) days after the commencement of the delay. Such notice shall contain a request for an extension of time and shall also state:

- a. the nature of the delay;
- b. the cause of the delay;
- c. the Work affected by the delay;
- d. the date the delay started;
- e. the effect of the delay on the Progress Schedule; and
- f. the actions taken and proposed by the Contractor to mitigate or lessen the impact of the delay.

16.3 Contractor assumes exclusive responsibility for submitting all the information specified above. The Contractor shall furnish promptly all additional documents or other information relating to the

alleged delay upon request of the Engineer or the Owner.

16.4 The Contractor's failure to give the required notice in a timely and complete manner as required shall constitute a waiver of any right to an Extension of Time.

16.5 The Contractor shall not be entitled to a separate Extension of Time for each of several causes of delay operating concurrently, but only for the actual total period of delay, as determined by the Engineer, irrespective of the different concurrent causes of such delay. If one of several causes of delay operating concurrently results from any fault, inaccuracy, error, act or omission of the Contractor, and would of itself (irrespective of the other concurrent causes) have delayed the Work, the Contractor shall not be entitled to receive any Extension of Time for such delay.

16.6 The Contractor shall receive no extension of time for any delay in the Work which will not result in a delay in the scheduled Completion Date.

16.7 Subject to the foregoing, if the Contractor is entitled to any requested Extension of Time, the Owner shall issue a Change Order specifying the duration of any such permitted extension.

16.8 Contractor's Waiver of Delay Damages. The Contractor acknowledges and agrees that the Owner seeks to promote fiscal stability and protect the integrity of the public bidding process by ascertaining, prior to the award of this Contract, the full cost of the Work in order to assure, to the extent possible, that the lowest responsible bid for this Work reasonably corresponds to what the public will actually pay. The Contractor understands that delays are common to public improvement projects such as this, and that changes in the Contract, Design, Drawings and Specifications may occur and may require extensive and lengthy reviews by various public authorities and may undergo a lengthy approval process. The Contractor is advised, therefore, that this public improvement project is complex and may be subject to delays. Accordingly, the Contractor agrees to make no claim whatsoever against the Owner, its employees, agents or representatives on account of any delay in the performance of the Work or any other obligation of

the Contractor under this Contract, including any delay caused by or resulting from any act or omission of the Owner, its employees, agents and representatives. In appropriate circumstances, as provided herein, the Contractor may be entitled to an Extension of Time in which to complete its performance of the Work. The Contractor nonetheless agrees that, whether or not it is granted an Extension of Time, the Contractor waives any and all right to claim damages for delay, and represents that it has taken into consideration the risk of loss and damage from delay in preparing and submitting its bid, and assumes all risk of loss therefrom.

16.9 Discretionary Allowance of Escalation Costs. Notwithstanding any provision in this Article, the Owner may, in its sole and absolute discretion, issue the Contractor a Change Order for Extra Payment to reimburse the Contractor for escalation in labor rates and material prices incurred by the Contractor by reason of an Excusable Delay, on condition that the Contractor shall have complied fully with the requirements and conditions for obtaining an Extension of Time and shall have furnished to the Engineer and to the Engineer's satisfaction proof of such escalation costs. The Contractor shall in no event be entitled to reimbursement for increased costs due to overhead, labor inefficiency or to any profit on the amount of such increased costs. The granting of any such Change Order shall not be deemed a waiver of any of the Owner's rights under this Contract or of any condition to be fulfilled by the Contractor.

Article XVII

Substantial Completion

17.1 The Contractor shall have achieved Substantial Completion of its Work when all of the conditions set forth in this Article have been met to the satisfaction of the Owner and Engineer.

17.2 Statement of Substantial Completion. The Contractor shall submit to the Engineer a signed, notarized Statement of Substantial Completion in which the Contractor certifies that:

- a. all Work and Extra Work, excepting the items on the Final Punch List and any close-out requirements, are complete and in all respects in compliance with the

Contract;

- b. all equipment and machinery, if any, furnished by the Contractor are operational and in good working order;
- c. all utilities specified or required under the Contract are connected and functioning properly;
- d. The Contractor shall achieve Final Completion, including completion of all Final Punch List items and close-out requirements, on or before a date certain ("Final Completion Date").

17.3 Statement of Claim. Simultaneously with its Statement of Substantial Completion, the Contractor shall submit to the Engineer a signed, notarized Statement of Claim setting forth in detail all claims asserted by the Contractor against the Owner, if any, relating to Work or Extra Work performed to the date of the Statement of Claim. Such Statement of Claim shall identify separately each such item of Work and Extra Work for which a claim is made; the dollar amount claimed and quantity of material supplied if applicable; and the date each such item of Work or Extra Work was completed or furnished. In the case of Extra Work, the Contractor shall state whether the Extra Work was authorized by the Engineer in writing and shall attach a copy of such authorization or applicable Change Order, as well as all Time and Material Statements if applicable. The Statement of Claim shall also identify all claims asserted by the Contractor on behalf of its Subcontractors and Material men.

17.4 Drawings. The Contractor shall submit, prior to or simultaneously with its Statement of Substantial Completion, a set of as-built (or record) drawings and all manufacturers' warranties and guarantees as required under the Contract Documents (unless the Contract Documents allow the Contractor to submit such drawings, warranties and guarantees prior to Final Completion).

17.5 Temporary Certificate of Occupancy. If a Certificate of Occupancy is required for

occupation of the Project, a temporary Certificate of Occupancy has been issued covering the whole of the Project.

17.6 Request for Final Punch List. Prior to submittal of its Statement of Substantial Completion, the Contractor shall request the Engineer in writing to prepare the Final Punch List setting forth those deficiencies which remain to be corrected or supplied. The Engineer shall prepare and furnish to the Contractor such Final Punch List. The Engineer may furnish the Final Punch List to the Contractor prior to the Contractor's request therefor.

17.7 Rejection and Approval. Upon receipt of the Contractor's Statement of Substantial Completion, the Engineer shall verify whether the Contractor has met all the conditions of Substantial Completion, and whether, in the Engineer's opinion, the Statement and information therein are correct and accurate. The Engineer may accept or reject such Statement as submitted in whole or in part and shall so notify the Contractor. In the case of rejection, the Engineer may direct the Contractor to correct or remedy deficiencies or errors and the Contractor shall promptly comply and submit one or more revised Statements as required by the Engineer. Upon approval of the Statement of Substantial Completion and verification that the Contractor has met all required conditions, the Engineer shall deliver to the Owner with a copy to the Contractor its certification that the Contractor has achieved Substantial Completion. The Engineer's acceptance and certification are for fiscal and record keeping purposes and shall not in any way constitute a waiver of any right of the Owner to assert any claims for loss, damage, reimbursement or indemnification against the Contractor, Engineer or any other party.

17.8 Substantial Completion Requisition. Following receipt of the Engineer's Certification of Substantial Completion, the Contractor may submit to the Engineer a Substantial Completion Requisition for the remaining balance of the Contract Price less amounts to be retained pursuant to this Contract. After receipt of a proper Substantial Completion Requisition satisfactory to the Engineer, the Engineer will

prepare and certify, and the Owner will approve, a voucher for payment of the unpaid balance, less two times the value as determined by the Engineer of all remaining items to be completed and an amount necessary to satisfy any claims, liens or judgments against the contractor which have not been suitably discharged, and any amounts withheld under Article XX. The voucher will be filed with Orange County Community College, with a copy available to the Contractor upon request. The Owner will pay the Contractor the amount specified in the voucher after the filing of such voucher in the Orange County Community College office.

17.9 Waiver and Release. The Contractor's acceptance of payment hereunder shall be construed as a complete, unconditional and general release of the Owner by the Contractor, and all persons claiming by, through or under the Contractor with respect to all claims for loss or damages relating to, or arising out of, this Contract or the Work, except for:

- a. unresolved claims set forth in the Statement of Claim pursuant to Paragraph 17.3 of this Article submitted by the Contractor and any claim arising out of or relating to Work performed by the Contractor after the Contractor's submittal of such Statement; and
- b. The Contractor's claims against the Owner for any amount then withheld pursuant to this Article. Nothing herein shall be construed as a right to revive any claims waived by the Contractor under other provisions of the Contract.

17.10 Owner's Discretion. Notwithstanding any of the above provisions, the Owner has the discretion to waive any of the above conditions upon which the Contractor's entitlement to Substantial Completion or payment therefor is based.

Article XVIII

Early or Partial Acceptance

18.1 Owner's Right to Early Occupation. At any time, whether before or after Substantial Completion, the Owner shall have the right to enter and occupy the Project Site, including any area in which the Work is being performed, for any reason whatsoever, including use and occupancy, any emergency, or the installation of any equipment, fixtures, or other property of any kind. Any occupancy by the Owner hereunder shall not constitute the Owner's acceptance of the Work, or Substantial Completion or Final Completion, and shall not otherwise relieve the Contractor of any responsibility under the Contract except as otherwise specified in this Article.

18.2 Partial Acceptance. At any time prior to Substantial Completion of all the Work, the Owner may elect, in the Owner's judgment, to certify any portion or phase of the Work as substantially complete. The Owner shall exercise such election by written Certificate of Partial Acceptance to the Contractor which:

- a. describes the portion accepted;
- b. states the portion of the Contract Price and the amount of retainage (if any) allocable to the portion accepted; and
- c. includes a Final Punch List for the accepted portion.

18.3 Partial Substantial Completion. Within thirty (30) days of delivery of the Owner's Certificate of Partial Acceptance, the Contractor may submit a Statement of Claim in conformity with Paragraph 17.3 and a Requisition for Substantial Completion as to the portion accepted in conformity with Paragraph 17.8. The terms and conditions set forth in Paragraphs 17.3, 17.4, 17.8, 17.9 and 17.10 shall apply with the same force and effect with respect to any Certification of Partial Acceptance, Statement of Claim and requisition for Substantial Completion thereunder.

18.4 The Owner's Certification of Partial Acceptance shall constitute, with respect to the portion in question, Substantial Completion for all purposes of the Contract except that, if the Owner commences

beneficial use and occupancy (and not mere testing) of the portion accepted before Final Completion, the Guarantee Period specified in Article XX shall commence, with respect to the portion accepted, on the date when the Owner commences such beneficial use and occupancy.

Article XIX

Final Completion

19.1 The Contractor shall have achieved Final Completion of its Work when all of the conditions set forth in this Article have been met to the satisfaction of the Owner and Engineer.

19.2 Statement of Final Completion. The Contractor shall submit to the Engineer a signed, notarized Statement of Final Completion in which the Contractor certifies that:

- a. all Work and Extra Work, including all the items on the Final Punch List and any close-out requirements, are complete and in all respects in compliance with the Contract;
- b. all equipment and machinery, if any, furnished by the Contractor are operational and in good working order;
- c. all utilities specified or required under the Contract are connected and functioning properly.

19.3 Statement of Claim. Simultaneously with its Statement of Final Completion, the Contractor shall submit to the Engineer a signed, notarized Statement of Claim setting forth in detail all claims asserted by the Contractor against the Owner, if any, relating to Work or Extra Work performed to the date of the Statement of Claim. Such Statement of Claim shall identify separately each item of Work and Extra Work for which a claim is made; the dollar amount claimed and quantity of material supplied if applicable; and the date such item of Work or Extra Work was completed or furnished. In the case of Extra

Work, the Contractor shall state whether the Extra Work was authorized by the Engineer in writing and shall attach a copy of such authorization or applicable Change Order, as well as all Time and Material Statements if applicable. The Statement of Claim shall also identify all claims asserted by the Contractor on behalf of its Subcontractors and Material men.

19.4 Drawings. The Contractor shall submit, prior to or simultaneously with its Statement of Final Completion, a set of as-built (or record) drawings and all manufacturers' warranties and guarantees as required under the Contract Documents.

19.5 Certification of Final Completion. Upon receipt of the Contractor's Statement of Final Completion, the Engineer shall verify whether the Contractor has met all the conditions of Final Completion and whether the Statement and information therein are correct and accurate. The Engineer may approve such Statement as submitted in whole or in part and shall so notify the Contractor. In the case of rejection, the Engineer may direct the Contractor to correct or remedy deficiencies or errors and the Contractor shall promptly comply and submit one or more revised Statements as required by the Engineer. Upon approval of the Statement of Final Completion and verification that the Contractor has met all required conditions, the Engineer shall deliver to the Owner with a copy to the Contractor its certification that the Contractor has achieved Final Completion. The Engineer's approval and certification are for fiscal and record keeping purposes and shall not in any way constitute a waiver of any right of the Owner to assert any claim for loss, damage, reimbursement or indemnification against the Contractor, Engineer or any other party.

19.6 Certificate of Occupancy. As a further condition to Final Completion, all governmental authorities having jurisdiction over the Project shall have inspected the Work and the Project and unconditionally authorized occupancy of the entire Project, and shall have issued all required permanent Certificates of Occupancy and all other permits, licenses, or certificates required for occupancy and the intended use.

19.7 Final Payment. The Contractor shall submit a Requisition for Final Payment simultaneously with its Statement of Final Completion. After receipt of a proper Requisition for Final Payment satisfactory to the Engineer, the Engineer will prepare and certify, and the Owner will approve, a voucher for payment, less all amounts necessary as determined by the Engineer to satisfy any claims, liens or judgments against the contractor which have not been suitably discharged, and all amounts withheld under Article XX. The voucher will be filed with Orange County Community College, with a copy available to the Contractor upon request. The Owner will pay the Contractor the amount specified in the voucher after the filing of such voucher in the Orange County Community College office. Such Final Payment shall constitute Final Acceptance of the Work.

19.9 Waiver and Release. The Contractor's acceptance of Final Payment (or the Contractor's failure to submit a Requisition for Final Payment and Statement of Claim as required in this Article within ninety (90) days after issuance of written notice to the Contractor of the Owner's determination that Final Completion has occurred) shall be construed as the Contractor's complete, unconditional and general release of the Owner by the Contractor (and all persons claiming by, through and/or under the Contractor) relating to all claims for loss and damage relating to, or arising out of, this Contract or the Work, except for:

- a. unresolved claims set forth in the Contractor's Statements of Claim;
- b. the Contractor's claim for amounts still withheld. Nothing herein shall be construed as a right to revive any claim previously waived by the Contractor under other provisions of the Contract.

19.10 Owner's Discretion. Notwithstanding any of the above provisions, the Owner has the discretion to waive any of the above conditions upon which the Contractor's entitlement to Final Completion or payment therefor is based.

Article XX

Correction of Work, Guarantee, and Maintenance Bond

20.1 The Contractor guarantees unconditionally to complete, repair, replace, restore, rebuild and correct promptly all Work which is incorrect, defective, omitted, or does not otherwise comply with the Contract, of which the Engineer or the Owner gives the Contractor written notice at any time during the Guarantee Period. "Guarantee Period" means the period beginning on the commencement date set forth in the Notice to Proceed and continuing:

- (a) through and until two (2) years after Final Completion; and
- (b) with respect to any Work repaired, replaced, restored or rebuilt by Contractor after Final Completion, through and until two (2) years after the completion of the applicable corrective action.

20.2 If the Contractor fails to commence required corrective action hereunder within three (3) days after written notice from the Engineer, or if the Contractor does not thereafter perform diligently and complete its corrective work, the Owner may undertake the necessary corrective work itself; and the Contractor shall bear all costs of such corrective work; or, at the Owner's election, the Owner may require the Surety to take corrective action under the Performance Bond, or Maintenance Bond where applicable.

20.3 The costs of corrective work referred to herein shall include the following:

- (a) all amounts paid by the Owner to any Contractor, consultant, or other person engaged by the Owner to advise, consult, or furnish labor, materials, services or equipment of any kind necessary (in the Owner's judgment) to perform the corrective Work;
- (b) all costs of correcting, repairing or replacing any other Work or part of the Project, or work of any other prime contractor, damaged, removed, or uncovered by reason of the Contractor's defective or omitted Work;

- (c) all costs of removing rejected Work from the Site; and
- (d) all loss, expenses and damages which the Owner incurs in connection with the foregoing.

20.4 The Owner or the Engineer may elect, by Change Order, to accept defective or non-conforming Work and charge the Contractor for the amount by which the value of the Work has been reduced, as determined by the Engineer.

20.5 The Guarantee Period specified herein establishes only the Contractor's specific obligation to correct the Work and shall not be construed to establish a period of limitation with respect to any other obligations or liabilities of Contractor under the Contract. This Article XX is intended to supplement and not to limit the Contractor's obligations under other provisions of the Contract.

20.6 Any amounts for which the Contractor is responsible hereunder shall be deducted from the unpaid balance of the Contract Price and the Contractor shall pay to the Owner upon demand any amount owing hereunder which exceeds the unpaid balance of the Contract Price.

20.7 The Contractor shall secure from the manufacturers of all equipment and materials required under the Contract such manufacturers' standard warranties and guarantees (or such other warranties and guarantees as the Specifications may require) in the name of the Owner and shall deliver the same to the Engineer.

20.8 To the extent that the Contractor has performed the Contractor's obligations under this Article, the Owner shall so certify after the expiration of the Guarantee Period.

Article XXI

Books and Records and Right of Audit

21.1 All payments whatsoever by the Owner to the Contractor with respect to the Contract, and

all Work of the Contractor and all Subcontractors, shall be subject to audit by the Owner at any time, whether before or after Final Completion.

21.2. The Contractor and all Subcontractors shall, upon written notice from the Owner, produce for examination and copying at the Contractor's, or the applicable Subcontractor's, office, by representatives of the Owner, any and all books and records as specified in Paragraph 21.3. Moreover, the Contractor, every Subcontractor, and their employees shall submit to examination under oath by any person designated by the Owner to investigate claims against the Owner, possible overpayments to the Contractor, or any other matters with respect to this Contract.

21.3 In this Contract, "Books and Records" means any and all books of account, bills, vouchers, invoices, payrolls, payroll reports, cost estimates and bid computations and analyses, pre-bidding worksheets, take-offs, and quotations from prospective Subcontractors, Subcontracts, purchase orders, time books, logs, daily job diaries and reports, periodic cost analyses kept during the course of the Work, bank deposit books, bank statements, check books, canceled checks, correspondence, and all other documents showing acts and transactions or relating to or arising out of the Work, this Contract, or any Subcontract.

21.4 The Contractor shall keep and maintain all books and records for at least six (6) years after Final Completion.

21.5 If the Contractor and its Subcontractors do not comply with Paragraphs 21.2 and 21.4 of this Article, the Owner shall be released from all claims arising under or relating to this Contract, except for sums certified by the Owner to be due under the Contract. No person has power to waive any provision of this Article; and in any legal proceeding against the Owner to recover any sum in excess of the sums certified by the Owner to be due under this Contract, the Contractor must allege in the Contractor's complaint, and prove at trial, the Contractor's compliance with this Article.

21.6 In addition to the foregoing, after commencement of any legal proceeding by the

Contractor arising under or by reason of this Contract, the Owner shall have the right upon written notice from the Owner's attorneys to require the Contractor under oath to produce all or any books and records for examination and to cause any officers, principals and employees of the Contractor to be examined under oath by the Owner's attorneys. The Contractor agrees that service of a subpoena for any such purpose shall be effective by mailing to the Contractor or any of its officers or principals by certified mail, return receipt requested to the address specified in this Contract therefor, or if such address ceases to be valid, to the party's last known address.

Article XXII

Liquidated Damages

22.1 If the Contractor fails to complete the Work on or before the scheduled Completion Date (as may be extended in accordance with Article XVI), the Contractor shall owe the Owner the amount specified in the Information for Bidders for each and every calendar day beyond such scheduled Completion Date until the occurrence of Substantial Completion to compensate the Owner for the delay suffered in obtaining beneficial use of the Work. The Contractor agrees that the Owner's actual damages for delay in obtaining beneficial use of the Work would be difficult or impossible to ascertain and that such amount constitutes a fair and reasonable amount of damages for the Owner's loss of beneficial use.

22.2 The Owner shall deduct any amounts owing to the Owner under this Article from any unpaid balance of the Contract Price, and the Contractor shall pay to the Owner, upon demand, any amount for liquidated damages, which exceeds the unpaid balance of the Contract Price.

22.3 This Article is intended to supplement (and not to restrict) all other rights and remedies of the Owner under the Contract. This Article is not intended, and shall not be construed, to limit the Owner's right to claim actual damages.

Article XXIII

Legal Proceedings by the Contractor

23.1 Limitation Period. The Contractor agrees that it must commence any and all legal proceedings of whatever nature against the Owner, Engineer, or their representatives, agents, officers and employees, no later than one calendar year following:

- a. Substantial Completion, with respect to claims arising out of or relating to Work or Extra Work performed, or events occurring, prior to Substantial Completion;
- b. Final Completion, with respect to claims arising out of or relating to Work or Extra Work performed, or events occurring, prior to Final Completion;
- c. Termination pursuant to Articles XIII and XIV.

23.2 Attorney's Fees and Legal Costs and Expenses. In the event that the Contractor commences any legal proceeding against the Owner seeking money damages arising out of or relating to the Work, the Contract or the Project, and the Owner thereafter makes a written offer of payment to the Contractor to settle such legal proceeding, and the Contractor does not accept in writing the Owner's offer of payment within thirty (30) calendar days of receipt thereof (unless otherwise extended in writing by mutual consent) and continues to prosecute the legal proceeding to a judgment or final determination, then the Contractor shall pay the full amount of the Owner's reasonable attorney's fees, legal costs and expenses if the Contractor recovers a judgment or final determination against the Owner for an amount (exclusive of interest) less than the amount offered by the Owner to settle. Furthermore, the Contractor shall pay the full amount of the Owner's reasonable attorney's fees, legal costs and expenses, whether or not the Owner made any written offer of settlement, if the Owner obtains a judgment or final determination dismissing the legal proceeding.

Article XXIV

Insurance

24.1 Required Insurance. "Required Insurance" means each and every insurance coverage and policy specified in this Article. Unless the Owner specifies otherwise, the Contractor, at its sole cost and expense, shall obtain and maintain in full force and effect all Required Insurance from the Contract Date through Final Completion and otherwise during any period when the Contractor or any Subcontractor is performing any work. The minimum periods and the minimum limits of coverage are not intended, and shall not be construed, to limit any liability or obligation of indemnity of the Contractor under this Contract. If Contractor fails to pay any premium for Required Insurance, or if any insurer cancels or modifies any Required Insurance without the Owner's consent, the Owner at its discretion may pay such premium or procure similar insurance coverage from the same or another insurer, and the Owner may deduct the entire cost or any part thereof from the Contract Price, or the Contractor shall pay the entire cost of any part thereof upon demand. The Contractor shall not perform Work, or allow any of Contractor's or Subcontractor's employees on the Site, during any period when any policy of Required Insurance is not in effect.

24.2 Workers' Compensation. The Contractor shall take out and maintain during the life of the Contract Workers' Compensation Insurance in conformity with the provisions of the Workers' Compensation Law of the State of New York, for all Contractor's employees engaged in work under this Contract, and in case any such work is sublet, the Contractor shall require all subcontractors engaged in work under this Contract to provide similar statutory Workers' Compensation and Employer's Liability Insurance. This Contract shall be void and of no effect unless the person or corporation making or executing same shall secure compensation and disability benefits coverage for employees in compliance with the provisions of the Workers' Compensation Law.

24.3 Commercial General Liability. The Contractor shall furnish a Contractor's Commercial General Liability Policy in the name of and for the benefit of the Owner, protecting the Owner, its agents

and employees, its officers, agents and employees from any and all claims, liability for personal injury (including death) and property damage to anyone arising out of the operations of the Contractor and all Subcontractors under this Contract. Blasting shall also be covered under said policy. The limits for this coverage, as to personal injury as well as to property damage, shall be in an amount no less than \$1,000,000 for each person and \$3,000,000 for each occurrence. The Contractor shall also furnish a Commercial General Liability policy for damage coverage in its own name identical to that provided for the Owner, protecting it from the operations of its Subcontractors under this Contract in an amount no less than \$1,000,000 for each person and \$3,000,000 for each occurrence.

24.4 Commercial Automobile Liability and Physical Damage. The Contractor shall furnish Bodily Injury Liability and Property Damage Liability insurance covering all automotive equipment used by it on this Contract with a limit of no less than \$1,000,000 combined single limit for Bodily Injury and Property Damage.

24.5 Builder's Risk. The Contractor shall carry Builder's Risk (fire and extended coverage) Insurance upon all work in place and/or materials stored at the construction site, including foundations and building at the construction site, and including building equipment. The insurance shall be for the benefit of the Contractor and the Owner as an additional insured, and each shall be named in the policy, or policies, as an insured. The policy shall furnish coverage at all times for the full replacement cost value of all completed construction, as well as materials in place and/or stored at the site, whether or not partial payment has been made by the Owner.

24.6 Proof of Coverage. Insurance certificates indicating proof of coverage of the required insurance shall be furnished in the name of the Owner and for all of the insurance required under this Contract, and certificates and the policies shall provide that the certificates and the policies cannot be changed or cancelled until 30 days written notice has been given to the Owner.

The insurance required shall be maintained in full force and effect during the performance of the Work. Two (2) copies each of these insurance certificates shall be furnished to the Owner by the Contractor at least ten (10) days prior to the commencement of any Work under this Contract. The original and one copy of the Owner's Commercial General Liability Insurance Policy shall be delivered to the Owner. All policies shall contain an endorsement to the effect that the Owner shall not be responsible for payment of any premium.

ARTICLE XXV

Labor Law Requirements

25.1 Labor Law, Article 8. The Contractor shall comply with Article 8 of the Labor Law of the State of New York, the terms of which are referred to and incorporated as though set forth fully herein.

25.2 No laborer, worker or mechanic in the employ of the Contractor, Subcontractor, or other person performing the Work or any part thereof shall be permitted or required to work more than eight (8) hours in any one calendar day or more than five (5) days in any one week except in cases of extraordinary emergency including fire, flood or danger to life or property.

25.3 Prevailing Wage Rates. Each laborer, worker and mechanic employed by the Contractor and its Subcontractors or other persons performing the Work or any part thereof shall be paid prevailing wages in accordance with Article 8 of the Labor Law. Each employee and person engaged in Work on this project, in the grade, or occupation listed on the Prevailing Wage Rate Schedule (Appendix A hereto), shall be paid not less than the wage rate so listed for that trade or occupation.

25.4 In the event it becomes necessary for the Contractor or any Subcontractor to employ on the project under this Contract any person in a trade or occupation (except executive, supervisory, administrative, clerical or other non-manual workers) for which no minimum wage rate is herein specified, the Contractor shall immediately notify the Owner, who will promptly thereafter furnish the Contractor with the minimum rate. The minimum rate thus furnished shall be applicable as a minimum for such trade or

occupation from the time of the initial employment of the person affected and during the continuance of such employment.

ARTICLE XVI

Miscellaneous

26.1 Patented and Copyrighted Material. The Contract Drawings, the Specifications, and all other documents forming part of the Contract and all drawings and shop drawings issued by the Owner or the Contractor in connection with this Contract or the Work shall be and shall remain the property of the Owner, whether or not the Owner completes the Project or terminates the Work or the Contract. The Owner shall own all patents and copyrights to all such material, including without limitation plans, drawings, designs, specifications, shop drawings, samples, studies, and surveys prepared by the Contractor, any Subcontractor, or the Owner relating to the performance of the Work, whether prior or subsequent to the Contract Date.

26.2 Notices. All notices, requests and demands required under this Contract shall be sent by hand or by certified mail, return receipt requested unless otherwise specified in this Contract, and shall be addressed to the Contractor or the Owner at their respective addresses as set forth in this Contract and to the Engineer as set forth in the Invitation to Bid. The Contractor shall promptly notify the Owner of all address changes.

26.3 Applicable Laws, Jurisdiction and Venue. This Contract shall be governed and construed under the laws of the State of New York. The parties consent to the jurisdiction of the Courts of the State of New York to resolve all disputes and claims arising out of or relating to this Contract. The parties agree that the venue of any and all litigation arising hereunder shall be in the County of Orange, New York.

26.4 Merger. This Contract embodies the entire agreement of the parties and supersedes all prior and contemporaneous representations, agreements and understandings relating to the subject matter

hereof, and any and all such prior and contemporaneous representations, agreements or understandings are deemed to be merged herein.

26.5 The Contractor agrees and represents that the Contractor shall make no claim and shall bring no action against any official or employee in his or her individual, personal capacity for any act, omission or statement made or done relating to or arising out of this Contract.

26.6 General Municipal Law § 109. The Contractor shall not assign, transfer or convey this Contract or any of its right, title or interest herein without the express prior consent in writing of the Owner.

26.7 A finding, ruling or determination that one or more of the provisions, terms or conditions in this Contract may be illegal or void shall not affect the validity of the remaining provisions, terms and conditions, which shall be severable and which shall be given their full force and effect.

SUNY Orange - Middletown Campus
Orange Hall Theater HVAC Unit Replacement, OCCC Project # OCCC-2023-20
FE Project # 22-230

IN WITNESS WHEREOF, Orange County Community College has caused this agreement to be signed by
Paul Martland, VP of Administration & Finance, pursuant to a resolution of authorization by said Orange
County Community College on the _____ day of _____, 2022, and the
Contractor has hereunto set his hand and seal this _____ day of _____, 2022.

By: _____

Title of Signatory: _____

Witness: _____

Contractor:

By:

X _____

Title of Signatory: _____

Witness: _____

STATE OF NEW YORK)
) SS:
COUNTY OF ORANGE)

On this ____ day of _____, 2022, before me the subscriber personally
appeared, to me known, and who, being by me duly sworn, did depose and say that he resides in
_____, and that he is the Supervisor of the Board of said _____;
that he knows the seal of said _____ and that the seal affixed to the foregoing
instrument is such seal; that the same was affixed thereto by the order of the Board of said
_____, and he signed his name hereto by like order.

Notary Public

ACKNOWLEDGEMENT OF PRINCIPAL, IF A CORPORATION

STATE OF NEW YORK)
) SS:
COUNTY OF ORANGE)

On this ____ day of _____, 2021, before me personally came and appeared _____, to me known, who, being by me duly sworn, did depose and say that he resides at _____, that he is the _____ of the corporation described in and which executed the foregoing instrument; that he knows the seal of said corporation; that one of the impressions affixed to said instrument is an impression of such seal; that it was affixed by order of the Directors of said corporation; and that he signed his name thereto by like order.

Notary Public

(CORPORATION SEAL)

ACKNOWLEDGEMENT OF PRINCIPAL, IF A PARTNERSHIP

STATE OF NEW YORK)
) SS:
COUNTY OF ORANGE)

On this _____ day of _____, 2021, before me personally came and appeared _____
_____ to me known to be one of the members of the firm of _____ described in and
who executed the foregoing instrument; and he duly acknowledged to me that he executed the same as and
for the act and deed of said firm.

Notary Public

SUNY Orange - Middletown Campus
Orange Hall Theater HVAC Unit Replacement, OCCC Project # OCCC-2023-20
FE Project # 22-230

ACKNOWLEDGEMENT OF PRINCIPAL, IF AN INDIVIDUAL

STATE OF NEW YORK)
)
COUNTY OF ORANGE) SS:

On this _____ day of _____, 2021, before me personally came and appeared
_____ to me known to be the person described in and who executed
the foregoing instrument; and he duly acknowledged to me that he executed the same.

Notary Public

SECTION 01 1000 - SPECIAL CONDITIONS

1. GENERAL

The proposal consists of all labor, tools, materials and equipment required for the proposed work as outlined on the plans and in the specifications.

2. CONTRACTOR'S RESPONSIBILITY

The Contractor shall provide a competent person responsible for installation of the HVAC system in accordance with plans and specifications. The competent person shall be familiar with N.Y.S. Labor Dept. and OSHA Standards for worker safety and safe site conditions.

Contractor's Use of Premises: Contractor will have **limited** use of **building** during construction, as it shall be partially occupied by Administrative Personnel. Staging of work must be done in coordination with building owner for occupant convenience. Contractor's use of premises is limited by Owner's right to perform work or employ other contractors on portions of project.

1. Owner will occupy premises during construction. Perform construction **only during** normal working hours (8 AM to 5 PM Monday thru Friday, other than holidays), unless otherwise agreed to in advance by Owner. Clean up work areas and return to a useable condition at the end of each work period.

3. OSHA REQUIREMENTS

All work is subject to OSHA Requirements.

1. Work to include replacement of items shown on plans.
4. This project includes the replacement of the theater air handler (AHU-A), one (1) outdoor condensing unit (CU-1) and one (1) roof mounted energy recovery unit (RU-1).
5. Work to commence on notice of award and to be completed within an amount of time agreed upon by the Owner, after Equipment Arrival.
6. Contractor shall coordinate scheduled work around summer class schedule.
7. Work outside of normal work day and work week is allowed at no additional cost to Owner; must be coordinated with Orange County Community College Capital Projects Coordinator and Security must be advised.
8. All workers to be registered with Orange County Community College and all vehicles on campus are to be registered with Orange County Community College. Contractor's Superintendent required at all times. Contractor to give contact information on Superintendent and also supply emergency numbers. All employees to be registered with OCCC. Additionally, contractor shall contact security for daily access and advise security to take the building offline. Contractor shall also notify security when they leave.

9. Work is to commence within 10 days of Notice to Proceed unless otherwise advised by the college and be manned continuously.
10. All 3rd party inspections, cooling equipment, electric, etc. to be paid by contractor.
11. The contractor shall supply all labor, material and equipment for a complete and thorough job, even if certain items are inadvertently omitted.
12. Project will have a pre-construction meeting and bi-weekly progress meetings.
13. As-built drawings required from contractors as well as O & M manuals and company instruction for employees.
14. Work area to remain passable at all times for College employees to be able to complete their work.
15. Work area to be cleaned daily by end of day.
16. Work area to be secured daily upon completion of work for that day.

GENERAL NOTES:

1. Drawings on these plans are diagrammatic. The general contractor is the only prime contractor; mention of other trades or contractors refer to his subcontractors. This contractor shall be responsible for coordinating all HVAC and Electrical work with other trades and the building structure. No extra payments will be authorized for rerouting or removal of installed work due to lack of coordination with other systems.
2. All work shall be the responsibility of the General Contractor and /or his subcontractors. Any reference to Electrical Contractor, Plumbing Contractor, HVAC Contractor or other trade specific contractor shall be understood to come under Requirements of the General Contractor.
3. Prior to any work, the Contractor shall inspect the roof and report any defects to the Engineer and SUNY Orange Representatives. The Contractor shall protect the roof from being damaged during demolition and construction, and shall be responsible for any damage. Any roof repairs shall be performed by the college's roofing contractor.
4. Contractor will not make new penetrations through plaster walls, ceilings or floors.
5. Provide shut-off valves at all piping branch take-offs and at all connections to equipment. Shut-off valves to be ball-valve type.
6. Provide drains with hose adapters and caps on piping at all low points. Provide manual vents on piping at all high points.
7. Coordination of electrical characteristics and requirements of all mechanical equipment is the responsibility of the Contractor.
8. All motor starters shall be furnished by the HVAC contractor and installed by the Contractor.

9. All required control equipment and wiring shall be furnished and installed by the college's Controls Contractor. This contractor shall be responsible for coordination with the controls contractor for installation.
10. Duct smoke detectors shall be furnished and installed by the college's Fire Alarm Contractor. The General Contractor shall coordinate with the Fire Alarm Contractor for installation.
11. The terms "provide" or "furnish", as used on the plans, indicate that the contractor is to furnish and install the referenced equipment or systems in their entirety as required for a complete and operable system.
12. Contractor shall provide and install all components indicated on detail sheets, plans, specifications and all pertinent equipment required for a complete and workable system.
13. Contract close-out: In the presence of the Owner or Engineer, demonstrate operation of systems and that all specifications have been met to the satisfaction of all parties.
14. All areas disturbed during construction shall be restored to original condition. Any grassed or landscaped areas and any pavement disturbed shall be restored to original condition with approved material. Approved topsoil shall be provided in grassed areas and properly graded. Seeding by Owner.
15. It is the intent and purpose of these specifications and drawings to include and provide for all materials, appliances and labor to properly complete and leave in perfect working condition the entire system hereinafter specified. Any material, labor or appliance not specifically mentioned in these specifications or shown on the drawings, but necessary for a complete installation, must be furnished by this contractor.

MECHANICAL DEMOLITION NOTES:

1. Remove all equipment as indicated on plan. Removals shall include all housekeeping pads, dampers, valves, fittings, and any other associated accessories which pertain to the equipment to be removed. Supports and hangers to remain for reuse where possible.
2. Removal of all power connections to demolition items shall be by the electrical contractor.
3. Any discrepancies between the demolition plans and actual field conditions shall be brought to the attention of the Engineer. Any demolition work which may be questionable due to unforeseen field conditions shall not be removed until reviewed by the Engineer or Building Facilities Manager.
4. Demolition work shall include the preparation of existing equipment for connection to new equipment.
5. All equipment removals shall become the property of this contractor. This contractor shall be responsible for the proper removal and disposal of demolition items off-site unless otherwise noted.

6. The plans are intended to convey the extent and scope of the demolition work. Every item intended for removal may not be shown. The contractor is advised to survey the project site before submitting a bid for demolition work.
7. It is the responsibility of the mechanical contractor for the draining, filling and chemical water treatment, per boiler manufacturer's requirements.
8. Contractor to protect walls and floors from being damaged during demo and disposal of demo material. Any damaged is to be replaced.

CONTROLS WIRING AND INSTALLATION NOTES:

1. Low-voltage control relays are required for any motor control circuit above 24V.
2. All existing low-voltage wiring to be reused. Extensions of this wire will be provided by General Contractor.
3. Unit controls shall be provided by the college's controls contractor and paid for by the college. This contractor shall be responsible for coordination with the controls contractor for installation.
4. No new penetrations are to be made for low-voltage wiring.

ADDITIONAL GENERAL NOTES:

1. All conduits are shown diagrammatically, exact runs shall be determined in field except where specifically dimensioned on conduit layouts. Contractor shall follow minimum spacing requirements to reduce electromagnetic interference. Coordinate conduit routing with all other trades.
2. All exposed circuits shall be run parallel to building walls and beams except where otherwise shown. Contractor shall install conduit in such a manner to avoid all interferences.
3. Deflection/expansion fittings shall be provided where rigid metal conduits cross structural expansion joints.
4. Exposed conduit shall be supported on walls or ceilings by approved hangers of angle or channel construction. Conduits shall be supported at least every eight (8') feet.
5. No conduit shall be smaller than 3/4" unless noted otherwise on plans.
6. Exact conduit stub-up locations are to be determined by the electrical contractor based on certified manufacturer's drawings of the respective equipment. Conduit shall be installed to agree with the equipment furnished.
7. Conduits passing through building floors or walls below grade are to be installed with watertight through wall conduit seal fittings.
8. Equipment furnished by others shall be installed and energized by the HVAC contractor.

9. The HVAC contractor shall not endanger the stability of the structure or any part thereof by cutting, drilling or otherwise, and shall not in any way cut or alter the work of any other contractor, except with the written consent of and under the direction of the architect and/or general contractor.
10. The electrical contractor shall secure all approvals and certificates and pay all fees for all the work installed. Certificates shall be delivered to the General Contractor before final payment will be made.
11. All work shall be done in accordance with the latest applicable version of the NEC as well as all State and local codes.
12. The drawings indicate and the specifications describe the general arrangements and location of outlet boxes, etc. The contractor shall, without extra cost to the owner, make all reasonable modifications in the work as may be required to prevent conflict with existing conditions, the work of other trades and for the proper installation of the work.
13. Prior to submission of the bid proposal, the college will allow for one site walk-through to allow all contractors interested in bidding to visit the site and examine carefully the existing conditions and the difficulties that will be incurred during the performance of this work. This site walk-through has been planned by the Owner to take place on Thursday, September 9th, 2021 at 8:30 A.M. All are strongly encouraged to attend in order to:
 - A. Verify and coordinate piping and conduit routing.
 - B. Verify and coordinate scope of demolition work.
 - C. Verify and coordinate scope of work involving connections to existing base building systems.
 - D. Verify with general contractor scope of work associated with rigging of equipment to be pre-purchased.
14. Claims for additional compensation arising due to failure of the contractor to fully understand the site conditions shall not be paid for any other party.
15. Connections to existing work:
 - A. Install new work and connect to existing work with minimal interference to existing facilities.
 - B. Temporary shut-downs of existing services:
 1. At no addition charges.
 2. At times not to interfere with normal operation of existing services.
 3. Only with written consent of the general contractor and/or building owner's representative.
 - C. Alarm and emergency systems: Not to be determined.
 - D. Maintain continuous operation of existing facilities as required with necessary temporary connections between new and existing work.
 - E. Connect new work to existing work in neat and acceptable manner. Restore existing disturbed work to original condition, including maintenance of wiring continuity as required.
16. Leave wire sufficiently long to permit making final connections. Conduit over ten (10') feet in which wiring is not installed – furnish pull string.

17. Do not pull thermoplastic wires at temperatures lower than 32 degrees F (0 Deg C). Provide cable supports for wire in riser conduits as required by code.
18. Verify locations of outlets and equipment in furnished rooms with architectural drawings of interior details and finish. In centering outlets and locating boxes and outlets, allow for overheat pipes, ducts and mechanical equipment, variations in fireproofing and plastering, window and door trim, paneling, hung ceiling, etc., and correct any inaccuracy resulting from failure to do so without the expense to owner.
19. Junction and Pull Boxes: Do not locate exposed in finished spaces unless required by NEC. Where necessary, re-route or make other arrangements for concealment. Provide pull boxes as indicated and wherever necessary to facilitate pulling of wire and coordinate locations with other trades. Covers of conduits, install pull boxes every 100 feet and as indicated. Coordinate locations with other trades. (No junction boxes to be mounted on plaster).
20. Support junction and pull boxes independently to building structure with no weight bearing on conduit.
21. All access door locations of other trades equipment, see respective trade drawings.
22. For each location of other trades equipment, see respective trade drawings.
23. Contractor shall provide and install all components indicated on detail sheets, plans, specifications and all pertinent equipment required for a complete workable system.
24. Flexible connections in exposed areas shall not exceed 18" maximum.
25. All new equipment wiring shall be extended from existing wiring.
26. HVAC contractor shall become familiar with and comply with owner's building standards for construction.
27. All final connections to vibrating equipment (motors, generators, etc.) shall be through a liquid tight flexible metal conduit.
28. There shall be no new penetrations through plaster walls, floors or ceilings.
29. All penetrations through fire rated partitions shall be sealed fire and smoke tight with an appropriate U.L. listed firestopping material and/or system.
30. The terms "provide" or "furnish", as used on the plans, indicate that the contractor is to furnish and install the referenced equipment or systems in their entirety as required for a complete and operable system.
31. Contractor shall provide and install all components indicated on detail sheets, plans, specifications and all pertinent equipment required for a complete and workable system.
32. Contract Close Out: In the presence of the owner, engineer or architect, demonstrate operation of systems and that all specifications have been met to the satisfaction of all parties.

33. It is the intent and purpose of these specifications and drawings to include and provide for all materials, appliances and labor to properly complete, and leave in perfect working condition, the entire system hereinafter specified. Any material, labor or appliance not specifically mentioned in these specifications or shown on the drawings, but necessary for a complete installation must be furnished by this contractor.

END OF SECTION

SECTION 01 1040 – PROJECT COORDINATION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section specifies administrative and supervisory requirements necessary for Project coordination including, but not necessarily limited to:
 - 1. Coordination.
 - 2. Administrative and supervisory personnel.
 - 3. General installation provisions.
 - 4. Cleaning and protection.
- B. Progress meetings, coordination meetings and pre-installation conferences are included in Section “Project Meetings”.
- C. Requirements for the Contractor’s Construction Schedule are included in Section “Submittals”.

1.3 COORDINATION

- A. Coordination: Coordinate construction activities included under various Sections of these Specifications to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections of the Specifications that are dependent upon each other for proper installation, connection, operation and watertight condition.
 - 1. Contractor must coordinate work with Owner and other prime contractors.
 - 2. Where installation of one part of the Work is dependent on installation of other components, either before or after its own installation, schedule construction activities in the sequence required to obtain the best results.
- B. Where necessary, prepare memoranda for distribution to each party involved outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.
 - 1. Prepare similar memoranda for the Owner and separate Contractors where coordination of their Work is required.

- C. Administrative Procedure: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 - 1. Preparation of schedules.
 - 2. Installation and removal of temporary facilities.
 - 3. Delivery and processing of submittals.
 - 4. Progress meetings.
 - 5. Project closeout activities.

1.4 SUBMITTALS

- A. Coordination Drawings: Prepare and submit coordination Drawings where close and careful coordination is required for installation of products and materials fabricated off-site by separate entities, and where limited space availability necessitates maximum utilization of space for efficient installation of different components.
 - 1. Show the interrelationship of components shown on separate Shop Drawings.
 - 2. Indicate required installation sequences.
 - 3. Comply with requirements contained in Section "Submittals".
- B. Staff Names: Within fifteen (15) days of Notice to Proceed, submit a list of the Contractor's principal staff assignments, including the Superintendent and other personnel in attendance at the site; identify individuals, their duties and responsibilities; list their addresses and telephone numbers.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 GENERAL INSTALLATION PROVISIONS

- A. Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.
- B. Manufacturer's Instructions: Comply with manufacturer's installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents.
- C. Inspect materials or equipment immediately upon delivery and again prior to installation. Reject damaged and defective items.
- D. Provide attachment and connection devices and methods necessary for securing Work. Secure Work true to line and level. Allow for expansion and building movement.

- E. Visual Effects: Provide uniform joint widths in exposed Work. Arrange joints in exposed Work to obtain the best visual effect. Refer questionable choices to the Architect for final decision.
- F. Recheck measurements and dimensions, before starting each installation.
- G. Install each component during weather conditions and Project status that will ensure the best possible results. Isolate each part of the completed construction from incompatible material as necessary to prevent deterioration.
- H. Coordinate temporary enclosures with required inspections and tests.

3.2 CLEANING AND PROTECTION

- A. During handling and installation, clean and protect construction in progress and adjoining materials in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- B. Limiting Exposures: Supervise construction activities to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period. Where applicable, such exposures include, but are not limited to, the following:
 - 1. Solvents.
 - 2. Chemicals.
 - 3. Puncture.
 - 4. Abrasion.
 - 5. Heavy traffic.
 - 6. Soiling, staining and corrosion.
 - 7. Combustion.
 - 8. Unusual wear or other misuse.
 - 9. Contact between incompatible materials.
 - 10. Destructive testing.
 - 11. Unprotected storage.
 - 12. Improper shipping or handling.
 - 13. Theft.
 - 14. Vandalism

END OF SECTION

SECTION 01 3000 - ADMINISTRATIVE REQUIREMENTS

PART 1 - GENERAL

1.1 PROJECT MANAGEMENT AND COORDINATION

- A. Coordinate construction to ensure efficient and orderly installation of each part of the Work.
- B. Engineer to coordinate with Owner to conduct progress meetings at Project site every 2 weeks. Owner to notify Contractor of meeting dates and times. Require attendance of each subcontractor or other entity concerned with current progress or involved with planning or coordination of future activities.
 - 1. Engineer shall record minutes and distribute to parties involved.

1.2 SUBMITTAL PROCEDURES

- A. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - 1. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing.
 - 2. Architect will not accept submittals from sources other than Contractor.
 - 3. Identify deviations from the Contract Documents.
 - 4. Submit six copies of each submittal.
- B. Place a permanent label or title block on each submittal for identification. Provide a 4- by 5- inch space on the label or beside title block to record review and approval markings and action taken. Include the following information on the label:
 - 1. Project name.
 - 2. Date.
 - 3. Name and address of Contractor.
 - 4. Name and address of subcontractor or supplier.
 - 5. Number and title of appropriate Specification Section.
- C. Architect will review each action submittal, mark as appropriate to indicate action taken, and return copies less those retained. Compliance with specified requirements remains Contractor's responsibility.
- D. Construction Schedule Submittal Procedure:
 - 1. Submit schedule within 10 days after date established for Commencement of the Work. Distribute copies to Owner, Engineer, subcontractors, and parties required to comply with dates.

2. Revise the schedule after each meeting or activity where revisions have been made. As Work progresses, mark each bar to indicate actual completion. Distribute revised copies to Owner, Architect, subcontractors, and parties required to comply with dates.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

- A. Product Data: Mark each copy to show applicable choices and options. Include the following:
 1. Data indicating compliance with specified standards and requirements.
 2. Notation of coordination requirements.
 3. For equipment data, include rated capacities, dimensions, weights, required clearances, and furnished specialties and accessories.
- B. Shop Drawings: Submit Project-specific information drawn to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data. Submit 1 reproducible print and 1 blue- or black-line print on sheets at least 8-1/2 by 11 inches but no larger than 30 by 42 inches. Architect will return the reproducible print. Include the following:
 1. Dimensions, profiles, methods of attachment, large-scale details, and other information, as appropriate for the Work.
 2. Identification of products and materials.
 3. Notation of coordination requirements.
 4. Notation of dimensions established by field measurement.
- C. Samples: Submit Samples finished as specified and identical with the material proposed. Where variations are inherent in the material, submit sufficient units to show full range of the variations. Include name of manufacturer and product name on label.

2.2 INFORMATION SUBMITTALS

- A. Construction Schedule: Prepare a horizontal bar chart Contractor's construction schedule.
 1. Provide a separate time bar for each activity, using same breakdown of Work indicated in the Schedule of Values, and a vertical line to identify the first workday of each week.
 2. Coordinate each element with other activities. Show each activity in proper sequence. Indicate sequences necessary for completion of related Work.
 3. Indicate Substantial Completion and allow time for Architect's procedures necessary for certifying Substantial Completion.
- B. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements.

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 3300 - SUBMITTALS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for submittals required for performance of the Work, including:
 - 1. Contractor's interior damage survey.
 - 2. Contractor's construction schedule.
 - 3. Submittal schedule.
 - 4. Daily construction reports.
 - 5. Shop Drawings.
 - 6. Product data.
 - 7. Samples.
- B. Administrative Submittals: Refer to division 1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to:
 - 1. Permits.
 - 2. Applications for payment.
 - 3. Performance and payment bonds.
 - 4. Insurance certificates.
 - 5. List of Subcontractors.
- C. Definitions: Refer to other Division 1 Sections and other Contract Documents for additional definitions:
 - 1. Shop Drawings: See General Conditions. Shop drawings also include:
 - a. Product data specifically prepared for this project.
 - b. Shop or plant inspection and test reports, when made on specific materials, products, or systems to be used in the work.
 - 2. Product Data: See General Conditions. Product data submittals also include:
 - a. Product data not specifically prepared for this project.
 - b. Performance curves, when issued by the manufacturer for all products of that type.
 - c. Printed selection data showing standard colors.
 - d. Wiring diagrams, when standard for all products of that type.
 - 3. Samples: See General Conditions. Submit full-size or size specified, fully fabricated samples cured and finished as specified and physically identical with the material or product proposed. Samples include partial sections of

manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture, and pattern.

- a. Mock-ups and similar samples specified in individual Work sections shall comply with requirements for “samples” to greatest extent possible, and process transmittal forms to provide a record of activity.
4. Informational Submittals: Submittals identified in the Contract Documents as to be submitted for information only.

1.3 SUBMITTAL PROCEDURES

- A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.
 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals and related activities that require sequential activity.
 2. Processing: Allow sufficient review time so that installation will not be delayed as a result of the time required to process submittals, including time for resubmittals.
 - a. Allow two weeks for initial review. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. The Architect will promptly advise the Contractor when a submittal being processed must be delayed for coordination.
 - b. If an intermediate submittal is necessary, process the same as the initial submittal.
 - c. Allow two weeks for reprocessing each submittal.
 - d. No extension of Contract Time will be authorized because of failure to transmit submittals to the Architect sufficiently in advance of the Work to permit processing.
- B. Submittal Preparation: Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.
 1. Provide a space approximately 4” x 5” on the label or beside the title block on Shop Drawings to record the Contractor’s review and approval markings and the action taken.
 2. Include the following information on the label for processing and recording action taken.
 - a. Project name.
 - b. Date.
 - c. Name and address of A/E.
 - d. Name and address of Contractor.
 - e. Name and address of subcontractor.
 - f. Name and address of supplier.
 - g. Name of manufacturer.
 - h. Number and title of appropriate Specification Section.
 - i. Drawing number and detail references, as appropriate.

- C. Submittal Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay. Coordinate submittals and activities that must be performed in sequence, as well as submittals of different types for the same product or system, so that the Architect has enough information to properly review the submittals.
- D. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from Contractor to Architect using a transmittal form. Submittals received from sources other than the Contractor will be returned without action. Submittals received without Contractor's executed review and approval will be returned without action.
 - 1. Transmittal Form: Use AIA Document G810.

1.4 CONTRACTOR'S INTERIOR DAMAGE SURVEY

- A. Prior to construction, including demolition, the Contractor shall conduct a survey and inspect the interior of the building and note any areas of damage which can be visually observed. On a plan the Contractor shall note the location and extent of damage or staining observed. A written description of same, keyed to the plan, shall also be prepared.
- B. These plans and notes, after being submitted to, and reviewed by the Architect, will be the basis for determining if any additional damage has been caused by the operations of the Contractor. This additional damage, if any, will be the responsibility of the Contractor. The Contractor agrees to bear the cost of the repair of additional damage caused by construction operations. Method of repair shall include all that is necessary to restore the damaged area to its original condition.
- C. Submit five (5) copies of the survey plan. The Architect and Owner will each retain one and will return the other for the Contractor's record.

1.5 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Bar-Chart Schedule: Prepare a fully developed, horizontal bar-chart type Contractor's construction schedule. Submit within 10 days of the date established for "Commencement of the Work".
 - 1. Provide a separate time bar for each significant construction activity in proper sequence of operation. Provide a continuous vertical line to identify the first working day of each week. Use the same breakdown of units of the Work as indicated in the "Schedule of Values". Indicate activities separately for each separate building.
 - 2. Within each time bar indicate estimated completion percentage in 10 percent increments. As Work progresses, place a contrasting mark in each bar to indicate percentage of Actual Completion.
 - 3. Secure time commitments for performing critical elements of the Work from parties involved. Coordinate each element on the schedule with other construction activities for each Prime Contract; include minor elements involved in the sequence of the Work. Show each activity in proper sequence. Indicted graphically sequences necessary for completion of related portions of the Work.

- B. Distribution: Following the Architect's response to the initial submittal, the Contractor shall revise and resubmit, if necessary, and upon approval will print and distribute copies to the Architect, Owner, subcontractors, and other parties required to comply with scheduled dates. Post copies in the Project meeting room and temporary field office.
 - 1. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.
- C. Schedule Updating: Revise the schedule after each meeting or activity, where revisions have been recognized or made. Issue the updated schedule concurrently with report of each meeting.

1.6 SUBMITTAL SCHEDULE

- A. After development and acceptance of the Contractor's construction schedule, prepare a complete schedule of submittals. Submit the schedule within the (10) days of the date required for establishment of the Contractor's construction schedule.
 - 1. Prepare the schedule in chronological order; include submittals required during the first 90 days of construction. Provide the following information:
 - a. Related Section number.
 - b. Submittals category.
 - c. Description of the part of the Work covered.

1.7 SUBMITTAL TIMING

- A. Transmit each submittal at or before the time indicated on the approved schedule of submittals. Deliver each submittal requiring approval in time to allow for adequate review and processing time, including resubmittals if necessary; failure of the Contractor in this respect will not be considered as grounds for an extension of the contract time.
- B. Deliver each informational submittal prior to start of the work involved, unless the submittal is of a type which cannot be prepared until after completion of the work; submit promptly. If a submittal must be processed within a certain time in order to maintain the progress of the work, state so clearly on the submittal.
- C. Allow a minimum of two (2) weeks for the first processing of each submittal. Allow more time when submittals must be coordinated with later submittals. Allow same time for processing of resubmittals as for original submissions.
- D. If a submittal must be delayed for coordination with other submittals not yet submitted, the Architect may at his option either return the submittal with no action or notify the Contractor of the other submittals which must be received before the submittal can be reviewed.

1.8 SUBMITTAL PROCEDURE

- A. Contractor Review: Sign each copy of each submittal certifying compliance with the requirements of the Contract Documents. Notify the Architect, in writing and at time of

submittal, or all points upon which the submittal does not conform to the requirements of the contract documents, if any.

1.9 DAILY CONSTRUCTION REPORTS

- A. Prepare a daily construction report, recording the following information concerning events at the site; and submit duplicate copies to the Architect at weekly intervals:
 - 1. List of subcontractors at the site.
 - 2. Approximate count of personnel at the site.
 - 3. High and low temperatures, general weather conditions.
 - 4. Accidents and unusual events.
 - 5. Meetings and significant decisions.
 - 6. Stoppages, delays, shortages, losses.
 - 7. Orders and requests of governing authorities.
 - 8. Change Orders received, implemented.
 - 9. Partial Completions, occupancies.
 - 10. Substantial Completions authorized.

1.10 SHOP DRAWINGS

- A. Submit newly prepared information drawn to accurate scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not considered Shop Drawings.
- B. Shop Drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates and similar drawings. Include the following information:
 - 1. Dimensions, at accurate scale.
 - 2. Identification of products and materials included.
 - 3. Compliance with specified standards.
 - 4. Notation of coordination requirements.
 - 5. Notation of dimensions established by field measurement, at accurate scale.
 - 6. Sheet Size: Except for templates, patterns and similar full size Drawings, submit Shop Drawings on sheets at least 8-1/2" x 11" but no larger than 24" x 36".
 - 7. Initial Submittal: Submit one electronic PDF and one blue or black-line print for the Architect's review; the reproducible print will be returned.
 - 8. Final Submittal: Submit 5 blue or black-line prints; submit 7 prints where required for maintenance manuals. 2 prints will be retained, the remainder will be returned.
 - 9. Do not use Shop Drawings without an appropriate final stamp indicating action taken in connection with construction.

1.11 PRODUCT DATA

- A. Collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates,

standard wiring diagrams and performance curves. Where Product data must be specially prepared because standard printed data is not suitable for use, submit as "Shop Drawings".

1. Mark each copy top show applicable choices and options. Where printed Product Data includes information on several products, some of which are not required, mark copies to indicate the applicable information. Include the following information:
 - a. Manufacturer's printed recommendations.
 - b. Compliance with recognized trade association standards.
 - c. Compliance with recognized testing agency standards.
 - d. Application of testing agency labels and seals.
 - e. Notation of dimensions verified by field measurement.
 - f. Notation of coordination requirements.
2. Submittals: Submit 5 copies of each required submittal; submit 7 copies where required for maintenance manuals. The Architect will retain one, and will return the other marked with action taken and corrections or modifications required.
 - a. Unless noncompliance with Contract document provisions is observed, the submittal may serve as the final submittal.

1.12 SAMPLES

- A. Submit full-size, fully fabricated Samples cured and finished as specified and physically identical with the material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture, and pattern.
 1. Mount, display, or package Samples in the manner specified to facilitate review of qualities indicated. Prepare Samples to match the Architect's Sample. Include the following.
 - a. Generic description of the Sample.
 - b. Sample source.
 - c. Product name or name of manufacturer.
 - d. Compliance with recognized standards.
 - e. Availability and delivery time.
 2. Submit Samples for review of kind, color, pattern, and texture, for a final check of these characteristics with other elements, and for a comparison of these characteristics between the final submittal and the actual component as delivered and installed.
 3. Preliminary submittals: Where Samples are for selection of color, patter, texture, or similar characteristics from a range of standard choices, submit a full set of choices for the material or product.
 - a. Preliminary submittals will be reviewed and returned with the Architect's mark indicating selection and other action.

4. Submittals: Except for Samples illustrating assembly details, workmanship, fabrication techniques, connections, operation and similar characteristics, submit 3 sets; one will be returned marked with action taken.
5. Maintain sets of Samples, as returned, at the Project site, for quality comparisons throughout the course of construction.

1.13 ARCHITECT'S ACTION

- A. Except for submittals for record, information or similar purposes, where action and return are required or requested, the Architect will review each submittal, mark to indicate action taken, and return promptly.
 1. Compliance with specified characteristics is the Contractor's responsibility.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED).

END OF SECTION

SECTION 01 4000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Testing and inspecting services are specified in other Sections of these Specifications or are required by authorities having jurisdiction and shall be performed by independent testing agencies.
 - 2. Owner will provide testing and inspecting services not specified to be provided by Contractor.
 - 3. Contractor is responsible for scheduling inspections and tests and notifying testing agency.
 - 4. Retesting and Re-inspecting: Contractor shall pay for additional testing and inspecting required as a result of tests and inspections indicating noncompliance with requirements.
- B. Performance and Design Criteria: Where design services or certifications by a professional engineer are required by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
 - 2. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated.
- C. Submittals: Testing agency shall submit a certified written report of each inspection and test to **Owner**, Engineer, Contractor, and to authorities having jurisdiction when authorities so direct. Reports of each inspection, test, or similar service shall include the following:
 - 1. Name, address, and telephone number of testing agency.
 - 2. Project title and testing agency's project number.
 - 3. Date of report and designation (number).
 - 4. Dates and locations where samples were taken or inspections and field tests made.
 - 5. Ambient conditions at the time of sample taking and inspecting or field testing.
 - 6. Names of individuals taking the sample or making the inspection or test.
 - 7. Product and test method.
 - 8. Inspection or test data including interpretation of test results and comments or professional opinion on whether inspected or tested Work complies with requirements.
 - 9. Recommendations on retesting or re-inspection.
 - 10. Name and signature of laboratory inspector.

- D. Testing Agency Qualifications: Agencies that specialize in the types of inspections and tests to be performed and are acceptable to authorities having jurisdiction.
- E. Testing Agency Responsibilities: Testing agency shall cooperate with Architect and Contractor in performing its duties and shall provide qualified personnel to perform inspections and tests.
 - 1. Agency shall promptly notify Architect and Contractor of deficiencies in the Work observed during performance of its services.
 - 2. Agency shall not release, revoke, alter, or enlarge requirements of the Contract Documents nor approve or accept any portion of the Work.
 - 3. Agency shall not perform duties of Contractor.
- F. Auxiliary Services: Cooperate with testing agencies and provide auxiliary services as requested, including the following:
 - 1. Access to the Work.
 - 2. Incidental labor and facilities to assist inspections and tests.
 - 3. Adequate quantities of materials for testing, and assistance in taking samples.
 - 4. Facilities for storing and curing test samples.
 - 5. Security and protection for samples and test equipment.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 4200 - REFERENCES

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. Publication Dates: Comply with standards in effect as of date of the Contract Documents, unless otherwise indicated.
- B. Abbreviations and Acronyms: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

AABC	Associated Air Balance Council www.aabchq.com	(202) 737-0202
AAMA	American Architectural Manufacturers Association www.aamanet.org	(847) 303-5664
AASHTO	American Association of State Highway and Transportation Officials www.aashto.org	(202) 624-5800
ACI	American Concrete Institute/ACI International www.aci-int.org	(248) 848-3700
AGA	American Gas Association www.aga.org	(202) 824-7000
AIA	American Institute of Architects (The) www.e-architect.com	(202) 626-7300
AMCA	Air Movement and Control Association International, Inc. www.amca.org	(847) 394-0150
ANSI	American National Standards Institute www.ansi.org	(202) 293-8020
ARI	Air-Conditioning & Refrigeration Institute www.ari.org	(703) 524-8800
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers www.ashrae.org	(800) 527-4723 (404) 636-8400
ASME	ASME International	(800) 843-2763

SUNY Orange - Middletown Campus
Orange Hall Theater HVAC Unit Replacement, OCCC Project # OCCC-2023-20
FE Project # 22-230

	(The American Society of Mechanical Engineers International) www.asme.org	(212) 591-7722
ASTM	American Society for Testing and Materials www.astm.org	(610) 832-9585
AWS	American Welding Society www.aws.org	(800) 443-9353 (305) 443-9353
AWWA	American Water Works Association www.awwa.org	(800) 926-7337 (303) 794-7711
BOCA	BOCA International, Inc. www.bocai.org	(708) 799-2300
CDA	Copper Development Association Inc. www.copper.org	(800) 232-3282 (212) 251-7200
CFR	Code of Federal Regulations www.access.gpo.gov/nara/cfr	(888) 293-6498 (202) 512-1530
EPA	Environmental Protection Agency www.epa.gov	(202) 260-2090
FMG	FM Global (Formerly: FM - Factory Mutual System) www.fmglobal.com	(401) 275-3000
HI	Hydraulic Institute www.pumps.org	(888) 786-7744 (973) 267-9700
ICC	International Code Council (Formerly: CABO - Council of American Building Officials) www.intlcode.org	(703) 931-4533
ICBO	International Conference of Building Officials www.icbo.org	(800) 284-4406 (562) 699-0541
IEEE	Institute of Electrical and Electronics Engineers, Inc. (The) www.ieee.org	(212) 419-7900
MBMA	Metal Building Manufacturers Association www.mbma.com	(216) 241-7333
NECA	National Electrical Contractors Association www.necanet.org	(301) 657-3110
NEMA	National Electrical Manufacturers Association	(703) 841-3200

www.nema.org

NETA	InterNational Electrical Testing Association www.netaworld.org	(303) 697-8441
NFPA	National Fire Protection Association www.nfpa.org	(800) 344-3555 (617) 770-3000
NRCA	National Roofing Contractors Association www.nrca.net	(800) 323-9545 (847) 299-9070
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association www.smacna.org	(703) 803-2980
UBC	Uniform Building Code (See: International Conference of Building Officials)	
UL	Underwriters Laboratories Inc. www.ul.com	(800) 704-4050 (847) 272-8800

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 5000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Use Charges: Contractor shall pay for all use charges except as noted otherwise.
- B. Use water and electric power from Owner's existing system without metering and without payment of use charges.
- C. Standards: Comply with ANSI A10.6, NECA's "Temporary Electrical Facilities," and NFPA 241.
- D. Temporary Utilities: At earliest feasible time, when acceptable to Owner, change over from use of temporary service to use of permanent service.

PART 2 - PRODUCTS

2.1 EQUIPMENT

- A. Heating Equipment: Unless Owner authorizes use of permanent heating system, provide vented, self-contained heaters with thermostatic control when working in new or existing facilities to maintain an indoor temperature of 50 degrees F.
 - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
 - 2. Heating Units: Listed and labeled, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use for type of fuel being consumed.

PART 3 - EXECUTION

3.1 TEMPORARY UTILITIES

- A. General: Use owner's facilities where available and as noted. Engage appropriate local utility company to install temporary service or connect to existing service where owner's facilities are insufficient for the use. Where utility company provides only part of the service, provide the remainder.
- B. Sanitary Facilities: Use of Owner's existing facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.

- C. Heating and Cooling: Provide temporary heating and cooling required for curing materials or for protecting installed construction from adverse weather. Use equipment that will not have a harmful effect on completed installations or elements being installed.

3.2 TEMPORARY FACILITIES

- A. Provide field offices, storage trailers, and other support facilities as necessary for the Work.
- B. Collect waste daily and, when containers are full, legally dispose of waste off-site.
 - 1. Handle hazardous, dangerous, or unsanitary waste materials in separate closed waste containers. Dispose of material according to applicable laws and regulations.
- C. Provide temporary enclosures for protection of construction and workers from inclement weather and for containment of heat.

3.3 TEMPORARY CONTROLS

- A. Provide temporary environmental controls as required by authorities having jurisdiction including, but not limited to, erosion and sediment control, dust control, noise control, and pollution control.
- B. Provide temporary barricades, warning signs, and lights to protect the public and construction personnel from construction hazards.
 - 1. Enclose construction areas with fences with lockable entrance gates, to prevent unauthorized access.
- C. Provide temporary fire protection until permanent systems supply fire-protection needs. Comply with NFPA 241.

3.4 TERMINATION AND REMOVAL

- A. Remove temporary facilities and controls before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

END OF SECTION

SECTION 01 6000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Provide products of same kind from a single source. The term "product" includes the terms "material," "equipment," "system," and similar terms.
- B. Product Substitutions: Substitutions include products and methods of construction differing from that required by the Contract Documents and proposed by Contractor after award of the Contract.
 - 1. Submit six copies of each request for product substitution.
 - 2. Submit requests within 14 days after signing the Contract.
 - 3. Submit requests in time to permit processing of request and subsequent submittals, if any, sufficiently in advance of when materials are required in the Work. Do not submit unapproved substitutions on Shop Drawings or other submittals.
 - 4. Identify product to be replaced and provide complete documentation showing compliance of proposed substitution with applicable requirements. Include a full comparison with the specified product, a list of changes to other Work required to accommodate the substitution, and any proposed changes in the Contract Sum or the Contract Time should the substitution be accepted.
 - 5. Architect will review the proposed substitution and notify Contractor of its acceptance or rejection.
- C. Comparable Product Submittal:
 - 1. Submit six copies of each request for approval of products as comparable to basis-of-design products. Submit requests in time to permit processing of request and subsequent submittals, if any, sufficiently in advance of when materials are required in the Work. Do not submit unapproved products on Shop Drawings or other submittals.
 - 2. Identify product to be replaced and provide complete documentation showing compliance of proposed product with applicable requirements. Include a full comparison with the specified product.
 - 3. Architect will review the proposed product and notify Contractor of its acceptance or rejection.
- D. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.
 - 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
 - 2. Deliver products to Project site in manufacturer's original sealed container or packaging, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.

3. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
4. Store materials in a manner that will not endanger Project structure.
5. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.

PART 2 - PRODUCTS

2.1 PRODUCT OPTIONS

- A. Provide products that comply with the Contract Documents, are undamaged, and are new at the time of installation.
 1. Provide products complete with accessories, trim, finish, and other devices and components needed for a complete installation and the intended use and effect.
- B. Select products to comply with all of the following that are applicable:
 1. Where only a single product or manufacturer is named, provide the item indicated. No substitutions will be permitted.
 2. Where two or more products or manufacturers are named, provide one of the items indicated. No substitutions will be permitted.
 3. Where products or manufacturers are specified by name, accompanied by the term "available products" or "available manufacturers," provide one of the named items or comply with provisions for "comparable product" to obtain approval for use of an unnamed product or manufacturer.
 4. Where a single product is named as the "basis-of-design" together with the names of other manufacturers, provide the named product or comply with provisions for "comparable product submittal" to obtain approval for use of a product of one of the other named manufacturers.
 5. Where a single product is named as the "basis-of-design" and no other manufacturers are named, provide the named product or comply with provisions for "comparable product submittal" to obtain approval for use of a product of another manufacturer.
 6. Where a product is described with required characteristics, provide a product that complies with those characteristics.
 7. Where compliance with performance requirements is specified, provide products that comply and are recommended in writing by the manufacturer for the application.
 8. Where compliance with codes, regulations, or standards, is specified, select a product that complies with the codes, regulations, or standards referenced.
- C. Unless otherwise indicated, Architect will select color, pattern, and texture of each product from manufacturer's full range of options that includes both standard and premium items.

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 7320 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Unless otherwise indicated, demolished materials become Contractor's property. Remove from Project site.
- B. Items indicated to be removed and salvaged remain Owner's property. Remove, clean, and deliver to Owner's designated storage area.
- C. Comply with EPA& DEC regulations and disposal regulations of authorities having jurisdiction.
- D. Conduct demolition without disrupting Owner's use of the building.
- E. It is possible that hazardous or contaminated materials may be encountered in the Work. If materials suspected of containing hazardous materials are encountered, immediately notify Architect and Owner. Hazardous materials shall be removed as indicated on the plans and in the specifications.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 DEMOLITION

- A. Maintain and protect existing utilities to remain in service before proceeding with demolition, providing bypass connections to other parts of the building.
- B. Locate, identify, shut off, disconnect, and cap off utility services to be demolished.
- C. Conduct demolition operations and remove debris to prevent injury to people and damage to adjacent buildings and site improvements.
- D. Provide and maintain shoring, bracing, or structural support to preserve building stability and prevent movement, settlement, or collapse.
- E. Protect building structure and interior from weather and water leakage and damage.
- F. Protect walls, ceilings, floors, and exposed finishes that are to remain. Erect and maintain dustproof partitions. Cover and protect fixtures, furnishings, and equipment that are to remain.
- G. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction.

- H. Promptly patch and repair holes and damaged surfaces of building caused by demolition. Restore exposed finishes of patched areas and extend finish restoration into remaining adjoining construction.
- I. Promptly remove demolished materials from Owner's property and legally dispose of them. Do not burn demolished materials.

END OF SECTION

SECTION 01 7700 – PROJECT CLOSEOUT

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The work shall include final cleaning, final observations, submissions and payments required to closeout the project.

1.2 CLEANING

- A. The General cleaning and more specific cleaning may be required in other individual Sections of the Specifications.
- B. This cleaning shall be done just prior to the Architect/Engineer's final observations for substantial completion. Recleaning will not be required after the Work has been observed and accepted unless later operations of the Contractor, in the opinion of the Architect/Engineer, make recleaning of certain portions necessary.

1.3 OBSERVATION

- A. Contractor:
 - 1. Submit written certification to the Architect/Engineer that Project, or designated portion of Project, is substantially complete.
 - 2. Submit list of all items to be completed or corrected.
- B. Architect/Engineer will make a final observation within (10) days after receipt of certification, together with Owner's Representative.
- C. Should the Architect/Engineer consider that the work is not substantially complete:
 - 1. He shall immediately notify Contractor, in writing, stating reasons.
 - 2. Contractor: Complete work, and send second written notice to the Architect, certifying that Project, or designated portion of project is substantially complete.
 - 3. Architect/Engineer will re-perform final observation the Work.
- D. Should the Architect/Engineer consider that the Work is substantially complete:
 - 1. Architect/Engineer will prepare and issue a Certificate of Substantial completion, AIA Document G704, complete with signatures of Owners and Contractor, accompanied by Contractor's list of items to be completed or corrected, as verified and amended by the Architect/Engineer and Owner's Representative.
 - 2. Contractor: Complete work listed for completion or correction within designated time.

1.4 CLOSEOUT SUBMITTALS

- A. Guarantees, Warranties, and Bonds: To requirements of paragraph 1.05.
- B. Project Record Documents: To requirements of paragraph 1.06 and 1.07.
- C. Required inspection certificates from AHJ.

1.5 GUARANTEES AND CERTIFICATIONS

- A. Prior to issuance of Certificate of Substantial Completion, the Contractor shall deliver to the Architect/Engineer, bound in separate, indexed folders, two (2) copies of all guarantees, warranties, bonds and certificates that are required by the General and Supplementary Conditions, and the individual technical sections of the Specifications.
- B. All submittals shall be duly executed and corporately sealed before delivery to the Architect.

1.6 RECORD DRAWINGS

- A. Prior to issuance of Certificate of Substantial Completion, the Contractor shall submit record drawings to the Architect/Engineer as follows:
 - 1. During construction, the Contractor shall keep an accurate record of all deviations between the Work as shown on the Drawings and that which is actually installed. This record set of prints shall be kept at the job site for final observation by the Architect/Engineer.
 - 2. Upon completion of the Work, such changes shall be neatly and correctly transferred to a reproducible set of the Drawings, and the Contractor shall certify by endorsement to the Drawings that the revisions are complete and accurate. He shall then deliver the reproducible record to the Architect/Engineer.

1.7 MAINTENANCE MANUAL

- A. Prior to issuance of Certificate of Substantial Completion, the Contractor shall submit maintenance manuals to the Architect/Engineer as follows:
 - 1. Each Subcontractor shall, under the direction of the Contractor, furnish three (3) complete sets of manuals, containing the manufacturer's instructions for maintenance and operation of each item of equipment and apparatus furnished under the Contract and any additional data specifically required under the technical sections of the Specifications for each division of the Work. The manuals shall be arranged in proper order, indexed, and suitably bound.
 - 2. The Contractor and each Subcontractor shall certify by endorsement thereon, that each of the manuals is complete and accurate. The Contractor shall assemble these manuals for all divisions of the Work, review them for completeness and submit them to the Architect/Engineer. The Contractor shall provide suitable

transfer case and deliver the manuals therein indexed and marked for each division of the Work.

PART 2.0 - PRODUCTS (NOT USED)

PART 3.0 - EXECUTION

3.1 FINAL OBSERVATION

- A. Contractor shall submit written certification that:
 - 1. Contract Documents have been reviewed.
 - 2. Project has been inspected by Contractor & AHJ for compliance with Contract Document.
 - 3. Work has been completed in accordance with Contract Documents.
 - 4. Equipment and systems have been tested in presence of Owner's Representative and are operational.
 - 5. Project is completed, and ready for final observation.
- B. Architect/Engineer will make final observation within ten (10) days after receipt of certification.
- C. Should the Architect/Engineer consider that the work is not finally complete:
 - 1. He shall notify Contractor, in writing, stating reasons.
 - 2. Contractor shall take immediate steps to remedy the stated deficiencies, and send second written notice to the Architect/Engineer certifying that the Work is complete.
 - 3. Architect/Engineer will re-perform final observation the Work.
- D. Should the Architect/Engineer consider that the Work is finally complete in accordance with requirements of Contract Documents, he shall request Contractor to make final payment submittals.

3.2 EVIDENCE OF PAYMENT, AND RELEASE OF LIENS

- A. Prior to issuance of final Certificate for Payment, the Contractor shall deliver to the Architect/Engineer, complete release of all claims as required by the General Conditions.
- B. The Contractor shall, along with his final Application for Payment deliver three (3) copies of AIA forms.
 - 1. G706- Contractor's Affidavit of Payment of Debts and Claims.

2. G707- Consent of Surety Company to Final Payment.
 3. G706A- Contractor's Affidavit of Release of Liens-with Contractor's Release of Waiver of Liens Subcontractor's Releases of Waivers of Liens
 4. Contractors letter of guarantee for a period of one (1) year from substantial completion.
 5. Maintenance Bond.
- C. All submittals shall be duly executed, notarized and sealed before delivery to the Architect/Engineer.

3.3 FINAL ADJUSTMENT OF ACCOUNTS

- A. Submit final statement of accounting to Architect/Engineer.
- B. Statement shall reflect all adjustments.
1. Original Contract Sum.
 2. Additions and deductions resulting from:
 - a. Previous change orders
 - b. Cash Allowances
 - c. Unit prices
 - d. Other adjustments
 - e. Deductions for uncorrected Work.
 - f. Deductions for non-conforming Work.
 - g. Deductions for liquidated damages.
 - h. Deductions for re-inspection payments.
 3. Total Contract Sum, as adjusted.
 4. Previous payments.
 5. Sum remaining due.
- C. Architect/Engineer will prepare final Change Order, reflecting approved adjustments to Contract Sum not previously made by Change Orders.

3.4 FINAL APPLICATION FOR PAYMENT & FINAL CERTIFICATE FOR PAYMENT

- A. Contractor shall submit final application in accordance with requirements of General Conditions.
- B. Architect/Engineer will issue final certificate in accordance with provisions of General Conditions.
- C. Should final completion be materially delayed through no fault of Contractor, Architect/Engineer may issue a semi-final Certificate for payment, in accordance with provisions of General Conditions.

END OF SECTION

SECTION 033053 - MISCELLANEOUS CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes but is not limited to the following: Cast basins, equipment pads, fence post anchors, cast-in-place concrete, including reinforcement, concrete materials, mixture design, placement procedures, and finishes.
- B. Related Sections:
 - 1. Division 31 Section "Earth Moving" for drainage fill under slabs-on-grade.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Other Action Submittal:
 - 1. Design Mixtures: For each concrete mixture.

1.4 QUALITY ASSURANCE

- A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
- B. Comply with the following sections of ACI 301 (ACI 301M), unless modified by requirements in the Contract Documents:
 - 1. "General Requirements."
 - 2. "Formwork and Formwork Accessories."
 - 3. "Reinforcement and Reinforcement Supports."
 - 4. "Concrete Mixtures."
 - 5. "Handling, Placing, and Constructing."
- C. Comply with ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

D. 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.
 - e. Special concrete finish subcontractor.
 - f. Engineer
2. Construction Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold-and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semirigid 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.

PART 2 - PRODUCTS

2.1 FORMWORK

- A. Furnish formwork and formwork accessories according to ACI 301 (ACI 301M).

2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
- B. Plain-Steel Wire: ASTM A 82/A 82M, as drawn.
- C. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, fabricated from as-drawn steel wire into flat sheets.
- D. Deformed-Steel Welded Wire Reinforcement: ASTM A 497/A 497M, flat sheet.
- E. Bar supports, chairs, spaces: ACI315.

2.3 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source throughout Project:
1. Portland Cement: ASTM C 150, Type I or Type II. Supplement with the following:

- a. Fly Ash: ASTM C 618, Class C or F.
- 2. Blended Hydraulic Cement: ASTM C 595, Type IS, Portland blast-furnace slag cement.
- B. Normal-Weight Aggregate: ASTM C 33, graded, 1-1/2-inch (38-mm) nominal maximum aggregate size.
- C. Lightweight Aggregate: ASTM C 330, 1-inch (25-mm) nominal maximum aggregate size.
- D. Water: ASTM C 94/C 94M.
- E. Synthetic Fiber: Monofilament polypropylene fibers engineered and designed for use in concrete, complying with ASTM C 1116/C 1116M, Type III, 1/2 to 1-1/2 inches (13 to 38 mm) long.
- F. Base Course: As specified in Section 31 20 00.

2.4 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 - 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 - 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 - 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 - 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.5 RELATED MATERIALS

- A. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber, or ASTM D 1752, cork or self-expanding cork.

2.6 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth or cotton mats.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.
- F. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

2.7 CONCRETE MIXTURES

- A. Comply with ACI 301 (ACI 301M) requirements for concrete mixtures.
- B. Normal-Weight Concrete: Prepare design mixes, proportioned according to ACI 301 (ACI 301M), as follows:
 - 1. Minimum Compressive Strength: 4000 psi (27.6 MPa) at 28 days.
 - 2. Maximum Water-Cementitious Materials Ratio: 0.45.
 - 3. Slump Limit: 4 inches (100 mm), plus or minus 1 inch (25 mm).
 - 4. Air Content: Maintain within range permitted by ACI 301 (ACI 301M). Do not allow air content of trowel-finished floor slabs to exceed 3 percent.
- C. Synthetic Fiber: Uniformly disperse in concrete mix at manufacturer's recommended rate but not less than a rate of 1.0 lb/cu. yd. (0.60 kg/cu. m) 1.5 lb/cu. yd. (0.90 kg/cu. m).

2.8 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116, and furnish batch ticket information.
 - 1. When air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.
 - 1. For mixer capacity of 1 cu. yd. (0.76 cu. m) 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. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd. (0.76 cu. m).
 - 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mix type, mix time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Design, construct, erect, brace, and maintain formwork according to ACI 301 (ACI 301M).

3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.3 STEEL REINFORCEMENT

- A. Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

3.4 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Locate and install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Engineer.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness, as follows:
 - 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with groover tool to a radius of 1/8 inch (3.2 mm). Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.
- D. Isolation Joints: Install joint-filler strips at junctions with slabs-on-grade and vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
 - 1. Extend joint fillers full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.

3.5 CONCRETE PLACEMENT

- A. Comply with ACI 301 (ACI 301M) for placing concrete.

- B. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301 (ACI 301M).
- C. Do not add water to concrete during delivery, at Project site, or during placement.
- D. Consolidate concrete with mechanical vibrating equipment.

3.6 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defective areas repaired and patched. Remove fins and other projections exceeding 1/2 inch (13 mm).
 - 1. Apply to concrete surfaces not exposed to public view (below grade).
- 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 defective areas. Remove fins and other projections exceeding 1/8 inch (3 mm).
 - 1. Apply to concrete surfaces exposed to public view.
- C. Rubbed Finish: Apply the following rubbed finish, defined in ACI 301 (ACI 301M), to smooth-formed finished as-cast concrete where indicated:
 - 1. Smooth-rubbed finish.
 - 2. Grout-cleaned finish.
 - 3. Cork-floated finish.
- 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.

3.7 FINISHING UNFORMED SURFACES

- A. General: Comply with ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Screed surfaces with a straightedge and strike off. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane before excess moisture or bleedwater appears on surface.
 - 1. Do not further disturb surfaces before starting finishing operations.
- C. Scratch Finish: Apply scratch finish to surfaces indicated and surfaces to receive concrete floor topping or mortar setting beds for ceramic or quarry tile, portland cement terrazzo, and other bonded cementitious floor finishes, unless otherwise indicated.

- D. Float Finish: Apply float finish to surfaces indicated, to surfaces to receive trowel finish, and to floor and slab surfaces to be covered with fluid-applied or sheet waterproofing, fluid-applied or direct-to-deck-applied membrane roofing, or sand-bed terrazzo.
- E. Trowel Finish: Apply a hard trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system.
- F. Trowel and Fine-Broom Finish: Apply a partial trowel finish, stopping after second troweling, to surfaces indicated and to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set methods. Immediately after second troweling, and when concrete is still plastic, slightly scarify surface with a fine broom.
- G. Nonslip Broom Finish: Apply a nonslip broom finish to surfaces indicated and to exterior concrete platforms, steps, and ramps. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.

3.8 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with ACI 301 (ACI 301M) for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m 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. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- D. Curing Methods: Cure formed and unformed concrete for at least seven days 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 (300-mm) 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 (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall

within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

4. Curing and Sealing Compound – See Attached.

3.9 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Tests: Perform according to ACI 301 (ACI 301M).
 1. Testing Frequency: One composite sample shall be obtained for each day's pour of each concrete mix exceeding 5 cu. yd. (4 cu. m) but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.
 2. Testing Frequency: One composite sample shall be obtained for each 100 cu. yd. (76 cu. m) or fraction thereof of each concrete mix placed each day.

3.10 REPAIRS

- A. Remove and replace concrete that does not comply with requirements in this Section.

END OF SECTION

SECTION 230500 - COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Summary: General requirements for motors, hangers and supports, vibration isolation and seismic restraints, and meters and gages.
- B. Submittals: Product Data for materials and equipment specified in this Section.

PART 2 - PRODUCTS

2.1 MOTORS

- A. Motor Characteristics:
 - 1. Motors 1 HP and Larger: Three phase.
 - 2. Motors Smaller Than 1 HP: Single phase.
 - 3. Frequency Rating: 60 Hz.
 - 4. Voltage Rating: NEMA standard voltage selected to operate on nominal circuit voltage to which motor is connected.
 - 5. Service Factor: 1.15 for open dripproof motors; 1.0 for totally enclosed motors.
 - 6. Duty: Continuous duty at ambient temperature of 105 deg F and at altitude of 3300 feet above sea level.
 - 7. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.
 - 8. Enclosure: Unless otherwise indicated, open dripproof.
 - 9. Motors Used with Variable-Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.

2.2 HANGERS AND SUPPORTS

- A. Hanger and Pipe Attachments: Factory fabricated with galvanized coatings; nonmetallic coated for hangers in direct contact with copper tubing.
- B. Building Attachments: Powder-actuated-type, drive-pin attachments with pullout and shear capacities appropriate for supported loads and building materials.
- C. Mechanical-Expansion Anchors: Insert wedge-type attachments with pullout and shear capacities appropriate for supported loads and building materials.

2.3 VIBRATION ISOLATION AND SEISMIC CONTROL DEVICES

A. Vibration Supports:

1. Pads: Arranged in single or multiple layers of oil- and water-resistant **neoprene** of sufficient stiffness for uniform loading over pad area, molded with a nonslip pattern and galvanized-steel baseplates, and factory cut to sizes that match requirements of supported equipment.
2. Mounts: Double-deflection type, with molded, oil-resistant fiberglass, rubber or neoprene isolator elements with factory-drilled, encapsulated top plate for bolting to equipment and baseplate for bolting to structure. Provide isolator with minimum 0.5-inch static deflection.
3. Spring Isolators: Freestanding, laterally stable, open-spring isolators. Provide isolator with minimum 1-inch static deflection.

B. Vibration Hangers:

1. Elastomeric Hangers: Double-deflection type, with molded, oil-resistant rubber or neoprene isolator elements bonded to steel housings with threaded connections for hanger rods. Provide isolator with minimum 0.5-inch static deflection.
2. Spring Hangers: Combination coil-spring and elastomeric-insert hanger with spring and insert in compression. Provide isolator with minimum 1-inch static deflection.

C. Seismic Restraints:

1. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.
2. Channel Support System: MFMA-3, shop- or field-fabricated support assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; and rated in tension, compression, and torsion forces.
3. Restraining Cables: Stainless-steel cables with end connections made of steel assemblies that swivel to final installation angle and utilize two clamping bolts for cable engagement.
4. Mechanical Anchor Bolts: Seismic-rated, drill-in, and stud-wedge or female-wedge type. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.
5. Adhesive Anchor Bolts: Drilled-in and capsule anchor system containing polyvinyl or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

2.4 PRESSURE GAGES AND TEST PLUGS

- ### A. Pressure Gages:
- Direct-mounting, indicating-dial type complying with ASME B40.100. Dry metal case, minimum 2-1/2-inch diameter with red pointer on white face, and plastic window. Minimum accuracy 3 percent of middle half of range. Range two times operating pressure.

- B. Test Plug: Corrosion-resistant brass or stainless-steel body with two self-sealing rubber core inserts and gasketed and threaded cap, with extended stem for units to be installed in insulated piping. Minimum pressure and temperature rating 500 psig at 200 deg F.

PART 3 - EXECUTION

3.1 MOTOR INSTALLATION

- A. Anchor motor assembly to base, adjustable rails, or other support, arranged and sized according to manufacturer's written instructions.

3.2 GENERAL PIPING INSTALLATIONS

- A. Install piping free of sags and bends.
- B. Install fittings for changes in direction and branch connections.
- C. Install sleeves for pipes passing through concrete and masonry walls, gypsum board partitions, and concrete floor and roof slabs.
- D. Exterior Wall, Pipe Penetrations: Mechanical sleeve seals installed in steel or cast-iron pipes for wall sleeves.
- E. Comply with requirements in Division 07 Section "Penetration Firestopping" for sealing pipe penetrations in fire-rated construction.
- F. Install unions at final connection to each piece of equipment.
- G. Install dielectric unions and flanges to connect piping materials of dissimilar metals in gas piping.
- H. Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals in water piping.

3.3 GENERAL EQUIPMENT INSTALLATIONS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components, unless otherwise indicated.
- C. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- D. Install equipment to allow right of way for piping installed at required slope.

3.4 CONCRETE BASES

- A. Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.
- B. Construct concrete bases of dimensions indicated, but not less than 6 inches larger in both directions than supported unit.
- C. Install dowel rods on 18-inch centers around the full perimeter of the base to connect concrete base to concrete floor.
- D. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
- E. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
- F. Install anchor bolts to elevations required for proper attachment to supported equipment.
- G. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Division 03 Section "Cast-in-Place Concrete."

3.5 HANGERS AND SUPPORTS

- A. Comply with MSS SP-69 and MSS SP-89. Install building attachments within concrete or to structural steel.
- B. Install hangers and supports to allow controlled thermal and seismic movement of piping systems.
- C. Install powder-actuated drive-pin fasteners in concrete after concrete is cured. Do not use in lightweight concrete or in slabs less than 4 inches thick.
- D. Install mechanical-expansion anchors in concrete after concrete is cured. Do not use in lightweight concrete or in slabs less than 4 inches thick.
- E. Comply with requirements in Division 07 Section "Penetration Firestopping" for sealing pipe penetrations in fire-rated construction.
- F. Load Distribution: Install hangers and supports so piping live and dead loading and stresses from movement will not be transmitted to connected equipment.
- G. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
 - 1. Adjustable Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30.
 - 2. Pipe Hangers (MSS Type 5): For suspension of pipes, NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.

3. Adjustable Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8.
 4. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8.
 5. Adjustable Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 2.
- H. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20.
 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20, if longer ends are required for riser clamps.

3.6 VIBRATION ISOLATION AND SEISMIC CONTROL DEVICE INSTALLATION

- A. Adjust vibration isolators to allow free movement of equipment limited by restraints.
- B. Install resilient bolt isolation washers and bushings on equipment anchor bolts.
- C. Install cables so they do not bend across sharp edges of adjacent equipment or building structure.

END OF SECTION

23 0513 COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.3 COORDINATION

- A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:
 - 1. Motor controllers.
 - 2. Torque, speed, and horsepower requirements of the load.
 - 3. Ratings and characteristics of supply circuit and required control sequence.
 - 4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

- A. Comply with requirements in this Section except when stricter requirements are specified in HVAC equipment schedules or Sections.
- B. Comply with NEMA MG 1 unless otherwise indicated.
- C. Comply with IEEE 841 for severe-duty motors.
- D. Motor selected for Unit Ventilators shall be an electrically commutated motor.

2.2 MOTOR CHARACTERISTICS

- A. Duty: Continuous duty at ambient temperature of 40 deg C (104°F) and at altitude of 3300 feet (1000 m) above sea level.

- B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

- A. Description: NEMA MG 1, Design B, medium induction motor.
- B. Efficiency: Energy efficient, as defined in NEMA MG 1.
- C. Service Factor: 1.15.
- D. Multispeed Motors: Variable torque.
 - 1. For motors with 2:1 speed ratio, consequent pole, single winding.
 - 2. For motors with other than 2:1 speed ratio, separate winding for each speed.
- E. Multispeed Motors: Separate winding for each speed.
- F. Rotor: Random-wound, squirrel cage.
- G. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.
- H. Temperature Rise: Match insulation rating.
- I. Insulation: Class F.
- J. Code Letter Designation:
 - 1. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.
- K. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

- A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.
- B. Motors Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.
 - 1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
 - 2. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.
 - 3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.

- 4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.
- C. Severe-Duty Motors: Comply with IEEE 841, with 1.15 minimum service factor.

2.5 SINGLE-PHASE MOTORS

- A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:
 - 1. Permanent-split capacitor.
 - 2. Split phase.
 - 3. Capacitor start, inductor run.
 - 4. Capacitor start, capacitor run.
- B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.
- C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
- D. Motors 1/20 HP and Smaller: Shaded-pole type.
- E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 230516 - EXPANSION FITTINGS AND LOOPS FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Flexible, ball-joint, packed expansion joints.
2. Slip-joint packed expansion joints.
3. Expansion-compensator packless expansion joints.
4. Flexible-hose packless expansion joints.
5. Metal-bellows packless expansion joints.
6. Rubber packless expansion joints.
7. Grooved-joint expansion joints.
8. Pipe loops and swing connections.
9. Alignment guides and anchors.

1.3 PERFORMANCE REQUIREMENTS

- A. Compatibility: Products shall be suitable for piping service fluids, materials, working pressures, and temperatures.
- B. Capability: Products to absorb 200 percent of maximum axial movement between anchors.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Delegated-Design Submittal: For each anchor and alignment guide 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. Design Calculations: Calculate requirements for thermal expansion of piping systems and for selecting and designing expansion joints, loops, and swing connections.
 2. Anchor Details: Detail fabrication of each anchor indicated. Show dimensions and methods of assembly and attachment to building structure.
 3. Alignment Guide Details: Detail field assembly and attachment to building structure.
 4. Schedule: Indicate type, manufacturer's number, size, material, pressure rating, end connections, and location for each expansion joint.

- C. Welding certificates.
- D. Product Certificates: For each type of expansion joint, from manufacturer.
- E. Maintenance Data: For expansion joints to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 - PRODUCTS

2.1 PACKED EXPANSION JOINTS

- A. Flexible, Ball-Joint, Packed Expansion Joints:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of 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. Advanced Thermal Systems, Inc.
 - b. Hyspan Precision Products, Inc.
 - c. Vibro Acoustics
 - 3. Standards: ASME Boiler and Pressure Vessel Code: Section II, "Materials"; and ASME B31.9, "Building Services Piping," for materials and design of pressure-containing parts and bolting.
 - 4. Material: Carbon-steel assembly with asbestos-free composition packing.
 - 5. Design: For 360-degree rotation and angular deflection.
 - 6. Minimum Pressure Rating: 250 psig at 400 deg F (1725 kPa at 204 deg C)
 - 7. Angular Deflection for NPS 6 (DN 150) and Smaller: 30 degree minimum.
 - 8. Angular Deflection for NPS 8 (DN 200) and Larger: 15 degree minimum.
 - 9. End Connections for NPS 2 (DN 50) and Smaller: Threaded.
 - 10. End Connections for NPS 2-1/2 (DN 65) and Larger: Flanged.
- B. Slip-Joint Packed Expansion Joints:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of 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. Adsko Manufacturing LLC.

- b. Advanced Thermal Systems, Inc.
- c. Hyspan Precision Products, Inc.
- 3. Standard: ASTM F 1007.
- 4. Material: Carbon steel with asbestos-free PTFE packing.
- 5. Design: With internal guide and injection device for repacking under pressure. Include drip connection if used for steam piping.
- 6. Configuration: double joint with base class(es) unless otherwise indicated.
- 7. End Connections: Flanged or weld ends to match piping system.

2.2 PACKLESS EXPANSION JOINTS

A. Metal, Expansion-Compensator Packless Expansion Joints:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of 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. Adscro Manufacturing LLC.
 - b. Flexicraft Industries.
 - c. Flex Pression Ltd.
 - d. Flex-Weld, Inc.
 - e. Hyspan Precision Products, Inc.
 - f. Metraflex, Inc.
 - g. Senior Flexonics Pathway.
 - h. Unaflex.
 - i. Unisource Manufacturing, Inc.
- 3. Minimum Pressure Rating: 175 psig (1200 kPa) unless otherwise indicated.
- 4. Configuration for Copper Tubing: Two-ply, phosphor-bronze bellows with copper pipe ends.
 - a. End Connections for Copper Tubing NPS 2 (DN 50) and Smaller: Threaded
 - b. End Connections for Copper Tubing NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Threaded.
- 5. Configuration for Steel Piping: Two-ply, stainless-steel bellows; steel-pipe end connections; and carbon-steel shroud.
 - a. End Connections for Steel Pipe NPS 2 (DN 50) and Smaller: Threaded.
 - b. End Connections for Steel Pipe NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged
 - c.

B. Rubber, Expansion-Compensator Packless Expansion Joints:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of 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. Amber/Booth Company, Inc.; a div. of Vibration Isolation Products of Texas, Inc.
 - b. Flex-Hose Co., Inc.
 - c. Flexicraft Industries.
 - d. General Rubber Corporation.
 - e. Mason Industries, Inc.; Mercer Rubber Co.
 - f. Proco Products, Inc.
 - g. Tozen Corporation.
 - h. Unaflex.
 - i. Unisource Manufacturing, Inc.
3. Material: Twin reinforced-rubber spheres with external restraining cables.
4. Minimum Pressure Rating: 150 psig at 170 deg F (1035 kPa at 77 deg C) unless otherwise indicated.
5. End Connections for NPS 2 (DN 50) and Smaller: Threaded.

C. Flexible-Hose Packless Expansion Joints:

1. Manufacturers: Subject to compliance with requirements, provide products by one of 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. Flex-Hose Co., Inc.
 - b. Flexicraft Industries.
 - c. Flex Pression Ltd.
 - d. Metraflex, Inc.
 - e. Unisource Manufacturing, Inc.
3. Description: Manufactured assembly with inlet and outlet elbow fittings and two flexible-metal-hose legs joined by long-radius, 180-degree return bend or center section of flexible hose.
4. Flexible Hose: Corrugated-metal inner hoses and braided outer sheaths.
5. Expansion Joints for Copper Tubing NPS 2 (DN 50) and Smaller: Copper-alloy fittings with solder-joint end connections.
 - a. Bronze hoses and single-braid bronze sheaths with 450 psig at 70 deg F (3100 kPa at 21 deg C) and 340 psig at 450 deg F (2340 kPa at 232 deg C) ratings.
 - b. Bronze hoses and double-braid bronze sheaths with 700 psig at 70 deg F (4830 kPa at 21 deg C) and 500 psig at 450 deg F (3450 kPa at 232 deg C) ratings.
6. Expansion Joints for Copper Tubing NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Copper-alloy fittings with threaded end connections.
 - a. Stainless-steel hoses and single-braid, stainless-steel sheaths with 300 psig at 70 deg F (2070 kPa at 21 deg C) and 225 psig at 450 deg F (1550 kPa at 232 deg C) ratings.

- b. Stainless-steel hoses and double-braid, stainless-steel sheaths with 420 psig at 70 deg F (2890 kPa at 21 deg C) and 315 psig at 450 deg F (2170 kPa at 232 deg C) ratings.
 - 7. Expansion Joints for Steel Piping NPS 2 (DN 50) and Smaller: Carbon-steel fittings with threaded end connections.
 - a. Stainless-steel hoses and single-braid, stainless-steel sheaths with 450 psig at 70 deg F (3100 kPa at 21 deg C) and 325 psig at 600 deg F (2250 kPa at 315 deg C) ratings.
 - b. Stainless-steel hoses and double-braid, stainless-steel sheaths with 700 psig at 70 deg F (4830 kPa at 21 deg C) and 515 psig at 600 deg F (3550 kPa at 315 deg C) ratings.
 - 8. Expansion Joints for Steel Piping NPS 2-1/2 to NPS 6 (DN 65 to DN 150): Carbon-steel fittings with flanged end connections.
 - a. Stainless-steel hoses and single-braid, stainless-steel sheaths with 200 psig at 70 deg F (1380 kPa at 21 deg C) and 145 psig at 600 deg F (1000 kPa at 315 deg C) ratings.
 - b. Stainless-steel hoses and double-braid, stainless-steel sheaths with 275 psig at 70 deg F (1900 kPa at 21 deg C) and 200 psig at 600 deg F (1380 kPa at 315 deg C) ratings.
 - 9. Expansion Joints for Steel Piping NPS 8 to NPS 12 (DN 200 to DN 300): Carbon-steel fittings with flanged end connections.
 - a. Stainless-steel hoses and single-braid, stainless-steel sheaths with 125 psig at 70 deg F (860 kPa at 21 deg C) and 90 psig at 600 deg F (625 kPa at 315 deg C) ratings.
 - b. Stainless-steel hoses and double-braid, stainless-steel sheaths with 165 psig at 70 deg F (1130 kPa at 21 deg C) and 120 psig at 600 deg F (830 kPa at 315 deg C) ratings.
 - 10. Expansion Joints for Steel Piping NPS 14 (DN 350) and Larger: Carbon-steel fittings with flanged end connections.
 - a. Stainless-steel hoses and double-braid, stainless-steel sheaths with 165 psig at 70 deg F (1130 kPa at 21 deg C) and 120 psig at 600 deg F (830 kPa at 315 deg C) ratings.
- D. Metal-Bellows Packless Expansion Joints:
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of 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. Adscro Manufacturing LLC.
 - b. American BOA, Inc.

- c. Badger Industries, Inc.
 - d. Expansion Joint Systems, Inc.
 - e. Flex-Hose Co., Inc.
 - f. Flexicraft Industries.
 - g. Flex Pression Ltd.
 - h. Flex-Weld, Inc.
 - i. Flo Fab inc.
 - j. Hyspan Precision Products, Inc.
 - k. Metraflex, Inc.
 - l. Proco Products, Inc.
 - m. Senior Flexonics Pathway.
 - n. Tozen Corporation.
 - o. Unaflex.
 - p. Unisource Manufacturing, Inc.
 - q. Universal Metal Hose; a subsidiary of Hyspan Precision Products, Inc.
 - r. U.S. Bellows, Inc.
 - s. WahlcoMetroflex.
- 3. Standards: ASTM F 1120 and EJMA's "Standards of the Expansion Joint Manufacturers Association, Inc."
 - 4. Type: Circular, corrugated bellows with external tie rods.
 - 5. Minimum Pressure Rating: 175 psig (1200 kPa) unless otherwise indicated.
 - 6. Configuration: Double joint with base class(es) unless otherwise indicated.
 - 7. Expansion Joints for Copper Tubing: Multi-ply phosphor-bronze bellows, copper pipe ends, and brass shrouds.
 - a. End Connections for Copper Tubing NPS 2 (DN 50) and Smaller: Threaded.
 - b. End Connections for Copper Tubing NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Threaded.
 - c. End Connections for Copper Tubing **NPS 5 (DN 125)** and Larger: Flanged.
 - 8. Expansion Joints for Steel Piping: Multi-ply stainless-steel bellows, steel pipe ends, and carbon-steel shroud.
 - a. End Connections for Steel Pipe NPS 2 (DN 50) and Smaller: Threaded.
 - b. End Connections for Steel Pipe NPS 2-1/2 (DN 65) and Larger: Flanged
- E. Rubber Packless Expansion Joints:
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of 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. Amber/Booth Company, Inc.; a div. of Vibration Isolation Products of Texas, Inc.
 - b. Flex-Hose Co., Inc.
 - c. Flexicraft Industries.
 - d. Flex-Weld, Inc.
 - e. Garlock Sealing Technologies.
 - f. General Rubber Corporation.

- g. Mason Industries, Inc.; Mercer Rubber Co.
 - h. Metraflex, Inc.
 - i. Proco Products, Inc.
 - j. Red Valve Company, Inc.
 - k. Tozen Corporation.
 - l. Unaflex.
 - m. Unisource Manufacturing, Inc.
- 3. Standards: ASTM F 1123 and FSA's "Technical Handbook: Non-Metallic Expansion Joints and Flexible Pipe Connectors."
 - 4. Material: Fabric-reinforced rubber complying with FSA-NMEJ-703.
 - 5. Arch Type: Multiple arches with external control rods.
 - 6. Spherical Type: Multiple spheres with external control rods.
 - 7. Minimum Pressure Rating for NPS 1-1/2 to NPS 4 (DN 40 to DN 100): 150 psig (1035 kPa) at 220 deg F (104 deg C).
 - 8. Minimum Pressure Rating for NPS 5 and NPS 6 (DN 125 and DN 150): 140 psig (966 kPa) at 200 deg F (93 deg C).
 - 9. Minimum Pressure Rating for NPS 8 to NPS 12 (DN 200 to DN 300): 140 psig (966 kPa) at 180 deg F (82 deg C).
 - 10. Material for Fluids Containing Acids, Alkalies, or Chemicals: BUNA-N.
 - 11. Material for Fluids Containing Gas, Hydrocarbons, or Oil: CR.
 - 12. Material for Water: EPDM.
 - 13. End Connections: Full-faced, integral steel flanges with steel retaining rings.

2.3 GROOVED-JOINT EXPANSION JOINTS

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of 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:
 - 3. Anvil International, Inc.
 - 4. Shurjoint Piping Products.
 - 5. Victaulic Company.
- B. Description: Factory-assembled expansion joint made of several grooved-end pipe nipples, couplings, and grooved joints.
- C. Standard: AWWA C606, for grooved joints.
- D. Nipples: Galvanized, ASTM A 53/A 53M, Schedule 40, Type E or S, steel pipe with grooved ends.
- E. Couplings: Seven flexible type for steel-pipe dimensions. Include ferrous housing sections, Buna-N gasket suitable for diluted acid, alkaline fluids, and cold and hot water, and bolts and nuts.

2.4 ALIGNMENT GUIDES AND ANCHORS

A. Alignment Guides:

1. Manufacturers: Subject to compliance with requirements, provide products by one of 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. Adscio Manufacturing LLC.
 - b. Advanced Thermal Systems, Inc.
 - c. Flex-Hose Co., Inc.
 - d. Flexicraft Industries.
 - e. Flex-Weld, Inc.
 - f. Hyspan Precision Products, Inc.
 - g. Metraflex, Inc.
 - h. Senior Flexonics Pathway.
 - i. Unisource Manufacturing, Inc.
 - j. U.S. Bellows, Inc.
3. Description: Steel, factory-fabricated alignment guide, with bolted two-section outer cylinder and base for attaching to structure; with two-section guiding spider for bolting to pipe.

B. Anchor Materials:

1. Steel Shapes and Plates: ASTM A 36/A 36M.
2. Bolts and Nuts: ASME B18.10 or ASTM A 183, steel hex head.
3. Washers: ASTM F 844, steel, plain, flat washers.
4. Mechanical Fasteners: Insert-wedge-type stud with expansion plug anchor for use in hardened portland cement concrete, with tension and shear capacities appropriate for application.
 - a. Stud: Threaded, zinc-coated carbon steel.
 - b. Expansion Plug: Zinc-coated steel.
 - c. Washer and Nut: Zinc-coated steel.
5. Chemical Fasteners: Insert-type-stud, bonding-system anchor for use with hardened portland cement concrete, with tension and shear capacities appropriate for application.
 - a. Bonding Material: ASTM C 881/C 881M, Type IV, Grade 3, two-component epoxy resin suitable for surface temperature of hardened concrete where fastener is to be installed.
 - b. Stud: ASTM A 307, zinc-coated carbon steel with continuous thread on stud unless otherwise indicated.
 - c. Washer and Nut: Zinc-coated steel.

PART 3 - EXECUTION

3.1 EXPANSION-JOINT INSTALLATION

- A. Install expansion joints of sizes matching sizes of piping in which they are installed.
- B. Install packed-type expansion joints with packing suitable for fluid service.
- C. Install metal-bellows expansion joints according to EJMA's "Standards of the Expansion Joint Manufacturers Association, Inc."
- D. Install rubber packless expansion joints according to FSA-NMEJ-702.
- E. Install grooved-joint expansion joints to grooved-end steel piping

3.2 PIPE LOOP AND SWING CONNECTION INSTALLATION

- A. Install pipe loops cold-sprung in tension or compression as required to partly absorb tension or compression produced during anticipated change in temperature.
- B. Connect risers and branch connections to mains with at least five pipe fittings including tee in main.
- C. Connect risers and branch connections to terminal units with at least four pipe fittings including tee in riser.
- D. Connect mains and branch connections to terminal units with at least four pipe fittings including tee in main.

3.3 ALIGNMENT-GUIDE AND ANCHOR INSTALLATION

- A. Install alignment guides to guide expansion and to avoid end-loading and torsional stress.
- B. Install one guide(s) on each side of pipe expansion fittings and loops. Install guides nearest to expansion joint not more than four pipe diameters from expansion joint.
- C. Attach guides to pipe and secure guides to building structure.
- D. Install anchors at locations to prevent stresses from exceeding those permitted by ASME B31.9 and to prevent transfer of loading and stresses to connected equipment.
- E. Anchor Attachments:
 - 1. Anchor Attachment to Steel Pipe: Attach by welding. Comply with ASME B31.9 and ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
 - 2. Anchor Attachment to Copper Tubing: Attach with pipe hangers. Use MSS SP-69, Type 24, U-bolts bolted to anchor.

- F. Fabricate and install steel anchors by welding steel shapes, plates, and bars. Comply with ASME B31.9 and AWS D1.1/D1.1M.
 - 1. Anchor Attachment to Steel Structural Members: Attach by welding.
 - 2. Anchor Attachment to Concrete Structural Members: Attach by fasteners. Follow fastener manufacturer's written instructions.
- G. Use grout to form flat bearing surfaces for guides and anchors attached to concrete.

END OF SECTION

SECTION 23 0519 - THERMOMETERS AND GAGES FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Bimetallic-actuated thermometers.
 - 2. Thermowells.
 - 3. Dial-type pressure gages.
 - 4. Gage attachments.
 - 5. Test plugs.
 - 6. Test-plug kits.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Product Certificates: For each type of thermometer and gage, from manufacturer.
- C. Operation and Maintenance Data: For thermometers and gages to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 BIMETALLIC-ACTUATED THERMOMETERS

- 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. Marsh Bellofram.
 - 2. Terice, H. O. Co.
 - 3. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
 - 4. Weiss Instruments, Inc.
 - 5. Weksler Glass Thermometer Corp.
 - 6. Approved Equal
- B. Standard: ASME B40.200.

- C. Case: Liquid-filled non-mercury and sealed type(s); Type 304 stainless steel, nominal face diameter as follows:
 - 1. Installation in piping: 3 inch diameter.
 - 2. Installations in tanks and similar equipment: 5 inch diameter.
 - 3. Installation in air-side systems: 5 inch diameter.
- D. Dial: Nonreflective aluminum with permanently etched scale markings and scales in deg F (deg C).
- E. Connector Type(s): Union joint, adjustable angle rigid, back and rigid, bottom, with unified-inch screw threads.
- F. Connector Size: 1/2 inch (13 mm), with ASME B1.1 screw threads.
- G. Stem: 0.25 or 0.375 inch (6.4 or 9.4 mm) in diameter; stainless steel.
- H. Window: Laminated safety glass.
- I. Ring: Stainless steel.
- J. Element: Bimetal coil.
- K. Pointer: Dark-colored metal.
- L. Accuracy: Plus or minus 1 percent of scale range.

2.2 THERMOWELLS

- A. Thermowells:
 - 1. Standard: ASME B40.200.
 - 2. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.
 - 3. Material for Use with Copper Tubing: CNR or CUNI.
 - 4. Material for Use with Steel Piping: CRES.
 - 5. Type: Stepped shank.
 - 6. External Threads: NPS 1/2, NPS 3/4, or NPS 1, (DN 15, DN 20, or NPS 25,) ASME B1.20.1 pipe threads.
 - 7. Internal Threads: 1/2, 3/4, and 1 inch (13, 19, and 25 mm), with ASME B1.1 screw threads.
 - 8. Bore: Diameter required to match thermometer bulb or stem.
 - 9. Insertion Length: Length required to match thermometer bulb or stem.
 - 10. Lagging Extension: Include on thermowells for insulated piping and tubing.
 - 11. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.
- B. Heat-Transfer Medium: Mixture of graphite and glycerin.

2.3 PRESSURE GAGES

- A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Ashcroft Inc.
 - b. Marsh Bellofram.
 - c. Trerice, H. O. Co.
 - d. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
 - e. Weiss Instruments, Inc.
 - f. Weksler Glass Thermometer Corp.
 - g. Approved Equal
 2. Standard: ASME B40.100.
 3. Case: Liquid-filled non-mercury type; stainless steel or cast aluminum 4-1/2-inch (114-mm) nominal diameter.
 4. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
 5. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2 (DN 8 or DN 15), ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
 6. Movement: Mechanical, with link to pressure element and connection to pointer.
 7. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi (kPa).
 8. Pointer: Dark-colored metal.
 9. Window: Laminated safety glass.
 10. Ring: Stainless steel.
 11. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

2.4 GAGE ATTACHMENTS

- A. Snubbers: ASME B40.100, brass; with NPS 1/4 or NPS 1/2 (DN 8 or DN 15), ASME B1.20.1 pipe threads and porous-metal-type surge-dampening device. Include extension for use on insulated piping.
- B. Valves: Brass or stainless-steel needle, with NPS 1/4 or NPS 1/2 (DN 8 or DN 15), ASME B1.20.1 pipe threads.

2.5 TEST PLUGS

- 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. Peterson Equipment Co., Inc.
 2. Trerice, H. O. Co.
 3. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
 4. Weiss Instruments, Inc.
 5. Weksler Glass Thermometer Corp.
 6. Approved Equal

- B. Description: Test-station fitting made for insertion into piping tee fitting.
- C. Body: Brass or stainless steel with core inserts and gasketed and threaded cap. Include extended stem on units to be installed in insulated piping.
- D. Thread Size: NPS 1/4 (DN 8) or NPS 1/2 (DN 15), ASME B1.20.1 pipe thread.
- E. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F (3450 kPa at 93 deg C).
- F. Core Inserts: Neoprene self-sealing rubber.

2.6 TEST-PLUG KITS

- 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. Peterson Equipment Co., Inc.
 - 2. Terice, H. O. Co.
 - 3. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
 - 4. Weiss Instruments, Inc.
 - 5. Weksler Glass Thermometer Corp.
 - 6. Approved Equal
- B. Furnish two test-plug kit(s) containing one thermometer(s), one pressure gage and adapter, and carrying case. Thermometer sensing elements, pressure gage, and adapter probes shall be of diameter to fit test plugs and of length to project into piping.
- C. Low-Range Thermometer: Small, bimetallic insertion type with 1- to 2-inch- (25- to 51-mm-) diameter dial and tapered-end sensing element. Dial range shall be at least 25 to 125 deg F (minus 4 to plus 52 deg C).
- D. High-Range Thermometer: Small, bimetallic insertion type with 1- to 2-inch- (25- to 51-mm-) diameter dial and tapered-end sensing element. Dial range shall be at least 0 to 220 deg F (minus 18 to plus 104 deg C).
- E. Pressure Gage: Small, Bourdon-tube insertion type with 2- to 3-inch- (51- to 76-mm-) diameter dial and probe. Dial range shall be at least 0 to 200 psig (0 to 1380 kPa).
- F. Carrying Case: Metal or plastic, with formed instrument padding.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install thermowells with socket extending [a minimum of one-third of pipe diameter and in vertical position in piping tees.
- B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.

- C. Install thermowells with extension on insulated piping.
- D. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.
- E. Install duct-thermometer mounting brackets in walls of ducts. Attach to duct with screws.
- F. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.
- G. Install valve and snubber in piping for each pressure gage for fluids (except steam).
- H. Install test plugs in piping tees.
- I. Install thermometers in the following locations:
 - 1. As indicated on plans, details and schematic diagrams.
 - 2. Inlet and outlet of each hydronic zone.
 - 3. Inlet and outlet of each hydronic boiler.
 - 4. Two inlets and two outlets of each chiller.
 - 5. Inlet and outlet of each hydronic coil in air-handling units.
 - 6. Two inlets and two outlets of each hydronic heat exchanger.
 - 7. Outside-, return-, and supply-air ducts.
- J. Install pressure gages in the following locations:
 - 1. As indicated on plans, details and schematic diagrams.
 - 2. Discharge of each pressure-reducing valve.
 - 3. Inlet and outlet of each chiller chilled-water and condenser-water connection.
 - 4. Suction and discharge of each pump.
 - 5. Inlet and outlet of each hydronic zone.
 - 6. Inlet and outlet of each hydronic boiler.
 - 7. Inlet and outlet of each hydronic coil in air-handling units.

3.2 CONNECTIONS

- A. Install thermometers and gages adjacent to machines and equipment to allow service and maintenance of thermometers, gages, machines, and equipment.

3.3 ADJUSTING

- A. After installation, calibrate meters according to manufacturer's written instructions.
- B. Adjust faces of meters and gages to proper angle for best visibility.

3.4 THERMOMETER SCHEDULE

- A. Thermometers at inlet and outlet of each hydronic zone shall be the following:
 - 1. Test plug with neoprene self-sealing rubber inserts.

- B. Thermometers at inlet and outlet of each hydronic boiler shall be the following:
 - 1. Liquid-filled, non-mercury, bimetallic-actuated type.
- C. Thermometers at inlets and outlets of each chiller shall be the following:
 - 1. Liquid-filled, non-mercury, bimetallic-actuated type.
- D. Thermometers at inlet and outlet of each hydronic coil in air-handling units and built-up central systems shall be the following:
 - 1. Liquid-filled, non-mercury, bimetallic-actuated type.
- E. Thermometers at inlet and outlet of each hydronic coil in unit ventilators and fan coil units shall be the following:
 - 1. Test plug with neoprene self-sealing rubber inserts.
- F. Thermometers at outside-, return-, and supply-air ducts shall be the following:
 - 1. Liquid-filled, non-mercury, bimetallic-actuated type.
- G. Thermometer stems shall be of length to match thermowell insertion length.

3.5 THERMOMETER SCALE-RANGE SCHEDULE

- A. Scale Range for Heating, Hot-Water Piping: 20 to 240 deg F (0 to 150 deg C).
- B. Scale Range for Air Ducts: Minus 40 to plus 160 deg F (Minus 40 to plus 100 deg C).

3.6 PRESSURE-GAGE SCHEDULE

- A. Pressure gages at discharge of each pressure-reducing valve shall be the following:
 - 1. Liquid-filled, non-mercury, direct-mounted, metal case.
- B. Pressure gages at suction and discharge of each pump shall be the following:
 - 1. Liquid-filled, non-mercury, direct-mounted, metal case.

3.7 PRESSURE-GAGE SCALE-RANGE SCHEDULE

- A. Scale Range for Heating, Hot-Water Piping: 0 to 100 psi (0 to 600 kPa).

END OF SECTION

SECTION 23 0523 - GENERAL-DUTY VALVES FOR HVAC PIPING

PART 1 - GENERAL (NOT USED)

PART 2 - PRODUCTS

2.1 GENERAL-DUTY VALVES

- A. End Connections: Threads shall comply with ANSI B1.20.1. Flanges shall comply with ANSI B16.1 for cast-iron valves and with ANSI B16.24 for bronze valves. Solder-joint connections shall comply with ANSI B16.18.
- B. One-Piece, Copper-Alloy Ball Valves: Brass or bronze body with chrome-plated bronze ball, PTFE or TFE seats, and 400-psig (2760-kPa) minimum CWP rating.
- C. Two-Piece, Copper-Alloy Ball Valves: Brass or bronze body with full regular port, chrome-plated bronze ball; PTFE or TFE seats; and 600-psig (4140-kPa) minimum CWP rating and blowout-proof stem.
- D. Bronze, Swing Check Valves: Class 125, bronze body with bronze disc and seat.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Use ball valves for shutoff duty; globe and ball for throttling duty.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves for each fixture and item of equipment.
- D. Install three-valve bypass around each pressure-reducing valve using throttling-type valves.
- E. Install valves in horizontal piping with stem at or above center of pipe.
- F. Install valves in a position to allow full stem movement.
- G. Install check valves for proper direction of flow in horizontal position with hinge pin level.

END OF SECTION

SECTION 23 0529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Metal pipe hangers and supports.
 - 2. Trapeze pipe hangers.
 - 3. Metal framing systems.
 - 4. Fiberglass strut systems.
 - 5. Thermal-hanger shield inserts.
 - 6. Fastener systems.
 - 7. Pipe stands.
 - 8. Equipment supports.

1.3 DEFINITIONS

- A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
 - 1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
 - 2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.

- B. Shop Drawings: Show fabrication and installation details and include calculations for the following; include Product Data for components:
 - 1. Trapeze pipe hangers.
 - 2. Metal framing systems.
 - 3. Pipe stands.
 - 4. Equipment supports.
- C. Welding certificates.

1.6 QUALITY ASSURANCE

- A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

- A. Carbon-Steel Pipe Hangers and Supports:
 - 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
 - 2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
 - 3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
 - 4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
 - 5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
- B. Stainless-Steel Pipe Hangers and Supports:
 - 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
 - 2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
 - 3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel .

2.2 THERMAL-HANGER SHIELD INSERTS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Carpenter & Paterson, Inc.
 - 2. Clement Support Services.

3. ERICO International Corporation.
 4. National Pipe Hanger Corporation.
 5. PHS Industries, Inc.
 6. Pipe Shields, Inc.; a subsidiary of Piping Technology & Products, Inc.
 7. Piping Technology & Products, Inc.
 8. Rilco Manufacturing Co., Inc.
 9. Value Engineered Products, Inc.
 10. Approved Equal
- B. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig (688-kPa) minimum compressive strength and vapor barrier.
- C. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass with 100-psig (688-kPa) minimum compressive strength.
- D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- F. Insert Length: Extend 2 inches (50 mm) beyond sheet metal shield for piping operating below ambient air temperature.

2.3 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
- B. Mechanical-Expansion Anchors: Insert-wedge-type, stainless- steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.4 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.5 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
1. Properties: Non-staining, noncorrosive, and nongaseous.

2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.
- B. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- C. Fastener System Installation:
 1. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- D. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- E. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- F. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- G. Install lateral bracing with pipe hangers and supports to prevent swaying.
- H. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 (DN 65) and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- I. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- J. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.
- K. Insulated Piping:
 1. Attach clamps and spacers to piping.
 - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.

- b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
- 2. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2 (DN 8 to DN 90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.
 - b. NPS 4 (DN 100): 12 inches (305 mm) long and 0.06 inch (1.52 mm) thick.
- 3. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make bearing surface smooth.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches (40 mm)

3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils (0.05 mm).
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

- B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use carbon-steel pipe hangers and supports, metal trapeze pipe hangers and metal framing systems and attachments for general service applications.
- F. Use stainless-steel pipe hangers and stainless-steel attachments for hostile environment applications.
- G. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.
- H. Use padded hangers for piping that is subject to scratching.
- I. Use thermal-hanger shield inserts for insulated piping and tubing.
- J. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
 - 2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F (566 deg C), pipes NPS 4 to NPS 24 (DN 100 to DN 600), requiring up to 4 inches (100 mm) of insulation.
 - 3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36 (DN 20 to DN 900), requiring clamp flexibility and up to 4 inches (100 mm) of insulation.
 - 4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 (DN 15 to DN 600) if little or no insulation is required.
 - 5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4 (DN 15 to DN 100), to allow off-center closure for hanger installation before pipe erection.
 - 6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8 (DN 20 to DN 200).
 - 7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
 - 8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
 - 9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
 - 10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8 (DN 10 to DN 200).

11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3 (DN 10 to DN 80).
 12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
 13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
 14. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36 (DN 100 to DN 900), with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
 15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36 (DN 100 to DN 900), with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
 16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 (DN 65 to DN 900) if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
 17. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30 (DN 25 to DN 750), from two rods if longitudinal movement caused by expansion and contraction might occur.
 18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24 (DN 65 to DN 600), from single rod if horizontal movement caused by expansion and contraction might occur.
 19. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 (DN 50 to DN 1050) if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
 20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 (DN 50 to DN 600) if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
 21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 (DN 50 to DN 750) if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.
- K. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24 (DN 24 to DN 600).
 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 (DN 20 to DN 600) if longer ends are required for riser clamps.
- L. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches (150 mm) for heavy loads.
 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) piping installations.
 3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.

4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
 5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F (49 to 232 deg C) piping installations.
- M. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
 3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
 6. C-Clamps (MSS Type 23): For structural shapes.
 7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
 8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
 9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
 10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
 11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
 12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
 - a. Light (MSS Type 31): 750 lb (340 kg).
 - b. Medium (MSS Type 32): 1500 lb (680 kg).
 - c. Heavy (MSS Type 33): 3000 lb (1360 kg).
 13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
 14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
 15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.
- N. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
 3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

- O. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.
- P. Use Mechanical – Expansion Anchors instead of building attachments where required in concrete construction.

END OF SECTION

SECTION 23 0548 - VIBRATION CONTROLS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Isolation pads.
 - 2. Isolation mounts.
 - 3. Elastomeric hangers.
 - 4. Spring hangers.
 - 5. Restraining braces and cables.
 - 6. Steel and inertia, vibration isolation equipment bases.

1.3 DEFINITIONS

- A. IBC: International Building Code.
- B. ICC-ES: ICC-Evaluation Service.
- C. OSHPD: Office of Statewide Health Planning and Development for the State of California.

1.4 SUBMITTALS

- A. Product Data: For the following:
 - 1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
- B. Coordination Drawings: Show coordination of bracing for HVAC piping and equipment with other systems and equipment in the vicinity, including other supports and restraints.
- C. Welding certificates.

1.5 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code – Steel."

PART 2 - PRODUCTS

2.1 VIBRATION ISOLATORS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Ace Mountings Co., Inc.
 2. Amber/Booth Company, Inc.
 3. California Dynamics Corporation.
 4. Isolation Technology, Inc.
 5. Kinetics Noise Control.
 6. Mason Industries.
 7. Vibration Eliminator Co., Inc.
 8. Vibration Isolation.
 9. Vibration Mountings & Controls, Inc.
- B. Mounts: Double-deflection type, with molded, oil-resistant rubber, hermetically sealed compressed fiberglass, or neoprene isolator elements with factory-drilled, encapsulated top plate for bolting to equipment and with baseplate for bolting to structure. Color-code or otherwise identify to indicate capacity range.
1. Materials: Cast-ductile-iron or welded steel housing containing two separate and opposing, oil-resistant rubber or neoprene elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.
 2. Neoprene: Shock-absorbing materials compounded according to the standard for bridge-bearing neoprene as defined by AASHTO.
 3. Minimum Static Deflection of 0.35”.
 4. Basis of Design: Mason Industries Type ND.
- C. Spring Hangers: Combination coil-spring and elastomeric-insert hanger with spring and insert in compression.
1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
 2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
 3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
 4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
 5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
 6. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
 7. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.
 8. Basis of Design: Mason Industries Type 30N.

2.2 VIBRATION ISOLATION EQUIPMENT BASES

- D. Steel Base: Factory-fabricated, welded, structural-steel bases and rails.
 - 1. Design Requirements: Lowest possible mounting height with not less than 1-inch (25-mm) clearance above the floor. Include equipment anchor bolts and auxiliary motor slide bases or rails.
 - a. Include supports for suction and discharge elbows for pumps.
 - 2. Structural Steel: Steel shapes, plates, and bars complying with ASTM A 36/A 36M. Bases shall have shape to accommodate supported equipment.
 - 3. Support Brackets: Factory-welded steel brackets on frame for outrigger isolation mountings and to provide for anchor bolts and equipment support.

2.3 FACTORY FINISHES

- A. Finish: Manufacturer's standard prime-coat finish ready for field painting.
- B. Finish: Manufacturer's standard paint applied to factory-assembled and -tested equipment before shipping.
 - 1. Powder coating on springs and housings.
 - 2. All hardware shall be galvanized. Hot-dip galvanize metal components for exterior use.
 - 3. Baked enamel or powder coat for metal components on isolators for interior use.
 - 4. Color-code or otherwise mark vibration isolation and and wind-control devices to indicate capacity range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and equipment to receive vibration isolation -control devices for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

- A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by OSHPD.

- B. Hanger Rod Stiffeners: Install hanger rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.
- C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.
- D. Spring Hangers shall be used for all piping in equipment rooms or adjacent to noise-sensitive areas.

3.3 VIBRATION-CONTROL DEVICE INSTALLATION

- A. Equipment Restraints:
 - 1. Install seismic snubbers on HVAC equipment mounted on vibration isolators. Locate snubbers as close as possible to vibration isolators and bolt to equipment base and supporting structure.
 - 2. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch (3.2 mm).
- B. Piping Restraints:
 - 1. Comply with requirements in MSS SP-127.
 - 2. Space lateral supports a maximum of 40 feet (12 m) o.c., and longitudinal supports a maximum of 80 feet (24 m) o.c.
 - 3. Brace a change of direction longer than 12 feet (3.7 m).
- C. Install cables so they do not bend across edges of adjacent equipment or building structure.
- D. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.
- E. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.
- F. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.
- G. Drilled-in Anchors:
 - 1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.

2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
5. Set anchors to manufacturer's recommended torque, using a torque wrench.
6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
 2. Test at least four of each type and size of installed anchors and fasteners selected by Architect.
 3. Measure isolator restraint clearance.
 4. Measure isolator deflection.
 5. Verify snubber minimum clearances.
 6. If a device fails test, modify all installations of same type and retest until satisfactory results are achieved.
- C. Remove and replace malfunctioning units and retest as specified above.
- D. Prepare test and inspection reports.

3.5 ADJUSTING

- A. Adjust isolators after piping system is at operating weight.
- B. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.
- C. Adjust active height of spring isolators.
- D. Adjust restraints to permit free movement of equipment within normal mode of operation.

3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain air-mounting systems. Refer to Division 01 Section "Demonstration And Training."

3.7 HVAC VIBRATION-CONTROL DEVICE SCHEDULE

- A. Supported or Suspended Equipment: Refer to Drawing Plans.

END OF SECTION

SECTION 23 0553 IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Equipment labels.
 - 2. Warning signs and labels.
 - 3. Pipe labels.
 - 4. Duct labels.
 - 5. Valve tags.
 - 6. Warning tags.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For color, letter style, and graphic representation required for each identification material and device.
- C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.
- D. Valve numbering scheme.
- E. Valve Schedules: For each piping system to include in maintenance manuals.

1.4 COORDINATION

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Material and Thickness: Brass, 0.032-inch (0.8-mm) Stainless steel, 0.025-inch (0.64-mm) Aluminum, 0.032-inch (0.8-mm) or anodized aluminum, 0.032-inch (0.8-mm) minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).
3. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
4. Fasteners: Stainless-steel rivets or self-tapping screws.
5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch (3.2 mm) thick, and having predrilled holes for attachment hardware.
2. Letter Color: Black.
3. Background Color: White.
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).
6. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

D. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch (A4) bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the

Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch (3.2 mm) thick, and having predrilled holes for attachment hardware.
- B. Letter Color: Black.
- C. Background Color: Yellow.
- D. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).
- E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).
- F. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
- G. Fasteners: Stainless-steel rivets or self-tapping screws.
- H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
- B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.
- C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
 - 1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
 - 2. Lettering Size: At least 1-1/2 inches (38 mm) high.

2.4 DUCT LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch (3.2 mm) thick, and having predrilled holes for attachment hardware.
- B. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).
- C. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).
- D. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
- E. Fasteners: Stainless-steel rivets or self-tapping screws.
- F. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- G. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings, duct size, and an arrow indicating flow direction.
 - 1. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions, or as separate unit on each duct label to indicate flow direction.
 - 2. Lettering Size: At least 1-1/2 inches (38 mm) high.

2.5 VALVE TAGS

- A. Valve Tags: Stamped or engraved with 1/4-inch (6.4-mm) letters for piping system abbreviation and 1/2-inch (13-mm) numbers.
 - 1. Tag Material: Brass, 0.032-inch (0.8-mm) Stainless steel, 0.025-inch (0.64-mm) Aluminum, 0.032-inch (0.8-mm) or anodized aluminum, 0.032-inch (0.8-mm) minimum thickness, and having predrilled or stamped holes for attachment hardware.
 - 2. Fasteners: Brass wire-link or beaded chain; or S-hook.
- B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch (A4) bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.
 - 1. Valve-tag schedule shall be included in operation and maintenance data.

2.6 WARNING TAGS

- A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.
 - 1. Size: Approximately 4 by 7 inches (100 by 178 mm).
 - 2. Fasteners: Brass grommet and wire.
 - 3. Nomenclature: Large-size primary caption such as “DANGER,” “CAUTION,” or “DO NOT OPERATE.”
 - 4. Color: Yellow background with black lettering.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

- A. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
 - 1. Near each valve and control device.
 - 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 - 3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
 - 4. At access doors, manholes, and similar access points that permit view of concealed piping.
 - 5. Near major equipment items and other points of origination and termination.
 - 6. Spaced at maximum intervals of 50 feet (15 m) along each run. Reduce intervals to 25 feet (7.6 m) in areas of congested piping and equipment.
 - 7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

- A. **3.4 DUCT LABEL INSTALLATION** Install plastic-laminated, self-adhesive duct labels with permanent adhesive on air ducts in the following color codes:

1. Blue: For return air ducts.
 2. Yellow: For supply air ducts.
 3. Green: For exhaust-, outside-, relief-, return-, and mixed-air ducts.
 4. ASME A13.1 Colors and Designs: For hazardous material exhaust.
- B. Locate labels near points where ducts enter into concealed spaces and at maximum intervals of 50 feet (15 m) in each space where ducts are exposed or concealed by removable ceiling system.

3.5 VALVE-TAG INSTALLATION

- A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience and lawn-watering hose connections; and HVAC terminal devices and similar roughing-in connections on end-use fixtures and units. List tagged valves in schedule.
- B. Valve-Tag Application Schedule:
1. Valve-Tag Size and Shape: 1-1/2 inches (38mm), round.
 2. Valve-Tag Color: Natural
 3. Letter Color: Black

3.6 WARNING-TAG INSTALLATION

- A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION

SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Balancing Air Systems:
 - a. Constant-volume air systems.
 - b. Dual-duct systems.
 - c. Variable-air-volume systems.
 - d. Multizone systems.
 - e. Induction-unit systems.
 - 2. Balancing Hydronic Piping Systems:
 - a. Constant-flow hydronic systems.
 - b. Variable-flow hydronic systems.
 - c. Primary-secondary hydronic systems.

1.3 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. NEBB: National Environmental Balancing Bureau.
- C. TAB: Testing, adjusting, and balancing.
- D. TABB: Testing, Adjusting, and Balancing Bureau.
- E. TAB Specialist: An entity engaged to perform TAB Work.

1.4 SUBMITTALS

- A. LEED Submittal:
 - 1. Air-Balance Report for LEED Prerequisite EQ 1: Documentation of work performed for ASHRAE 62.1-2004, Section 7.2.2, "Air Balancing."

- B. Qualification Data: Within 15 days of Contractor's Notice to Proceed, submit documentation that the TAB contractor and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.
- C. Contract Documents Examination Report: Within 15 days of Contractor's Notice to Proceed, submit the Contract Documents review report as specified in Part 3.
- D. Strategies and Procedures Plan: Within 30 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.
- E. Certified TAB reports.
- F. Sample report forms.
- G. Instrument calibration reports, to include the following:
 - 1. Instrument type and make.
 - 2. Serial number.
 - 3. Application.
 - 4. Dates of use.
 - 5. Dates of calibration.

1.5 QUALITY ASSURANCE

- A. TAB Contractor Qualifications: Engage a TAB entity certified by AABC, NEBB or TABB.
 - 1. TAB Field Supervisor: Employee of the TAB contractor and certified by AABC, NEBB or TABB.
 - 2. TAB Technician: Employee of the TAB contractor and who is certified by AABC, NEBB, or TABB as a TAB technician.
- B. TAB Conference: Meet with Engineer, College Staff, and Construction Manager on approval of the TAB strategies and procedures plan to develop a mutual understanding of the details. Require the participation of the TAB field supervisor and technicians. Provide seven days' advance notice of scheduled meeting time and location.
 - 1. Agenda Items:
 - a. The Contract Documents examination report.
 - b. The TAB plan.
 - c. Coordination and cooperation of trades and subcontractors.
 - d. Coordination of documentation and communication flow.
- C. Certify TAB field data reports and perform the following:
 - 1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
 - 2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.

- D. TAB Report Forms: Use standard TAB contractor's forms approved by the A/E and college.
- E. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."

1.6 PROJECT CONDITIONS

- A. Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.
- B. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

1.7 COORDINATION

- A. Notice: Provide seven days' advance notice for each test. Include scheduled test dates and times.
- B. Perform TAB after leakage and pressure tests on water distribution systems have been satisfactorily completed.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TAB SPECIALISTS – NOT USED

3.2 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.
- B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.
- C. Examine the approved submittals for HVAC systems and equipment.
- D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they meet the leakage class of connected ducts as specified in Division 23 Section "HVAC Ducts and Casings" and are

properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.

- E. Examine equipment performance data including fan and pump curves.
 - 1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
 - 2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.
- F. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- G. Examine test reports specified in individual system and equipment Sections.
- H. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.
- I. Examine strainers. Verify that startup screens are replaced by permanent screens with indicated perforations.
- J. Examine three-way valves for proper installation for their intended function of diverting or mixing fluid flows.
- K. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
- L. Examine system pumps to ensure absence of entrained air in the suction piping.
- M. Examine operating safety interlocks and controls on HVAC equipment.
- N. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.3 PREPARATION

- A. Prepare a TAB plan that includes strategies and step-by-step procedures.
- B. Complete system-readiness checks and prepare reports. Verify the following:
 - 1. Permanent electrical-power wiring is complete.
 - 2. Hydronic systems are filled, clean, and free of air.
 - 3. Automatic temperature-control systems are operational.
 - 4. Equipment and duct access doors are securely closed.
 - 5. Balance, smoke, and fire dampers are open.

6. Isolating and balancing valves are open and control valves are operational.
7. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
8. Windows and doors can be closed so indicated conditions for system operations can be met.

3.4 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in this Section.
 1. Comply with requirements in ASHRAE 62.1-2004, Section 7.2.2, "Air Balancing."
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.
 1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
 2. After testing and balancing, install test ports and duct access doors that comply with requirements in Division 23 Section "Air Duct Accessories."
 3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Division 23 Section "HVAC Insulation."
- C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.5 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.
- B. Prepare schematic diagrams of systems' "as-built" duct layouts.
- C. For variable-air-volume systems, develop a plan to simulate diversity.
- D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.
- E. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.
- F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- G. Verify that motor starters are equipped with properly sized thermal protection.

- H. Check dampers for proper position to achieve desired airflow path.
- I. Check for airflow blockages.
- J. Check condensate drains for proper connections and functioning.
- K. Check for proper sealing of air-handling-unit components.
- L. Verify that air duct system is sealed as specified in Division 23 Section "Metal Ducts."

3.6 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

- A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
 - 1. Measure total airflow.
 - a. Where sufficient space in ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow.
 - 2. Measure fan static pressures as follows to determine actual static pressure:
 - a. Measure outlet static pressure as far downstream from the fan as practical and upstream from restrictions in ducts such as elbows and transitions.
 - b. Measure static pressure directly at the fan outlet or through the flexible connection.
 - c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from the flexible connection, and downstream from duct restrictions.
 - d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.
 - 3. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.
 - a. Report the cleanliness status of filters and the time static pressures are measured.
 - 4. Measure static pressures entering and leaving other devices, such as sound traps, heat-recovery equipment, and air washers, under final balanced conditions.
 - 5. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
 - 6. Obtain approval from the A/E for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in Division 23 Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
 - 7. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full-cooling, full-

heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

- B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.
 - 1. Measure airflow of submain and branch ducts.
 - a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.
 - 2. Measure static pressure at a point downstream from the balancing damper, and adjust volume dampers until the proper static pressure is achieved.
 - 3. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.
- C. Measure air outlets and inlets without making adjustments.
 - 1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.
- D. Adjust air outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using branch volume dampers rather than extractors and the dampers at air terminals.
 - 1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
 - 2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.7 PROCEDURES FOR DUAL-DUCT SYSTEMS – NOT USED

3.8 PROCEDURES FOR VARIABLE-AIR-VOLUME SYSTEMS – NOT USED

3.9 PROCEDURES FOR MULTIZONE SYSTEMS – NOT USED

3.10 PROCEDURES FOR INDUCTION-UNIT SYSTEMS – NOT USED

3.11 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

- A. Prepare test reports with pertinent design data, and number in sequence starting at pump to end of system. Check the sum of branch-circuit flows against the approved pump flow rate. Correct variations that exceed plus or minus 5 percent.
- B. Prepare schematic diagrams of systems' "as-built" piping layouts.

- C. Prepare hydronic systems for testing and balancing according to the following, in addition to the general preparation procedures specified above:
 - 1. Open all manual valves for maximum flow.
 - 2. Check liquid level in expansion tank.
 - 3. Check makeup water-station pressure gage for adequate pressure for highest vent.
 - 4. Check flow-control valves for specified sequence of operation, and set at indicated flow.
 - 5. Set differential-pressure control valves at the specified differential pressure. Do not set at fully closed position when pump is positive-displacement type unless several terminal valves are kept open.
 - 6. Set system controls so automatic valves are wide open to heat exchangers.
 - 7. Check pump-motor load. If motor is overloaded, throttle main flow-balancing device so motor nameplate rating is not exceeded.
 - 8. Check air vents for a forceful liquid flow exiting from vents when manually operated.

3.12 PROCEDURES FOR CONSTANT-FLOW HYDRONIC SYSTEMS

- A. Measure water flow at pumps. Use the following procedures except for positive-displacement pumps:
 - 1. Verify impeller size by operating the pump with the discharge valve closed. Read pressure differential across the pump. Convert pressure to head and correct for differences in gage heights. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.
 - a. If impeller sizes must be adjusted to achieve pump performance, obtain approval from the A/E and Owner.
 - 2. Check system resistance. With all valves open, read pressure differential across the pump and mark pump manufacturer's head-capacity curve. Adjust pump discharge valve until indicated water flow is achieved.
 - a. Monitor motor performance during procedures and do not operate motors in overload conditions.
 - 3. Verify pump-motor brake horsepower. Calculate the intended brake horsepower for the system based on pump manufacturer's performance data. Compare calculated brake horsepower with nameplate data on the pump motor. Report conditions where actual amperage exceeds motor nameplate amperage.
 - 4. Report flow rates that are not within plus or minus 10 percent of design.
- B. Measure flow at all automatic flow control valves to verify that valves are functioning as designed.
- C. Measure flow at all pressure-independent characterized control valves, with valves in fully open position, to verify that valves are functioning as designed.
- D. Set calibrated balancing valves, if installed, at calculated presettings.

- E. Measure flow at all stations and adjust, where necessary, to obtain first balance.
 - 1. System components that have Cv rating or an accurately cataloged flow-pressure-drop relationship may be used as a flow-indicating device.
- F. Measure flow at main balancing station and set main balancing device to achieve flow that is 5 percent greater than indicated flow.
- G. Adjust balancing stations to within specified tolerances of indicated flow rate as follows:
 - 1. Determine the balancing station with the highest percentage over indicated flow.
 - 2. Adjust each station in turn, beginning with the station with the highest percentage over indicated flow and proceeding to the station with the lowest percentage over indicated flow.
 - 3. Record settings and mark balancing devices.
- H. Measure pump flow rate and make final measurements of pump amperage, voltage, rpm, pump heads, and systems' pressures and temperatures including outdoor-air temperature.
- I. Measure the differential-pressure-control-valve settings existing at the conclusion of balancing.
- J. Check settings and operation of each safety valve. Record settings.

3.13 PROCEDURES FOR VARIABLE-FLOW HYDRONIC SYSTEMS

- A. Balance systems with automatic two- and three-way control valves by setting systems at maximum flow through heat-exchange terminals and proceed as specified above for hydronic systems.

3.14 PROCEDURES FOR PRIMARY-SECONDARY HYDRONIC SYSTEMS

- A. Balance the primary circuit flow first and then balance the secondary circuits.

3.15 PROCEDURES FOR STEAM SYSTEMS – NOT USED

3.16 PROCEDURES FOR HEAT EXCHANGERS – NOT USED

3.17 PROCEDURES FOR MOTORS

- A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:
 - 1. Manufacturer's name, model number, and serial number.
 - 2. Motor horsepower rating.
 - 3. Motor rpm.
 - 4. Efficiency rating.
 - 5. Nameplate and measured voltage, each phase.

6. Nameplate and measured amperage, each phase.
 7. Starter thermal-protection-element rating.
- B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass of the controller to prove proper operation. Record observations including name of controller manufacturer, model number, serial number, and nameplate data.
- 3.18 PROCEDURES FOR CHILLERS – NOT USED
- 3.19 PROCEDURES FOR COOLING TOWERS – NOT USED
- 3.20 PROCEDURES FOR CONDENSING UNITS
- A. Verify proper rotation of fans.
 - B. Measure entering- and leaving-air temperatures.
 - C. Record compressor data.
- 3.21 PROCEDURES FOR BOILERS – NOT USED
- 3.22 PROCEDURES FOR HEAT-TRANSFER COILS – NOT USED
- 3.23 PROCEDURES FOR TESTING, ADJUSTING, AND BALANCING EXISTING SYSTEMS
- A. Perform a preconstruction inspection of existing equipment that is to remain and be reused.
 1. Measure and record the operating speed, airflow, and static pressure of each fan.
 2. Measure motor voltage and amperage. Compare the values to motor nameplate information.
 3. Check the refrigerant charge.
 4. Check the condition of filters.
 5. Check the condition of coils.
 6. Check the operation of the drain pan and condensate-drain trap.
 7. Check bearings and other lubricated parts for proper lubrication.
 8. Report on the operating condition of the equipment and the results of the measurements taken. Report deficiencies.
 - B. Before performing testing and balancing of existing systems, inspect existing equipment that is to remain and be reused to verify that existing equipment has been cleaned and refurbished. Verify the following:
 1. New filters are installed.
 2. Coils are clean and fins combed.

3. Drain pans are clean.
 4. Fans are clean.
 5. Bearings and other parts are properly lubricated.
 6. Deficiencies noted in the preconstruction report are corrected.
- C. Perform testing and balancing of existing systems to the extent that existing systems are affected by the renovation work.
1. Compare the indicated airflow of the renovated work to the measured fan airflows, and determine the new fan speed and the face velocity of filters and coils.
 2. Verify that the indicated airflows of the renovated work result in filter and coil face velocities and fan speeds that are within the acceptable limits defined by equipment manufacturer.
 3. If calculations increase or decrease the air flow rates and water flow rates by more than 5 percent, make equipment adjustments to achieve the calculated rates. If increase or decrease is 5 percent or less, equipment adjustments are not required.
 4. Balance each air outlet.

3.24 TOLERANCES

- A. Set HVAC system's air flow rates and water flow rates within the following tolerances:
1. Supply, Return, and Exhaust Fans and Equipment with Fans: Not Used
 2. Air Outlets and Inlets: Not Used
 3. Heating-Water Flow Rate: Plus or minus 10 percent.
 4. Cooling-Water Flow Rate: Plus or minus 10 percent.

3.25 REPORTING

- A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.
- B. Status Reports: Prepare progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.26 FINAL REPORT

- A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
 2. Include a list of instruments used for procedures, along with proof of calibration.
- B. Final Report Contents: In addition to certified field-report data, include the following:
1. Pump curves.
 2. Fan curves.
 3. Manufacturers' test data.
 4. Field test reports prepared by system and equipment installers.
 5. Other information relative to equipment performance; do not include Shop Drawings and product data.
- C. General Report Data: In addition to form titles and entries, include the following data:
1. Title page.
 2. Name and address of the TAB contractor.
 3. Project name.
 4. Project location.
 5. Architect's name and address.
 6. Engineer's name and address.
 7. Contractor's name and address.
 8. Report date.
 9. Signature of TAB supervisor who certifies the report.
 10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
 11. Summary of contents including the following:
 - a. Indicated versus final performance.
 - b. Notable characteristics of systems.
 - c. Description of system operation sequence if it varies from the Contract Documents.
 12. Nomenclature sheets for each item of equipment.
 13. Data for terminal units, including manufacturer's name, type, size, and fittings.
 14. Notes to explain why certain final data in the body of reports vary from indicated values.
 15. Test conditions for fans and pump performance forms including the following:
 - a. Settings for outdoor-, return-, and exhaust-air dampers.
 - b. Conditions of filters.
 - c. Cooling coil, wet- and dry-bulb conditions.
 - d. Face and bypass damper settings at coils.
 - e. Fan drive settings including settings and percentage of maximum pitch diameter.
 - f. Inlet vane settings for variable-air-volume systems.
 - g. Settings for supply-air, static-pressure controller.
 - h. Other system operating conditions that affect performance.
- D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outdoor, supply, return, and exhaust airflows.
2. Water and steam flow rates.
3. Duct, outlet, and inlet sizes.
4. Pipe and valve sizes and locations.
5. Terminal units.
6. Balancing stations.
7. Position of balancing devices.

E. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:

1. Unit Data:
 - a. Unit identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and unit size.
 - e. Manufacturer's serial number.
 - f. Unit arrangement and class.
 - g. Discharge arrangement.
 - h. Sheave make, size in inches. and bore.
 - i. Center-to-center dimensions of sheave, and amount of adjustments in inches.
 - j. Number, make, and size of belts.
 - k. Number, type, and size of filters.
2. Motor Data:
 - a. Motor make, and frame type and size.
 - b. Horsepower and rpm.
 - c. Volts, phase, and hertz.
 - d. Full-load amperage and service factor.
 - e. Sheave make, size in inches, and bore.
 - f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
3. Test Data (Indicated and Actual Values):
 - a. Total air flow rate in cfm.
 - b. Total system static pressure in inches wg.
 - c. Fan rpm.
 - d. Discharge static pressure in inches wg.
 - e. Filter static-pressure differential in inches wg.
 - f. Preheat-coil static-pressure differential in inches wg.
 - g. Cooling-coil static-pressure differential in inches wg.
 - h. Heating-coil static-pressure differential in inches wg.
 - i. Outdoor airflow in cfm.
 - j. Return airflow in cfm.
 - k. Outdoor-air damper position.
 - l. Return-air damper position.
 - m. Vortex damper position.

F. Apparatus-Coil Test Reports:

1. Coil Data:
 - a. System identification.
 - b. Location.
 - c. Coil type.
 - d. Number of rows.
 - e. Fin spacing in fins per inch o.c.
 - f. Make and model number.
 - g. Face area in sq. ft..
 - h. Tube size in NPS.
 - i. Tube and fin materials.
 - j. Circuiting arrangement.
2. Test Data (Indicated and Actual Values):
 - a. Air flow rate in cfm.
 - b. Average face velocity in fpm.
 - c. Air pressure drop in inches wg.
 - d. Outdoor-air, wet- and dry-bulb temperatures in deg F.
 - e. Return-air, wet- and dry-bulb temperatures in deg F.
 - f. Entering-air, wet- and dry-bulb temperatures in deg F.
 - g. Leaving-air, wet- and dry-bulb temperatures in deg F.
 - h. Water flow rate in gpm.
 - i. Water pressure differential in feet of head or psig.
 - j. Entering-water temperature in deg F.
 - k. Leaving-water temperature in deg F.
 - l. Refrigerant expansion valve and refrigerant types.
 - m. Refrigerant suction pressure in psig.
 - n. Refrigerant suction temperature in deg F.
 - o. Inlet steam pressure in psig.
- G. Gas- and Oil-Fired Heat Apparatus Test Reports: In addition to manufacturer's factory startup equipment reports, include the following: Not Used
- H. Electric-Coil Test Reports: For electric furnaces, duct coils, and electric coils installed in central-station air-handling units, include the following: Not Used
- I. Fan Test Reports: For supply, return, and exhaust fans, include the following:
 1. Fan Data:
 - a. System identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and size.
 - e. Manufacturer's serial number.
 - f. Arrangement and class.
 - g. Sheave make, size in inches, and bore.
 - h. Center-to-center dimensions of sheave, and amount of adjustments in inches.

2. Motor Data:
 - a. Motor make, and frame type and size.
 - b. Horsepower and rpm.
 - c. Volts, phase, and hertz.
 - d. Full-load amperage and service factor.
 - e. Sheave make, size in inches, and bore.
 - f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
 - g. Number, make, and size of belts.
3. Test Data (Indicated and Actual Values):
 - a. Total airflow rate in cfm.
 - b. Total system static pressure in inches wg.
 - c. Fan rpm.
 - d. Discharge static pressure in inches wg.
 - e. Suction static pressure in inches wg.
- J. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:
 1. Report Data:
 - a. System and air-handling-unit number.
 - b. Location and zone.
 - c. Traverse air temperature in deg F.
 - d. Duct static pressure in inches wg.
 - e. Duct size in inches.
 - f. Duct area in sq. ft..
 - g. Indicated air flow rate in cfm.
 - h. Indicated velocity in fpm.
 - i. Actual air flow rate in cfm.
 - j. Actual average velocity in fpm.
 - k. Barometric pressure in psig.
- K. Air-Terminal-Device Reports: Not Used
- L. System-Coil Reports: For reheat coils and water coils of terminal units, include the following:
Not Used
- M. Pump Test Reports: Calculate impeller size by plotting the shutoff head on pump curves and include the following:
 1. Unit Data:
 - a. Unit identification.
 - b. Location.
 - c. Service.
 - d. Make and size.
 - e. Model number and serial number.

- f. Water flow rate in gpm .
- g. Water pressure differential in feet of head or psig.
- h. Required net positive suction head in feet of head or psig.
- i. Pump rpm.
- j. Impeller diameter in inches.
- k. Motor make and frame size.
- l. Motor horsepower and rpm.
- m. Voltage at each connection.
- n. Amperage for each phase.
- o. Full-load amperage and service factor.
- p. Seal type.

2. Test Data (Indicated and Actual Values):

- a. Static head in feet of head or psig.
- b. Pump shutoff pressure in feet of head or psig.
- c. Actual impeller size in inches.
- d. Full-open flow rate in gpm.
- e. Full-open pressure in feet of head or psig.
- f. Final discharge pressure in feet of head or psig.
- g. Final suction pressure in feet of head or psig.
- h. Final total pressure in feet of head or psig.
- i. Final water flow rate in gpm.
- j. Voltage at each connection.
- k. Amperage for each phase.

N. Instrument Calibration Reports:

1. Report Data:

- a. Instrument type and make.
- b. Serial number.
- c. Application.
- d. Dates of use.
- e. Dates of calibration.

3.27 INSPECTIONS

A. Initial Inspection:

- 1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the final report.
- 2. Check the following for each system:
 - a. Measure water flow of at least 5 percent of terminals.
 - b. Verify that balancing devices are marked with final balance position.
 - c. Note deviations from the Contract Documents in the final report.

B. Final Inspection:

1. After initial inspection is complete and documentation by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by A/E, Owner, and Construction Manager.
2. The TAB contractor's test and balance engineer shall conduct the inspection in the presence of A/E, Owner and Construction Manager.
3. A/E shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.
4. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
5. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.

C. TAB Work will be considered defective if it does not pass final inspections. If TAB Work fails, proceed as follows:

1. Recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
2. If the second final inspection also fails, Owner may contract the services of another TAB contractor to complete TAB Work according to the Contract Documents and deduct the cost of the services from the original TAB contractor's final payment.

D. Prepare test and inspection reports.

3.28 ADDITIONAL TESTS

- A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.
- B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION

SECTION 230700 - HVAC INSULATION

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data for each type of HVAC insulation material.
- B. Quality Assurance: Labeled with maximum flame-spread index of 25 and maximum smoke-developed index of 50 according to ASTM E 84.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.
- B. Mineral-Fiber Blanket Insulation: Comply with ASTM C 553, Type II and ASTM C 1290, Type I.
- C. Mineral-Fiber Board Insulation: Comply with ASTM C 612, Type IA or Type IB. For equipment applications, provide insulation with factory-applied FSK jacket.
- D. Mineral-Fiber, Preformed Pipe Insulation: Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ.
- E. Mineral-Fiber, Pipe and Tank Insulation: Complying with ASTM C 1393, Type II or Type IIIA Category 2, or with properties similar to ASTM C 612, Type IB; and having factory-applied FSK jacket.
 - 1. Nominal Density: 2.5 lb/cu. ft. (40 kg/cu. m) or more.
 - 2. Thermal Conductivity (k-value) at 100 Deg F ((55 Deg C):) 0.29 Btu x in./h x sq. ft. x deg F (0.042 W/m x K) or less.
- F. Polyolefin Insulation: Unicellular, polyethylene thermal plastic insulation. Comply with ASTM C 534 or ASTM C 1427, Type I, Grade 1 for tubular materials and Type II, Grade 1 for sheet materials.
- G. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.
- H. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
- I. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.

- J. Factory-Applied Jackets: When factory-applied jackets are indicated, comply with the following:
 - 1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
 - 2. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
- K. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
- L. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

PART 3 - EXECUTION

3.1 INSULATION INSTALLATION

- A. Comply with requirements of the Midwest Insulation Contractors Association's "National Commercial & Industrial Insulation Standards" for insulation installation on pipes and equipment.
- B. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- C. Insulation Installation at Fire-Rated Wall, Partition, and Floor Penetrations: Install insulation continuously through penetrations. Seal penetrations. Comply with requirements in Division 07 Section "Penetration Firestopping."
- D. Flexible Elastomeric Insulation Installation:
 - 1. Seal longitudinal seams and end joints with adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
 - 2. Insulation Installation on Pipe Fittings and Elbows: Install mitered sections of pipe insulation. Secure insulation materials and seal seams with adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- E. Mineral-Fiber Insulation Installation:
 - 1. Insulation Installation on Straight Pipes and Tubes: Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
 - 2. For insulation with factory-applied jackets on above ambient surfaces, secure laps with outward clinched staples at 6 inches (150 mm) o.c.
 - 3. For insulation with factory-applied jackets on below ambient surfaces, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

4. Blanket and Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
5. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier.

F. Polyolefin Insulation Installation:

1. Seal split-tube longitudinal seams and end joints with adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
2. Insulation Installation on Pipe Fittings and Elbows: Install mitered sections of polyolefin pipe insulation. Secure insulation materials and seal seams with adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

G. Plenums and Ducts Requiring Insulation:

1. Concealed and exposed supply and outdoor air.
2. Concealed and exposed return air located in nonconditioned space.
3. Concealed and exposed exhaust between isolation damper and penetration of building exterior.

H. Plenums and Ducts Not Insulated:

1. Metal ducts with duct liner.
2. Factory-insulated plenums and casings.
3. Flexible connectors.
4. Vibration-control devices.
5. Factory-insulated access panels and doors.

I. Piping Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawlspaces.
2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.2 DUCT AND PLENUM INSULATION SCHEDULE

A. Concealed duct insulation shall be one of the following:

1. Flexible Elastomeric: 2 inch thick.
2. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.
3. Mineral-Fiber Board: 2 inches thick and 1.5-lb/cu. ft. nominal density.

B. Exposed duct insulation shall be one of the following:

1. Flexible Elastomeric: 2 inch thick.
2. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.
3. Mineral-Fiber Board: 2 inches thick and 1.5-lb/cu. ft. nominal density.

3.3 HVAC PIPING INSULATION SCHEDULE

- A. Refrigerant Suction and Hot-Gas Piping: Insulation shall be the following:
 - 1. Flexible Elastomeric: 1 inch thick.

END OF SECTION

SECTION 232113 - HYDRONIC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes pipe and fitting materials, joining methods, special-duty valves, and specialties for the following:
 - 1. Chilled-water piping.
 - 2. Glycol cooling-water piping.
 - 3. Makeup-water piping.
- B. Related Sections include the following:
 - 1. Division 23 Section "Hydronic Pumps" for pumps, motors, and accessories for hydronic piping.

1.3 PERFORMANCE REQUIREMENTS

- A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature:
 - 1. Makeup-Water Piping: 80 psig (552 kPa) at 150 deg F (66 deg C).

1.4 SUBMITTALS

- A. Product Data: For each type of the following:
 - 1. Plastic pipe and fittings with solvent cement.
 - 2. RTRP and RTRF with adhesive.
 - 3. Pressure-seal fittings.
 - 4. Valves. Include flow and pressure drop curves based on manufacturer's testing for calibrated-orifice balancing valves and automatic flow-control valves.
 - 5. Hydronic specialties.
- B. LEED Submittal:
 - 1. Product Data for Credit EQ 4.1: For solvent cements and adhesive primers, including printed statement of VOC content.

- C. Shop Drawings: Detail, at 1/4 (1:50) scale, the piping layout, fabrication of pipe anchors, hangers, supports for multiple pipes, alignment guides, expansion joints and loops, and attachments of the same to the building structure. Detail location of anchors, alignment guides, and expansion joints and loops.
- D. Welding certificates.
- E. Qualification Data: For Installer.
- F. Field quality-control test reports.
- G. Operation and Maintenance Data: For air control devices, hydronic specialties, and special-duty valves to include in emergency, operation, and maintenance manuals.
- H. Water Analysis: Submit a copy of the water analysis to illustrate water quality available at Project site.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Installers of Pressure-Sealed Joints: Installers shall be certified by the pressure-seal joint manufacturer as having been trained and qualified to join piping with pressure-seal pipe couplings and fittings.
- B. Steel Support Welding: Qualify processes and operators according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- C. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX.
 - 1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
 - 2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
- D. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 01.

PART 2 - PRODUCTS

2.1 STEEL PIPE AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, black steel with plain ends; type, grade, and wall thickness as indicated in Part 3 "Piping Applications" Article.

- B. Cast-Iron Threaded Fittings: ASME B16.4; Classes 125 and 250 as indicated in Part 3 "Piping Applications" Article.
- C. Malleable-Iron Threaded Fittings: ASME B16.3, Classes 150 and 300 as indicated in Part 3 "Piping Applications" Article.
- D. Malleable-Iron Unions: ASME B16.39; Classes 150, 250, and 300 as indicated in Part 3 "Piping Applications" Article.
- E. Cast-Iron Pipe Flanges and Flanged Fittings: ASME B16.1, Classes 25, 125, and 250; raised ground face, and bolt holes spot faced as indicated in Part 3 "Piping Applications" Article.
- F. Wrought-Steel Fittings: ASTM A 234/A 234M, wall thickness to match adjoining pipe.
- G. Wrought Cast- and Forged-Steel Flanges and Flanged Fittings: ASME B16.5, including bolts, nuts, and gaskets of the following material group, end connections, and facings:
 - 1. Material Group: 1.1.
 - 2. End Connections: Butt welding.
 - 3. Facings: Raised face.
- H. Grooved Mechanical-Joint Fittings and Couplings:
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Anvil International, Inc.
 - b. Central Sprinkler Company; a division of Tyco Fire & Building Products.
 - c. National Fittings, Inc.
 - d. S. P. Fittings; a division of Star Pipe Products.
 - e. Victaulic Company of America.
 - 2. Joint Fittings: ASTM A 536, Grade 65-45-12 ductile iron; ASTM A 47/A 47M, Grade 32510 malleable iron; ASTM A 53/A 53M, Type F, E, or S, Grade B fabricated steel; or ASTM A 106, Grade B steel fittings with grooves or shoulders constructed to accept grooved-end couplings; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.
 - 3. Couplings: Ductile- or malleable-iron housing and synthetic rubber gasket of central cavity pressure-responsive design; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.
- I. Steel Pressure-Seal Fittings:
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Victaulic Company of America.

2. Housing: Steel.
 3. O-Rings and Pipe Stop: EPDM.
 4. Tools: Manufacturer's special tool.
 5. Minimum 300-psig (2070-kPa) working-pressure rating at 230 deg F (110 deg C).
- J. Steel Pipe Nipples: ASTM A 733, made of same materials and wall thicknesses as pipe in which they are installed.

2.2 PLASTIC PIPE AND FITTINGS

- A. CPVC Plastic Pipe: ASTM F 441/F 441M, Schedules 40 and 80, plain ends as indicated in Part 3 "Piping Applications" Article.
- B. CPVC Plastic Pipe Fittings: Socket-type pipe fittings, ASTM F 438 for Schedule 40 pipe; ASTM F 439 for Schedule 80 pipe.
- C. PVC Plastic Pipe: ASTM D 1785, Schedules 40 and 80, plain ends as indicated in Part 3 "Piping Applications" Article.
- D. PVC Plastic Pipe Fittings: Socket-type pipe fittings, ASTM D 2466 for Schedule 40 pipe; ASTM D 2467 for Schedule 80 pipe.

2.3 JOINING MATERIALS

- A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated.
 - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
- B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- E. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for joining copper with copper; or BAg-1, silver alloy for joining copper with bronze or steel.
- F. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- G. Solvent Cements for Joining Plastic Piping:

1. CPVC Piping: ASTM F 493.
 - a. Use CPVC solvent cement that has a VOC content of 490 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - b. Use adhesive primer that has a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 2. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
 - a. Use PVC solvent cement that has a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - b. Use adhesive primer that has a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- H. Gasket Material: Thickness, material, and type suitable for fluid to be handled and working temperatures and pressures.

2.4 TRANSITION FITTINGS

- A. Plastic-to-Metal Transition Fittings:
1. CPVC and PVC one-piece fitting with one threaded brass or copper insert and one Schedule 80 solvent-cement-joint end.
- B. Plastic-to-Metal Transition Unions:
1. MSS SP-107, CPVC and PVC union. Include brass or copper end, Schedule 80 solvent-cement-joint end, rubber gasket, and threaded union.

2.5 DIELECTRIC FITTINGS

- A. Description: Combination fitting of copper-alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
- B. Insulating Material: Suitable for system fluid, pressure, and temperature.
1. Factory-fabricated union assembly, for 250-psig (1725-kPa) minimum working pressure at 180 deg F (82 deg C).
- C. Dielectric Flanges:
1. Factory-fabricated companion-flange assembly, for 150- or 300-psig (1035- or 2070-kPa) minimum working pressure as required to suit system pressures.
- D. Dielectric-Flange Kits:
1. Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.

2. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig (1035- or 2070-kPa) minimum working pressure where required to suit system pressures.

E. Dielectric Couplings:

1. Galvanized-steel coupling with inert and noncorrosive thermoplastic lining; threaded ends; and 300-psig (2070-kPa) minimum working pressure at 225 deg F (107 deg C).

F. Dielectric Nipples:

1. Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig (2070-kPa) minimum working pressure at 225 deg F (107 deg C).

2.6 VALVES

A. Gate, Globe, Check, Ball, and Butterfly Valves: Comply with requirements specified in Division 23 Section "General-Duty Valves for HVAC Piping."

B. Automatic Temperature-Control Valves, Actuators, and Sensors: Comply with requirements specified in Division 23 Section "Instrumentation and Control for HVAC."

C. Cast-Iron or Steel, Calibrated-Orifice, Balancing Valves:

1. Body: Cast-iron or steel body, ball, plug, or globe pattern with calibrated orifice or venturi.
2. Ball: Brass or stainless steel.
3. Stem Seals: EPDM O-rings.
4. Disc: Glass and carbon-filled PTFE.
5. Seat: PTFE.
6. End Connections: Flanged or grooved.
7. Pressure Gage Connections: Integral seals for portable differential pressure meter.
8. Handle Style: Lever, with memory stop to retain set position.
9. CWP Rating: Minimum 125 psig (860 kPa).
10. Maximum Operating Temperature: 250 deg F (121 deg C).

D. Automatic Flow-Control Valves:

1. Body: Brass or ferrous metal.
2. Piston and Spring Assembly: [**Stainless steel**] [**Corrosion resistant**], tamper proof, self cleaning, and removable.
3. Combination Assemblies: Include bronze or brass-alloy ball valve.
4. Identification Tag: Marked with zone identification, valve number, and flow rate.
5. Size: Same as pipe in which installed.
6. Performance: Maintain constant flow, plus or minus 5 percent over system pressure fluctuations.
7. Minimum CWP Rating: 175 psig (1207 kPa).
8. Maximum Operating Temperature: 250 deg F (121 deg C).

2.7 HYDRONIC PIPING SPECIALTIES

- A. Stainless-Steel Bellow, Flexible Connectors:
 - 1. Body: Stainless-steel bellows with woven, flexible, bronze, wire-reinforcing protective jacket.
 - 2. End Connections: Threaded or flanged to match equipment connected.
 - 3. Performance: Capable of 3/4-inch (20-mm) misalignment.
 - 4. CWP Rating: 150 psig (1035 kPa).
 - 5. Maximum Operating Temperature: 250 deg F (121 deg C).
- B. Expansion fittings are specified in Division 23 Section "Expansion Fittings and Loops for HVAC Piping."

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

- A. Glycol cooling-water piping, aboveground, NPS 2 (DN 50) and smaller, shall be any of the following:
 - 1. Schedule 40 steel pipe; Class 125, cast-iron fittings; cast-iron flanges and flange fittings; and threaded joints.
- B. Glycol cooling-water piping, aboveground, NPS 2-1/2 (DN 65) and larger, shall be any of the following:
 - 1. Schedule 40 steel pipe; grooved, mechanical joint coupling and fittings; and grooved, mechanical joints.
- C. Makeup-water piping installed aboveground shall be either of the following:
 - 1. Schedule 40 steel pipe; Class 125, cast-iron fittings; cast-iron flanges and flange fittings; and threaded joints.
- D. Makeup-Water Piping Installed Belowground and within Slabs: Type K (A), annealed-temper copper tubing, wrought-copper fittings, and soldered joints. Use the fewest possible joints.

3.2 VALVE APPLICATIONS

- A. Install shut-off-duty valves at each branch connection to supply mains, and at supply connection to each piece of equipment.
- B. Install calibrated-orifice, balancing valves at each branch connection to return main.
- C. Install calibrated-orifice, balancing valves in the return pipe of each heating or cooling terminal.
- D. Install check valves at each pump discharge and elsewhere as required to control flow direction.

- E. Install safety valves at hot-water generators and elsewhere as required by ASME Boiler and Pressure Vessel Code. Install drip-pan elbow on safety-valve outlet and pipe without valves to the outdoors; and pipe drain to nearest floor drain or as indicated on Drawings. Comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1, for installation requirements.
- F. Install pressure-reducing valves at makeup-water connection to regulate system fill pressure.

3.3 PIPING INSTALLATIONS

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.
- B. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- C. Install piping to permit valve servicing.
- D. Install piping at indicated slopes.
- E. Install piping free of sags and bends.
- F. Install fittings for changes in direction and branch connections.
- G. Select system components with pressure rating equal to or greater than system operating pressure.
- H. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.
- I. Install drains, consisting of a tee fitting, NPS 3/4 (DN 20) ball valve, and short NPS 3/4 (DN 20) threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.
- J. Install piping at a uniform grade of 0.2 percent upward in direction of flow.
- K. Install branch connections to mains using mechanically formed tee fittings in main pipe, with the branch connected to the bottom of the main pipe. For up-feed risers, connect the branch to the top of the main pipe.
- L. Install valves according to Division 23 Section "General-Duty Valves for HVAC Piping."
- M. Install unions in piping, NPS 2 (DN 50) and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.
- N. Install flanges in piping, NPS 2-1/2 (DN 65) and larger, at final connections of equipment and elsewhere as indicated.

- O. Install strainers on inlet side of each control valve, pressure-reducing valve, solenoid valve, in-line pump, and elsewhere as indicated. Install NPS 3/4 (DN 20) nipple and ball valve in blowdown connection of strainers NPS 2 (DN 50) and larger. Match size of strainer blowoff connection for strainers smaller than NPS 2 (DN 50).
- P. Install expansion loops, expansion joints, anchors, and pipe alignment guides as specified in Division 23 Section "Expansion Fittings and Loops for HVAC Piping."
- Q. Identify piping as specified in Division 23 Section "Identification for HVAC Piping and Equipment."
- R. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 23 Section "Sleeves and Sleeve Seals for HVAC Piping."
- S. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Division 23 Section "Sleeves and Sleeve Seals for HVAC Piping."

3.4 HANGERS AND SUPPORTS

- A. Hanger, support, and anchor devices are specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment." Comply with the following requirements for maximum spacing of supports.
- B. Seismic restraints are specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."
- C. Install the following pipe attachments:
 - 1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet (6 m) long.
 - 2. Adjustable roller hangers and spring hangers for individual horizontal piping 20 feet (6 m) or longer.
 - 3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet (6 m) or longer, supported on a trapeze.
 - 4. Spring hangers to support vertical runs.
 - 5. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
 - 6. On plastic pipe, install pads or cushions on bearing surfaces to prevent hanger from scratching pipe.
- D. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:
 - 1. NPS 3/4 (DN 20): Maximum span, 7 feet (2.1 m); minimum rod size, 1/4 inch (6.4 mm).
 - 2. NPS 1 (DN 25): Maximum span, 7 feet (2.1 m); minimum rod size, 1/4 inch (6.4 mm).
 - 3. NPS 1-1/2 (DN 40): Maximum span, 9 feet (2.7 m); minimum rod size, 3/8 inch (10 mm).
 - 4. NPS 2 (DN 50): Maximum span, 10 feet (3 m); minimum rod size, 3/8 inch (10 mm).

5. NPS 2-1/2 (DN 65): Maximum span, 11 feet (3.4 m); minimum rod size, 3/8 inch (10 mm).
 6. NPS 3 (DN 80): Maximum span, 12 feet (3.7 m); minimum rod size, 3/8 inch (10 mm).
 7. NPS 4 (DN 100): Maximum span, 14 feet (4.3 m); minimum rod size, 1/2 inch (13 mm).
 8. NPS 6 (DN 150): Maximum span, 17 feet (5.2 m); minimum rod size, 1/2 inch (13 mm).
 9. NPS 8 (DN 200): Maximum span, 19 feet (5.8 m); minimum rod size, 5/8 inch (16 mm).
 10. NPS 10 (DN 250): Maximum span, 20 feet (6.1 m); minimum rod size, 3/4 inch (19 mm).
 11. NPS 12 (DN 300): Maximum span, 23 feet (7 m); minimum rod size, 7/8 inch (22 mm).
 12. NPS 14 (DN 350): Maximum span, 25 feet (7.6 m); minimum rod size, 1 inch (25 mm).
 13. NPS 16 (DN 400): Maximum span, 27 feet (8.2 m); minimum rod size, 1 inch (25 mm).
 14. NPS 18 (DN 450): Maximum span, 28 feet (8.5 m); minimum rod size, 1-1/4 inches (32 mm).
 15. NPS 20 (DN 500): Maximum span, 30 feet (9.1 m); minimum rod size, 1-1/4 inches (32 mm).
- E. Install hangers for drawn-temper copper piping with the following maximum spacing and minimum rod sizes:
1. NPS 3/4 (DN 20): Maximum span, 5 feet (1.5 m); minimum rod size, 1/4 inch (6.4 mm).
 2. NPS 1 (DN 25): Maximum span, 6 feet (1.8 m); minimum rod size, 1/4 inch (6.4 mm).
 3. NPS 1-1/2 (DN 40): Maximum span, 8 feet (2.4 m); minimum rod size, 3/8 inch (10 mm).
 4. NPS 2 (DN 50): Maximum span, 8 feet (2.4 m); minimum rod size, 3/8 inch (10 mm).
 5. NPS 2-1/2 (DN 65): Maximum span, 9 feet (2.7 m); minimum rod size, 3/8 inch (10 mm).
 6. NPS 3 (DN 80): Maximum span, 10 feet (3 m); minimum rod size, 3/8 inch (10 mm).
- F. Support vertical runs at roof, at each floor, and at 10-foot (3-m) intervals between floors.

3.5 PIPE JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

- F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- G. Welded Joints: Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- I. Plastic Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
 - 2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
 - 3. PVC Pressure Piping: Join ASTM D 1785 schedule number, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule number PVC pipe and socket fittings according to ASTM D 2855.
 - 4. PVC Nonpressure Piping: Join according to ASTM D 2855.
- J. Fiberglass Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.
- K. Grooved Joints: Assemble joints with coupling and gasket, lubricant, and bolts. Cut or roll grooves in ends of pipe based on pipe and coupling manufacturer's written instructions for pipe wall thickness. Use grooved-end fittings and rigid, grooved-end-pipe couplings.
- L. Mechanically Formed, Copper-Tube-Outlet Joints: Use manufacturer-recommended tool and procedure, and brazed joints.
- M. Pressure-Sealed Joints: Use manufacturer-recommended tool and procedure. Leave insertion marks on pipe after assembly.

3.6 HYDRONIC SPECIALTIES INSTALLATION

- A. Install manual air vents at high points in piping, at heat-transfer coils, and elsewhere as required for system air venting.
- B. Install automatic air vents at high points of system piping in mechanical equipment rooms only. Manual vents at heat-transfer coils and elsewhere as required for air venting.

3.7 FIELD QUALITY CONTROL

- A. Prepare hydronic piping according to ASME B31.9 and as follows:
 - 1. Leave joints, including welds, uninsulated and exposed for examination during test.
 - 2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
 - 3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.
 - 4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
 - 5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.
- B. Perform the following tests on hydronic piping:
 - 1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
 - 2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.
 - 3. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall not exceed maximum pressure for any component in system under test. Isolate equipment prior to testing.
 - 4. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
 - 5. Prepare written report of testing.
- C. Perform the following before operating the system:
 - 1. Open manual valves fully.
 - 2. Inspect pumps for proper rotation.
 - 3. Set makeup pressure-reducing valves for required system pressure.
 - 4. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
 - 5. Set temperature controls so all coils are calling for full flow.
 - 6. Inspect and set operating temperatures of hydronic equipment, such as boilers, chillers, cooling towers, to specified values.
 - 7. Verify lubrication of motors and bearings.

END OF SECTION

SECTION 232300 - REFRIGERANT PIPING

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Comply with ASME B31.5, "Refrigerant Piping," and with ASHRAE 15, "Safety Code for Mechanical Refrigeration."

PART 2 - PRODUCTS

2.1 TUBES AND FITTINGS

- A. Copper Tube: ASTM B 88, Types K and L and ASTM B 280, Type ACR.
- B. Wrought-Copper Fittings: ASME B16.22.
- C. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.
- D. Brazing Filler Metals: AWS A5.8.

2.2 VALVES

- A. Thermostatic Expansion Valve: Comply with ARI 750; forged brass or steel body, stainless-steel internal parts, copper tubing filled with refrigerant charge for 40 deg F suction temperature; 450-psig working pressure, and 240 deg F operating temperature.
- B. Solenoid Valves: Comply with ARI 760; 240 deg F temperature rating, 400-psig working pressure, 240 deg F operating temperature; and 24-V normally closed holding coil.

2.3 REFRIGERANT PIPING SPECIALTIES

- A. Strainers: Welded steel with corrosion-resistant coating and 100-mesh stainless-steel screen with socket ends; 500-psig working pressure and 275 deg F working temperature.
- B. Moisture/Liquid Indicators: 500-psig operating pressure, 240 deg F operating temperature; with replaceable, polished, optical viewing window and color-coded moisture indicator.
- C. Filter Dryers: 500-psig operating pressure; 240 deg F operating temperature; with replaceable core kit, gaskets, and filter-dryer cartridge.
- D. Mufflers: Welded steel with corrosion-resistant coating and socket ends; 500-psig operating pressure; 240 deg F operating temperature.

- E. Refrigerant: ASHRAE 34, R-410A.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with requirements in Division 23 Section "Common Work Results for HVAC" for basic piping installation requirements.
- B. Install wall penetration system at each pipe penetration through foundation wall. Make installation watertight. Comply with requirements in Division 23 Section "Common Work Results for HVAC" for wall penetration systems.
- C. Install refrigerant piping and charge with refrigerant according to ASHRAE 15.
- D. Belowground, install copper tubing in PVC conduit. Vent conduit outdoors.
- E. Insulate suction lines to comply with Division 23 Section "HVAC Insulation."
- F. Slope refrigerant piping as follows:
 - 1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
 - 2. Install horizontal suction lines with a uniform slope downward to compressor.
 - 3. Install traps and double risers to entrain oil in vertical runs.
 - 4. Liquid lines may be installed level.
- G. Install solenoid valves upstream from each thermostatic expansion valve. Install solenoid valves in horizontal lines with coil at top.
- H. Install thermostatic expansion valves as close as possible to distributors on evaporator coils.
- I. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.
- J. Install strainers upstream from and adjacent to solenoid valves, thermostatic expansion valves, and compressors unless they are furnished as an integral assembly for device being protected:
- K. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

3.2 PIPING SCHEDULE FOR REFRIGERANT R-22 – NOT USED

3.3 PIPING APPLICATIONS FOR REFRIGERANT R-407C – NOT USED

3.4 PIPING APPLICATIONS FOR REFRIGERANT R-410A

- A. Suction Lines: Copper, Type ACR, Type K or Type L, annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.
- B. Hot-Gas and Liquid Lines: Copper, Type ACR, Type K or Type L, annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.

END OF SECTION

SECTION 233100 - HVAC DUCTS AND CASINGS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Summary: Metal and nonmetal ducts and accessories in pressure classes 2-inch wg or less and a maximum velocity of 2400 fpm.
- B. Submittals: Product Data for fire and smoke dampers and Shop Drawings detailing duct layout and including locations and types of duct accessories, duct sizes, transitions, radius and vaned elbows, special supports details, and inlets and outlet types and locations.
- C. Comply with NFPA 90A for systems serving spaces more than 25,000 cu. ft. in volume or building Types II, IV, and V construction more than 3 stories in height.
- D. Comply with NFPA 90B for systems serving spaces in 1- or 2-family dwellings or serving spaces less than 25,000 cu. ft..
- E. Comply with NFPA 96, "Ventilation Control and Fire Protection of Commercial Cooking Operations," Chapter 3, "Duct System," for range hood ducts, except single-family residential usage, unless otherwise indicated.
- F. Comply with UL 181 and UL 181A for ducts and closures.

PART 2 - PRODUCTS

2.1 DUCTS

- A. Galvanized Steel Sheet: Forming steel with minimum G60 hot-dip galvanized coating.
- B. Carbon-Steel Sheets: ASTM A 366/A 366M, cold-rolled sheets; commercial quality; with oiled, matte finish for exposed ducts.
- C. Stainless Steel: ASTM A 480/A 480M, Type 316, and having a No. 2D finish for concealed ducts and No. 4 for exposed ducts.
- D. Fibrous-Glass Duct Board: Comply with UL 181, Class 1, 1-inch- thick, fibrous glass with fire-resistant, reinforced foil-scrim-kraft barrier, and having the air-side surface treated to prevent erosion.
- E. Duct Liner: ASTM C 1071, Type II, 1/2 inch thick; with an airstream surface coated with a high-temperature-resistant coating.
 - 1. Adhesive: ASTM C 916, Type I.

2. Mechanical Fasteners: Galvanized steel pin, length required to penetrate liner plus a maximum 1/8-inch projection into the airstream.
- F. Joint and Seam Tape, and Sealant: Comply with UL 181A.
- G. Rectangular Metal Duct Fabrication: Comply with SMACNA's "HVAC Duct Construction Standard" for metal thickness, reinforcing types and intervals, tie-rod applications, and joint types and intervals.
- H. Fibrous-Glass Duct Fabrication: Comply with SMACNA's "Fibrous Glass Duct Construction Standard."
- I. Fibrous-Glass Liner: Comply with NFPA 90A or NFPA 90B and with NAIMA AH124.
1. Thickness: 1/2 inch.
 2. Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.
 3. Mechanical Fasteners: Galvanized steel suitable for adhesive attachment, mechanical attachment, or welding attachment.

2.2 ACCESSORIES

- A. Volume-Control Dampers: Factory-fabricated volume-control dampers, complete with required hardware and accessories. Single blade and multiple opposed blade, standard leakage rating, and suitable for horizontal or vertical applications.
- B. Fire Dampers: Factory-fabricated fire dampers, complete with required hardware and accessories. UL labeled according to UL 555, "Fire Dampers."
- C. Ceiling Fire Dampers: Factory-fabricated fire dampers, complete with required hardware and accessories. UL listed and labeled; comply with the construction details for the tested floor/roof-ceiling assemblies as indicated in UL's "Fire Resistance Directory."
- D. Smoke Dampers: Factory-fabricated smoke and fire dampers, complete with required hardware and accessories. UL labeled according to UL 555S, "Leakage Rated Dampers for Use in Smoke Control Systems." Combination fire and smoke dampers shall also be UL labeled for 1-1/2-hour rating according to UL 555, "Fire Dampers."
- E. Flexible Connectors: Flame-retarded or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.
- F. Flexible Ducts: Spiral-wound steel spring with flameproof vinyl sheathing, Corrugated aluminum, or Factory-fabricated, insulated, round duct, with an outer jacket enclosing 1-inch-thick, glass-fiber insulation around a continuous inner liner.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Duct System Pressure Class: Construct and install each duct system for the specific duct pressure classification indicated.
- B. Conceal ducts from view in finished and occupied spaces.
- C. Avoid passing through electrical equipment spaces and enclosures.
- D. Dishwasher Exhaust Duct Installation: Comply with SMACNA's "HVAC Duct Construction Standard."
- E. Support and connect metal ducts according to SMACNA's "HVAC Duct Construction Standard."
- F. Support and connect fibrous-glass ducts according to SMACNA's "Fibrous Glass Duct Construction Standard."
- G. Install duct accessories according to details of construction as shown in SMACNA standards.
- H. Install volume-control dampers in lined duct with methods to avoid damage to liner and to avoid erosion of duct liner.
- I. Install fire and smoke dampers according to manufacturer's UL-approved written instructions.
- J. Install fusible links in fire dampers.

3.2 TESTING, ADJUSTING, AND BALANCING

- A. Balance airflow within distribution systems, including submains, branches, and terminals to indicated quantities.

END OF SECTION 233100

SECTION 236200 - PACKAGED COMPRESSOR AND CONDENSER UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes packaged, refrigerant compressor and condenser units.

1.3 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Compressor and condenser units shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.4 SUBMITTALS

- A. Product Data: For each compressor and condenser unit. Include rated capacities, operating characteristics, and furnished specialties and accessories. Include equipment dimensions, weights and structural loads, required clearances, method of field assembly, components, and location and size of each field connection.
- B. LEED Submittals:
 - 1. Product Data for Prerequisite EA 2: Documentation indicating that units comply with applicable requirements in ASHRAE/IESNA 90.1-2004.
 - 2. Product Data for Credit EA 4: Documentation indicating that compressor and condenser units and refrigerants comply.
- C. Shop Drawings: For compressor and condenser units. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Wiring Diagrams: For power, signal, and control wiring.
- D. Delegated-Design Submittal: For compressor and condenser units 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. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
 2. Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
- E. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
1. Structural members to which compressor and condenser units will be attached.
 2. Liquid and vapor pipe sizes.
 3. Refrigerant specialties.
 4. Piping including connections, oil traps, and double risers.
 5. Compressors.
 6. Evaporators.
- F. Seismic Qualification Certification: For compressor and condenser units, accessories, and components, from manufacturer.
1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- G. Field quality-control reports.
- H. Operation and Maintenance Data: For compressor and condenser units to include in emergency, operation, and maintenance manuals.
- I. Warranty: Sample of special warranty.

1.5 QUALITY ASSURANCE

- A. Product Options: Drawings indicate size, profiles, and dimensional requirements of compressor and condenser units and are based on the specific system indicated. See Division 01 Section "Product Requirements."
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Fabricate and label refrigeration system according to ASHRAE 15, "Safety Standard for Refrigeration Systems."
- D. ASHRAE/IESNA 90.1-2004 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6, "Heating, Ventilating, and Air-Conditioning."

- E. ASME Compliance: Fabricate and label water-cooled compressor and condenser units to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

1.6 COORDINATION

- A. Coordinate sizes and locations of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.
- B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."
- C. Coordinate location of piping and electrical rough-ins.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of compressor and condenser units that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Compressor failure.
 - b. Condenser coil leak.
 - 2. Warranty Period: Five years from date of Substantial Completion.
 - 3. Warranty Period (Compressor Only): Five years from date of Substantial Completion.
 - 4. Warranty Period (Components Other Than Compressor): Five years from date of Substantial Completion.
 - 5. Warranty Period (Condenser Coil Only): Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 COMPRESSOR AND CONDENSER UNITS, AIR COOLED, 1 TO 5 TONS – NOT USED

2.2 COMPRESSOR AND CONDENSER UNITS, AIR COOLED, 6 TO 120 TONS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings (Fraser-Johnston YJ-50) or comparable product by one of the following:
 - 1. Carrier Corporation; Commercial HVAC Systems.
 - 2. Continental Products.
 - 3. Dunham-Bush, Inc.
 - 4. Engineered Air.
 - 5. Lennox International Inc.
 - 6. McQuay International.

7. Rheem Air Conditioning Division.
 8. Ruud Air Conditioning Division.
 9. Trane; a business of American Standard Companies.
 10. YORK; a Johnson Controls company.
- B. Description: Factory assembled and tested, air cooled; consisting of casing, compressors, condenser coils, condenser fans and motors, and unit controls.
- C. Compressor: Hermetic scroll compressor designed for service with crankcase sight glass, crankcase heater, and backseating service access valves on suction and discharge ports.
1. Capacity Control: On-off compressor cycling.
- D. Compressor: Hermetic or semihermetic rotary screw compressor designed for service with crankcase sight glass, crankcase heater, and backseating service access valves on suction and discharge ports.
1. Capacity Control: On-off compressor cycling.
- E. Refrigerant: R-410A.
- F. Condenser Coil: Seamless copper-tube, aluminum-fin coil, including subcooling circuit and backseating liquid-line service access valve. Factory pressure test coils, then dehydrate by drawing a vacuum and fill with a holding charge of nitrogen or refrigerant.
- G. Condenser Fans: Propeller-type vertical discharge; either directly or belt driven. Include the following:
1. Permanently lubricated, ball-bearing totally enclosed motors.
 2. Separate motor for each fan.
 3. Dynamically and statically balanced fan assemblies.
- H. Operating and safety controls include the following:
1. Manual-reset, high-pressure cutout switches.
 2. Automatic-reset, low-pressure cutout switches.
 3. Low-oil-pressure cutout switch.
 4. Compressor-winding thermostat cutout switch.
 5. Three-leg, compressor-overload protection.
 6. Control transformer.
 7. Magnetic contactors for compressor and condenser fan motors.
 8. Timer to prevent excessive compressor cycling.
- I. Accessories:
1. Gage Panel: Package with refrigerant circuit suction and discharge gages.
 2. Part-winding-start timing relay, circuit breakers, and contactors.
 3. Phase Monitor.
 4. Copper Tube/Aluminum Fin Condenser Coil
 5. Smart Equipment Controller with Gateway to BACnet MS/TP (Programmable to Modbus or N2)

- J. Unit Casings: Designed for outdoor installation with weather protection for components and controls and with removable panels for required access to compressors, controls, condenser fans, motors, and drives. Additional features include the following:
1. Steel, galvanized or zinc coated, for exposed casing surfaces; treated and finished with manufacturer's standard paint coating.
 2. Perimeter base rail with forklift slots and lifting holes to facilitate rigging.
 3. Gasketed control panel door.
 4. Nonfused disconnect switch, factory mounted and wired, for single external electrical power connection.
 5. Condenser coil grille.
- K. Capacities and Characteristics:
1. Compressor and Condenser Unit:
 - a. Full-Load Cooling Capacity: 576.2 MBH.
 - b. Energy-Efficiency Ratio (EER): 10.5.
 - c. Integrated Energy-Efficiency Ratio (IEER): 11.8.
 2. Refrigerant Connections:
 - a. Liquid Pipe Size: 7/8 OD.
 - b. Suction Pipe Size: 1-5/8 OD.
 3. Compressors:
 - a. Number of Compressors: 4.
 - b. Rated-Load Amperes: 48.1.
 - c. Locked-Rotor Amperes: 245.
 4. Air-Cooled Condenser:
 - a. Ambient-Air Temperature: 95 deg F.
 - b. Number of Condenser Fans: 4.
 5. Electrical Characteristics:
 - a. Volts: 460.
 - b. Phase: 3.
 - c. Hertz: 60.
 - d. Maximum Circuit Ampacity: 90.7.
 - e. Maximum Overcurrent Protection: 100.

2.3 COMPRESSOR AND CONDENSER UNITS, WATER COOLED – NOT USED

2.4 MOTORS

- A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."
 - 1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
 - 2. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Division 26 Sections.

2.5 SOURCE QUALITY CONTROL

- A. Verification of Performance: Rate compressor and condenser units according to ARI 340/360.
- B. Energy Efficiency: Equal to or greater than prescribed by ASHRAE/IESNA 90.1-2004, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings," Section 6, "Heating, Ventilating, and Air-Conditioning."
- C. Test and inspect shell and tube condensers according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
- D. Testing Requirements: Factory test sound-power-level ratings according to ARI 270.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of compressor and condenser units.
- B. Examine roughing-in for refrigerant piping systems to verify actual locations of piping connections before equipment installation.
- C. Examine walls, floors, and roofs for suitable conditions where compressor and condenser units will be installed.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install units level and plumb, firmly anchored in locations indicated; maintain manufacturer's recommended clearances.

- B. Install compressor and condenser units on PE mounting base.
- C. Install compressor and condenser units on concrete base. Concrete materials and installation requirements are specified in Division 03.
- D. Concrete Bases:
 - 1. Install dowel rods to connect concrete base to concrete slab. Unless otherwise indicated, install dowel rods on 18-inch centers around full perimeter of the base.
 - 2. For equipment supported on structural slab, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
 - 3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 4. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 5. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
- E. Install roof-mounting units on equipment supports specified in Division 07.
- F. Vibration Isolation: Mount compressor and condenser units on rubber pads with a minimum deflection of 1/4 inch. Vibration isolation devices and installation requirements are specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."
- G. Maintain manufacturer's recommended clearances for service and maintenance.
- H. Loose Components: Install electrical components, devices, and accessories that are not factory mounted.

3.3 CONNECTIONS

- A. Comply with requirements for piping in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.
- C. Connect precharged refrigerant tubing to unit's quick-connect fittings. Install tubing so it does not interfere with access to unit. Install furnished accessories.
- D. Connect refrigerant piping to air-cooled compressor and condenser units; maintain required access to unit. Install furnished field-mounted accessories. Refrigerant piping and specialties are specified in Division 23 Section "Refrigerant Piping."
- E. Connect refrigerant and condenser-water piping to water-cooled compressor and condenser units. Refrigerant piping and specialties are specified in Division 23 Section "Refrigerant Piping" and condenser-water piping and specialties are specified in Division 23 Section "Hydronic Piping." Install shutoff valve and union or flange at each water supply connection; install balancing valve and union or flange at each return connection.

3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections, and to assist in testing.
- B. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical test. Certify compliance with test parameters.
 - 2. Leak Test: After installation, charge system with refrigerant and oil and test for leaks. Repair leaks, replace lost refrigerant and oil, and retest until no leaks exist.
 - 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor operation and unit operation, product capability, and compliance with requirements.
 - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - 5. Verify proper airflow over coils.
- C. Verify that vibration isolation and flexible connections properly dampen vibration transmission to structure.
- D. Compressor and condenser units will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

3.5 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions and perform the following:
 - a. Inspect for physical damage to unit casing.
 - b. Verify that access doors move freely and are weathertight.
 - c. Clean units and inspect for construction debris.
 - d. Verify that all bolts and screws are tight.
 - e. Adjust vibration isolation and flexible connections.
 - f. Verify that controls are connected and operational.
- B. Lubricate bearings on fan motors.
- C. Verify that fan wheel is rotating in the correct direction and is not vibrating or binding.
- D. Adjust fan belts to proper alignment and tension.

- E. Start unit according to manufacturer's written instructions and complete manufacturer's startup checklist.
- F. Measure and record airflow and air temperature rise over coils.
- G. Verify proper operation of condenser capacity control device.
- H. Verify that vibration isolation and flexible connections properly dampen vibration transmission to structure.
- I. After startup and performance test, lubricate bearings.

3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain compressor and condenser units.

END OF SECTION

SECTION 237200 - AIR-TO-AIR ENERGY RECOVERY EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Heat wheels.
 - 2. Heat-pipe heat exchangers.
 - 3. Fixed-plate sensible heat exchangers.
 - 4. Fixed-plate total heat exchangers.
 - 5. Packaged energy recovery units.

1.3 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design vibration isolation and seismic-restraint details, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Seismic Performance: Air-to-air energy recovery equipment shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, furnished specialties, and accessories.
- B. LEED Submittals:
 - 1. Product Data for Credit EA 4: Documentation required by Credit EA 4 indicating that equipment and refrigerants comply.
 - 2. Product Data for Prerequisite EQ 1: Documentation indicating that units comply with ASHRAE 62.1-2004, Section 5 - "Systems and Equipment."

- C. Shop Drawings: For air-to-air energy recovery equipment. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 2. Wiring Diagrams: For power, signal, and control wiring.
- D. Delegated-Design Submittal: For air-to-air energy recovery equipment 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. Detail fabrication and assembly of air-to-air energy recovery equipment.
 - 2. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
 - 3. Design Calculations: Calculate requirements for selecting vibration isolators and for designing vibration isolation bases.
- E. Coordination Drawings: Plans, elevations, and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:
 - 1. Suspended ceiling components.
 - 2. Structural members to which equipment or suspension systems will be attached.
- F. Seismic Qualification Certificates: For air-to-air energy recovery equipment, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- G. Field quality-control reports.
- H. Operation and Maintenance Data: For air-to-air energy recovery equipment to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. ARI Compliance:

1. Capacity ratings for air-to-air energy recovery equipment shall comply with ARI 1060, "Performance Rating of Air-to-Air Heat Exchangers for Energy Recovery Ventilation Equipment."
2. Capacity ratings for air coils shall comply with ARI 410, "Forced-Circulation Air-Cooling and Air-Heating Coils."

C. ASHRAE Compliance:

1. Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
2. Capacity ratings for air-to-air energy recovery equipment shall comply with ASHRAE 84, "Method of Testing Air-to-Air Heat Exchangers."

D. NRCA Compliance: Roof curbs for roof-mounted equipment shall be constructed according to recommendations of NRCA.

E. UL Compliance:

1. Packaged heat recovery ventilators shall comply with requirements in UL 1812, "Ducted Heat Recovery Ventilators"; or UL 1815, "Nonducted Heat Recovery Ventilators."
2. Electric coils shall comply with requirements in UL 1995, "Heating and Cooling Equipment."

1.6 COORDINATION

- A. Coordinate layout and installation of air-to-air energy recovery equipment and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.
- B. Coordinate sizes and locations of concrete bases with actual equipment provided.
- C. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of air-to-air energy recovery equipment that fail in materials or workmanship within specified warranty period.
 1. Warranty Period for Packaged Energy Recovery Units: 1 year.
 2. Warranty Period for Fixed-Plate Total Heat Exchangers: Not Used.
 3. Warranty Period for Energy Wheel: 5 Years.

1.8 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Filters: One set(s) of each type of filter specified.
 - 2. Fan Belts: One set(s) of belts for each belt-driven fan in energy recovery units.
 - 3. Wheel Belts: One set(s) of belts for each heat wheel.

PART 2 - PRODUCTS

2.1 HEAT WHEELS – NOT USED

2.2 HEAT-PIPE HEAT EXCHANGERS – NOT USED

2.3 FIXED-PLATE SENSIBLE HEAT EXCHANGERS – NOT USED

2.4 FIXED-PLATE TOTAL HEAT EXCHANGERS – NOT USED

2.5 PACKAGED ENERGY RECOVERY UNITS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings (Greenheck ERV-90-30L) or comparable product by one of the following:
 - 1. Advanced Thermal Technologies.
 - 2. American Energy Exchange, Inc.
 - 3. Applied Air; Mestek Technology, Inc.
 - 4. Carnes.
 - 5. Des Champs Technologies.
 - 6. Engineered Air.
 - 7. Fairchild Industrial Products Company.
 - 8. Gaylord Industries, Inc.
 - 9. Loren Cook Company.
 - 10. Mitsubishi Electric & Electronics USA, Inc.; HVAC Advanced Products Division.
 - 11. Mitsubishi Electric Sales Canada Inc.
 - 12. RenewAire LLC.
 - 13. SEMCO Incorporated.
 - 14. Trane; American Standard Companies, Inc.
 - 15. Venmar CES Inc.
 - 16. Wing, L. J.; Mestek Technology, Inc.
- B. Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

- C. Housing: Manufacturer's standard construction with corrosion-protection coating and exterior finish, gasketed and calked weathertight, hinged access doors with neoprene gaskets for inspection and access to internal parts, minimum 1-inch- thick thermal insulation, knockouts for electrical and piping connections, exterior drain connection, and lifting lugs.
 - 1. Inlet: Weatherproof hood, with damper for exhaust and supply.
 - a. Exhaust: Gravity backdraft damper.
 - b. Supply: Spring-return, two-position, motor-operated damper.
 - 2. Roof Curb: Refer to Division 07 Section "Roof Accessories" for roof curbs and equipment supports.
- D. Heat Recovery Device: Heat wheel.
- E. Supply and Exhaust Fans: Forward-curved, centrifugal fan with spring isolators and flexible duct connections.
 - 1. Motor and Drive: Belt driven with adjustable sheaves, motor mounted on adjustable base.
 - 2. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."
 - 3. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
 - 4. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Division 26 Sections.
 - 5. Spring isolators on each fan having 1-inch static deflection.
- F. Disposable Panel Filters: Not Used
- G. Extended-Surface, Disposable Panel Filters: Not Used
- H. Extended-Surface, Nonsupported-Media Filters:
 - 1. Comply with NFPA 90A.
 - 2. Filter Holding Frames: Arranged for flat or angular orientation, with access doors on both sides of unit. Filters shall be removable from one side or lift out from access plenum.
 - 3. Factory-fabricated, dry, extended-surface, self-supporting type.
 - 4. Initial Resistance: <Insert inches wg (Pa)>.
 - 5. Recommended Final Resistance: <Insert inches wg (Pa)>.
 - 6. Minimum Arrestance: 95, according to ASHRAE 52.1.
 - 7. Minimum Merv: 13, according to ASHRAE 52.2.
 - 8. Media: Fibrous material constructed so individual pleats are maintained in tapered form by flexible internal supports under rated-airflow conditions.
 - 9. Filter-Media Frame: Galvanized steel.
 - 10. Mounting Frames: Welded, galvanized steel with gaskets and fasteners, suitable for bolting together into built-up filter banks.

- I. Cooling Coils: Not Used
- J. Cooling-Coil Condensate Drain Pans: Not Used
- K. Hot-Water Coils: Not Used
- L. Steam Coils: Not Used
- M. Electrical Coils, Controls, and Accessories: Not Used
- N. Indirect-Fired Gas Furnaces: Not Used
- O. Piping and Wiring: Fabricate units with space within housing for piping and electrical conduits. Wire motors and controls so only external connections are required during installation.
 - 1. Indoor Enclosure: NEMA 250, Type 12 enclosure contains relays, starters, and terminal strip.
 - 2. Outdoor Enclosure: NEMA 250, Type 3R enclosure contains relays, starters, and terminal strip.
 - 3. Include nonfused disconnect switches.
 - 4. Variable-speed controller to vary fan capacity from 100 to approximately 50 percent.
- P. Accessories:
 - 1. Roof Curb: Galvanized steel with gasketing, and factory-installed wood nailer; complying with NRCA standards; minimum height of 16 inches.
 - 2. Intake weather hood.
 - 3. Exhaust weather hood with birdscreen.
 - 4. Low-Leakage, Isolation Dampers: Double-skin, airfoil-blade, galvanized-steel, aluminum, or extruded-aluminum dampers with compressible jamb seals and extruded-vinyl blade edge seals, in opposed-blade arrangement with steel operating rods rotating in stainless-steel sleeve bearings mounted in a single galvanized-steel aluminum, or extruded-aluminum frame, with operating rods connected with a common linkage, and electric damper operator factory wired. Leakage rate shall not exceed 3 cfm/sq. ft. at 1-inch wg and 9 cfm/sq. ft. at 4-inch wg.
 - 5. Isolation Dampers: Opposed-blade, galvanized-steel, aluminum, or extruded-aluminum dampers with steel operating rods rotating in sintered bronze or nylon bearings mounted in a single galvanized-steel, aluminum, or extruded-aluminum frame with operating rods connected with a common linkage, and electric damper operator factory wired. Blades shall have gaskets and edge seals, and shall be mechanically fastened to operating rod.
 - 6. Duct flanges.
 - 7. Rubber-in-shear isolators for ceiling-mounted units.
 - 8. Hinged access doors with quarter-turn latches.
 - 9. Weatherproofing for tilt-control system.

2.6 CONTROLS

- A. Time Clock: Not Used

- B. Motion (Occupancy) Sensor: Not Used
- C. Carbon Monoxide Sensor: Not used
- D. Humidistat: Not Used
- E. Chilled-Water-Cooling-Coils Controls: Not Used
- F. Refrigerant-Cooling-Coils Controls: Not Used
- G. Hot-Water- and Steam- Coils Controls: Not Used
- H. Electric-Coils Controls: Not Used
- I. Indirect-Fired-Gas-Furnaces Controls: Not Used
- J. Dirt Filter Sensors
- K. Frost Control – Modulating Wheel

2.7 CAPACITIES AND CHARACTERISTICS

- A. Exhaust Air:
 - 1. Airflow: 6,100 CFM.
 - 2. Summer:
 - a. Entering-Air Temperature, Dry Bulb: 75.0 deg F.
 - b. Entering-Air Temperature, Wet Bulb: 62.5 deg F.
 - c. Leaving-Air Temperature, Dry Bulb: 91.2 deg F.
 - d. Leaving-Air Temperature, Wet Bulb: 75.2 deg F.
 - 3. Winter:
 - a. Entering-Air Temperature, Dry Bulb: 70.0 deg F.
 - b. Entering-Air Temperature, Wet Bulb: 55.6 deg F.
 - c. Leaving-Air Temperature, Dry Bulb: 27.5 deg F.
 - d. Leaving-Air Temperature, Wet Bulb: 24.9 deg F.
 - 4. External Static Pressure: 1 inches wg .
 - 5. Fan Motor Size: 5 HP.
- B. Supply Air:
 - 1. Airflow: 6,100 cfm.
 - 2. Summer:
 - a. Entering-Air Temperature, Dry Bulb: 95.0 deg F.
 - b. Entering-Air Temperature, Wet Bulb: 78.0 deg F.
 - c. Leaving-Air Temperature, Dry Bulb: 78.6 deg F.

- d. Leaving-Air Temperature, Wet Bulb: 66.1 deg F.
- 3. Winter:
 - a. Entering-Air Temperature, Dry Bulb: 18.0 deg F.
 - b. Entering-Air Temperature, Wet Bulb: 14.8 deg F.
 - c. Leaving-Air Temperature, Dry Bulb: 60.0 deg F.
 - d. Leaving-Air Temperature, Wet Bulb: 49.1 deg F.
- 4. External Static Pressure: 1 inches wg.
- 5. Fan Motor Size: 5 HP.
- C. Unit Power Supply:
 - 1. Volts: 460.
 - 2. Phase: 3.
 - 3. Hertz: 60.
 - 4. MCA: 19.1 Amps.
 - 5. MOCP: 25 Amps.
- D. Effectiveness:
 - 1. Summer: 78.6%
 - 2. Winter: 79.8%
- E. Cooling Coil: Not Used
- F. Hot-Water and Steam Coils: Not Used
- G. Electric Heating Coils: Not Used
- H. Indirect-Fired Gas Furnace: Not Used

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine casing insulation materials and filter media before air-to-air energy recovery equipment installation. Reject insulation materials and filter media that are wet, moisture damaged, or mold damaged.
- C. Examine roughing-in for electrical services to verify actual locations of connections before installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install heat wheels so supply and exhaust airstreams flow in opposite directions and rotation is away from exhaust side to purge section to supply side.
 - 1. Install access doors in both supply and exhaust ducts, both upstream and downstream, for access to wheel surfaces, drive motor, and seals.
 - 2. Install removable panels or access doors between supply and exhaust ducts on building side for bypass during startup.
 - 3. Access doors and panels are specified in Division 23 Section "Air Duct Accessories."
- B. Roof Curb: Install on roof structure or concrete base, level and secure, according to The NRCA "Roofing and Waterproofing Manual - Volume 4: Construction Details - Low-Slope Roofing," Illustration "Raised Curb Detail for Rooftop Air Handling Units and Ducts." Install air-to-air energy recovery equipment on curbs and coordinate roof penetrations and flashing with roof construction specified in Division 07 Section "Roof Accessories." Secure air-to-air energy recovery equipment to upper curb rail, and secure curb base to roof framing or concrete base with anchor bolts.
- C. Unit Support: Install unit level on structural curbs. Coordinate wall penetrations and flashing with wall construction. Secure air-to-air energy recovery equipment to structural support with anchor bolts.
- D. Install wind and seismic restraints according to manufacturers' written instructions.
- E. Install units with clearances for service and maintenance.
- F. Install new filters at completion of equipment installation and before testing, adjusting, and balancing.

3.3 CONNECTIONS

- A. Comply with requirements for ductwork specified in Division 23 Section "Metal Ducts."
- B. Electrical Connections: Comply with applicable requirements in Division 26 Sections.
 - 1. Install electrical devices furnished with units but not factory mounted.

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- B. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Tests and Inspections:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
2. Adjust seals and purge.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
4. Set initial temperature and humidity set points.
5. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

D. Air-to-air energy recovery equipment will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain air-to-air energy recovery units.

END OF SECTION

SECTION 237313 - MODULAR INDOOR CENTRAL-STATION AIR-HANDLING UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Constant-air-volume, single-zone air-handling units.

1.3 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design vibration isolation and seismic-restraint details, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Casing panels shall be self-supporting and capable of withstanding 133 percent of internal static pressures indicated, without panel joints exceeding a deflection of [L/200] [L/100] <Insert value> where "L" is the unsupported span length within completed casings.
- C. Seismic Performance: Air-handling units shall withstand the effects of earthquake motions determined according to ASCE/SEI 7>.
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.4 SUBMITTALS

- A. Product Data: For each air-handling unit indicated.
 - 1. Unit dimensions and weight.
 - 2. Cabinet material, metal thickness, finishes, insulation, and accessories.
 - 3. Fans:
 - a. Certified fan-performance curves with system operating conditions indicated.
 - b. Certified fan-sound power ratings.
 - c. Fan construction and accessories.
 - d. Motor ratings, electrical characteristics, and motor accessories.

4. Certified coil-performance ratings with system operating conditions indicated.
5. Dampers, including housings, linkages, and operators.
6. Filters with performance characteristics.

B. LEED Submittal:

1. Product Data for Prerequisite EQ 1: Documentation indicating that units comply with ASHRAE 62.1-2004, Section 5 - "Systems and Equipment."

C. Delegated-Design Submittal: For vibration isolation 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. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
2. Design Calculations: Calculate requirements for selecting vibration isolators and for designing vibration isolation bases.

D. Coordination Drawings: Floor plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Mechanical-room layout and relationships between components and adjacent structural and mechanical elements.
2. Support location, type, and weight.
3. Field measurements.

E. Seismic Qualification Certificates: For air-handling units, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

F. Source quality-control reports.

G. Field quality-control reports.

H. Operation and Maintenance Data: For air-handling units to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

- B. NFPA Compliance: Comply with NFPA 90A for design, fabrication, and installation of air-handling units and components.
- C. ARI Certification: Air-handling units and their components shall be factory tested according to ARI 430, "Central-Station Air-Handling Units," and shall be listed and labeled by ARI.
- D. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
- E. ASHRAE/IESNA 90.1-2004 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6 - "Heating, Ventilating, and Air-Conditioning."
- F. Comply with NFPA 70.

1.6 COORDINATION

- A. Coordinate sizes and locations of concrete bases with actual equipment provided.
- B. Coordinate sizes and locations of structural-steel support members, if any, with actual equipment provided.

1.7 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Filters: One set(s) for each air-handling unit.
 - 2. Gaskets: One set(s) for each access door.
 - 3. Fan Belts: Not Used

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings (Temtrol) or comparable product by one of the following:
 - 1. Air Enterprises, Inc.
 - 2. Airtherm; a Mestek company.
 - 3. Buffalo Air Handling.
 - 4. Carrier Corporation; a member of the United Technologies Corporation Family.
 - 5. Coil Company, LLC.
 - 6. Dunham-Bush, Inc.
 - 7. Engineered Air.
 - 8. Mammoth Inc.
 - 9. McQuay International

10. Scott Springfield Mfg. Inc.
11. Trane; American Standard Inc.
12. USA Coil & Air.
13. YORK International Corporation.

2.2 UNIT CASINGS

A. General Fabrication Requirements for Casings:

1. Forming: Form walls, roofs, and floors with at least two breaks at each joint.
2. Casing Joints: Sheet metal screws or pop rivets.
3. Sealing: Seal all joints with water-resistant sealant.
4. Factory Finish for Steel and Galvanized-Steel Casings: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on enamel finish, consisting of prime coat and thermosetting topcoat.
5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

B. Casing Insulation and Adhesive:

1. Materials: ASTM C 1071, Type II.
2. Location and Application: Factory applied with adhesive and mechanical fasteners to the internal surface of section panels downstream from, and including, the cooling-coil section.
 - a. Liner Adhesive: Comply with ASTM C 916, Type I.
 - b. Mechanical Fasteners: Galvanized steel, suitable for adhesive attachment, mechanical attachment, or welding attachment to duct without damaging liner when applied as recommended by manufacturer and without causing leakage in cabinet.
 - c. Liner materials applied in this location shall have air-stream surface coated with a temperature-resistant coating or faced with a plain or coated fibrous mat or fabric depending on service-air velocity.
3. Location and Application: Encased between outside and inside casing.

C. Inspection and Access Panels and Access Doors:

1. Panel and Door Fabrication: Formed and reinforced, single- or double-wall and insulated panels of same materials and thicknesses as casing.
2. Inspection and Access Panels:
 - a. Fasteners: Two or more camlock type for panel lift-out operation. Arrangement shall allow panels to be opened against air-pressure differential.
 - b. Gasket: Neoprene, applied around entire perimeters of panel frames.
 - c. Size: Large enough to allow inspection and maintenance of air-handling unit's internal components.
3. Access Doors:

- a. Hinges: A minimum of two ball-bearing hinges or stainless-steel piano hinge and two wedge-lever-type latches, operable from inside and outside. Arrange doors to be opened against air-pressure differential.
 - b. Gasket: Neoprene, applied around entire perimeters of panel frames.
 - c. Size: At least 24 inches wide by full height of unit casing up to a maximum height of 60 inches.
- 4. Locations and Applications:
 - a. Fan Section: Doors.
 - b. Access Section: Doors.
 - c. Coil Section: Inspection and access panel.
 - d. Damper Section: Doors.
 - e. Filter Section: Doors large enough to allow periodic removal and installation of filters.
 - f. Mixing Section: Doors.
 - g. Humidifier Section: Not Used
- 5. Service Light: 100-W vaporproof fixture with switched junction box located outside adjacent to door.
 - a. Locations: Fan section and Mixing Section.
- D. Condensate Drain Pans:
 - 1. Fabricated with one or two percent slope in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and from humidifiers and to direct water toward drain connection.
 - a. Length: Extend drain pan downstream from leaving face to comply with ASHRAE 62.1-2004.
 - b. Depth: A minimum of 2 inches deep.
 - 2. [Formed sections] [Integral part of floor plating].
 - 3. Single-wall, [galvanized] [stainless]-steel sheet.
 - 4. Double-wall, [galvanized] [stainless]-steel sheet with space between walls filled with foam insulation and moisture-tight seal.
 - 5. Drain Connection: Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on one end of pan.
 - a. Minimum Connection Size: NPS 1 or NPS 2.
 - 6. Pan-Top Surface Coating: Asphaltic waterproofing compound.
 - 7. Units with stacked coils shall have an intermediate drain pan to collect condensate from top coil.
- E. Service Platform: Not Used
- F. Air-Handling-Unit Mounting Frame: Formed galvanized-steel channel or structural channel supports, designed for low deflection, welded with integral lifting lugs.

1. Seismic Fabrication Requirements: Fabricate mounting base and attachment to air-handling unit sections, accessories, and components with reinforcement strong enough to withstand seismic forces defined in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment" when air-handling unit frame is anchored to building structure.

2.3 FAN, DRIVE, AND MOTOR SECTION

- A. Fan and Drive Assemblies: Statically and dynamically balanced and designed for continuous operation at maximum-rated fan speed and motor horsepower.
 1. Shafts: Designed for continuous operation at maximum-rated fan speed and motor horsepower, and with field-adjustable alignment.
 - a. Turned, ground, and polished hot-rolled steel with keyway. Ship with a protective coating of lubricating oil.
 - b. Designed to operate at no more than 70 percent of first critical speed at top of fan's speed range.
- B. Centrifugal Fan Housings: Not Used.
- C. Plenum Fan Housings: Steel frame and panel; fabricated without fan scroll and volute housing.
- D. Backward-Inclined, Centrifugal Fan Wheels: Not Used
- E. Forward-Curved, Centrifugal Fan Wheels: Not Used
- F. Airfoil, Centrifugal Fan Wheels: Not Used
- G. Axial Fans: Not Used
- H. Fan Shaft Bearings:
 1. Prelubricated and Sealed, Ball Bearings: Self-aligning, pillow-block type with a rated life of [50,000] [120,000] <Insert number> hours according to ABMA 9.
 2. Grease-Lubricated, Tapered-Roller Bearings: Self-aligning, pillow-block type with double-locking collars and 2-piece, cast-iron housing[with grease lines extended to outside unit] and a rated life of [50,000] [120,000] <Insert number> hours according to ABMA 11.
 3. Grease-Lubricated Bearings: Self-aligning, pillow-block-type, ball or roller bearings with adapter mount and two-piece, cast-iron housing[with grease lines extended to outside unit].
- I. Belt Drives: Not Used
- J. Variable-Inlet Vanes: Not Used
- K. Discharge Dampers: Not Used

- L. Internal Vibration Isolation: Fans shall be factory mounted with manufacturer's standard vibration isolation mounting devices having a minimum static deflection of 1 inch.
 - 1. Seismic Fabrication Requirements: Fabricate fan section, internal mounting frame and attachment to fans, fan housings, motors, casings, accessories, and other fan section components with reinforcement strong enough to withstand seismic forces defined in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment" when fan-mounting frame and air-handling-unit mounting frame are anchored to building structure.
- M. Motor: Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."
 - 1. Enclosure Type: Totally enclosed, fan cooled.
 - 2. NEMA Premium (TM) efficient motors as defined in NEMA MG 1.
 - 3. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
 - 4. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Division 26 Sections.
 - 5. Mount unit-mounted disconnect switches on exterior of unit.
 - 6. <Insert unique motor characteristics>.
- N. Variable Frequency Controllers:
 - 1. Description: NEMA ICS 2, IGBT, PWM, VFC; listed and labeled as a complete unit and arranged to provide variable speed of an NEMA MG 1, Design B, 3-phase induction motor by adjusting output voltage and frequency.
 - 2. Output Rating: 3-phase; 6 to 60 Hz, with voltage proportional to frequency throughout voltage range.
 - 3. Unit Operating Requirements:
 - a. Input ac voltage tolerance of 380 to 500 V, plus or minus 10 percent.
 - b. Input frequency tolerance of 50/60 Hz, plus or minus 6 percent.
 - c. Minimum Efficiency: 96 percent at 60 Hz, full load.
 - d. Minimum Displacement Primary-Side Power Factor: 96 percent.
 - e. Overload Capability: 1.1 times the base load current for 60 seconds; 2.0 times the base load current for 3 seconds.
 - f. Starting Torque: 100 percent of rated torque or as indicated.
 - g. Speed Regulation: Plus or minus 1 percent.
 - 4. Isolated control interface to allow controller to follow control signal over an 11:1 speed range.
 - 5. Internal Adjustability Capabilities:
 - a. Minimum Speed: 5 to 25 percent of maximum rpm.
 - b. Maximum Speed: 80 to 100 percent of maximum rpm.
 - c. Acceleration: 2 to a minimum of 22 seconds.
 - d. Deceleration: 2 to a minimum of 22 seconds.
 - e. Current Limit: 50 to a minimum of 110 percent of maximum rating.

6. Self-Protection and Reliability Features:
 - a. Input transient protection by means of surge suppressors.
 - b. Undervoltage and overvoltage trips; inverter overtemperature, overload, and overcurrent trips.
 - c. Adjustable motor overload relays capable of NEMA ICS 2, [Class 10] [Class 20] [Class 30] performance.
 - d. Notch filter to prevent operation of the controller-motor-load combination at a natural frequency of the combination.
 - e. Instantaneous line-to-line and line-to-ground overcurrent trips.
 - f. Loss-of-phase protection.
 - g. Reverse-phase protection.
 - h. Short-circuit protection.
 - i. Motor overtemperature fault.
7. Automatic Reset/Restart: Attempts three restarts after controller fault or on return of power after an interruption and before shutting down for manual reset or fault correction. Bidirectional autospeed search shall be capable of starting into rotating loads spinning in either direction and returning motor to set speed in proper direction, without damage to controller, motor, or load.
8. Power-Interruption Protection: To prevent motor from re-energizing after a power interruption until motor has stopped.
9. Torque Boost: Automatically varies starting and continuous torque to at least 1.5 times the minimum torque to ensure high-starting torque and increased torque at slow speeds.
10. Motor Temperature Compensation at Slow Speeds: Adjustable current fall-back based on output frequency for temperature protection of self-cooled, fan-ventilated motors at slow speeds.
11. Door-mounted LED status lights shall indicate the following conditions:
 - a. Power on.
 - b. Run.
 - c. Overvoltage.
 - d. Line fault.
 - e. Overcurrent.
 - f. External fault.
12. Panel-Mounted Operator Station: Start-stop and auto-manual selector switches with manual-speed-control potentiometer and elapsed time meter.
13. Meters or digital readout devices and selector switch, mounted flush in controller door and connected to indicate the following controller parameters:
 - a. Output frequency (Hertz).
 - b. Motor speed (rpm).
 - c. Motor status (running, stop, fault).
 - d. Motor current (amperes).
 - e. Motor torque (percent).
 - f. Fault or alarming status (code).
 - g. Proportional-integral-derivative (PID) feedback signal (percent).
 - h. DC-link voltage (volts direct current).
 - i. Set-point frequency (Hertz).

- j. Motor output voltage (volts).
- 14. Control Signal Interface:
 - a. Electric Input Signal Interface: A minimum of 2 analog inputs (0 to 10 V or 0/4-20 mA) and 6 programmable digital inputs.
 - b. Remote signal inputs capable of accepting any of the following speed-setting input signals from the control system:
 - 1) 0 to 10-V dc.
 - 2) 0-20 or 4-20 mA.
 - 3) Potentiometer using up/down digital inputs.
 - 4) Fixed frequencies using digital inputs.
 - 5) RS485.
 - 6) Keypad display for local hand operation.
 - c. Output signal interface with a minimum of 1 analog output signal (0/4-20 mA), which can be programmed to any of the following:
 - 1) Output frequency (Hertz).
 - 2) Output current (load).
 - 3) DC-link voltage (volts direct current).
 - 4) Motor torque (percent).
 - 5) Motor speed (rpm).
 - 6) Set-point frequency (Hertz).
 - d. Remote indication interface with a minimum of 2 dry circuit relay outputs (120-V ac, 1 A) for remote indication of the following:
 - 1) Motor running.
 - 2) Set-point speed reached.
 - 3) Fault and warning indication (overtemperature or overcurrent).
 - 4) High- or low-speed limits reached.
- 15. Communications: RS485 interface allows VFC to be used with an external system within a multidrop LAN configuration. Interface shall allow all parameter settings of VFC to be programmed via BMS control. Provide capability for VFC to retain these settings within the nonvolatile memory.
- 16. Integral Disconnecting Means: [NEMA AB 1, instantaneous-trip circuit breaker] [NEMA AB 1, molded-case switch] [NEMA KS 1, nonfusible switch] [NEMA KS 1, fusible switch] with lockable handle.
- 17. Accessories:
 - a. Devices shall be factory installed in controller enclosure unless otherwise indicated.
 - b. Push-Button Stations, Pilot Lights, and Selector Switches: NEMA ICS 2, heavy-duty type.
 - c. Standard Displays:
 - 1) Output frequency (Hertz).

- 2) Set-point frequency (Hertz).
- 3) Motor current (amperes).
- 4) DC-link voltage (volts direct current).
- 5) Motor torque (percent).
- 6) Motor speed (rpm).
- 7) Motor output voltage (volts).

2.4 COIL SECTION

A. General Requirements for Coil Section:

1. Comply with ARI 410.
2. Fabricate coil section to allow removal and replacement of coil for maintenance and to allow in-place access for service and maintenance of coil(s).
3. For multizone units, provide air deflectors and air baffles to balance airflow across coils.
4. Coils shall not act as structural component of unit.
5. Seismic Fabrication Requirements: Fabricate coil section, internal mounting frame and attachment to coils, and other coil section components with reinforcement strong enough to withstand seismic forces defined in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment" when coil-mounting frame and air-handling-unit mounting frame are anchored to building structure.

B. Electrical Heating Coils, Controls, and Accessories: Not Used

2.5 AIR FILTRATION SECTION

A. General Requirements for Air Filtration Section:

1. Comply with NFPA 90A.
2. Provide minimum arrestance according to ASHRAE 52.1, and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2.
3. Provide filter holding frames arranged for flat or angular orientation, with access doors on both sides of unit. Filters shall be removable from one side or lifted out from access plenum.

B. Disposable Panel Filters: Not Used

C. Extended-Surface, Disposable Panel Filters:

1. Factory-fabricated, dry, extended-surface type.
2. Thickness: 2 inches.
3. Initial Resistance: <Insert inches wg (Pa)>.
4. Recommended Final Resistance: <Insert inches wg (Pa)>.
5. Arrestance (ASHRAE 52.1): 90.
6. Merv (ASHRAE 52.2): 8.
7. Media: Fibrous material formed into deep-V-shaped pleats and held by self-supporting wire grid.
8. Media-Grid Frame: Galvanized steel.

- 9. Mounting Frames: Welded, galvanized steel, with gaskets and fasteners, suitable for bolting together into built-up filter banks.
- D. Extended-Surface, Nonsupported-Media Filters: Not Used
- E. Automatic Roll Filters: Not Used
- F. Activated-Carbon Panel Filters: Not Used
- G. Activated-Carbon Filters: Not Used
- H. HEPA Filters: Not Used
- I. Filter Gage:
 - 1. 3-1/2-inch- or 2-inch- diameter, diaphragm-actuated dial in metal case.
 - 2. Vent valves.
 - 3. Black figures on white background.
 - 4. Front recalibration adjustment.
 - 5. 2 or 3 percent of full-scale accuracy.
 - 6. Range: 0- to 2.0-inch wg.
 - 7. Accessories: Static-pressure tips with integral compression fittings, 1/4-inch (6-mm) aluminum tubing, and 2- or 3-way vent valves.

2.6 DAMPERS

- A. General Requirements for Dampers: Leakage rate, according to AMCA 500, "Laboratory Methods for Testing Dampers for Rating," shall not exceed 2 percent of air quantity at 2000-fpm face velocity through damper and 4-inch wg pressure differential.
- B. Damper Operators: Comply with requirements in Division 23 Section "Instrumentation and Control for HVAC."
- C. Electronic Damper Operators:
 - 1. Direct-coupled type designed for minimum 60,000 full-stroke cycles at rated torque.
 - 2. Electronic damper position indicator shall have visual scale indicating percent of travel and 2- to 10-V dc, feedback signal.
 - 3. Operator Motors:
 - a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Division 23 Section "Common Motor Requirements for HVAC."
 - b. Size to operate with sufficient reserve power to provide smooth modulating action or two-position action.
 - c. Permanent Split-Capacitor or Shaded-Pole Type: Gear trains completely oil immersed and sealed. Equip spring-return motors with integral spiral-spring mechanism in housings designed for easy removal for service or adjustment of limit switches, auxiliary switches, or feedback potentiometer.

4. Nonspring-Return Motors for Dampers Larger Than 25 Sq. Ft.: Size for running torque of 150 in. x lbf and breakaway torque of 300 in. x lbf.
 5. Spring-Return Motors for Dampers Larger Than 25 Sq. Ft.: Size for running and breakaway torque of 150 in. x lbf.
 6. Size dampers for running torque calculated as follows:
 - a. Parallel-Blade Damper with Edge Seals: 7 inch-lb/sq. ft. of damper.
 - b. Opposed-Blade Damper with Edge Seals: 5 inch-lb/sq. ft. of damper.
 - c. Parallel-Blade Damper without Edge Seals: 4 inch-lb/sq. ft. of damper.
 - d. Opposed-Blade Damper without Edge Seals: 3 inch-lb/sq. ft. of damper.
 - e. Dampers with 2- to 3-Inch wg of Pressure Drop or Face Velocities of 1000 to 2500 fpm: Increase running torque by 1.5.
 - f. Dampers with 3- to 4-Inch wg of Pressure Drop or Face Velocities of 2500 to 3000 fpm: Increase running torque by 2.0.
 7. Coupling: V-bolt and V-shaped, toothed cradle.
 8. Overload Protection: Electronic overload or digital rotation-sensing circuitry.
 9. Fail-Safe Operation: Mechanical, spring-return mechanism with external, manual gear release on nonspring-return actuators.
 10. Power Requirements (Two-Position Spring Return): [24] [120] [230]-V ac.
 11. Power Requirements (Modulating): Maximum 10 VA at 24-V ac or 8 W at 24-V dc.
 12. Proportional Signal: 2- to 10-V dc or 4 to 20 mA, and 2- to 10-V dc position feedback signal.
 13. Temperature Rating: [Minus 22 to plus 122 deg F (Minus 30 to plus 50 deg C)] [40 to 104 deg F (5 to 40 deg C)].
 14. Run Time: [12 seconds open, 5 seconds closed] [30 seconds] [60 seconds] [120 seconds].
- D. Pneumatic Damper Operators: Not Used
- E. Zone Dampers: Not Used
- F. Face-and-Bypass Dampers: Not Used
- G. Outdoor- and Return-Air Dampers: Low-leakage, double-skin, airfoil-blade, galvanized-steel, aluminum, or extruded-aluminum dampers with compressible jamb seals and extruded-vinyl blade edge seals in opposed-blade arrangement with steel operating rods rotating in stainless-steel sleeve bearings mounted in a single galvanized-steel, aluminum, or extruded-aluminum frame, and with operating rods connected with a common linkage. Leakage rate shall not exceed 3 cfm/sq. ft. at 1-inch wg and 8 cfm/sq. ft. at 4-inch wg.
- H. Mixing Section: Multiple-blade, air-mixer assembly located immediately downstream of mixing section.
- I. Combination Filter and Mixing Section:
1. Cabinet support members shall hold 2-inch- (50-mm-) thick, pleated, flat, permanent or throwaway filters.
 2. Multiple-blade, air-mixer assembly shall mix air to prevent stratification, located immediately downstream of mixing box.

2.7 HUMIDIFIERS – NOT USED

2.8 AIR-TO-AIR ENERGY RECOVERY – NOT USED

2.9 CAPACITIES AND CHARACTERISTICS

A. Casing:

1. Outside Casing: Galvanized steel, minimum [0.052 inch (1.3 mm)] [0.064 inch (1.6 mm)] [0.079 inch (2.0 mm)] <Insert value> thick.
2. Inside Casing: Galvanized steel, solid, minimum [0.052 inch (1.3 mm)] [0.064 inch (1.6 mm)] [0.079 inch (2.0 mm)] <Insert value> thick.
3. Floor Plate: Aluminum treadplate, minimum 0.1 inches thick.
4. Insulation Thickness: [1 inch (25 mm)] [1-1/2 inches (40 mm)] [2 inches (50 mm)] <Insert value>.
5. Static-Pressure Classifications for Unit Sections before Fans: [2-inch wg (500 Pa)] [3-inch wg (750 Pa)] [4-inch wg (1000 Pa)] [6-inch wg (1500 Pa)] [8-inch wg (2000 Pa)] [9-inch wg (2250 Pa)] [10-inch wg (2500 Pa)] <Insert value>.
6. Static-Pressure Classifications for Unit Sections after Fans: [2-inch wg (500 Pa)] [3-inch wg (750 Pa)] [4-inch wg (1000 Pa)] [6-inch wg (1500 Pa)] [8-inch wg (2000 Pa)] [9-inch wg (2250 Pa)] [10-inch wg (2500 Pa)] <Insert value>.

B. Supply Fan:

1. Class III: AMCA 99-2408.
2. Drive: Direct.
3. Type: Galvanized-steel, Plenum.
4. Number of Fans: 2
5. Number of Fan Wheels: 1.
6. Fan Diameter : 20 inches.
7. Fan Housing and Wheel Coating: [Thermoplastic vinyl] [Epoxy] [Zinc] [Synthetic resin] [Phenolic] [Polytetrafluoroethylene] [Vinyl ester] [Hot-dip galvanized] [Powder-baked enamel]; <Insert manufacturer's name; trade name>.
8. Airflow: 15,000 cfm.
9. Total Static Pressure: 3 inches wg.
10. External Static Pressure: 1.28 inches wg (kPa)>.
11. Speed: 2,262.
12. Motor Size: 6 HP each fan.
13. Motor Speed: 1745.
14. Electrical Characteristics:
 - a. Volts: 460.
 - b. Phase: Three.
 - c. Hertz: 60.
 - d. Full-Load Amperes: 7.5 each fan / 15 total.
15. Fan Discharge Sound Power:

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200.7 Bare Fan Sound Power (dB re: 10E-12 watts)											
Operating Condition		63	125	250	500	1k	2k	4k	8k	LwA	Lw
Condition 1	Inlet	90	86	103	92	87	87	86	79	98	103
	Outlet	86	82	94	90	89	86	86	76	94	97

C. Exhaust or Return Fan: Not Used

D. Preheat Coil: Not Used

E. Heating Coil:

1. Heat-Transfer Rate: 585,500 Btu/h.
2. Entering-Air Temperature: 40 deg F.
3. Leaving-Air Temperature: 75.6 deg F.
4. Face Area: 29.29 sq. ft..
5. Face Velocity: 512.09 fpm
6. Maximum Air-Side, Static-Pressure Drop: 0.11 inches wg.
7. Coil Type: [Continuous circuit] [Self-draining] [Cleanable].
8. Coil Type: Single tube.
9. Piping Connections: Threaded, same end of coil.
10. Tube Material: Copper.
11. Tube Thickness: 0.625 inches.
12. Fin Type: [Plate] [Spiral].
13. Fin Material: Aluminum.
14. Fin Spacing: 10 fins per inch.
15. Fin Thickness: 0.008 inches.
16. Fin and Tube Joint: [Mechanical bond] [Silver brazed].
17. Headers:
 - a. Cast iron with cleaning plugs and drain and air vent tappings extended to exterior of unit.
 - b. Seamless copper tube with brazed joints, prime coated.
 - c. Fabricated steel, with brazed joints, prime coated.
 - d. Provide insulated cover to conceal headers exposed outside casings.
18. Frames: Channel frame, [0.052-inch- (1.3-mm-) thick galvanized steel] [0.064-inch- (1.6-mm-) thick galvanized steel] [0.079-inch- (2.0-mm-) thick galvanized steel] [0.0625-inch- (1.58-mm-) thick galvanized steel].
19. Number of Rows: 1.
20. Coil Working-Pressure Ratings: 200 psig, 325 deg F.
21. Water:
 - a. Water Flow: 59 gpm.
 - b. Maximum Water Pressure Drop: 4.06 feet of head.
 - c. Entering-Water Temperature: 180 deg F.
 - d. Leaving-Water Temperature: 159.7 deg F.
 - e. Tube Velocity: 3.63 fps.
22. Steam: Not Used

23. Coating: [Thermoplastic vinyl] [Epoxy] [Zinc] [Synthetic resin] [Phenolic]
[Polytetrafluoroethylene] [Vinyl ester] [Hot-dip galvanized] [Powder-baked enamel];
<Insert manufacturer's name; trade name>.
24. Integral Face-and-Bypass Dampers: Not Used

F. Electric Heating Coil: Not Used

G. Cooling Coil:

1. Sensible Heat-Transfer Rate: 422,300 Btu/h.
2. Total Heat-Transfer Rate: 646,800 Btu/h.
3. Entering-Air, Dry-Bulb Temperature: 80.0 deg F.
4. Entering-Air, Wet-Bulb Temperature: 67.0 deg F.
5. Leaving-Air, Dry-Bulb Temperature: 52.2 deg F.
6. Leaving-Air, Wet-Bulb Temperature: 51.9 deg F.
7. Face Area: 29.55 sq. ft..
8. Face Velocity: 507.64 fpm.
9. Maximum Air-Side, Static-Pressure Drop: 0.81 inches wg.
10. Coil Type: [Continuous circuit] [Self-draining] [Cleanable].
11. Piping Connections: Sweat, same end of coil.
12. Tube Material: Copper.
13. Tube Thickness: 0.5 inches.
14. Fin Type: [Plate] [Spiral].
15. Fin Material: Aluminum.
16. Fin Spacing: 12 fins per inch.
17. Fin Thickness: 0.006 inches.
18. Fin and Tube Joint: [Mechanical bond] [Silver brazed].
19. Headers:
 - a. Cast iron with cleaning plugs and drain and air vent tappings extended to exterior of unit.
 - b. Seamless copper tube with brazed joints, prime coated.
 - c. Fabricated steel, with brazed joints, prime coated.
 - d. Provide insulated cover to conceal headers exposed outside casings.
20. Frames: Channel frame, [0.052-inch- (1.3-mm-) thick galvanized steel] [0.064-inch- (1.6-mm-) thick galvanized steel] [0.079-inch- (2.0-mm-) thick galvanized steel] [0.0625-inch- (1.58-mm-) thick galvanized steel] .
21. Number of Rows: 6.
22. Coil Working-Pressure Ratings: 200 psig, 325 deg F.
23. Water: Not Used
24. Refrigerant Type: R-410A.
25. Coating: [Thermoplastic vinyl] [Epoxy] [Zinc] [Synthetic resin] [Phenolic]
[Polytetrafluoroethylene] [Vinyl ester] [Hot-dip galvanized] [Powder-baked enamel];
<Insert manufacturer's name; trade name>.

H. Prefilters: Not Used

I. Filters:

1. Type: Pleated.
2. Filter Bank Size: 72.125 in W x 60.000 in H
3. Filter Sizes: (3) 12 in x 24 in & (6) 24 in x 24 in.
4. Thickness or Depth: 2 inches.
5. Number of Filters: 9.
6. Access Location: [Front] [Back] [Side].
7. Maximum or Rated Face Velocity: 500 fpm.

- J. Dampers: Mixing dampers.
- K. Steam Grid Humidifier: Not Used
- L. Wet Glass Cell Washer: Not Used
- M. Evaporative Humidifier: Not Used
- N. Air-to-Air Energy Recovery: Not Used

2.10 SOURCE QUALITY CONTROL

- A. Fan Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Fans shall bear AMCA-certified sound ratings seal.
- B. Fan Performance Rating: Factory test fan performance for airflow, pressure, power, air density, rotation speed, and efficiency. Rate performance according to AMCA 210, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating."
- C. Water Coils: Factory tested to 300 psig according to ARI 410 and ASHRAE 33.
- D. Steam Coils: Not Used
- E. Refrigerant Coils: Factory tested to 450 psig according to ARI 410 and ASHRAE 33.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine casing insulation materials and filter media before air-handling unit installation. Reject insulation materials and filter media that are wet, moisture damaged, or mold damaged.
- C. Examine roughing-in for steam, hydronic, and condensate drainage piping systems and electrical services to verify actual locations of connections before installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Equipment Mounting: Install air-handling units on concrete floors using elastomeric pads. Secure units to anchor bolts installed in concrete bases. Comply with requirements for concrete bases specified in Division 03 Section "Miscellaneous Cast-in-Place Concrete." Comply with requirements for vibration isolation devices specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."
 - 1. Minimum Deflection: 1 inch.
 - 2. Install galvanized or stainless-steel plate to equally distribute weight over elastomeric pad.
 - 3. Install dowel rods to connect base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.
 - 4. Install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
 - 5. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 6. Install anchor bolts to elevations required for proper attachment to supported equipment.
- B. Suspended Units: Not Used
- C. Arrange installation of units to provide access space around air-handling units for service and maintenance.
- D. Do not operate fan system until filters (temporary or permanent) are in place. Replace temporary filters used during construction and testing, with new, clean filters.
- E. Install filter-gage, static-pressure taps upstream and downstream of filters. Mount filter gages on outside of filter housing or filter plenum in accessible position. Provide filter gages on filter banks, installed with separate static-pressure taps upstream and downstream of filters.

3.3 CONNECTIONS

- A. Comply with requirements for piping specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to air-handling unit to allow service and maintenance.
- C. Connect piping to air-handling units mounted on vibration isolators with flexible connectors.
- D. Connect condensate drain pans using NPS 1-1/4, ASTM B 88, Type M copper tubing. Extend to nearest equipment or floor drain. Construct deep trap at connection to drain pan and install cleanouts at changes in direction.
- E. Hot- and Chilled-Water Piping: Comply with applicable requirements in Division 23 Section "Hydronic Piping." Install shutoff valve and union or flange at each coil supply connection. Install balancing valve and union or flange at each coil return connection.

- F. Steam and Condensate Piping: Not Used
- G. Refrigerant Piping: Comply with applicable requirements in Division 23 Section "Refrigerant Piping." Install shutoff valve and union or flange at each supply and return connection.
- H. Connect duct to air-handling units with flexible connections. Comply with requirements in Division 23 Section "Air Duct Accessories."

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- B. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- C. Tests and Inspections:
 - 1. Leak Test: After installation, fill water and steam coils with water, and test coils and connections for leaks.
 - 2. Charge refrigerant coils with refrigerant and test for leaks.
 - 3. Fan Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 4. Automatic-Roll-Filter Operational Test: Not Used
 - 5. HEPA-Filter Operational Test: Not Used
 - 6. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Air-handling unit or components will be considered defective if unit or components do not pass tests and inspections.
- E. Prepare test and inspection reports.

3.5 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.
 - 2. Verify that shipping, blocking, and bracing are removed.
 - 3. Verify that unit is secure on mountings and supporting devices and that connections to piping, ducts, and electrical systems are complete. Verify that proper thermal-overload protection is installed in motors, controllers, and switches.
 - 4. Verify proper motor rotation direction, free fan wheel rotation, and smooth bearing operations. Reconnect fan drive system, align belts, and install belt guards.

5. Verify that bearings, pulleys, belts, and other moving parts are lubricated with factory-recommended lubricants.
6. Verify that outdoor- and return-air mixing dampers open and close, and maintain minimum outdoor-air setting.
7. Comb coil fins for parallel orientation.
8. Verify that proper thermal-overload protection is installed for electric coils.
9. Install new, clean filters.
10. Verify that manual and automatic volume control and fire and smoke dampers in connected duct systems are in fully open position.

B. Starting procedures for air-handling units include the following:

1. Energize motor; verify proper operation of motor, drive system, and fan wheel. Adjust fan to indicated rpm.
2. Measure and record motor electrical values for voltage and amperage.
3. Manually operate dampers from fully closed to fully open position and record fan performance.

3.6 ADJUSTING

- A. Adjust damper linkages for proper damper operation.
- B. Comply with requirements in Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for air-handling system testing, adjusting, and balancing.

3.7 CLEANING

- A. After completing system installation and testing, adjusting, and balancing air-handling unit and air-distribution systems and after completing startup service, clean air-handling units internally to remove foreign material and construction dirt and dust. Clean fan wheels, cabinets, dampers, coils, and filter housings, and install new, clean filters.

3.8 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain air-handling units.

END OF SECTION

SECTION 26 0500 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Electrical equipment coordination and installation.
 - 2. Common electrical installation requirements.

1.3 DEFINITIONS

- A. EPDM: Ethylene-propylene-diene terpolymer rubber.
- B. NBR: Acrylonitrile-butadiene rubber.
- C. PVC: Polyvinyl Chloride

1.4 SUBMITTALS

- A. Product Data: For sleeve seals.

1.5 COORDINATION

- A. Coordinate arrangement, mounting, and support of electrical equipment:
 - 1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
 - 2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
 - 3. To allow right of way for piping and conduit installed at required slope.
 - 4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.
- B. Contractor shall be responsible to have all electrical inspections performed by an approved third-party electrical inspection agency. Name of inspection agency shall be submitted to the owner for approval. In addition, the contractor shall submit a schedule of inspections to be performed before starting any work. Inspections shall include but not be limited to above ceiling, rough in and trench work. Results of each inspection shall be submitted in writing to the owner.

- C. All electrical work shall conform to the latest New York State approved NEC (NFPA 70) code for electrical installations.

PART 2 - PRODUCTS

2.1 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, non-staining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

- A. Comply with NECA 1.
- B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
- C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- E. Right of Way: Give to piping systems installed at a required slope.

END OF SECTION

SECTION 26 0519 – LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Building wires and cables rated 600 V and less.
 - 2. Connectors, splices, and terminations rated 600 V and less.

1.3 DEFINITIONS

- A. EPDM: Ethylene-propylene-diene terpolymer rubber.
- B. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Qualification Data: For testing agency.
- C. Field quality-control test reports.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.
 - 1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

- C. Comply with NFPA 70.

1.6 COORDINATION

- A. Set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Alcan Products Corporation; Alcan Cable Division.
 - 2. American Insulated Wire Corp.; a Leviton Company.
 - 3. General Cable Corporation.
 - 4. Senator Wire & Cable Company.
 - 5. Southwire Company.
- C. Copper Conductors: Comply with NEMA WC 70.
- D. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN.

2.2 CONNECTORS AND SPLICES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. AFC Cable Systems, Inc.
 - 2. Hubbell Power Systems, Inc.
 - 3. O-Z/Gedney; EGS Electrical Group LLC.
 - 4. 3M; Electrical Products Division.
 - 5. Tyco Electronics Corp.
- C. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Feed Circuit in Tunnel: Type THHN-THWN, single conductors in Schedule 40 PVC conduit.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- D. Support cables according to Division 26 Section "Hangers and Supports for Electrical Systems."
- E. Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems."

3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
 - 1. Use oxide inhibitor in each splice and tap conductor for aluminum conductors.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.

- B. Perform tests and inspections and prepare test reports.
- C. Tests and Inspections: As per NETA Standards.
 - 1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors, for compliance with requirements.
 - 2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
- D. Test Reports: Prepare a written report to record the following:
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
- E. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION

SECTION 26 0526 – GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section. All grounding shall comply with NFPA 70.

1.2 SUMMARY

- A. Section Includes: Grounding systems and equipment.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Informational Submittals: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article, including the following:
 - 1. Grounding arrangements and connections for separately derived systems.
 - 2. Grounding for sensitive electronic equipment.
- C. Qualification Data: For qualified testing agency and testing agency's field supervisor.
- D. Field quality-control reports.
- E. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
 - 1. Instructions for periodic testing and inspection of grounding features at ground rings based on NETA MTS NFPA 70B.
 - a. Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
 - b. Include recommended testing intervals.

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA or an NRTL.
 - 1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Stranded Conductors: ASTM B 8.
 - 3. Tinned Conductors: ASTM B 33.
 - 4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
 - 5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
 - 6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
 - 7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

2.2 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, pressure type with at least two bolts.
 - 1. Pipe Connectors: Clamp type, sized for pipe.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

- B. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.
- C. Conductor Terminations and Connections:
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 - 2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
 - 3. Connections to Ground Rods at Test Wells: Bolted connectors.
 - 4. Connections to Structural Steel: Welded connectors.

3.2 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
 - 1. Feeders and branch circuits.
 - 2. Single-phase motor and appliance branch circuits.
 - 3. Three-phase motor and appliance branch circuits.
 - 4. Flexible raceway runs.
 - 5. Armored and metal-clad cable runs.
 - 6. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
 - 7. Rack-Mounted Electronic Equipment Circuits: Install insulated equipment grounding conductor in branch-circuit runs from equipment-area power panels and power-distribution units.

3.3 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
 - 1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 - 2. Use exothermic-welded connectors for outdoor locations and in tunnel.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Tests and Inspections:
 - 1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
 - 2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
- C. Grounding system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.
- E. Report measured ground resistances that exceed the following values:
 - 1. Power or System with Capacity of 500 kVA and Less: 5 ohms.
- F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Hangers and supports for electrical equipment and systems.

1.3 DEFINITIONS

- A. PVC: Rigid Polyvinyl Conduit.

1.4 PERFORMANCE REQUIREMENTS

- A. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
- B. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.5 SUBMITTALS

- A. Product Data: For the following:
 - 1. Stainless Steel slotted support systems.
- B. Shop Drawings: Show fabrication and installation details and include calculations for the following:
 - 1. Stainless Steel slotted channel systems. Include Product Data for components and mockup. See division 5.

1.6 QUALITY ASSURANCE

- A. Comply with NFPA 70.

1.7 COORDINATION

- A. Coordinate size and location of supports with existing conditions.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Stainless Slotted Support Systems: See Division 5.
- B. Conduit and Cable Support Devices: Stainless hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- C. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
- D. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
 - 1. Mechanical-Expansion Anchors: Insert-wedge-type, stainless steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Cooper B-Line, Inc.; a division of Cooper Industries.
 - 2) Simpson.
 - 3) Hilti Inc.
 - 2. Hanger Rods: Threaded stainless steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Stainless Steel bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
- B. Materials: Stainless Steel. Comply with requirements in Division 05.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for PVC required by NFPA 70.

3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
- C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - 1. To Existing Concrete: Expansion anchor fasteners.
- D. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in Division 05 Section "Metal Fabrications" for site-fabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

END OF SECTION

SECTION 260533 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.
- B. Related Sections include the following:
 - 1. Division 5 Section 05 05430 Slotted Channel Framing

1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. ENT: Electrical nonmetallic tubing.
- C. EPDM: Ethylene-propylene-diene terpolymer rubber.
- D. FMC: Flexible metal conduit.
- E. IMC: Intermediate metal conduit.
- F. LFMC: Liquidtight flexible metal conduit.
- G. LFNC: Liquidtight flexible nonmetallic conduit.
- H. NBR: Acrylonitrile-butadiene rubber.
- I. RNC: Rigid nonmetallic conduit.

1.4 SUBMITTALS

- A. Product Data: For surface raceways, junction and pull boxes.
- B. Shop Drawings: For the following raceway components. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Custom junction and pull boxes.

1.5 QUALITY ASSURANCE

- A. Electrical Components and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 NONMETALLIC CONDUIT AND TUBING

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. AFC Cable Systems, Inc.
 - 2. Anamet Electrical, Inc.; Anaconda Metal Hose.
 - 3. Arco Corporation.
 - 4. CANTEX Inc.
 - 5. CertainTeed Corp.; Pipe & Plastics Group.
 - 6. Condux International, Inc.
 - 7. ElecSYS, Inc.
 - 8. Electri-Flex Co.
 - 9. Lamson & Sessions; Carlon Electrical Products.
 - 10. Manhattan/CDT/Cole-Flex.
 - 11. RACO; a Hubbell Company.
 - 12. Thomas & Betts Corporation.
- C. RNC: NEMA TC 2, Type EPC-40-PVC, unless otherwise indicated.
- D. LFNC: UL 1660.
- E. Fittings for RNC: NEMA TC 3; match to conduit or tubing type and material.
- F. Fittings for LFNC: UL 514B.

2.2 BOXES, ENCLOSURES, AND CABINETS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper Industries, Inc.
 2. Hoffman.
 3. Hubbell.
- C. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- D. Stainless Steel Access, Pull, and Junction Boxes: NEMA FB 1, Stainless Steel with gasketed cover.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Tunnel: Apply raceway products as specified below, unless otherwise indicated:
1. Exposed Conduit: RNC, Type EPC-40-PVC.
 2. Concealed Conduit, Aboveground: RNC, Type EPC-40-PVC.
 3. Underground Conduit: RNC, Type EPC- 80-PVC, direct buried.
 4. Boxes and Enclosures, Aboveground: NEMA 250, Type 4, stainless steel for damp or wet locations.
- B. Minimum Raceway Size: 4-inch trade size.
- C. Raceway Fittings: Compatible with raceways and suitable for use and location.

3.2 INSTALLATION

- A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.
- B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Complete raceway installation before starting conductor installation.
- D. Support raceways as specified in Division 5 and Division 26 Section "Hangers and Supports for Electrical Systems."
- E. Install no more than the equivalent of three 90-degree bends.
- F. Expansion-Joint Fittings for RNC: Install in each run of conduit as located on drawings and that has straight-run length that exceeds 50 feet.
1. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at the time of installation.

3.3 PROTECTION

- A. Provide final protection and maintain conditions that ensure conduits, supports, and boxes are without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 26 0553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Identification for raceways.
 - 2. Identification for conductors.
 - 3. Warning labels and signs.
 - 4. Instruction signs.
 - 5. Equipment identification labels.
 - 6. Miscellaneous identification products.

1.3 SUBMITTALS

- A. Product Data: For each electrical identification product indicated.
- B. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.
- C. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

1.4 QUALITY ASSURANCE

- A. Comply with ANSI A13.1
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.
- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.5 COORDINATION

- A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.
- B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- C. Coordinate installation of identifying devices with location of access panels and doors.
- D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 POWER RACEWAY IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.
- B. Self-Adhesive Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- C. Snap-Around Labels for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
- D. Snap-Around, Color-Coding Bands for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches (50 mm) long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
- E. Tape and Stencil for Raceways Carrying Circuits More Than 600 V: 4-inch- (100-mm-) wide black stripes on 10-inch (250-mm) centers diagonally over orange background that extends full length of raceway or duct and is 12 inches (300 mm) wide. Stop stripes at legends.
- F. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch (50 by 50 by 1.3 mm), with stamped legend, punched for use with self-locking cable tie fastener.
- G. Write-On Tags: Polyester tag, 0.015 inch (0.38 mm) thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
 - 1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

2.2 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
- B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- C. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch (50 by 50 by 1.3 mm), with stamped legend, punched for use with self-locking cable tie fastener.
- D. Write-On Tags: Polyester tag, 0.015 inch (0.38 mm) thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
 - 1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
- E. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
- F. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches (50 mm) long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

2.3 WARNING LABELS AND SIGNS

- A. Comply with NFPA 70 and 29 CFR 1910.145.
- B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.
- C. Baked-Enamel Warning Signs:
 - 1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
 - 2. 1/4-inch (6.4-mm) grommets in corners for mounting.
 - 3. Nominal size, 7 by 10 inches (180 by 250 mm).
- D. Metal-Backed, Butyrate Warning Signs:
 - 1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch (1-mm) galvanized-steel backing; and with colors, legend, and size required for application.
 - 2. 1/4-inch (6.4-mm) grommets in corners for mounting.
 - 3. Nominal size, 10 by 14 inches (250 by 360 mm).
- E. Warning label and sign shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 MM)."

2.4 INSTRUCTION SIGNS

- A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch (1.6 mm) thick for signs up to 20 sq. inches (129 sq. cm) and 1/8 inch (3.2 mm) thick for larger sizes.
 1. Engraved legend with black letters on white face.
 2. Punched or drilled for mechanical fasteners.
 3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.
- B. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm).
- C. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm). Overlay shall provide a weatherproof and UV-resistant seal for label.

2.5 EQUIPMENT IDENTIFICATION LABELS

- A. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).

2.6 CABLE TIES

- A. General-Purpose Cable Ties: Fungus inert, self extinguishing, one piece, self locking, Type 6/6 nylon.
 1. Minimum Width: 3/16 inch (5 mm).
 2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 12,000 psi (82.7 MPa).
 3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
 4. Color: Black except where used for color-coding.
- B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self extinguishing, one piece, self locking, Type 6/6 nylon.
 1. Minimum Width: 3/16 inch (5 mm).
 2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 12,000 psi (82.7 MPa).
 3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).

4. Color: Black.
- C. Plenum-Rated Cable Ties: Self extinguishing, UV stabilized, one piece, self locking.
1. Minimum Width: 3/16 inch (5 mm).
 2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 7000 psi (48.2 MPa).
 3. UL 94 Flame Rating: 94V-0.
 4. Temperature Range: Minus 50 to plus 284 deg F (Minus 46 to plus 140 deg C).
 5. Color: Black.

2.7 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in Division 09 painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).
- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Verify identity of each item before installing identification products.
- B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- C. Apply identification devices to surfaces that require finish after completing finish work.
- D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
- F. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
- G. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.
- H. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

3.2 IDENTIFICATION SCHEDULE

- A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A, and 120 V to ground: Identify with self-adhesive vinyl tape applied in bands. Install labels at 15 foot maximum intervals.
- B. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:
 1. Emergency Power.
 2. Power.
- C. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
 1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors.
 - a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
 - b. Colors for 208/120-V Circuits:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Phase C: Blue.
 - c. Colors for 480/277-V Circuits:
 - 1) Phase A: Brown.
 - 2) Phase B: Orange.
 - 3) Phase C: Yellow.
 - d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
- D. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.

END OF SECTION

SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Fusible switches.
 - 2. Nonfusible switches.
 - 3. Receptacle switches.
 - 4. Shunt trip switches.
 - 5. Molded-case circuit breakers (MCCBs).
 - 6. Molded-case switches.
 - 7. Enclosures.

1.3 DEFINITIONS

- A. NC: Normally closed.
- B. NO: Normally open.
- C. SPDT: Single pole, double throw.

1.4 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

1.5 SUBMITTALS

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
 - 1. Enclosure types and details for types other than NEMA 250, Type 1.

2. Current and voltage ratings.
 3. Short-circuit current ratings (interrupting and withstand, as appropriate).
 4. Include evidence of NRTL listing for series rating of installed devices.
 5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
 6. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.
- B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.
1. Wiring Diagrams: For power, signal, and control wiring.
- C. Qualification Data: For qualified testing agency.
- D. Seismic Qualification Certificates: For enclosed switches and circuit breakers, accessories, and components, from manufacturer.
1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- E. Field quality-control reports.
1. Test procedures used.
 2. Test results that comply with requirements.
 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
- F. Manufacturer's field service report.
- G. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
 2. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.
- B. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.
- C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- E. Comply with NFPA 70.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
 1. Ambient Temperature: Not less than minus 22 deg F (minus 30 deg C) and not exceeding 104 deg F (40 deg C).
 2. Altitude: Not exceeding 6600 feet (2010 m).
- B. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
 1. Notify Owner no fewer than seven days in advance of proposed interruption of electric service.
 2. Indicate method of providing temporary electric service. If outage is for more than 4 hours, W.H.E.N. hour work also permitted for more than 4 hours.
 3. Do not proceed with interruption of electric service without Owner's written permission.
 4. Comply with NFPA 70E.

1.8 COORDINATION

- A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

1.9 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
2. Fuse Pullers: Two for each size and type.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide Eaton or comparable product by one of the following:
 1. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 2. Siemens Energy & Automation, Inc.
 3. Square D; a brand of Schneider Electric.
- C. Type GD, General Duty, Single Throw, 240-V ac, 800 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with plug fuse interiors to accommodate indicated fuses, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.
- D. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- E. Type HD, Heavy Duty, Six Pole, Single Throw, 600-V ac, 200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- F. Type HD, Heavy Duty, Double Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- G. Accessories:
 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
 3. Isolated Ground Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
 4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.

5. Auxiliary Contact Kit: One NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
6. Hookstick Handle: Allows use of a hookstick to operate the handle.
7. Lugs: Mechanical type, suitable for number, size, and conductor material.
8. Service-Rated Switches: Labeled for use as service equipment.
9. Accessory Control Power Voltage: Remote mounted and powered; 120-V ac.

2.2 NONFUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 3. Siemens Energy & Automation, Inc.
- B. Basis-of-Design Product: Subject to compliance with requirements, provide Square D or comparable product by one of the following:
 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 3. Siemens Energy & Automation, Inc.
- C. Type GD, General Duty, Single Throw, 600 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.
- D. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- E. Type HD, Heavy Duty, Six Pole, Single Throw, 600-V ac, 200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- F. Type HD, Heavy Duty, Double Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- G. Accessories:
 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
 3. Isolated Ground Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
 4. Auxiliary Contact Kit: One NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.

5. Hookstick Handle: Allows use of a hookstick to operate the handle.
6. Lugs: Compression type, suitable for number, size, and conductor material.
7. Accessory Control Power Voltage: Remote mounted and powered; 120-V ac.

2.3 MOLDED-CASE CIRCUIT BREAKERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 3. Siemens Energy & Automation, Inc.
 4. Square D; a brand of Schneider Electric.
- C. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.
- D. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
- E. Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
- F. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:
 1. Instantaneous trip.
 2. Long- and short-time pickup levels.
 3. Long- and short-time time adjustments.
 4. Ground-fault pickup level, time delay, and I^2t response.
- G. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.
- H. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker and trip activation on fuse opening or on opening of fuse compartment door.
- I. Ground-Fault, Circuit-Interrupter (GFCI) Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
- J. Ground-Fault, Equipment-Protection (GFEP) Circuit Breakers: With Class B ground-fault protection (30-mA trip).
- K. Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.
4. Ground-Fault Protection: Comply with UL 1053; integrally mounted, self-powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
5. Communication Capability: Universal-mounted communication module with functions and features compatible with power monitoring and control system, specified in Division 26 Section "Electrical Power Monitoring and Control."
6. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
7. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
8. Auxiliary Contacts: One SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
9. Alarm Switch: One NC contact that operates only when circuit breaker has tripped.
10. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
11. Zone-Selective Interlocking: Integral with ground-fault trip unit; for interlocking ground-fault protection function.
12. Electrical Operator: Provide remote control for on, off, and reset operations.
13. Accessory Control Power Voltage: Remote mounted and powered; 120-V ac.

2.4 ENCLOSURES

- A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
 1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
 2. Outdoor Locations: NEMA 250, Type 3R.
 3. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
 4. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- B. Comply with mounting and anchoring requirements specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
- C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- D. Install fuses in fusible devices.
- E. Comply with NECA 1.

3.3 IDENTIFICATION

- A. Comply with requirements in Division 26 Section "Identification for Electrical Systems."
 - 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
 - 2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- D. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- E. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
 - 3. Perform the following infrared scan tests and inspections and prepare reports:

- a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Remove front panels so joints and connections are accessible to portable scanner.
 - b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each enclosed switch and circuit breaker 11 months after date of Substantial Completion.
 - c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
- F. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.
- G. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 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 as determined in Division 26 Section "Overcurrent Protective Device Coordination Study".

END OF SECTION

SECTION 311000 - SITE CLEARING

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
- B. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.
- C. Do not begin site-clearing operations until temporary erosion and sedimentation control measures are in place.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance.
- B. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.
- C. Protect site improvements to remain from damage. Restore damaged improvements to condition existing before start of site clearing.
- D. Locate and clearly flag trees and vegetation to remain or to be relocated.
- E. Protect remaining trees and shrubs from damage and maintain vegetation. Employ a licensed arborist to repair tree and shrub damage. Restore damaged vegetation. Replace damaged trees that cannot be restored to full growth, as determined by arborist.
- F. Do not store materials or equipment or permit excavation within drip line of remaining trees.
- G. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.

3.2 SITE CLEARING

- A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction. Removal includes digging out stumps and obstructions and grubbing roots.

- B. Strip topsoil. Stockpile topsoil that will be reused in the Work.
 - 1. Stockpile surplus topsoil to allow for respreading deeper topsoil.
- C. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.
- D. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.
 - 1. Neatly saw-cut length of existing pavement to remain before removing existing pavement.
- E. In areas not to be further excavated, fill depressions resulting from site clearing. Place and compact satisfactory soil materials in 6-inch- thick layers to density of surrounding original ground.
- F. Dispose of waste materials, including trash, debris, and excess topsoil, off Owner's property. Burning waste materials on-site is not permitted.
 - 1. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities.

END OF SECTION

SECTION 312000 - EARTH MOVING

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Unit prices for rock excavation are included in Division 01 Section "Price and Payment Procedures."
- B. Unauthorized excavation consists of excavation below subgrade elevations or beyond indicated lines and dimensions without direction by A/E. Unauthorized excavation, as well as remedial work directed by A/E, shall be without additional compensation.
- C. Do not interrupt existing utilities serving facilities occupied by Owner or others unless permitted in writing by A/E and then only after arranging to provide temporary utility services according to requirements indicated.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Satisfactory Soil: ASTM D 2487 Soil Classification Groups GW, GP, GM, SW, SP, and SM; free of rock or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetation, or other deleterious matter.
- B. Unsatisfactory Soil: ASTM D 2487 Soil Classification Groups GC, SC, ML, MH, CL, CH, OL, OH, and PT.
- C. Backfill and Fill: Satisfactory soil materials.
- D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- E. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.
- F. Drainage Course: Narrowly graded mixture of **washed** crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.

3.1 EARTHWORK

- A. Protect and maintain erosion and sedimentation controls, which are specified in Division 31 Section "Site Clearing," during earthwork operations.
- B. Protect subgrades and foundation soils from softening and damage by water, freezing temperatures, or frost.
- C. Explosives: **Do not use explosives.**
- D. Excavate to subgrade elevations regardless of character of materials and obstructions encountered.
- E. Excavate to subgrade elevations. Material to be excavated will be classified as earth and rock. Do not excavate rock until it has been classified and cross sectioned by A/E. The Contract Sum will be adjusted for rock excavation according to unit prices included in the Contract Documents.
- F. Excavate for structures, building slabs, pavements, and walkways. Trim subgrades to required lines and grades.
- G. Utility Trenches: Not Used
- H. Plow strip or break up sloped surfaces steeper than 1 vertical to 4 horizontal to receive fill.
- I. When subgrade or existing ground surface to receive fill has a density less than that required for fill, break up ground surface, pulverize, moisture-condition or aerate soil, and recompact.
- J. Place backfill and fill in layers not more than 8 inches in loose depth at optimum moisture content. Compact each layer under structures, building slabs, pavements, and walkways to **95** percent of maximum dry unit weight according to ASTM D 698; elsewhere to **90** percent.
- K. Grade areas to a smooth surface to cross sections, lines, and elevations indicated. Grade lawns, walkways, and unpaved subgrades to tolerances of plus or minus 1 inch and pavements and areas within building lines to plus or minus 1/2 inch.
- L. Under pavements and walkways, place subbase course material on prepared subgrades and compact at optimum moisture content to required grades, lines, cross sections, and thicknesses.
- M. Under slabs-on-grade, place drainage course on prepared subgrade and compact to required cross section and thickness.
- N. Allow testing agency to inspect and test each subgrade and each fill or backfill layer and verify compliance with requirements.
- O. Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

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END OF SECTION

SECTION 323113 - CHAIN-LINK FENCES AND GATES

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data.
- B. Quality Standard: Comply with CLFMI CLF 2445, unless otherwise indicated.

PART 2 - PRODUCTS

2.1 FENCE COMPONENTS

- A. Fabric: Metallic-coated steel, 2-inch mesh, 0.120-inch- diameter wire.
 - 1. Polymer Coating: ASTM F 668, Class 2a or 2b.
 - 2. Color: Dark green.
 - 3. Selvage: Knuckled at bottom and twisted at top.
- B. Posts and Rails: Galvanized-steel pipe complying with ASTM F 1043 requirements for Light Industrial Fence, and color coated to match fabric.
- C. Tension Wire: Metallic coated, ASTM A 824.
- D. Fittings and Accessories: ASTM F 626, color coated to match fabric, and as follows:
 - 1. Post and Line Caps: Provide weathertight cap for each post. Provide line post caps with loop to receive tension wire or top rail.
 - 2. Post Brace Assembly: Same material as top rail with 3/8-inch- diameter rod and adjustable tightener.
 - 3. Bottom and Center Rail: Same material as top rail with cap on each end.
- E. Gate Posts, Swing Gates, and Accessories: ASTM F 900, same metal and finish as posts and rails, with galvanized hardware and accessories.
- F. Privacy Slats: Not Used

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install fence to comply with ASTM F 567.

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Orange Hall Theater HVAC Unit Replacement, OCCC Project # 2023-20

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- B. Excavation: Drill post holes 8 inches in diameter and 40 inches in depth, equally spaced, but not more than 10 feet apart.

- C. Setting Posts: Set posts in holes approximately 4 inches above bottom of excavation. Align posts vertically and align tops. Pour concrete footings with tops 2 inches above grade, troweled to a crown to shed water.

END OF SECTION

SECTION 323223 - SEGMENTED RETAINING WALLS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Structural Performance: Provide segmental retaining walls capable of withstanding gravity loads according to NCMA's "Design Manual for Segmental Retaining Walls."
- B. Seismic Performance: Provide segmental retaining walls capable of withstanding the effects of earthquake motions determined according NCMA's "Segmental Retaining Walls - Seismic Design Manual."
- C. Submittals:
 - 1. Product Data.
 - 2. Product Test Reports: Indicating compliance of retaining wall units with requirements.

PART 2 - PRODUCTS

2.1 RETAINING WALL MATERIALS

- A. Concrete Units: ASTM C 1372, Normal Weight
 - 1. Exposed Faces: Smooth.
 - 2. Shape and Dimensions: Any shape and dimensions that will produce segmental retaining walls of dimensions and profiles indicated.
 - 3. Corner Cap units and other special shapes to provide textures on exposed surfaces matching faces.
 - 4. Pins, clips, cap adhesive, and other accessories recommended by retaining wall unit manufacturer.
- B. Leveling Base: Base material per Division 31 Section "Earth Moving."
- C. Drainage Fill: Comply with Division 33 Section "Subdrainage."
- D. Soil Fill: Satisfactory soils per Division 31 Section "Earth Moving."
- E. Filter Fabric: Comply with Division 33 Section "Subdrainage."
- F. Soil Reinforcement: [Knitted or woven polyester geogrid] [molded polyethylene geogrid] [or] [woven polyamide, polyester, or polyolefin geotextile].

3.1 RETAINING WALL INSTALLATION

- A. Place and compact base material to 95 percent maximum dry unit weight according to ASTM D 698.
- B. Place retaining wall units according to NCMA's "Segmental Retaining Wall Installation Guide."
 - 1. Place fills on both sides of wall at same time, where both sides are indicated to be filled.
 - 2. Fill voids with drainage fill.
- C. Cap Units: Place cap units and secure with cap adhesive.

3.2 FILL PLACEMENT

- A. Place, spread, and compact fill in uniform lifts for full width and length of embankment as wall is laid. Begin at back of wall and place and spread fill toward embankment.
 - 1. Use only hand-operated compaction equipment within 48 inches of wall.
 - 2. Compact drainage fill and reinforced soil fill to 95 percent maximum dry unit weight according to ASTM D 698.
 - 3. Compact nonreinforced soil fill per Division 31 Section "Earth Moving."
- B. Embed reinforcement a minimum of 8 inches into retaining wall and stretch tight over compacted backfill. Anchor soil reinforcement before placing fill on it.
 - 1. Use additional soil reinforcement at corners and curved walls to provide continuous reinforcement.
 - 2. Do not dump fill material directly onto geosynthetics.
- C. In each compacted backfill layer, perform at least 1 field in-place compaction test for each 150 feet or less of segmental retaining wall length.

END OF SECTION