

HVAC & PLUMBING SYMBOL SCHEDULE

| SYMBOL | DESCRIPTION | SYMBOL | DESCRIPTION |
|--------|--|--------|---|
| ⊕ | REFER TO PLAN NOTES | 111 | ROOM CALLOUT |
| (E) | EXISTING EQUIPMENT OR MATERIAL DESIGNATION | △ | REVISION NUMBER |
| --- | EXISTING COMPONENT PEN WEIGHT | ⚡ | CONNECT NEW TO EXISTING. VERIFY EXACT LOCATION. |
| ---- | DEMOLITION PEN WEIGHT - COMPONENT MAY ALSO BE SHADED | ⦿ | DISCONNECT FROM EXISTING. VERIFY EXACT LOCATION. |
| T.C.C. | TEMPERATURE CONTROL CONTRACTOR | G.C. | GENERAL CONTRACTOR |
| E.C. | ELECTRICAL CONTRACTOR | M.C. | MECHANICAL CONTRACTOR |
| P.C. | PLUMBING CONTRACTOR | TYP. | TYPICAL ALL INSTANCES |
| 24x12 | (UP) DUCT SEC., POSITIVE PRESSURE-FIRST SIZE IS TOP DIM.(TYP.) | | BALANCING DAMPER W/ MANUAL LOCKING QUADRANT |
| 24x12 | (DOWN) DUCT SECTION, POSITIVE PRESSURE | | RECTANGULAR - OPPOSED BLADE / ROUND - BUTTERFLY |
| 24x12 | (UP) DUCT SECTION, NEGATIVE PRESSURE | | BALANCING DAMPER W/ MOTORIZED LOCKING QUADRANT |
| 24x12 | (DOWN) DUCT SECTION, NEGATIVE PRESSURE | | RECTANGULAR - OPPOSED BLADE / ROUND - BUTTERFLY |
| | SUPPLY DUCT DROP | 18x12 | DUCT SIZE, FIRST FIGURE IS SIDE SHOWN-CLEAR INSIDE DIM. |
| | SUPPLY DUCT RISER | | DUCT CHANGE OF ELEVATION RISE(R) DROP(D) |
| | RETURN DUCT DROP | | FLEXIBLE CONNECTION |
| | RETURN DUCT RISER | | SIDE WALL SUPPLY REGISTER |
| | FLEXIBLE DUCT | | ROOFTOP UNIT |
| | TURNING VANES | AHU | AIR HANDLING UNIT |
| SA | SUPPLY AIR | VAV | VARIABLE AIR VOLUME UNIT |
| OA | OUTSIDE AIR | FTU | FAN POWERED TERMINAL UNIT |
| RA | RETURN AIR | FCU | FAN COIL UNIT |
| EA | EXHAUST AIR | MAU | MAKE-UP AIR UNIT |
| OBD | OPPOSED BLADE DAMPER | SF | SUPPLY AIR FAN |
| BOD | BOTTOM OF DUCT ELEVATION ABOVE FLOOR | EF | EXHAUST FAN |
| BOS | BOTTOM OF STEEL | SR | SUPPLY REGISTER |
| TOD | TOP OF DUCT ELEVATION ABOVE FLOOR | RG | RETURN GRILLE |
| DH | DUCT HEATER | F | FURNACE |
| DP | DIFFERENTIAL PRESSURE | UH | UNIT HEATER |
| CVR | CONSTANT VOLUME REHEAT UNIT | CRAC | COMPUTER ROOM AIR CONDITIONING UNIT |
| V V R | VARIABLE VOLUME REHEAT UNIT | H | HUMIDIFIER |
| V V T | VARIABLE VOLUME VARIABLE TEMPERATURE | VFD | VARIABLE FREQUENCY DRIVE |
| UV | ULTRAVIOLET STERILE CONDITIONER | FD | FIRE DAMPER IN FLOOR (VERTICAL POSITION) |
| | RADIATION DAMPER | FD | FIRE DAMPER IN WALL (HORIZONTAL POSITION) |
| | MOTOR | SD | SMOKE DAMPER |
| | TEMPERATURE SENSOR | FSD | COMBINATION FIRE/SMOKE DAMPER (VERTICAL POSITION) |
| | HUMIDITY SENSOR | FSD | COMBINATION FIRE/SMOKE DAMPER (HORIZONTAL POSITION) |
| | ELECTRIC OR DDC HUMIDISTAT (HSTAT) | Ⓣ | ELECTRIC OR DDC THERMOSTAT (TSTAT) |
| | PNEUMATIC HUMIDISTAT | Ⓣ | PNEUMATIC THERMOSTAT |
| CWS | CHILLED WATER SUPPLY LINE (CWS) | HWS | HOT WATER SUPPLY LINE (HWS) |
| CWR | CHILLED WATER RETURN LINE (CWR) | HWR | HOT WATER RETURN LINE (HWR) |
| | DOUBLE CHECK BACKFLOW ASSEMBLY | | BALL VALVE |
| | REDUCED PRESSURE ZONE BACKFLOW ASSEMBLY | | CALIBRATED BALANCE VALVE - CIRCUIT SETTER |
| | GAS COCK | | BUTTERFLY VALVE |
| | VALVE IN DROP | | 2-WAY CONTROL VALVE (PNEUMATIC) |
| | VALVE IN RISER | | 3-WAY CONTROL VALVE (PNEUMATIC) |
| | GATE VALVE / SHUT OFF VALVE | | 2-WAY CONTROL VALVE (ELECTRIC) |
| | GLOBE VALVE | | 3-WAY CONTROL VALVE (ELECTRIC) |
| | 3 PIECE BALL VALVE | | CHECK VALVE |
| | HYDRAULIC VALVE | | PRESSURE REDUCING VALVE (PRV) |
| | EMERGENCY VALVE WITH FIRE LINK | | WAFER CHECK VALVE |
| | STRAINER | | AUTOMATIC FLOW CONTROL VALVE |
| | PLUG VALVE | | CALIBRATED ORIFICE PLATE FLOW METER |
| | SPRING HANGER | | THERMOMETER |
| | PIPE HANGER | | PRESSURE GAUGE |
| | CAP | | CONCENTRIC REDUCER OR INCREASER |
| | PIPE RISE | | ECCENTRIC REDUCER |
| | PIPE DROP | | TOP CONNECTION, 45° OR 90° |
| | UNION OR FLANGE CONNECTION | | BOTTOM CONNECTION, 45° OR 90° |
| | DIRECTION OF FLOW | | SIDE CONNECTION |
| | ANCHOR | | CAPPED OUTLET |

NOT ALL MAY BE USED ON PROJECT

GENERAL NOTES

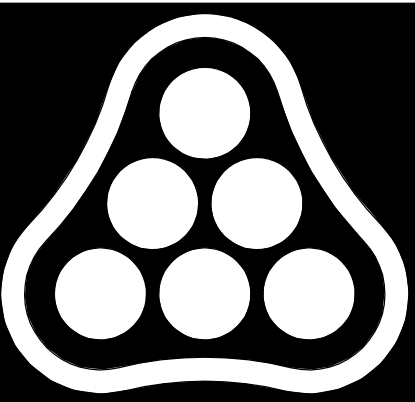
- VERIFY JOB SITE CONDITIONS AND DIMENSIONS BEFORE BEGINNING WORK. PLANS ARE SCHEMATIC IN NATURE. LAYOUT IS BASED ON BEST AVAILABLE INFORMATION. CONTRACTOR SHALL FIELD VERIFY EXISTING CONDITIONS AND DIMENSIONS.
 - NO PIPING, DUCTWORK, ETC. SHALL PENETRATE STRUCTURAL MEMBERS.
 - PROVIDE MISCELLANEOUS CUTTING, PATCHING AND REPAIRING OF FINISHES, ROOF, WALLS, ETC., AS REQUIRED TO ACCOMMODATE THE NEW WORK.
 - IT IS THE CONTRACTOR'S RESPONSIBILITY TO FIELD VERIFY EXACT LOCATION, CONFIGURATION AND ROUTING OF EXISTING SYSTEMS REQUIRED TO REMAIN IN OPERATION DURING THE PROJECT TO PREVENT DAMAGE DURING DEMOLITION AND PHASING.
 - REMOVE ALL EXISTING EQUIPMENT AND PIPING THAT IS NOT REQUIRED FOR A WORKING INSTALLATION.
 - COORDINATE ALL WORK WITH OTHER TRADES PRIOR TO INSTALLATION.
 - ALL CUTTING AND PATCHING SHALL BE CLOSELY COORDINATED WITH THE G.C.
 - COORDINATE ROUTING OF PLUMBING, AND HVAC PIPING WITH DUCTWORK, LIGHTS, ARCHITECTURAL CEILING AND STRUCTURAL ELEMENTS. PIPING SHALL RISE AND DROP, JOG OR OFFSET AS REQUIRED TO AVOID CONFLICTS. DUCTWORK SHALL TAKE PRECEDENCE OVER ALL PIPING, EXCEPT WHERE GRADE MUST BE MAINTAINED FOR DRAINAGE. REWORK OF INSTALLED WORK TO RESOLVE CONFLICTS ARISING FROM LACK OF COORDINATION SHALL NOT JUSTIFY AN INCREASE IN THE CONTRACT AMOUNT.
 - DO NOT ROUTE PIPING OR DUCTWORK OVER ELECTRICAL PANELS OR EQUIPMENT. PIPING OR DUCTWORK SHALL NOT BE ROUTED THROUGH ELECTRICAL ROOMS, TELECOM ROOMS OR ELEVATOR EQUIPMENT ROOMS UNLESS SPECIFICALLY SERVING THAT ROOM. COORDINATE WITH E.C. PROVIDE WATERTIGHT DRIP PAN WITH DRAIN TO NEAREST APPROVED RECEPTOR WHERE REQUIRED.
 - COORDINATE SIZE AND LOCATION OF MECHANICAL EQUIPMENT PADS WITH G.C.
 - ALL WORK IS TO CONFORM WITH APPLICABLE CODES AND STANDARDS.
 - DUCT SIZES SHOWN ARE ACTUAL INSIDE CLEAR DIMENSIONS. INCREASE SHEET METAL DIMENSIONS AS REQUIRED TO ACCOMMODATE DUCT LINER WHERE LINER IS SPECIFIED.
 - ALL EQUIPMENT SUPPORT STANDS SHALL BE PRIMED AND PAINTED WITH EPOXY ENAMEL.
 - HYDRONIC PIPING SHALL BE MAINTAINED FULL SIZE UP TO COIL CONNECTIONS. SHUT-OFF VALVES, STRAINERS, BALANCE VALVES, ETC. WILL NOT BE ALLOWED TO REDUCE FROM LINE/RUNOUT SIZE. CONTROL VALVES MAY BE DOWN SIZED FOR FLOW RATE, NOT TO EXCEED 4 PSIG PRESSURE DROP AT DESIGN FLOW.
 - TEMPERATURE CONTROLS CONTRACTOR (TCC) SHALL FURNISH AND INSTALL ALL LOW VOLTAGE WIRING AND ASSOCIATED CONDUIT REQUIRED FOR MECHANICAL CONTROL SYSTEM. WIRING SHALL BE IN CONDUIT INSIDE WALLS, IN ROOMS WITH EXPOSED CEILINGS, AND ABOVE HARD CEILINGS. LINE VOLTAGE WIRING AND ASSOCIATED CONDUIT SHALL BE PROVIDED AND INSTALLED BY E.C. CONTROL SYSTEM SHALL BE INSTALLED IN ACCORDANCE WITH SPECIFICATIONS.
 - CONTRACTOR TO INSTALL TEMPORARY FILTERS OVER ALL RETURN AND EXHAUST GRILLES IN WORK AREA DURING CONSTRUCTION.
 - THESE DRAWINGS ARE ACCOMPANIED BY SPECIFICATIONS. REFER TO SPECIFICATIONS FOR FURTHER INFORMATION.
 - EQUIPMENT THAT REQUIRES MAINTENANCE SHALL BE LOCATED A MINIMUM OF 10'-0" FROM THE BUILDING ROOF EDGE WHERE REQUIRED BY CODE.
- NOTE: NOT ALL MAY APPLY ON PROJECT.

SHEET LIST

| | |
|------|---------------------------|
| M0.1 | MECHANICAL COVER SHEET |
| M0.2 | MECHANICAL SPECIFICATIONS |
| M0.3 | MECHANICAL SPECIFICATIONS |
| M1.1 | MECHANICAL ROOF PLAN |
| M2.1 | ENLARGED MECHANICAL PLAN |
| M3.1 | MECHANICAL DETAILS |
| M4.1 | MECHANICAL SCHEDULES |

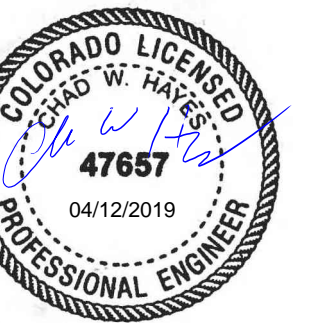
GENERAL DEMOLITION NOTES

- VERIFY ALL EXISTING CONDITIONS PRIOR TO BEGINNING WORK. BRING ANY DISCREPANCIES FROM THE DRAWINGS AND NOTES TO THE ARCHITECT IMMEDIATELY. MINOR CHANGES IN THE SCOPE OF THE DEMOLITION WORK SHALL NOT JUSTIFY AN ADDITIONAL COST.
 - REMOVAL OF EXISTING FIXTURES AND EQUIPMENT WILL REQUIRE ISOLATING THE PIPING RISERS OR MAINS VIA SHUT-OFF VALVES. INSTALL NEW ISOLATION VALVES WHERE REQUIRED FOR COMPLETION OF WORK.
 - REMOVAL OF EXISTING FIXTURES AND EQUIPMENT, ETC. WILL REQUIRE CAPPING AND SEALING EXISTING MAINS OR BRANCHES AS NECESSARY AND REQUIRED TO ALLOW THE REMAINING SYSTEMS TO FULLY OPERATE WITHOUT DEGRADATION.
 - CONTRACTOR SHALL PROVIDE PROTECTIVE PLASTIC DROP CLOTHS TO PROTECT THE EXISTING OCCUPIED AREAS AND EQUIPMENT FROM DUST AND DEBRIS DURING THE CONSTRUCTION WORK, AND SHALL CLEAN THE AREAS OF ALL CONSTRUCTION DIRT DAILY, AND UPON COMPLETION OF THE WORK.
 - ALL DRAINED PIPING RISERS AND MAINS SHALL BE REFILLED WITH PROPER FLUID AND PROPERLY VENTED BY THIS CONTRACTOR, ONCE NEW WORK HAS BEEN INSTALLED.
 - COORDINATE WITH GENERAL CONTRACTOR THE REMOVAL AND REPLACEMENT OF ALL EXISTING CEILINGS, WALLS, ETC. AS REQUIRED FOR MECHANICAL DEMOLITION WORK.
 - EXISTING PIPING AND EQUIPMENT, ETC., NOT TO BE UTILIZED IN THE COMPLETED BUILDING SHALL BE DISCONTINUED OR REMOVED AS REQUIRED. ALL ENDS OF DISCONTINUED PIPING SHALL BE CAPPED IN THE NEAREST WALL, CEILING OR FLOOR SO THAT THEY ARE COMPLETELY CONCEALED. OPENINGS LEFT IN WALLS, CEILINGS, ETC., WHERE EQUIPMENT AND PIPE, ETC., ARE REMOVED AND NOT REPLACED, SHALL BE PATCHED NEATLY WITH SIMILAR MATERIAL TO ADJACENT CONSTRUCTION. REFER TO DRAWINGS DELINEATING NEW WORK FOR ADDITIONAL INFORMATION REGARDING SYSTEMS OR PORTIONS OF SYSTEMS WHERE USE IS TO BE DISCONTINUED.
 - EXISTING PIPING, FIXTURES AND EQUIPMENT THAT ARE NOT TO BE REUSED SHALL BE REMOVED AND SHALL REMAIN THE PROPERTY OF THE OWNER IF THEY WISH TO RETAIN OWNERSHIP OF SAME. IF NOT, EQUIPMENT SHALL BECOME THE PROPERTY OF THIS CONTRACTOR AND SHALL BE REMOVED FROM THE SITE AS SOON AS PRACTICAL AND DISPOSED OF IN ACCORDANCE WITH APPLICABLE LAWS AND REGULATIONS.
 - ALL CUTTING AND CHANNELING OF EXISTING BUILDING SHALL BE ACCOMPLISHED IN A NEAT AND WORKMANLIKE MANNER WITHOUT REMOVAL OF EXCESS MATERIALS. THIS CONTRACTOR SHALL PATCH AND REPLACE WITH MATERIAL SIMILAR TO ADJACENT CONSTRUCTION.
 - WHERE EXISTING PIPING AND EQUIPMENT, ETC., THAT ARE TO BE UTILIZED IN THE COMPLETED PROGRAM CONFLICT WITH NEW CONSTRUCTION AND THE REQUIRED DEMOLITION, THEY SHALL BE RELOCATED AND RECONNECTED TO MAINTAIN THE DESIRED SERVICE.
 - PORTIONS OF EXISTING SYSTEMS MAY BE SHOWN FOR CLARITY EVEN THOUGH IT MAY NOT BE NECESSARY TO MODIFY OR REVISE THEM. ALL EXISTING SYSTEMS ARE SHOWN BASED ON ORIGINAL OR REMODEL BUILDING DRAWINGS. CONTRACTOR TO VERIFY ALL EXISTING CONDITIONS.
 - ALL WORK MUST BE COORDINATED AND SCHEDULED WITH THE OWNER AND OCCUPANTS OF THIS BUILDING SO AS TO PROVIDE THE LEAST AMOUNT OF DISRUPTION OF BUILDING ACTIVITIES AS POSSIBLE. MAINTAIN CONDITIONED SPACE FOR ALL OWNER OCCUPIED AREAS DURING CONSTRUCTION.
 - ALL ACCESSIBLE ABANDONED PIPING AND DUCTWORK SHALL BE REMOVED AND PROPERLY DISPOSED OF.
- NOTE: NOT ALL MAY APPLY TO PROJECT



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PSD - JSSC BOILER REPLACEMENT

2407 LAPORTE AVENUE
FORT COLLINS, CO 80521

MECHANICAL COVER SHEET

100% CONSTRUCTION DOCUMENTS

JOB NO. 190168-000
DATE 4/12/2019
DRAWN BY JDB
CHECKED BY CWH

M0.1

SECTION 200500 – COMMON WORK RESULTS FOR FIRE PROTECTION, PLUMBING, AND MECHANICAL

PART 1 - GENERAL

1.1 GENERAL CONDITIONS

- A. The General Conditions, Supplemental General Conditions, Special Conditions and General Requirements are part of this contract and shall be referred to as they apply to this section of the specifications.
- 1.2 EXAMINATION OF SITE
- A. Visit the site, inspect the existing conditions and check the drawings and specifications so as to be fully informed of the requirements for completion of the work. Lack of such information shall not justify an extra to the contract price.

1.3 SCOPE

- A. The Mechanical Work shall include labor, materials, and equipment to install systems as shown on plans and hereinafter specified. The installation shall include all labor, materials, tools, transportation, equipment, services and facilities, required for the complete, proper and substantial installation of all mechanical work shown on the plans, and/or outlined in these specifications. The installation shall include all materials, appliances, and apparatus not specifically mentioned herein or noted on the drawings but which are necessary to make a complete working installation of all mechanical systems.
- B. Show on prints in red ink all changes from original plans made during the installation. Return these prints to the Architect upon completion of the project.
- C. By bidding, this contractor acknowledges his understanding of the work to be done and agrees to install complete and workable systems.

1.4 CODES

- A. Execute work in compliance with all applicable Federal, State and Municipal laws, codes, ordinances, and local customs regarding the trade to perform the work.
- B. Codes shall govern in case of any direct conflict between codes and plans and specifications; except when plans and specifications require higher standards than those required by code. Variance from the plan and specifications made to comply with code must be approved by the Architect. If approved they shall be made with no increased cost to the Owner.
- C. In addition, the following published Standards and Regulations shall be adhered to as applicable to the work involved:
1. Latest issue of the Local, State, and National Plumbing Codes
 2. Latest issue of the ASHRAE Guide
 3. Latest issue of the SMACNA Handbook
 4. Applicable NFPA Pamphlets
 5. Applicable ANSI Standards
 6. American Society of Mechanical Engineers Boiler Code
 7. American Society of Mechanical Engineers Unfired Pressure Vessel Code
 8. American Standards Association Code for Mechanical
 9. Occupational Safety and Health Act
 10. Current Editions of Uniform Building Code
 11. Latest issue of the State Air Pollution Control Regulations
 12. Rules of the State Boiler Inspection Department
 13. Americans with Disabilities Act

1.5 DEFINITIONS

- A. It shall be understood that the drawings and specifications complement one another and items specified shall also meet the criteria set forth on the drawings.
- B. Where any device or item is referred to in the singular sense (such as "the unit"), such reference applies to as many devices as are required to complete the installation as shown on the drawings.
- C. The term "work" shall mean all obligations imposed upon the Contractor by the Contract Documents.

1.6 ABBREVIATIONS

- A. ADA - Americans with Disabilities Act
- B. AGA - American Gas Association
- C. AISI - American Iron and Steel Institute
- D. AMCA - Air Moving and Conditioning Association, Inc.
- E. ANSI - American National Standards Institute
- F. ASHRAE - American Society of Heating, Refrigeration & Air-Conditioning Engineers, Inc.
- G. ASME - American Society of Mechanical Engineers
- H. ASTM - American Society for Testing and Materials
- I. AWWA - American Water Works Association
- J. BPVC - Boiler and Pressure Vessel Code of ASME
- K. CISPI - Cast Iron Soil Pipe Institute
- L. NFPA - National Fire Protection Association
- M. SMACNA - Sheet Metal and Air-Conditioning Contractors National Association, Inc.
- N. UL - Underwriters' Laboratories, Inc.
- O. ETL - ETL Testing Laboratories, Inc.
- P. OSHA - Occupational Safety and Health Administration

1.7 PERMITS

- A. Obtain and pay for all licenses and permits, fees, inspection and certificates required for the execution of this work.
- B. Pay fees and charges for connection to outside services and use of property.
- C. Deliver permits and certificates to the Architect for transmittal to the Owner.

1.8 RESPONSIBILITY

- A. This contractor will be held responsible for any and all damage to any part of the building or to the work of other contractors, as may be caused through his operation.
- B. The operation and maintenance of the New Mechanical Equipment during construction shall be the responsibility of this contractor until the acceptance of the building by the Owner.
- C. The General Contractor shall pay for all fuel cost for operation of the equipment, unless indicated otherwise in the specifications.
- D. This Contractor shall make all provisions for entry of equipment, installed under this Contract, to the installed location. This Contractor shall provide openings in existing construction if necessary. This Contractor shall do all repair necessary to restore the building to the original condition. During the period of entry of equipment and removal of trash, no disruption of the Owner's normal business shall occur.

1.9 WORK TO BE DONE BY GENERAL CONTRACTOR

- A. Build in all openings, sleeves, chases, etc., for piping, as established, furnished and set by this contractor.
- B. Mechanical Contractor shall furnish bolts, brackets, hangers, etc., required for work established and arrange for General Contractor to build into concrete structure. General Contractor shall install all factory sleeved fire dampers, furnished by Mechanical Contractor, in walls and floors.
- C. Paint all mechanical equipment so specified. Use paint which is specified by the Architect.

1.10 WORK TO BE DONE BY ELECTRICAL CONTRACTOR

- A. The Electrical Contractor shall provide all motor starters complete with auxiliary contacts where required for the function of this system unless specifically noted otherwise on the plans or in these specifications.
- B. All required line voltage wiring for the mechanical control system shall be furnished and installed by the Electrical Contractor under supervision of the Control Manufacturer's representative.
- C. Check mechanical specifications to verify wiring requirements for motor driven equipment. Provide complete wiring for the equipment including all required interlocking. Provide complete wiring for power factor correction capacitors.
- D. The Electrical Contractor shall install the power factor correction capacitors furnished by the Mechanical Contractor for equipment so specified.

1.11 ELECTRICAL REQUIREMENTS BY MECHANICAL CONTRACTOR

- A. Mechanical Contractor shall furnish all motors, motor interlocking control devices, certain magnetic starters, etc.
- B. Submittals shall include complete equipment wiring diagrams and temperature control drawings for all the equipment furnished.
- C. Submittals shall show all wiring connections, starters, auxiliary contactors, interlocking selector switches, separate control voltage power supplies, for each and every item of equipment, etc., requiring wiring.
- D. Provide one copy of Engineer approved shop drawings showing all wiring and temperature control requirements of all mechanical equipment to the Electrical Contractor.
- 1.12 WORKMANSHIP AND COORDINATION
- A. Make installation substantially as shown on the plans.
- B. Pipe and duct routing and equipment location shown on the drawings are schematic in nature. Make alterations in location of apparatus or piping as may be required to conform to building construction without extra charge.
- C. Equipment service clearances, per equipment manufacturers' specifications, shall be maintained from general construction. No pipe or ductwork shall be installed within these clearances. No piping, coils, or ductwork shall be installed above electrical panels, starters or switch gear, or in elevator equipment rooms.
- D. Cooperate with other contractors in their installation of work.
- E. The ductwork shall take precedence over all pipe work except where it is necessary to maintain an even grade or specific slope on the piping.
- F. Use only experienced mechanics.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Material and equipment shall be new, of best quality and design and free from defects. A manufacturer's nameplate affixed in a conspicuous place will be required on each major component of equipment stating manufacturer's name, address and catalog number.

2.2 MATERIALS OF APPROVED EQUAL

- A. Where items of equipment and/or materials are specifically identified herein by a manufacturer's name, model or catalog number, only such specific items may be used in the base bid, except as hereinafter provided.
- B. Unless requests for changes in base bid specifications are received and approved and noted by addendum prior to the opening of bids, the successful contractor will be held to furnish specified item.
- C. After contract is awarded, changes in specifications shall be made only as defined under "Substitution of Equipment".
- 2.3 SUBSTITUTION OF EQUIPMENT
- A. After execution of the contract, substitution of equipment of makes other than those specifically named in the contract documents will be approved by the Engineer only if the equipment named in the specifications cannot be delivered to the job in time to complete the work in proper sequence to work of other contractors, due to conditions beyond control of the contractor.
- B. Requests for substitutions must be accompanied by documentary proof of equality or difference in price and delivery, if any, in form of certified quotations from suppliers of both specified and proposed equipment.
- C. The Owner shall receive all benefits of the difference in cost involved in any substitution, and the contract altered by change order to credit Owner with any savings so obtained.

2.4 SUBMITTALS

- A. Contractor shall send to the Architect for approval submittals on all equipment, accessories, and components.
- B. Where catalog cuts are used, mark them to indicate equipment, capacities, controls, fittings, valves, sizes, etc.
- C. Reference each item to applicable specification paragraph number and plan sheet number. Reference items not appearing in base specification to applicable alternate numbers, change order numbers, letters of authorization, etc.
- D. All shop drawings shall be checked and signed by the mechanical contractor prior to submittal to the Engineer.
- E. Shop drawings submitted without contractor's signature or approval and verification will not be approved. Quantities will not be checked or verified. It is the contractor's responsibility to provide the proper quantities required to complete the job.
- F. Portions of the work requiring a shop drawing submittal shall not begin until the shop drawing has been approved by the Engineer.
- G. Submit wiring diagrams for all mechanical equipment requiring field wiring clearly showing all required connections.
- H. Engineer's acceptance of Compliance Submittals will not relieve Contractor from his responsibility for any deviations from the requirements of the Contract Documents unless Contractor has in writing called Engineer's attention to such deviation at the time of submission and Engineer has given written approval to the specific deviation, nor shall any acceptance by Engineer relieve Contractor from responsibility for errors or omissions in Compliance Submittals.

2.5 CUTTING AND PATCHING

- A. Notify the General Contractor in ample time, of the location of all chases, sleeves, and any other openings required in connection with the work of this contract.
- B. Cutting and patching made necessary because of failure to comply with the above shall be done by the General Contractor at the expense of the Mechanical Contractor.

2.6 MUTILATION

- A. All mutilation of finishing initiated by installation of plumbing pipes, fixtures, etc., shall be properly pointed up by the respective finishing contractor and paid for by the Mechanical Contractor.

PART 3 - EXECUTION

3.1 TESTING

- A. Furnish testing equipment and test all piping systems under methods and conditions as specified.
- B. Test for a period of not less than 12 hours in the presence of the Architect.
- C. Make all necessary replacements and repair and repeat tests until the entire system is approved and satisfactory.
- D. Test under pressure with liquid or gas as directed or specified.

3.2 PAINTING

- A. All painting shall be done by the General Contractor.
- B. Painting shall be for the following items: all piping, ductwork, frame work, and all equipment not furnished with factory finish, etc., in all exposed areas of the building and/or as noted on the drawings. Omit painting of piping in tunnels and in concealed areas.

3.3 LABELING

- A. Install mechanically engraved metal or plastic label at equipment, not less than 2-1/2 inches wide by 3/4 inch tall with letters between 1/4 inch and 1/2 inch tall. Utilize labels with pre-drilled holes and stainless steel rivets or self-tapping screws, or labels with contact-type permanent adhesive.
- B. Identify all service piping which is accessible for maintenance operation with semi rigid plastic markers complete with direction of flow arrows. Each marker must show approved color-coded background, proper color of legend, approved legend letter size and approved marker length. Use snap on or Type SNA markers on diameters 3/4" thru 5". Use strap-on or Type STR on diameter 6" and larger. Locate pipe markers at each valve, each branch and riser takeoff, each passage through wall or floor construction, each passage to underground and at 25 foot intervals on all horizontal pipe runs.

3.4 OPERATING INSTRUCTIONS

- A. Prepare and submit to the Engineer for approval three (3) copies of operating instructions made in conjunction with Equipment Manufacturer's representative. Instruction shall contain equipment starting sequence, interlocks, controls, switches, etc. which affect the equipment operation. Place copies in maintenance instructions brochure.

3.5 MAINTENANCE INSTRUCTIONS

- A. Prepare a brochure in triplicate covering all systems and equipment furnished and installed under this contract. Each brochure shall include certified equipment drawings and/or catalog data as submitted, complete maintenance instructions, parts lists for each item of equipment, any special emergency operating instructions, all equipment warranties with starting dates identified, and a list of service organizations including addresses and telephone numbers.
- B. Brochures shall be bound in hard backed, three-ring binders with an index, sub-dividers and reinforced sheets.
- C. Label cover with the following:
- D. Project name and address
 - E. Section of work covered by brochure, i.e., "Plumbing Heating, Ventilation, Air Conditioning", etc.
 - F. Name and address of Architect, Engineer, Contractor.
 - G. Telephone number of Contractor including night and emergency numbers.
 - H. Brochures shall be submitted to the Engineer for approval and delivery to the Owner.

3.6 FINAL INSPECTION

- A. Final inspection will be made upon written request from the Mechanical Contractor after the project is completed.
- B. Furnish a workman familiar with this project to accompany the Engineer on final inspection and have available ladders, drop cords, and other equipment as required to gain access to any portion of this system.
- C. This contractor and his principal sub-contractors shall be represented at the inspection by a person of authority responsible to demonstrate to the Engineer that his work conforms to the intent of the plans and specifications.
- D. Extra inspections made necessary by the Mechanical Contractor's failure to comply with the conditions as set forth above shall be charged to the contractor at the inspector's time both on the job and spent in travel between the office and the project site.

3.7 GUARANTEE

- A. Guarantee all work, material and equipment for a period of one year after date of final certificate of acceptance by the Architect.
- B. During the year guarantee period the mechanical contractor shall be responsible for any defects which develop in the mechanical systems. Upon notification of a defect by the Architect, (s)he shall make immediate effort to correct it and shall notify the Architect when this work is completed.
- C. Repairs and/or replacements shall be made with no cost to Owner.

END OF SECTION 200500

SECTION 220500 – COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL (NOT USED)

PART 2 - PRODUCTS

2.1 PRODUCTS

A. Pipe And Fittings

- a. Provide standard weight IPS brass nipples and adapters where required between copper tubing and fixtures. Steel, Galvanized or iron nipples are not permitted between copper lines and brass valves or trim.
- b. Joints: Joints in all copper domestic piping systems shall be made using 95/5 tin/antimony or equal tensile strength solder that contains no lead. Engelhard "Silvabrite 100," Oatey "SafeLo," or Canfield "Watersafe" are all acceptable. Use flux recommended by solder manufacturer. Absolutely no lead containing solders or fluxes will be allowed in any portion of the work. The District reserves the right to inspect solders, fluxes and joints. Any joint found containing lead solder shall be cause for resoldering all joints made in all systems in the building. Copper heating and chilling piping systems shall be brazed for 2" pipes and smaller, except connections to valves and unit ventilators, etc., that may be damaged by the heat.
- c. All copper tubing to be reamed to full inside diameter of the tubing.
- d. If copper pipe is found NOT reamed at any one location, contractor may be required to disassemble all piping and have a consultant approved by the engineer and school district to verify reaming. Cost for ALL deconstruction and put back to be paid by the contractor whether all locations are non-compliant or not.
- e. All welding fittings shall be Tube Turn, Taylor Forge, B&W, Ladish or Yoloy.
- f. T-drill, Press Fit type fittings, Shark Bit Fittings, Copper Grooved, Grooved fittings are not acceptable in hydronic, chilled, or domestic water systems.
- B. Permissible Assemblies For Welded Piping Systems
- a. Service working pressure is limited to 160 psig
 - b. Weld all black steel pipe 2-1/2" and larger except where flanges are required. End to end butt weld joints 3/4" through 2" pipe are allowed only with internal welding rings.
 - c. Where welding rings are used, machine pipe ends for proper fit.
 - d. Elbows: Use welding elbows.
 - e. Tees: Use welding tees. Weldolets are allowed in shop prefabricated assemblies or in lines 5" and larger, providing all slag is removed from inside the piping.
 - f. Reducers: Use welding reducers.
 - g. Caps: Use welding caps.
 - h. Prepare pipe ends in tees, laterals, and reducers for weld penetration in accordance with ASA standards.
 - i. Mitered elbows, tees, and reducers are prohibited in welded lines. 10.Elbows: Use long radius butt-welding elbows in expansion loops and bends.
 - j. Use long radius reducing butt-welding elbows at equipment where a 90-degree bend and size change is required.
 - k. National Certified Pipe Welding Bureau or AWS shall certify welders and procedures.

2.2 HANGERS AND SUPPORTS

- A. Manufacturers: Crane - B-Line - Grinnel - Unistrut - Elen.
- B. Use strap type pipe ring hangers on pipe up thru 3" equal to Grinnel Fig. 69 or CT-69. Use standard duty clevis hangers on piping larger than 3" equal to Grinnel Fig. 260.
- C. Use inserts or supporting members in construction above for overhead suspension. Set inserts or supporting members for hangers in form for concrete construction. Use expansion inserts only where approved by the Architect's inspector.
- D. Use heavy welded steel brackets for wall suspension. Mount brackets and wall supports on masonry walls with bolts through the wall and a suitable steel back plate on the back of the wall.
- E. Provide all surface mounted and concealed unistrut for pipe supports in all equipment rooms and above ceilings for pipe and duct mounting. Unistrut shall all be at a minimum of heavy 12 ga., 1-5/8" construction. Contractor shall insure adequate support of each unistrut section based on the load that section is to handle.
- F. Support fire water piping independent of all other piping.
- G. Size hangers on insulated pipe 3" and smaller to fit the pipe. Use copper plated hangers for copper pipe. Size hangers on insulated pipe 4" and larger to fit the insulation, and provide pipe sleeves and high density insulation inserts as specified under "Insulation and Pipe Covering".
- H. Space hangers 8'-0" on center for steel, iron, and copper pipe up to 1".
- I. Space hangers 10'-0" on center for steel, iron, and copper pipe above 1".
- J. Mount piping so that all runs are parallel and evenly spaced.

- M. Except as otherwise indicated, provide factory-fabricated vertical-piping clamps complying with MSS SP-58, of one of the following types listed, selected by Installer to suit vertical piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Select size of vertical piping clamps to exactly fit pipe size of bare pipe. Provide copper-plated clamps for copper-piping systems.
- N. Two-Bolt Riser Clamps: MSS Type 8.
- O. Except as otherwise indicated, provide factory-fabricated hanger-rod attachments complying with MSS SP-58, of one of the following MSS types listed, selected by Installer to suit horizontal-piping hangers and building attachments, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hanger-rod attachments to suit hanger rods. Provide copper-plated hanger-rod attachments for copper-piping systems.

- Steel Turnbuckles: MSS Type 13.
 - Steel Clevises: MSS Type 14.
 - Swivel Turnbuckles: MSS Type 15.
 - Malleable Iron Sockets: MSS Type 16.
 - Steel Weldless Eye Nuts: MSS Type 17.
- P. Except as otherwise indicated, provide factory-fabricated building attachments complying with MSS SP-58, of one of the following MSS types listed, selected by Installer to suit building substrate conditions, in accordance with MSS SP-69 and manufacturer's published product information. Select size of building attachments to suit hanger rods. Provide copper-plated building attachments for copper-piping systems.
- a. Concrete Inserts: MSS Type 18.
 - b. Top Beam C-Clamps: MSS Type 19.
 - c. Side Beam or Channel Clamps: MSS Type 20.
 - d. Center Beam Clamps: MSS Type 21.
 - e. C-Clamps: MSS Type 23.
 - f. Side Beam Clamps: MSS Type 27.
 - g. Malleable Beam Clamps: MSS Type 30.
 - h. Steel Brackets:
 - i. Light Duty: MSS Type 31.
 - j. Side Beam Brackets: MSS Type 34.
- Q. Install hangers and supports to allow controlled movement of piping systems and to permit freedom of movement. Resting of pipe in framing or structural members is not permitted.
- R. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.
- S. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes, and so that maximum pipe deflections allowed by ANSI B31 are not exceeded.
- T. Insulated Piping: Comply with the following installation requirements:
- a. Clamps: Attach clamps, including spacers (if any), to piping with clamps projecting through insulation; do not exceed pipe stresses allowed by ANSI B31.
 - b. Shields: Where low-compressive-strength insulation or vapor barriers are indicated on cold or chilled water piping, install coated protective shields.
 - c. Saddles: Where insulation without vapor barrier is indicated, install protection saddles.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Excavating, Trenching, And Backfilling
- a. Excavation: Trenches for all underground pipe lines shall not be carried below the required depths except as necessary for special pipe bedding or to remove unstable soil or rock.

3.2 INSTALLATION

A. Piping Installation

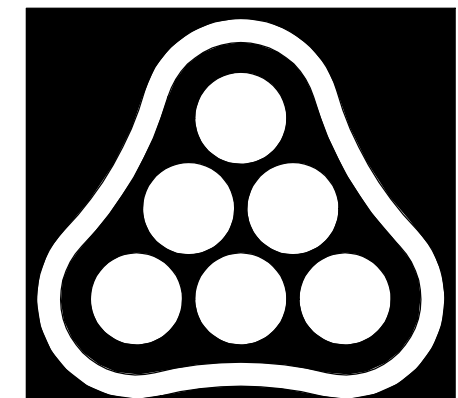
- a. General:
- Use straight round pipe. Reamed to full size after cutting. Remove all chips from reaming.
 - Arrange pipe in group runs where feasible. Coordinate locations with all trades. Avoid traps in piping.
 - Install piping to take advantage of every available means to facilitate thermal expansion of pipe. Provide anchors and guides to control direction of travel. Guides shall be Keflex type B with BH hanger, or Adscoc, or type P, for insulated pipe. Provide ample length to maintain 25% engagement with maximum pipe travel. Provide anchors for domestic water piping serving automatic dishwashers.
 - b. Expansion loops shall be used for expansion compensation. Install anchors at both ends of pipe lengths served by expansion loops so that pipe movement due to expansion is directed toward the expansion loop without damaging the building construction. Both sides of the expansion loop shall be anchored. As a minimum, locate one guide 4 pipe diameters and the second guide 14 pipe diameters from each side of the expansion loop. Both sides of the expansion loop shall have two guides.

3.3 CLEANING AND PROTECTION

A. Disinfecting And Special Cleaning

- a. When a new system is to be connected to an existing system, isolate the new system for cleaning and flushing. Reaming chips must be removed by flushing, cleaning strainers, etc.

END OF SECTION 220500



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M0.2

SECTION 220553 – IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- 1. Types of identification devices specified in this section include the following:
 - a. Plastic Pipe Markers.
 - b. Plastic Tape.
 - c. Plastic Duct Markers.
 - d. Valve Tags.
 - e. Valve Schedule Frames.
 - f. Engraved Plastic-Laminate Signs.
 - g. Equipment Markers.
 - h. Plasticized Tags.

1.2 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacturer of identification devices of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Codes and Standards:

- a. ANSI Standards: Comply with ANSI A 3.1 for littering size, length of color field, colors, and viewing angles of identification devices.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide products by one of the following:
- B. Mechanical Identification:
 - a. Westline Products
 - b. Brady (W.H.) Co.; Signmark Div.
 - c. Seton Name Plate Corp.

2.2 PRODUCTS

- A. Mechanical Identification Materials
 - a. General: Provide manufacturer's standard products of categories and types required for each application. Where more than single type is specified for application, selection is Installer's option, but provide single selection for each product category.
- B. Plastic Pipe Markers
 - a. Snap-On Type: Provide manufacturer's standard pre-printed, semi-rigid snap-on, color-coded pipe markers, complying with ANSI A13.1.
 - b. Insulation: Furnish 1" thick molded fiberglass insulation with jacket for each plastic pipe marker to be installed on uninsulated pipes subjected to fluid temperatures of 125 deg. F. (52 deg. C.) or greater. Cut length to extend 2" beyond each end of plastic pipe marker.
 - c. Small Pipes: For external diameters less than 6" (including insulation if any), provide full-band pipe markers, extending 360 degrees around pipe at each location, fastened by one of the following methods:
 - Snap-on application of pre-tensioned semi-rigid plastic pipe marker.
 - Taped to pipe (or insulation) with color-coded plastic adhesive tape, not less than 3/4" wide; full circle at both ends of pipe marker, tape lapped 1-1/2".
 - d. Lettering: Comply with piping system nomenclature or to match existing building lettering nomenclature system and abbreviate only as necessary for each application length.
 - e. Arrows: Print each pipe marker with arrows indicating direction of flow, either integrally with piping system service lettering (to accommodate both directions), or as separate unit of plastic.
- C. Plastic Tape
 - a. General: Provide manufacturer's standard color-coded pressure-sensitive (self-adhesive) vinyl tape, not less than 3 mils thick.
 - b. Width: Provide 1-1/2" wide tape markers on pipes with outside diameters (including insulation, if any) of less than 6", 2-1/2" wide tape for larger pipes.
 - c. Color: Comply with ANSI A13.1.
- D. Valve Tags
 - a. Brass Valve Tags: Provide 18-gauge polished brass valve tags with stamp-engraved piping system abbreviation in 1/4" high letters and sequenced valve numbers 1/2" high, and with 5/32" hole for fastener.
 - Provide 1-1/2" diameter tags.
 - Fill tag engraving with black enamel.
 - b. Valve Tag Fasteners: Provide manufacturer's standard solid brass chain (wire link or beaded type), and solid brass S-hooks of the sizes required for proper attachment of tags to valves, and manufactured specifically for that purpose.
 - c. Access Panel Markers: Provide mechanical equipment identification as indicated in this section.
 - d. Identify all valves located above ceilings or behind access panels using Dymo embossing Tape punched with M-3 Dymomite hand embossing tool. Punch out 3/32" holes at each side of label and secure with Parker-Kalon self-taping screws in addition to adhesive.

E. Lettering And Graphics

- a. General: Provide numbers, lettering and wording as indicated and approved by the Owner/Engineer for proper identification and operation/ maintenance of mechanical systems and equipment.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General Installation Requirements
 - a. Coordination: Where identification is to be applied to surfaces which require insulation, painting or other covering or finish, including valve tags in finished mechanical spaces, install identification after completion of covering and painting. Install identification prior to installation of acoustical ceilings and similar removable concealment.
- B. Piping System Identification
 - a. General: Install pipe markers on each system and include arrows to show normal direction of flow.
 - b. The requirement of labeling the mechanical system components and the quality of the identification shall be emphasized in areas exposed to the student population, including, but not limited to, the stairways, the gymnasium, the cafeteria, the mechanical yard, the art room, the music room and roof areas visible from the second floor.
 - c. Plastic pipe markers. Install on pipe insulation segment where required for hot non-insulated pipes.
 - d. Locate pipe markers and color bands as follows wherever piping is exposed to view in occupied spaces, machine rooms, accessible maintenance spaces (shafts, tunnels, plenums) and exterior non-concealed locations.
 - Near each valve and control device.
 - Near each branch, excluding short take-offs for fixtures and terminal units; mark each pipe at branch, where there could be question of flow pattern.
 - Near locations where pipes pass through walls or floors/ceilings, or enter non-accessible enclosures.
 - At access doors, manholes and similar access points which permit view of concealed piping.
 - Near major equipment items and other points of origination and termination. 10. Spaced intermediately at maximum spacing of 25' along each piping run, except reduce
 - spacing to 15' in congested areas of piping and equipment.
 - On piping above removable acoustical ceilings.
- C. Valve Identification
 - a. General: Provide valve tag on valves in each piping system. List each tagged valve in valve schedule for each piping system. List valve tag locations on redline drawing at location of valves.
 - Building services main shut-off valves.
 - Each individual system main shut-off valves.
 - Each individual system floor shut-off valves.
 - Each individual system major branch shut-off valves.

END OF SECTION 220553

SECTION 220719 – PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Piping System Insulation: Fiberglass.
- 1.2 QUALITY ASSURANCE
 - A. Manufacturer's Qualifications: not less than 3 years.
 - B. Installer's Qualifications: Firm with at least 5 years successful installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide product by one of the following:
 - a. Mechanical Insulation:
 - Schuller (formerly Manville Corp.)
 - Owens-Corning Fiberglas Corp.
 - CertainTeed Corp.
 - Knauf Fiber Glass
 - Manson
 - Armstrong World Industries, Inc.
 - b. Jacketing & Covering Products:
 - Childers
 - Coel-Co (PVC for interior applications)
 - Zeston (PVC for interior applications)

2.2 PRODUCTS

- A. Pipe And Duct Sleeves
 - a. Provide sleeves for all pipes into building. The contractor shall provide the opening.
 - b. For sleeves passing through fire rated walls/floors, fill void with fire stop material.
 - c. Pipe Sleeves:
 - Masonry Wall Sleeves: Schedule 40 PVC pipe reamed, and finished flush with wall.
 - Gyp Wall Sleeves and Sleeves through Existing Construction: Schedule 40 PVC ends terminating flush with the wall.
 - Roof Sleeves and Floor Sleeves in Concealed Locations (chases): Schedule 40 PVC.
 - Make pipe sleeves 1/2" larger inside diameter than the outside diameter of the pipe or pipe insulation, where insulated. Fabricate sleeves from new materials, with ends cut square.
- B. Sleeve Flashing, Caulking: For sleeves passing through membrane waterproofing or lead safe, provide 16 oz. soft sheet copper of 4 pound lead per square foot flashing extending 9" beyond sleeve in all directions; secure to waterproofing or lead safe; turn down flashing into space between pipe and sleeve, insert oakum gasket, pour lead, caulk water tight. Over air plenums caulk all sleeves with polysulfite base sealing compound conforming to ASA A116.1 (Thiokol).
- C. Sleeve Sleeves are indicated with flashing flanges provide Josam, or equal, 26420 series threaded riser sleeve with anchor lugs, flashing flange, steel pipe extensions.
- C. Pipe and Duct Sleeves through Existing Construction:
 - a. This Contractor shall provide all openings for pipes and ducts passing through existing walls, footings, roofs and floors.
 - b. Installations for pipes shall be core drilled 1/2" larger than the outside pipe or insulation diameter. After installation, seal around pipes. Coordinate opening locations such that no structural members are damaged.
 - c. Where larger portions of existing construction are removed for a number of pipes, provide individual sleeves for each pipe. This Contractor shall then grout around sleeves to match existing construction. Reinforce mesh, angles, etc., shall be used to provide structural stability to the new grouting.
 - d. Openings for ducts shall be neatly cut to the shape of the duct and 1" larger than the outside dimension. After installation, seal around ducts. Coordinate opening locations such that no structural members are damaged.
 - e. Where larger rough openings are made, Contractor shall provide sleeve and grout as stated above.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Plumbing Piping System Insulation
 - a. Insulation Omitted: Omit insulation on chrome-plated exposed piping (except for handicapped fixtures), air chambers, unions, balance cocks, flow regulators, drain lines from water coolers, drainage piping located in crawl spaces or tunnels, buried piping, fire protection piping, and pre-insulated equipment.
 - Cold Piping: Fiberglass: 1" thickness.
 - b. Hot Piping:
 - Fiberglass: 1" thick for pipe sizes up to and including 2", 1-1/2" thick for pipe sizes over 2".
- B. Installation Of Piping Insulation
 - a. Do not insulate cleanouts and access openings. Neatly bevel and finish up to edges of such openings.
 - b. Cover valves, fittings and similar items in each piping system with equivalent thickness and composition of insulation as applied to adjoining pipe run. Install factory molded. Use PVC Zeston type covers. Mitered joints are not acceptable.
 - c. Extend piping insulation without interruption through walls, floors and similar piping penetrations.
 - d. Provide insulation inserts with shields at all supports. Butt pipe insulation against pipe hanger insulation inserts. For all piping apply wet coat of vapor barrier lap cement on butt joints and seal all joints and seams with 3" wide vapor barrier tape or band.
 - e. Piping Exposed to Weather: Protect outdoor insulation from weather by installing outdoor protective jacketing as recommended by manufacturer.
 - All longitudinal joints shall be installed so they are directed downward. All joints shall be sealed.
 - Provide color-coded insulation jacketing on all interior piping exposed in finished areas and in mechanical rooms.

C. EXISTING INSULATION REPAIR

- a. Repair damaged sections of existing mechanical insulation, both previously damaged or damaged during this construction period. Use insulation, install new jacket lapping and sealed over existing.

END OF SECTION 220719

SECTION 220400 - PLUMBING

1.1 GAS PIPING

- A. Standard black steel piping with welded fittings for piping 2 1/2" and larger. Standard threaded fittings for 2" and smaller.
- B. Gas pipe in locations that are not accessible shall be continuous with no fittings or unions. Pipe shall be fully welded where applicable.
- C. Install gas cock external to the building, on each gas line entering the building and at each piece of equipment served.
- D. Gas Cocks 2 Inch and Smaller: 150 psi WOG, bronze body, straightaway pattern, square head, threaded ends.
- E. Gas Cocks 2-1/2 Inch and Larger: MS SP-78; 175 psi, lubricated plug type, semi-steel body, single gland, wrench operated, flanged ends.
- F. Install a dirt leg and union for a rigid connection to each gas appliance unless noted otherwise on drawings.
- G. Test under 30 psi. air pressure.

1.2 GAS PRESSURE REGULATORS

- A. ANSI Z21.18 or ANSI Z21.18a, single stage, steel jacketed, corrosion-resistant pressure regulators. Include atmospheric vent, elevation compensator, with threaded ends for 2" and smaller and flanged ends for 2 1/2" and larger. Regulator pressure ratings, inlet and outlet pressures, and flow volume in standard cubic feet per hour are as indicated.

END OF SECTION 220400

SECTION 230593 - AIR TEST AND BALANCE

PART 1 - GENERAL

1.1 SCOPE

- A. The Mechanical Contractor shall procure the services of Lawrence H Finn & Associates, Jedi Balancing or another independent firm, fully certified with the National Environmental Balancing Bureau (NEEB). The firm shall test air moving equipment and air distribution and exhaust systems and to supervise the balance and adjustment of these systems. All work shall be done under direct supervision of a qualified and licensed Heating and Ventilating Engineer. The mechanical contractor shall provide workmen of the proper trade to make adjustments to the systems as determined by the Engineer. The Contractor shall provide access as required, including any necessary scaffolding, and shall cooperate with testing laboratory personnel. All instruments used in this work shall be accurately calibrated and maintained in good working order. If requested the tests shall be conducted in the presence of the Mechanical Engineer responsible for the project and/or his representative. Air balance and testing shall not begin until the system has been completed and is in full working order. The Contractor shall put all heating, ventilating, and air conditioning systems and equipment into full operation 24 hours prior to the onset of testing and balancing and shall continue the operation of same during each working day until the completion of all test and balance work. The Contractor shall award the test and balance contract upon receipt of his contract to proceed with the air conditioning installation, to allow the Air Balance and Testing Engineer to schedule his work in cooperation with other trades involved and comply with completion date. Upon completion of the air conditioning system installation, the Air Balance and Testing Engineer shall perform the following tests, supervise adjustments and system modifications, and compile the test data as required for evaluation and approval.
- B. In addition to procuring the services of an air balancing engineer as hereinafter specified the mechanical contractor shall:
 - 1. Clean air filters, ductwork, coils, fans, etc. in the air system to remove all construction dust and debris.
 - 2. Assist in boiler start-up and balance all pumps on the heating water system.
 - 3. Supply and install all balancing dampers as required for final balancing as determined by the balancing engineer.
 - 4. Furnish workmen familiar with this project and of the proper trade to assist the balancing engineer in the air and water balancing. Also make available subject to request by the balancing engineer trained servicemen of the control and equipment suppliers to assist as needed during the testing of their portion of the project.
 - 5. Furnish plans, operating manuals, and shop drawings of all equipment installed for use by the Air and Water Balancing Agency.
 - 6. Have all systems in full operation a minimum of 24 hours before Balancing Engineer arrives on job.

1.2 DATA FILE

- A. Prepare complete PDF data file on all equipment and devices tested indicating name plate data, design requirements and final operating conditions.

1.3 INSTRUCTION

- A. At the completion of the balancing, review the operating and maintenance brochures as supplied by the Mechanical Contractor supplement these instructions as determined through balancing experience. Meet with owners personnel to review proper operating procedures.
- B. Warranty that the system is set in accordance with values as established by the plans and specifications.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 230593

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Installation of Ductwork Accessories
 - 1. Install access doors to open against system air pressure, with latches operable from either side, except outside only where duct is too small for person to enter.

3.2 CLEANING AND PROTECTION

- A. Adjusting and Cleaning
 - 1. Label access doors in per label and identification requirements.
 - 2. Final positioning of manual dampers.

END OF SECTION

SECTION 232113 – HYDRONIC PIPING

1.1 HEATING WATER

- A. Install steel pipe with threaded joints and fittings for 2 inch and smaller, and with welded joints for 2-1/2 inch and larger.
- B. At Contractors option in lieu of black steel, install Type L, drawn copper tubing with wrought copper fittings and solder joints for 2 inch and smaller, above ground, within building.
- C. Extend piping insulation without interruption through walls, floors and similar piping penetrations.
- D. Provide insulation inserts with shields at all supports. Butt pipe insulation against pipe hanger insulation inserts. For all piping apply wet coat of vapor barrier lap cement on butt joints and seal all joints and seams with 3" wide vapor barrier tape or band.
- E. Piping Exposed to Weather: Protect outdoor insulation from weather by installing outdoor protective jacketing as recommended by manufacturer.
 - All longitudinal joints shall be installed so they are directed downward. All joints shall be sealed.
 - Provide color-coded insulation jacketing on all interior piping exposed in finished areas and in mechanical rooms.

SECTION 235000 - CENTRAL HEATING EQUIPMENT (PSD TECH SPEC)

2.01 Manufacturers

2.02 Products

A. STRAINERS

- 1. Strainers for water, 2" and smaller shall be cast iron or semi-steel, screwed "Y" strainer, 250 lb. construction, and 1/2 inch ball valve with capped hose adapter, to be capped with brass not plastic, for blow-down. Strainer shall be Armstrong No. A1SC, or prior approved equal for 2-1/2" and less, Armstrong No. A1FL for 2 1/2" and larger.
- 2. Screens for water service shall be stainless steel. For strainers 2 inches and less, strainers shall be 20-mesh or 1/32" perforations. For strainers 2 1/2" to 8", mesh shall be perforated brass with 1/16" openings.

B. AIR SEPARATOR*

- 1. Acceptable Manufacturers:
 - Amtrol.
 - ii. Bell & Gossett (Rolairtrol).
 - iii. Taco.
 - iv. Spirol Vent (Preferred)
 - v. Approved Equal.
- 2. Separator shall be the centrifugal type, with strainer, line size, with a Hoffman #79 auto air release valve. 125 psi working pressure. Pipe discharge to glycol feeder (preferred) or floor drain
- 3. Air separator shall be suitably supported in piping system with clearance provided for strainer removal.

C. AIR VENTS*

- 1. Provide manual (not automatic) air vent valves at the high point wherever drops occur in the direction of water flow, at the top of all supply risers and at the high point of return risers on all hot water heating supply and return mains. Air vent ball valves shall be installed on the top of the risers in an accessible location. A 1/4" copper tube shall extend from a reducer provided at the high point to a point where a bucket can be placed to catch any drips. No Armstrong air vents will be allowed. Use Hoffman of applicable size. Or approved equal.
- 2. Add air vents to high points in RTU piping.
- 3. Provide isolation ball valves for replacement.
- 4. The high side of heating elements on up-fed cabinet unit heaters, etc., shall be piped complete with a 3/4" x 4" high air chamber with a reducer at the top from which a 1/4" copper tube shall be extended to an accessible manual (not automatic) air vent valve as above.

D. EXPANSION TANK*

- 1. Acceptable Manufacturers:
 - Amtrol.
 - Armstrong
 - Bell & Gossett.
 - Taco.
- 2. Tank shall be the elastomeric bladder type, with positive water and air separation, pressurized.
- 3. Size as specified and as required for proper venting pressure.
- 4. With vertical mounting support feet, air charging valve, and air pressure gauge. Accessible floor-type with isolation and union.

E. HOT WATER HEATING PUMP AND DOMESTIC HOT WATER CIRC PUMPS*

- 1. 1. Acceptable Manufacturers:
 - Taco
 - Bell & Gossett
 - Grundfos Magna
 - Armstrong
- 2. Pumps shall have mechanical seals designed for hot water service to 220°F, steel shafts, renewable wearing rings, bronze impellers, and casings designed for 150 PSIG working pressure. Pumps, except close-coupled type, shall have flexible couplings of non-metallic or single barrel spring design. Multiple spring couplers will not be accepted.
 - a. Provide one (1) extra set of mechanical seals for each pump.
 - b. Pump manufacturer shall machine the pump impellers, if necessary, to meet capacities scheduled. Pumps shall be dynamically balanced prior to shipment.
 - c. Extreme care is to be exercised when installing pumps such that no strain whatsoever is placed on the mains due to pump position.
 - d. Motors shall be built for pump service, with electrical characteristics as indicated. Motors shall have built-in thermal overload protection. And premium efficiency.
 - e. Ball valve isolations on each side of pumps.
 - f. Install hot water heat pumps on return side to prevent overheating.

F. UNIT HEATERS*

- 1. Acceptable Manufacturers: Modine is standard of design. (NO STANDARD UNIVENTS) No Reznor units accepted.

END OF SECTION 235000

SECTION 235200 HEATING BOILERS (PSD TECH SPEC)

Part 1: General

1.01 Summary

- A. Heating water boilers

Part 2: Products

- 2.01 Boiler shall be Lochinvar Crest as scheduled. No substitution will considered.

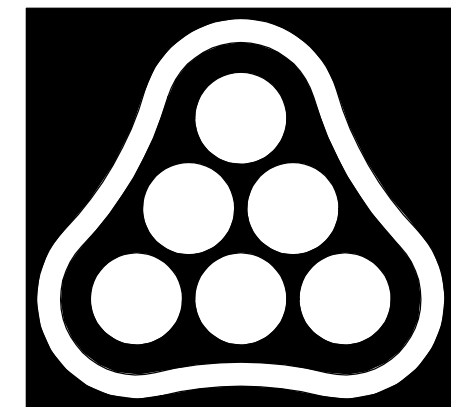
Part 3: Execution

A. Preparation

B. Installation

- 1. Boiler to sit on provided rails to elevate off the floor.
- 2. Boiler shall be field assembled. Boiler shall be complete with air eliminator, insulated jacket, cast iron sections, forced draft burner, approved gas train, pressure relief valve, and controls. With pressurized fire box for forced draft venting.

END OF SECTION 235200



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FORT COLLINS, CO 80524
970-232-9558 www.pec1.com



PSD - JSSC BOILER REPLACEMENT

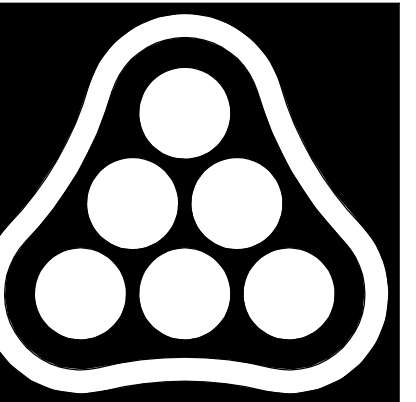
 2407 LAPORTE AVENUE
 FORT COLLINS, CO 80521

MECHANICAL SPECIFICATIONS

100% CONSTRUCTION DOCUMENTS

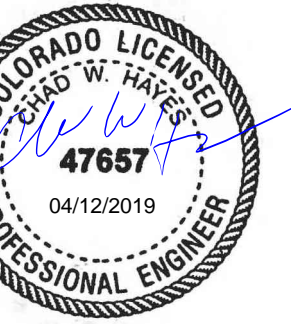
JOB NO.190168-000
DATE 4/12/2019
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M0.3



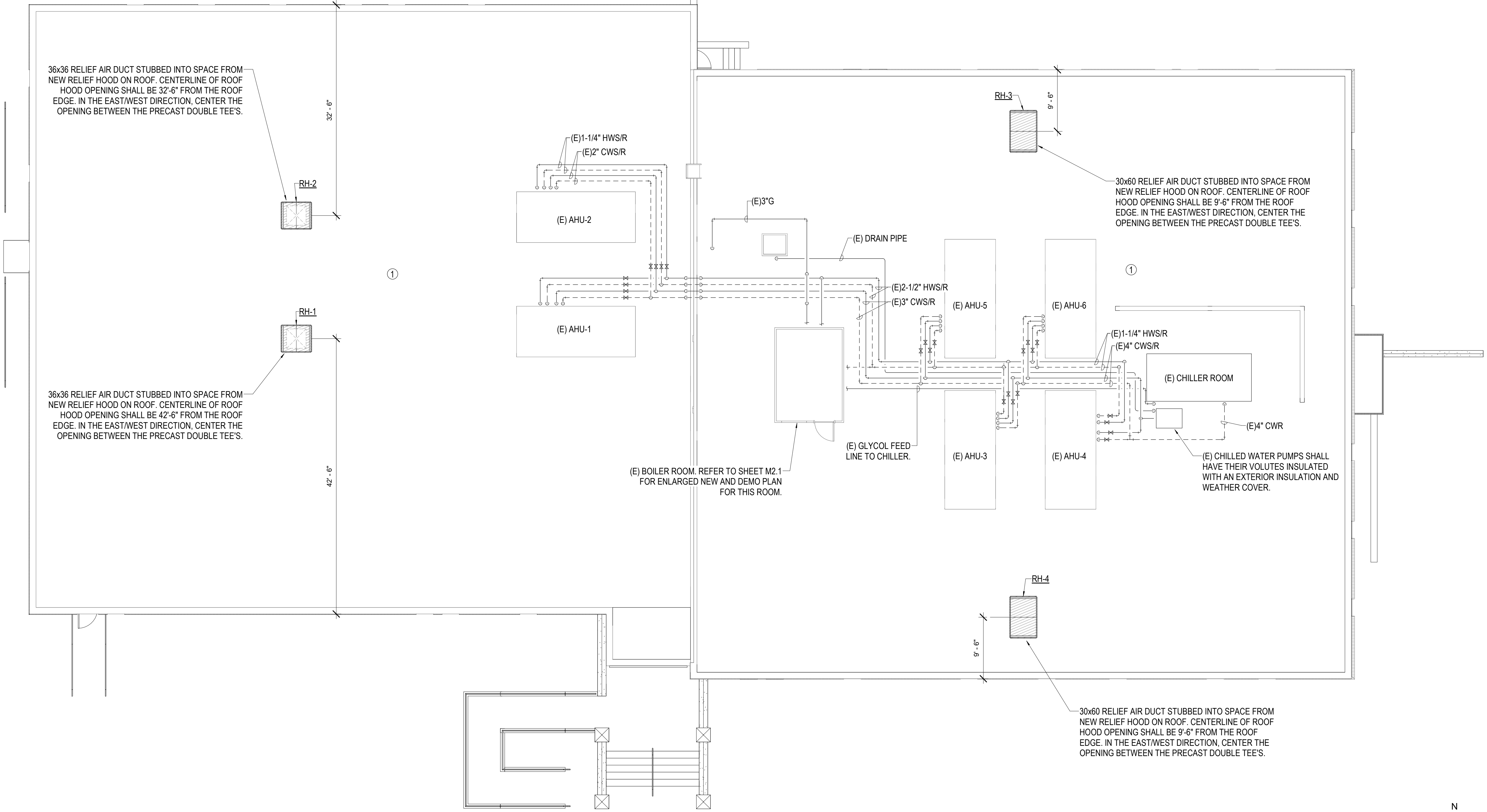
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KEYED NOTES
1. INSTALL SPACE SENSOR IN OPEN OFFICE AREA AT CEILING LEVEL. INSTALL WHERE SPACE ALLOWS.

GENERAL NOTES
1. PLANS ARE SCHEMATIC IN NATURE. LAYOUT IS BASED ON BEST AVAILABLE INFORMATION. CONTRACTOR SHALL FIELD VERIFY EXISTING CONDITIONS AND DIMENSIONS. BRING ANY DISCREPANCIES FROM THE DRAWINGS AND NOTES TO THE OWNER'S REPRESENTATIVE IMMEDIATELY. MINOR CHANGES IN THE SCOPE OF THE DEMOLITION WORK SHALL NOT JUSTIFY AN ADDITIONAL COST.
2. CONTRACTOR SHALL PROVIDE PROTECTIVE PLASTIC DROP CLOTHS TO PROTECT ANY EXISTING OCCUPIED AREAS AND EQUIPMENT FROM DUST AND DEBRIS DURING THE CONSTRUCTION WORK AND SHALL CLEAN THE AREAS OF ALL CONSTRUCTION DIRT DAILY, AND UPON COMPLETION OF THE WORK.
3. ALL CUTTING AND CHANNELING OF EXISTING BUILDING SHALL BE ACCOMPLISHED IN A NEAT AND WORKMANLIKE MANNER WITHOUT REMOVAL OF EXCESS MATERIALS. THIS CONTRACTOR SHALL PATCH AND REPLACE WITH MATERIAL SIMILAR TO ADJACENT CONSTRUCTION.
4. CUTTING OF STRUCTURAL MEMBERS IS NOT ALLOWED.



36x36 RELIEF AIR DUCT STUBBED INTO SPACE FROM NEW RELIEF HOOD ON ROOF. CENTERLINE OF ROOF HOOD OPENING SHALL BE 32'-6" FROM THE ROOF EDGE. IN THE EAST/WEST DIRECTION, CENTER THE OPENING BETWEEN THE PRECAST DOUBLE TEE'S.

RH-2

36x36 RELIEF AIR DUCT STUBBED INTO SPACE FROM NEW RELIEF HOOD ON ROOF. CENTERLINE OF ROOF HOOD OPENING SHALL BE 42'-6" FROM THE ROOF EDGE. IN THE EAST/WEST DIRECTION, CENTER THE OPENING BETWEEN THE PRECAST DOUBLE TEE'S.

RH-1

RH-3

30x60 RELIEF AIR DUCT STUBBED INTO SPACE FROM NEW RELIEF HOOD ON ROOF. CENTERLINE OF ROOF HOOD OPENING SHALL BE 9'-6" FROM THE ROOF EDGE. IN THE EAST/WEST DIRECTION, CENTER THE OPENING BETWEEN THE PRECAST DOUBLE TEE'S.

RH-4

30x60 RELIEF AIR DUCT STUBBED INTO SPACE FROM NEW RELIEF HOOD ON ROOF. CENTERLINE OF ROOF HOOD OPENING SHALL BE 9'-6" FROM THE ROOF EDGE. IN THE EAST/WEST DIRECTION, CENTER THE OPENING BETWEEN THE PRECAST DOUBLE TEE'S.

(E) BOILER ROOM. REFER TO SHEET M2.1 FOR ENLARGED NEW AND DEMO PLAN FOR THIS ROOM.

(E) CHILLED WATER PUMPS SHALL HAVE THEIR VOLUTES INSULATED WITH AN EXTERIOR INSULATION AND WEATHER COVER.

1 MECHANICAL ROOF PLAN
1/8" = 1'-0"

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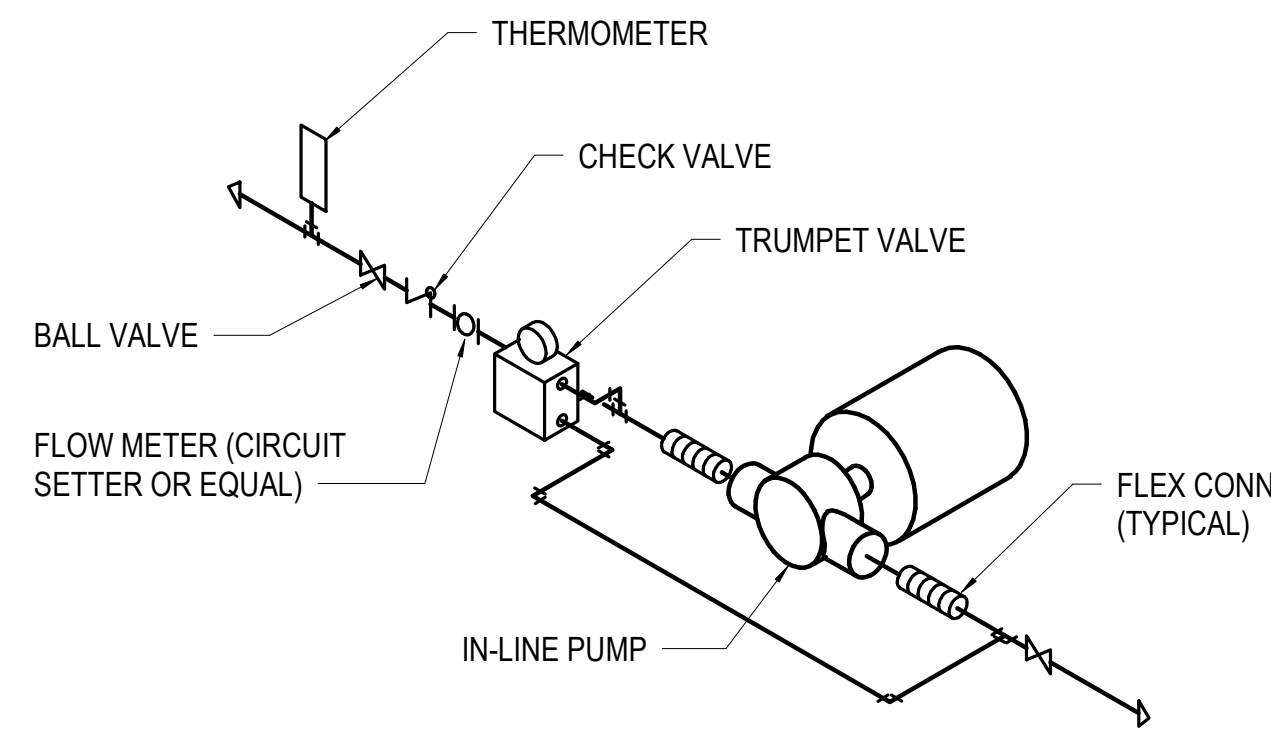
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MECHANICAL ROOF PLAN

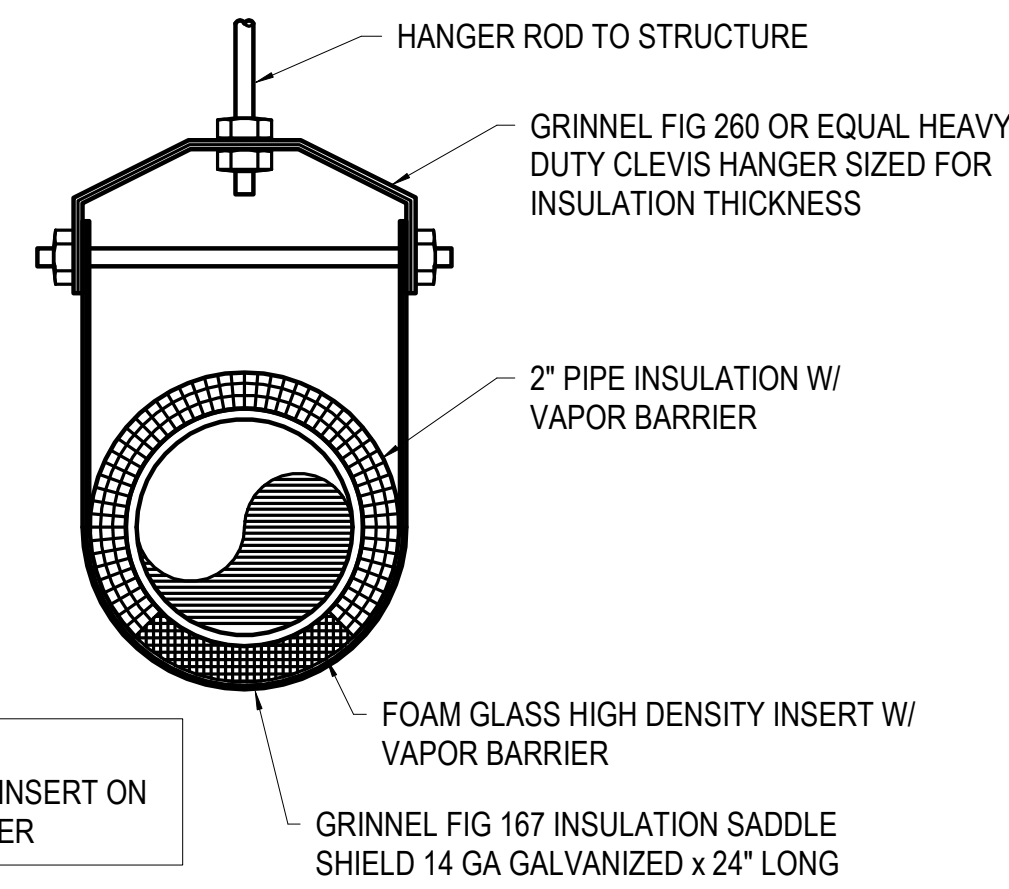
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M1.1



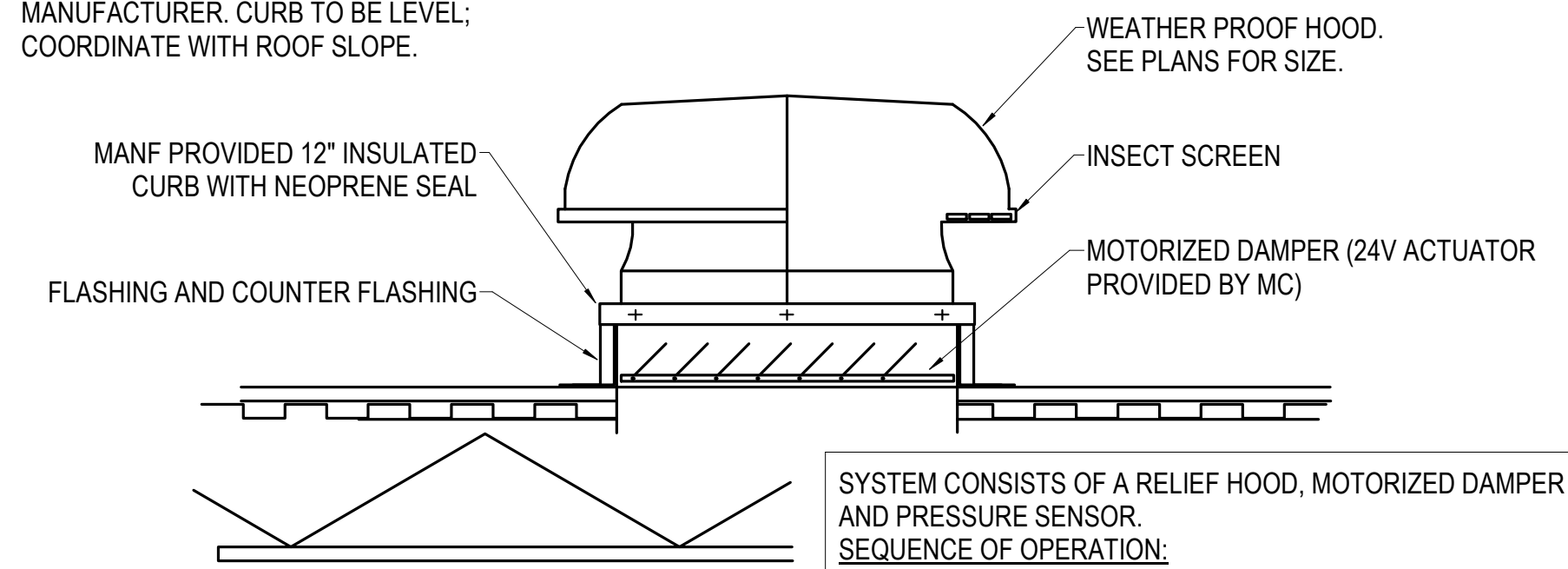
2 PUMP PIPING DETAIL - IN-LINE
NO SCALE



NOTE:
OMIT FOAM GLASS INSERT ON PIPES 3" AND LARGER

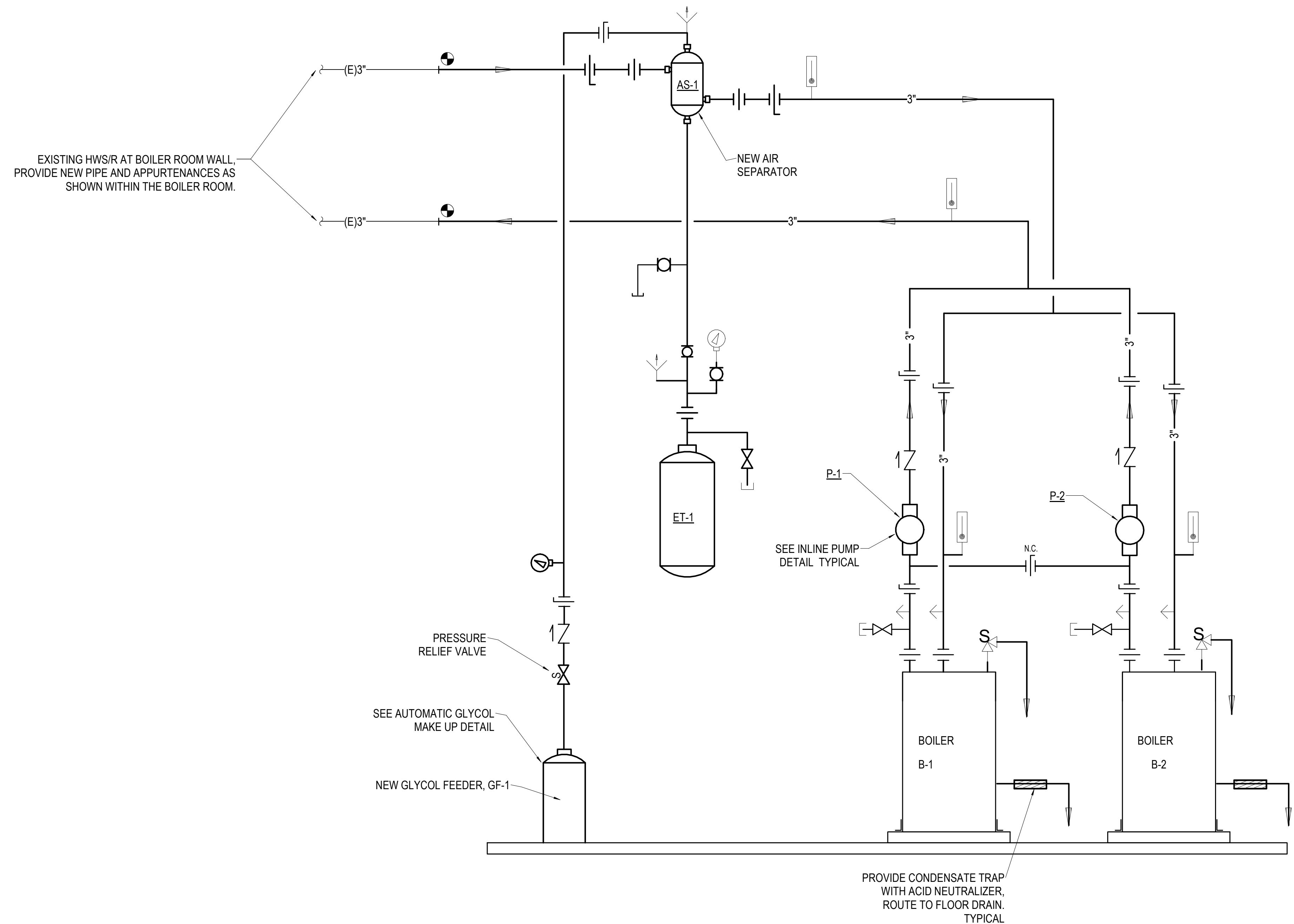
3 PIPE HANGER DETAIL
NO SCALE

NOTE:
COORDINATE ROOF PENETRATION WITH STRUCTURAL AND ROOFING MANUFACTURER. CURB TO BE LEVEL; COORDINATE WITH ROOF SLOPE.

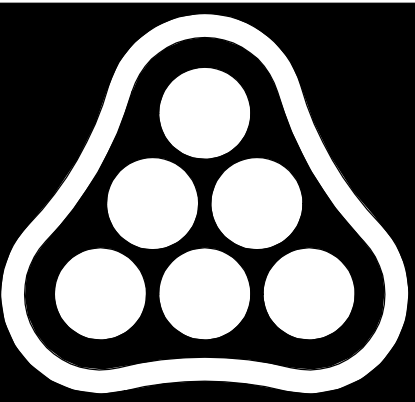


SYSTEM CONSISTS OF A RELIEF HOOD, MOTORIZED DAMPER AND PRESSURE SENSOR.
SEQUENCE OF OPERATION:
• RELIEF HOOD DAMPER TO BE NORMALLY CLOSED. UPON A POSITIVE DIFFERENTIAL PRESSURE SIGNAL FROM THE PRESSURE SENSOR, THE DAMPER SHALL BE ENERGIZED AND OPENED.
INSTALL PRESSURE SENSOR IN THE CEILING SPACE AT THE CENTER OF THE OPEN OFFICE AREA.

4 RELIEF HOOD DETAIL & CONTROLS
NO SCALE



1 HYDRONIC PIPING SCHEMATIC
NO SCALE



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MECHANICAL DETAILS

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M3.1

BOILER SCHEDULE - GAS HOT WATER

| MARK | MANUFACTURER & MODEL | FUEL TYPE | EWT | LWT | MBH INPUT | MBH OUTPUT @ SITE | MINIMUM EFFICIENCY | FLUE DIA. | ELECTRICAL | | | WEIGHT | REMARKS |
|------|----------------------|-----------|-----|-----|-----------|-------------------|--------------------|-----------|------------|-----|-----|-----------|---------|
| | | | | | | | | | VOLTS/PH | FLA | MCA | | |
| B-1 | LOCHINVAR FB-1001 | GAS | 160 | 180 | 999 | 845 | 96% | 6 | 120/1 | 6 | 8 | 2,000 LBS | - |
| B-2 | LOCHINVAR FB-1001 | GAS | 160 | 180 | 999 | 845 | 96% | 6 | 120/1 | 6 | 8 | 2,000 LBS | - |

PUMP SCHEDULE

| MARK | SERVICE | MANUFACTURER & MODEL | TYPE | MIN CAPACITY | | | MIN SIZE CONN | | MOTOR (BY M.C.) | | | REMARKS |
|------|---------------|-------------------------|--------|--------------|-----------|------------|---------------|-------|-----------------|-------|---------|---------|
| | | | | GPM | FEET HEAD | FLUID | SUCTION | DISCH | WATTS | RPM | VOLT/PH | |
| P-1 | HEATING WATER | GRUNDOFS MAGNA3 50-150F | INLINE | 86 | 25 | 30% GLYCOL | 2" | 2" | 643 | 3,566 | 120/1 | NOTE A |
| P-2 | HEATING WATER | GRUNDOFS MAGNA3 50-150F | INLINE | 86 | 25 | 30% GLYCOL | 2" | 2" | 643 | 3,566 | 120/1 | NOTE A |

NOTES:
A. PROVIDE PUMP WITH AN INLINE MAGNET.

ROOF HOOD SCHEDULE

| MARK | SERVES | INTAKE OR RELIEF | HOOD SIZE | | CAPACITY | | MAXIMUM VELOCITY (FPM) | MANUFACTURER & MODEL NUMBER | REMARKS |
|------|--------------------|------------------|-------------------|----------------|----------|-----------------------|------------------------|-----------------------------|---------|
| | | | THROAT SIZE (FT2) | HOOD SIZE (IN) | CFM | THROAT VELOCITY (FPM) | | | |
| RH-1 | INTERMEDIATE LEVEL | RELIEF | 9 | 57x51 | 4,500 | 440 | 450 | COOK 36X36GR | NOTES |
| RH-2 | INTERMEDIATE LEVEL | RELIEF | 9 | 57x51 | 4,500 | 440 | 450 | COOK 36X36GR | NOTES |
| RH-3 | UPPER LEVEL | RELIEF | 12.5 | 53x75 | 5,500 | 440 | 450 | COOK 30X60GR | NOTES |
| RH-4 | UPPER LEVEL | RELIEF | 12.5 | 53x75 | 5,500 | 440 | 450 | COOK 30X60GR | NOTES |

NOTES:
A. PROVIDE INSECT SCREEN, BIRD SCREEN, ROOF HOOD AND MOTORIZED DAMPER. MC TO PROVIDE 24V ACTUATOR.

ELECTRIC UNIT HEATER SCHEDULE

| MARK | TYPE | FAN CFM | HEATING CAPACITY | | MOTOR | | MANUFACTURER & MODEL | ACCESSORIES & REMARKS |
|------|------|---------|------------------|--------|---------|------|----------------------|-----------------------|
| | | | KW | BTUH | VOLTAGE | AMPS | | |
| UH-1 | WALL | 700 | 7.5 | 25,600 | 208/3 | 20.8 | RAYWALL F2F5107CAIL | NOTE A |

NOTES:
A. PROVIDE INTEGRAL DISCONNECT, MOUNTING BRACKET AND WALL T-STAT.

AIR SEPARATOR SCHEDULE

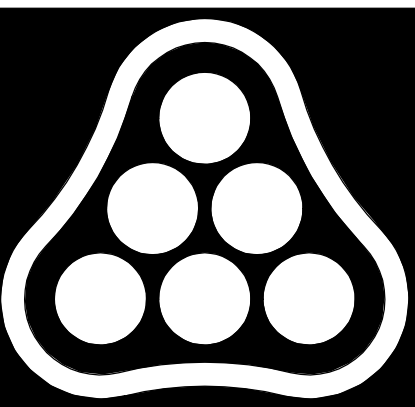
| MARK | SERVICE | TYPE | GPM | MAX WORKING PRESSURE (PSI) | PIPE SIZE | MANUFACTURER & MODEL NUMBER | ACCESSORIES & REMARKS |
|------|---------------|----------|-----|----------------------------|-----------|-----------------------------|-----------------------|
| AS-1 | HEATING WATER | AIR/DIRT | 86 | 150 | 3"ø | SPIROTHERM VDT300 | - |

EXPANSION TANK SCHEDULE

| MARK | SYSTEM | TYPE | FILL PRESS PSIG | TANK VOLUME (GAL) | ACCEPTANCE VOLUME (GAL) | MANUFACTURER & MODEL NUMBER | ACCESSORIES & REAMRKS |
|------|---------------|---------|-----------------|-------------------|-------------------------|-----------------------------|-----------------------|
| ET-1 | HEATING WATER | BLADDER | 20 | 34 | 26.8 | AMTROL ST-130CL | - |

MECHANICAL EQUIPMENT SCHEDULE

| MARK | SYSTEM | CAPACITY (GAL) | ELECTRICAL | MANUFACTURER & MODEL | ACCESSORIES & REMARKS |
|------|---------------|----------------|----------------|----------------------|-----------------------|
| GF-1 | HEATING WATER | 6.6 | 115 VAC OUTLET | AXIOM MF200 | - |
| GF-2 | CHILLED WATER | 6.6 | 115 VAC OUTLET | AXIOM MF200 | - |



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MECHANICAL SCHEDULES

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