

**INVITATION TO BID -**

Sealed bids for HVAC REVISIONS - Tyhee Elementary project will be received and opened by a Representative of the Board of Trustees of School District No. 25, Bannock County, Idaho, at 3115 Pole Line Road, Pocatello, Idaho 83201, until 9:30 AM on March 14, 2018.

2018 - HVAC REVISIONS  
FOR  
TYHEE ELEMENTARY

Specifications or additional details (including bid forms) may be secured from Engineered Systems Associates, Inc. located at 1355 East Center, Pocatello, Idaho 83201. All bids must be on the forms furnished, all blank spaces filled in, and signed with the name, address, and license number of the Bidder. No qualified bids will be read.

Each bid shall be accompanied by a certified check, cashier's check or a bidder's bond (executed by a qualified surety company with the power to do business in the State of Idaho) in the sum of not less than five percent (5%) of the total bid, made payable to School District No. 25, Bannock County, Pocatello, Idaho. This surety shall be forfeited by the bidder in the event of failure to enter into a contract. Personal and company checks will not be accepted. Compliance with Idaho Public Works Law is required.

The Board of Trustees reserves the right to reject any or all bids or to waive any informalities, or to accept the bid or bids deemed best for School District No. 25, Bannock County, Pocatello, Idaho.

A mandatory pre-bid walk-through will be held on February 27, 2018 at 2:30 PM at the Tyhee Elementary School, 12743 West Tyhee Road, Pocatello, Idaho 83202. All prime bidders are required to attend. Contact person for this project is Alan Spidell, School Plant Coordinator

Plans, specifications, proposal forms, and other information are on file for examination at the following locations.

Engineered Systems Associates, Inc.  
1355 East Center, Pocatello, Idaho 83201  
208-233-0501

Pocatello School District Maintenance Shop  
185 East Maple Street  
Pocatello, Idaho 83201

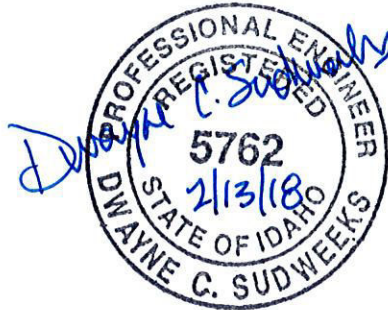
One set of documents may be obtained by licensed general contractors and by licensed mechanical and electrical subcontractors from the Engineer for a refundable deposit of \$100.00. Others may obtain documents at cost, non-refundable.

Jacob Gertsch, Clerk  
School District No. 25

*Publish dates:* February 21, 2018 and February 28, 2018.

IDAHO STATE JOURNAL

SPECIFICATIONS  
FOR  
2018 HVAC REVISIONS  
FOR  
TYHEE ELEMENTARY SCHOOL  
POCATELLO SCHOOL DISTRICT #25  
POCATELLO, IDAHO  
FEBRUARY 2018



Prepared  
by

Engineered Systems Associates, Inc.  
1355 East Center  
Pocatello, Idaho 83201  
(208) 233-0501

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Jacob Gertsch, Clerk  
School District No. 25

*Publish dates:* February 21, 2018 and February 28, 2018.

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**INSTRUCTIONS TO BIDDERS**

**BIDS:**

Sealed “Bids” will be received on or before the time and date set forth under “INVITATION TO BID.”

The owner reserves the right to accept or reject any part of a bid, a single bid or all bids.

Bidders submitting a “Bid” on this work will be required to figure and furnish everything as called for by these plans, specifications, and the requirements of the “Bid” sheet.

All bids shall be in a sealed envelope addressed to the Board of Trustees of School District No. 25, 3115 Pole Line Road, Pocatello, Idaho. The following shall be written on the exterior of the envelope:

**BIDS FOR 2018 HVAC REVISIONS – TYHEE ELEMENTARY**

Bids to be opened on March 14, 2018 at 9:30 AM, at the District Office, 3115 Pole Line Rd. Pocatello, Idaho. Bids not hand-delivered at the time of the bid opening must be received in the mail or at the Pocatello/Chubbuck School District No. 25 office no later than 4:00 pm the day prior to the bid opening.

The successful low bidder shall, within 7 days of the bid award, provide a bid cost breakdown per building trade, to the Engineer.

**MANDATORY PRE-BID WALK-THROUGH**

A mandatory pre-bid walk-through will be held on February 27, 2018. It is required that all prime bidders attend. The walk-through will begin at 2:30 PM at the Tyhee Elementary School, 12743 W. Tyhee Rd. Pocatello, Idaho, 83202. Access to the building after the walk through must be arranged thru Alan Spidell, (208) 233-2604.

**EVIDENCE OF QUALIFICATIONS:**

Upon request of the owner, a bidder whose bid is under consideration for award of the contract shall submit, promptly, satisfactory evidence of his financial resources, his experiences, and the organization and equipment he has available for performance of the contract.

**BID GUARANTEE:**

As a guarantee that, if awarded the contract, the bidder will execute same and furnish bond, each bid will be accompanied by a Certified Check, Cashier’s Check or Bid Bond for not less than five percent (5%) of the base bid payable to the Owner. **NO PERSONAL OR COMPANY CHECKS WILL BE ACCEPTED.**

**INSURANCE:**

All contractors who provide goods or services to the District are required to provide the District with certificates of insurance for General Liability, Auto Liability, Workers Compensation, and Professional Liability, if applicable.

The General Liability and/or Professional Liability certificate must name the District as an additional insured under the contractor’s policy.

Certificates are to be provided to the district prior to any work commencing on District property. This would include the placement of any equipment or materials at the work site.

Minimum Insurance Limits

General Liability	\$1,000,000 per occurrence \$1,000,000 products and completed operations \$1,000,000 annual aggregate
Auto Liability	\$1,000,000 per occurrence

**HOLD HARMLESS AGREEMENTS:**

The District expects your work to conform with professional standards. The contractor is expected to hold the District harmless for all damages or claims arising out of the work performed by the contractor. The District will not agree to hold the contractor harmless for damages or claims.

**PERFORMANCE BOND:**

The successful bidder will be required to furnish an 85% performance bond when entering into the contract work, per Idaho Code Section 54-1926, "...conditioned upon the faithful performance of the contract in accordance with the plans, specifications and conditions thereof."

**PAYMENT BOND:**

The successful bidder will be required to furnish a 85% payment bond when entering into the contract work, per Idaho code Section 54-1926, "solely for the protection of persons supplying labor or materials, or returning, leasing, or otherwise supplying equipment to the contractor or his subcontractors in the prosecution of the work provided for in such contract."

**CONTRACTOR'S LICENSE:**

In compliance with the Idaho Laws, the contractor must be registered with the State of Idaho, and hold the required Public Works Contractor's License before obtaining the contract documents and before submitting a bid for this work

**RETAINAGE:**

The Owner will retain 5% of the Contractor's earned sum to ensure faithful performance and verify that all taxes are paid on projects. The State Tax Commission requires up to 30 days to provide the verification to the Owner.

The five percent retainage may be used by Owner to offset any and all losses incurred by Owner in the course of the performance of the Contract by Contractor, including but not limited to tax liens, defective performance, defective products – including those of subcontractors or other damage caused by Contractor in the performance of this Contract. Owner shall provide Contractor with a written itemization of all sums retained by Owner at the time of its issuance of final payment. Under no circumstances shall Owner retain more than five percent of the contract price without written agreement of Contractor.

**OWNER/CONTRACTOR AGREEMENT:**

Unless otherwise required in the Bidding documents, the Agreement of the Work will be written on a contract similar to AIA Document A101, Standard Form of Agreement Between Owner and Contractor where the basis of payment is a stipulated sum.

**EMPLOYMENT OF RESIDENTS OF IDAHO:**

In compliance with Idaho Laws, Sections 44-1001 and 44-1002 Idaho Code, the contractor "...must employ ninety-five percent (95%) bona fide Idaho residents as employees on any such contracts except where under such contracts fifty (50) or less persons are employed the contractor may employ ten percent (10%) nonresidents, provided however, in all cases such employers must give preference to the employment of bona fide Idaho residents in the performance of such work..."

**TIME FRAME:**

It is essential that this work be completed on schedule. Construction will begin May 25, 2018, and all work must be complete by August 3, 2018. The successful contractor will be required to work double shifts, overtime, or other arrangements as necessary to insure the project will be completed on time. See section 01142 Liquidated Damages.

**EVIDENCE OF ABILITY:**

Each bidder shall submit with his bid a list of 3 similar projects in scope, size and time frame, that have been completed in the past 5 years, as evidence that said Contractor has the ability to complete this work. Also list manpower available and contractors approach to completing this project in the time frame specified.

**BID SERVICE:**

This project will not be run through the bid service. All sub-bids are to be bid directly to the Prime Bidding Contractors.

**STATE TAX:**

The successful bidder shall within thirty (30) days of award of bid, file appropriate documents with the State Tax Commission as required by the Idaho Code Section 54-1904 A.

END OF INSTRUCTIONS TO BIDDERS



**TYHEE ELEMENTARY HVAC REVISIONS**

**BID FORM**

TO:

GENTLEMEN:

The Undersigned hereby submits the following proposals:

1. BID ITEM:

Having carefully examined the Specifications and Drawings entitled:

2018 - HVAC REVISIONS  
FOR  
TYHEE ELEMENTARY

as well as the premises and conditions affecting the work, the undersigned proposes to furnish all labor and materials and to perform all work as required by and in strict accordance with the above-named documents for the following sum:

BASE BID: (\$ \_\_\_\_\_)

---

2. CONTRACT:

If the undersigned be notified of the acceptance of this proposal,  
\_\_\_\_\_ agrees to execute a contract for  
the above work, for a compensation of the above stated amount.

3. COMPLETION DATE:

The Undersigned hereby also agrees to complete the work contemplated on or before \_\_\_\_\_ 2018, and agrees to the Liquidated Damages for work not substantially complete by this date.

The Undersigned acknowledges receipt of addenda numbers \_\_\_\_, \_\_\_\_, \_\_\_\_.

4. ALCOHOL AND DRUG-FREE WORKPLACE:

Pursuant to Idaho Code, Section 72-1717 I, the undersigned certify that

\_\_\_\_\_  
(Name of contractor)

is in compliance with the provisions of Idaho Code, Section 72-1717 and will maintain such program throughout the life of this contract and shall subcontract work only to subcontractors meeting the requirements of Idaho Code, Section 72-1717 (1)(a).

Dated at \_\_\_\_\_ this \_\_\_\_\_ day  
of \_\_\_\_\_ 2018.

Very truly yours,

\_\_\_\_\_  
Bidder

\_\_\_\_\_  
Street or Building Address

\_\_\_\_\_  
Authorized Signature, Title

\_\_\_\_\_  
City State Zip

\_\_\_\_\_  
Idaho Public Works License No.

\_\_\_\_\_  
Telephone

\_\_\_\_\_  
WORKERS COMPENSATION AND EMPLOYEE LIABILITY EXPIRATION DATE: \_\_\_\_\_

SUB-CONTRACTORS WHO SHALL BE UTILIZED ON THIS CONTRACT:

PLUMBING: (name) \_\_\_\_\_

(Address): \_\_\_\_\_

Idaho Public Works Contractors License No.: \_\_\_\_\_

Idaho Plumbing Contractors License No.: \_\_\_\_\_

HEATING & AIR CONDITIONING (Name) : \_\_\_\_\_

(Address): \_\_\_\_\_

Idaho Public Works Contractors License No.: \_\_\_\_\_

ELECTRICAL (Name): \_\_\_\_\_

(Address): \_\_\_\_\_

Idaho Public Works License No.: \_\_\_\_\_

Idaho Electrical Contractor's License No.: \_\_\_\_\_

END OF BID FORM FOR **TYHEE ELEMENTARY HVAC.**

## CONSTRUCTION CONTRACT

This contract is made and entered into, effective as of «**ContractDate**», by and between School District No. 25, Bannock County, Idaho, (“Owner”), and «Company», (“Contractor”), a company duly licensed as a public works contractor in the State of Idaho, as follows:

1. **DESCRIPTION OF WORK.** Contractor shall perform the following described work, in accordance with the contract plans and specifications, more particularly described below:

2018 HVAC REVISIONS  
FOR  
TYHEE ELEMENTARY

2. **CONTRACT DOCUMENTS.** The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings Specifications, Addenda issues prior to execution of this Agreement, other documents listed in this Agreement and Modifications issued after execution of this Agreement; these form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreement either written or oral.
3. **CONTRACT PRICE.** Owner agrees to pay Contractor, for the work described, the total price of «ContractAmount». Payment of this amount is subject to additions or deductions in accordance with the provisions of this contract.
4. **UNIT PRICES.** Unit prices, if any, are as follows:  
**UNIT PRICES GO HERE OR STATE “NONE”**
5. **PAYMENT SCHEDULE.** Based upon applications for payment submitted to the Architect by the Contractor and Certificates for Payment issued by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided in these Contract Documents.

Each Application for Payment shall be based on the most recent statement of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form and supported by such data to substantiate its accuracy as the Architect may require. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor’s Applications for Payment.

Except with the Owner’s prior approval, the Contractor shall not make advance payments to suppliers for materials, or equipment, which have not been delivered and stored at the site.

Owner shall make final payment to Contractor no later than 30-days after the issuance of the Architect’s final Certificate for Payment or within thirty (30) days after the work is completed, if the contract is at that time fully performed, and subject to the condition that final payment shall not be due until Contractor has delivered to Owner a complete release of all liens arising out of the contract, or receipts in full covering all labor, materials, and equipment for which a lien could be filed. Notwithstanding the above, Owner will retain five percent of the contract price from the final payment to be released to the Contractor when the Owner receives a tax release from the Idaho State Tax Commission. The five percent retainage may be used by Owner to offset any and all losses incurred by Owner in the course of the performance of the Contract by Contractor, including but not limited to tax liens, defective performance, defective products – including those of subcontractors or other damage caused by Contractor in the performance of this Contract. Owner shall provide Contractor with a written itemization of all sums retained by Owner at the time of its issuance of final payment. Under no circumstances shall Owner retain more than five percent of the contract price without written agreement of Contractor. In the event that progress payments will be made under this contract, the payment schedule will be set forth below or in

an attachment hereto:

*Provided that an Application for Payment is received by the Owner not later than the Twenty Fifth (25<sup>th</sup>) day of a month, the Owner shall make payment to the Contractor not later than the Fifteenth (15<sup>th</sup>) day of the following month. If an Application for Payment is received by the Owner after the application date fixed above, payment shall be made by the Owner not later than Thirty (30) days after the Owner receives the Application for Payment.”*

6. **EFFECT OF PAYMENT.** Owner by making payment waives all claims except those arising out of:
  - A. Faulty work appearing after final payment is made;
  - B. Work that does not comply with this contract;
  - C. Outstanding claims of lien;
  - D. Failure of Contractor to comply with any special guarantees required by the contract. Contractor, by accepting final payment, waives all claims except those that he has previously made in writing, and which remain unsettled at the time of acceptance.
7. **STARTING AND COMPLETION DATES.** Construction under this contract shall begin on May 25, 2018, and be completed by August 3, 2018 .
8. **RESPONSIBILITIES OF OWNER.** Owner shall furnish all necessary surveys for the work, and shall secure and pay for easements for permanent structures or permanent changes in existing structures or facilities on the work site, or which are necessary for its proper completion.

Owner reserves the right to let other contracts for construction work to be performed at the work site. Contractor shall cooperate with all other contractors to the effect that their work shall not be impeded by his construction, and shall give such other contractors access to the work site necessary to perform their contracts.

9. **RESPONSIBILITIES OF CONTRACTOR.** Contractor's duties and rights in connection with the above-described project are as follow:
  - A. Responsibility for the Supervision of Construction. Contractor shall be solely responsible for all construction under this contract, including the techniques, sequences, procedures, and means, and for coordination for all work. Contractor shall supervise and direct the work to the best of his ability, and give it all the attention necessary for such proper supervision and direction. The project shall be completed in a proper, workmanlike manner, consistent with the highest standards of quality in the community.
  - B. Furnishing of Labor, Materials, etc. Contractor shall provide and pay for all labor, materials, and equipment, including tools, equipment, and machinery, utilities, including water, transportation, and all other facilities and services necessary for the proper completion of work on the project in accordance with the contract. Ninety-five percent (95%) of Contractor's employees must be bona fide Idaho residents as required by Idaho Code § 44-1001.
  - C. Procurement of Licenses and Permits. Contractor shall pay all taxes required by law in connection with work on the project in accordance with this contract including sales, use, and similar taxes, and shall secure all licenses and permits necessary for proper completion of the work, paying the fees for such licenses and permits. Contractor represents that he is authorized to do business in the State of Idaho and, pursuant to Idaho Code §63-1502, shall provide evidence that he is so qualified.
  - D. Payment of Taxes.
    - i Pursuant to Idaho Code §63-1503, Contractor agrees to pay promptly when due all taxes (other than on real property), excises and license fees due to the state, its subdivisions, and municipal and

quasi-municipal corporation therein accrued or accruing during the term of this contract, whether or not the same shall be payable at the end of such term. If the said taxes, excises, and license fees are not payable at the end of said term, but liability for the payment thereof exists, even though the same constitute liens upon his property, to secure the same to the satisfaction of the respective officers charged with the collection thereof. In the event of the Contractor's default in the payment or securing of such taxes, excises, and license fees, the Contractor hereby consents that the Owner may withhold from any payment due to the Contractor under this contract, the estimated amount of such accrued and accruing taxes, excises, and license fees for the benefit of all taxing units to which said Contractor is liable.

- ii Pursuant to Idaho Code §63-1502, Contractor shall provide evidence that he has paid or secured to the satisfaction of the respective taxing units, as defined in Idaho Code §63-1501, all taxes for which he or his property is liable then due or delinquent.
  - iii Pursuant to Idaho Code §63-1504, before Owner shall approve any claim on account of construction work performed as required by this contract, Contractor (or any sub-contractor claimant) must furnish evidence to Owner that he (i.e. Contractor or any sub-contractor, as the case may be) has paid all taxes, excises and license fees due to the state and its taxing units, due and payable during the term of this contract for such construction, and that he has secured all such taxes, excises, and license fees liability for the payment of which has accrued during the term of this contract, notwithstanding they may not yet be due or payable.
- E. Except as otherwise provided in Idaho Code §44-1002, Contractor must employ ninety-five percent (95%) bona fide Idaho residents as employees on the project unless fifty (50) or less persons are employed in which event Contractor may employ ten percent (10%) nonresidents, provided however, in any case Contractor must give preference to the employment of bona fide residents in the performance of said work.
- F. Compliance With Construction Laws and Regulations. Contractor shall comply with all laws and ordinances, and the rules, regulations, or orders of all public authorities relating to the performance of the work under and pursuant to this contract. If any of this contract is at variance with any such laws, ordinances, rules, regulations, or orders, he shall notify Owner promptly on discovery of such variance.
- G. Responsibility for Negligence of Employees and Subcontractors. Contractor assumes full responsibility for acts, negligence, or omissions of all his employees on the project, for those of his subcontractors and their employees, and for those of all other persons doing work under a contract with him. Smoking and alcohol are prohibited on school property. Unauthorized persons are not allowed on the job site.
- H. Warranty of Fitness of Equipment and Materials. Contractor represents and warrants to Owner that all equipment and materials used in the work, and made a part of the structures on such work, or placed permanently in connection with such work, will be new, of good quality, free of defects, and in conformity with this contract. It is understood and agreed between the parties to this contract that all equipment and materials not so in conformity will be considered defective.
- I. Clean-up. Contractor agrees to keep the work premises and adjoining ways free of waste material and rubbish caused by his work or that of his subcontractors. Contractor further agrees to remove all such waste material and rubbish on termination of the project, together with all of his tools, equipment, machinery, and surplus materials. Contractor agrees, on terminating his work at the site, to conduct general clean-up operations, including the cleaning of all glass surfaces, paved streets and walks, steps, and interior floors and walls.
- J. Indemnity and Hold Harmless Agreement.
- i Contractor agrees to indemnify and hold harmless Owner, and its agents and employees, from and against any and all claims, damages, losses, and expenses, including reasonable attorney's fees in case it shall be necessary to file an action, arising out of performance of the work in this contract, that is (a) for bodily injury, illness, or death, or for property damage, including loss of use, and (b)

caused in whole or in part by Contractor's intentional and/or negligent act or omission, the act of an employee or agent of the Contractor or that of a subcontractor.

- ii Contractor further agrees to indemnify, save harmless, and make whole, Owner from any and all defects appearing or developing in the workmanship or materials performed or furnished under this Contract for a period of one (1) year after the acceptance thereof by Owner.

K. Performance and Payment Bonds. Contemporaneously with the execution of this contract, Contractor shall provide performance and payment bonds in the form required by Idaho Code § 54-1926. The bonds shall be eighty-five percent (85%) of the contract price and shall provide Owner with security for faithful performance of the contract and also provide security for protection of persons supplying labor and/or materials for the contract.

10. **TIME OF ESSENCE; EXTENSION OF TIME.** All times stated in this contract are of the essence. The time stated in this contract may be extended by a change order from Owner for such reasonable time as it may determine, when in its opinion Contractor is delayed in work progress by changes ordered, labor disputes, fire, prolonged transportation delays, injuries, or other causes beyond Contractor's control or which justify the delay. Otherwise, in the event the project is not completed by the scheduled completion date, Contractor shall be required to pay Owner as liquidated damages the sum of \$500 for each calendar day, after the scheduled completion date, that the project is unfinished.

11. **SUBCONTRACTORS.** Contractor agrees to furnish Owner, prior to the execution of this contract, with a list of names of subcontractors to whom he proposes to award the principal portions of the work to be subcontracted by him.

A subcontractor, for the purposes of this contract, shall be a person with whom Contractor has a direct contract for work at the project site.

Contractor agrees not to employ a subcontractor to whose employment Owner reasonably objects, nor shall Contractor be required to hire a subcontractor to whose employment he reasonably objects.

All contracts between Contractor and subcontractor shall conform to the provisions of this contract, and shall incorporate in them the relevant provisions of this contract.

12. **ARBITRATION.** All claims and disputes relating to this contract shall be subject to arbitration at the option of either Owner or Contractor in accordance with the Arbitration Rules of the American Arbitration Association for the construction industry.

- A. A formal written demand for Arbitration shall be filed with BOTH the other party to this contract AND with the American Arbitration Association, within a reasonable time after the dispute has arisen, but NOT LATER THAN SIXTY (60) DAYS after the claim or dispute arose.
- B. A "claim" or "dispute" under this Paragraph arises when the claiming or disputing party FIRST knew or reasonably should have known of the subject matter of the "claim" or "dispute." The purpose of this Paragraph is to encourage the prompt resolution of any and all "claims" or "disputes." As a result, any doubts regarding the determination of when such notice occurred shall be resolved by giving all due deference to the EARLIEST date of notice. The determination of when a "claim" or "dispute" occurred shall not be determined by reference to the date where an "impasse" had occurred.
- C. The Arbitrator is authorized to award reasonable attorney fees to the prevailing party.

13. **INSURANCE.** Contractor agrees to keep in force at his own expense during the entire period of construction on the project such liability insurance as will protect him from claims, under workers' compensation and other employee benefit laws, for bodily injury and death, and for property damage, that may arise out of work under this contract, whether directly or indirectly by Contractor, or directly or indirectly by a subcontractor. The

minimum liability limits of such insurance shall not be less than the limits required by law for that type of damage claim. Proof of such insurance shall be filed by Contractor with Owner within a reasonable time after execution of this contract. Contractor shall be responsible for insuring all construction materials, tools and equipment stored at the job site.

14. **CORRECTING WORK.** When it appears to the Owner or the Contractor during the course of construction that any work does not conform to the provisions of this contract, Contractor shall make necessary corrections so that such work will so conform, and in addition will correct any defects caused by faulty materials, equipment, or quality of performance in work supervised by him or by a subcontractor, appearing within one (1) year from the date of final payment, or within such longer period as may be prescribed by law.
15. **WORK CHANGES.** Owner reserves the right to order work changes in the nature of additions, deletions, or modifications, without invalidating this contract, and agrees to make corresponding adjustments in the contract price and time for completion.

All changes will be authorized by a written change order signed by Owner. The change order will include conforming changes in the contract price and completion time.

Work shall be changed, and the contract price and completion time shall be modified only as set out in the written change order. No work is to be initiated without the written change order in place.

Any adjustment in the contract price resulting in a credit or a charge to Owner shall be determined by mutual contract of the parties, or by arbitration, before starting the work involved in the change.

The total allowance for combined overhead and profit for changes shall be included in the total cost to the owner and shall be based on the following schedule.

- A. For the Contractor, 10% over cost.
- B. For the Sub-Contractor, 15% over cost to be divided 10% for Sub-Contractor and 5% for Contractor.
- C. For any Sub-Subcontractor, 15% over cost to be divided 5% for Contractor, 5% for Sub-Contractor, and 5% for Sub-Subcontractor.

16. **CONTRACTOR'S TERMINATION.** Owner may, on five days notice to Contractor, terminate this contract before the completion date specified in this contract, or extended times provided by approved change orders, and without prejudice to any other remedy they may have, if Contractor defaults in performance of any provision in this contract, or fails to carry out his work in accordance with the provisions of the contract documents. If the unpaid balance on the contract price at the time of such termination exceeds the expense of finishing the work, owners will pay such excess to Contractor. If the expense of finishing the work exceeds the unpaid balance at the time of termination, Contractor agrees to pay the difference to Owners.
17. **GOVERNING LAW.** It is agreed that this contract shall be governed by, construed, and enforced in accordance with the laws of the State of Idaho.
18. **GENDER AND NUMBER.** As used in this contract, the masculine, feminine, or neuter gender, and the singular or plural number, each shall be deemed to include the other whenever the context so indicates.
19. **ATTORNEY FEES.** In the event that any action, including Arbitration, is filed in relation to this contract, the unsuccessful party in the action shall pay to the prevailing party, in addition to all the sums that either party may be called on to pay at Arbitration, a reasonable sum for the successful party's attorney's fees.
20. **ENTIRE AGREEMENT.** This contract shall constitute the entire agreement between the parties and any prior understanding or representation of any kind preceding the date of this contract shall not be binding upon either party except to the extent incorporated in this contract.

21. **MODIFICATION OF AGREEMENT.** Any modification of this contract or additional obligation assumed by either party in connection with this agreement shall not be binding upon either party except to the extent an amendment in writing, executed by both the Owner and the Contractor.

22. **NOTICES.** Any notice provided for or concerning this contract shall be in writing and be deemed sufficiently given when sent by certified or registered mail and addressed as follows:

To: Owner  
School District No. 25  
3115 Poleline Rd.  
Pocatello, Idaho 83201-6119

To: Engineered Systems Assoc., Inc.  
1355 East Center  
Pocatello, Idaho 83201

23. **ASSIGNMENT OF RIGHTS.** The rights of each party under this contract are personal to that party and may not be assigned or transferred to any other person, firm, corporation, or other entity without the prior, express, and written consent of the other party.



24. **PARAGRAPH HEADINGS.** The titles to the paragraphs of this contract are solely for the convenience of the parties and shall not be used to explain, modify, simplify, or aid in the interpretation of the provisions of this contract.

**IN WITNESS WHEREOF** the parties have executed this contract on the date indicated below:

**CONTRACTOR:**  
«Company»

Dated: \_\_\_\_\_

By: \_\_\_\_\_

Title: \_\_\_\_\_

Attest: \_\_\_\_\_

**OWNER:**  
School District No. 25  
Bannock County, Idaho

Dated: \_\_\_\_\_

By: \_\_\_\_\_

Bart J. Reed  
Director of Business Operations

Attest: \_\_\_\_\_

10018M.wpd  
REVISED February, 2017.cbg  
Reviewed/Approved/BR

KNOW ALL MEN: That we \_\_\_\_\_, Principal,  
\_\_\_\_\_, Surety,

are held firmly bound unto \_\_\_\_\_, Owner,  
in the sum of \_\_\_\_\_ Dollars  
(\$\_\_\_\_\_)

for the payment of which we bind ourselves, our legal representatives, successors, and assigns, jointly and severally, firmly by the presents.

WHEREAS, Principal has executed contract with Owner, dated  
for

copy of which contract is by reference made a part hereof.

NOW, THEREFORE, if Principal shall faithfully perform such contract and pay all persons who have furnished labor or material for use in or about the improvement and shall indemnify and save harmless the Owner from all cost and indemnify and save harmless the Owner from any defect or defects in any of the workmanship or materials entering into any part of the work which shall develop or be discovered within one year after the final acceptance of such work, then this obligation shall be null and void, otherwise it shall remain in full force and effect.

Provided, that the liability hereunder for defects in materials or workmanship for a period of one year after final acceptance of the work shall not exceed the sum of: \_\_\_\_\_ Dollars  
(\$\_\_\_\_\_)

All persons who have furnished labor or materials for use in or about the improvement shall have a direct right of action under the bond, subject to the Owner's priority.

The Contract, including the completion thereof after default, if any, shall be prosecuted under full supervision of a duly qualified Engineer.

Any payment of payments under the bond shall reduce its penalty to the extent of such payment of payments.

No suit or action may be maintained under the bond unless it shall have been instituted within two years from date on which final payment under the contract falls due.

The Owner and Engineer shall cooperate with and assist Surety in prosecuting its rights and claims, if any, against Principal and others by supplying testimony, books, records, and documentary evidences in their possession.

The Surety hereby waives notice of any alterations, extensions, or forbearance made or extended by the Owner or Principal.

In event Principal is in default under the contract as defined therein, Surety will (a) within fifteen days of determination of such default, take over and assume completion of said contract and become entitled to the payment of the balance of the contract price, or (b) pay the Owner in cash the reasonable cost of completion, less the balance of the contract price including retained percentage. The cost of completion shall be fixed by taking bids from at least three responsible contractors, one chosen by the Owner, one by the Engineer, and one by the Surety. The Surety will make such payment within fifteen days after the cost of completion shall have been so determined.

Signed and sealed this \_\_\_\_\_ day of \_\_\_\_\_ 2018.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

(Principal)

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

(Surety)

## **DIVISION 01 - GENERAL PROVISIONS**

### **01002 SCOPE OF WORK**

1. The work to be done under this specification includes the furnishing of all labor, equipment, and materials to do all work as specified and shown on the drawings. It is the intent of these specifications that the work shall be complete and ready for operation before acceptance. The work shall include, but is not necessarily limited to, the following:
  - a. Replacement of the existing HVAC systems, new electrical, motor control center, and cutting and patching required for the replacement work.

### **01005 INTERPRETATIONS**

1. Questions regarding drawings and specifications should be addressed to Engineered Systems Associates, 1355 East Center, Pocatello, Idaho 83201. Questions will be answered by bulletin or addendum addressed to all Bidders. All addenda issued during the time of bidding will be incorporated into the contract. Questions received less than 48 hours before bid time cannot be answered. Contact with District Staff, Board of Trustees, or Administration will be by written permission only.

### **01010 ORDINANCES**

1. The work shall be installed in accordance with the local plumbing and electrical codes, any other government code or ordinance that pertains to this type of work, and to the rules and regulations of the local utility companies.
2. Should these specifications and drawings conflict with any regulatory codes, the most stringent requirement shall govern the proper installation of the work and no extra charge shall be made for any changes required to comply with the code.
3. The contractor hereby binds himself to protect and save harmless the owner from all damages arising from the violation of any and all Federal, State, County, City, and all other laws, rules, regulations, in the performance of the terms of the contract.

### **01015 WORKMANSHIP**

1. Workmanship shall be the best quality of its kind for respective industries, trades, crafts, and practices and shall be acceptable in every respect to the Owner, making good and perfect work in all details of construction.

### **01018 EXAMINATION OF SITE AND CONDITIONS**

1. Before submitting a proposal, Bidders shall carefully examine the drawings and specifications, visit the worksite and fully inform themselves of all existing conditions and limitations, and shall include in their proposal a sum to cover the cost of all items included in the contract and shall rely entirely on their own examination in making their proposal.

### **01020 FEES & PERMITS**

1. The Contractor shall procure all necessary permits, pay for the same and shall obtain all official license for the construction of the work and for temporary obstructions, enclosures, openings of streets for pipes, walls, etc. arising from the construction and completion of the work as mentioned in the specifications. He shall be responsible for all violations of the law for any reason in connection with the construction of the work or caused by obstructing streets, sidewalks, etc., and he shall give all requisite notice to public authorities.

### **01040 HOLD HARMLESS AGREEMENT**

1. In addition to obtaining insurance coverage as required by the Contract Documents above, Contractor shall indemnify and save harmless Owner from and against any and all liability, demands, causes of action, or claims

thereof, whether well-founded or otherwise, including the cost of defending the same, for bodily injury to any person whomsoever, (including employees of Owner) or damage to property of any person in the course of, or in connection with, the operations by Contractor under this Contract. No subcontractor shall relieve the Contractor of any of his liability or obligations under the contract. Contractor agrees that he is fully responsible to Owner for acts or omissions of his sub-contractors and their material men and of persons either directly or indirectly employed by them.

#### **01045 LIENS AND ENCUMBRANCES**

1. The Contractor, before receiving final payment of the job, shall furnish evidence of satisfactory and complete release on all liens and encumbrances of any nature that he may have placed thereon.
2. All sub-contractors furnishing material must be paid in full and receipted bills therefrom be submitted before final payment is made.

#### **01050 EXECUTION, CORRELATION AND INTENT OF DOCUMENTS**

1. Perfect coordination of all the documents comprising the contract is sought in their preparation. The formal contract document shall, however, be construed as precedent to and as superseding provisions in, or inferences drawn from provisions in any or all other documents of the contract in disagreement therewith. In case of disagreement between the drawings and the specifications, the specifications' requirements shall prevail. Requirements shown on the drawings and not cited or contradicted in the specifications or requirements cited in the specifications and not shown on the drawings, shall be as binding upon the parties as though cited in the specifications and shown on the drawings.

#### **01055 DETAIL DRAWINGS AND INSTRUCTIONS**

1. Contractor shall check all drawings and any supplementary drawings which may be furnished by the Engineer and shall promptly notify the Engineer of any discrepancies. Each Contractor shall compare all drawings and verify figures before laying out his work and will be responsible for any errors which might have been avoided thereby. When measurements are affected by conditions already established, the Contractor shall take measurements, notwithstanding the giving of scale, or figure, dimensions on the drawings. All questions regarding the figures, drawings, plans and specifications and the interpretation thereof and resolving of conflicts and inconsistencies therein shall be determined by the Engineer, and the work shall be performed in accordance with such determinations and instructions of the Engineer.
2. The omission from the drawings or specifications or the description of details of work which is evidently necessary to carry out the intent of the drawings and specifications, or which is customarily performed, shall not relieve the Contractor from performing such omission and details of work but they shall be performed as if fully, correctly set forth and described in the drawings and specifications.

#### **01060 CHANGES IN THE WORK**

1. The owner, without invalidating the contract, may order extra work or make changes by altering, adding to or deducting from the work, the contract sum being adjusted accordingly. All such work shall be executed under the conditions of the original contract, except that any claim for extension of the time caused thereby shall be adjusted at the time of ordering such change.
2. The total allowance for combined overhead and profit for changes shall be included in the total cost to the owner and shall be based on the following schedule: A. For the Contractor, 10% over cost.; B. For the Sub-Contractor, 15% over cost to be divided 10% for Sub-Contractor and 5% for Contractor; and C. For any Sub-Subcontractor, 15% over cost to be divided 5% for Contractor, 5% for Sub-Contractor, and 5% for Sub-Subcontractor.

#### **01065 BRAND NAMES AND SUBSTITUTIONS**

1. Reference in this specification to any product or material by name, make or catalog number shall be interpreted as establishing a standard of quality and shall not be construed as limited competition. The Contractor may, at his option, use any product or material that conforms with this specification for which he has received written approval five days prior to bid opening.
2. Substitution request shall include complete submittal data showing compliance with the specified items and listing any differences from that specified.

#### **01070 EQUIPMENT SUBMITTAL**

1. Equipment and materials proposed for installation shall be submitted in six copies to the Engineer by the Contractor for the Engineer's approval or rejection. The schedules shall include catalogs, cuts, drawings and such other descriptive data or samples that are requested by the Engineer. The submittals must be in the Engineer's office not later than ten (10) days after award of contract. Contractor shall not order any equipment until he has received written approval from the Engineer.
2. The contractor shall provide all labor, materials, tools, and equipment, etc. necessary for the complete and substantial execution of everything described in the plans and specifications.

#### **01075 CONTRACTOR SHALL VISIT THE SITE**

1. The Contractor shall visit the site before placing his bid in order to become familiar with existing conditions. No extra charge will be paid to the Contractor due to his failure to completely ascertain existing conditions.

#### **01080 MATERIALS, EQUIPMENT AND ACCESSORIES**

1. Unless otherwise specified, all equipment, accessories and materials shall be new and undamaged, and the workmanship shall be of the best quality for use intended and shall be acceptable to the Engineer or Owner.
2. Equipment, accessories and materials shall be essentially the standard products of the manufacturer, or as specified herein. Where two or more units of the same class of new equipment are required, these units shall be products of a single manufacturer.
3. The contractor shall make arrangement and coordinate with the Maintenance Dept. for storage of materials and equipment. Any damages of life or property caused by storage of materials on the above indicated place shall be paid for by the contractor, who shall hold the owner harmless for any damages concerning the same.

#### **01085 REMOVING OF DEBRIS, ETC.**

- I. The contractor shall at all times keep the premises free from accumulations of waste material or rubbish caused by his employees or work, and at the completion of the work he shall remove all his rubbish from and about the building and all tools and surplus materials and shall leave his work clean. In case of dispute, the owner shall remove the rubbish and surplus materials and charge the cost to the contractor.
- II. Upon completion of the work remove all surplus materials and rubbish. Clean all spots resulting from this work from hardware, floors, glass, walls, etc. Do all required patching up and repair of work of other trades damaged by this division of the work and leave the premises in a clean, orderly condition.

#### **01090 INSPECTIONS**

1. The Contractor must at all times allow the Owner's authorized representative to come on the job for the purpose of inspection and lend any assistance necessary to help this work along.

## **01092 MAINTENANCE & OPERATING MANUALS**

1. Prior to the pre-final project review, this Contractor shall compile two (2) sets of Maintenance and Operating Instructions. Bind each set in a three-ring loose leaf binder. Manuals shall include, but shall not be limited to, the following:
  - a. Provide a master index at beginning of Manual showing items included. Use plastic index tabs for sections of Manual.
  - b. First section shall have an index tab labeled "General" and shall contain the following information:
    1. One sheet consisting of names, addresses, and phone numbers of Mechanical & Electrical Engineers, General Contractor, and Subcontractors.
    2. One sheet entitled List of Suppliers which gives a complete list of equipment installed with name, address, and phone number of vendor for each item of equipment.
    3. Sheets entitled Description of System which give a general description of the mechanical system. The information should be broken into three categories:
      - Major Equipment Location
      - Descriptions of Systems and Operations
      - Suggested Maintenance and Routines:
        - a) Summary list of mechanical equipment requiring lubrication showing name of equipment, location, and type and frequency of lubrication.
        - b) List of mechanical equipment used indicating name, model, serial number, and name plate data of each item together with number and name associated with each system item.
  - c. The second section shall have an index tab labeled "Equipment" and shall be followed by an index tab for each type of equipment, including plumbing fixtures, temperature controls, doors, ceilings, floor, and electrical.
    1. Include approved copies of submittals for each piece of equipment. Literature shall show capacities and size of equipment used and be marked indicating each specific item with applicable data underlined.
    2. Include manufacturer's published maintenance and operating instructions for each piece of equipment.
      - a) Instructions shall include name of vendor, installation instructions, parts numbers & lists, operation instructions of equipment, and maintenance & lubrication instructions.
      - b) Step-by-step procedure to follow in putting each piece of mechanical equipment into operation.
      - c) Provide schematic control diagrams for each separate fan system, refrigeration system, heating system, control panel, etc. Each diagram shall show locations of start-stop switches, insertion thermostats, room thermostats, thermometers, firestats, pressure gauges, automatic valves, and refrigeration accessories. Mark correct operating settings for each control instrument on these diagrams.
      - d) Provide diagram for electrical control system showing wiring of related electrical control items such as firestats, fuses, interlocks, electrical switches, and relays.
      - e) Provide a drawing of each temperature control panel identifying components on the panels and their function.
      - f) Provide a sequence of control as part of the temperature control section.
  - d. Provide an index tab for the Air Balance and Test Run Reports and insert the reports.
2. These manuals shall be submitted to the Engineer for approval and distribution prior to the pre-final project review.

## **01100 BUILDING DAMAGE**

1. This Contractor shall be responsible for any damage to the building, carpets, furnishings, etc., caused by his workmen. Special care shall be taken to cover all carpets, floors, protect wall and ceilings. If floors are damaged repairs will be at the Contractors expense. If carpets are soiled by this Contractor, he shall clean the

carpets at his expense. If building walls are soiled, he shall be required to clean the walls or repaint them. Take special care in moving about in this building facility. Protect stairs with covering and plywood.

2. All walls, floors and ceilings shall be protected in the areas of construction and the areas of access to the construction. Any damage to existing surfaces shall be patched and repaired to match the existing conditions as approved by the Engineer at the Contractor's expense.

#### **01105 CONTRACTOR USE OF BUILDING FACILITIES**

1. This Contractor will not be allowed the use of the building rest room facilities, showers, cooking facilities, refrigerators, etc., or to occupy other areas of the building such as classroom facilities. Lunches and food should be eaten in the mechanical room or outside of the building. The Contractor will be responsible to clean the facilities when he leaves the project.
2. The Contractor shall provide onsite temporary toilet facilities for use of Contractor's employees during the period of work on this contract.

#### **01110 CO-ORDINATION AND SCHEDULING**

1. Contractor shall confer with the Owner at site to determine most suitable time to perform the work. Once started, the installation shall be completed promptly to get the system back in service as soon as practical.

#### **01115 TEST RUN**

1. Contractor shall operate system for such time as necessary to demonstrate satisfactory performance. Make required adjustments and instruct Owner's representative in its proper operation and maintenance.

#### **01120 GUARANTEE**

1. Contractor shall warrant and guarantee all work performed by him directly and by his sub-contractors, and shall make good any defect in workmanship or materials which may develop in his work within one year from the date of final acceptance thereof. Any repairs, adjustments or replacements must be made promptly after notification from the Owner of such defects.

#### **01122 PATCHING AND PAINTING EXCEPT WHERE NOTED OTHERWISE.**

1. Necessary openings shall be cut to approximately the required size with neat workmanship and with openings properly located for the proper operation of the system and the utility of the space considered. Necessary patching shall be done in such a way that brick and concrete if removed shall be restored as it was. Plaster shall be restored as it was; plaster shall be spackled or re-plastered as required. All surfaces shall be restored with first quality materials of a color to properly match the existing materials surrounding the opening or place where patching has been done.
2. All equipment furnished in finished painted condition by this Contractor shall be left without mark or scratch. Any necessary refinishing to match original shall be done.
3. It is the Contractors responsibility to patch and repair all openings or unfinished areas left by the Contractor and subcontractors due to the demolition of the existing equipment and piping or installation of new equipment and piping except where noted. Areas shall be patched to match the existing conditions where noted. Painting will be done by the Owner.
4. All carpet patching will be done by the owner.

#### **01125 APPLICATIONS FOR PAYMENTS**

1. At least ten (10) days before the request for the first payment on the contract the Contractor shall furnish to the Engineer, for his approval, a schedule of values or a breakdown of the various parts of the work as subdivided in the specifications (for the total equaling the contract price) on forms approved by the Engineer in triplicate.



The approved values shall become the basis for determining progress payments and for negotiating change orders. Reference be made to the Contract Agreement, a copy of which is bound with these specifications.

2. At least ten (10) days before each payment falls due, the Contractor shall submit to the Engineer three copies of a statement of the form described above showing the proportionate part of the work performed and materials on the site up to the first of the month, which date shall be the termination of the period covered by the payment. Such statement shall be made in the form approved by the Engineer, but it shall not be binding against the Engineer's judgment.
3. Application for payments dated on or prior to the 25<sup>th</sup> of the month, shall be made by the 15<sup>th</sup> of the following month. Application for payments dated after the 25<sup>th</sup> of the month, payment shall be made within the next pay cycle.
4. The first payment on this project will be made after July 1, 2018.

#### **01130 CONTRACTOR'S LIABILITY FOR TAXES**

1. In accordance with Section 3, Chapter 246, Idaho Session Laws, 1937, the Contractor in consideration of securing the business of erecting or construction public works in the state, recognizing that the business in which he is engaged is of a transitory character and that in the pursuit thereof, his property contained therein may be without the state when taxes, excises or license fees to which he is liable become payable, agrees:
  - a. To pay promptly when due all taxes (other than real property) and license fees due to the state, its subdivisions and municipal or quasimunicipal corporation therein accrued or accruing during the term of this Contract, whether or not the same shall be payable at the end of such term.
  - b. That if said taxes, excises and license fees are not payable at the end of such term, both liability for the payment thereof, exists, even though the same constitute liens upon his property to secure the same to the satisfaction of the respective officers charged with the collection thereof;
  - c. That, in the event of his default in the payment of securing of such taxes, excises and license fees, to consent that the department, officer, board or taxing unit entering into the Contract may withhold from any payments due him hereunder the estimated amount of such accrued and accruing taxes, excises and license fees for the benefit of all taxing units to which said Contractor is liable.
  - d. The Contract Sum and any agreed variations there, includes all Federal, State and Local taxes imposed by law.

#### **01135 OWNERSHIP OF REMOVALS**

1. The Owner shall have first right to claim any of the existing equipment or materials being removed. The Contractor shall notify the Owner when he is ready to do the demolition and the Owner shall have a maximum of one week to make his wishes known to the Contractor. A list of Owner desired equipment will be issued as an addendum.
2. The Contractor shall be responsible for any or all other removals as may be necessary and required to entirely complete the work included under this contract.
3. All apparatus, equipment, fixtures, electrical work, mechanical work, utilities, piping and all other salvageable materials of whatever character shall carefully be removed by the Contractor and/or Subcontractors and same shall be the property of the Contractor, except where specifically called out on the drawings or listed in the addendum.

#### **01136 DEMOLITION**

1. The Contractor shall contain demolition work required in each room or area so as to minimize any dust and damage to other parts of the building.
2. Protect all walls, floors and ceilings were demolition takes place.

3. Remove all material from the building as soon as possible and protect areas of exit from damage from the removed material and equipment.

**01140 ROOFING REPAIRS**

1. All roofing and patching related to any new work on the roof to be performed by a metal roofing certified Contractor to maintain the current warrantee. The curbs are to extend a minimum of 12 inches above the roof surface. Roofing Contractor shall inspect existing roof where new work is to be done to verify condition and protection required.
2. A letter from the roofing manufacturer will be required verifying that the current roof warrantee has been maintained or extended.

**01142 ASBESTOS**

1. Any asbestos encountered shall be called to the attention of the engineer and the owner.
2. All asbestos removal work will be taken care of by the school district under separate contract.

**01144 DATA, FIRE ALARM AND SECURITY**

1. Any changes necessary to the existing data, fire alarm, security, or speaker system to complete the work specified shall be called to the attention of the engineer and the owner.
2. The owner shall take care of any changes to the existing data, fire alarm, security system, or speaker system under separate contract or with their own forces.

**01146 LIQUIDATED DAMAGES**

1. The Owner will suffer financial loss in an amount that is difficult to quantify if the Project is not Substantially Complete on the date set forth in the Contract Documents. The Contractor (and his Surety) shall be liable for and shall pay to the Owner the sums hereinafter stipulated as fixed, agreed and liquidated damages, and not as a penalty, for each calendar day of delay until work is Substantially Complete:

Five Hundred and no/100-----Dollars (\$500.00)

**01147 SUPERINTENDENT**

1. The Contractor shall employ a competent Superintendent who shall be in attendance at the project site during the performance of any work by the Contractor or his sub-contractors. The Superintendent shall represent the Contractor and communications given to the Superintendent shall be as binding as if given to the Contractor. Important communications shall be confirmed in writing.
2. The Superintendent shall not be changed except with the consent of the Engineer unless the Superintendent proves to be unsatisfactory to the Contractor and ceases to be in his employ. Under this circumstance the new Superintendent shall also be satisfactory to the Engineer and the Owner.
3. The Superintendent shall coordinate all work of the sub-contractors so as to insure the work is completed on time and coordinate between all sub-contractors.
4. The Superintendent shall have safety and coordination meetings with all contractors and sub-contractors at least weekly.

**01148 CONSTRUCTION MEETINGS**

1. At the pre-construction meeting all contractors and sub-contractors shall be present. A construction schedule shall be presented by the contractor.
2. Construction meetings will be scheduled for the project. All contractors and sub-contractors working at the time are expected to be present for the construction meetings.
3. The Owners representative and the Engineer will be present at all construction meetings.

**01150 GENERAL CONDITIONS**

1. By reference, the Standard Form of the American Institute of Architects for General Conditions of the Contract, A.I.A. Document A 201 is a part of this contract.

**END OF DIVISION 01**

**DIVISION 02: GENERAL WORK**

02002 CUTTING AND PATCHING

**DIVISION 02: GENERAL WORK**

**SECTION 02002 – CUTTING AND PATCHING**

**PART 1 - GENERAL**

1.1 SECTION INCLUDES

- A. All existing surfaces that must be cut or demolished as shown on the drawings or as required for the demolition for the existing system and the installation of the new equipment and lighting.
- B. All surfaces shall be patched with materials to match the existing surfaces.
- C. All surfaces that are patched shall be finished and ready for painting. All painting work to be done by the School District.
- D. Any carpet replacement will be done by the School District after the floors have been patched.
- E. Any wood floors or structures will be patched by this Contractor.
- F. Any concrete masonry walls or structure shall be patched with concrete masonry.
- G. Any roof patching will need to be done with metal roof material to match the existing roof and sealed water tight. Work to be done by a certified Metal Roofing Contractor.
- H. All existing carpet areas and flooring shall be protected with four mil plastic and plywood covering to protect the area where construction work is taking place and the hallways and exits are being used for access by the Contractor.
- I. All hall walls and exits used by the Contractor shall be protected by heavy plastic floor to ceiling to prevent damage by the Contractor during the construction period.

END OF SECTION 02002

END OF DIVISION 02

**DIVISION 23: HEATING, VENTILATING, AND AIR-CONDITIONING**

**23 0000 HEATING, VENTILATING, AND AIR-CONDITIONING**

- 23 0501 COMMON HVAC REQUIREMENTS
- 23 0502 DEMOLITION AND REPAIR
- 23 0553 IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT
- 23 0593 TESTING, ADJUSTING, AND BALANCING
- 23 0713 DUCT LINING
- 23 0716 MECHANICAL INSULATION AND FIRE STOPPING
- 23 0800 FIRE STOPPING
- 23 0933 AUTOMATIC TEMPERATURE CONTROLS

**23 2000 HVAC PIPING AND PUMPS**

- 23 2300 REFRIGERANT PIPING SYSTEMS
- 23 2310 REFRIGERANT SPECIALITIES
- 23 2600 CONDENSATE DRAIN PIPING

**23 3000 HVAC AIR DISTRIBUTION**

- 23 3114 LOW-PRESSURE STEEL DUCTWORK
- 23 3316 FIRE DAMPERS
- 23 3713 AIR OUTLETS & INLETS
- 23 4100 DISPOSABLE FILTERS

**23 4000 CENTRAL HEATING AND COOLING EQUIPMENT**

- 23 4145 FURNACE AIR PIPING
- 23 5417 HIGH EFFICIENCY NATURAL GAS FURNACE
- 23 7413 PACKAGED ROOFTOP AIR CONDITIONING UNITS

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## SECTION 23 0501 – COMMON HVAC REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Furnish labor, materials, and equipment necessary for completion of work as described in Contract Documents.
- B. It is the intent of these specifications that the systems specified herein are to be complete and operational before being turned over to the owner. During the bidding process, the contractor is to ask questions or call to the engineer's attention any items that are not shown or may be required to make the system complete and operational. Once the project is bid and the contractor has accepted the contract, it is his responsibility to furnish and install all equipment and parts necessary to provide a complete and operational system without additional cost to the owner.
- C. Furnish and install fire stopping materials to seal penetrations through fire rated structures and draft stops.
- D. Includes But Not Limited To:
  - 1. General procedures and requirements for HVAC.
- E. Related Sections:
  - 1. Section 23 0593: Testing, Adjusting, and Balancing for HVAC.

#### 1.3 SUBMITTALS

- A. Substitutions: By specific designation and description, standards are established for specialties and equipment. Other makes of specialties and equipment of equal quality will be considered provided such proposed substitutions are submitted to the Architect for his approval, complete with specification data showing how it meets the specifications, at least 5 working days prior to bid opening. A list of approved substitutions will be published as an addendum.
  - 1. Submit a single copy of Manufacturer's catalog data including Manufacturer's complete specification for each proposed substitution.
  - 2. The Architect or Engineer is to be the sole judge as to the quality of any material offered as an equal.
- B. Product Data, Shop Drawings: Within 30 days after award of contract, submit 6 sets of Manufacturer's catalog data for each manufactured item.
  - 1. Literature shall include enough information to show complete compliance with Contract Document requirements.
  - 2. Mark literature to indicate specific item with applicable data underlined.
  - 3. Information shall include but not be limited to capacities, ratings, type of material used, guarantee, and such dimensions as are necessary to check space requirements.
  - 4. When accepted, submittal shall be an addition to Contract Documents and shall be in equal force. No variation shall be permitted.
  - 5. Even though the submittals have been accepted by the Engineer, it does not relieve the contractor from meeting all of the requirements of the plans and specifications and providing a complete and operational system.
- C. Drawings of Record: One complete sets of blue line mechanical drawings shall be provided for the purpose of showing a complete picture of the work as actually installed.
  - 1. These drawings shall serve as work progress report sheets. Contractor shall make notations neat and legible therein daily as the work proceeds.
  - 2. The drawings shall be kept at the job at a location designated by the Mechanical Engineer.
  - 3. At completion of the project these "as-built" drawings shall be signed by the Contractor, dated, and returned to the Architect.

- D. Operating Instructions and Service Manual: The Mechanical Contractor shall prepare 2 copies of an Operation and Maintenance Manual for all mechanical systems and equipment used in this project. Manuals shall be bound in hard-backed binders and the front cover and spine of each binder shall indicate the name and location of the project. Use plastic tab indexes for all sections. Provide a section for each different type of equipment item. The following items shall be included in the manual, together with any other pertinent data. This list is not complete and is to be used as a guide.
1. Provide a master index at the beginning of the manual showing all items included.
  2. The first section of the manual shall contain:
    - a. Names, addresses, and telephone numbers of Architect, Mechanical Engineer, Electrical Engineer, General Contractor, Plumbing Contractor, HVAC Contractor, and Temperature Control Contractor.
    - b. List of Suppliers which shall include a complete list of each piece of equipment used with the name, address, and telephone number of vendor.
    - c. General Description of Systems including –
      - 1) Location of all major equipment
      - 2) Description of the various mechanical systems
      - 3) Description of operation and control of the mechanical systems
      - 4) Suggested maintenance schedule
    - d. Copy of contractor's written warranty
  3. Provide a copy of approved submittal literature for each piece of equipment.
  4. Provide maintenance and operation literature published by the manufacturer for each piece of equipment which includes: oiling, lubrication and greasing data; belt sizes, types and lengths; wiring diagrams; step-by-step procedure to follow in putting each piece of mechanical equipment in operation.
  5. Include parts numbers of all replaceable items.
  6. Provide control diagram and operation sequence, along with labeling of control piping and instruments to match diagram.
  7. Include a valve chart indicating valve locations.
- E. Include air balance and/or water balance reports.
- F. Include Start-up Reports.

#### 1.4 SUBMITTALS FOR COMMON HVAC REQUIREMENTS

- A. Quality Assurance / Control:
1. Manufacturer's installation manuals providing detailed instructions on assembly, joint sealing, and system pressure testing for leaks.
  2. Specification data on sealer proposed for sealing ductwork.
- B. Quality Assurance
1. Requirements: Construction details not specifically called out in Contract Documents shall conform to applicable requirements of SMACNA HVAC Duct Construction Standards.
  2. Pre-Installation Conference: Schedule conference immediately before installation of ductwork.

#### 1.5 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies:
1. Perform work in accordance with applicable provisions of local and state Plumbing Code, Gas Ordinances, and adoptions thereof. Provide materials and labor necessary to comply with rules, regulations, and ordinances.
  2. In case of differences between building codes, state laws, local ordinances, utility company regulations, and Contract Documents, the most stringent shall govern. Promptly notify Architect in writing of such differences.
- B. Applicable Specifications: Referenced specifications, standards, and publications shall be of the issues in effect on date of Advertisement for Bid.
1. "Heating, Ventilating and Air Conditioning Guide" published by the American Society of Heating and Air Conditioning Engineers.
  2. "Engineering Standards" published by the Heating, Piping, and Air Conditioning Contractors National Association.
  3. "2015 International Building Code", "2015 International Mechanical Code", and "2015 International Fire Code" as published by the International Conference of Building Officials.



4. 2015 Idaho Plumbing Code as published by the International Association of Plumbing and Mechanical Officials.
5. "National Electrical Code" as published by the National Fire Protection Association.
6. "2015 International Energy Conservation Code".

C. Identification: Motor and equipment name plates as well as applicable UL and AGA labels shall be in place when Project is turned over to Owner.

#### 1.6 INSPECTIONS AND PERMITS

A. Pay for permits, fees, or charges for inspection or other services. Local and state codes and ordinances must be properly executed without expense to Owner and are considered as minimum requirements. Local and state codes and ordinances do not relieve the Contractor from work shown that exceeds minimum requirements.

#### 1.7 ADDITIONAL WORK:

A. Design is based on equipment as described in the drawing equipment schedule. Any change in foundation bases, electrical wiring, conduit connections, piping, controls and openings required by alternate equipment submitted and approved shall be paid for by this division. All work shall be in accordance with the requirements of the applicable sections.

### **PART 2 - PRODUCTS FOR COMMON HVAC REQUIREMENTS**

A. Finishes, Where Applicable: Colors as selected by Architect.

B. Duct Hangers:

1. One inch 25 mm by 18 ga 1.27 mm galvanized steel straps or steel rods as shown on Drawings, and spaced not more than 96 inches 2 400 mm apart. Do not use wire hangers.
2. Attaching screws at trusses shall be 2 inch 50 mm No. 10 round head wood screws. Nails not allowed.

### **PART 3 - EXECUTION**

#### 3.1 EXAMINATION

A. Site Inspection:

1. Examine premises and understand the conditions which may affect performance of work of this Division before submitting proposals for this work.
2. No subsequent allowance for time or money will be considered for any consequence related to failure to examine site conditions.

B. Drawings:

1. Mechanical drawings show general arrangement of piping, ductwork, equipment, etc, and do not attempt to show complete details of building construction which affect installation. This Contractor shall refer to site visit for additional building detail which affect installation of his work.
  - a. Follow mechanical drawings as closely as actual building construction and work of other trades will permit.
  - b. No extra payments will be allowed where piping and/or ductwork must be offset to avoid other work or where minor changes are necessary to facilitate installation.
  - c. Everything shown on the mechanical drawings shall be the responsibility of Mechanical Contractor unless specifically noted otherwise.
2. Because of small scale of mechanical drawings, it is not possible to indicate all offsets, fittings, and accessories which may be required. Investigate structural and finish conditions affecting this work and arrange work accordingly, providing such fittings, valves, and accessories required to meet conditions. Do not scale drawings for locations of equipment or piping.

C. Insure that items to be furnished fit space available. Make necessary field measurements to ascertain space requirements including those for connections and furnish and install equipment of size and shape so final installation shall suit true intent and meaning of Contract Documents.

1. If approval is received to use other than specified items, responsibility for specified capacities and insuring that items to be furnished will fit space available lies with this Division.

2. If non-specified equipment is used and it will not fit job site conditions, this Contractor assumes responsibility for replacement with items named in Contract Documents.

### 3.2 PREPARATION

- A. Cut carefully to minimize necessity for repairs to existing work. Do not cut beams, columns, or trusses.
  1. Patch and repair walls, floors, ceilings, and roofs with materials of same quality and appearance as adjacent surfaces unless otherwise shown. Surface finishes shall exactly match existing finishes of same materials.
  2. Each Section of this Division shall bear expense of cutting, patching, repairing, and replacing of work of other Sections required because of its fault, error, tardiness, or because of damage done by it.

### 3.3 INSTALLATION

- A. Arrange pipes, ducts, and equipment to permit ready access to valves, unions, traps, starters, motors, control components, and to clear openings of doors and access panels.

### 3.4 STORAGE AND PROTECTION OF MATERIALS:

- A. Provide storage space for storage of materials and assume complete responsibility for losses due to any cause whatsoever. Storage shall not interfere with traffic conditions in any public thoroughfare.
- B. Protect completed work, work underway, and materials against loss or damage.
- C. Close pipe openings with caps or plugs during installation. Cover fixtures and equipment and protect against dirt, or injury caused by water, chemical, or mechanical accident.

### 3.5 COOPERATION

- A. Cooperate with other crafts in coordination of work. Promptly respond when notified that construction is ready for installation of work under Division 23000. Contractor will be held responsible for any delays which might be caused by his negligence or failure to cooperate with the other Contractors or crafts.

### 3.6 SUPERVISION

- A. Provide a competent superintendent in charge of the work at all times. Anyone found incompetent shall be removed at once and replaced by someone satisfactory, when requested by the Engineer.

### 3.7 INSTALLATION CHECK:

- A. An experienced, competent, and authorized representative of the manufacturer or supplier of each item of equipment indicated in the equipment schedule shall visit the project to inspect, check, adjust if necessary, and approve the equipment installation. In each case, the equipment supplier's representative shall be present when the equipment is placed in operation. The equipment supplier's representative shall revisit the project as often as necessary until all trouble is corrected and the equipment installation and operation is satisfactory to the Engineer.
- B. Each equipment supplier's representative shall furnish to the Owner, through the Engineer, a written report certifying the following:
  1. Equipment has been properly installed and lubricated.
  2. Equipment is in accurate alignment.
  3. Equipment is free from any undue stress imposed by connecting piping or anchor bolts.
  4. Equipment has been operated under full load conditions.
  5. Equipment operated satisfactorily.
- C. All costs for this installation check shall be included in the prices quoted by equipment suppliers.

### 3.8 CLEANING EQUIPMENT AND PREMISES

- A. Properly lubricate equipment before Owner's acceptance.

- B. Clean exposed piping, ductwork, equipment, and fixtures. Repair damaged finishes and leave everything in working order.
- C. Remove stickers from fixtures and exposed ductwork.
- D. At date of Substantial Completion, air filters shall be new, clean, and approved by Owner's representative.

### 3.9 TESTS

- A. No piping work, fixtures, or equipment shall be concealed or covered until they have been inspected and approved by the inspector. Notify inspector when the work is ready for inspection.
- B. All work shall be completely installed, tested as required by Contract Documents and the city and county ordinances and shall be leak-tight before the inspection is requested.
- C. Tests shall be repeated to the satisfaction of those making the inspections.
- D. Heating/cooling piping shall be flushed out, tested at 100 psi and left under pressure of supply main or a minimum of 40 psi for the balance of the construction period.

### 3.10 WARRANTY

- A. Contractor shall guarantee work under Division 23 to be free from inherent defects for a period of one year from acceptance.
  - 1. Contractor shall repair, revise or replace any and all such leaks, failure or inoperativeness due to defective work, materials, or parts free of charge for a period of one year from final acceptance, provided such defect is not due to carelessness in operation or maintenance.
  - 2. In addition, the Contractor shall furnish all refrigeration emergency repairs, emergency service and all refrigerant required due to defective workmanship, materials, or parts for a period of one year from final acceptance at no cost to the Owner, provided such repairs, service and refrigerant are not caused by lack of proper operation and maintenance.
- B. In addition to warranty specified in General Conditions, heating, cooling, and plumbing systems are to be free from noise in operation that may develop from failure to construct system in accordance with Contract Documents.

### 3.11 SYSTEM START-UP, OWNER'S INSTRUCTIONS

- A. Off-Season Start-up
  - 1. If Substantial Completion inspection occurs during heating season, schedule spring start-up of cooling systems. If inspection occurs during cooling season, schedule autumn start-up for heating systems.
  - 2. Notify Owner 7 days minimum before scheduled start-up.
  - 3. Time will be allowed to completely service, test, check, and off-season start systems. During allowed time, train Owner's representatives in operation and maintenance of system.
  - 4. At end of off-season start-up, furnish Owner with letter confirming that above work has been satisfactorily completed.
- B. Owner's Instructions
  - 1. Instruct building maintenance personnel and Owner Representative in operation and maintenance of mechanical systems utilizing Operation & Maintenance Manual when so doing.
  - 2. Minimum instruction periods shall be as follows –
    - a. Mechanical - Two hours.
    - b. Temperature Control - Two hours.
  - 3. Instruction periods shall occur after Substantial Completion inspection when systems are properly working and before final payment is made.
  - 4. None of these instructional periods shall overlap another.

### 3.12 PROTECTION

- A. Do not run heat pump, air handling units, fan coil units, or other pieces of equipment used for moving supply air without proper air filters installed properly in system.

- B. The mechanical systems are not designed to be used for temporary construction heat. If any equipment is to be started prior to testing and substantial completion, such equipment will be returned to new condition with full one year warranties, from date of substantial completion after any construction use. This includes, but is not necessarily limited to: Equipment, filters, ductwork, fixtures, etc.

### 3.13 COMMON HVAC REQUIREMENTS:

#### A. INSTALLATION

1. During installation, protect open ends of ducts by covering with plastic sheet tied in place to prevent entrance of debris and dirt.
2. Make necessary allowances and provisions in installation of sheet metal ducts for structural conditions of building. Revisions in layout and configuration may be allowed, with prior written approval of Architect. Maintain required airflows in suggesting revisions.
3. Hangers And Supports:
  - a. Install pair of hangers close to each transverse joint and elsewhere as required by spacing indicated in table on Drawings.
  - b. Install upper ends of hanger securely to floor or roof construction above by method shown on Drawings.
  - c. Attach strap hangers to ducts with cadmium-plated screws. Use of pop rivets or other means will not be accepted.
  - d. Where hangers are secured to forms before concrete slabs are poured, cut off flush all nails, strap ends, and other projections after forms are removed.
  - e. Secure vertical ducts passing through floors by extending bracing angles to rest firmly on floors without loose blocking or shimming. Support vertical ducts, which do not pass through floors, by using bands bolted to walls, columns, etc. Size, spacing, and method of attachment to vertical ducts shall be same as specified for hanger bands on horizontal ducts.

END OF SECTION 23 0501

## **SECTION 23 0502 - DEMOLITION AND REPAIR**

### **PART 1 - GENERAL**

#### 1.1 RELATED DOCUMENTS

- A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and Section 23 0501 apply to this Section.

#### 1.2 SUMMARY

- A. Under this section remove obsolete piping and mechanical equipment and relocate, reconnect or replace existing piping affected by demolition or new construction. Remove concealed piping abandoned due to demolition or new construction, or cap piping flush with existing surfaces.

#### 1.3 DRAWINGS AND EXISTING CONDITIONS

- A. All relocations, reconnections and removals are not necessarily indicated on the drawings. As such, the Contractor shall make adequate allowance in his proposal for this work as no extra charges will be allowed for these items.

### **PART 2 - NOT USED**

### **PART 3 - EXECUTION**

#### 3.1 TEMPORARY CONNECTIONS

- A. Where existing piping must remain in service to supply occupied areas during construction, provide temporary piping, connections, and equipment to maintain service to such areas. All shall be performed in a neat and safe manner to prevent injury to the building or its occupants.

#### 3.2 EXISTING CONDITIONS

- A. All required drilling, cutting, block-outs and demolition work required for the removal and/or installation of the mechanical system is the responsibility of this Contractor.
- B. No joists, beams, girders, trusses or columns shall be cut by any Contractor without written permission from the Architect.
- C. The patching, repair, and finishing to existing or new surfaces is the responsibility of this Contractor, unless specifically called for under sections of specifications covering these materials.
- D. Disconnect all equipment that is to be removed or relocated. Relocate any existing equipment that obstructs new construction.

#### 3.3 EXISTING TO REMAIN IN USE

- A. Where affected by demolition or new construction, relocate, replace, extend, or repair piping and equipment to allow continued use of same. Use methods and materials as specified for new construction.

#### 3.4 MATERIALS AND EQUIPMENT REMOVED

- A. All obsolete materials, piping, and equipment shall become the property of the Contractor and be removed from the site promptly.

END OF SECTION 23 0502

## SECTION 23 0553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and Section 23 05 01 apply to this Section.

#### 1.2 SUMMARY

- A. Furnish and install identification of equipment and piping both new and existing as described in Contract Documents.
- B. Mechanical Contractor shall touch-up equipment where factory paint has been damaged. Repaint entire item where more than 20 percent of the surface is involved.
- C. Primary painting of walls, ceilings, ductwork, piping and plenums is covered in the general painting section of these Contract Documents.

### PART 2 - PRODUCTS

#### 2.1 PAINT

- A. Benjamin Moore Impervo or equivalent by Paint Manufacturer approved in Section 09 900.
- B. Use appropriate primer.

#### 2.2 LABELS

- A. Black Formica with white reveal on engraving.

#### 2.3 CODED BANDS

- A. Using colored bands and arrows to indicate supply and return, with colored reflective tape, color code all piping installed in this contract at not more than 20-foot intervals, at equipment, at walls, etc., in accordance with ANSI Standards.
- B. Approved Manufacturers:
  - 1. Seton
  - 2. Craftmark

#### 2.4 PIPE IDENTIFICATION

- A. In addition to the colored bands, stencil with black paint in 1/2 inch high letters a symbol and directional arrow for all fluids handled or use Seaton coded and colored pipe markers and arrows to meet ANSI Standards.
- B. Use appropriate primer.

#### 2.5 EQUIPMENT IDENTIFICATION

- A. Provide an engraved plastic plate for each piece of equipment stating the name of the item, symbol number, area served, and capacity. Label all control components with plastic embossed mechanically attached labels. Sample:  
Supply Fan SF-1 - North Classrooms  
10,000 CFM @ 2.5"

#### 2.6 VALVE IDENTIFICATION

- A. Make a list of and tag all valves installed in this work.
  - 1. Valve tags shall be of brass, not less than 1"x 2" round size, hung with brass chains.
  - 2. Tag shall indicate plumbing or heating service.

**PART 3 - EXECUTION**

**3.1 APPLICATION**

**A. Engraved Plates:**

1. Identify thermostats and control panels in mechanical rooms, furnaces, boilers and hot water heating specialties, duct furnaces, air handling units, electric duct heaters, and condensing units with following data engraved and fastened to equipment with screws –
  - a. Equipment mark noted on Drawings (i.e., SF-1)
  - b. Area served (i.e., North Classrooms)
  - c. Capacity (10,000 CFM @ 2.5)

**B. Stenciling:**

1. Locate identifying legends and directional arrows at following points on each piping system –(new and existing).
  - a. Adjacent to each item of equipment and special fitting.
  - b. At point of entry and exit where piping goes through wall.
  - c. On each riser and junction.
  - d. Every 50 feet on long continuous lines.
2. Gas, & Valve Identification —(new and existing).
  - a. Identify specific pipe contents by stenciling pipe with written legend and placing of arrows to indicate direction of flow.

**C. Painting:**

1. Background Color - Provide by painting of piping at identification locations –(new and existing).

Symbol	Name	Color
NG	Natural Gas	Yellow

2. Identification stenciling and flow arrows shall be following colors for proper contrast:

<u>Arrows &amp; ID Stenciling</u>	<u>Color Shade of Pipe</u>
White	Red, Grays, & black
Black	Yellows, Oranges, Greens, & White

END OF SECTION 23 0553

## SECTION 23 0593 - TESTING, ADJUSTING, AND BALANCING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Division 23 - Basic Mechanical Requirements and Basic Mechanical Materials and Methods Sections apply to work of this section.

#### 1.2 SUMMARY SCOPE

- A. This Section includes TAB to produce design objectives for the following:
  - 1. Air Systems.
    - a. Gas Furnaces.
    - b. Exhaust fans.
    - c. Roof Top Units.

#### 1.3 SUBMITTALS

- A. Agency Data:
  - 1. Submit proof that the proposed testing, adjusting, and balancing agency meets the qualifications specified below. The firm or individuals performing the work herein specified may not be the installing firm.
- B. Engineer and Technicians Data:
  - 1. Submit proof that the Test and Balance Engineer assigned to supervise the procedures, and the technicians proposed to perform the procedures meet the qualifications specified below.
- C. Procedures and Agenda: Submit a synopsis of the testing, adjusting, and balancing procedures and agenda proposed to be used for this project.
- D. Sample Forms: Submit sample forms, if other than those standard forms prepared by the AABC or NEBB are proposed.
- E. Certified Reports: Submit testing, adjusting, and balancing reports bearing the seal and signature of the Test and Balance Engineer. The reports shall be certified proof that the systems have been tested, adjusted, and balanced in accordance with the referenced standards; are an accurate representation of how the systems have been installed; are a true representation of how the systems are operating at the completion of the testing, adjusting, and balancing procedures; and are an accurate record of all final quantities measured, to establish normal operating values of the systems. Follow the procedures and format specified below.
  - 1. Draft Reports: Upon completion of testing, adjusting, and balancing procedures, prepare draft reports on the approved forms. Draft reports may be hand written, but must be complete, factual, accurate, and legible. Organize and format draft reports in the same manner specified for the final reports. Submit 2 complete sets of draft reports. Only 1 complete set of draft reports will be returned.
  - 2. Final Report: Upon verification and approval of draft reports, prepare final reports, type written, and organized and formatted as specified below. Submit 4 complete sets of final reports.
  - 3. Report Format: Report forms shall be those standard forms prepared by the referenced standard for each respective item and system to be tested, adjusted, and balanced. Bind report forms complete with schematic systems diagrams and other data. Divide the contents of the binder into the below listed divisions, separated by divider tabs:
    - a. General Information and Summary
    - b. Air Systems
    - c. Temperature Control System Verification.
- F. Report Contents: Provide the following minimum information, forms, and data:
  - 1. General information and Summary: Inside cover sheet to identify testing, adjusting, balancing agency, Contractor, Owner, Engineer, and Project. Include addresses and contact names and telephone numbers. Also include a certification sheet containing the seal and name, address, telephone number, and signature of the Certified Test and Balance Engineer. Include in this division a listing of the instrumentation used for the procedures along with the instrument calibration sheet.
  - 2. The remainder of the report shall contain the appropriate forms containing as a minimum, the information indicated on the standard report forms prepared by the AABC or NEBB, for each respective item and system. Prepare a schematic diagram for each item of equipment and system to accompany each respective report form. The report shall contain the following information, and all other data resulting from the testing, adjusting, and balancing work:



- a. All nameplate and specification data for all air handling equipment and motors.
  - b. Actual metered running amperage for each phase of each motor on all pumps and air handling equipment.
  - c. Actual metered voltage at air handling equipment (phase-to-phase for all phases).
  - d. Fan RPM for each piece of air handling equipment.
  - e. Total actual CFM being handled by each piece of air handling equipment.
  - f. Actual CFM of systems by rooms.
3. Certify that all smoke and fire dampers operate properly and can be reset under actual system operating conditions.

G. Calibration Reports:

1. Submit proof that all required instrumentation has been calibrated to tolerances specified in the referenced standards, within a period of six months prior to starting the project.

#### 1.4 CERTIFICATION

A. Agency Qualifications:

1. Employ the services of a certified testing, adjusting, and balancing agency meeting the qualifications specified below, to be the single source of responsibility to test, adjust, and balance the building mechanical systems identified above, to produce the design objectives. Services shall include checking installations for conformity to design, measurement, and establishment of the fluid quantities of the mechanical systems as required to meet design specifications, recording and reporting the results, and operation of all systems to demonstrate satisfactory performance to the owner.
2. The testing, adjusting, and balancing agency certified by National Environmental Balancing Bureau (NEBB) or Associated Air Balance Council (AABC) in those testing and balancing disciplines required for this project, and having at least one person certified by NEBB or AABC as a Test and Balance supervisor, and a registered professional mechanical engineer, licensed in the state where the work will be performed.

B. Codes and Standard:

1. NEBB: "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems."
2. AABC: "National Standards for Total System Balance."
3. ASHRAE: ASHRAE Handbook, 1984 Systems Volume, Chapter 37, Testing, Adjusting, and Balancing.

#### 1.5 PROJECT CONDITIONS

- A. Systems Operation: Systems shall be fully operation and clean prior to beginning procedures.

#### 1.6 SEQUENCING AND SCHEDULING

- A. Test, adjust, and balance the air systems before hydronic, steam, and refrigerant systems within +10% to -5% of contract requirements.

- B. The report shall be approved by the Engineer. Test and balance shall be performed prior to substantial completion.

### PART 2 - NOT USED

### PART 3 - EXECUTION

#### 3.1 PRELIMINARY PROCEDURES FOR AIR SYSTEM BALANCING

A. Before operating the system, perform these steps.

1. Obtain design drawings and specifications and become thoroughly acquainted with the design intent.
2. Obtain copies of approved shop drawings of all air handling equipment, outlets (supply, return, and exhaust) and temperature control diagrams.
3. Compare design to installed equipment and field installations.
4. Walk the system from the system air handling equipment to terminal units to determine variations of installation from design.
5. Check filters for cleanliness and to determine if they are the type specified.
6. Check dampers (both volume and fire) for correct and locked position. Check automatic operating and safety controls and devices to determine that they are properly connected, functioning, and at proper operating setpoint.
7. Prepare report test sheets for both fans and outlets. Obtain manufacturer's outlet factors and recommended procedures for testing. Prepare a summation of required outlet volumes to permit a cross-check with required fan volumes.
8. Determine best locations in main and branch ductwork for most accurate duct traverses.
9. Place outlet dampers in the full open position.

10. Prepare schematic diagrams of system "As-Built" ductwork and piping layouts to facilitate reporting.
11. Lubricate all motors and bearings.
12. Check fan belt tension.
13. Check fan rotation.

### 3.2 MEASUREMENTS

- A. Provide all required instrumentation to obtain proper measurements, calibrated to the tolerances specified in the referenced standards. Instruments shall be properly maintained and protected against damage.
- B. Provide instruments meeting the specifications of the referenced standards.
- C. Use only those instruments which have the maximum field measuring accuracy and are best suited to the function being measured.
- D. Apply instrument as recommended by the manufacturer.
- E. Use instruments with minimum scale and maximum subdivisions and with scale ranges proper for the value being measured.
- F. When averaging values, take a sufficient quantity of readings which will result in a repeatability error of less than 5%. When measuring a single point, repeat readings until 2 consecutive identical values are obtained.
- G. Take all readings with the eye at the level of the indicated value to prevent parallax.
- H. Use pulsation dampeners where necessary to eliminate error involved in estimating average of rapidly fluctuation readings.
- I. Take measurements in the system where best suited to the task.

### 3.3 PERFORMING TESTING, ADJUSTING, AND BALANCING

- A. Perform testing and balancing procedures on each system identified, in accordance with the detailed procedures outlined in the referenced standards. Balancing of the air systems and hydronic systems shall be achieved by adjusting the automatic controls, balancing valves, dampers, air terminal devices, and the fan/motor drives within each system.
- B. Cut insulation, ductwork, and piping for installation of test probes to the minimum extent necessary to allow adequate performance of procedures.
- C. Patch insulation, ductwork, and housings, using materials identical to those removed.
- D. Seal ducts and piping, and test for and repair leaks.
- E. Seal insulation to re-establish integrity of the vapor barrier.
- F. Adjust timing relays of environmental equipment motor reduced voltage starters to the optimum time period for the motor to come up to the maximum reduced voltage speed and then transition to the full voltage speed to prevent damage to motor, and to limit starting current spike to the lowest possible and practical.
- G. Mark equipment settings, including damper control positions, valve indicators, fan speed control levers, and similar controls and devices, to show final settings. Mark with paint or other suitable, permanent identification materials.
- H. Retest, adjust, and balance systems subsequent to significant system modifications, and resubmit test results.

### 3.4 RECORD AND REPORT DATA

- A. Record all data obtained during testing, adjusting, and balancing in accordance with, and on the forms recommended by the referenced standards, and as approved on the sample report forms.
- B. Prepare report of recommendations for correcting unsatisfactory mechanical performances when system cannot be successfully balanced.
- C. Report shall be certified and stamped by a registered professional mechanical engineer employed by the agency and

licensed in the state where the work will be performed.

- D. Engineer is to provide a floor plan and test and balance contractor to include the plan in test and balance report and identify actual cfm on drawing or number the diffusers to match report.

### 3.5 DEMONSTRATION

- A. If requested, testing, adjusting, and balancing agency shall conduct any or all of the field tests in the presence of the engineer.
- B. Agency shall include a maximum of one (1) call back to the project within the one year warranty period to make additional adjustments if requested by the engineer.

END OF SECTION 23 0593

## SECTION 23 0713 - DUCT LINING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, and Section 23 0500 apply to this Section.

#### 1.2 SUMMARY

- A. Furnish and install acoustic lining in following above ground metal ductwork as described in Contract Documents unless detailed otherwise:
  - 1. Outside air
  - 2. Supply air
  - 3. Return air
  - 4. Exhaust air
  - 5. Elbows, fittings, and diffuser drops greater than 12 inches in length.

#### 1.3 SYSTEM DESCRIPTION

- A. Duct dimensions shown on Drawings are for free area inside insulation. Allowance must be made for insulation, where applicable.

#### 1.4 RATINGS:

- A. Material shall have maximum air friction correction factor of 1.10 at 1000 FPM velocity and have a minimum sound absorption coefficient NRC of .60.

### PART 2 - PRODUCTS

#### 2.1 DUCT LINER

- A. One inch thick, 1-1/2 lb density fiberglass, factory edge coated.
- B. Duct lining materials are to meet the requirements of UL 181 for mold, humidity, and erosion resistance.
- C. Approved Manufacturers:
  - 1. Certaineed Ultralite 150 Certa Edge Coat
  - 2. Knauf - Type M
  - 3. Manville - Lina-Coustic
  - 4. Owen Corning Fiberglas - Aeroflex

#### 2.2 ADHESIVE

- A. Water Base Type:
  - 1. Cain - Hydrotak
  - 2. Duro Dyne - WSA
  - 3. Kingco - 10-568
  - 4. Miracle - PF-101
  - 5. Mon-Eco - 22-67
  - 6. Techno Adhesive - 133
- B. Solvent Base (non-flammable) Type:
  - 1. Cain - Safetak
  - 2. Duro Dyne - FPG
  - 3. Kingco - 15-137
  - 4. Miracle - PF-91
  - 5. Mon-Eco - 22-24
  - 6. Techno Adhesive - 'Non-Flam' 106
- C. Solvent Base (flammable) Type:
  - 1. Cain - HV200
  - 2. Duro Dyne - MPG

3. Kingco - 15-146
4. Miracle - PF-96
5. Mon-Eco - 22-22
6. Techno Adhesive - 'Flammable' 106

## 2.3 FASTENERS

- A. Adhesively secured fasteners not allowed.
- B. Approved Manufacturers:
  1. AGM Industries Inc - "DynaPoint" Series DD-9 pin
  2. Cain
  3. Duro Dyne
  4. Omark dished head "Insul-Pins"
  5. Grip nails may be used if each nail is installed by "Grip Nail Air Hammer" or by "Automatic Fastener Equipment" in accordance with Manufacturer's recommendations.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install mat finish surface on air stream side. Secure insulation to cleaned sheet metal duct with continuous 100% coat of adhesive and with 3/4 inch long mechanical fasteners 12 inches on center maximum unless detailed otherwise on Drawings. Pin all duct liner.
- B. Accurately cut liner and thoroughly coat ends with adhesive. Butt joints tightly. Top and bottom sections of insulation shall overlap sides. If liner is all one piece, folded corners shall be tight against metal. Ends shall butt tightly together.
- C. In casings and plenums further contain insulation with wire mesh.

### 3.2 FIELD QUALITY CONTROL

- A. If insulation is installed without longitudinal and end joints butted together, installation will be rejected and work removed and replaced with work that conforms to this Specification.
- B. Insulation shall be installed in accordance with Duct Liner Application Standard SMACNA Manual 15.

### 3.3 ADJUSTING, CLEANING

- A. Keep duct liner clean and free from dust. At completion of project, vacuum duct liner if it is dirty or dusty.

END OF SECTION 23 0713

## SECTION 23 0716 - MECHANICAL INSULATION AND FIRE STOPPING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and Section 23 05 01 apply to this Section.

#### 1.2 SUMMARY

- A. Furnish and install mechanical insulation and fire stopping as described in Contract Documents including but not limited to the following:
  - 1. Ductwork Insulation
  - 2. Fire Stopping

#### 1.3 QUALITY ASSURANCE

- A. Insulation shall have composite (insulation, jacket or facing and adhesive used to adhere facing or jacket to insulation) fire and smoke hazard ratings as tested by Procedure ASTM E-84, NFPA 255 and UL 723 not exceeding: Flame Spread of 25 and Smoke Developed of 50.
- B. Insulation Contractor shall certify in writing, prior to installation, that all products to be used will meet the above criteria.
- C. Accessories, such as adhesives, mastics, cements, and tapes, for fittings shall have the same component ratings as listed above.
- D. Products, or their shipping cartons, shall bear a label indicating that flame and smoke ratings do not exceed above requirements.
- E. Any treatment of jacket or facings to impart flame and smoke safety shall be permanent.
- F. The use of water-soluble treatments is prohibited.

END OF SECTION 23 0716

## **SECTION 23 0800 – FIRE STOPPING**

### **PART 1 - GENERAL**

#### 1.1 RELATED DOCUMENTS

- A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and Section 23 05 01 apply to this Section.

#### 1.2 SUMMARY

- A. Furnish and install fire stopping as described in Contract Documents.

#### 1.3 QUALITY ASSURANCE

- A. Fire stopping material shall meet ASTM E814, E84 and be UL listed.

### **PART 2 - PRODUCTS**

#### 2.1 MANUFACTURED UNITS

- A. Material shall be flexible, long lasting, intumescent acrylic seal to accommodate vibration and building movement.
- B. Caulk simple penetrations with gaps of 1/4" or less with:
  - 1. Dow Corning Fire Stop Sealant
  - 2. Pensil 300
- C. Caulk multiple penetrations and/or penetrations with gaps in excess of 1/4" with:
  - 1. Dow Corning Fire Stop Foam
  - 2. Pensil 200
  - 3. IPC flame safe FS-1900
  - 4. Tremco "Tremstop 1A"

### **PART 3 - EXECUTION**

#### 3.1 INSTALLATION

- A. Follow manufacturer's installation instructions explicitly.
- B. Seal penetrations of ductwork, piping, and other mechanical equipment through one-hour and two-hour rated partitions as shown on Architectural and Mechanical Drawings.
- C. Install fire stopping material on clean surfaces to assure adherence.

END OF SECTION 23 0800

## SECTION 23 0933 – AUTOMATIC TEMPERATURE CONTROLS

**Note: All controls to be done by SD 25. This Section included for reference only.**

### PART 1 - GENERAL

#### 1.1 GENERAL CONDITIONS:

- A. The General Conditions, Supplementary General Conditions, alternates and addenda, applicable drawings and the technical specifications, shall all apply to all work under this division.

#### 1.2 DDC CONTROL SYSTEM, AUTOMATED LOGIC WEBCONTROL BY CLIMA-TECH CORP

- A. Statement of Intent
  - 1. The existing DDC control system will be connected to all new equipment and programmed by Clima-Tech Corporation (208) 377-9755 and integrated into School District No. 25 existing WebCTRLTM frontend software. The graphical user interface shall display real time values of all system operating conditions. Additionally, it shall include graphic displays of system programming, operating logic and logic flow. It shall be capable of displaying that logic flow with real time values of logical inputs and outputs. Graphical displays shall be consistent with those currently available for the server room equipment. The features of the system must be fully installed, configured and demonstrated in a manner that provides maximum benefit to the end user. Connectivity shall be over the owner's internal Ethernet system and, when allowed, over the Internet using the servers IP address.

#### 1.3 SCOPE OF WORK

- A. Control Hardware and Software
  - 1. Automatic Temperature Control Contractor shall be responsible to furnish and install all control hardware and software necessary for complete DDC control system as specified. Most components are existing and recently replaced. ATC contractor shall furnish all other necessary modules, temperature sensors, flow sensors, humidity sensors, IAQ sensors, control valves, control valve actuators, dampers, damper actuators and any other items necessary for a complete system and sequence of control. Automatic control valves, dry wells for fluid temperature sensors, dampers and actuators furnished by Temperature Control Contractor will be installed by Mechanical Contractors.
- B. Specifically the ATC Contractor shall furnish the following:
  - 1. Individual unitary control modules for each unitary system:
    - a. New furnaces with A/C
    - b. Unitary package make-up air units new RTU's
- C. Control Wiring and Interface to Line Voltage Control
  - 1. ATC Contractor shall be responsible for control wiring to all control modules, sensors, pilot duty control relays and actuators required to provide sequences of operation as noted in Part 5. Installation of devices provided by others shall be the responsibility of the contractor providing those devices. ATC Contractor shall provide all control conduit within mechanical room or at equipment locations required to connect components included within this section. Electrical Contractor shall provide all required conduit, contactors, magnetic starters and motor control centers required for operation of mechanical systems except where specifically noted to be provided by equipment manufacturer. Unitary equipment will be supplied with required fan relays, compressor contactors, gas valves, electric heat sequencers and transformer ready for connection to control modules.
- D. Commissioning
  - 1. ATC Contractor shall be responsible for self-commissioning of all hardware and software furnished with the project. Completed field commissioning sheets shall be included with the final "as-built" O&M manuals. These sheets shall include validation check fields for all physical and LAN inputs and outputs and graphics for each operating unit or system within the facility. Each system and point shall be listed, using logical names for future reference by the owner. Commissioning shall include calibration and verification of operation of each I/O and graphic field. Functional commissioning of software programming to meet sequences of operation as submitted and approved shall be verified on the field commissioning sheets.
- E. Training and Technical Support
  - 1. Contractor shall provide two 4 hour training sessions to owner representatives on operation and servicing of automatic temperature control system. Training shall be oriented to making the owner self sufficient in the day to day use and operation of the DDC system. Additionally the training shall include information specifically focused on showing the owners representative methods of troubleshooting the mechanical



systems using the DDC system. For this purpose, the trainer must be well grounded in both DDC system operation and in the mechanical systems service.

2. The contractor shall provide unlimited phone technical support to the owner's representative and at least two visits to the job site during the one year warranty period. If the technical support location of the contractor is outside of the toll free calling area for the customer, the contractor shall have a toll free number or accept collect calls for the purpose of providing technical support.

#### 1.4 SUBMITTALS AND O&M MANUALS

##### A. Submittals

1. Submittals shall include the following sections:
  - a. Title Page
  - b. Table of Contents
  - c. Typical Device Wiring Drawings
  - d. Summary Bill of Materials
  - e. Sequences of Operation
  - f. Local Area Network Drawings
  - g. Drawings for all operating systems showing both equipment and module connections
2. Manufacturers specification data sheets for all control modules, sensors, dampers, valves, actuators, flow switches, current sensors and transducers required in the project.

##### B. O&M Manuals

1. O&M Manuals shall be furnished upon project completion and include technical instructions for all items originally included in the submittal with "as built" modifications and completed Commissioning Worksheets. O&M Manuals shall be included in 01092 M&O Manuals. Contractor's toll free technical support number or the words "Call Collect" with the contractor's regular phone number shall be on the front of the manual.

#### 1.5 SYSTEM SOFTWARE

##### A. System Software

1. All operating program and site specific software shall be furnished to the owner on CD ROM disks.

### **PART 2 - PRODUCT**

#### 2.1 SOFTWARE CAPABILITY

##### A. BACnet COMPATIBILITY

1. The system shall be fully native BACnet at the time of installation. This means that the system must use BACnet as the native communication protocol between distributed controllers communicating on the controller network.
2. Programming for the system shall use BACnet objects and services. All BACnet objects and services shall be opened for read and/or read/write access during programming for future exposure to other BACnet systems. The front end software for the system shall be able to query other third party BACnet points for read/write access.

##### B. Graphical Programming

1. The system shall be programmed using a graphical programming language for ease of operator understanding. Operating sequences and logic flow shall be assembled in a schematic format using MicroBlocks representing inputs, outputs and logical functions such as setpoints, switches, limits, relays, PIDs etc. The programming software shall be furnished within this scope of work.
2. Full simulation capability shall also be provided with the graphic programming. User shall be able to fully simulate the constructed sequence on screen before the sequences are downloaded into the controllers. The system shall also include the ability to simulate multiple graphic programs communicating with each other on a simulated network.

##### C. Graphical Interface Software

1. The operators interface software shall be graphics based and display in 256 colors at a minimum 1024x768 pixel resolution. Graphics display screens shall include a system level graphic of either a map of facilities or an elevation of the building, a graphic of each building floor plan and graphics for each operating system or unit within each building. Entry to the zone and equipment level interface graphics shall be through area maps and/or floor plans to facilitate user orientation. Additionally the system hierarchy shall be displayed in a fashion similar to Windows Explorer to enable the user to navigate to any graphical screen in the system by expanding building levels or floor levels and selecting a particular zone or system. Graphics shall be accessed by using a mouse or other pointer device. The system shall provide a visual indication of which building, floor and zone the user is accessing at any time. System shall be capable of changing all parameters

and schedules, as well as downloading operating software from the same Graphical User Interface software program as that used for viewing system operation.

D. Management Functions

- 1. The DDC system shall have the ability to schedule each individual zone, each building or floor or the entire network of buildings for any user with a single entry. Additionally the operator shall have the capability of assembling groups of zones, buildings or floors for single entry programming, e.g. several offices may be grouped for scheduling of Saturday operations. Available schedule types shall include normal operation, unoccupied operation, setback override and holidays. For maximum flexibility, schedules shall reside in the local control modules. Dated schedules shall be self managing and automatically delete after execution.

E. Alarms, Trends and Reports

- 1. System and Temperature Alarms
  - a. The system shall have the capability of monitoring conditions throughout the system and sending alarms or messages to an e-mail address, local PC or printer or to remote PC's, printers or to dial-up pagers. Alarms and messages shall be able to be prioritized for various levels of reporting and action. The operator shall have the ability to customize alarm text and messages.
- 2. Trends
  - a. The system shall be capable of trending any input or output, or any logical point within the graphic program. There shall be no limitation to the number of points that can be trended at any particular time. Modules shall store in live memory 288 trend samples points for each trended item. The interval between trend samples shall be adjustable from 1 second to 24 hours. Trends from one or more modules shall be able to be simultaneously displayed on a single trend graph. Operator shall be able to "window" any segment of a trend to enlarge the view by dragging a mouse to form the "window". The system shall also have the ability of automatically downloading trend information from any module to the server or other computer connected to the network for historical trend storage. This trend information shall be able to be displayed on the trend graph along with live current trends in seamless fashion. Trend data collection requiring the use of a locally connected PC for data storage is unacceptable.
- 3. Reports
  - a. The system shall be capable of generating reports of equipment run times, all trended points, temperature conditions, electric demand and usage and alarms or messages. The system shall also have the ability of automatically downloading report information from any module to the server or other computer connected to the network. The operator shall have the ability to create custom report and logging formats.

PART 3 - MINIMUM 1/0 POINTS LIST

3.1 MINIMUM 1/0 POINTS REQUIRED

Description

FB Type	Qty	Module	Point Name	AI	BI	BO	AO	FB Pts	Ttl Pnts
Zone	WTA Heat Pump								
	Qty>	31							
			Zone Temperature	1					
			SP Adj/Override	1	1				
			Supply Air Temp	1					
			Fan Status		1				
			Fan S/S			1			
			Cooling S/S			1			
			Heating S/S			1			
			Valve Open/Close			1			
<b>Sum of Points</b>				<b>3</b>	<b>2</b>	<b>4</b>	<b>0</b>	<b>9</b>	<b>279</b>
Zone	Exhaust Fan Control								

Qty>	4						
		Exhaust Fan Status	1				
		Exhaust Fan S/S		1			
		<b>Sum of Points</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>2</b>
Zone	<b>Outdoor Air Unit 2</b>						
Qty>	2						
		Supply Air Temp	1				
		Fan Status		1			
		Fan S/S			1		
		Heating 1 S/S			1		
		Heating 2 S/S			1		
		OA Damper			1		
		<b>Sum of Points</b>	<b>1</b>	<b>1</b>	<b>4</b>	<b>0</b>	<b>6</b>
							<b>8</b>

### 3.2 PROVIDE ADDITIONAL POINTS

- A. Provide additional points as required to match the sequence of operation and provide the Owner with the ability to control and view the operating parameters of the complete system.

END OF SECTION 23 0933

## **SECTION 23 2300 - REFRIGERANT PIPING SYSTEMS**

### **PART 1 - GENERAL**

#### 1.1 RELATED DOCUMENTS

- A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and Section 23 0501 apply to this Section.

#### 1.2 SUMMARY

- A. Furnish and install piping for refrigeration systems as described in Contract Documents.

#### 1.3 QUALITY ASSURANCE

- A. Qualifications:
  - 1. Refrigerant piping shall be installed by a refrigeration contractor licensed by State.

### **PART 2 - PRODUCTS**

#### 2.1 REFRIGERANT PIPING

- A. Meet requirements of ASTM B 280-88, "Specification for Seamless Copper Tube for Air Conditioning & Refrigeration Field Service", hard drawn straight lengths.
- B. Do not use pre-charged refrigerant lines.

#### 2.2 REFRIGERANT FITTINGS

- A. Wrought copper with long radius elbows.
- B. Approved Manufacturers:
  - 1. Mueller Streamline
  - 2. Nibco Inc
  - 3. Grinnell
  - 4. Elkhart Products Corp

#### 2.3 SUCTION LINE TRAPS

- A. Manufactured standard one-piece traps.

#### 2.4 CONNECTION MATERIAL

- A. Brazing Rods:
  - 1. Copper to Copper Connections:
  - 2. AWS Classification BCuP-4 Copper Phosphorus (6% silver).
  - 3. AWS Classification BCuP-5 Copper Phosphorus (15% silver).
  - 4. Copper to Brass or Copper to Steel Connections:
  - 5. AWS Classification BAg-5 Silver (45% silver).
  - 6. Do not use rods containing Cadmium.

#### 2.5 FLUX

- A. Approved Manufacturers:
  - 1. "Stay-Silv white brazing flux" by J W Harris Co
  - 2. High quality silver solder flux by Handy & Harmon

### **PART 3 - EXECUTION**

#### 3.1 INSTALLATION

- A. Do not install refrigerant piping underground or in tunnels.

- B. Slope suction lines down toward compressor one inch/10 feet. Locate traps at vertical rises against flow in suction lines.
- C. Refrigeration system connections shall be copper-to-copper, copper-to-brass, or copper-to-steel type properly cleaned and brazed with specified rods. Use flux only where necessary.
  - 1. No soft solder (tin, lead, antimony) connections will be allowed in system.
- D. Braze valve, sight glass, and flexible connections.
- E. Circulate dry nitrogen through tubes being brazed to eliminate formation of copper oxide during brazing operation.

### 3.2 FIELD QUALITY CONTROL

- A. Make evacuation and leak tests in presence of Architect's Engineer after completing refrigeration piping systems. Positive pressure test will not suffice for procedure outlined below.
  - 1. Draw vacuum on each entire system with vacuum pump to 200 microns using vacuum gauge calibrated in microns. Do not use cooling compressor to evacuate system nor operate it while system is under high vacuum. Isolate compressor from system piping using shut-off valves prior to pulling vacuum.
  - 2. Break vacuum with freon to be used and re-establish vacuum test. Vacuum shall hold for 24 hours at 200 microns without compressor running.
  - 3. Conduct tests at 70 deg F ambient temperature minimum.
  - 4. Do not run systems until above tests have been made and systems started up as specified. Inform Owner's Representative of status of systems at time of final inspection and schedule start-up and testing if prevented by outdoor conditions before this time.
  - 5. After testing, fully charge system with refrigerant and conduct test with Halide Leak Detector.

END OF SECTION 23 2300

## **SECTION 23 2310 - REFRIGERANT SPECIALTIES**

### **PART 1 - GENERAL**

#### 1.1 RELATED DOCUMENTS

- A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and Section 23 0501 apply to this Section.

#### 1.2 SUMMARY

- A. Furnish and install refrigeration specialties as described in Contract Documents except for expansion valves on 2 through 5 ton condensing units.

### **PART 2 - PRODUCTS**

#### 2.1 EXPANSION VALVES

- A. For pressure type distributors, externally equalized with stainless steel diaphragm, and same refrigerant in thermostatic elements as in system.
- B. Size valves to provide full rated capacity of cooling coil served. Coordinate selection with evaporator coil and condensing unit.
- C. Approved Manufacturers:
  - 1. Alco
  - 2. Henry
  - 3. Mueller
  - 4. Parker
  - 5. Singer
  - 6. Sporlan

#### 2.2 FILTER-DRIER

- A. On lines 3/4 inch outside diameter and larger, filter-drier shall be replaceable core type with Schraeder type valve.
- B. On lines smaller than 3/4 inch outside diameter, filter-drier shall be sealed type using flared copper fittings.
- C. Size shall be full line size.
- D. Approved Manufacturers:
  - 1. Alco
  - 2. Mueller
  - 3. Parker
  - 4. Sporlan
  - 5. Virginia

#### 2.3 SIGHT GLASS

- A. Combination moisture and liquid indicator with protection cap.
- B. Sight glass shall be full line size.
- C. Sight glass connections shall be solid copper or brass, no copper-coated steel sight glasses allowed.
- D. Approved Manufacturers:
  - 1. Alco
  - 2. Mueller
  - 3. Parker
  - 4. Superior
  - 5. Virginia

## 2.4 MANUAL REFRIGERANT SHUT-OFF VALVE

- A. Ball valves designed for refrigeration service and full line size.
- B. Valve shall have cap seals.
- C. Valves with hand wheels are not acceptable.
- D. Provide service valve on each liquid and suction line at compressor.
- E. If service valves come as integral part of condensing unit, additional service valves shall not be required.
- F. Approved Manufacturers:
  - 1. ConBraCo (Apollo)
  - 2. Henry
  - 3. Mueller
  - 4. Superior
  - 5. Virginia

## **PART 3 - EXECUTION**

### 3.1 INSTALLATION

- A. Install valves and specialties in accessible locations. Install refrigeration distributors and suction outlet at same end of coil.

END OF SECTION 23 2310

## SECTION 23 2600- CONDENSATE DRAIN PIPING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Includes But Not Limited To:
  - 1. Furnish and install condensate drain piping as described in Contract Documents.
- B. Related Requirements:
  - 1. Section 23 0501: Common HVAC Requirements.

#### 1.2 REFERENCES

- A. Reference Standards:
  - 1. ASTM International:
    - a. ASTM B 88-03, 'Standard Specification for Seamless Copper Water Tube.'

### PART 2 - PRODUCTS

#### 2.1 SYSTEMS

- A. Materials:
  - 1. Condensate Drains:
    - a. Schedule 40 PVC for condensate drains from furnace combustion chambers and furnace cooling coils, and auxiliary drain pans.
- B. Manufactured Units
  - 1. Condensate Pump
    - a. Rated at 225 gph at 15 feet total head. Complete with one gallon polystyrene tank with pump and automatic float control. 1/5 hp, 120 V, one phase, 60 Hertz.
    - b. Condensate piping shall be Type M copper or Schedule 40 PVC.
    - c. Approved Manufacturers -
      - 1) No. CU551UL by Beckett Pumps, (888) 232-5388
      - 2) No. VCL45S by Little Giant Pump Co, Oklahoma City, OK (405) 947-2511

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Condensate Drains:
  - 1. Support piping and protect from damage.
  - 2. Do not combine PVC condensate drain piping from furnace combustion chamber with copper condensate drain piping from cooling coil.
  - 3. Do not combine auxiliary drain pan piping with furnace / Cooling Coil Condensate drain piping.

END OF SECTION 22 2600



## SECTION 23 3114 - LOW-PRESSURE STEEL DUCTWORK

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and Section 23 05 01 apply to this Section.

#### 1.2 SUMMARY

- A. Furnish and install above-grade ductwork and related items as described in Contract Documents.

### PART 2 - PRODUCTS

#### 2.1 DUCTS

- A. Fabricate of zinc-coated lockforming quality steel sheets meeting requirements of ASTM 653A/653M, "Specification for Sheet Steel Zinc-Coated (Galvanized) by the Hot-Dip Process, Lock Forming Quality", with G 60 coating.
- B. Use of aluminum, non-metallic, or round ducts is not permitted. [Specification writer: Use of aluminum ducts in areas with high chlorine content (eg.: ventilation for pools, spas, etc.) should be considered on a per job basis.]

#### 2.2 DUCT JOINTS

- A. Ducts with sides up to and including 36 inches shall be as detailed in the SMACNA manual.
- B. Duct sizes over 36 inches shall be fabricated using SMACNA T-24 flange joints or pre-fabricated systems as follows:
  - 1. Ducts with sides over 36 inches to 48 inches:
    - a. Transverse duct joint system by Ductmate/25, Nexus, Ward, or WDCI (Lite) (SMACNA "E" or "G" Type connection).
  - 2. Ducts 48 inches & larger:
    - a. Ductmate/35, Nexus, or WDCI (Heavy) (SMACNA "J" Type connection).
  - 3. Approved Manufacturers:
    - a. Ductmate Industries Inc, 10760 Bay Meadows Drive, Sandy, UT 84092 (801) 571-5308
    - b. Nexus, Exanno Corp, P O Box 729, Buffalo, NY 14206 (716) 849-0545
    - c. Ward Industries Inc, 1661 Lebanon Church Road, Pittsburg, PA 15236 (800) 466-9374
    - d. WDCI, P O Box 10868, Pittsburg, PA 15236 (800) 245-3188

#### 2.3 ACCESS DOORS IN DUCTS

- A. At each manual outside air damper and at each motorized damper, install factory built insulated access door with hinges and sash locks. Locate doors within 6 inches of installed dampers. Construction shall be galvanized sheet metal, 24 ga minimum.
- B. Fire and smoke damper access doors shall have a minimum clear opening of 12" x 12" or as specified on Drawings to easily service fire or smoke damper. Doors shall be within 6 inches of fire and smoke dampers and in Mechanical Room if possible.
- C. Identify each door with 1/2" high letters reading "smoke damper" or "fire damper".
- D. Approved Manufacturers:
  - 1. AirBalance - Fire/Seal #FSA 100
  - 2. Air Control Products - HAD-10
  - 3. Cesco-Advanced Air - HAD-10
  - 4. Elgen - Model 85 A
  - 5. Kees Inc - ADH-D.
  - 6. Louvers & Dampers - #SMD-G-F
  - 7. Nailor-Hart Industries Inc - Series 0831
  - 8. National Controlled Air Inc - Model AD-FL-1

## 2.4 FLEXIBLE EQUIPMENT CONNECTIONS

- A. 30 oz closely woven UL approved glass fabric, double coated with neoprene.
- B. Fire retardant, waterproof, air-tight, resistant to acids and grease, and withstand constant temperatures of 250 deg F.
- C. Approved Manufacturers:
  - 1. Cain - N-100
  - 2. Duro Dyne - MFN
  - 3. Elgen - ZLN
  - 4. Ventfabrics - Ventglas

## 2.5 MOTORIZED OUTSIDE AIR DAMPERS

- A. Damper Blades:
  - 1. 18 gauge galvanized steel or equivalent aluminum with replaceable rubber blade edges, 9 inches wide maximum.
  - 2. End seals shall be flexible metal compression type.
  - 3. Opposed blade type.
- B. Make provision for damper actuators and actuator linkages to be mounted external of air flow.
- C. Approved Manufacturers & Models:
  - 1. Air Balance - AC-2
  - 2. American Warming - VC-2-AAVA
  - 3. Arrow - OBDAF-207
  - 4. Greenheck - VCD-2100
  - 5. Honeywell - D641
  - 6. Johnson - D1300
  - 7. Louvers & Dampers - TSD400
  - 8. Ruskin - CD36 or CD60
  - 9. Safe Air - 610
  - 10. Vent Products - 5800

## 2.6 BACKDRAFT DAMPER

- A. Backdraft blades shall be nonmetallic and shall be neoprene coated fiberglass.
- B. Stop shall be galvanized steel screen or expanded metal, 1/2 inch mesh.
- C. Frame shall be galvanized steel or extruded aluminum alloy.
- D. Approved Models & Manufacturers:
  - 1. Air Control Products - FBD
  - 2. American Warming - BD-15
  - 3. CESCO - FBD 101
  - 4. Ruskin - NMS2
  - 5. Safe Air

## 2.7 DUCT HANGERS

- A. 1" x 18 gauge galvanized steel straps or steel rods as shown on Drawings, and spaced not more than 8 feet apart. Do not use wire hangers.
- B. Attaching screws at trusses shall be 1-1/2 inch No. 10 round head wood screws. Nails not allowed.

## 2.8 DUCT SEALER

- A. Cain - Duct Butter or Butter Tak
- B. Design Polymerics - DP 1010
- C. DSC - Stretch Coat

- D. Duro Dyne - S2
- E. Hardcast - #601 Iron-Grip or Peel-N-Seal Tape
  - 1. Kingco - 15-325
  - 2. Mon-Eco - 44-41
  - 3. Trans-Continental Equipment Co - Multipurpose Duct Sealant
  - 4. United - Sheet Metal duct-sealer

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

- A. Ducts:
  - 1. Straight and smooth on inside with joints neatly finished unless otherwise directed.
  - 2. Duct panels through 48 inch dimension having acoustic duct liner need not be crossbroken or beaded.
  - 3. Crossbreak unlined ducts and duct panels larger than 48 inch or bead 12 inches on center.
  - 4. Securely anchor ducts to building structure with specified duct hangers attached with screws. Do not hang more than one duct from a duct hanger.
  - 5. Brace and install ducts so they shall be free of vibration under all conditions of operation.
  - 6. Ducts shall not bear on top of structural members.
  - 7. Make duct take-offs to branches, registers, grilles, and diffusers as detailed on Drawings.
  - 8. Ducts shall be large enough to accommodate inside acoustic duct liner. Dimensions shown on Drawings are net clear inside dimensions after duct liner has been installed.
  - 9. Properly flash where ducts protrude above roof.
  - 10. Install internal ends of slip joints in direction of flow. Make joints air tight using specified duct sealer.
  - 11. Cover horizontal and longitudinal joints on exterior ducts with two layers of Hardcast tape installed with Hardcast HC-20 adhesive according to Manufacturer's recommendations.
  - 12. Paint ductwork visible through registers, grilles, and diffusers flat black.
- B. Install flexible inlet and outlet duct connections to each furnace, fan, fan coil unit, and air handling unit.
- C. Air Turns:
  - 1. Permanently installed, consisting of single thickness curved metal blades with one inch straight trailing edge to permit air to make abrupt turn without appreciable turbulence, in 90 degree elbows of above ground supply and return ductwork.
  - 2. 4-1/2 inch wide minimum vane rail. Do not use junior vane rails.
  - 3. Double thickness vanes not acceptable.
  - 4. Quiet and free from vibration when system is in operation. See SMACNA Manual
- D. Install motorized dampers

END OF SECTION 23 3114

## **SECTION 23 3346 - FLEX DUCT**

### **PART 1 - GENERAL**

#### 1.1 RELATED DOCUMENTS

- A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and Section 23 05 01 apply to this Section.

#### 1.2 SUMMARY

- A. Furnish and install supply air branch duct runouts to diffusers as described in Contract Documents.

### **PART 2 - PRODUCTS**

#### 2.1 DUCTS

- A. Formable, flexible, circular duct which shall retain its cross-section, shape, rigidity, and shall not restrict air flow after bending.
- B. Nominal 1-1/2 inches thick, 3/4 lb/cu ft density fiberglass insulation with air-tight, polyethylene or polyester core, sheathed in seamless vapor barrier jacket factory installed over flexible assembly.
- C. Assembly, including insulation and vapor barrier, shall meet Class I requirement of NFPA 90A and be UL 181 rated, with flame spread of 25 or less and smoke developed rating of 50 or under.
- D. Length of flexible ductwork shall not exceed 8'-0".

#### 2.2 APPROVED MANUFACTURERS

- A. ANCO-FLEX - 4625
- B. Flex-Aire - PF/UPC #090
- C. Hart & Cooley - F114
- D. Thermaflex - G-KM

### **PART 3 - EXECUTION**

#### 3.1 INSTALLATION

- A. Install duct in fully extended condition free of sags and kinks.
- B. Make duct connections by coating exterior of duct collar for 3 inches with duct sealer and securing duct in place over sheet metal collar with 1/2 inch wide metal cinch bands and sheet metal screws.

END OF SECTION 23 3346

## **SECTION 23 3713 - AIR OUTLETS & INLETS**

### **PART 4 - GENERAL**

#### 4.1 RELATED DOCUMENTS

- A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and Section 23 0501 apply to this Section.

#### 4.2 SUMMARY

- A. Furnish and install wall supply registers, transfer grilles, return air grilles, soffit grilles, ceiling diffusers, louvers connected to ductwork, and registers as described in Contract Documents.

### **PART 5 - PRODUCTS**

#### 5.1 GRILLES & REGISTERS

- A. Approved Manufacturers:
  - 1. Price
  - 2. Anemostat
  - 3. Krueger
  - 4. Titus
  - 5. Tuttle & Bailey

#### 5.2 SPIN-IN FITTINGS

- A. Low pressure round take-offs to diffusers shall be made with spin-in fittings. They shall incorporate a manual balancing damper. The damper shall be spring loaded and a positive locking wing nut shall secure the damper position.
- B. Approved Manufacturers:
  - 1. Sheet metal fittings: Genflex DB-1DEL, Hercules

### **PART 6 - EXECUTION**

#### 6.1 INSTALLATION

- A. Anchor securely into openings.
- B. Install with screws to match color and finish of grilles and registers.
- C. Touch-up any scratched finish surfaces.
- D. Install in accordance with manufacturer's instructions.
- E. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.
- F. Install diffusers to ductwork with air tight connection.
- G. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.
- H. Paint ductwork visible behind air outlets and inlets matte black. Refer to Section 09 9000.

END OF SECTION 23 3713

## **SECTION 23 4100 – DISPOSABLE FILTERS**

### **PART 1 - GENERAL**

#### 1.1 RELATED DOCUMENTS

- A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and Section 23 05 01 apply to this Section.

#### 1.2 SUMMARY

- A. Furnish and install filters used in mechanical equipment.

### **PART 2 - PRODUCTS**

#### 2.1 FURNACE FILTERS

- A. Filters shall be two inch thick throw-away type as recommended by Furnace Manufacturer. Provide one spare set to be left with the Owner.

#### 2.2 AIR HANDLING UNIT FILTERS

- A. 2 inch thick, medium efficiency, disposable type pre-formed pleated design, having at least 4.5 sq ft of filtering media per sq ft of face area.
- B. Media shall be reinforced non-woven cotton fabric, treated with adhesive similar to "Vyclad B" and continuously laminated to supporting steel wire grid conforming to configuration of pleats.
- C. Media pack shall be sealed in a chipboard frame or beverage board.
- D. Filters shall have rated average efficiency of 25 to 30% on ASHRAE Test Standard 52-76 and be capable of operating with variable face velocities up to 500 FPM without impairing efficiency.
- E. Initial resistance shall not exceed 0.30 inches w.g. at 500 FPM or 0.14 inch w.g. at 300 FPM. Filter shall be listed Class 2 by UL.
- F. Provide one extra set to be left with the Owner.
- G. Approved Manufacturers:
  - 1. Type 30/30 by Farr Co
  - 2. Mark 80 by Serv-Aire
  - 3. HC Type 40 by Envopleat
  - 4. DP2-40 by Air Guard

END OF SECTION 23 4100

## **SECTION 23 4145 – FURNACE AIR PIPING**

### **PART 1 - GENERAL**

#### 1.1 RELATED DOCUMENTS

- A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and Section 23 0501 apply to this Section.

#### 1.2 SUMMARY

- A. Furnish and install furnace vent piping and combustion air intake piping as described in Contract Documents.

### **PART 2 - PRODUCTS**

#### 2.1 AIR PIPING

- A. Schedule 40 pipe and fittings meeting requirements of one of following:
  1. ASTM D 1785-89, "Specification for Poly(Vinyl Chloride)(PVC) Plastic Pipe, Schedules 40, 80, and 120."
  2. ASTM D 2661-89, " Specification for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Drain, Waste, and Vent Pipe and fittings."
  3. ASTM D 2665-89a, "Specification for Poly(Vinyl Chloride)(PVC) Plastic Drain, Waste, and Vent Pipe and Fittings."

#### 2.2 PRIMER & CEMENT

- A. Meet requirements of ASTM D 2564-88, "Specification for Solvent Cements for Poly(Vinyl Chloride)(PVC) Plastic Pipe and Fittings."

### **PART 3 - EXECUTION**

#### 3.1 INSTALLATION

- A. Do not combine furnace drain piping with cooling coil drain piping.
- B. Run individual vent and individual combustion intake piping from each furnace to outdoors with location and formation recommended by Furnace Manufacturer. Slope lines downward toward furnaces.
- C. Slope combustion chamber drain downward to funnel drain. Anchor to wall with wall clamps, allowing free movement through clamp for expansion.
- D. Use vent terminal kit or clamping system provided by Furnace Manufacturer. Install vent and combustion air intake piping at clearance and distances required by Furnace Manufacturer.
- E. Attach factory-supplied neoprene coupling to furnace combustion-air inlet connection and secure with clamp.
- F. Ensure that factory-supplied perforated metal disc is installed in flexible coupling, unless its removal is required.

END OF SECTION 23 4145

## SECTION 23 5417 – HIGH EFFICIENCY NATURAL GAS FURNACE

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, and Section 23 0501 apply to this Section.

#### 1.2 SUMMARY

- A. Furnish and install gas fired condensing high efficiency furnace as described in Contract Documents.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURED UNITS

- A. Fabrication:
  - 1. Furnaces shall be factory assembled units certified by AGA complete with blower section, furnace section, condensing coil, steel casing, piped, and wired.
  - 2. Blower section shall consist of cabinet, blower, and motor.
  - 3. Cabinet shall be of 22 gauge minimum cold rolled steel and have finish coat of baked-on enamel.
  - 4. Blower shall be Class 1, full DIDW, statically and dynamically balanced.
  - 5. Filters shall be one inch thick pleated throw-away type as furnished by furnace manufacturer.
  - 6. Provide furnace with accessory side mounted filter box frame and factory available bottom closure.
  - 7. Automatic controls:
    - a. 100% cut-off safety pilot
    - b. Manual gas shut-off valve
    - c. Operating automatic gas valve
    - d. Solid state type fan and thermal limit controls
    - e. 24 volt transformer
    - f. Electronic ignition system
    - g. Pressure switch safety for induced draft fan
- B. Units:
  - 1. Blower shall be driven by motor with adjustable pitch V-belt drive or by a multi-speed direct driven motor.
  - 2. Furnace section shall be enclosed in 22 gauge minimum enameled steel casing lined with foil covered insulation.
  - 3. Heat exchanger shall be ceramic or glass coated, stainless steel, or 18 gauge aluminized steel with 20 year minimum limited warranty.
  - 4. Units shall be rated at 93% minimum AFUE (Annual Fuel Utilization Efficiency) calculated in accordance with DOE test procedures.
  - 5. 2" or 3" intake and exhaust lines to outside with factory furnished combination flue/intake assembly for roof or sidewall.
- C. Approved Manufacturers:
  - 1. Lennox
  - 2. Carrier
  - 3. Bryant
  - 4. Trane

### PART 3 - EXECUTION

#### 3.1 FIELD QUALITY CONTROL

- A. Quality Assurance: Furnace manufacturer's representative shall start up and check out furnace equipment as follows:
  - 1. Verify proper gas orifice sizing for altitude.
  - 2. Clock gas meter for rated input.
  - 3. Verify and set gas pressure at furnace.
  - 4. Check and measure temperature rise.
  - 5. Check safety controls for proper operation.

END OF SECTION 23 5417



## SECTION 23 7413 - PACKAGED ROOFTOP AIR CONDITIONING UNITS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, and Section 23 0501 apply to this Section.

#### 1.2 REFERENCES

- A. NFPA 90 A & B - Installation of Air Conditioning and Ventilation Systems and Installation of Warm Air Heating and Air Conditioning Systems. (all)
- B. ANSI/ASHRAE 15 - Safety Code for Mechanical Refrigeration. (all)
- C. ARI 360 - Commercial and Industrial Unitary Air Conditioning Equipment testing and rating standard. (g/e, c/e above 135,000 btuh)
- D. ARI 340 - Commercial and Industrial Unitary Heat pump Equipment.(hp above 135,000 btuh)
- E. ANSI/ASHRAE 37 - Testing Unitary Air Conditioning and Heat Pump Equipment. (all)
- F. ANSI/ASHRAE/IESNA 90.1-1999 - Energy Standard for New Buildings Except Low-Rise Residential Buildings.
- G. ANSI Z21.47/UL1995 - Unitary Air Conditioning Standard for safety requirements.
- H. California Energy Commission Administrative Code - Title 20/24 - Establishes the minimum efficiency requirements for HVAC equipment installed in new buildings in the State of California. (all)
- I. ARI 210/240 - Unitary Air-Conditioning Equipment and Air- Source Heat Pump Equipment. (all under 135,000 btuh)
- J. ARI 270 - Sound Rating of Outdoor Unitary Equipment. (all below 135,000)
- K. ARI 370 - Sound Rating of Large Outdoor Refrigerating and Air Conditioning Equipment.(all above 135,000 Btuh)
- L. ANSI/NFPA 70-1995 - National Electric Code. (all)

#### 1.3 SUBMITTALS

- A. Submit unit performance data including: capacity, nominal and operating performance.

#### 1.4 DELIVERY, STORAGE and HANDLING

- A. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.

#### 1.5 WARRANTY

- A. Provide parts warranty for one year from start-up or 18 months from shipment, whichever occurs first.
- B. Provide five year extended warranty for compressors.
- C. Provide five year heat exchanger limited warranty.

#### 1.6 REGULATORY REQUIREMENTS

- A. Unit shall conform to ANSI Z21.47/UL1995 for construction of packaged air conditioner.
  - 1. In the event the unit is not UL approved, the manufacturer must, at his expense, provide for a field inspection by a UL representative to verify conformance to UL standards. If necessary, contractor shall perform

modifications to the unit to comply with UL, as directed by the UL representative, at no additional expense to the Owner.

## **PART 2 - PRODUCTS**

### **2.1 SUMMARY**

- A. The contractor shall furnish and install package rooftop unit(s) as shown and scheduled on the contract documents. The unit(s) shall be installed in accordance with this specification and perform at the specified conditions as scheduled.
- B. **APPROVED MANUFACTURERS**
  - 1. Trane
  - 2. Carrier
  - 3. Lennox
  - 4. Substitutions: As indicated under the general and/or supplemental conditions of these specifications. Mechanical contractor shall be responsible for electrical and mechanical changes to the structure when using a product other than the specified product. As built drawing changes are the responsibility of the mechanical contractor.

### **2.2 GENERAL UNIT DESCRIPTION**

- A. Unit(s) furnished and installed shall be packaged rooftop (s) as scheduled on contract documents and these specifications. Cooling capacity ratings shall be based on ARI Standard. Unit(s) shall consist of insulated weather-tight casing with compressor(s), air-cooled condenser coil, condenser fans, evaporator coil, return-air filters, supply motors and unit controls.
- B. Unit(s) shall be 100% factory run tested and fully charged.
- C. Units shall be dedicated downflow airflow as manufactured.

### **2.3 UNIT CASING**

- A. Cabinet: Galvanized steel, phosphatized, and finished with an air-dry paint coating with removable access panels. Structural members shall be 16 gauge with access doors and removable panels of minimum 20 gauge.
- B. Units cabinet surface shall be tested 1000 hours in salt spray test in compliance with ASTM B117.
- C. Cabinet top cover shall be one piece construction or where seams exists, it shall be double-hemmed and gasket-sealed.
- D. Access Panels: Water- and air-tight panels with handles shall provide access to filters, heating section, return air fan section, supply air fan section, evaporator coil section, and unit control section.
- E. Downflow unit's base pans shall have a raised 1 1/8 inch high lip around the supply and return openings for water integrity.
- F. Insulation: Provide 1/2 inch thick coated fiberglass insulation on all exterior panels in contact with the return and conditioned air stream.
- G. Provide openings either on side of unit or thru the base for power, control and gas connections.

### **2.4 FANS AND MOTORS**

- A. Provide evaporator fan section with forward curved, double width, double inlet, centrifugal type fan.
- B. Provide self-aligning, grease lubricated, ball or sleeve bearings with permanent lubrication fittings.
- C. Provide units 5 tons and above with belt driven, supply fans with adjustable motor sheaves.
- D. Outdoor and Indoor Fan shall be permanently lubricated and have internal thermal overload protection.
- E. Outdoor fans shall be direct drive, statically and dynamically balanced, draw through in the vertical discharge position.

- F. Provide shafts constructed of solid hot rolled steel, ground and polished, with key-way, and protectively coated with lubricating oil.

## 2.5 FILTER SECTION

- A. Provide Merv 11 pleated filters.

## 2.6 CONDENSER SECTION

- A. Provide vertical discharge, direct drive fans with aluminum blades. Fans shall be statically balanced. Motors shall be permanently lubricated, with integral thermal overload protection in a weather tight casing.

## 2.7 REFRIGERATION SYSTEM

- A. Compressor(s): Provide direct drive, hermetic type, scroll compressor with centrifugal type oil pump. Motor shall be suction gas cooled and have internal spring isolation. Compressors shall include crankcase heaters, internal pressure relief, temperature and current sensitive overloads.
- B. Units shall have cooling capabilities down to 0 degree F as standard for field-installed low ambient accessory, the manufacturer shall provide a factory-authorized service technician that will assure proper installation and operation.
- C. Provide each unit with refrigerant circuit(s) factory-supplied completely piped with liquid line filter-drier, suction and liquid line pressure ports.

## 2.8 OUTDOOR AIR SECTION

- A. Provide 100% return air.
- B. Provide economizer with.
- C. Provide adjustable minimum position control located in the economizer section of the unit.
- D. Provide spring return motor for outside air damper closure during unit shutdown or power interruption.

## 2.9 OPERATING CONTROLS

- A. Provide factory-wired roof top units with 24 volt control circuit with control transformers, contactor pressure lugs or terminal block for power wiring. Contractor to provide new disconnect device. Units shall have single point power connections. Field wiring of zone controls to be NEC Class II.
- B. Provide microprocessor unit-mounted control which when used with an electronic zone sensor provides proportional integral room control. This UCM shall perform all unit functions by making all heating, cooling and ventilating decisions through resident software logic.
- C. Provide factory-installed indoor evaporator defrost control to prevent compressor slugging by interrupting compressor operation.
- D. Provide a anti-cycle timing and minimum on/off between stages timing in the microprocessor.
- E. Economizer Preferred Cooling - Compressor operation is integrated with economizer cycle to allow mechanical cooling when economizer is not adequate to satisfy zone requirements. Compressors are enabled if space temperature is recovering to cooling setpoint at a rate of less than 0.2 degrees per minute. Compressor low ambient lockout overrides this function.

## 2.10 STAGING CONTROLS

- A. Provide NEC Class II, electronic, adjustable zone control to maintain zone temperature setting, with new DDC controls. See specification Section 23 0933.

## 2.11 UNIT SOUND RATING NUMBER

- A. SHALL BE MAXIMUM 80db BASED ON ARI 270 AND ARI 370.

2.12 OPTIONS REQUIRED

- A. Condenser hail guard.
- B. Convenient outlet.
- C. Unit electrical service disconnect.

**PART 3 - EXECUTION**

3.1 EXAMINATION

- A. Contractor shall verify that existing curb is ready to receive work and opening dimensions with fit new unit.
- B. Contractor shall verify that proper power supply is available.

3.2 INSTALLATION

- A. Contractor shall install in accordance with manufacturer's instructions.
- B. Mount units on existing built roof mounting curb or new curb as specified providing watertight enclosure to protect ductwork and utility services.

END OF SECTION 23 7413

END OF DIVISION 23

**DIVISION 26: ELECTRICAL**

**26 0000                    ELECTRICAL**

26 0501	COMMON ELECTRICAL REQUIREMENTS
26 0502	ELECTRICAL DEMOLITION REQUIREMENTS
26 0519	LINE-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
26 0526	GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
26 0533	RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

**26 2000                    LOW (LINE) VOLTAGE DISTRIBUTION**

26 2195	ELECTRICAL IDENTIFICATION
26 2816	ENCLOSED SWITCHES AND CIRCUIT BREAKERS

**END OF TABLE OF CONTENTS**

## SECTION 26 0501 - COMMON ELECTRICAL REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Includes But Not Limited To:
  - 1. General electrical system requirements and procedures.
  - 2. Make electrical connections to equipment provided under other Sections.
  - 3. Furnish and install Penetration Firestop Systems at electrical system penetrations as described in Contract Documents.

#### 1.2 SUBMITTALS

- A. Product Data:
  - 1. Provide following information for each item of equipment:
    - a. Catalog Sheets.
    - b. Assembly details or dimension drawings.
    - c. Installation instructions.
    - d. Manufacturer's name and catalog number.
    - e. Name of local supplier.
  - 2. Furnish such information for following equipment:
    - a. Section 26 2816: Enclosed switches and circuit breakers.
  - 3. Do not purchase equipment before approval of product data.
  - 4. Submit in three-ring binder with hard cover (six sets)
- B. Quality Assurance / Control:
  - 1. Report of site tests, before Substantial Completion.

#### 1.3 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies:
  - 1. NEC and local ordinances and regulations shall govern unless more stringent requirements are specified.
  - 2. Material and equipment provided shall meet standards of NEMA or UL, or ULC, CSA, or EEMAC and bear their label wherever standards have been established and label service is available.
- B. Materials and equipment provided under following Sections shall be by same Manufacturer:
  - 1. Sections 26 2416, 26 2816, and 26 2913: Panelboards, Enclosed Switches And Circuit Breakers, and Enclosed Controllers.
- C. Contractor shall obtain all permits and arrange all inspections required by local codes and ordinances applicable to this Division.

#### 1.4 OWNER'S INSTRUCTIONS

- A. Provide competent instructor for time required to adequately train maintenance personnel in operation and maintenance of electrical equipment and systems. Factory representatives shall assist this instruction as necessary. Schedule instruction period at time of final inspection.

#### 1.5 OPERATION AND MAINTENANCE MANUALS

- A. Prepare and submit (2) two complete copies of the O & M Manuals—manuals to contain information listed below. Place each manual in a tabbed three-ring binder upon completion of the project. Deliver to General Contractor upon completion.

1. Operation and Maintenance manual must contain the following items:
  - a. Copies of reviewed shop drawings.
  - b. Letter of 1-year guarantee of workmanship.
  - c. Copy of voltage and ammeter readings.
  - d. Copy of letter verifying owner's receipt of spare parts.
  - e. Manufacturers installation instructions and parts.

## **1.6 GUARANTEE**

- A. The following guarantee is a part of this specification and shall be binding on the part of the Contractor:
  1. "The Contractor guarantees that this installation is free from mechanical defects. He agrees to replace or repair, to the satisfaction of the Owner's Representative, any part of this installation which may fail or be determined unacceptable within a period of one (1) year after final acceptance."

## **1.7 RECORD DRAWINGS**

- A. During the course of construction, the Electrical Contractor shall maintain a set of drawings upon which all deviations from the original layout are recorded. These marked-up prints shall be turned over to the Architect/Engineer at the conclusion of the work.

## **PART 2 - PRODUCTS: Not Used**

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. All relocations, reconnections, and removals are not necessarily indicated on Drawings. All such work shall be included without additional cost to Owner.
- B. Confirm dimensions, ratings, and specifications of equipment to be installed and coordinate these with site dimensions and with other Sections.

### **3.2 INSTALLATION**

- A. General:
  1. Locations of electrical equipment shown on Drawings are approximate only. Field verify actual locations for proper installation.
  2. Coordinate electrical equipment locations and conduit runs with those providing equipment to be served before installation or rough-in.
  3. Work related to other trades which is required under this Division, such as cutting and patching, trenching, and backfilling, shall be performed according to standards specified in applicable Sections.
- B. Install Penetration Firestop System appropriate for penetration at electrical system penetrations through walls, ceilings, and top plates of walls.

### **3.3 FIELD QUALITY CONTROL**

- A. Site Tests: Test systems and demonstrate equipment as working and operating properly. Notify Engineer before test. Rectify defects at no additional cost to Owner.
- B. Measure current for each phase of each motor under actual final load operation, i.e. after air balance is completed for fan units, etc. Record this information along with full-load nameplates current rating and size of thermal overload unit installed for each motor.

**END OF SECTION 26 0501**

## **SECTION 26 0502 - ELECTRICAL DEMOLITION REQUIREMENTS**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. Includes But Not Limited To
  - 1. Demolition involving electrical system as described in Contract Documents.
- B. Related Sections
  - 1. Section 26 0501 - Common Electrical Requirements
  - 2. New and replacement work specified in appropriate specification Section.

### **PART 2 - NOT USED**

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. All relocations, reconnections, and removals are not necessarily indicated on Drawings. All such work shall be included without additional cost to Owner.

#### **3.2 PREPARATION**

- A. Disconnect equipment that is to be removed or relocated. Carefully remove, disassemble, or dismantle as required, and store in approved location on site, existing items to be reused in completed work.
- B. Where affected by demolition or new construction, relocate, extend, or repair raceways, conductors, outlets, and apparatus to allow continued use of electrical system. Use methods and materials as specified for new construction.

#### **3.3 PERFORMANCE**

- A. Perform drilling, cutting, block-offs, and demolition work required for removal of necessary portions of electrical system. Do not cut joists, beams, girders, trusses, or columns without prior written permission from Architect.
- B. Remove concealed wiring abandoned due to demolition or new construction. Remove circuits, conduits, and conductors that are not to be re-used back to next active fixture, device, or junction box.
- C. Patch, repair, and finish surfaces affected by electrical demolition work, unless work is specifically called for under other Sections of the specifications.
- D. Coordinate electrical demolition with general demolition work being performed by the School District and the General Contractor.

#### **3.4 CLEANING**

- A. Remove obsolete raceways, conductors, apparatus, and lighting fixtures promptly from site and dispose of legally.

**END OF SECTION 26 0502**



## SECTION 26 0519 - LINE-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Includes But Not Limited To:
  - 1. Quality of conductors used on Project except as excluded below.
- B. Related Sections:
  - 1. Section 26 0501: Common Electrical Requirements.

#### 1.2 DEFINITIONS

- A. Line Voltage: Over 70 Volts.

### PART 2 - PRODUCTS

#### 2.1 COMPONENTS

- A. Line Voltage Conductors:
  - 1. Copper with AWG sizes as shown:
    - a. Minimum size shall be No. 12 except where specified otherwise.
    - b. Conductor size No. 8 and larger.
  - 2. Insulation:
    - a. Standard Conductor Size No. 10 And Smaller: 600V type THWN or XHHW (75 deg C).
    - b. Standard Conductor Size No. 8 And Larger: 600V Type THW, THWN, or XHHW (75 deg C).
    - c. Higher temperature insulation as required by NEC or local codes.
  - 3. Colors:
    - a. 208Y / 120 V System:
      - 1) Black: Phase A.
      - 2) Red: Phase B.
      - 3) Blue: Phase C.
      - 4) Green: Ground.
      - 5) White: Neutral.
    - b. Conductors size No. 10 and smaller shall be colored full length. Tagging or other methods for coding of conductors size No. 10 and smaller not allowed.
    - c. For feeder conductors larger than No. 10 at pull boxes, gutters, and panels, use painted or taped band or color tag color-coded as specified above.
- B. Standard Connectors:
  - 1. Conductors No. 8 And Smaller: Steel spring wire connectors.
  - 2. Conductors Larger Than No. 8: Pressure type terminal lugs.
  - 3. Connections Outside Building: Watertight steel spring wire connections with waterproof, non-hardening sealant.
- C. Terminal blocks for tapping conductors:
  - 1. Terminals shall be suitable for use with 75 deg C copper conductors.
  - 2. Acceptable Products:
    - a. 16323 by Cooper Bussmann, St Louis, MO [www.bussmann.com](http://www.bussmann.com)
    - b. LBA363106 by Square D Co, Palatine, IL [www.squared.com](http://www.squared.com).
    - c. Equal as approved by Architect before bidding. See Section 01 6000.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. General:
  - 1. Conductors and cables shall be continuous from outlet to outlet.
  - 2. Do not use direct burial cable.

- B. Line Voltage Conductors (Over 70 Volts):
1. Install conductors in raceway except where specifically indicated otherwise. Run conductors of different voltage systems in separate conduits.
  2. Route circuits at own discretion, however, circuiting shall be as shown in Panel Schedules. Group circuit homeruns to panels as shown on Drawings.
  3. Neutrals:
    - a. On three-phase, 4-wire systems, do not use common neutral for more than three circuits.
    - b. On single-phase, 3-wire systems, do not use common neutral for more than two circuits.
    - c. Run separate neutrals for each circuit where specifically noted on Drawings.
    - d. Where common neutral is run for two or three home run circuits, connect phase conductors to breakers in panel which are attached to separate phase legs so neutral conductors will carry only unbalanced current. Neutral conductors shall be of same size as phase conductors unless specifically noted otherwise.
  4. Pulling Conductors:
    - a. Do not pull conductors into conduit until raceway system is complete and cabinets and outlet boxes are free of foreign matter and moisture.
    - b. Do not use heavy mechanical means for pulling conductors.
    - c. Use only listed wire pulling lubricants.

**END OF SECTION 26 0519**

## SECTION 26 0526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Includes But Not Limited To:
  - 1. Furnish and install grounding for electrical installation as described in Contract Documents except as excluded below.
- B. Related Sections:
  - 1. Section 26 0501: Common Electrical Requirements.

### PART 2 - PRODUCTS

#### 2.1 COMPONENTS

- A. Size materials as shown on Drawings and in accordance with applicable codes.
- B. Grounding And Bonding Jumper Conductors: Bare copper or with green insulation.
- C. Make grounding conductor connections to ground rods and water pipes using approved bolted clamps listed for such use.
- D. Service Grounding Connections And Cable Splices:
  - 1. Make by compression type connectors designed specifically for this purpose.
  - 2. Acceptable Products:
    - a. Burndy
    - b. Thomas & Betts.
    - c. Equal as approved by Architect before bidding.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Grounding conductors and bonding jumper conductors shall be continuous from terminal to terminal without splice. Provide grounding for following.
  - 1. Electrical service, its equipment and enclosures.
  - 2. Conduits and other conductor enclosures.
  - 3. Neutral or identified conductor of interior wiring system.
  - 4. Main panelboard, power and lighting panelboards.
  - 5. Non-current-carrying metal parts of fixed equipment such as motors, starter and controller cabinets, instrument cases, and lighting fixtures.
- B. Grounding connection to main water supply shall be accessible for inspection and made within 6 inches of point of entrance of water line to building. Provide bonding jumpers across water meter and valves to assure electrical continuity.
- C. Ground identified common conductor of electrical system at secondary side of main transformer supplying building. Ground identified grounded (neutral) conductor of electrical system on supply side of main service disconnect.
- D. Pull grounding conductors in non-metallic raceways, in flexible steel conduit exceeding 72 inches in length, and in flexible conduit connecting to mechanical equipment.
- E. Provide grounding bushings on all feeder conduit entrances into panelboards and equipment enclosures.
- F. Bond conduit grounding bushings to enclosures with minimum #10 AWG conductor.
- G. Connect equipment grounds to building system ground.
  - 1. Use same size equipment grounding conductors as phase conductors up through #10 AWG.
  - 2. Use NEC Table 250-95 for others unless noted otherwise in Drawings.

- H. Run separate insulated grounding cable from each equipment cabinet to electrical panel. Do not use intermediate connections or splices. Affix directly to cabinet.
- I. On motors, connect ground conductors to conduit with approved grounding bushing and to metal frame with bolted solderless lug.
- J. Ground each separately derived system neutral to nearest ground per NEC and local inspector.
- K. Provide a separate, insulated equipment green grounding conductor in all feeder and branch circuits. Terminate each end on a grounding lug, bus, or bushing and to all metallic enclosures. A conduit ground is not acceptable. Install grounding bushings on both ends of all feeder conduit and bond to ground system.

**END OF SECTION 26 0526**

## SECTION 26 0533 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Includes But Not Limited To:
  - 1. Quality of material and installation procedures for raceway, boxes, and fittings used on Project but furnished under other Divisions.
  - 2. Furnish and install raceway, conduit, and boxes used on Project not specified to be installed under other Divisions.
  - 3. Furnish and install air / vapor barrier back boxes as described in Contract Documents.
  - 4. Furnish and install main electrical service raceway to comply with electrical utility company requirements.
- B. Related Sections
  - 1. Section 26 0501: General Electrical Requirements.

### PART 2 - PRODUCTS

#### 2.1 COMPONENTS

- A. Raceway And Conduit:
  - 1. Sizes:
    - a. 3/4 inch min. for exterior underground use.
    - b. 1/2 inch minimum elsewhere, all home runs shall be 3/4 inch min. unless indicated otherwise.
  - 2. Types: Usage of each type is restricted as specified below by product.
    - a. Galvanized rigid steel or galvanized intermediate metal conduit (IMC) is allowed for use in all areas. Where in contact with earth or concrete, wrap buried galvanized rigid steel and galvanized IMC conduit and fittings completely with vinyl tape.
    - b. Galvanized Electrical Metallic Tubing (EMT):
      - 1) Allowed for use only in indoor dry locations where it is:
        - a) Not subject to damage.
        - b) Not in contact with earth.
        - c) Not in concrete.
      - 2) Flexible steel conduit or metal-clad cable required for final connections to indoor mechanical equipment.
    - c. Schedule 40 Polyvinyl Chloride (PVC) Conduit:
      - 1) Allowed for use only underground or below concrete with galvanized rigid steel or IMC elbows and risers.
    - d. Listed, Liquid-Tight Flexible Metal Conduit:
      - 1) Use in outdoor final connections to mechanical equipment, length not to exceed 36 inches.
    - e. Pre-wired 3/8 Inch Flexible Fixture Whips: Allowed only for connection to recessed lighting fixtures, lengths not to exceed 72 inches.
  - 3. Prohibited Raceway Materials:
    - a. Aluminum conduit.
    - b. Armored cable type AC (BX) cable.
- B. Raceway And Conduit Fittings:
  - 1. Rigid Steel Conduit And IMC: Threaded and designed for conduit use.
  - 2. EMT:
    - a. Compression type.
    - b. Steel set screw housing type.
  - 3. PVC Conduit:
    - a. PVC type. Use PVC adapters at all boxes.
    - b. PVC components, (conduit, fittings, cement) shall be from same Manufacturer.
  - 4. Flexible Steel Conduit: Screw-in type.
  - 5. Liquid-tight Flexible Metal Conduit: Sealite type.
  - 6. Expansion fittings shall be equal to OZ Type AX sized to raceway and including bonding jumper.
  - 7. Prohibited Fitting Materials:
    - a. Crimp-on, tap-on, indenter type fittings.
    - b. Cast set-screw fittings for EMT.
    - c. Spray (aerosol) PVC cement.

1. Galvanized steel of proper size and shape are acceptable for all systems. Where metal boxes are used, provide following:
  - a. Provide metal supports and other accessories for installation of each box.
  - b. Equip ceiling and bracket fixture boxes with fixture studs where required.
  - c. Equip outlets in plastered, paneled, and furred finishes with plaster rings and extensions to bring box flush with finish surface.
2. Telephone / data outlet boxes shall be 4' 11/16" deep box with single gang mud ring.

## 2.2 MANUFACTURERS

- A. Contact Information:
  1. Cooper B-Line, Highland, IL [www.bline.com](http://www.bline.com).
  2. Hubbell Incorporated, Milford, CT [www.hubbell-wiring.com](http://www.hubbell-wiring.com).
  3. Square D, Palatine, IL [www.squared.com](http://www.squared.com).
  4. Steel City, Div Thomas & Betts, Memphis, TN [www.tnb.com](http://www.tnb.com).
  5. Thomas & Betts, Memphis, TN [www.tnb.com](http://www.tnb.com).
  6. Walker Systems Inc, Williamstown, [www.wiremold.com](http://www.wiremold.com).
  7. Wiremold Co, West Hartford, CT [www.wiremold.com](http://www.wiremold.com).

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Confirm dimensions, ratings, and specifications of materials to be installed and coordinate these with site dimensions and with other Sections.

### 3.2 INSTALLATION

- A. Interface With Other Work:
  1. Coordinate with Divisions 22 and 23 for installation of raceway for control of plumbing and HVAC equipment.
  2. Before rough-in, verify locations of boxes with work of other trades to insure that they are properly located for purpose intended.
    - a. Coordinate location of outlet for water cooler with Division 22.
    - b. Coordinate location of outlets adjacent to or in millwork before rough-in. Refer conflicts to Architect and locate outlet under his direction.
  3. Install pull wires in raceways installed under this Section where conductors or cables are to be installed under other Divisions.
- B. Conduit And Raceway:
  1. Conceal raceways within ceilings, walls, and floors, except at Contractor's option, conduit may be exposed on walls or ceilings of mechanical equipment areas and above acoustical panel suspension ceiling systems. Install exposed raceway runs parallel to or at right angles to building structure lines.
  2. Keep raceway runs 6 inches minimum from hot water pipes.
  3. Make no more than four quarter bends, 360 degrees total, in any conduit run between outlet and outlet, fitting and fitting, or outlet and fitting.
    - a. Make bends and offsets so conduit is not injured and internal diameter of conduit is not effectively reduced.
    - b. Radius of curve shall be at least minimum indicated by NEC.
  4. Cut conduit smooth and square with run and ream to remove rough edges. Cap raceway ends during construction. Clean or replace raceway in which water or foreign matter have accumulated.
  5. Install insulated bushings on each end of raceway 1-1/4 inches in diameter and larger, and on all raceways where low voltage cables emerge. Install expansion fittings where raceways cross building expansion joints.
  6. Provide nylon pull string with printed footage indicators secured at each end of each empty conduit, except sleeves and nipples. Identify with tags at each end the origin and destination of each empty conduit, and indicate same on all empty or spare conduits on the as-built drawings.
  7. Where conduit penetrates fire-rated walls and floors, seal opening around conduit with UL-listed foamed silicone elastomer compound. Fill void around perimeter of conduits with nonmetallic nonshrink grout in all concrete or masonry walls.
  8. Conduit And Raceway Support:
    - a. Securely support raceway with approved straps, clamps, or hangers, spaced as required.
    - b. Do not support from mechanical ducts or duct supports without Architect's written approval. Securely mount raceway supports, boxes, and cabinets in an approved manner by:
      - 1) Expansion shields in concrete or solid masonry.
      - 2) Toggle bolts on hollow masonry units.
      - 3) Wood screws on wood.

- 4) Metal screws on metal.
9. Prohibited Procedures:
    - a. Use of wooden plugs inserted in concrete or masonry units for mounting raceway, supports, boxes, cabinets, or other equipment.
    - b. Installation of raceway that has been crushed or deformed.
    - c. Use of torches for bending PVC.
    - d. Spray applied PVC cement.
    - e. Boring holes in truss members.
    - f. Notching of structural members.
    - g. Supporting raceway from ceiling system support wires.
    - h. Nail drive straps or tie wire for supporting raceway.
- C. Boxes:
    1. Boxes shall be accessible and installed with approved cover.
    2. Do not locate device boxes that are on opposite sides of framed walls in the same stud space. In other wall construction, do not install boxes back to back.
    3. Locate boxes so pipes, ducts, or other items do not obstruct outlets.
    4. Install outlets flush with finished surface and level and plumb.
    5. Support switch boxes larger than two-gang with side brackets and steel bar hangers in framed walls.
    6. At time of substantial completion, install blank plates on uncovered outlet boxes that are for future use.
    7. Install air / vapor barrier back boxes behind outlet boxes that penetrate vapor barrier.

**END OF SECTION 26 0533**

## SECTION 26 2195 - ELECTRICAL IDENTIFICATION

### PART 1 - GENERAL

#### 1.1 WORK INCLUDED

- A. Nameplates and labels.
- B. Wire and cable markers.

#### 1.2 RELATED WORK

- A. This Section shall be used in conjunction with the following other specifications and related Contract Documents to establish the total requirements for electrical identification.
  - 1. Section 16010 - Basic Electrical Requirements
- B. In the event of conflict regarding electrical identification requirements between this Section and any other section, the provisions of this Section shall govern.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. Nameplates: Engraved three-layer laminated plastic, minimum 3/16 inch high white letters on a black background.
- B. Wire and Cable Markers: Split sleeve or tubing type. Cloth or wraparound adhesive types not approved.
- C. Conductor-color Tape: Colored vinyl electrical tape.

### PART 1 - EXECUTION

#### 1.1 INSTALLATION

- A. Degrease and clean surfaces to receive nameplates.
- B. Install nameplates and labels parallel to equipment lines.
- C. Secure nameplates to equipment fronts. Secure nameplate to outside face of panelboard doors.
- D. Embossed tape will not be permitted for any application.
- E. Electrical Contractor shall write the circuit number to which each device is connected on the inside of the box (clearly visible when device is removed) and on the backside of each coverplate. Use a permanent black marker.

#### 1.2 WIRE IDENTIFICATION

- A. Conductors for power circuits to be identified per the following schedule.

<u>Conductor</u>	<u>208Y/120V</u>
Phase A	Black
Phase B	Red
Phase C	Blue
Neutral	White
Grounding	Green
Isolated Ground	Green with yellow stripe
Switchleg (lighting)	Pink

#### 1.3 NAMEPLATE ENGRAVING SCHEDULE

- A. Provide nameplates of minimum letter height as scheduled below.



- B. Panelboards, Switchboards and Motor Control Centers: 3/16 inch; identify equipment designation. 1/8 inch; identify voltage rating and source.
- C. Individual Circuit Breakers, Switches, and Motor Starters in Switchboards, and Motor Control Centers: 1/8 inch; identify source to device and the load it serves, including location.
- D. Individual Circuit Breakers, Enclosed Switches, and Motor Starters: 1/8 inch; identify load served and source.

**END OF SECTION 26 2195**

## SECTION 26 2816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Includes But Not Limited To:
  - 1. Furnish and install disconnects as described in Contract Documents, except those provided integral with equipment.
- B. Related Sections:
  - 1. Section 26 0501: Common Electrical Requirements.

### PART 2 - PRODUCTS

#### 2.1 EQUIPMENT

- A. Disconnects:
  - 1. Heavy-duty quick-make, quick-break type, non-fused unless indicated otherwise.
  - 2. Provide interlock to prevent opening of door when switch is in ON position.
  - 3. Provide means to lock switch in OFF position with padlock.
  - 4. Disconnects for motor circuits shall be horsepower rated
  - 5. Disconnects For Furnace Units And Unit Heaters: Provide manual starter with thermal overload relay. Provide overload relay to match motor full load amps.
  - 6. Enclosures:
    - a. Interior: NEMA / CEMA Type 1.
    - b. Exterior: NEMA / CEMA Type 3R.
  - 7. Fuses:
    - a. Fuse fused disconnects with dual-element time delay fuses.
    - b. Fuses on Project shall be from single manufacturer.
    - c. Approved Manufacturers.
      - 1) Cooper Bussmann, Chicago, IL [www.bussmann.com](http://www.bussmann.com).
      - 2) Edison Fusegear, Des Peres, MO (314) 391-3443.
      - 3) GEC Alstom Electrical Equipment, Hawthorne, NJ (800) 678-9322 or (201) 869-7777.
      - 4) Ferraz Shawmut, Newburyport, MA [www.ferrazshawmut.com](http://www.ferrazshawmut.com).
      - 5) Littelfuse Inc, Des Plaines, IL [www.littelfuse.com](http://www.littelfuse.com).
  - 8. Approved Manufacturer.
    - a. Same as Manufacturer of Project's main panelboard.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Install disconnects where shown on the drawings.
- B. Label disconnects to indicate equipment served, such as Condensing Unit CU-1. Use 1/16 inch thick laminated plastic composition material with contrasting color core. Engraved letters shall be 1/4 inch high. Attach labels with screws.
- C. Inspect for physical damage, proper alignment, anchorage, and grounding. Check tightness of all connections at disconnects.

**END OF SECTION 26 2816**

**END OF DIVISION 26**