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State of New Hampshire

DEPARTMENT OF ADMINISTRATIVE SERVICES
25 Capitol Street – Room 100
Concord, New Hampshire 03301
(603) 271-3201 | Office@das.nh.gov

Charles M. Arlinghaus
Commissioner

Catherine A. Keane
Deputy Commissioner

Sheri L. Rockburn
Assistant Commissioner

December 21, 2022

His Excellency, Governor Christopher T. Sununu
and the Honorable Council
State House
Concord, New Hampshire 03301

REQUESTED ACTION

Authorize the Department of Administrative Services to enter into a contract with Glover Plumbing & Heating Service LLC, (VC# 169898) Barrington, NH, for a total price not to exceed $26,450.00 to furnish and install HVAC combustion air ductwork, louvers, and dampers at 19 Pillsbury Street in Concord. The term of the contract shall begin on January 25, 2023, or upon approval of the Governor and Executive Council whichever is later, through April 17, 2023. **100% Capital Funds**

Funding is available in account titled Department of Administrative Services as follows:

	FY23
01-14-14-140030-71730000, Statewide Projects; Statewide Emergency Funding	
034-500162 - Repairs/Renovation Building	$ 26,450.00

EXPLANATION

In accordance with RSA 21-I:12, II B, the Department of Administrative Services, Division of Plant and Property Management is responsible to "provide for the general maintenance of state-owned buildings and grounds, except as otherwise provided by law." The Division of Plant and Property Management maintains 91 state owned buildings located throughout the state. This contract is required to provide combustion air ductwork, louvers, and dampers for a new steam boiler at a state-owned facility located at 19 Pillsbury Street.

A request for bids was issued and placed on the State of New Hampshire, Bureau of Purchase and Property web site on November 30, 2022. In addition to posting the bid on our web site, we also notified forty-three (43) contractors that are registered with the Bureau of Purchase and Property regarding the bidding opportunity. Two compliant bids were received. Glover Plumbing and Heating was the low bidder. Attached is a copy of the bid summary.

Respectfully submitted,

Charles M. Arlinghaus,
Commissioner

RFB DAS 2023-319

Furnish and Install HVAC Combustion Air Ductwork, Louvers and Dampers

December 15, 2022 @ 1:30 PM

Vendor	Bid
Glover Plumbing & Heating	$26,450.00
Alliance Group, Inc.	$33,576.00

Indicates Apparent Low Bidder

Quote submission from Northeastern Sheet Metal Inc., is non compliant because it did not comply with RFB requirements. They also failed to submit the required signed Bid form and did not acknowledge two addendums.

Bids under review. Contract award pending approval of Governor and Council

Notice: This agreement and all of its attachments shall become public upon submission to Governor and Executive Council for approval. Any information that is private, confidential or proprietary must be clearly identified to the agency and agreed to in writing prior to signing the contract.

AGREEMENT

The State of New Hampshire and the Contractor hereby mutually agree as follows:

GENERAL PROVISIONS

1. IDENTIFICATION.

1.1 State Agency Name Department of Administrative Services		1.2 State Agency Address Concord, NH 03301	
1.3 Contractor Name Glover Plumbing & Heating Service LLC (VC#169898)		1.4 Contractor Address 2035 Franklin Pierce Hwy Barrington, NH 03825	
1.5 Contractor Phone Number (603) 664-9733	1.6 Account Number 010-014-014-140030-71730000-034-500162	1.7 Completion Date April 17, 2023	1.8 Price Limitation $26,450.00
1.9 Contracting Officer for State Agency Michael P. Connor		1.10 State Agency Telephone Number (603) 271-6889	
1.11 Contractor Signature Date: 12/20/22		1.12 Name and Title of Contractor Signatory **David A Glover Manger**	
1.13 State Agency Signature Date: 12/20/22		1.14 Name and Title of State Agency Signatory Charles M. Arlinghaus, Commissioner	
1.15 Approval by the N.H. Department of Administration, Division of Personnel *(if applicable)* By:		Director, On:	
1.16 Approval by the Attorney General (Form, Substance and Execution) *(if applicable)* By:		On: 01/05/2023	
1.17 Approval by the Governor and Executive Council *(if applicable)* G&C Item number:		G&C Meeting Date:	

Initials: DA
Date: 12-20-22

2. **SERVICES TO BE PERFORMED.** The State of New Hampshire, acting through the agency identified in block 1.1 ("State"), engages contractor identified in block 1.3 ("Contractor") to perform, and the Contractor shall perform, the work or sale of goods, or both, identified and more particularly described in the attached EXHIBIT B which is incorporated herein by reference ("Services").

3. **EFFECTIVE DATE/COMPLETION OF SERVICES.**

3.1 Notwithstanding any provision of this Agreement to the contrary, and subject to the approval of the Governor and Executive Council of the State of New Hampshire, if applicable, this Agreement, and all obligations of the parties hereunder, shall become effective on the date the Governor and Executive Council approve this Agreement as indicated in block 1.17, unless no such approval is required, in which case the Agreement shall become effective on the date the Agreement is signed by the State Agency as shown in block 1.13 ("Effective Date").

3.2 If the Contractor commences the Services prior to the Effective Date, all Services performed by the Contractor prior to the Effective Date shall be performed at the sole risk of the Contractor, and in the event that this Agreement does not become effective, the State shall have no liability to the Contractor, including without limitation, any obligation to pay the Contractor for any costs incurred or Services performed. Contractor must complete all Services by the Completion Date specified in block 1.7.

4. **CONDITIONAL NATURE OF AGREEMENT.**

Notwithstanding any provision of this Agreement to the contrary, all obligations of the State hereunder, including, without limitation, the continuance of payments hereunder, are contingent upon the availability and continued appropriation of funds affected by any state or federal legislative or executive action that reduces, eliminates or otherwise modifies the appropriation or availability of funding for this Agreement and the Scope for Services provided in EXHIBIT B, in whole or in part. In no event shall the State be liable for any payments hereunder in excess of such available appropriated funds. In the event of a reduction or termination of appropriated funds, the State shall have the right to withhold payment until such funds become available, if ever, and shall have the right to reduce or terminate the Services under this Agreement immediately upon giving the Contractor notice of such reduction or termination. The State shall not be required to transfer funds from any other account or source to the Account identified in block 1.6 in the event funds in that Account are reduced or unavailable.

5. **CONTRACT PRICE/PRICE LIMITATION/ PAYMENT.**

5.1 The contract price, method of payment, and terms of payment are identified and more particularly described in EXHIBIT C which is incorporated herein by reference.

5.2 The payment by the State of the contract price shall be the only and the complete reimbursement to the Contractor for all expenses, of whatever nature incurred by the Contractor in the performance hereof, and shall be the only and the complete compensation to the Contractor for the Services. The State shall have no liability to the Contractor other than the contract price.

5.3 The State reserves the right to offset from any amounts otherwise payable to the Contractor under this Agreement those liquidated amounts required or permitted by N.H. RSA 80:7 through RSA 80:7-c or any other provision of law.

5.4 Notwithstanding any provision in this Agreement to the contrary, and notwithstanding unexpected circumstances, in no event shall the total of all payments authorized, or actually made hereunder, exceed the Price Limitation set forth in block 1.8.

6. **COMPLIANCE BY CONTRACTOR WITH LAWS AND REGULATIONS/ EQUAL EMPLOYMENT OPPORTUNITY.**

6.1 In connection with the performance of the Services, the Contractor shall comply with all applicable statutes, laws, regulations, and orders of federal, state, county or municipal authorities which impose any obligation or duty upon the Contractor, including, but not limited to, civil rights and equal employment opportunity laws. In addition, if this Agreement is funded in any part by monies of the United States, the Contractor shall comply with all federal executive orders, rules, regulations and statutes, and with any rules, regulations and guidelines as the State or the United States issue to implement these regulations. The Contractor shall also comply with all applicable intellectual property laws.

6.2 During the term of this Agreement, the Contractor shall not discriminate against employees or applicants for employment because of race, color, religion, creed, age, sex, handicap, sexual orientation, or national origin and will take affirmative action to prevent such discrimination.

6.3. The Contractor agrees to permit the State or United States access to any of the Contractor's books, records and accounts for the purpose of ascertaining compliance with all rules, regulations and orders, and the covenants, terms and conditions of this Agreement.

7. **PERSONNEL.**

7.1 The Contractor shall at its own expense provide all personnel necessary to perform the Services. The Contractor warrants that all personnel engaged in the Services shall be qualified to perform the Services, and shall be properly licensed and otherwise authorized to do so under all applicable laws.

7.2 Unless otherwise authorized in writing, during the term of this Agreement, and for a period of six (6) months after the Completion Date in block 1.7, the Contractor shall not hire, and shall not permit any subcontractor or other person, firm or corporation with whom it is engaged in a combined effort to perform the Services to hire, any person who is a State employee or official, who is materially involved in the procurement, administration or performance of this Agreement. This provision shall survive termination of this Agreement.

7.3 The Contracting Officer specified in block 1.9, or his or her successor, shall be the State's representative. In the event of any dispute concerning the interpretation of this Agreement, the Contracting Officer's decision shall be final for the State.

Contractor Initials

Date 12-20-22

Contractor, or subcontractors, including but not limited to the negligence, reckless or intentional conduct. The State shall not be liable for any costs incurred by the Contractor arising under this paragraph 13. Notwithstanding the foregoing, nothing herein contained shall be deemed to constitute a waiver of the sovereign immunity of the State, which immunity is hereby reserved to the State. This covenant in paragraph 13 shall survive the termination of this Agreement.

14. INSURANCE.

14.1 The Contractor shall, at its sole expense, obtain and continuously maintain in force, and shall require any subcontractor or assignee to obtain and maintain in force, the following insurance:

14.1.1 commercial general liability insurance against all claims of bodily injury, death or property damage, in amounts of not less than $1,000,000 per occurrence and $2,000,000 aggregate or excess; and

14.1.2 special cause of loss coverage form covering all property subject to subparagraph 10.2 herein, in an amount not less than 80% of the whole replacement value of the property.

14.2 The policies described in subparagraph 14.1 herein shall be on policy forms and endorsements approved for use in the State of New Hampshire by the N.H. Department of Insurance, and issued by insurers licensed in the State of New Hampshire.

14.3 The Contractor shall furnish to the Contracting Officer identified in block 1.9, or his or her successor, a certificate(s) of insurance for all insurance required under this Agreement. Contractor shall also furnish to the Contracting Officer identified in block 1.9, or his or her successor, certificate(s) of insurance for all renewal(s) of insurance required under this Agreement no later than ten (10) days prior to the expiration date of each insurance policy. The certificate(s) of insurance and any renewals thereof shall be attached and are incorporated herein by reference.

15. WORKERS' COMPENSATION.

15.1 By signing this agreement, the Contractor agrees, certifies and warrants that the Contractor is in compliance with or exempt from, the requirements of N.H. RSA chapter 281-A *("Workers' Compensation")*.

15.2 To the extent the Contractor is subject to the requirements of N.H. RSA chapter 281-A, Contractor shall maintain, and require any subcontractor or assignee to secure and maintain, payment of Workers' Compensation in connection with activities which the person proposes to undertake pursuant to this Agreement. The Contractor shall furnish the Contracting Officer identified in block 1.9, or his or her successor, proof of Workers' Compensation in the manner described in N.H. RSA chapter 281-A and any applicable renewal(s) thereof, which shall be attached and are incorporated herein by reference. The State shall not be responsible for payment of any Workers' Compensation premiums or for any other claim or benefit for Contractor, or any subcontractor or employee of Contractor, which might arise under applicable State of New Hampshire Workers' Compensation laws in connection with the performance of the Services under this Agreement.

16. NOTICE. Any notice by a party hereto to the other party shall be deemed to have been duly delivered or given at the time of mailing by certified mail, postage prepaid, in a United States Post Office addressed to the parties at the addresses given in blocks 1.2 and 1.4, herein.

17. AMENDMENT. This Agreement may be amended, waived or discharged only by an instrument in writing signed by the parties hereto and only after approval of such amendment, waiver or discharge by the Governor and Executive Council of the State of New Hampshire unless no such approval is required under the circumstances pursuant to State law, rule or policy.

18. CHOICE OF LAW AND FORUM. This Agreement shall be governed, interpreted and construed in accordance with the laws of the State of New Hampshire, and is binding upon and inures to the benefit of the parties and their respective successors and assigns. The wording used in this Agreement is the wording chosen by the parties to express their mutual intent, and no rule of construction shall be applied against or in favor of any party. Any actions arising out of this Agreement shall be brought and maintained in New Hampshire Superior Court which shall have exclusive jurisdiction thereof.

19. CONFLICTING TERMS. In the event of a conflict between the terms of this P-37 form (as modified in EXHIBIT A) and/or attachments and amendment thereof, the terms of the P-37 (as modified in EXHIBIT A) shall control.

20. THIRD PARTIES. The parties hereto do not intend to benefit any third parties and this Agreement shall not be construed to confer any such benefit.

21. HEADINGS. The headings throughout the Agreement are for reference purposes only, and the words contained therein shall in no way be held to explain, modify, amplify or aid in the interpretation, construction or meaning of the provisions of this Agreement.

22. SPECIAL PROVISIONS. Additional or modifying provisions set forth in the attached EXHIBIT A are incorporated herein by reference.

23. SEVERABILITY. In the event any of the provisions of this Agreement are held by a court of competent jurisdiction to be contrary to any state or federal law, the remaining provisions of this Agreement will remain in full force and effect.

24. ENTIRE AGREEMENT. This Agreement, which may be executed in a number of counterparts, each of which shall be deemed an original, constitutes the entire agreement and understanding between the parties, and supersedes all prior agreements and understandings with respect to the subject matter hereof.

Contractor Initials

Date 12-30-22

8. EVENT OF DEFAULT/REMEDIES.

8.1 Any one or more of the following acts or omissions of the Contractor shall constitute an event of default hereunder ("Event of Default"):

8.1.1 failure to perform the Services satisfactorily or on schedule;

8.1.2 failure to submit any report required hereunder; and/or

8.1.3 failure to perform any other covenant, term or condition of this Agreement.

8.2 Upon the occurrence of any Event of Default, the State may take any one, or more, or all, of the following actions:

8.2.1 give the Contractor a written notice specifying the Event of Default and requiring it to be remedied within, in the absence of a greater or lesser specification of time, thirty (30) days from the date of the notice; and if the Event of Default is not timely cured, terminate this Agreement, effective two (2) days after giving the Contractor notice of termination;

8.2.2 give the Contractor a written notice specifying the Event of Default and suspending all payments to be made under this Agreement and ordering that the portion of the contract price which would otherwise accrue to the Contractor during the period from the date of such notice until such time as the State determines that the Contractor has cured the Event of Default shall never be paid to the Contractor;

8.2.3 give the Contractor a written notice specifying the Event of Default and set off against any other obligations the State may owe to the Contractor any damages the State suffers by reason of any Event of Default; and/or

8.2.4 give the Contractor a written notice specifying the Event of Default, treat the Agreement as breached, terminate the Agreement and pursue any of its remedies at law or in equity, or both.

8.3. No failure by the State to enforce any provisions hereof after any Event of Default shall be deemed a waiver of its rights with regard to that Event of Default, or any subsequent Event of Default. No express failure to enforce any Event of Default shall be deemed a waiver of the right of the State to enforce each and all of the provisions hereof upon any further or other Event of Default on the part of the Contractor.

9. TERMINATION.

9.1 Notwithstanding paragraph 8, the State may, at its sole discretion, terminate the Agreement for any reason, in whole or in part, by thirty (30) days written notice to the Contractor that the State is exercising its option to terminate the Agreement.

9.2 In the event of an early termination of this Agreement for any reason other than the completion of the Services, the Contractor shall, at the State's discretion, deliver to the Contracting Officer, not later than fifteen (15) days after the date of termination, a report ("Termination Report") describing in detail all Services performed, and the contract price earned, to and including the date of termination. The form, subject matter, content, and number of copies of the Termination Report shall be identical to those of any Final Report described in the attached EXHIBIT B. In addition, at the State's discretion, the Contractor shall, within 15 days of notice of early termination, develop and submit to the State a Transition Plan for services under the Agreement.

10. DATA/ACCESS/CONFIDENTIALITY/ PRESERVATION.

10.1 As used in this Agreement, the word "data" shall mean all information and things developed or obtained during the performance of, or acquired or developed by reason of, this Agreement, including, but not limited to, all studies, reports, files, formulae, surveys, maps, charts, sound recordings, video recordings, pictorial reproductions, drawings, analyses, graphic representations, computer programs, computer printouts, notes, letters, memoranda, papers, and documents, all whether finished or unfinished.

10.2 All data and any property which has been received from the State or purchased with funds provided for that purpose under this Agreement, shall be the property of the State, and shall be returned to the State upon demand or upon termination of this Agreement for any reason.

10.3 Confidentiality of data shall be governed by N.H. RSA chapter 91-A or other existing law. Disclosure of data requires prior written approval of the State.

11. CONTRACTOR'S RELATION TO THE STATE. In the performance of this Agreement the Contractor is in all respects an independent contractor, and is neither an agent nor an employee of the State. Neither the Contractor nor any of its officers, employees, agents or members shall have authority to bind the State or receive any benefits, workers' compensation or other emoluments provided by the State to its employees.

12. ASSIGNMENT/DELEGATION/SUBCONTRACTS.

12.1 The Contractor shall not assign, or otherwise transfer any interest in this Agreement without the prior written notice, which shall be provided to the State at least fifteen (15) days prior to the assignment, and a written consent of the State. For purposes of this paragraph, a Change of Control shall constitute assignment. "Change of Control" means (a) merger, consolidation, or a transaction or series of related transactions in which a third party, together with its affiliates, becomes the direct or indirect owner of fifty percent (50%) or more of the voting shares or similar equity interests, or combined voting power of the Contractor, or (b) the sale of all or substantially all of the assets of the Contractor.

12.2 None of the Services shall be subcontracted by the Contractor without prior written notice and consent of the State. The State is entitled to copies of all subcontracts and assignment agreements and shall not be bound by any provisions contained in a subcontract or an assignment agreement to which it is not a party.

13. INDEMNIFICATION. Unless otherwise exempted by law, the Contractor shall indemnify and hold harmless the State, its officers and employees, from and against any and all claims, liabilities and costs for any personal injury or property damages, patent or copyright infringement, or other claims asserted against the State, its officers or employees, which arise out of (or which may be claimed to arise out of) the acts or omission of the

Contractor Initials

Date 12-20-22

EXHIBIT "A"

SPECIAL PROVISIONS

1. **No Special Provisions.**

Contractor Initials
Date 12-20-22

EXHIBIT "B"

SCOPE OF SERVICES

1. The Contractor shall "furnish and install HVAC combustion air ductwork, louvers and dampers" at 19 Pillsbury Street, Concord, NH.

2. The term of this contract shall be from January 25, 2023, through April 17, 2023.

3. The term "furnish and install HVAC combustion air ductwork, louvers and dampers", as used above shall include all supervision, supplies, equipment, labor, and transportation necessary for the successful completion of the work under the terms and conditions contained herein.

4. The Contractor shall furnish and install the combustion air ductwork, louvers and dampers as described herein, in Appendix A, Specifications and on the attached plans (M00-1, M10-1 and M50-1) entitled Pillsbury Street Boiler Replacement, dated 12/2/2022 with the following exceptions:

a. Insulation on the combustion air ductwork can start inboard of the exterior wall, please do not reduce the area of duct/louver required.
b. Drawing M50-1, Detail #1. Contractor to provide sill flashing as required. Contractor to provide 20 gauge bent angle pre attached to louver prior to installation. Contractor to provide spacers at fasteners to keep angle away from face of louver ¼" minimum.
c. Damper actuators to be provided by others.

5. The Contractor shall complete the installation during mid March 2023.

6. All work performed shall be scheduled by the State Project Manager from the Department of Administrative Services.

7. All work shall be completed from 7:00 AM to 4:30 PM unless prior arrangements are made in advance with the State Project Manager.

7. The Contractor shall conduct their work to interfere as little as possible with State business. They shall at their own expense, wherever necessary or required, furnish safety devices, and take such other precautions as may be necessary to protect life and property.

9. The Contractor agrees that any damage or injury to building, material and equipment or to the other property caused by the Contractor during the performance of these services shall be repaired at their own expense.

10. The Contractor shall notify the State Project Manager of any maintenance related issues that are discovered while performing the work.

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

Contractor Initials _____

Date 12-20-22

12. The Contractor shall initiate, maintain, and supervise all safety precautions and programs in connection with the work. The Contractor shall provide the necessary equipment and comply with all City, State and or Federal safety regulations.

13. The Contactor shall also be aware of laws and regulations relating to hazardous materials that may be encountered during construction operations. The health and safety of employees, the general public, and the potential of damage to the overall environment is possible if hazardous materials are not recognized, reported, and the appropriate action taken to dispose of, remove from the site, or otherwise contain the possible contaminants.

14. If any abnormal condition is encountered or exposed that indicates the presence of a hazardous material or toxic waste, construction operations shall be immediately suspended in the project area and the State Project Manager notified. No further work shall be conducted in the area of the contaminated material until the site has been investigated and the State has given approval to continue the work in the area. The Contractor shall fully cooperate with the State and perform any remedial work as directed.

15. The Contractor shall provide adequate supervision of their employees to ensure complete and satisfactory performance of all work in accordance with the terms of the contract.

16. The Contractor shall provide methods, means, and facilities to minimize noise produced by construction operations.

17. The Contractor shall ensure that all materials shall be of the best quality, all work is completed in a professional manner, and all aspects of the project are delivered in good working order, complete and perfect in every respect. All materials and equipment shall be new unless otherwise specified and shall be good quality free from faults and defects.

18. The Contractor shall further ensure that all dirt and debris resulting from the work under any resulting contract shall be disposed of at the end of each day or at the completion of work. The Contractor shall properly dispose of any materials removed or replaced. In addition, any areas disturbed shall be restored to their original condition.

19. The Contractor shall supervise and direct the work, using their best skill and attention. The Contractor shall be solely responsible for all construction means, methods, techniques, sequences, and procedures and for coordinating all portions of the work. All aspects of the project shall be subject to the inspection and approval of the State. The Contractor guarantees to repair, replace, re-execute, or otherwise correct any defect in workmanship, materials, of the like that fails to conform to the requirements of the State, or that appear during the progress of the work or within one year of final acceptance by the State. The Contractor shall supply the State with all warranty information whether it be expressed or implied.

20. The Contractor shall perform all the work and furnish all the materials, tools, equipment, and safety devices necessary to perform in the manner and within the time hereinafter specified. The Contractor shall complete the entire work to the satisfaction of the State and in accordance with the Specifications herein mentioned, at the price herein agreed upon and fixed, therefore. All the work, labor furnished under this contract, shall be done, and furnished strictly pursuant to, and in conformity with the specifications described herein, and the directions of the State representatives as given from time to time during the progress of the work, under the terms of this contract.

Contractor Initials _____

Date 12-20-22

21. The Contractor shall adequately secure and protect their own tools, equipment, materials, and supplies. The State assumes no liability for any damage, theft, or negligent injury to the Contractor's property or to the property of their employees, agents or approved sub-contractors.

22. Contractor shall take all responsibility for the work under this contract; for the protection of the work; and for preventing injuries to persons and damage to property and utilities on or about the work. They shall in no way be relieved of their responsibility by any right of the State to give permission or issue orders relating to any part of the work; or by any such permission given on orders issued or by failure of the State to give such permission or issue such orders. The Contractor shall bear all losses resulting to him or to the State on account of the amount or character of the work, or because of the nature of the area in or on which the work is done differed from what was estimated or expected, or account of the weather, elements, or other causes.

23. The Contractor shall be responsible to the State for the acts and omissions of their employees, subcontractors and their agents and employees and other persons performing any of the work under a contract.

24. All work shall be done in such a manner as not to interfere with the State's operating functions. The Contractor and their employees shall familiarize themselves and comply with all rules and regulations applicable to each project.

25. The work staff shall consist of qualified persons completely familiar with the products and equipment they shall use. The Contracting Officer may require the Contractor to dismiss from the work such employees as deems incompetent, careless, insubordinate, or otherwise objectionable, or whose continued employment on the work is deemed to be contrary to the public interest or inconsistent with the best interest of security and the State.

26. The Contractor or their personnel shall not represent themselves as employees or agents of the State.

27. While on State property, employees shall be subject to the control of the State, but under no circumstances shall such persons be deemed to be employees of the State.

28. The State will:

a) Provide the Contractor with all pertinent information regarding the requirements for this contract within two (2) working days of receiving a request for information from the Contractor.
b) Examine any documents submitted by the Contractor and rendering decisions pertaining thereto promptly to avoid delay in the progress of the Contractor's work.

29. All Contractor correspondence and submittals shall be sent to:

Michael Connor
State of New Hampshire
Department of Administrative Services
25 Capitol Street, Room 33
Concord, NH 03301

Contractor Initials MH
Date 12-20-22

EXHIBIT "C"

PAYMENT TERMS

1. The Contractor hereby agrees to furnish and install HVAC Combustion Air Ductwork, Louvers and Dampers at 19 Pillsbury Street for a not to exceed total of **$26,450.00** (herein after referred to as the contract price) in return for the services described in Exhibit "B".

2. Invoices shall be submitted after completion of work. Special charges, surcharges, processing charges, or fuel charges of any kind (by whatever name) may not be added on at any time.

3. Payments shall be paid in full within thirty (30) days after receipt of invoice and acceptance to the State's satisfaction. Payments will be made via ACH unless otherwise specified by the State.

Contractor Initials DA

Date 12-20-22

State of New Hampshire

Department of State

CERTIFICATE.

I, David M. Scanlan, Secretary of State of the State of New Hampshire, do hereby certify that GLOVER PLUMBING & HEATING SERVICE LLC is a New Hampshire Limited Liability Company registered to transact business in New Hampshire on October 30, 2002. I further certify that all fees and documents required by the Secretary of State's office have been received and is in good standing as far as this office is concerned.

Business ID: **418739**

Certificate Number : **0005910708**

IN TESTIMONY WHEREOF,

I hereto set my hand and cause to be affixed the Seal of the State of New Hampshire, this **20th** day of **December** A.D. **2022.**

David M. Scanlan

Secretary of State

Glover Plumbing & Heating Service LLC
Corporate Authorization Resolution

(Limited Partnership or LLC- Corporate General Partner or Manager)

Corporate Resolution

I, David Glover Jr., **hereby certify** that I am duly elected Clerk/Secretary of
(Name)
Glover Plumbing & Heating Service LLC I hereby certify the following is a true copy of a vote taken at a
(Name of Corporation)

meeting of the Board of Directors/shareholders, duly called and held on December 01, 2022,

at which a quorum of the Directors/shareholders were present and voting.

VOTED: That David Glover is duly authorized to enter a
(Name and Title)

contract on behalf of Glover Plumbing & Heating Service LLC which is the general
(Name of Corporation)

partner of Glover Plumbing & Heating Service LLC a limited partnership,
(Name of Limited Partnership)

with the Department of Administrative Service, State of New Hampshire and
(Name of State Agency)

further is authorized to execute any documents which may in his/her

judgment be desirable or necessary to effect the purpose of this vote.

I hereby certify that said vote has not been amended or repealed and remains in full force and effect as of the 20 day of December 2022. I further certify that it is understood that the State of New Hampshire will rely on this certificate as evidence that the person listed above currently occupies the position indicated and that they have full authority to bind the corporation and that the corporation as the general partner has full authority to bind the limited partnership to the specific contract indicated. This authority **shall remain valid for thirty (30)** days from the date of this Corporate Resolution.

DATED: December 20, 2022 **ATTEST:** Member
(Name & Title)

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY): 12/19/2022

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER	CONTACT NAME: Janice Bagley	
Avery Insurance 21 South Main Street PO Box 1510 Wolfeboro NH 03894-1510	PHONE (A/C, No, Ext): (603) 569-2515	FAX (A/C, No): (603) 569-4266
	E-MAIL ADDRESS: janiceb@averyinsurance.net	

INSURED	INSURER(S) AFFORDING COVERAGE	NAIC #
Glover Plumbing & Heating Service LLC 2035 Franklin Pierce Hwy Barrington NH 03825-7358	INSURER A: Patriot Insurance	32069
	INSURER B: Frankenmuth Insurance	13986
	INSURER C:	
	INSURER D:	
	INSURER E:	
	INSURER F:	

COVERAGES **CERTIFICATE NUMBER:** 22-23 Master **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
A	[X] COMMERCIAL GENERAL LIABILITY [ ] CLAIMS-MADE [X] OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: [ ] POLICY [X] PRO-JECT [ ] LOC [ ] OTHER:	Y	Y	6694314	06/27/2022	06/27/2023	EACH OCCURRENCE	$ 1,000,000
							DAMAGE TO RENTED PREMISES (Ea occurrence)	$ 1,000,000
							MED EXP (Any one person)	$ 10,000
							PERSONAL & ADV INJURY	$ 1,000,000
							GENERAL AGGREGATE	$ 2,000,000
							PRODUCTS - COMP/OP AGG	$ 2,000,000
								$
B	AUTOMOBILE LIABILITY [X] ANY AUTO [ ] OWNED AUTOS ONLY [ ] SCHEDULED AUTOS [ ] HIRED AUTOS ONLY [ ] NON-OWNED AUTOS ONLY	Y		6694313	06/27/2022	06/27/2023	COMBINED SINGLE LIMIT (Ea accident)	$ 1,000,000
							BODILY INJURY (Per person)	$
							BODILY INJURY (Per accident)	$
							PROPERTY DAMAGE (Per accident)	$
								$
A	[X] UMBRELLA LIAB [X] OCCUR [ ] EXCESS LIAB [ ] CLAIMS-MADE [ ] DED [ ] RETENTION $	Y	Y	6694314	06/27/2022	06/27/2023	EACH OCCURRENCE	$ 1,000,000
							AGGREGATE	$ 1,000,000
								$
B	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH) Y/N [Y] If yes, describe under DESCRIPTION OF OPERATIONS below	N/A		6694312	06/27/2022	06/27/2023	[X] PER STATUTE [ ] OTH-ER	
							E.L. EACH ACCIDENT	$ 500,000
							E.L. DISEASE - EA EMPLOYEE	$ 500,000
							E.L. DISEASE - POLICY LIMIT	$ 500,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

Coverage as per terms and conditions of policy.

David Glover is excluded from Workers Compensation coverage.

CERTIFICATE HOLDER

State of New Hampshire
Dept of Administrative Service
25 Capital St, Room 120
Concord NH 03301

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

Furnish and Install HVAC Combustion Air Ductwork, Louvers and Dampers	
Specifications	
Appendix A	
12/15/2022	
Section	Description
78413	Penetration Firestopping
79200	Joint Sealants
230500	Common Work Results for HVAC
230529	Hangers and Supports for HVAC Piping and Equipment
230713	Duct Insulation
233113	HVAC Ducts
233700	Air Outlets and Inlets
	mike/other/Appendix A Specifications Furnish and Install HVAC combustion air ductwork, louvers and dampers 12152022

SECTION 078413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Penetration firestopping systems.

B. Related Requirements:

1.

2. Division 22 and 23 Sections specifying duct and piping penetrations.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: Penetration firestopping systems.

B. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.

1. Engineering Judgments: Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping system, submit illustration, with modifications marked, approved by penetration firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly developed in accordance with current International Firestop Council (IFC) guidelines. Obtain approval of authorities having jurisdiction prior to submittal.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Listed System Designs: For each penetration firestopping system, for tests performed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Approvals according to FM Approvals 4991, "Approval Standard for Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install penetration firestopping system when ambient or substrate temperatures are outside limits permitted by penetration firestopping system manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

B. Install and cure penetration firestopping materials per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.8 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems can be installed according to specified firestopping system design.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping systems.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain penetration firestop systems for each type of opening indicated from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:

1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
2. Test in accordance with testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:

a. Penetration firestop systems installed with products bearing the classification marking of a qualified product certification agency in accordance with listed system designs published by a qualified testing agency.

1) UL in its online directory "Product iQ."
2) Intertek Group in its "Directory of Building Products."
3) FM Approvals in its "Approval Guide."

2.3 PENETRATION FIRESTOPPING SYSTEMS

A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems are to be compatible with one another, with the substrates forming openings, and with penetrating items if any.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. 3M Building and Construction.
   b. A/D Fire Protection Systems Inc.
   c. Hilti, Inc.
   d. NUCO Inc.
   e. Passive Fire Protection Partners.
   f. Specified Technologies, Inc.

B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined in accordance with ASTM E814 or UL 1479.

1. F-Rating: Not less than the fire-resistance rating of the wall penetrated.
2. Membrane Penetrations: Install recessed fixtures such that the required fire resistance will not be reduced.

C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined in accordance with ASTM E814 or UL 1479.

1. F-Rating: At least one hour, but not less than the fire-resistance rating of the floor penetrated.
2. T-Rating: At least one hour, but not less than the fire-resistance rating of the floor. The following floor penetrations do not require a T-rating:

   a. Those within the cavity of a wall.
   b. Floor, tub, or shower drains within a concealed space.
   c. 4-inch or smaller metal conduit penetrating directly into metal-enclosed electrical switchgear.

D. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, in accordance with ASTM E84.

E. Manufactured Piping Penetration Firestopping System: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.
2. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
3. W-Rating: Provide penetration firestopping systems showing no evidence of water leakage when tested according to UL 1479.

F. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by

penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.

1. Permanent forming/damming/backing materials.
2. Substrate primers.
3. Collars.
4. Steel sleeves.

2.4 FILL MATERIALS

A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer sleeve lined with an intumescent strip, a flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.

C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced intumescent elastomeric sheet bonded to galvanized-steel sheet.

E. Intumescent Putties: Nonhardening, water-resistant, intumescent putties containing no solvents or inorganic fibers.

F. Intumescent Wrap Strips: Single-component intumescent elastomeric strips for use around combustible penetrants.

G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

H. Pillows/Bags: Compressible, removable, and reusable intumescent pillows encased in fire-retardant polyester or glass-fiber cloth. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.

I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants.

K. Fire-Rated Cable Sleeve Kits: Complete kits designed for new or existing cable penetrations through walls to accept standard accessories.

L. Thermal Wrap: Flexible protective wrap tested and listed for up to 2-hour fire ratings in accordance with ASTM E814 or UL 1479 for membrane penetrations or ASTM E1725 or UL 1724 for thermal barrier and circuit integrity protection.

M. Fire-Rated Cable Pathways: Single or gangable device modules composed of a steel raceway with integral intumescent material and requiring no additional action in the form of plugs, twisting closure, putty, pillows, sealant, or otherwise to achieve fire and air-leakage ratings.

N. Retrofit Device for Cable Bundles: Factory-made, intumescent, collar-like device for firestopping existing over-filled cable sleeves and capable of being installed around projecting sleeves and cable bundles.

O. Wall-Opening Protective Materials: Intumescent, non-curing putty pads or self-adhesive inserts for protection of electrical switch and receptacle boxes.

P. Fire-Rated HVAC Retaining Angles: Steel angle system with integral intumescent firestop gasket for use around rectangular steel HVAC ducts without fire dampers.

Q. Firestop Plugs: Flexible, re-enterable, intumescent, foam-rubber plug for use in blank round openings and cable sleeves.

R. Fire-Rated Cable Grommet: Molded two-piece grommet made of plenum-grade polymer and foam inner core for sealing small cable penetrations in gypsum walls up to 1/2 inch in diameter.

S. Closet Flange Gasket: Molded, single-component, flexible, intumescent gasket for use beneath a water closet (toilet) flange in floor applications.

T. Endothermic Wrap: Flexible, insulating, fire-resistant, endothermic wrap for protecting membrane penetrations of utility boxes, critical electrical circuits, communications lines, and fuel lines.

2.5 MIXING

A. Penetration Firestopping Materials: For those products requiring mixing before application, comply with penetration firestopping system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Before installing penetration firestopping systems, clean out openings immediately to comply with manufacturer's written instructions and with the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping materials.
2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping materials. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.3 INSTALLATION OF PENETRATION FIRESTOPPING SYSTEMS

A. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.

B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.

C. Install fill materials by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches high and with minimum 0.375-inch strokes.

1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet from end of wall and at intervals not exceeding 30 feet.

B. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of penetration firestopping system edge so labels are visible to anyone seeking to remove penetrating items or firestopping systems. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing and inspecting agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.5 FIELD QUALITY CONTROL

A. Owner may engage a qualified testing agency to perform tests and inspections according to ASTM E2174.

B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.

C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping material and install new materials to produce systems complying with specified requirements.

END OF SECTION 078413

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SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Urethane joint sealants.
   2. Latex joint sealants.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data:
   1. Urethane joint sealants.
   2. Latex joint sealants.

B. Samples for Initial Selection: Manufacturer's standard color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Joint-Sealant Schedule: Include the following information:

   1. Joint-sealant application, joint location, and designation.
   2. Joint-sealant manufacturer and product name.
   3. Joint-sealant formulation.
   4. Joint-sealant color.

1.4 CLOSEOUT SUBMITTALS

A. Manufacturers' special warranties.

B. Installer's special warranties.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Authorized representative who is trained and approved by manufacturer.

B. Testing Agency Qualifications: Qualified in accordance with ASTM C1021 to conduct the testing indicated.

1.6 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

B. Joint Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than allowed by joint sealant manufacturer for application indicated.

C. Joint Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain joint sealants from single manufacturer.

2.2 JOINT SEALANTS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. VOC Content of Interior Sealants: Provide sealants and sealant primers for use inside the weatherproofing system that comply with the following limits for VOC content when calculated according to 40 CFR 59, Part 59, Subpart D (EPA Method 24):
1. Architectural Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

C. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.3 URETHANE JOINT SEALANTS

A. Urethane, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, urethane joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT. [Type 1]
1. Sonolastic NP-1; Sonneborn, Division of ChemRex Inc.
2. Dymonic; Tremco.
3. Sikaflex-1a; Sika Corporation, Inc.
4. Dynatrol I; Pecora Corporation.

5. Vulkem 116; Tremco.
6. Chem-Calk 900; Bostik Findley.

B. Urethane, M, NS, 25, NT: Multicomponent, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, urethane joint sealant; ASTM C920, Type M, Grade NS, Class 25, Use NT. [Type 2]
1. Sonolastic NP-2; Sonneborn, Division of ChemRex Inc.
2. Dymeric 240/240FC; Tremco.
3. Sikaflex-2c, NS; Sika Corporation, Inc.
4. Dynatrol 2; Pecora Corporation.
5. Vulkem 922; Tremco.
6. Chem-Calk 500; Bostik Findley.

2.4 LATEX JOINT SEALANTS

A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C834, Type OP, Grade NF. [Type 3]
1. Tremflex 834; Tremco.
2. AC-20; Pecora Corporation.
3. Chem-Calk 600; Bostik Findley

2.5 JOINT-SEALANT BACKING

A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
1. Closed-cell polyethylene foam, nonabsorbent to liquid water and gas, non-outgassing in unruptured state.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.6 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

    a. Concrete.
    b. Masonry.

3. Remove laitance and form-release agents from concrete.
4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

    a. Metal.
    b. Glass.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants in accordance with requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile in accordance with Figure 8A in ASTM C1193 unless otherwise indicated.

3.4 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without

deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.6 JOINT-SEALANT SCHEDULE

A. Joints between Exterior Metal Frames and Adjacent Work: Type 2, colors as selected.

B. Exterior Joints for Which No Other Sealant Type is Indicated: Type 2, colors as selected.

C. Concealed Interior Perimeter Joints of Exterior Openings: Type 1.

D. Exposed Interior Perimeter Joints of Exterior Openings: Type 3, colors as selected.

E. Interior Joints for Which No Other Sealant is Indicated: Type 3, colors as selected

END OF SECTION 079200

SECTION 230500 – COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Provide labor, materials, accessories, and other related items as required to complete operations in connection with the complete installation of the combustion air ductwork, louvers and dampers as indicated on the Drawings and as specified herein.

1.2 RELATED REQUIREMENTS

A. Conditions of the Contract apply to the work, including the work of this Division. Examine Contract Documents for requirements affecting the work.

1.3 MECHANICAL PRE-CONSTRUCTION MEETING

A. Conduct a mechanical conference at Project site as follows:

1. At least 14 days prior to beginning of mechanical work, conduct a meeting to review detailed requirements for mechanical systems installation and testing requirements. Review mechanical drawings and specifications, discuss project specific details and requirements, and review and discuss expectations for quality control. Establish preliminary work progress schedule and procedures for materials inspection, testing, and certifications. Require representatives of each entity directly concerned with mechanical system installation to attend conference, including but not limited to, the following:

a. Mechanical contractor project manager.

b. Mechanical contractor job foremen.

c. Sheetmetal job foreman.

1.4 CONTRACT DOCUMENTS

A. The general location of the apparatus and the details of the work are indicated on the Drawings. Exact locations not indicated shall be determined at the site as the work progresses and shall be subject to the Engineer's approval.

B. It is not intended that the Drawings shall show every pipe, pipe rise, pipe drop, duct rise, duct drop, pipe fitting, duct fitting, or appliance, but is shall be a requirement to furnish, without additional expense, material, and labor necessary to complete the system in accordance with the design intent and with the highest possible quality available.

C. The Contractor shall take no advantage of any apparent error or omission in the Drawings and Specifications, and the Engineer shall be permitted to make such corrections and interpretations as may be deemed necessary for the fulfillment of the intent of the Drawings and Specifications. Where errors or omissions appear in the Contract Documents, the Contractor shall promptly notify the State in writing of the errors or omissions. Inconsistencies in the contract documents are to be reported before proposals are received, whenever found.

D. Should the Drawings or the Specifications disagree in themselves or with each other, the Contractor shall provide the better quality or greater quantity of work and/or materials unless otherwise directed by written addendum to the Contract Documents.

1.5 ALTERATIONS

A. Execute alterations, additions, removals, relocations, new work, and other related items as indicated or required to provide a complete installation in accordance with the intent of the Contract Documents, including changes required by building alterations.

B. Existing work disturbed or damaged by the alteration or the new work shall be repaired or replaced to the Engineer's satisfaction and at no additional cost to the State.

C. Existing ductwork, piping, and other systems indicated to be removed, shall be removed from the site. Cap off existing services remaining. The State retains the right to ownership of heating and ventilation equipment scheduled to be removed; store such equipment where requested by the State. Material not retained by the State shall be removed from the site.

1.6 REQUIREMENTS

A. Installation Instructions: Obtain manufacturer's printed installation instructions to aid in properly executing work on major pieces of equipment. Install equipment in accordance with manufacturer's recommendations.

B. Objectional Noise, Fumes and Vibration:

1. Mechanical and electrical equipment shall operate without creating objectionable noise, fumes, or vibration, as determined by the State.
2. If such objectionable noise, fumes, or vibration is produced, and transmitted to occupied portions of the building by apparatus, piping, ducts, or any other part of mechanical and electrical work, make necessary changes and additions, as approved, without extra cost to the State.

C. Equipment Design and Installation:

1. Uniformity: Unless otherwise specified, equipment or material of same type or classification, used for same purposes, shall be product of same manufacturer.
2. Design: Equipment and accessories not specifically described or identified by manufacturer's catalog number shall be designed in conformity with ASME, IEEE, or other applicable technical standards, suitable for maximum working pressure, and with neat and finished appearance.
3. Installation: Erect equipment aligned, level, and adjusted for satisfactory operation. Install so that connecting and disconnecting of piping and accessories can be made readily, and so that parts are easily accessible for inspection, operation, maintenance, and repair. Minor deviations from indicated arrangements may be made, as approved.

D. Hanging of Equipment, Ductwork and Piping:

1. Attach supports only to structural members and non-metal deck concrete slabs.
2. Support equipment, ductwork, and piping from the top chord of bar hoists at the "Panel Points" or from the top flange of beams. Provide intermediate support consisting of steel angle or equal as required where supports are installed between joist spaces.
3. Piping 2-inch (50 mm) nominal and smaller may be supported from the bottom chord of the bar joists at the "Panel Points" or from the bottom flange of the beams.
4. Do not anchor supports to metal decking with or without a concreted slab.

E. Protection of Equipment and Materials: Responsibility for care and protection of materials and mechanical work rests with the Contractor until the entire project has been completed tested and the project is accepted by the State.

1.7 SUBMITTALS

A. After award of Contract and before installation, submit for approval shop drawings, bulletins, product data samples and other related items.

B. Submit shop drawings and product data as required in each section. Submittal shall include physical data and performance data required to verify compliance with the Contract Documents.

C. Architect/Engineer's review will not include the review, coordination, or verification of dimensions or quantities, these shall be the responsibility of the Contractor.

1.8 SUBSTITUTIONS

A. The first item listed under "Acceptable Manufacturers", "Approved Manufacturers" or "Manufacturers" is the design basis.

1. Other manufacturers listed may be used in the base bid, but conformance with details of the Specifications, as well as dimensional and electrical data, shall be verified by the Contractor.

2. Architect/Engineer has not verified that each listed manufacturer has the ability to provide an acceptable substitution of the basis-of design product. Contractor may not assume that substitutions will be approved.

3. Modifications required as a result of differences between the design basis item and the submitted and approved item must be approved by the Engineer and made at the Contractor's expense. As an example, if a rooftop HVAC unit is submitted and approved and if the unit's dimensions and weights are different from those of the unit which was used as the design basis, the Contractor shall be responsible for building structural modifications required to accommodate the submitted and approved unit, at no additional cost to the State.

4. For times which have no manufacturers listed, any item conforming with the Contract Documents is acceptable.

1.9 COORDINATION

A. Coordinate scheduling, submittals, and work of the various sections of the Specifications to assure efficient and orderly sequence of installation of interdependent construction elements, with provisions of accommodating items installed later.

B. Verify that utility requirement characteristics of operating equipment are compatible with building utilities. Coordinate work of various Divisions having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

C. Coordinate space requirements and installation of mechanical and electrical work which are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with line of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

D. In finished areas, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

E. Coordinate completion and clean-up of work of separate Sections in preparation for substantial completion.

F. After State occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of State's activities.

1.10 REQUESTS FOR ENGINEER'S CADD DRAWINGS

A. In lieu of generating their own CADD drawings, the Contractor may elect to use the Engineer's electronic copies of CADD drawings for the purpose of developing coordination drawings, developing control system graphics or for other reasons that pertain to the requirements of this Contract. If the Contractor elects to utilize the Engineer's electronic copies of CADD drawings, the electronic files shall be purchased from the Engineer at the Engineer's current billing rate per drawing. The Contractor shall provide payment and shall sign a release-of-liability form before electronic CADD drawings are released.

1.11 CLEANING

A. Remove debris from site daily.

B. Material and pieces of equipment shall be turned over to the State free of dust and dirt, both inside and out.

C. At the completion of the Project, equipment shall have a clean, neat appearance of factory finish by cleaning or repainting as required.

D. At the completion of the Project, surfaces exposed to view shall have a clean, neat appearance of finish free from smudges and scratches by cleaning or repainting as required.

1.12 ADJUSTMENTS AND OWNERS'S INSTRUCTIONS

A. After completion of the installation work called for in the Contract Documents, furnish necessary mechanics or engineers for the adjustment and operation of the systems, to the end that the systems are perfectly adjusted and turned over to the State in perfect working order. Further instruct the State's authorized representative in the care of operation of the installation, providing framed instruction charts, directions, and other related items.

B. Instructors providing State training shall be experienced and familiar with the jobsite.

1.13 COMPLETION OF SYSTEMS

A. The following mechanical systems shall not be completed until the following conditions are satisfied:

1. Ductwork Systems:

a. Ductwork and related components and accessories shall be completely installed and insulated as specified.

2. Piping Systems:

a. Piping, valves, and accessories shall be completely installed, insulated, and labeled as specified.

b. Piping pressure testing be completed, and pressure testing reports shall be submitted and approved.

c. Piping systems shall be balanced, and a balancing report shall be submitted and approved.

d. Commissioning shall be completed.

3. Equipment:

a. Equipment including but not limited to boilers, heat exchangers, terminal heat transfer units, pumps, air handling units, condensing units, chillers, split system air conditioning equipment, and exhaust fans, shall be completely installed.

b. Equipment start-up reports shall be completed, submitted, and approved.

c. Equipment balancing shall be completed, and the balancing report shall be submitted and approved.

d. Commissioning shall be completed.

1.14 OPERATING AND MAINTENANCE MANUALS

A. Furnish two (2) bound operating and maintenance manuals. Deliver to the State for review. Quantity is for the State, the Engineer will not retain a bound copy.

B. For maintenance purposes, provide approved submittals, parts lists, specifications, and manufacturer's maintenance bulletins for each piece of equipment. For materials used which have been submitted to the Engineer for approval but do not require regular maintenance, such as piping, ductwork, and insulation, provide one copy of approved submittals.

C. Provide name, address and telephone number of the manufacturer's representative and service company, for each piece of equipment or material so that service or spare parts can be readily obtained.

1.15 WARRANTY

A. Provide guarantees and warranties for work under this Contract as indicated in the Contract.

B. Provide manufacturer's standard warranties and guarantees for work by the mechanical trades. However, such warranties and guarantees shall be in addition to and not in lieu of other liabilities which the manufacturer and the Contractor may have by law or by other provisions of the Contract Documents.

C. Guarantee that elements of the system provided under this Contract are of sufficient capacity to meet the specified performance requirements as set forth in these specifications or as indicated on the Drawings.

D. Upon receipt of notice from the State of failure of any part of the mechanical system or equipment during the warranty period, the Contractor shall replace the affected part or parts.

E. Furnish a written guarantee covering the above requirements before submitting the application for final payment.

PART 2- PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF WECTION 230500

SECTION 230529 – HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Pipe and equipment hangers and supports.

B. Sleeves and seals.

1.2 REFERENCES

A. ASME.

B. ASTM

C. MSS.

D. NFPA 70 - National Electrical Code

1.3 SUBMITTALS

A. Shop Drawings: Indicate system layout with location and detail of trapeze hangers.

B. Product Data: Provide manufacturers catalog data including load capacity.

C. Design Data: Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers.

D. Manufacturer's Installation Instructions: Indicate special procedures and assembly of components.

1.4 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum 3 years' experience.

1.5 REGULATORY REQUIREMENTS

A. Conform to applicable Codes for support of piping.

B. Supports for Electrical: In conformance with NFPA 70 and Division 26 of the Specifications.

PART 2 - PRODUCTS

2.1 HANGERS, SUPPORTS, & PIPE CLAMPS

A. Approved Manufacturers (first manufacturer is basis of design):
   1. Strut Hangers:
      a. Unistrut (division of Tyco).

b. Anvil International.
c. Cooper B-Line.
d. Hydra-Zorb Company.
e. Thomas & Betts - Superstrut line.
f. Tolco (division of Cooper B-Line).

2. Adjustable Swivel Band Hangers:
   a. Carpenter & Paterson.
   b. Anvil International.
   c. Cooper B-Line.
   d. Tolco (division of Cooper B-Line).
3. Clevis Hangers:
   a. Cooper B-Line.
   b. Anvil International.
   c. Carpenter & Paterson.
   d. Tolco (division of Cooper B-Line).
4. J-Hangers:
   a. Cooper B-Line.
   b. Carpenter & Paterson.
   c. Thomas & Betts - Superstrut line.
   d. Tolco (division of Cooper B-Line).
   e. Unistrut (division of Tyco).
5. Cushion Clamps:
   a. Hydra-Zorb Company.
   b. Cooper B-Line.
   c. Thomas & Betts - Superstrut line.
   d. Tolco (division of Cooper B-Line).
   e. Unistrut (division of Tyco).
6. Insulated Pipe Couplings:
   a. Cooper B-Line - Armafix line.
   b. Klo-Shure Corporation.
7. No substitutions.

B. Horizontal Piping Supports: Provide struts for trapeze hangers for single or multiple pipes. Where individual piping runs are hung with individual hangers, adjustable swivel band hangers, clevis hangers, or j-hangers may be used.

C. Strut hangers shall be standard 1-5/8 inches x1-5/8 inches (41x41 mm) size.

D. Hangers, clamps, and supports located outdoors or otherwise exposed to weather, or in wet or washdown areas, shall be hot-dipped galvanized steel or 300-series stainless steel. Struts may be extruded aluminum. Threaded rods, nuts, and washers may have standard galvanizing if hot-dipped galvanized is not available.
   1. Hot-dipped galvanized steel shall have a nominal zinc coating of 2.6 mil (0.066 mm) thickness and 1.5 oz./sq.ft (458 g/m^2) coating weight.
   2. In lieu of galvanizing, strut systems and their accessories may have Unistrut Perma-Green III electrodeposited thermoset acrylic coating, or be epoxy-coated equal to B-Line's Dura-Green or Dura-Copper coatings.
   3. Lesser coatings for struts and clamps, such as pre-galvanizing (0.75 mil (0.019 mm) thickness), electroplated zinc (0.2 to 0.5 mil (0.005 to 0.013 mm) thickness), and yellow zinc dichromate coating, are not acceptable in these locations.

E. Pipe hanger rods and nuts shall be plated to match the hangers. Nuts shall be self-locking type, or provide double nuts tightened to lock together. Rods shall be threaded one end, or continuous threaded. Provide washers at each nut.

F. Cushion Clamps for Un-insulated Lines: Plastic cushion shall be Dupont Hytel plastic, 5555HS plastic elastomer, warranted from -40 to 275 degrees F (-40 to 135 degrees C).

G. Copper-plated hangers are plated for identification only. Traditional thin copper plating on steel substrate does not provide adequate protection from galvanic corrosion due to contact between dissimilar metals.
   1. Where copper-plated supports are specified for use with copper piping, either copper plating or a copper-colored finish such as Cooper B-Line's Dura-Copper epoxy coating is acceptable. This is for identification, and does not protect dissimilar metals.
   2. Where copper piping is used with steel hangers and supports, provide protection from galvanic corrosion such as thick plastic or vinyl factory coating, or plastic-lined cushion clamps.

H. For Insulated Lines Clamped to Strut: Insulated pipe coupling insert with the same thickness as the insulation. Protects insulation from crushing, and provides continuous insulation and vapor barrier thru the hanger or clamp. Klo-Shure product provides plastic pipe support and rigid outer band, for field insulation into the coupling. Armafix product provides insulation with rigid outer band, for field insulation glued to the ends of the insert.

2.2 PIPE SUPPORTS

A. Steam and Steam Condensate Piping:
   1. Conform to ASME B31.1, ASTM F708, MSS SP58, MSSSP69 and MSS SP89.
   2. Hangers for Pipe Sizes 1/2 to 1-1/2 inch (13 to 38 mm): Malleable iron, adjustable swivel, split ring.
   3. Hangers for Pipe Sizes 2 to 4 inches (50 to 100 mm): Carbon steel, adjustable, clevis.
   4. Hangers for Pipe Sizes 5 inches (125 mm) and Over: Adjustable steel yoke, cast iron roll, double hanger.
   5. Multiple or Trapeze Hangers for Pipe Sizes to 4 inches (100 mm): Steel channels with welded spacers and hanger rods.
   6. Multiple or Trapeze Hangers for Pipe Sizes 5 inches (125 mm) and Over: Steel channels with welded spacers and hanger rods; cast iron roll and stand.
   7. Wall Support for Pipe Sizes to 3 inches (70 mm): Cast iron hook.
   8. Wall Support for Pipe Sizes 4 to 5 inches (100 to 125 mm): Welded steel bracket and wrought steel clamp.
   9. Wall Support for Pipe Sizes 6 inches (150 mm) and Over: Welded steel bracket and wrought steel clamp; adjustable steel yoke and cast iron roll.
   10. Vertical Support: Steel riser clamp.
   11. Floor Support for Pipe Sizes to 4 inches (100 mm): Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
   12. Floor Support for Pipe Sizes 5 inches (125 mm) and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.
   13. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

2.3 SLEEVES

A. Sleeves for Pipes Through Non-fire Rated Floors: 18 ga (1.2 mm) thick galvanized steel.

B. Sleeves for Pipes Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 ga (1.2 mm) thick galvanized steel.

C. Sleeves for Pipes Through Fire Rated and Fire Resistive Floors and Walls, and Fire Proofing: Prefabricated fire rated sleeves including seals, UL listed.

D. Sleeves for Round Ductwork: Galvanized steel.

E. Sleeves for Rectangular Ductwork: Galvanized steel.

F. Stuffing or Firestopping Insulation: Glass fiber type, non-combustible.

G. Sealant: Acrylic.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.2 PIPE HANGERS AND SUPPORTS

A. Support horizontal piping as scheduled.

B. Install hangers to provide minimum 1/2 inch (13 mm) space between finished covering and adjacent work.

C. Place hangers within 12 inches (300 mm) of each horizontal elbow.

D. Use hangers with 1-1/2 inch (38 mm) minimum vertical adjustment.

E. Support horizontal cast iron pipe adjacent to each hub, with 5 feet (1.5 m) maximum spacing between hangers.

F. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.

G. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

H. Support riser piping independently of connected horizontal piping.

I. Provide copper plated hangers and supports for copper piping.

J. Design hangers for pipe movement without disengagement of supported pipe.

K. Prime coat exposed steel hangers and supports. Refer to Division 09 Section "Painting". Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

L. Do not support pipes from other pipes or equipment.

M. Size pipe hangers to accommodate continuous piping insulation.

3.3 SLEEVES

A. Set sleeves in position in formwork. Provide reinforcing around sleeves.

B. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

C. Extend sleeves through floors 1 inch (25 mm) above finished floor level. Caulk sleeves.

D. Where piping or ductwork penetrates floor, ceiling, or wall, close off space between pipe or duct and adjacent work with fire stopping insulation and caulk air tight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.

E. Install chrome plated steel escutcheons at finished surfaces.

3.4 SUPPORTING OTHER TRADES

A. Supports furnished under Division 23 of the Specifications may also be used to support piping furnished under Division 22 "Plumbing" and conduits furnished under Division 26 "Electrical" if this Subcontractor is willing to allow this. Supports shared with other trades shall be designed to accommodate the weight, expansion/contraction, vibration, and other requirements of the other trades' items without detriment to the function, accessibility, and serviceability of the HVAC items or those of the other trades. Provide flexible sections of piping and conduit as required to allow each trade's items to expand and contract along with the other trades, and to absorb vibration caused by the other trades.

B. Electrical lighting fixtures and equipment, and architectural items such as ceilings, may not be supported from supports furnished under this Section.

C. Prevent contact between components of other trades, such as architectural suspended ceiling support wires, and HVAC supports which may transmit vibration to the occupied space.

3.5 SCHEDULES

PIPE SIZE		HANGER ROD MAX. HANGER SPACING		DIAMETER	
Inches	(mm)	Feet	(m)	Inches	(mm)
Steel and Copper Piping					
1/2 to 1-1/4	12 to 32	6.5	2	3/8	9
1-1/2 to 2	38 to 50	10	3	3/8	9
2-1/2 to 3	62 to 75	10	3	1/2	13
4 to 6	100 to 150	10	3	5/8	15

PIPE SIZE		HANGER ROD MAX. HANGER SPACING		DIAMETER	
8 to 12	200 to 300	14	4.25	7/8	22
14 and Over	350 and Over	20	6	1	25
Polypropylene Piping					
1/2 to 2-1/2	12 to 64	4	1.2	3/8	9
3 and over	75 and over	6	1.8	3/8	9
PVC (All Sizes)		6	1.8	3/8	9

END OF SECTION 230529

SECTION 230713 – DUCT INSULATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Ductwork Insulation.

1.2 RELATED SECTIONS

A. Division 23 Section "HVAC Ducts": Ductwork.

1.3 REFERENCES

A. ASTM

B. ISO 6944 - 1985 - Fire Resistance Tests - Ventilation Ducts.

C. NAIMA - National Insulation Standards.

D. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.

E. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.

F. SMACNA - HVAC Duct Construction Standards - Metal and Flexible.

G. UL 94 - Tests for Flammability of Plastic Materials for Parts in Devices and Appliances.

H. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials.

1.4 SUBMITTALS

A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this Section with minimum 3 years' experience.

B. Applicator Qualifications: Company specializing in performing the work of this Section with minimum 3 years' experience.

1.6 REGULATORY REQUIREMENTS

A. Materials: Flame spread/smoke developed rating of 25/50 in accordance with ASTM E84, NFPA 255 and UL 723. For elastomeric foam insulation, rating shall apply for thicknesses up to 2 inches (50 mm).

B. Insulation materials shall be asbestos free. No fibers with dimensions similar to asbestos fibers

shall be released from any material.

1.7 DELIVERY, STORAGE, AND PROTECTION

A. Transport, handle, store, and protect products.

B. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

C. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Glass and Mineral Fiber Products:
1. Knauf Insulation.
2. Certainteed Corporation.
3. Johns Manville.
4. Owens Corning.
5. No substitutions.

B. Elastomeric Foam Products:
1. Armacell LLC.
2. K-Flex USA.
3. No substitutions.

C. Polyisocyanurate Foam Board Products:
1. The Dow Chemical Company.
2. Atlas Roofing Corporation.
3. Rmax, Inc.

D. Glass Fiber Insulation Sealing Tapes:
1. Venture Tape Corporation.
2. 3M Company.
3. Ideal Tape Co., division of American Biltrite Inc.
4. Nashua Tape Products, division of Berry Plastics Corp.
5. No substitutions.

E. Accessories:
1. Ceel-Co division of Johns Manville (product: plastic jacket systems).
2. Foster Products, division of Specialty Construction Brands, Inc., a subsidiary of H.B.

Fuller (mastics, sealants, reinforcing membranes, and accessories).
3. Johns Manville (products: Super-Seal acrylic polymer coatings, Zeston plastic jacket systems).
4. Pabco/Childers Metals, division of ITW Insulation Systems (products: metal jacket systems, and accessories).
5. Vac Systems International (product: Tough Coat acrylic polymer mechanical insulation repair coating).
6. Venture Tape Corporation (product: Jacket for outdoor insulation).

2.2 GLASS FIBER, FLEXIBLE

A. Insulation: ASTM C553; flexible, noncombustible blanket.
1. 'K' ('Ksi') value: ASTM C518, 0.25 at 75 degrees F (0.039 at 24 degrees C).
2. Maximum service temperature: 250 degrees F (121 degrees C) faced and 350 degrees F (176 degrees C) unfaced.
3. Maximum moisture absorption: 0.20 percent by volume.
4. Minimum density: 1.0 lb/cu. ft. (16 kg/m^3).

B. Vapor Barrier Jacket:
1. ASTM C1136, Kraft paper reinforced with glass fiber yarn and bonded to vapor barrier film. Facing as required for the application. Integral staple flap on one edge.
a. Aluminum Faced: FSK (aluminum foil-scrim-kraft) construction.
b. White Faced: PSK (polypropylene-scrim-kraft) construction.
2. Moisture vapor transmission: ASTM E96; 0.02 perm.
3. Suitable for insulation surface temperatures up to 150 degrees F (66 degrees C).
4. Overlap longitudinal laps and butt strips.
5. Secure with outward clinch expanding staples and vapor barrier mastic and pressure sensitive tape.

C. Vapor Barrier Tape: See article "Glass Fiber Insulation Sealing Tape" in this Section.

D. Outdoor Vapor Barrier Mastic: Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

E. Tie Wire: Annealed steel, 16 ga (1.5 mm).

2.3 GLASS FIBER, RIGID

A. Insulation: ASTM C612; rigid, noncombustible blanket. Supplied in board form.
1. 'K' ('Ksi') value: ASTM C518, 0.24 at 75 degrees F (0.036 at 24 degrees C).
2. Maximum service temperature: 450 degrees F (232 degrees C).
3. Maximum moisture absorption: 1.0 percent by volume.
4. Density: 3.0 lb/cu. ft. (48 kg/cu m).

B. Vapor Barrier Jacket:
1. ASTM C1136, kraft paper reinforced with glass fiber yarn and bonded to aluminized film. Facing as required for the application.
a. Aluminum Faced: FSK (foil-scrim-kraft) construction
b. White Faced: ASJ (all-service jacket) construction.
2. Moisture vapor transmission: ASTM E96; 0.02 perm.
3. Suitable for insulation surface temperatures up to 150 degrees F (66 degrees C).

4. Overlap longitudinal laps and butt strips.
5. Secure insulation with mechanical fasteners to substrate, and seal jacket with pressure sensitive tape.

C. Vapor Barrier Tape: See article "Glass Fiber Insulation Sealing Tape" in this Section.

D. Indoor Vapor Barrier Finish:
1. Cloth: Untreated; 9 oz/sq yd (305 g/sq m) weight, glass fabric.
2. Vinyl emulsion type acrylic, compatible with insulation, black color.

2.4 GLASS FIBER, SEMI-RIGID

A. Insulation: ASTM C612; semi-rigid, noncombustible blanket, with fibers oriented perpendicular to insulation surface to provide compressive strength while maintaining flexibility. Supplied in roll form, suitable for application on rounded shapes such as pipes, tanks, ducts, vessels, and other similar round and irregular shapes.
1. 'K' ('Ksi') value: ASTM C518, 0.24 at 75 degrees F (0.036 at 24 degrees C).
2. Maximum service temperature: 450 degrees F (232 degrees C).
3. Maximum moisture absorption: 1.0 percent by volume.
4. Density: 2.5 lb/cu. ft. (40 kg/cu m).

B. Vapor Barrier Jacket:
1. ASTM C1136, kraft paper with glass fiber yarn and bonded to aluminized film. Facing as required for the application.
a. Aluminum Faced: FSK (foil-scrim-kraft) construction
b. White Faced: ASJ (all-service jacket) construction.
2. Moisture vapor transmission: ASTM E96; 0.02 perm.
3. Suitable for insulation surface temperatures up to 150 degrees F (66 degrees C).
4. Overlap longitudinal laps and butt strips.
5. Secure with outward clinch expanding staples and vapor barrier mastic and pressure sensitive tape.

C. Vapor Barrier Tape: See article "Glass Fiber Insulation Sealing Tape" in this Section.

D. Indoor Vapor Barrier Finish:
1. Cloth: Untreated; 9 oz/sq yd (305 g/sq m) weight, glass fabric.
2. Vinyl emulsion type acrylic, compatible with insulation, black color.

2.5 GLASS FIBER, PREFORMED PIPE COVERING

A. Insulation: ASTM C547; rigid molded, noncombustible.
1. 'K' ('Ksi') value: ASTM C177, 0.24 Btu-in/(hr-sq.ft-°F) at 75 degrees F (0.035 W/m-K at 24 degrees C).
2. Maximum service temperature: 850 degrees F (454 degrees C).
3. Maximum moisture absorption: 0.2 percent by volume.

B. Vapor Barrier Jacket:
1. ASTM C1136, White kraft paper with glass fiber yarn, bonded to aluminized film.
2. Moisture vapor transmission: ASTM E96; 0.02 perm-inches.

C. Tie Wire: 0.048 inch (1.22 mm) stainless steel with twisted ends on maximum 12 inch

(300 mm) centers.

D. Vapor Barrier Lap Adhesive: Compatible with insulation.

E. Vapor Barrier Tape: Provide self-adhesive butt strips furnished by the insulation manufacturer, with finish to match the insulation outer finish.

F. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.

G. Indoor Vapor Barrier Finish:
   1. Cloth: Untreated; 9 oz/sq yd (305 g/sq m) weight.
   2. Vinyl emulsion type acrylic, compatible with insulation, white color.

H. Outdoor Vapor Barrier Mastic: Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

I. Outdoor Breather Mastic: Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

J. Insulating Cement: ASTM C449/C449M.

2.6 GLASS FIBER INSULATION SEALING TAPE

A. Self-adhesive tape with integral vapor barrier, pressure sensitive acrylic-based or rubber-based adhesive, and release liner strip. Width 3 inch (76 mm) nominal.

B. Manufactured by VentureTape, by the insulation manufacturer, or by one of the other tape manufacturers listed in the article "Manufacturers" in this Section.

C. Types:
   1. For rigid and semi-rigid insulations, tape shall be reinforced type. For flexible "duct wrap" insulation, tape shall be either reinforced or non-reinforced.
   2. White or aluminum outer surface to match the insulation.
   3. Reinforced: Kraft paper reinforced with glass fiber yarn and bonded to vapor barrier layer.
      a. Aluminum Finish with FSK: VentureTape 1525CW.
      b. White Finish with ASJ: VentureTape 1540CW
      c. White Finish with PSK: VentureTape 1531CW.
   4. Non-Reinforced: Foil insulation tape. Dead-soft temper 2 mil (0.05 mm) thick aluminum foil, without reinforcement. Hand-tearable.
      a. Venture Tape 3520CW.
   5. Performance:
      a. Peel Adhesion: PSTC-101 with 20 minute dwell, 45 oz/in. (12.5 N / 25 mm).
      b. Shear Adhesion: PSTC-107, 2.2 psi (15.2 kPa) after 24 hours.
      c. Tensile Strength: PSTC-131:
         1) Reinforced Types: 40 lb/in. (180.8 N / 25 mm).
         2) Non-reinforced Types: 21 lb/in. (94.9 N / 25 mm).
      d. Elongation: PSTC 131, 6 percent maximum.
      e. Service Temperature: -40 to 240 degrees F (-40 to 116 degrees C).
      f. UL 723 listed or classified (flame/smoke rating).

2.7 ELASTOMERIC FOAM

A. Approved Products:
   1. Armacell: AP Armaflex and AP Armaflex FS sheet insulation.
   2. K-Flex USA: Insul-Sheet S2S and K-Flex LS sheet insulation.

B. Insulation: ASTM C534; flexible, cellular elastomeric, molded or sheet.
   1. 'K' ('Ksi') value: ASTM C177; 0.277 Btu-in/(h-ft2-degreesF) at 75 degrees F (0.04 W/m-K at 24 degrees C).
   2. Minimum service temperature: -70 degrees F (-57 degrees C) (flexible to -40 degrees F (-40 degrees C)).
   3. Maximum service temperature: 220 degrees F (104 degrees C).
   4. Maximum moisture absorption: ASTM C209, 0.2 percent by volume; or ASTM D1056, 5 percent by weight.
   5. Moisture vapor transmission: ASTM E96; 0.08 perm-inches (0.116 ng/(s-m-Pa)).
   6. Connection: Waterproof vapor barrier adhesive.
   7. Density: 3.0 to 6.0 lb/cu ft (48 to 96 kg/cu m).

C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that ductwork has been tested before applying insulation materials.

C. Verify that surfaces are clean, foreign material removed, and dry.

D. Verify that insulation materials are clean and dry. Discard any materials that exhibit signs of moisture damage, contamination, mold, mildew, or other biological growth. Discard any materials used in the air handling airstream if they have been exposed to water.

3.2 INSTALLATION

A. Follow manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Provide insulation for surfaces of ductwork, as indicated and specified. Insulation values shall meet or exceed the requirements of ASHRAE 90.1-2010, State Energy Codes, and Table I, whichever is greater. In addition, comply with the other requirements of this Section.

D. Insulated Ductwork Conveying Air below Ambient Temperature:
   1. Provide insulation with vapor barrier jackets.
   2. Finish with tape and vapor barrier jacket.
   3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
   4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

E. Insulated Ductwork Conveying Air above Ambient Temperature:
   1. Provide with or without standard vapor barrier jacket.
   2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.

F. Ductwork Exposed below 10 feet (3 meters) above finished floor in Mechanical Equipment Rooms or below 8 feet (2.4 meters) above finished floor in Finished Spaces: Provide glass fiber rigid insulation with vapor barrier jacket.

G. Where rigid glass fiber insulation is scheduled, semi-rigid glass fiber insulation may be used on round and flat oval ducts and irregular shapes, and preformed pipe insulation may be used on small diameter round ducts.

H. External Duct Insulation Application:
   1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
   2. Secure insulation without vapor barrier with staples, tape, or wires.
   3. Install without sag on underside of ductwork. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift ductwork off trapeze hangers and insert spacers.
   4. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
   5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

I. Install insulation after ductwork and equipment have been tested and approved.

J. Ensure that surface is clean and dry prior to installation. Ensure that insulation is dry before and during application. Finish with system at operating conditions.

K. Ensure that insulation is continuous through inside walls. Pack around ducts with fireproof self-supporting insulation material, properly sealed.

L. Finish insulation neatly at hangers, supports and other protrusions.

M. Locate insulation or cover seams in least visible locations.

N. Repair separation of joints or cracking of insulation due to thermal movement or poor workmanship.

O. Standing seams, supporting angles and flanges on insulated ductwork shall be insulated with thickness equal to the duct and edges shall be finished and vapor sealed.

P. Mechanical fasteners shall not be riveted or screwed to the duct and shall not penetrate the metalwork.

3.3 FIELD INSPECTION

A. Visually inspect to ensure that materials used conform to Specifications. Inspect installations progressively for compliance with requirements.

TABLE I
DUCTWORK INSULATION MATERIAL AND WALL THICKNESS

DUCTWORK TYPE	INSULATION MATERIAL	VAPOR BARRIER REQUIRED	INSULATION WALL THICKNESS
Supply ductwork (unless exposed in a conditioned space)	Glass Fiber, Flexible	Yes	1 ½ inches (38.1 mm)
	Glass Fiber, Rigid	Yes	1 ½ inches (38.1 mm)
Exposed supply ductwork in mechanical or equipment rooms	Glass Fiber, Rigid	Yes	1 ½ inches (38.1 mm)
Ductwork located outdoors, including above roofs	Polyisocyanurate Foam Board, Rigid, with Waterproof Jacket	Yes	2 layers of 1 ½ inch (38.1 mm) with staggered joints
Supply, return and exhaust ductwork in cold attic spaces, crawl spaces or any space outside of the building insulation envelope but within the building shell and protected from weather	Glass Fiber, Flexible	Yes	2 layers of 1 ½ inches (38.1 mm) with staggered joints
	Glass Fiber, Rigid	Yes	2 layers of 1 ½ inches (38.1 mm) with staggered joints
Exhaust ductwork from exterior building openings (such as louvers and roof hoods) to 4 feet (1.2 m) interior of motorized damper or backdraft damper.	Glass Fiber, Flexible (only if ductwork is concealed)	Yes	1 ½ inches (38.1 mm)
	Glass Fiber, Rigid	Yes	1 ½ inch (38.1 mm)
Outside air intake ductwork	Glass Fiber, Flexible (only if ductwork is concealed)	Yes	2 layers of 1 ½ inch (38.1 mm) with staggered joints
	Glass Fiber, Rigid	Yes	2 layers of 1 ½ inch (38.1 mm) with staggered joints
Mixed air ductwork	Glass Fiber, Flexible (only if ductwork is concealed)	Yes	2 layers of 1 ½ inches (38.1 mm) with staggered joints
	Glass Fiber, Rigid	Yes	2 layers of 1 ½ inches (38.1 mm) with staggered joints
Combustion air ductwork	Glass Fiber, Rigid	Yes	2 layers of 1 ½ inch (38.1 mm) with staggered joints
Evaporative condenser intake and exhaust ducts	Glass Fiber, Rigid	Yes	1 ½ inch (38.1 mm)
Transfer ducts	Elastomeric Foam Duct Liner	--	1inch (25.4 mm)
Ductwork 10 feet upstream and downstream from a supply or return fan, or through the first elbow, whichever is longer (excluding fresh air intake ductwork)	Elastomeric Foam Duct Liner	--	1inch (25.4 mm)
Ductwork indicated on Drawings to be acoustically lined	Elastomeric Foam Duct Liner	--	1inch (25.4 mm)

Kitchen Hood Grease Exhaust Ductwork near combustible materials and where indicated	Fire Resistive Duct Wrap	---	2 layers of 1-1/2 inches (38.1 mm) with staggered joints per Manufacturer's Recommendations to achieve zero clearance to combustibles
Kitchen Hood Grease Exhaust Ductwork where indicated to provide an alternative to a rated shaft enclosure	Fire Resistive Duct Wrap	---	2 layers of 1-1/2 inches (38.1 mm) with staggered joints per Manufacturer's Recommendations to achieve equivalence to a 2-hour rated shaft enclosure.
Fume Hood Exhaust Duct First 10 feet of exhaust duct outside of a vertical chase	Fire Resistive Duct Wrap	---	2 layers of 1-1/2 inches (38.1 mm) with staggered joints per Manufacturer's Recommendations to achieve equivalence to a 2-hour rated shaft enclosure.

END OF SECTION 230713

SECTION 233113 – HVAC DUCTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Metal Ductwork.

1.2 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

A. Division 26 – Electrical: Smoke detectors.

1.3 RELATED SECTIONS

A. Division 23 Section "Hangers and Supports for HVAC Piping and Equipment": Sleeves.

B. Division 23 Section "Duct Insulation": External insulation and duct liner.

C. Division 23 Section "Air Outlets and Inlets."

1.4 REFERENCES

A. ASTM

B. AWS D9.1 - Welding of Sheet Metal.

C. NBS PS 15 - Voluntary Product Standard for Custom Contact-Molded Reinforced-Polyester Chemical Resistant Process Equipment.

D. NFPA

E. SMACNA

F. UL.

1.5 PERFORMANCE REQUIREMENTS

A. No variation of duct configuration or sizes is permitted except by written permission from the Architect. Size proposed substitutions of round ducts in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

1.6 SUBMITTALS

A. Shop Drawings: Indicate duct fittings, particulars such as gauges, sizes, welds, and configuration. Submit prior to start of work.

B. Product Data: Provide data for duct materials and duct connectors.

1.7 PROJECT RECORD DOCUMENTS

A. Submit under provisions of the contract.

B. Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Indicate additional fittings used.

1.8 QUALITY ASSURANCE

A. Perform Work in accordance with SMACNA HVACDCS.

1.9 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this Section with minimum 3 years' experience.

B. Installer: Company specializing in performing the work of this Section with minimum 3 years' experience.

1.10 REGULATORY REQUIREMENTS

A. Construct ductwork to NFPA 90A, NFPA 90B and NFPA 96 standards.

1.11 ENVIRONMENTAL REQUIREMENTS

A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

B. Maintain temperatures during and after installation of duct sealants.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufactured Ductwork - Round and Flat Oval:
1. McGill AirFlow LLC, a subsidiary of United McGill Corporation.
2. Aero Heating & Ventilating, Inc.; Portland, ME.
3. Atlantic Air Products LLC; Bow, NH.
4. Hahnel Brothers; Bangor and Lewiston, ME.
5. Hranec Corporation; Uniontown, PA.
6. Lindab, Inc. – duct fittings only.
7. Macy Industries, Inc.; Hookset, NH.
8. Monroe Metal Mfg. Inc.; Monroe, NC.
9. Northeastern Sheet Metal Inc.; Goffstown, NH.
10. Semco Inc., division of the Flakt Woods Group.
11. S.G. Torrice Co.; Wilmington, MA – spiral duct lengths.
12. Sheet Metal Connectors Inc.; Minneapolis, MN.
13. Spiral Manufacturing Co. Inc.; Minneapolis, MN.
14. No substitutions.

B. Manufactured Ductwork - Transverse Duct Connection System:
1. Ductmate.
2. HFC Enterprises; Baldwin Park, CA – Dura Flange product line, for round and flat oval ducts only.

C. Sealants:
   1. Hardcast, a division of Carlisle Corporation.
   2. 3M Company.
   3. Ductmate.
   4. Foster.
   5. McGill AirSeal LLC, a subsidiary of United McGill Corporation.
   6. Mon-Eco Industries, Inc - Eco product line.
   7. Polymer Adhesive Sealant Systems.

2.2 MATERIALS

A. Galvanized Steel Ducts:
   1. Steel sheet metal components of galvanized ductwork in this Specification Section shall be galvanized steel sheet, lock-forming quality, having G60 or heavier zinc coating (G90 minimum for outdoor or moist applications) conforming to ASTM A653 rating system and tested in accordance with ASTM A90.
   2. Provide paint-grip exterior surfaces for exposed ducts, where available.
   3. Sheet metal gauge shall be not less than 24 gauge (0.56 mm).

2.3 ACCESSORIES

A. Fasteners: Rivets, bolts, or sheet metal screws.

B. Sealants: See Duct Sealant portion of this Specification.

C. Hanger Rod: ASTM A36; galvanized steel; threaded both ends, threaded one end, or continuously threaded.

2.4 DUCTWORK FABRICATION

A. Fabricate and support in accordance with SMACNA HVACDCS, as specified or as indicated on the drawings. Provide duct material, gauges, reinforcing, and sealing for operating pressures indicated.

B. SMACNA Duct Construction Manuals:
   1. The SMACNA recommendations shall be considered as mandatory requirements.
   2. Substitute the word "shall" for the word "should" in these manuals.
   3. Where the Contract Specifications differ from SMACNA recommendations, the more stringent requirements (as determined by the Architect) shall take precedence.
   4. Details on the Contract Drawings take precedence over SMACNA standards.

C. Sheet metal shall be galvanized steel as specified in Part 2 paragraph "Materials" in this Section, unless otherwise indicated or specified.

D. Construct Tees, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline.
   1. Where space is too restricted for full-radius elbows, provide mitered (square-throat) elbows with single wall turning vanes. Do not use air foil turning vanes.
   2. Mitered elbows in round or flat-oval ductwork shall be factory-manufactured.
   3. Radiused elbows with throat radius 1/2 times width of duct (centerline radius 1 width of

duct) may be used instead of mitered elbows, but only where space is too restricted for full radius.

4. Fittings not conforming to these requirements will be ordered removed and replaced with proper fittings.

E. Increase duct sizes gradually, not exceeding 15 degrees divergence or convergence (per side) wherever possible; maximum 30 degrees divergence (per side) upstream of equipment and 45 degrees convergence (per side) downstream.

F. Fabricate continuously welded round and oval duct fittings two gauges heavier than duct gauges indicated in SMACNA Standard. Joints shall be minimum 4 inch (100 mm) cemented slip joint, brazed or electric welded. Prime coat welded joints.

G. Provide standard 45 degree lateral wye takeoffs unless otherwise indicated where 90 degree conical tee connections may be used.

H. Longitudinal locks or seams known as "button-punch-snap-lock" and other "snap-lock" types will not be permitted in rectangular duct. Snap-lock longitudinal seams may be used on round ducts up to 8 inches diameter, with screws provided to secure the seams at 24 inches (609 mm) on center maximum spacing.

I. Exposed Ducts: Select and handle materials with care for a neat appearance. Joint connections on round and flat oval ducts shall be sleeve or flanged type; drawbands are not acceptable.

2.5 MANUFACTURED DUCTWORK AND FITTINGS

A. Manufactured ductwork and fittings listed below are acceptable alternatives to standard ductwork systems. For exposed round and flat oval ductwork, factory-manufactured ductwork and fittings are required.

B. Manufacture in accordance with SMACNA HVACDCS, and as specified or as indicated on the drawings. Provide duct material, gauges, reinforcing, and sealing for operating pressures indicated.

C. Exposed Round and Flat Oval Ductwork: Shall be manufactured ductwork by one of the listed manufacturers.

1. Spiral Ductwork Acceptable Products:
   a. McGill Airflow: Standard Uni-Seal product line (smooth surface between spiral lockseams) or Uni-Rib product line (one standing seam reinforcement between each pair of spiral lockseams).
   b. Monroe Metal Inc.: Standard spiral product line (smooth surface between spiral lockseams). V-Rib product line is not allowed.
   c. Other Manufacturers: Standard spiral product line (smooth surface between spiral lockseams).
   d. Ductwork and fittings shall be products of a single manufacturer.

D. Exposed Ducts:

1. Select and handle materials with care for a neat appearance.
2. Joint connections on round and flat oval ducts shall be sleeve or flanged type; drawbands are not acceptable. Joint connections on flat oval ducts 42 inches (1.07 m) and wider shall be flanged type to ensure tight fit and good appearance.

3. Provide exterior reinforcing only where required, with prior approval from the Architect.
4. External reinforcement of flat-oval ducts shall be full-perimeter angle rings. Straight angles along flat sides only are not allowed.

E. Galvanized and stainless steel sheet metal used in fabrication shall be not less than 26 gauge (0.551 mm) thickness. Aluminum shall be not less than 0.025 in. (0.635 mm) nominal thickness. This requirement supersedes SMACNA requirements.

F. Round and Flat Oval Duct and Fittings:
1. Shall be suitable for at least 4 in. WG (996 Pa) positive pressure and 2 in. WG (498 Pa) negative pressure in accordance with SMACNA HVACDCS standards. This is a minimum; provide higher ratings where required.
2. Fittings shall be fabricated of sheet metal at least one gauge heavier than straight duct of the same size.
3. Fittings shall be factory-sealed so that no field sealing of joints between gores or segments is required. Acceptable methods of construction are fully welded, spot-welded with inner sealant, or standing-seam crimped joints.

G. Radiused Elbows in Round and Flat Oval:
1. In exposed ductwork shall be non-adjustable type, factory-sealed.
2. In concealed ductwork may be adjustable type, with full long radius as detailed on the Drawings. Short-radius elbows are not allowed.
3. Shall be constructed of the following minimum number of segments or gores: 90-degree: 4 gores; 60-degree: 3 gores; 45-degree: 3 gores; 30-degree: 2 gores; 22-1/2-degree: 2 gores.
4. 1-piece stamped elbows are acceptable up to 12 inches (305 mm) diameter. Pleated elbows are acceptable up to 10 inches (254 mm) diameter.

H. Mitered Elbows in Round and Flat Oval:
1. Available in both 90-degree and 45-degree elbows.
2. Shall have minimum number of welded single-wall vanes as follows (size is duct width in plane of bend):
   a. 3 to 9 inch (76 to 229 mm): 2.
   b. 10 to 14 inch (254 to 356 mm): 3.
   c. 15 to 19 inch (381 to 483 mm): 4.
   d. 20 to 60 inch (508 to 1524 mm): 5.
   e. Larger Sizes: 12-inch (305 mm) maximum spacing.

I. Inner tie-rod reinforcement is not allowed. Increase duct sheet metal gauge or external reinforcement as required.

J. Flat Oval Ducts: Machine made from round spiral lockseam duct.

K. Transverse Duct Connection System: SMACNA "F" rated or SMACNA "J" rated rigidity class connection, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips. Product shall be Ductmate factory-manufactured connectors, or field-formed flanges using a specialized machine.

2.6 PRESSURE CLASSIFICATION

A. Ratings as indicated on the Drawings or as specified. See Ductwork Pressure Class Schedule in

Part 3 of this Section.

B. If no ratings are indicated, ductwork shall be rated for the external static pressure of the system plus 25 percent.
   1. If 4 dampers (of any type) or fewer can isolate a duct system, that portion of the system shall be rated for the shut-off pressure of the system fans.

2.7 DUCT SEALING

A. Seal ductwork as outlined in the SMACNA HVACDCS. Seal ductwork to a minimum of class A (transverse joints, longitudinal seams, and duct wall penetrations), regardless of pressure class.

B. Seal ductwork systems as required to ensure that maximum duct leakage does not exceed that allowed by the latest edition of the SMACNA HVAC Air Duct Leakage Test Manual. Allow sealant to dry in accordance with manufacturer's requirements of time and environmental conditions before ductwork systems are pressurized.

C. Duct sealing materials used shall be non-flammable and non-combustible in both liquid and solid states.

D. Seal Pittsburgh hammered lockseams by flooding the joint with sealant prior to assembly.

E. Seal exposed ducts by applying mastic-type or gasket-type sealer just before the joint or seam is made; remove excess sealant for a neat appearance.

F. Fill (with matching duct material such as sheet metal) any gaps in duct which exceed the recommendations of the sealant manufacturer, and in no case shall liquid or mastic sealant be used to fill gaps or openings which exceed 1/8 inch (3.2 mm) in any direction. Verify that system air pressure acting on a wide gap will not exert enough force to damage or loosen the sealant.

G. Materials for Sealing:
   1. Hardcast: Flex-Grip 550 or Iron-Grip 601 mastic.
   2. Hardcast: gypsum-based tape and mastic, waterproof type when used on moist-air exhaust or in humid or outdoor locations.
   3. Ductmate: Flanged lateral joints with gaskets.
   4. Ductmate: PROseal.
   5. Foster: Duct-Fas or Safetee mastic sealant. Duct-Fas is UV resistant and recommended for applications exposed to sunlight.
   6. Mon-Eco: Eco-Duct Seal 4450 (red color) or 4452 (grey color). Use grey color where ducts will be unpainted and exposed to public view.
   7. Polymer Adhesives Sealant Systems: Airseal No. 11 premium sealant.

2.8 UNIFORMITY OF MATERIALS

A. Ductwork accessories, including but not limited to volume dampers, smoke dampers, fire dampers, combination fire/smoke dampers, backdraft dampers and motorized dampers, shall be fabricated of materials that are similar to the ductwork in which they are installed.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install components furnished under other Section and Divisions of the Specifications. Such items may include but are not limited to: Sensors and airflow measuring stations furnished under Division 23 Section "Instrumentation and Control for Mechanical Systems"; gauges and meters; and smoke detectors furnished under Division 26 – Electrical.

C. Install ducts in accordance with SMACNA HVACDCS.

D. Duct Hangers and Supports: SMACNA HVACDCS, Section 4. Hang ducts up to and including 36 inches (914 mm) in width by a minimum of 1 in x 16 ga (25 mm x 1.61 mm) flat straps on each side of the duct on 4 ft (1.22 m) centers, bent under bottom of duct a minimum of 2 inches (50 mm) and securely fastened to duct. Hang ducts larger than 36 inches (914 mm) in width by 3/8 inch (9.5 mm) steel rods and 2 x 2 x 1/4-inch (50x50x6.3 mm) steel angle trapeze hangers, spaced 4 ft (1.22 mm) on center. Anchor risers in the center of the vertical run to allow ends of riser free vertical movements.
   1. Ducts with Extra Weight Such As Lead Lining or Lagging: Include the extra weight in determination of suitable hangers and supports.

E. Hanging of Ductwork:
   1. Attach supports only to structural framing members and non-metal deck concrete slabs.
   2. Support ductwork from the top chord of bar joists at the "Panel Points" or from the top flange of beams. Provide intermediate support consisting of steel angle or equal as required where supports are installed between joist spaces.
   3. Do not anchor supports to metal decking with or without a concreted slab.

F. Duct Sizes are inside clear dimensions. For lined ducts, maintain sizes inside lining.

G. "Fishmouth" duct connections are not allowed.

H. Exposed Ducts:
   1. Handle with care for a neat appearance. Repair or replace dented or damaged ductwork as required by the Architect. Select hangers for appearance, and to prevent sagging or distortion of duct.
   2. Remove labels attached to ducts before receiving paint.

I. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pitot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.

J. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

K. Use crimp joints with or without bead for joining round duct sizes 8 inch (200 mm) and smaller with crimp in direction of air flow.

L. Use double nuts and lock washers on threaded rod supports. Strap hangers shall be minimum 16 gauge (1.50 mm) x 1 inch (25 mm) galvanized straps. Hanger and support components including but not limited to "unistrut" shall be galvanized steel except that where other duct materials are used, the hanger materials shall be compatible and non-corrosive to the duct. Wire hangers are not acceptable.

M. Set plenum doors 6 to 12 inches (150 to 300 mm) above floor. Arrange door swings so that fan static pressure holds door in closed position.

N. During construction, provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system. Do not start ducted air moving equipment until construction is completed to a stage where airborne construction dust is no longer present. At the time of substantial completion, the entire air distribution system shall be turned over to the Owner clear of construction dust and debris. If the interior surfaces of any ducted air moving equipment or the interior surfaces of any portion of the ductwork distribution system are found, as determined by the Architect, to contain significant construction dust and debris, the entire air distribution system shall be cleaned in accordance with Division 23. If proper precautions are taken to prevent construction dust and debris from entering the ductwork during construction and if the Architect finds all ductwork to be free from such dust and debris, air duct cleaning shall not be required.

O. For fresh air intake connected to louvers or brick or block vents, pitch bottom of plenums down to bottom of louver at minimum 1/4 inch per foot (2 percent). Seal connections and joints on bottom of plenums watertight with mastic. Connect bottom of plenum to top-inside edge of bottom louver blade or waterstop as detailed on the Drawings, to ensure positive drainage. Provide ¾" drain connection at the lowest point upstream of pitched duct connection to louver. Pipe to nearest floor drain.

P. Install duct-mounted components furnished under other Sections of this Specification, such as smoke dampers, control dampers, control sensors, and smoke detectors. Install with straight lengths of duct as required for proper operation. Provide access at such components as required. Install in accessible locations for maintenance; notify the Architect if a location indicated or selected requires addition of access by other trades.

3.2 SCHEDULES

A. Ductwork Material Schedule

AIR SYSTEM	MATERIAL
Combustion Air	Galvanized Steel, Aluminum

Ductwork Pressure Class Schedule

AIR SYSTEM	SMACNA PRESSURE CLASS
Combustion Air	1/2 inch (125 Pa)

END OF SECTION 233113

SECTION 233700 - AIR OUTLETS AND INLETS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Diffusers.

B. Registers/Grilles.

C. Louvers.

1.2 REFERENCES

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.

B. ADC 1062 - Certification, Rating and Test Manual.

C. AMCA 500 - Test Method for Louvers, Dampers and Shutters.

D. AMCA 511 - Certified Ratings Program for Air Control Devices

E. ARI 650 - Air Outlets and Inlets.

F. ASHRAE 70 - Method of Testing for Rating the Air Flow Performance of Outlets and Inlets.

G. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

H. ASTM E413 - Classification for Rating Sound Insulation.

I. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.

J. NFPA 70 - National Electrical Code.

K. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.

1.3 SUBMITTALS

A. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets indicating type, size, application, rated airflow, noise level, pressure drop, and throw distance as applicable. Submit both manufacturer's standard performance tables and graphs, AND tabulated selection data specific to this project. NOTE: Submittals without complete and sufficient information, to verify the performance specified and scheduled on the Drawings, shall be rejected.

1.4 PROJECT RECORD DOCUMENTS

A. Submit under provisions of the contract.

B. Record actual locations of air outlets and inlets.

1.5 QUALITY ASSURANCE

A. Test and rate air outlet and inlet performance in accordance with ADC Equipment Test Code 1062 and ASHRAE 70.

B. Test and rate louver performance in accordance with AMCA 500.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this Section with minimum 3 years' experience.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Diffusers, Registers, Grilles, and Drum Louvers:
1. Titus.
2. Anemostat.
3. Krueger.
4. Metalaire.
5. Price.
6. Nailor

B. Louvers:
1. Greenheck.
2. Airolite.
3. American Warming and Ventilating.
4. Arrow.
5. Ruskin.
6. United Enertech.
7. Nailor

C. No substitutions.

2.2 WALL SUPPLY REGISTERS/GRILLES

A. Type: Streamlined and individually adjustable blades, 3/4 inch (19 mm) minimum depth, 3/4 inch (19 mm) maximum spacing with spring or other device to set blades, vertical or horizontal face as indicated, double deflection.

B. Frame: 1-1/4 inch (32 mm) margin with countersunk screw mounting and gasket.

C. Fabrication: Steel with 20 gauge (0.90 mm) minimum frames and 22 gauge (0.80 mm) minimum blades, steel and aluminum with 20 gauge (0.90 mm) minimum frame, or aluminum extrusions, as indicated, with factory off-white enamel finish.

D. Damper: Integral, gang-operated opposed blade type with removable key operator, operable from face.

2.3 LOUVERS (6 INCH)

A. Louvers shall be equal to, and shall have free areas no less than, Greenheck model ESD-603. Acceptable substitutes by other listed manufacturers (subject to performance specified and scheduled on Drawings) shall be
   1. Airolite: Model K6746.
   2. American Warming & Ventilating: Model LE-31.
   3. Arrow: Model EA-615-D.
   4. Ruskin: Model ELF6375DX.
   5. United Enertech: Model _____.

B. For reference, free area of a model ESD-603 in 48 inch x 48 inch (1.2 m x 1.2 m) size is 8.63 sq. ft (0.80 m2).

C. Free area velocity at beginning of water penetration shall be at least 1000 fpm (5.0 m/sec). Beginning of water penetration is defined by AMCA as 0.01 oz. per sq. ft (3g/m2).

D. Air pressure drop for intake air at an air velocity of 1000 fpm (5.0 m/sec) in intake mode shall not exceed 0.18 in. wg (44.9 Pa).

E. Testing for water penetration and air performance shall be in accordance with AMCA Standard 511, using a 48 inch x 48 inch (1.2 m x 1.2 m) louver.

F. Type: 6 inch (150 mm) deep with drainable blades on approximately 37 to 45 degree slope, heavy channel frame, removable expanded aluminum bird screen with 1/2 inch (13mm) mesh mounted on interior face.

G. Fabrication: 0.081 inch (2.05 mm) thick 6063-T5 extruded aluminum alloy, welded assembly.

H. Mounting: Furnish with standard box frame and angles for installation.

I. Finish: Factory mill finish.The Architect will select color. Accessories visible from outdoors or exposed to the airstream, such as interior and exterior screens, shall have finish identical to the louver.

J. Louvers shall bear the AMCA rating seal for water penetration and air performance.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Check location of outlets and inlets and make necessary adjustments in position to conform to architectural features, symmetry, and lighting arrangement.

C. Install outlets and inlets to ductwork with air tight connection.

D. Slope ducts or plenums at louvers, and at brick or block vents, to drain outward, and seal bottoms watertight.

E. Surfaces exposed to view shall be clean, and free of stains, smudges, and scratches.

END OF SECTION 233700

ABBREV / DESCRIPTION

ABBREV	DESCRIPTION
ACV	AUTOMATIC CONTROL VALVE
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
ALD	ACOUSTICAL LINED DUCT
AMS	AIRFLOW MEASURING STATION
APD	AIR PRESSURE DROP
ATC	AUTOMATIC TEMPERATURE CONTROL
B	BAROMETRIC DAMPER
BD	BACKDRAFT DAMPER
BHP	BRAKE HORSEPOWER
BPD	BYPASS DAMPER
BTU	BRITISH THERMAL UNITS
CBD	COUNTERBALANCED BACKDRAFT DAMPER
CFM	CUBIC FEET PER MINUTE
CHWR	CHILLED WATER RETURN
CHWS	CHILLED WATER SUPPLY
CO	CLEANOUT
CTE	CONNECT TO EXISTING
CWR	CONDENSER WATER RETURN
CWS	CONDENSER WATER SUPPLY
DCW	DOMESTIC COLD WATER
DEG.F	DEGREES FAHRENHEIT
DHW	DOMESTIC HOT WATER
DIA	DIAMETER
DN	DOWN
DTR	DUAL TEMPERATURE RETURN
DTS	DUAL TEMPERATURE SUPPLY
EAT	ENTERING AIR TEMPERATURE
ESP	EXTERNAL STATIC PRESSURE
EWT	ENTERING WATER TEMPERATURE
EXG	EXISTING
EXH	EXHAUST
F&T	FLOAT & THERMOSTATIC TRAP
F/S	FIRE AND SMOKE COMBINATION DAMPER
FC	FLEXIBLE CONNECTION
FD	FIRE DAMPER
FL	FINNED LENGTH OF RADIATION
FM	FLOW METER
FOR	FUEL OIL RETURN
FOS	FUEL OIL SUPPLY
FPF	FINS PER FOOT
FPI	FINS PER/INCH
FPM	FEET PER MINUTE
FT	FEET
FT-HD	FEET OF HEAD
FT-WG	FEET WATER GAUGE
FTR	FIN TUBE RADIATOR
GAL	GALLONS
GPM	GALLONS PER MINUTE
HP	HORSEPOWER
HPCR	HIGH PRESSURE CONDENSATE RETURN (OVER 30 PSIG)
HPS	HIGH PRESSURE STEAM (OVER 30PSIG)
HRR	HEAT RECOVERY RETURN
HRS	HEAT RECOVERY SUPPLY
HWR	HOT WATER RETURN
HWS	HOT WATER SUPPLY

ABBREV / DESCRIPTION

ABBREV	DESCRIPTION
IN	INCHES
LAT	LEAVING AIR TEMPERATURE
LPCR	LOW PRESSURE CONDENSATE RETURN (LESS THAN 15 PSI)
LPS	LOW PRESSURE STEAM(LESS THAN 15 PSI)
LRA	LOCKED ROTOR AMPS
LSGV	LOCK & SHIELD GATE VALVE
LWT	LEAVING WATER TEMPERATURE
M	MOTORIZED DAMPER
MAX	MAXIMUM
MBH	1000 BRITISH THERMAL UNITS
MCA	MINIMUM CIRCUIT AMPS
MIN	MINIMUM
MOPD	MAXIMUM OVERCURRENT PROTECTIVE DEVICE
MPCR	MEDIUM PRESSURE CONDENSATE RETURN(15-30 PSIG)
MPS	MEDIUM PRESSURE STEAM (15-30 PSIG)
NA	NOT APPLICABLE
NC	NOISE CRITERIA
NIC	NOT IN CONTRACT
NO	NORMALLY OPEN
NTS	NOT TO SCALE
OA	OUTSIDE AIR
OC	ON CENTER
OED	OPEN END DUCT
OS&Y	OUTSIDE SCREW & YOKE GATE VALVE
PD	PRESSURE DROP
PRD	PRESSURE RELIEF DAMPER
PRV	PRESSURE REDUCING VALVE
PSI	POUNDS PER SQUARE INCH
PSIG	POUNDS PER SQUARE INCH GAUGE
RET	RETURN
RL	REFRIGERANT LIQUID
RLA	RATED LOAD AMPERES
RPM	REVOLUTIONS PER MINUTE
RS	REFRIGERANT SUCTION
S	SMOKE DAMPER
SP	STATIC PRESSURE
SS	STAINLESS STEEL
SUP	SUPPLY
TEMP	TEMPERATURE
TT	THERMOSTATIC TRAP
TYP	TYPICAL
V	VOLUME DAMPER
VFD	VARIABLE FREQUENCY DRIVE
W/	WITH
W/O	WITHOUT
WC	WATER COLUMN
WG	WATER GAUGE
WMS	WELDED WIRE MESH SCREEN
WPD	WATER PRESSURE DROP
Z	ZONE DAMPER
PREFIX OF X	EXISTING

PIPING LEGEND

SYMBOL	DESCRIPTION
	EXISTING SUPPLY PIPING TO REMAIN
	EXISTING RETURN PIPING TO REMAIN
	NEW SUPPLY PIPING
	NEW RETURN PIPING
	ACV 2 - WAY
	ACV 3 - WAY
	BUTTERFLY VALVE
	CAP - PIPE
	CHECK VALVE
	COMBINATION BALANCING, FLOW MEASURING & TIGHT SHUT-OFF VALVE
DPS	DIFFERENTIAL PRESSURE SENSOR
	FLOAT & THERMOSTATIC TRAP
	ISOLATION VALVE
	GLOBE VALVE
	INVERTED BUCKET TRAP
	LOCKSHIELD GATE VALVE
V	MANUAL AIR VENT
	OS&Y GATE VALVE
	PETCOCK FOR GAUGE CONNECTION
	PIPE ANCHOR
	PIPE DOWN
	PIPE UP
	PIPE GUIDE
	PLUG VALVE
P	PRESSURE GAUGE
	PRESSURE REDUCING VALVE
	PRESSURE RELIEF VALVE
	REDUCER - CONCENTRIC
	REDUCER - ECCENTRIC
	STRAINER
	TAKE - OFF FROM BOTTOM OF PIPE
	TAKE - OFF FROM TOP OF PIPE
	THERMOMETER
	THERMOMETER WELL
T	THERMOSTATIC TRAP
	UNION
A 10'-0" FL/D 1.2 GPM	RADIATION I.D. (TYPE A, 10'-0" FINNED LENGTH, BALANCED TO 1.2 GPM) WITH DAMPER
A 10'-0" FL 1.2 GPM	RADIATION I.D. (TYPE A, 10'-0" FINNED LENGTH, BALANCED TO 1.2 GPM) WITHOUT DAMPER

DUCTWORK LEGEND

SYMBOL	DESCRIPTION
	EXISTING DUCTWORK TO REMAIN
	NEW DUCTWORK
	ACOUSTICALLY LINED DUCT
AMS	AIRFLOW MEASURING STATION
BD	BACKDRAFT DAMPER
CB	COUNTERBALANCED DAMPER
Ø	SPIRAL DUCT DIAMETER
	DUCT SECTION - SUPPLY/OUTDOOR AIR
	DUCT SECTION - RETURN AIR
	DUCT SECTION - EXHAUST AIR
	DUCT TURNING VANES
F	FIRE DAMPER (1 1/2 HOUR RATED)
F/S	FIRE AND SMOKE DAMPER (1 1/2 HOUR RATED)
FD (3 HR)	FIRE DAMPER (3 HOUR RATED)
	FLEXIBLE DUCT
	LOUVER
M	MOTORIZED DAMPER
PRD	PRESSURE RELIEF DAMPER
	RETURN OR EXHAUST AIR
S	SMOKE DAMPER
SD	DUCT MOUNTED SMOKE DETECTOR
	STRAINER
SPS	STATIC PRESSURE SENSOR
	SUPPLY OR OUTSIDE AIR
V	VOLUME DAMPER

S (SUPPLY) R (RETURN)
E (EXHAUST) T (TRANSFER)
SUPPLY DIFFUSER (TYPE 2)
DIFFUSER DESCRIPTION
(SEE REG., GRILLES & DIFF SCHEDULE)
QUANTITY
400 CFM EA

CONTROLS LEGEND

SYMBOL	DESCRIPTION
H	HUMIDISTAT
HS	HUMIDITY SENSOR
TS	TEMPERATURE SENSOR
T	THERMOSTAT
TC	THERMOSTAT COOLING
TH	THERMOSTAT HEATING
TN	THERMOSTAT - NIGHT
TH/C	THERMOSTAT - HEATING/COOLING

GENERIC LEGEND

SYMBOL	DESCRIPTION
	CONNECT NEW TO EXISTING
	COMPLETELY REMOVE EQUIPMENT, DUCTWORK, OR PIPING
	EXISTING EQUIPMENT TO REMAIN
	NEW EQUIPMENT
A M10.1	SECTION I.D. (SECTION A SHOWN ON DWG M10.1)

GENERAL NOTES

1 VISIT THE BUILDING SITE PRIOR TO BIDDING TO BECOME FAMILIAR WITH EXISTING CONDITIONS, AND TO TAKE MEASUREMENTS AS NECESSARY FOR COMPLETION OF THE WORK ASSOCIATED WITH THE DESIGN INTENT OF THE CONTRACT DOCUMENTS.
2 COORDINATE WORK OF MECHANICAL SUBCONTRACTOR WITH WORK OF OTHER TRADES.
3 DUCTWORK, PIPING AND EQUIPMENT ARE INDICATED DIAGRAMMATICALLY, FIELD-VERIFY LOCATIONS.
4 PRIOR TO FABRICATING DUCTWORK, COORDINATE WITH OTHER TRADES TO ENSURE THAT THE DUCTWORK CAN BE INSTALLED WITH THE INDICATED SIZES AND LOCATIONS.FIELD-VERIFY EXISTING DUCT SIZES AND CONDITIONS.SUBMIT ANY DISCREPANCIES OR PROPOSED CHANGES.
5 DUCT ELBOWS SHALL BE LONG-RADIUS TYPE (THROAT RADIUS EQUAL TO OR GREATER THAN DUCT WIDTH IN THE PLANE OF THE TURN) WHEREVER SPACE ALLOWS. IF SPACE IS NOT ADEQUATE, PROVIDE MITERED ELBOWS WITH TURNING VANES.
6 PROVIDE 16 GAUGE SINGLE-THICKNESS TURNING VANES AT MITERED DUCT ELBOWS. VANE EDGES (LEADING AND TRAILING) SHALL BE TANGENTIAL TO AIRFLOW.
7 PIPING SHALL BE CONCEALED EXCEPT IN MECHANICAL ROOMS AND AS INDICATED. WHERE PIPES DROP IN BLOCK WALLS, PROVIDE 1/2" THICK INSULATION MINIMUM.
8 SEAL DUCTWORK AND PIPING THRU MECHANICAL ROOM FLOORS AND PARTITIONS, AND THRU FIRE-RATED ASSEMBLIES, WITH FIRESTOP MATERIAL AS SPECIFIED.
9 PROVIDE ALL REQUIRED PENETRATIONS IN RATED ASSEMBLIES, INCLUDING BUT LIMITED TO WALLS AND FLOORS WITH A UL APPROVED FIRESTOPPING ASSEMBLY, INCLUDING LISTING LABEL OF PENETRATION AFTER PASSING THROUGH UTILITIES.

DEMOLITION NOTES

1 DURING DEMOLITION PROPERLY CAP AND PROTECT ALL PIPING & DUCTWORK THAT WILL REMAIN IN OPERATION

2 MECHANICAL CONTRACTOR SHALL REFER TO THE SPECIFICATIONS FOR DISTRIBUTION OF RESPONSIBILITY AMONGST CONTRACTORS FOR SPECIFIC PORTIONS OF CUTTING AND PATCHING WORK. PLUMBING CONTRACTOR SHALL COORDINATE ALL CUTTING AND PATCHING WORK WITH ALL OTHER CONTRACTORS INVOLVED AS DEFINED IN THE SPECIFICATIONS

3 LOCATION OF EXISTING PIPING & DUCTWORK AS SHOWN ON DRAWINGS IS APPROXIMATE

4 COMPLETELY REMOVE ALL EQUIPMENT AS INDICATED & OR MISCELLANEOUS ARTICLES IN THEIR ENTIRETY INCLUDING AUXILLARY EQUIPMENT, PIPING, WIRING & CONDUIT

5 INCLUDE ALL DEMOLITION OF SYSTEMS AND COMPONENTS WHERE SYSTEMS SHALL BE REPLACED BY NEW WORK. REFER TO THE DRAWINGS & SPECIFICATIONS FOR SCOPE OF NEW & RECONNECTED WORK. THE INTENT OF THIS REQUIREMENT IS TO HAVE THE CONTRACTOR DISCONNECT, DEMOLISH & REMOVE ALL EXPOSED & CONCEALED WORK WHERE BEING REPLACED OR CONNECTED TO THE PROPOSED LAYOUTS

6 COORDINATE ELECTRICAL POWER DISCONNECTION PRIOR TO DEMOLITION WITH ELECTRICAL CONTRACTOR

7 CONTRACTOR SHALL CLEAN UP, REMOVE AND DISPOSE OF ALL DEBRIS AND DISCARDED ITEMS UPON COMPLETION OF CONSTRUCTION TO BE READY FOR A NEW OCCUPANCY CONDITION

8 DEMOLISH & COMPLETLY REMOVE EXISTING CONDITIONS DESIGNATED BY A HEAVY DASHED LINE UNLESS NOTED OTHERWISE. REFER TO LEGEND AND DEMOLITION PLANS FOR SCOPE OF WORK

Harriman

STATE OF
NEW HAMPSHIRE
PILLSBURY ST
BOILER REPLACEMENT

CONCORD, NEW HAMPSHIRE

Harriman Project No.	22209

Graphic Scale

CONSTRUCTION DOCUMENTS

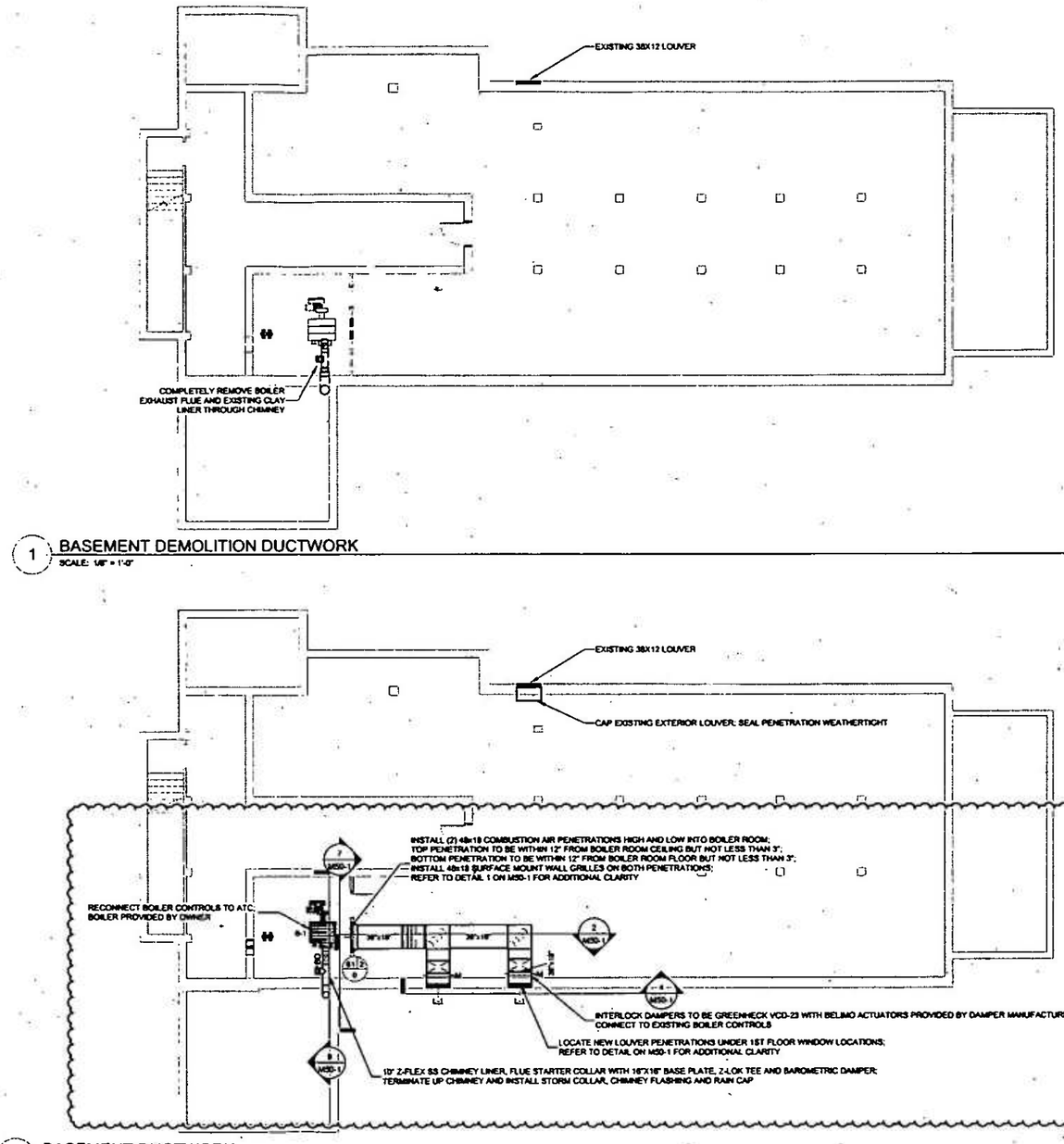
NOVEMBER 14, 2022

Revision Date	Revision Description
12-02-2022	ADDENDUM 1

Drawn by: ASG

LEGEND & GENERAL NOTES

M00-1



1 BASEMENT DEMOLITION DUCTWORK
SCALE: 1/8" = 1'-0"

2 BASEMENT DUCTWORK
SCALE: 1/8" = 1'-0"

REGISTERS, GRILLES & DIFFUSERS SCHEDULE

TAG	MANUFACTURER	MODEL	TYPE	NECK SIZE (IN)	DIRECTION OF BLOW	MAX NC	MAX SP	DAMPER	FINISH	BORDER	NOTES
S1	PRICE INDUSTRIES	510 SERIES	WALL GRILLE	48"X18"	SEE PLANS	35	0.15 in-wg	NO DAMPER	BAKED WHITE ENAMEL	SURFACE MOUNT	

LOUVER SCHEDULE

TAG	MANUFACTURER	MODEL	MIN FREE AREA (SQ.IN))	APD (IN.WG)	DIMENSIONS (WxHxD) (IN)	FRONT BLADES		FINISH	NOTES
						SPACE	ANGLE		
L-1	GREENHECK	ESD-403	333	0.1	36-18-6	3	45	MILL	PROVIDE WITH BIRD SCREEN

BOILER SCHEDULE

TAG	MANUFACTURER	MODEL	BURNER			LBS/HR	BURNER		ELECTRICAL				NOTES
			FUEL TYPE	INPUT (MBH)	OUTPUT (MBH)		MANUFACTURER	MODEL	POWER (HP)	VOLTAGE	PHASE	AMPS	
B-1	HB SMITH	78HE-8-4	NG	980	686.6	798	POWER FLAME	J50A-15	0.33	120	1	20	

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STATE OF
NEW HAMPSHIRE
PILLSBURY ST
BOILER REPLACEMENT

CONCORD, NEW HAMPSHIRE

Harriman Project No.	22269

Graphic Scale | Plan North | True North

CONSTRUCTION DOCUMENTS

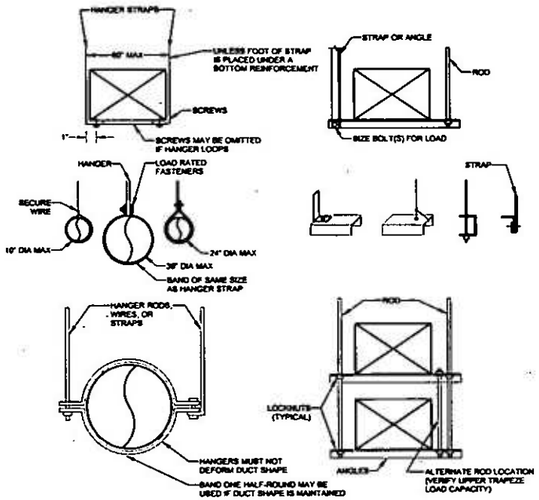
NOVEMBER 14, 2022

Revision Date	Revision Description
12-02-2022	ADDENDUM 1

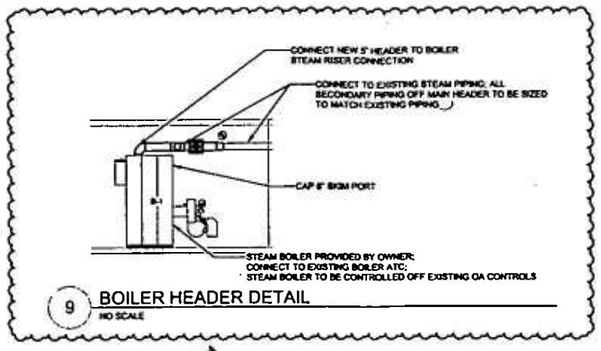
Drawn by: ASG

BASEMENT DUCT PLAN

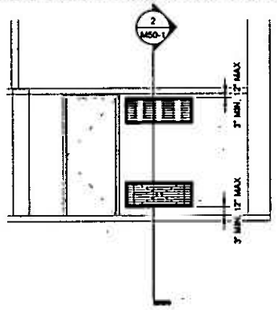
M10-1



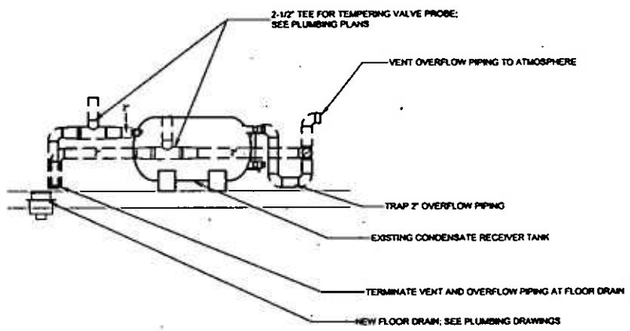
6 LOWER HANGER ATTACHMENT
NO SCALE



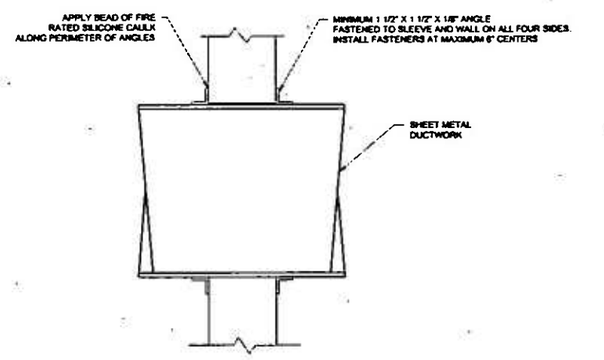
9 BOILER HEADER DETAIL
NO SCALE



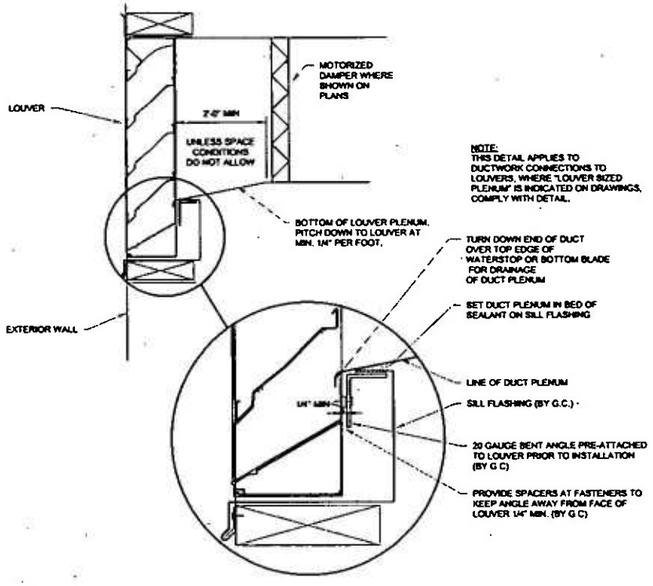
7 BOILER COMBUSTION AIR TERMINAL DETAIL
NO SCALE



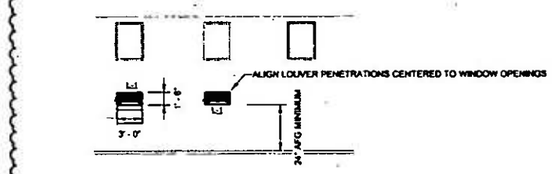
8 EXISTING CONDENSATE RECEIVER TANK PIPING SCHEMATIC
NO SCALE



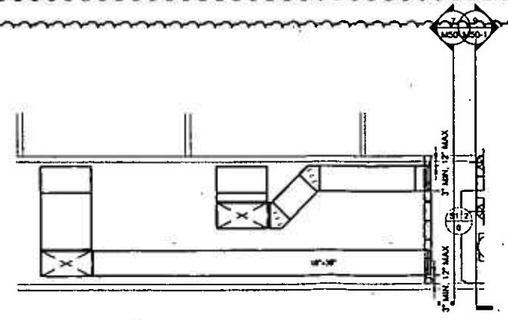
5 DUCT ONE HOUR FIRE PENETRATION
NO SCALE



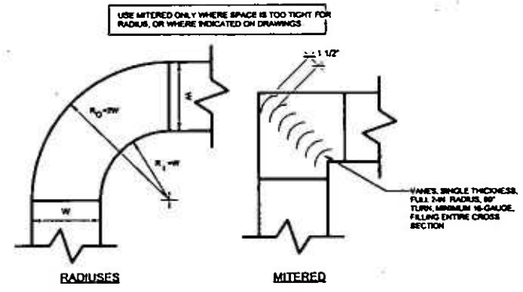
1 LOUVER CONNECTION
SCALE: 1/8" = 1'-0"



4 EXTERIOR LOUVER ELEVATION DETAIL
NO SCALE



2 COMBUSTION AIR DUCTWORK ELEVATION
NO SCALE



3 DUCT ELBOW
NO SCALE

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STATE OF NEW HAMPSHIRE
PILLSBURY ST
BOILER REPLACEMENT

CONCORD, NEW HAMPSHIRE

Harriman Project No.	22200

Graphic Scale
0" 1"

CONSTRUCTION DOCUMENTS
NOVEMBER 14, 2022

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Drawn by: ASG

DETAILS

M50-1