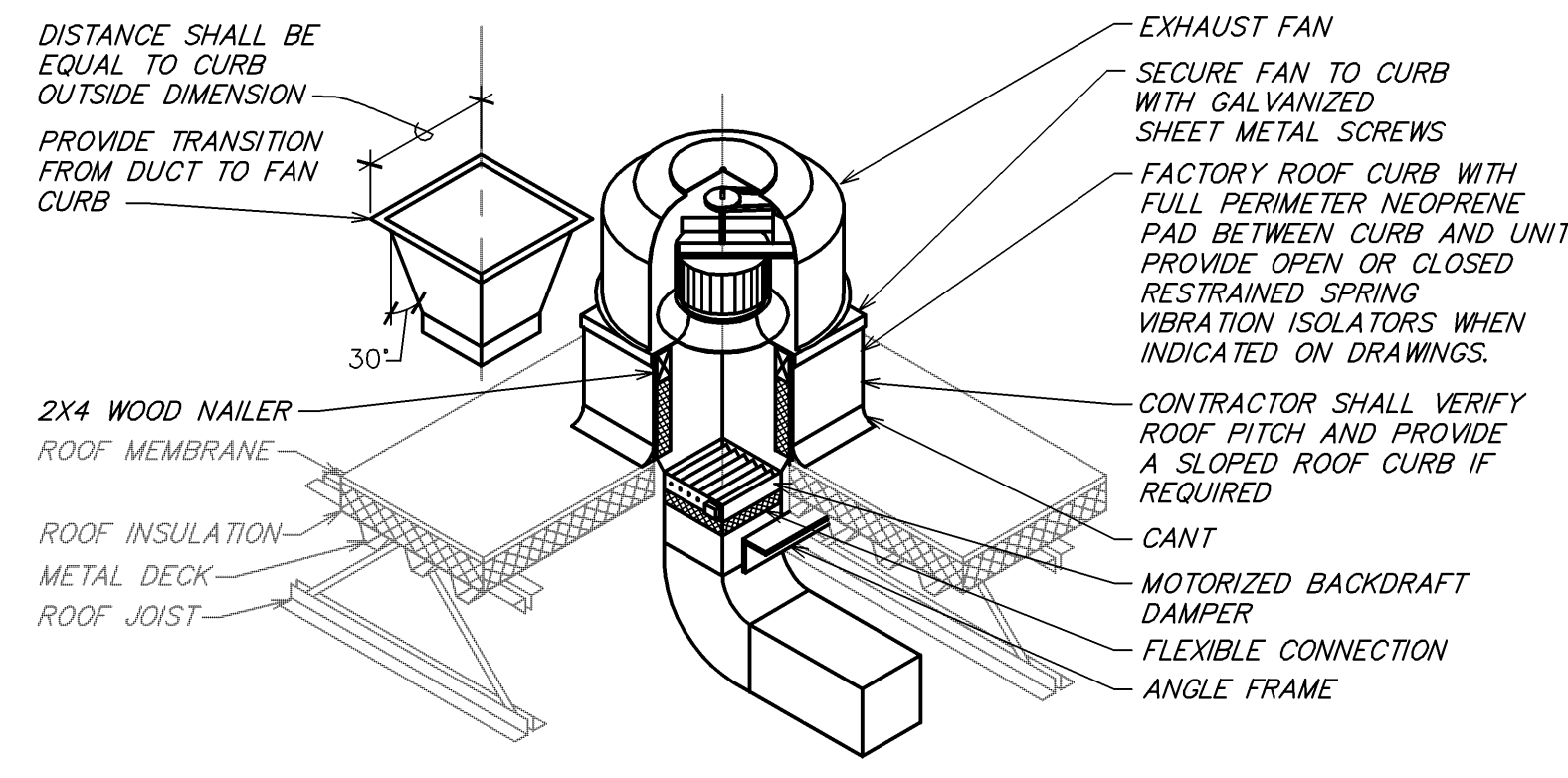
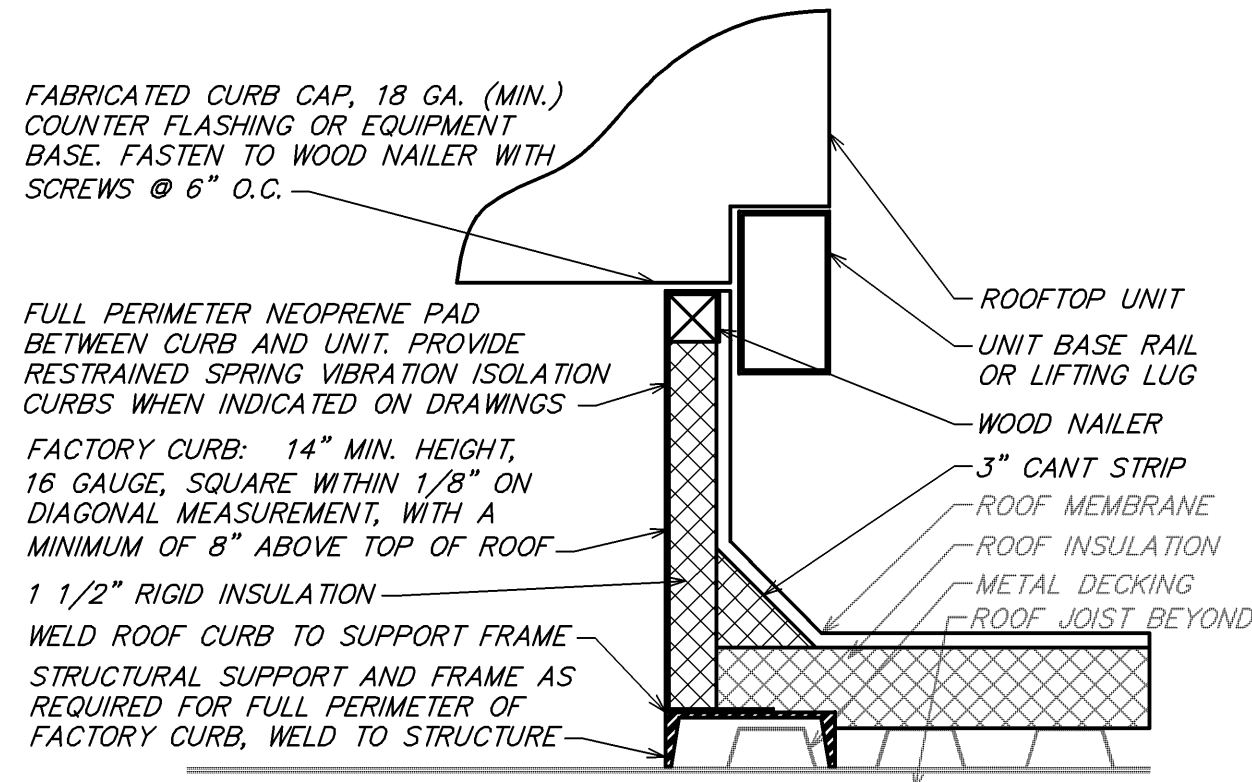


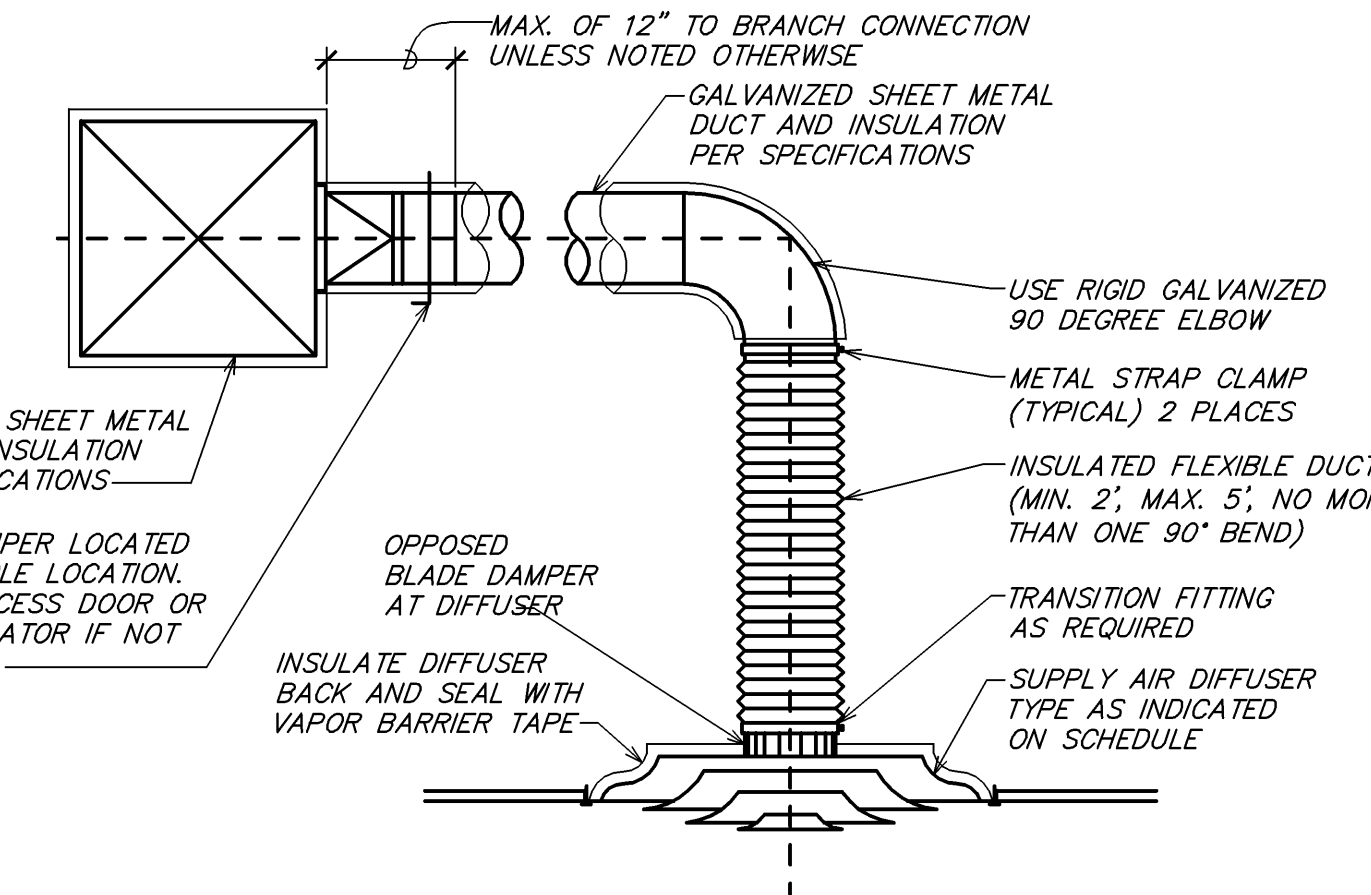
**1 KITCHEN HOOD EXHAUST FAN**  
NOT TO SCALE



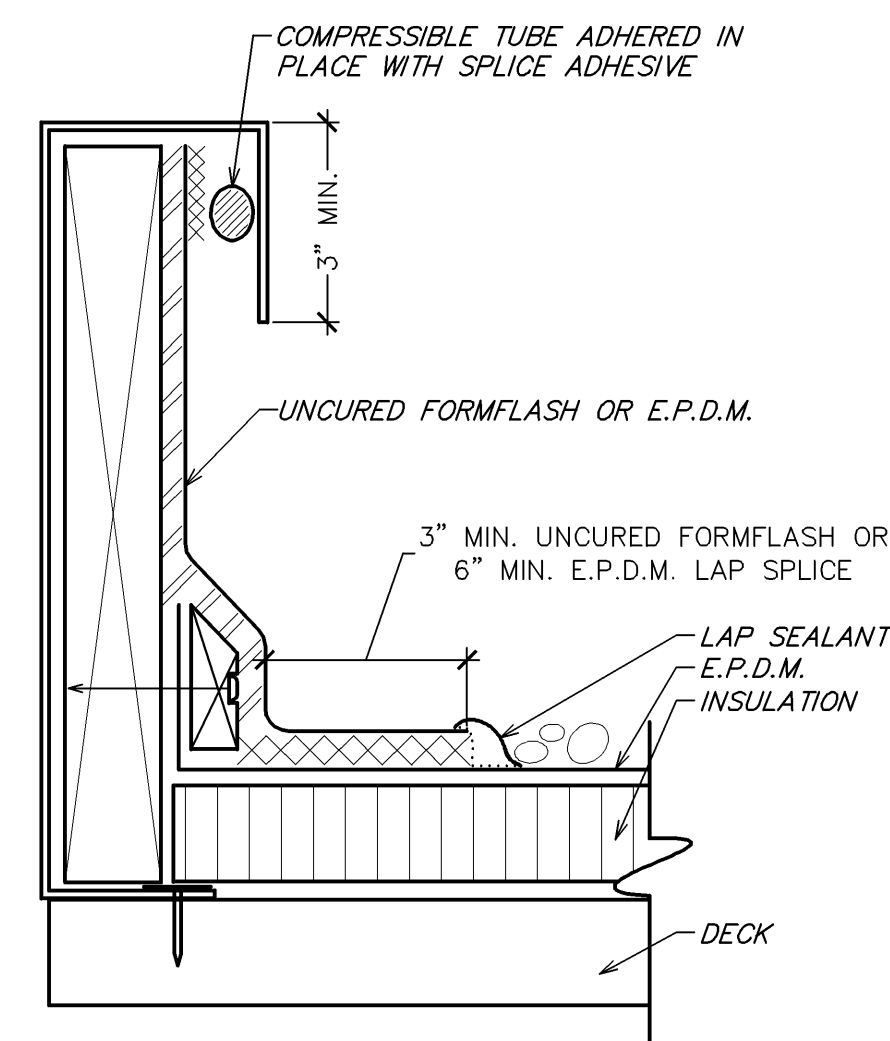
**5 ROOF EXHAUST FAN DETAIL**  
NOT TO SCALE



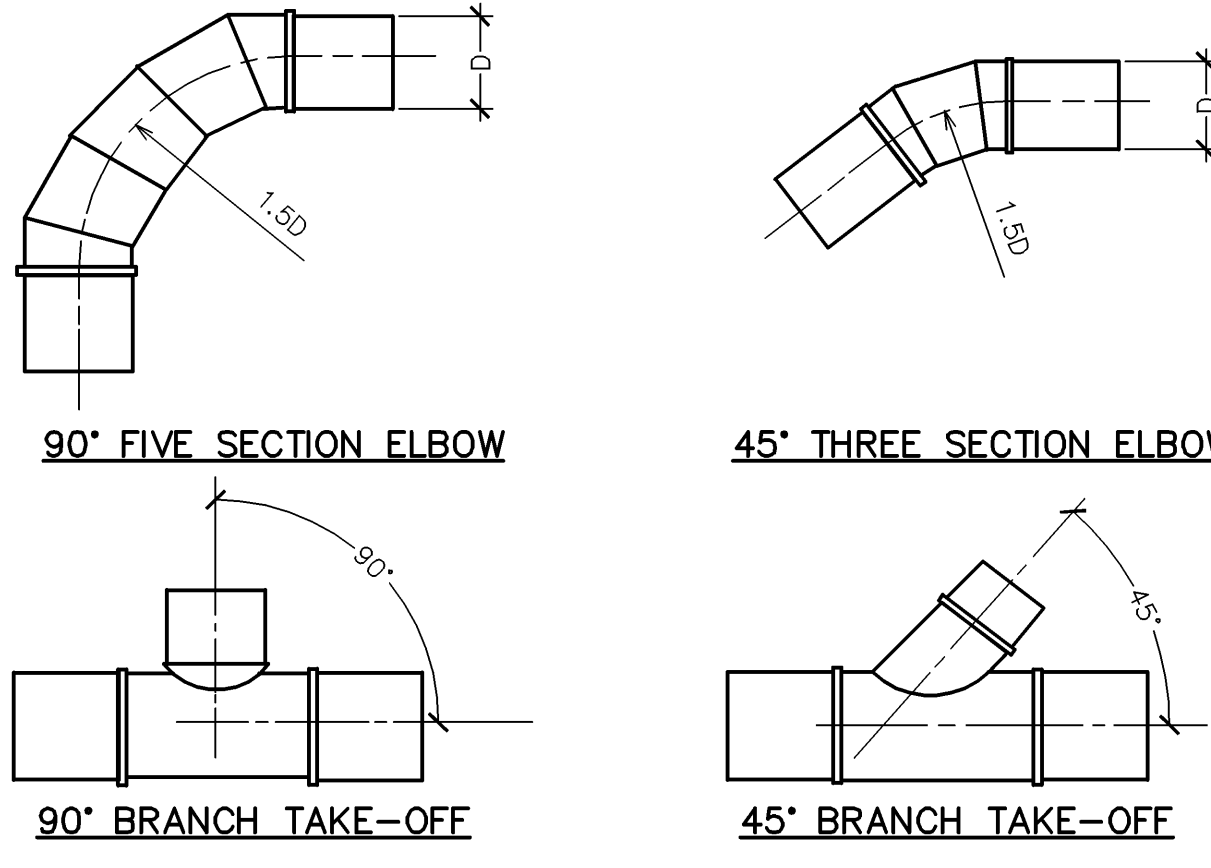
**9 ROOF CURB DETAIL**  
NOT TO SCALE



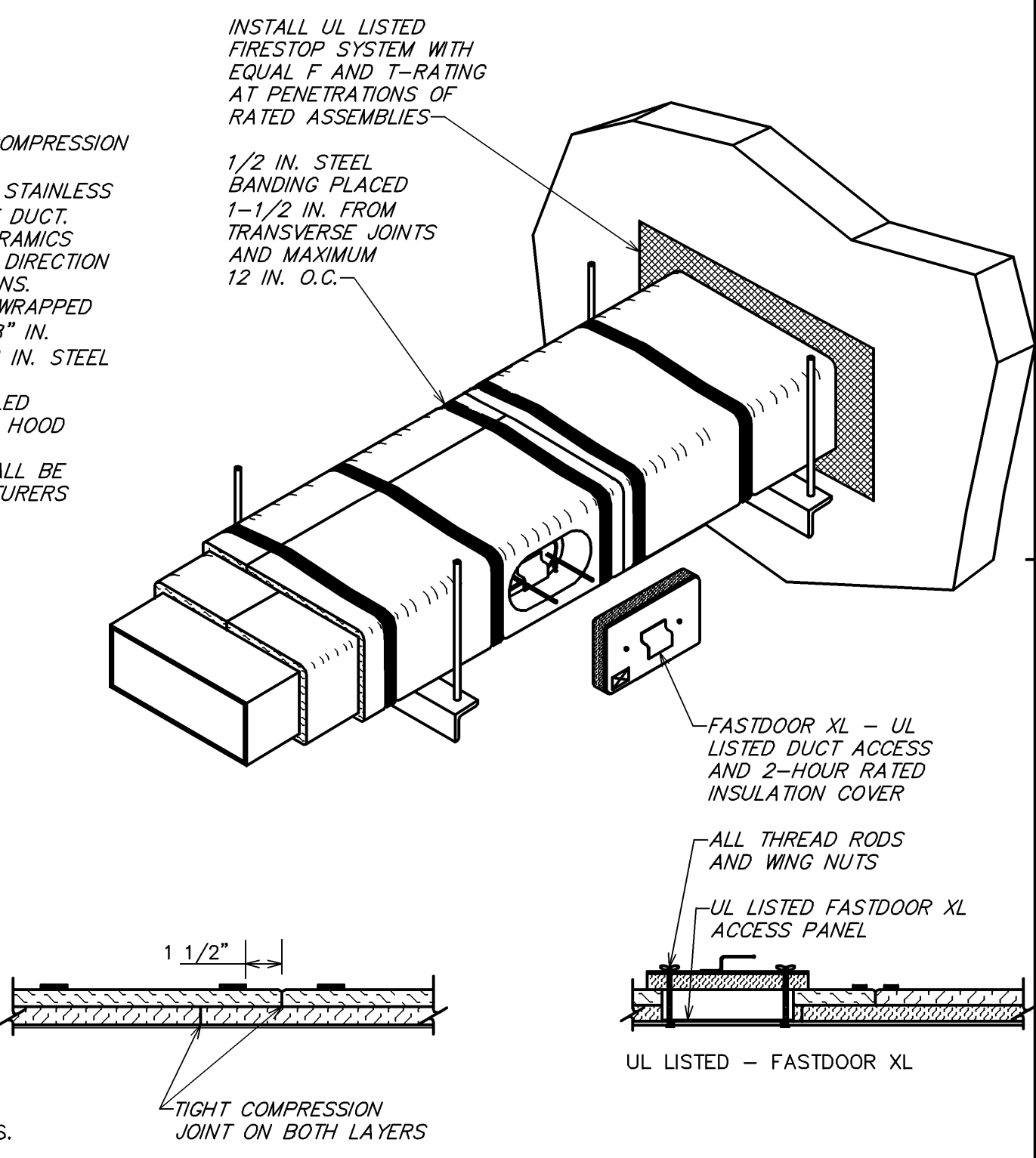
**6 TYPICAL DIFFUSER CONNECTION**  
NOT TO SCALE



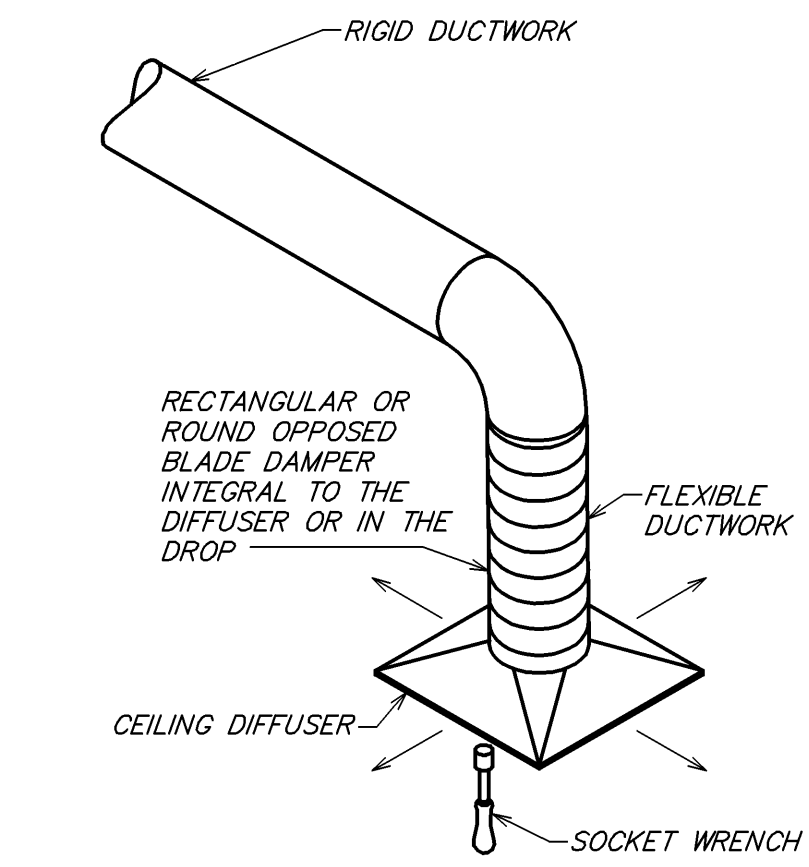
**10 CURB FLASHING DETAIL**  
NOT TO SCALE



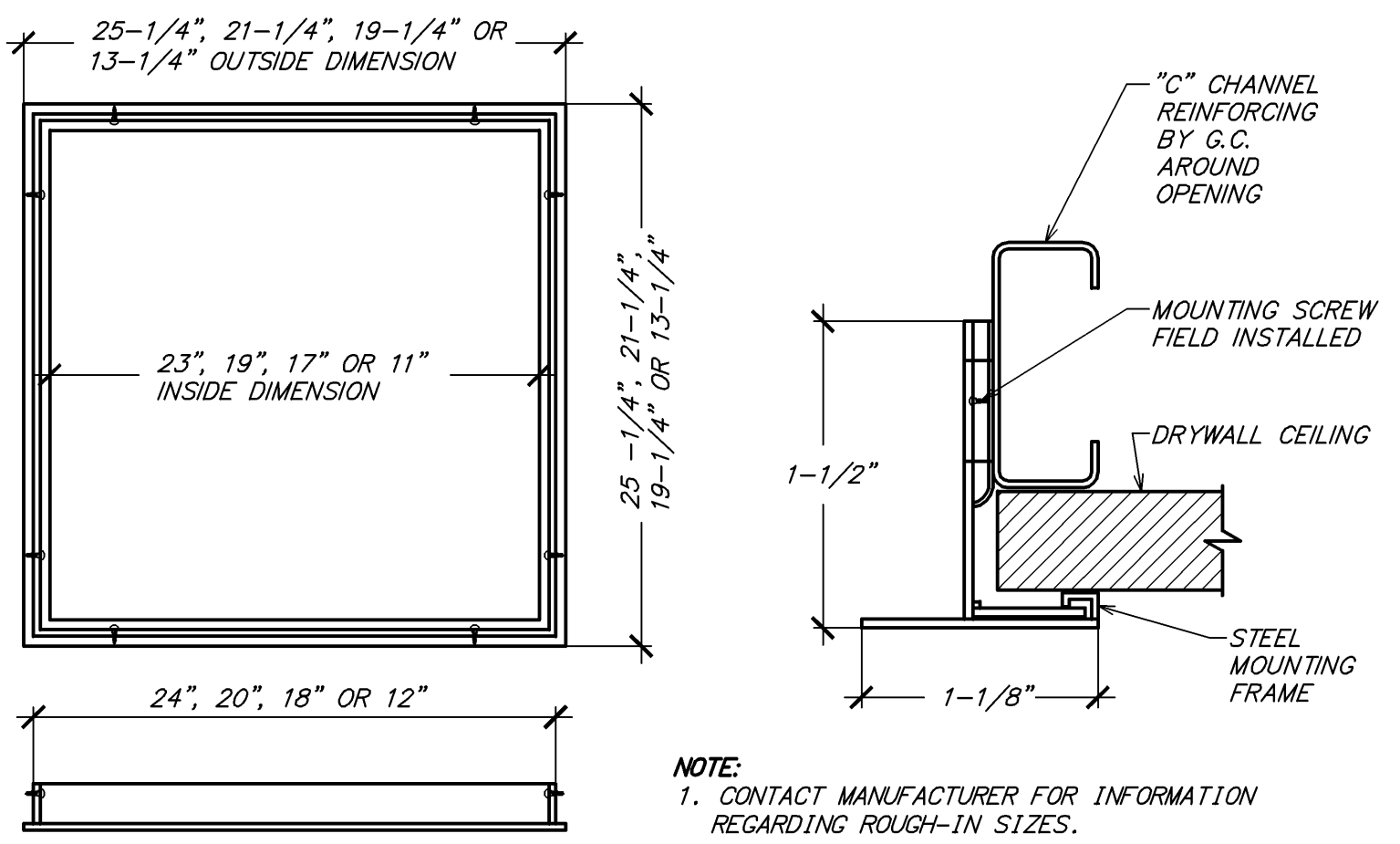
**7 TYPICAL ROUND DUCT FITTINGS**  
NOT TO SCALE



**2 FIREMASTER FASTWRAP XL DETAIL**  
NOT TO SCALE



**3 REMOTE VOLUME DAMPER CONTROLLER**  
NOT TO SCALE

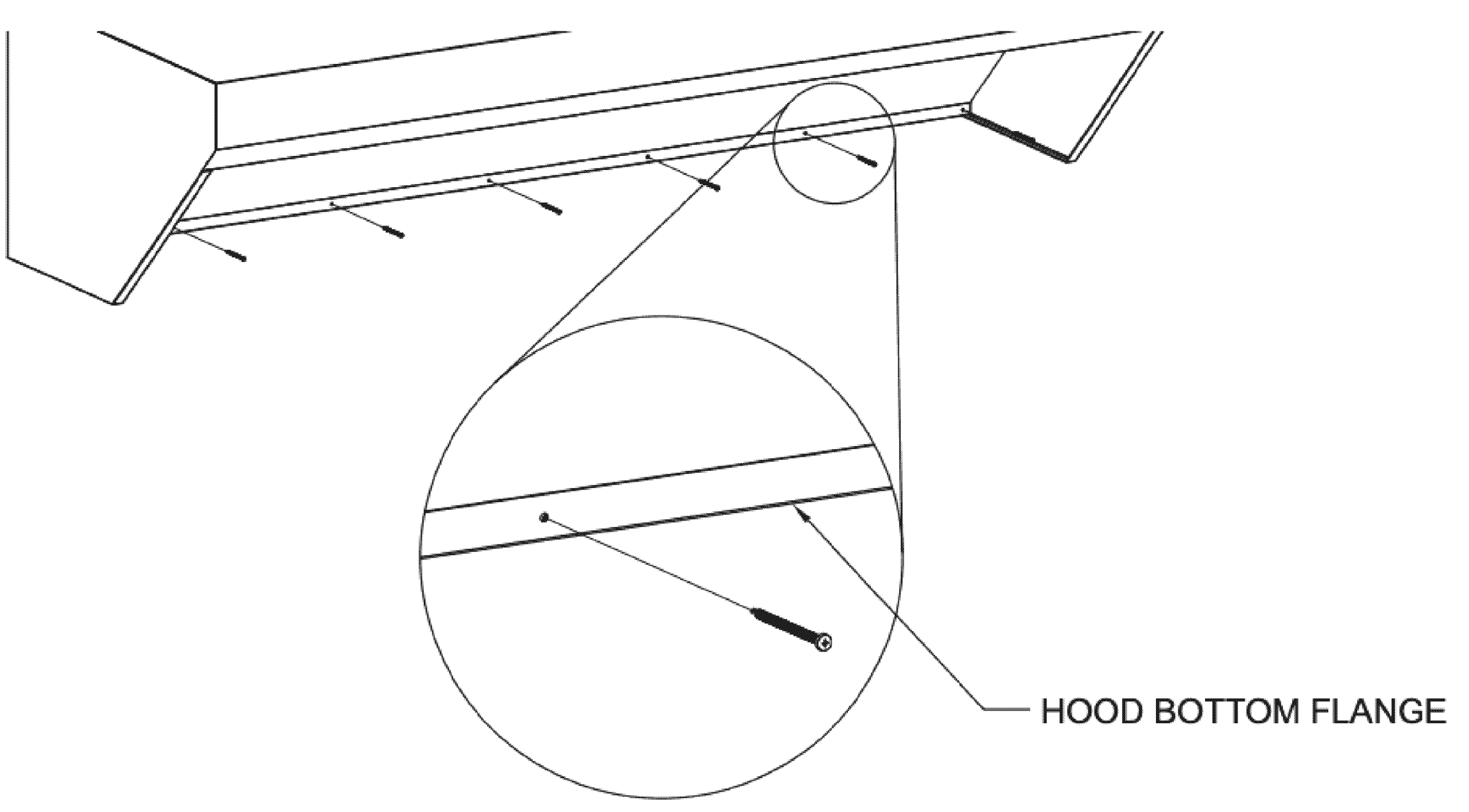


**8 TYPICAL DRYWALL MOUNTING FRAME DETAIL**  
NOT TO SCALE

DIA.	WIRE DIA.	ROD	STRAP
10" DN	ONE 12 GA.	1/4"	1" x 22 GA.
11-18"	TWO 12 GA. OR ONE 8 GA.	1/4"	1" x 22 GA.
19-24"	TWO 10 GA.	1/4"	1" x 22 GA.
25-36"	TWO 8 GA.	3/8"	1" x 20 GA.
37-50"	-	TWO 3/8"	TWO 1" x 20 GA.
51-60"	-	TWO 3/8"	TWO 1" x 18 GA.
61-84"	-	TWO 3/8"	TWO 1" x 16 GA.
85-96"	-	TWO 1/2"	TWO 1 1/2" x 16 GA.

NOTES:  
1. STRAPS ARE GALVANIZED STEEL. RODS ARE UNCOATED OR GALVANIZED STEEL. WIRE IS BLACK ANNEALED, BRIGHT BASIC OR GALVANIZED STEEL. ALL ARE ALTERNATIVES.  
2. TABLE ALLOWS FOR CONVENTIONAL WALL THICKNESS, AND JOINT SYSTEMS PLUS ONE LB/SF OF INSULATION WEIGHT. IF HEAVIER DUCTS ARE TO BE INSTALLED, ADJUST HANGER SIZES TO BE WITHIN THEIR LOAD LIMITS.

**4 ROUND DUCT HANGER TABLE**  
NOT TO SCALE

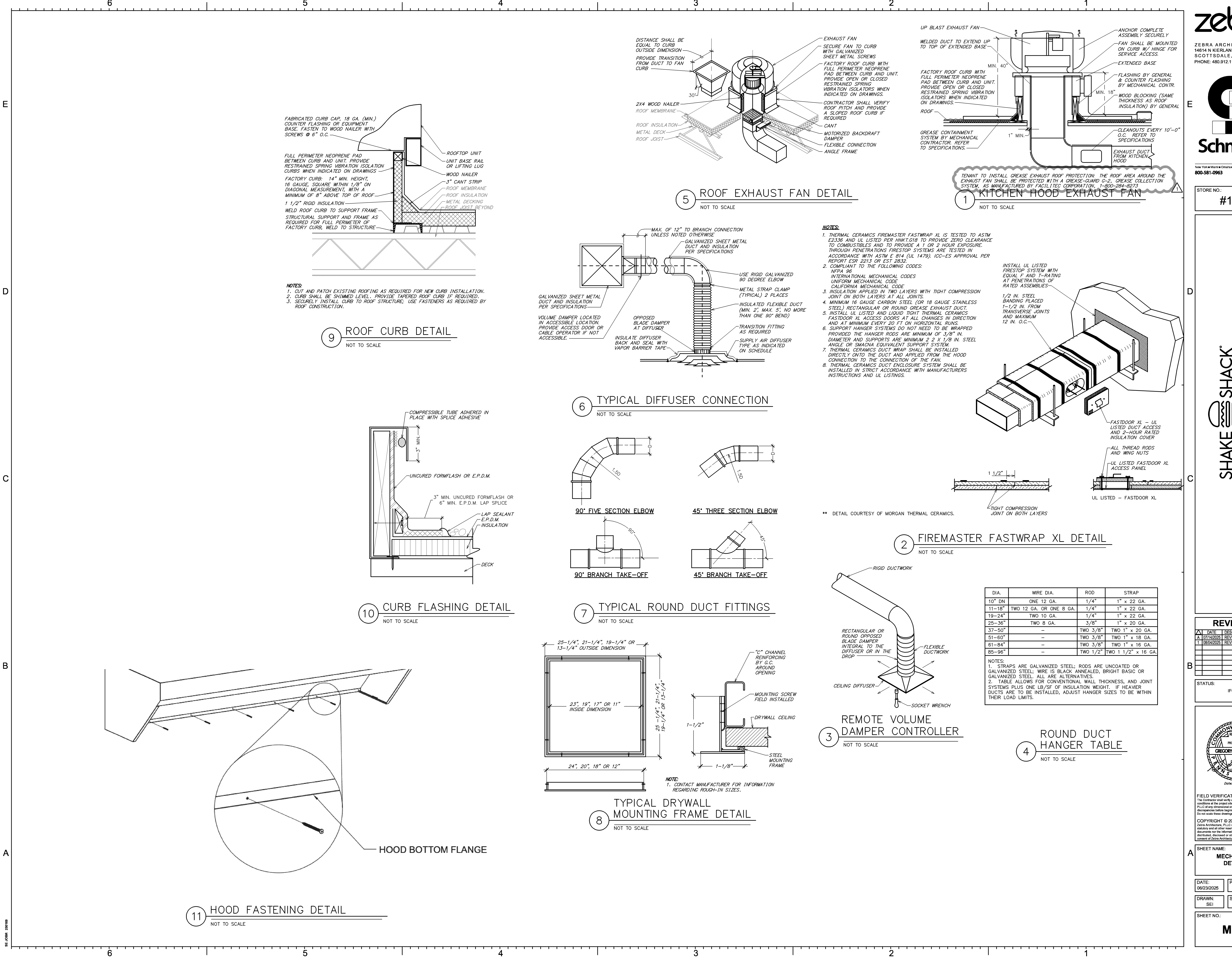


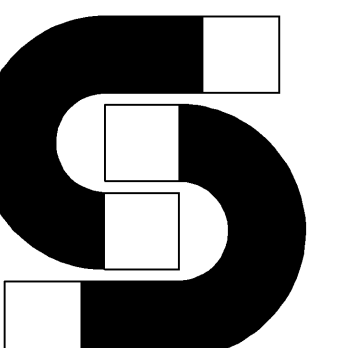
**11 HOOD FASTENING DETAIL**  
NOT TO SCALE

**NOTES:**

- THERMAL CERAMICS FIREMASTER FASTWRAP XL IS TESTED TO ASTM E2336 AND UL LISTED PER HNK1.G18 TO PROVIDE ZERO CLEARANCE TO COMBUSTIBLES AND TO PROVIDE A 1 OR 2 HOUR EXPOSURE THROUGH PENETRATIONS FIRESTOP SYSTEMS ARE TESTED IN ACCORDANCE WITH ASTM E 914 (UL 1479). ICC-ES APPROVAL PER REPORT ESR 2213 OR EST 2832.
- COMPLIANT TO THE FOLLOWING CODES:  
NFPA 96  
INTERNATIONAL MECHANICAL CODES  
UNIFORM MECHANICAL CODE  
CALIFORNIA MECHANICAL CODE
- INSULATION APPLIED IN TWO LAYERS WITH TIGHT COMPRESSION JOINT ON BOTH LAYERS AT ALL JOINTS.
- MINIMUM 16 GAUGE CARBON STEEL (OR 18 GAUGE STAINLESS STEEL) RECTANGULAR OR ROUND TIGHT THERMAL CERAMICS FASTDOOR XL ACCESS DOORS AT ALL CHANGES IN DIRECTION AND AT MINIMUM EVERY 20 FT ON HORIZONTAL RUNS.
- INSTALL UL LISTED AND LIQUID TIGHT THERMAL CERAMICS FASTDOOR XL ACCESS DOORS AT ALL CHANGES IN DIRECTION AND AT MINIMUM EVERY 20 FT ON HORIZONTAL RUNS.
- SUPPORT HANGER SYSTEMS DO NOT NEED TO BE WRAPPED PROVIDED THE HANGER RODS ARE MINIMUM OF 3/8" IN DIAMETER AND SUPPORTS ARE MINIMUM 2 2 x 1/8 IN. STEEL ANGLE OR SIMILAR EQUIVALENT SUPPORT SYSTEM.
- THERMAL CERAMICS DUCT WRAP SHALL BE INSTALLED DIRECTLY ONTO THE DUCT AND APPLIED FROM THE HOOD CONNECTION TO THE CONNECTION OF THE FAN.
- THERMAL CERAMICS DUCT ENCLOSURE SYSTEM SHALL BE INSTALLED IN STRICT ACCORDANCE WITH MANUFACTURERS INSTRUCTIONS AND UL LISTINGS.

\*\* DETAIL COURTESY OF MORGAN THERMAL CERAMICS.





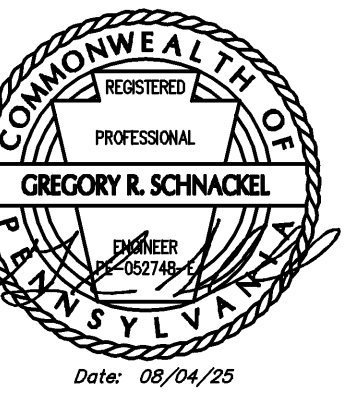
STORE NO:  
**#1758**

**SHAKE SHACK**  
ROSS PARK MALL  
TENANT SPACE VC12A  
1000 ROSS PARK MALL DRIVE  
PITTSBURGH, PA 15227

**REVISIONS**

NO.	DATE	DESCRIPTION
A	07/14/2025	REVISION A
T	08/04/2025	REVISION T

STATUS: IFC SET



FIELD VERIFICATION:  
The Contractor shall verify all signal dimensions and conditions at the project site and notify Zebra Architecture, PLLC and the manufacturer, immediately if discrepancies before beginning or fabricating any work. Do not scale from drawings.

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SHEET NAME:  
**MECHANICAL DETAILS**

DATE: 08/23/2025 PROJECT NO: 40403  
DRAWN: SEI SCALE: AS NOTED

SHEET NO.:  
**M502**

MAXIMUM HALF OF DUCT PERMETER	PAIR AT 10 FT. SPACING		PAIR AT 8 FT. SPACING		PAIR AT 5 FT. SPACING		PAIR AT 4 FT. SPACING	
	STRAP	WIRE/ROD	STRAP	WIRE/ROD	STRAP	WIRE/ROD	STRAP	WIRE/ROD
P/2 = 30"	1" x 22 GA.	10 GA. (.135")	1" x 22 GA.	10 GA. (.135")	1" x 22 GA.	12 GA. (.106")	1" x 22 GA.	12 GA. (.106")
P/2 = 72"	1" x 18 GA.	3/8"	1" x 20 GA.	1/4"	1" x 22 GA.	1/4"	1" x 22 GA.	1/4"
P/2 = 96"	1" x 16 GA.	3/8"	1" x 18 GA.	3/8"	1" x 20 GA.	3/8"	1" x 22 GA.	1/4"
P/2 = 120"	1 1/2" x 16 GA.	1/2"	1" x 16 GA.	3/8"	1" x 18 GA.	3/8"	1" x 20 GA.	1/4"
P/2 = 168"	1 1/2" x 16 GA.	1/2"	1 1/2" x 16 GA.	1/2"	1" x 16 GA.	3/8"	1" x 18 GA.	3/8"
P/2 = 192"	---	1/2"	1 1/2" x 16 GA.	1/2"	1" x 16 GA.	3/8"	1" x 16 GA.	3/8"
P/2 = 193" UP	SPECIAL ANALYSIS REQUIRED							

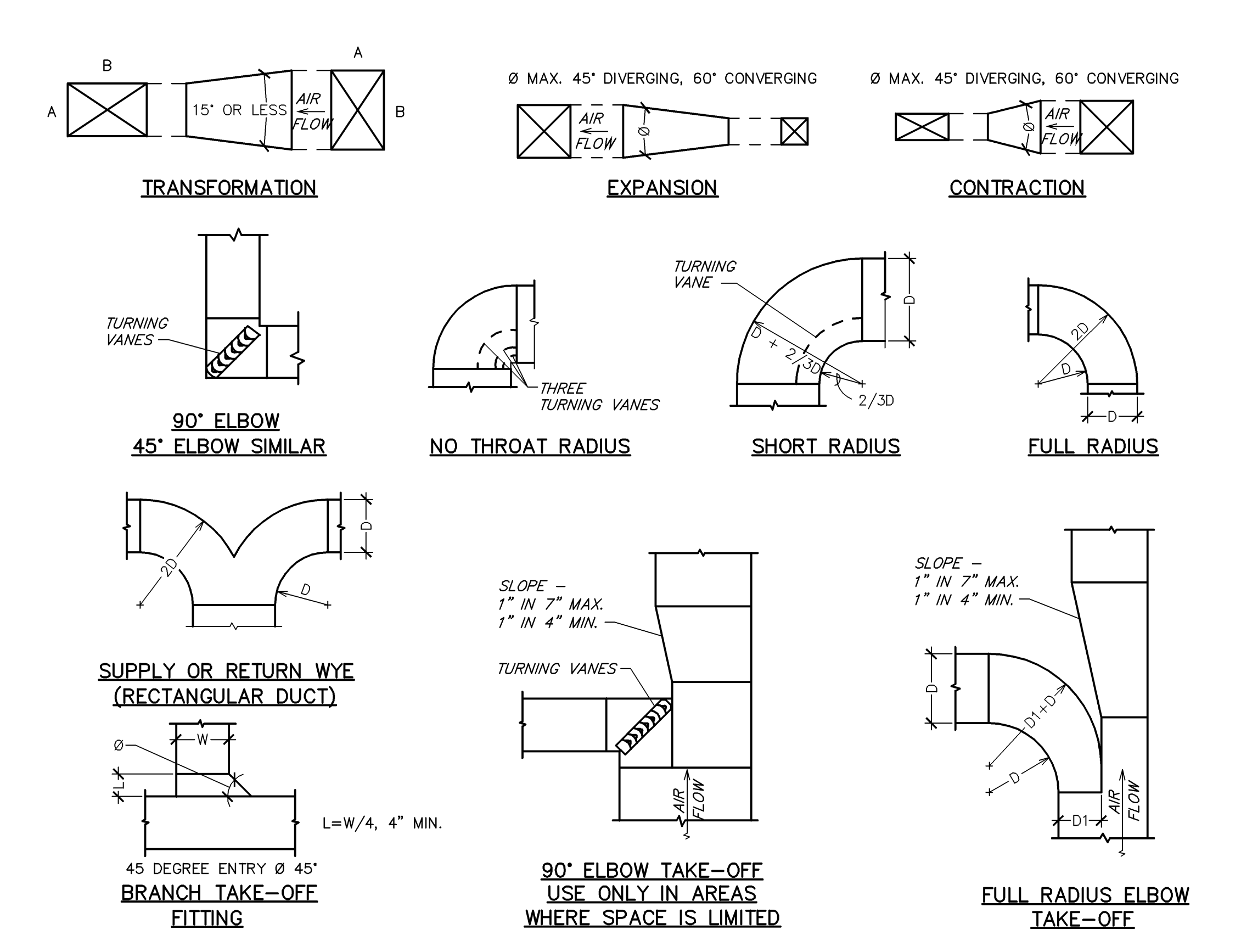
  

WHEN STRAPS ARE LAP JOINED USE THESE MINIMUM FASTENERS:	SINGLE HANGER MAXIMUM ALLOWABLE LOAD	
	STRAP	WIRE OR ROD (DIA.)
1" x 18, 20, 22 GA. - TWO #10 OR ONE 1/4" BOLT	1" x 22 GA. - 260 LBS.	0.106" - 80 LBS.
1" x 16 GA. - TWO 3/8" DIA.	1" x 20 GA. - 320 LBS.	0.135" - 120 LBS.
1" x 16 GA. - TWO 3/8" DIA.	1" x 18 GA. - 420 LBS.	0.162" - 160 LBS.
1 1/2" x 16 GA. - TWO 3/8" DIA.	1" x 16 GA. - 700 LBS.	1/4" - 270 LBS.
1 1/2" x 16 GA. - TWO 3/8" DIA.	1 1/2" x 16 GA. - 1100 LBS.	3/8" - 680 LBS.
		1/2" - 1250 LBS.
		5/8" - 2000 LBS.
		3/4" - 3000 LBS.

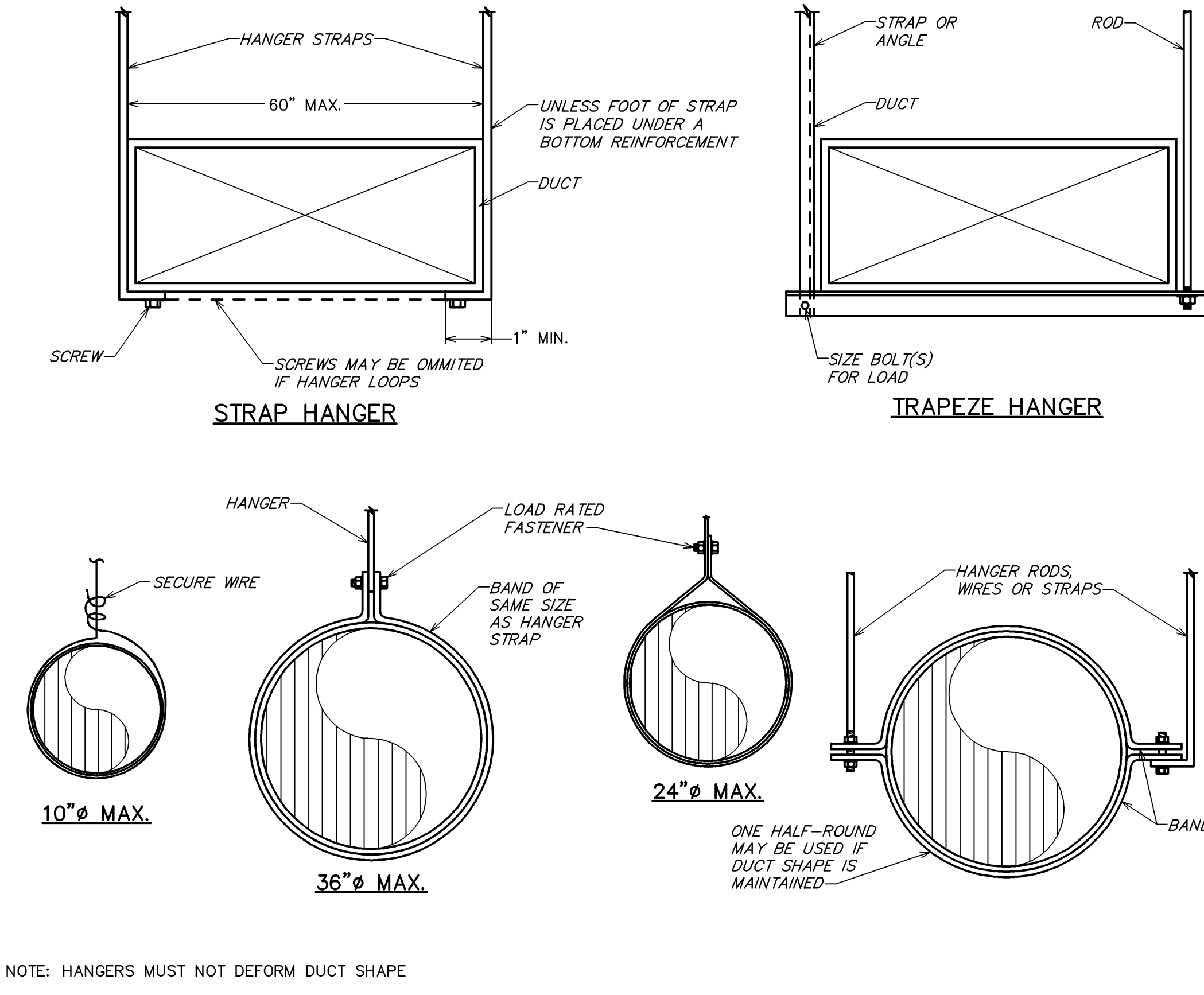
  

NOTES:  
1. DIMENSIONS OTHER THAN GAUGE ARE IN INCHES.  
2. TABLES ALLOW FOR DUCT WEIGHT, 1 LB./SF INSULATION WEIGHT AND NORMAL REINFORCEMENT AND TRAPEZE WEIGHT, BUT NO EXTERNAL LOADS.  
3. STRAPS ARE GALVANIZED STEEL; OTHER MATERIALS ARE UNCOATED STEEL.  
4. ALLOWABLE LOADS FOR P/2 ASSUME THAT DUCTS ARE 16 GA. MAXIMUM, EXCEPT THAT WHEN MAXIMUM DUCT DIMENSION (W) IS OVER 60" THEN P/2 MAXIMUM IS 1.25 W.  
5. 12, 10 OR 8 GA. WIRE IS STEEL OF BLACK ANNEALED, BRIGHT BASIC OR GALVANIZED TYPE.  
6. DUCTS SHALL BE SUPPORTED AT INTERVALS NOT EXCEEDING 10 FEET.

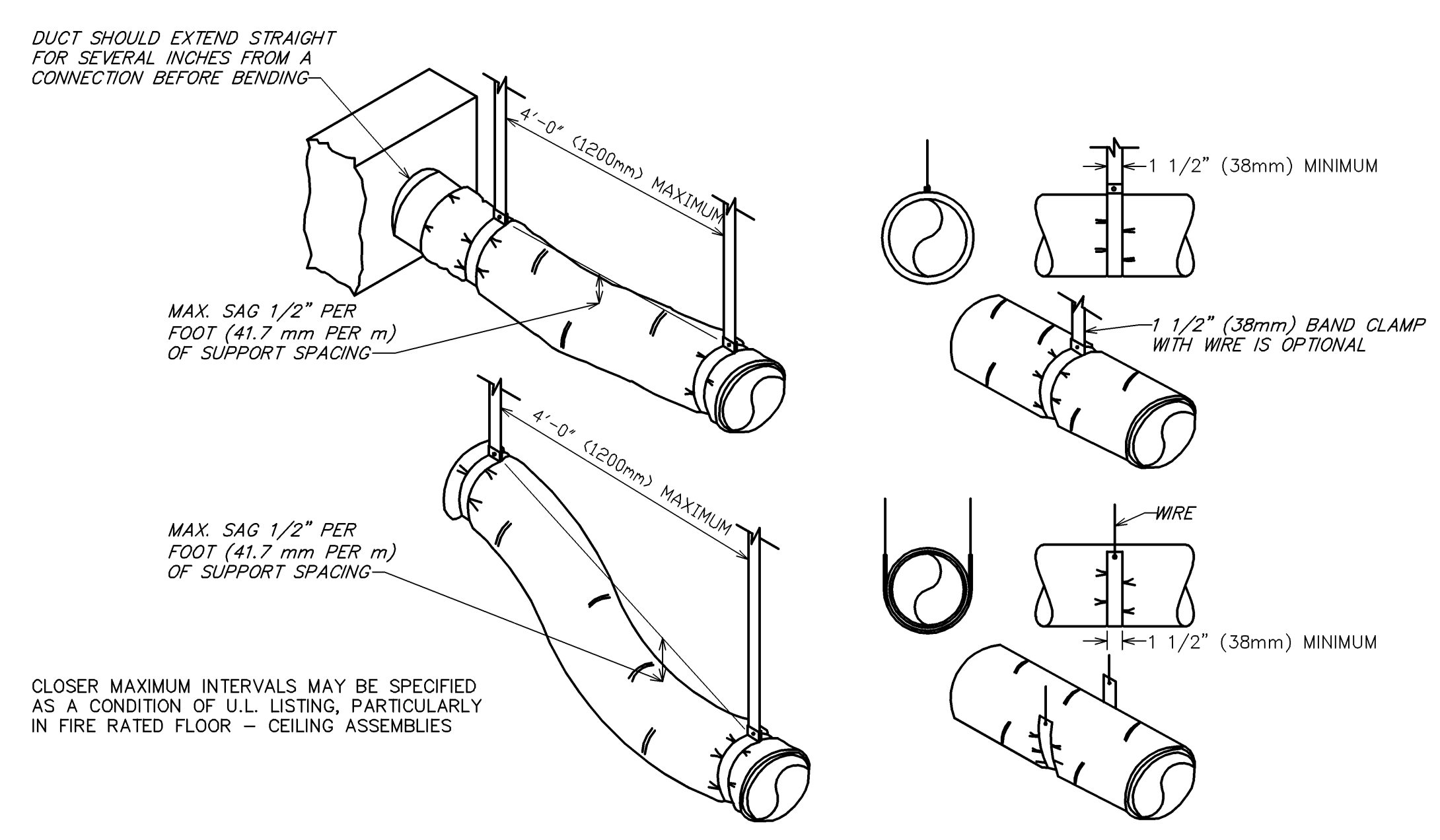
**1** RECTANGULAR DUCT HANGER TABLE  
NOT TO SCALE



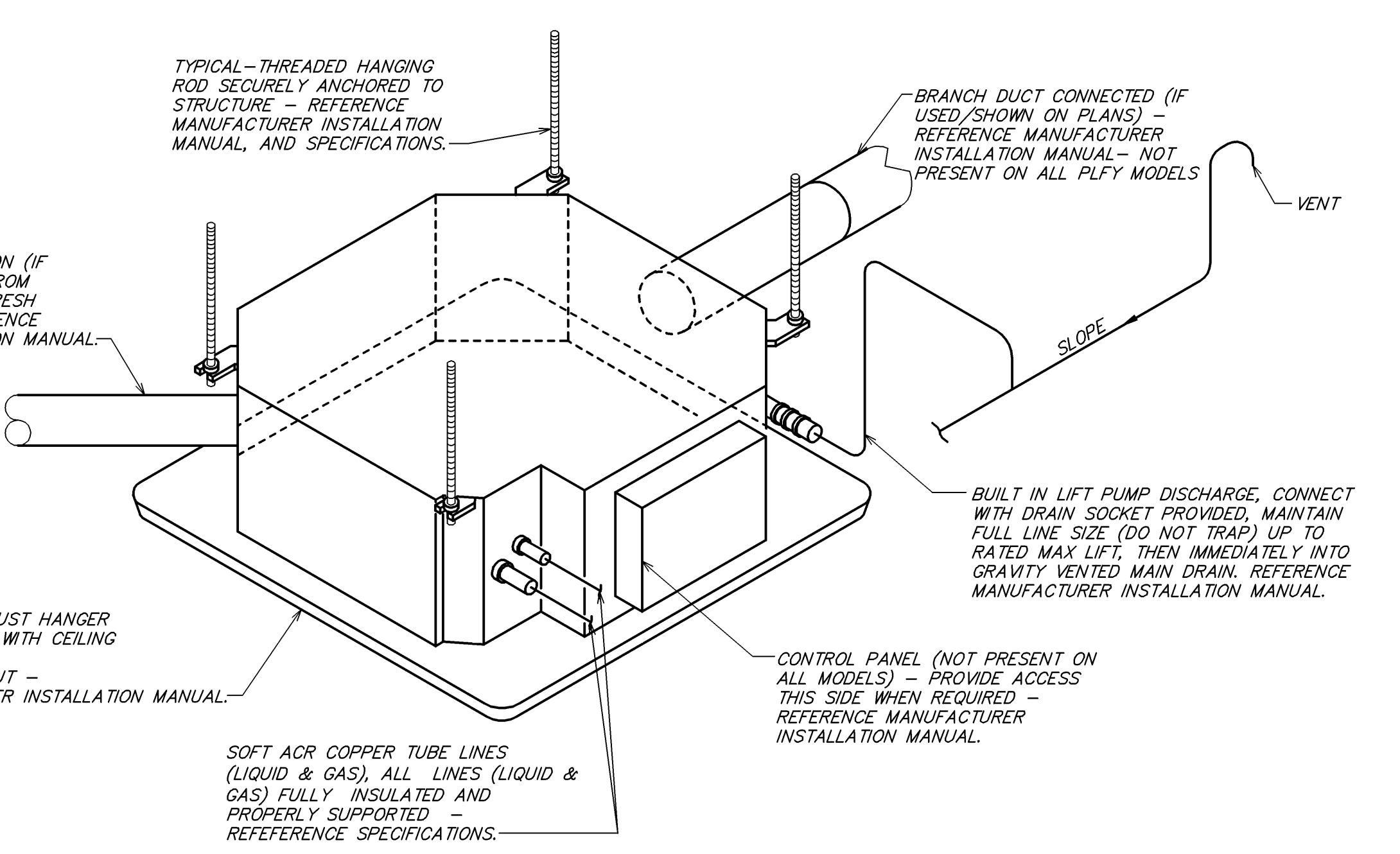
**4** DUCTWORK DETAILS  
NOT TO SCALE



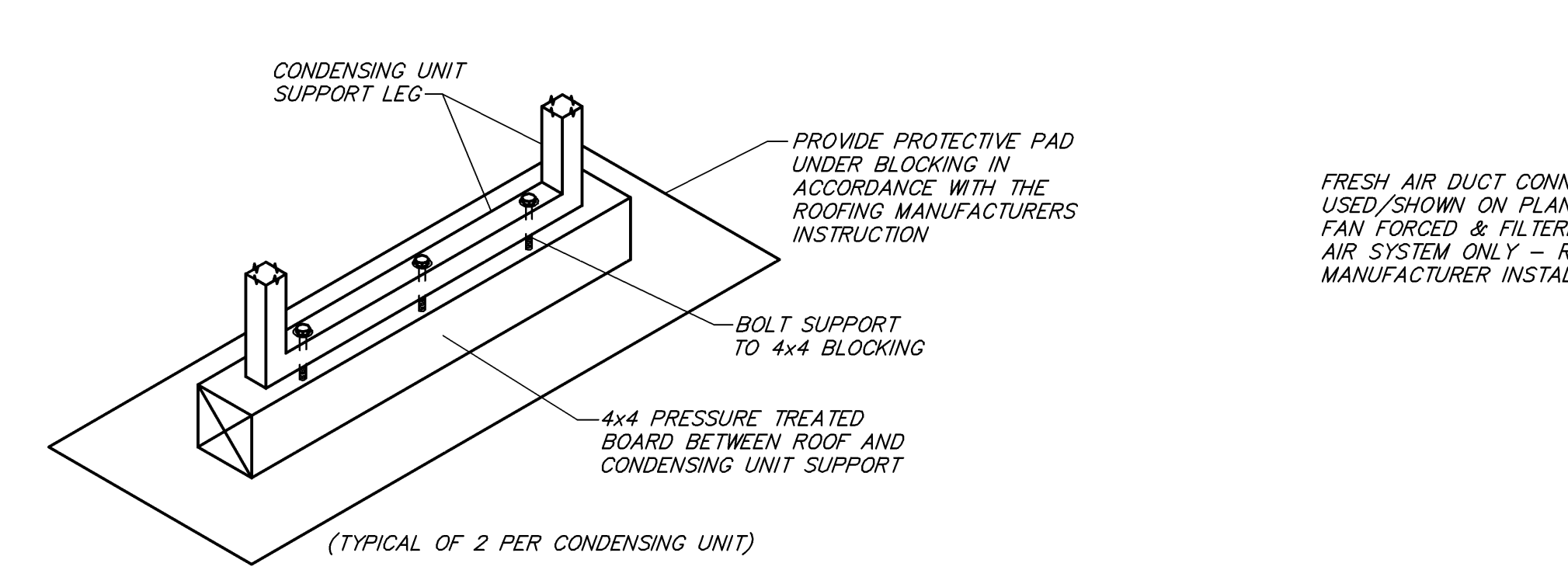
**6** DUCT HANGER DETAIL  
NOT TO SCALE



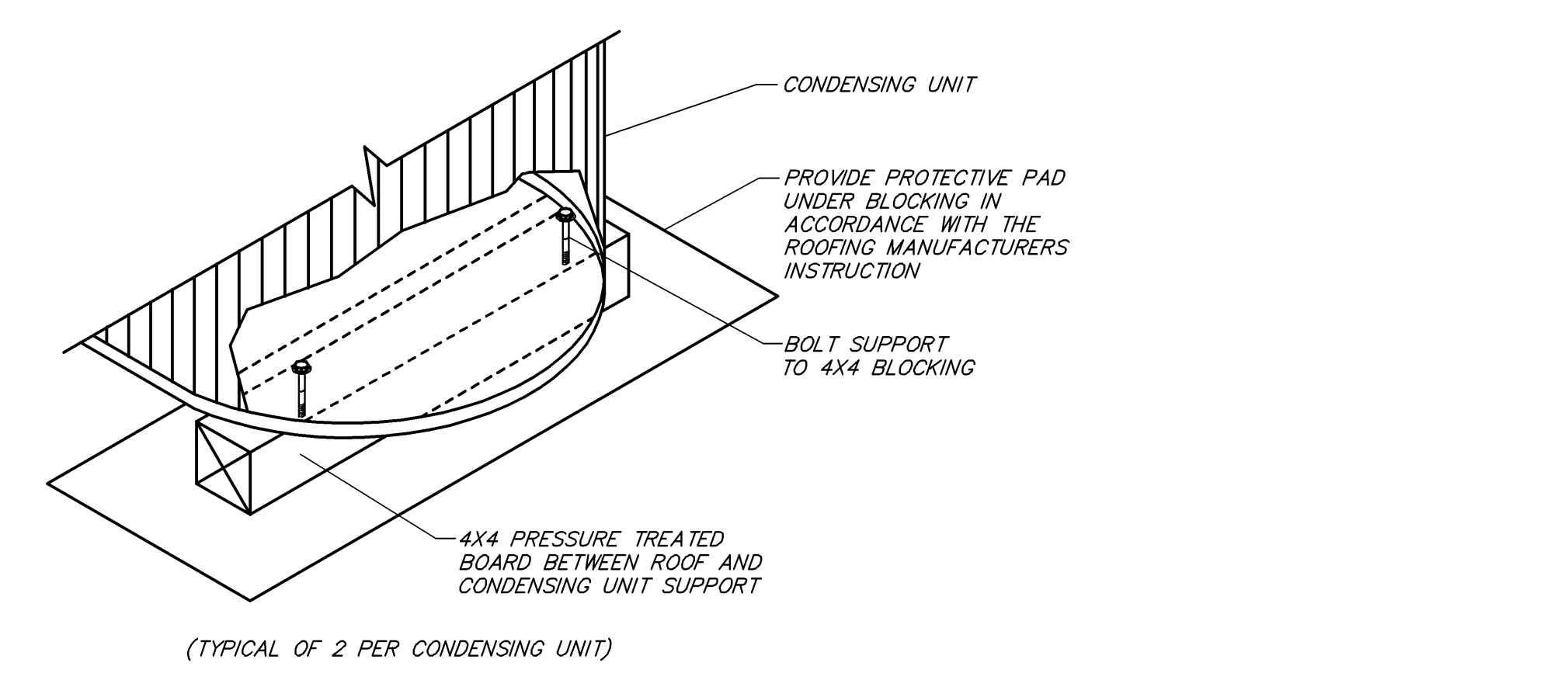
**2** FLEXIBLE DUCT SUPPORTS  
NOT TO SCALE



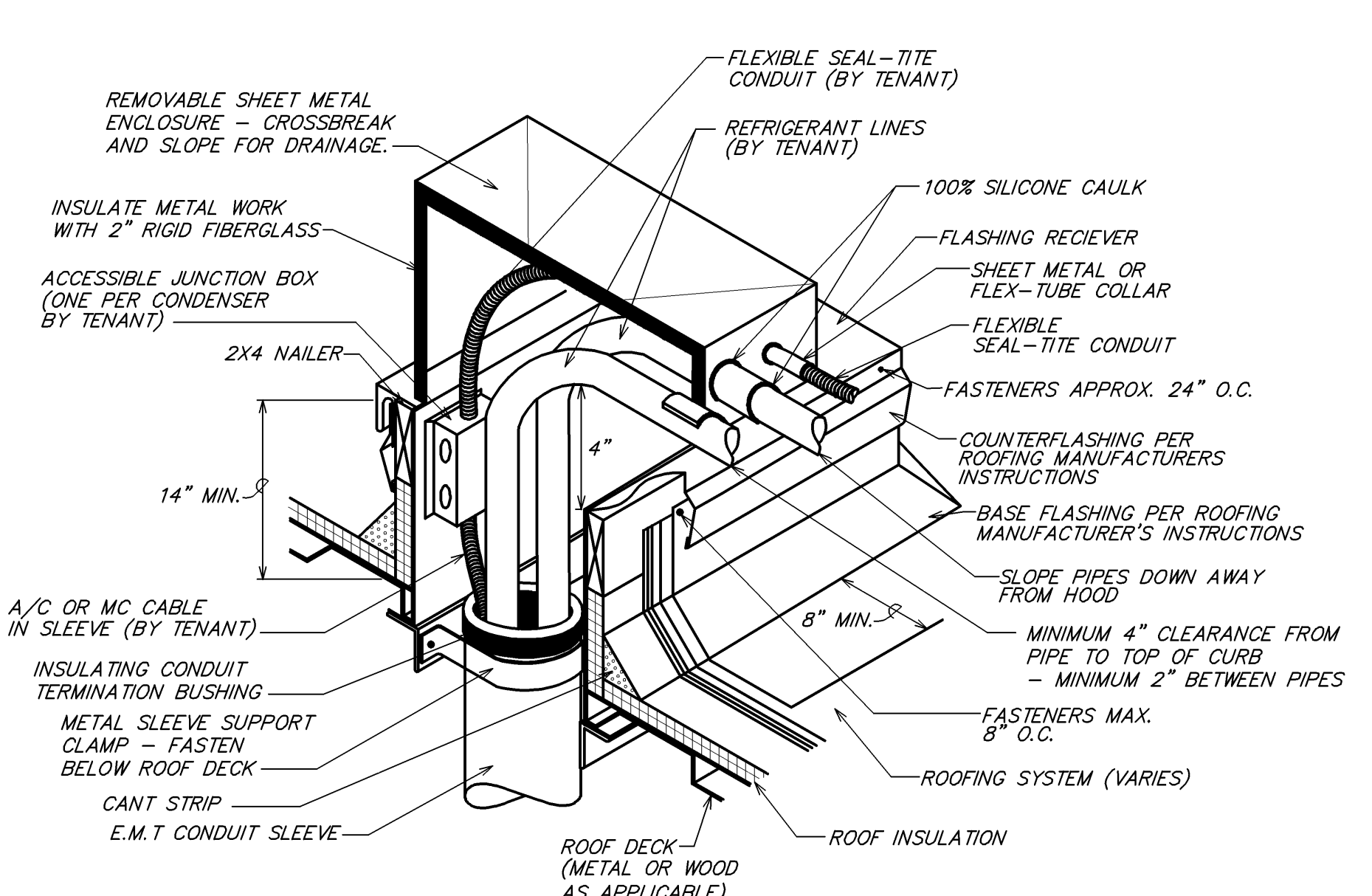
**5** CASSETTE UNIT  
NOT TO SCALE



**7** CONDENSING UNIT SUPPORT DETAIL  
NOT TO SCALE



**8** CONDENSING UNIT SUPPORT DETAIL  
NOT TO SCALE



**3** CONDENSER REFRIGERANT LINE PIPING AND POWER THROUGH ROOF DECK  
NOT TO SCALE

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SECTION 230545 - VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT

SECTION 230560 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

SECTION 230715 - DUCT INSULATION

SECTION 230715.13 - GREASE DUCT FIREPROOFING

SECTION 230719 - HVAC PIPING INSULATION

SECTION 230800 - COMMISSIONING OF HVAC

SECTION 230983 - SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

SECTION 231300 - REFRIGERANT PIPING AND ACCESSORIES

SECTION 231300 - AIR DUCT ACCESSORIES

SECTION 231300 - AIR DUCT ACCESSORIES

SECTION 231423 - HVAC POWER VENTILATORS

SECTION 231700 - AIR CURTAINS AND INLETS

SECTION 231413 - PACKAGED OUTDOOR ROOF TOP UNITS - GAS FIRED

SECTION 238127 - SMALL SPLIT-SYSTEM HEATING AND COOLING

**SECTION 230000 - HVAC GENERAL CONDITIONS**

**1.01 APPLICABILITY**

A. This section supplements all sections of the Specifications for Division 23 and shall apply to all phases of work hereinafter specified, shown on the Drawings, or required to provide a complete installation of approved HVAC systems.

**1.02 DEFINITIONS**

A. "Work" is hereby defined as: "The construction and services required by the Contract Documents whether completed or partially completed and includes all labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The work may constitute a whole or a part of the project."

B. "Furnish" is hereby defined as: "To supply and deliver, unload, and inspect for damage."

C. "Install" is hereby defined as: "To unpack, assemble, erect, apply, place, finish, cure, protect, clean, connect, and place into operation in the work."

D. "Provide" is hereby defined as: "To furnish and install."

E. "Connect" is hereby defined as: "To bring service to the equipment and make final attachment including necessary ductwork, piping, wiring, etc."

F. "Expose" is hereby defined as: "To remove or strip away, including, but not limited to, shafts, hung ceilings, embedded in construction, in crawl spaces, or buried."

G. "Erect" is hereby defined as: "Not installed underground nor concealed as defined by the Specifications."

H. "Drawings" is hereby defined as: "All plans, details, equipment schedules, diagrams, sketches, etc. issued for the construction of the work for the project."

**1.03 CODES AND STANDARDS**

A. Perform work in accordance with the applicable Building Code, Electrical Code, Fire Code, Mechanical Code, Plumbing Code, Energy Code, and all other applicable codes, ordinances, and regulations. Perform work in accordance with the Americans with Disabilities Act (ADA) and the Authority Having Jurisdiction (AHJ) including Fire Marshal(s).

B. Perform work in accordance with Landlord requirements, including any Tenant Criteria Manuals and Lease Exhibits, where applicable.

C. Perform work in accordance with the applicable codes and standards of the industry. Make all arrangements with the utility companies for proper coordination of the work.

D. Recognized Standards: Design, manufacture, testing and method of installation of all apparatus and materials furnished under the requirements of these specifications shall conform to the latest published standards of Underwriters Laboratories, Inc. (U.L.), American Society for Testing and Materials (ASTM), American National Standards Institute (ANSI), International Fire Code (IFC), National Fire Protection Association (NFPA), American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), and the Sheet Metal and Air-Conditioning Contractors' National Association (SMACNA).

E. The Contract Documents shall take precedence where the Contract Documents exceed codes, laws, ordinances, utility or regulatory codes, and accessories of all dirt, debris, splatter, and other deleterious materials. Follow the manufacturer's recommendations for cleaning or pressure cleaning on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters and coils. Balance volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.

**1.04 PERMITS AND FEES**

A. Obtain all permits, licenses, fees, inspections and arrangements required for the work under this Contract shall be obtained by the Contractor at his expense, unless otherwise indicated.

**1.05 CONTRACT DRAWINGS**

A. The Contractor is responsible to obtain, fully understand, and coordinate the work with the complete set of Contract Documents. Any required permits, including all associated costs, arising from issues caused by the Contractor's failure to understand and/or coordinate the work with the complete set of Contract Documents are the Contractor's sole responsibility.

B. Work under these sections unless indicated otherwise and is intended to convey the scope of work and indicate the general arrangement of ductwork, piping, equipment, and accessories. Follow these drawings in laying out the work and verify spaces for the installation of these materials and equipment. Wherever a question exists as to the exact intended location of ductwork, piping, equipment, obtain instructions from the Architect before proceeding with the work.

C. Notify the Architect for resolution if a discrepancy is discovered within the Contract Documents. Failure of the Contractor to notify the Architect of discrepancies shall result in the resolution becoming the Contractor's responsibility and subject to the Architect's review and possible rejection. Should the Architect reject a discrepancy resolution of which they were not notified, the Contractor is fully responsible for the resolution, including all associated costs, until approval of the installation is given by the Architect.

**1.06 EXISTING CONDITIONS**

A. Verify all existing conditions prior to beginning work.

B. Any existing conditions indicated in the Contract Documents are based on information drawings provided by the project and possibly limited field verification. The Contractor shall adjust for actual field conditions at no additional expense to the Owner.

C. The Contractor shall visit the project site, review existing conditions against the Contract Documents, and familiarize himself with the work prior to bidding and start of the work. By signing and submitting the bid, the Contractor acknowledges the site visit has been completed and the existing conditions are accepted.

D. The Contractor shall notify the Architect of major discrepancies in writing so the appropriate modifications to the design can be made without delay to the project. The Contractor assumes full responsibility of adjusting for discrepancies of which the Architect is not informed.

**1.07 SUBMITTALS**

A. Shop Drawings:

1. Furnish the following submittals to the Architect for review by the Engineer:
  - a. Provide product data and shop drawings for vibration isolation.
  - b. Provide balancing firm qualifications and test report for:
    - i. Testing, Adjusting, and Balancing.
  - c. Provide product data for refrigerant piping.
  - d. Provide product data for grease duct fireproofing (if specified).
  - e. Provide product data for HVAC ductwork.
  - f. Provide product data and shop drawings for HVAC power ventilators.
  - g. Provide product data for air curtains or air outlets and their accessories.
  - h. Provide product data and shop drawings for condensing units and heat pumps.
  - i. Provide product data and shop drawings for air handling and fan coil units.
2. Submit all other than those listed above will not be reviewed and will be returned stating as such.
3. Shop drawings shall be prepared by a manufacturer's representative and shall contain names of the manufacturer and cut sheets of equipment to be used on the project. Use manufacturer's specifications to identify equipment indicated on drawings or schedules. Indicate catalog number on the cut sheets. As applicable, provide construction data, weight and dimensional data, voltage ratings, performance data, listing, pump curves, fan curves and sound data as part of the shop drawing submittal.
4. Submittals are reviewed only for general compliance with the Contract Documents. Dimensions, quantities and details are not checked during submittal review. Review of the submittals does not relieve the Contractor of the responsibility for providing all materials, equipment and accessories necessary for a complete and operational system meeting the requirements of the project and the intent of the Contract Documents. The responsibility for coordination of substituted materials and equipment lies solely with the substituting Contractor.
5. Electrical Characteristics: Verify that proper power supply is available prior to ordering equipment. Verify proper voltage and current rating of power supply and inform Engineer of any deviations prior to order, connection of equipment or start-up. Responsibility for verification of proper power supply voltage and any required voltage or damage resulting from incorrect connections shall rest with the Contractor.

B. Test Reports: Provide Testing, Adjusting, and Balancing (TAB) and Commissioning reports to the Architect for review by the Engineer. All other reports shall be provided to the Owner.

**1.08 QUALITY ASSURANCE**

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum five years experience.

B. Installer Qualifications: Company specializing in performing the work of this section, with minimum five years experience.

C. Products:

1. Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.
2. All equipment and components shall be free of all rust/corrosion or any visible damage. All items not complying with this requirement shall be replaced without any change in the Contract amount.
3. Equipment performance and accessories shall be as scheduled on the Drawings and specified herein. Inclusion in both locations is not a prerequisite to inclusion in the Contract. Equipment and accessories specified in either location shall be included in the Contract. Provide all necessary accessories and connections as required for a complete functional system, including required components as reasonably inferred to as necessary although such components may not be specifically indicated in the Contract Documents.

D. Code or utility company requirements shall supersede any conflicting requirements of this section.

**1.09 DELIVERY, STORAGE, AND HANDLING**

A. Rooftop Equipment: Protect units from physical damage by storing off site until roof mounting curbs are in place, readying and final cooling equipment; Fans (Exhaust and supply), Coils; Terminal equipment; Air inlets and outlets (Diffusers, grilles, louvers, etc.).

B. Measure dampers and accessories from damage to fittings, blades and finishes.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect motors stored on site from weather and moisture by maintaining facility covers and suitable weather-proofing cover. For extended outdoor storage, remove motors from equipment and store separately.

**1.10 WARRANTY AND GUARANTEE**

A. Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

B. Provide one year manufacturer warranty for pumps.

C. Provide three year manufacturer warranty for solid state ignition modules.

D. Provide five year manufacturer warranty for compressors, heat exchangers, condensing units, and electronic air cleaners.

**PART 2 PRODUCTS**

**2.01 SUBSTITUTIONS**

A. The manufacturers listed are listed to set minimum standards for quality, design, and functionality. The products of other manufacturers may be submitted, at the Contractor's option, during shop drawing review unless indicated otherwise. The products of other manufacturers shall meet or exceed all requirements of the Contract Documents. The Contractor accepts all responsibility for costs and coordination issues arising out of the substitution of materials or equipment, and the coordination of such substitutions with all other contractors and subcontractors.

B. The Contractor may use any of the following ductwork, piping or insulation materials at his option, provided the selected material meets with the approval of all State, local authorities and any utility company requirements. Verification of compliance of the selected material is the sole responsibility of the installing Contractor.

**PART 3 EXECUTION**

**3.01 COORDINATION OF WORK**

A. Examine the Contract Documents as a whole for the work of other trades. Coordinate all work accordingly.

B. Promptly report to the Architect any delay or difficulties encountered in the installation of the work, which might prevent proper and prompt installation, or make it unfeasible to connect with or receive the work of others. Failure to so report shall constitute acceptance of the work of other trades as being fit and proper for the execution of this work.

C. Plan, lay out, and coordinate the work with all trades well enough in advance so that it proceeds with a minimum of interference to work that has not been completed and work that is in progress. Inform all trades of openings required for the work and provide all special frames, sleeves, and anchor bolts required. The HVAC system layout may be altered to suit the conditions with engineer approval, prior to the installation of any work and without additional cost to the Owner. Conflicts arising from lack of coordination shall be this Contractor's responsibility.

D. Perform all work in conformity with the Contract Documents and afford other trades reasonable opportunity for the proper progress of their work. Properly connect and coordinate this work with the work of other trades at such time and in such a manner as to avoid interference with the work of other trades.

E. All roofing penetrations shall be flashed and weather sealed by the roofing manufacturer's authorized roofing contractor at this Contractor's expense. This Contractor shall contract with the factory authorized roofing contractor for the specific roofing system applicable to this Project. The use of an unauthorized roofing contractor may result in removal of the roof or other loss to the installing Contractor's expense.

F. All temperature control wiring, thermostat wiring, damper interlock wiring, control panel interlock wiring and miscellaneous low voltage wiring associated with the equipment furnished or installed under this contract shall be furnished and installed by the mechanical contractor or his sub-contractor. All wiring installed under this contract shall be in full compliance with the National Electrical Code, all State and local codes and requirements of the Electrical Specifications for this project.

**3.02 EXAMINATION**

A. Verify field measurements are as indicated on the Drawings.

B. Verify all equipment locations prior to rough-in. Maintain adequate equipment service clearance per manufacturer and code.

C. Verify routing of all ductwork and piping in field prior to fabrication or installation. Verify adequate clearance with structure, light fixtures, and ceiling heights.

D. Verify that proper fuel and power supply is available for connection.

**3.03 INTERFACE WITH OTHER PRODUCTS**

A. Install all ductwork, pipe, equipment, and accessories to preserve fire resistance ratings, partitions and other elements using materials and methods specified.

**3.04 FIELD QUALITY CONTROL**

A. Provide tests as necessary to establish the adequacy, quality, safety, completed status, and suitable operation of each system. Tests shall be conducted under the supervision of the Architect.

**3.05 CLEANING AND REPAIR**

A. Clean fire suppression parts to remove harmful materials.

B. Clean exposed surfaces of ductwork, piping, equipment, and accessories of all dirt, debris, splatter, and other deleterious materials. Follow the manufacturer's recommendations for cleaning or pressure cleaning on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters and coils. Balance volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.

**3.06 PROJECT CLOSEOUT**

A. Project Record Documents: At project closeout, provide one printed copy and one electronic copy of the project record documents to the Owner. Record documents to be included in the Project Record Documents shall include, as a minimum:

1. Actual locations of all equipment, ductwork, air inlets/outlets, accessories, etc.
2. Actual routing of ductwork with sizes and elevations.
3. Actual locations of control devices including valves and volume dampers.

B. Record Drawings: Information contained on project record drawings shall include, as a minimum:

1. Actual locations of all equipment, ductwork, air inlets/outlets, accessories, etc.
2. Actual routing of ductwork with sizes and elevations.
3. Actual locations of control devices including valves and volume dampers.

C. Maintenance: Provide descriptive literature, maintenance, and operation data for all hvac equipment, control systems, accessories, and materials used. Include maintenance procedures and parts list of each item installed under this contract. Include all manufacturer's warranties and warranties.

D. Materials: At project closeout, furnish to the Owner the following:

1. One set of replacement filters for all hvac equipment.
2. One set of maintenance procedures for the system, if applicable.
3. Summary of outdoor and exhaust flows to indicate amount of building pressurization.

E. Test Reports: Submit to the Owner all testing reports.

**SECTION 230545 - VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT**

**1.01 SECTION INCLUDES**

A. Vibration isolators.

B. Equipment:

1. Fans, axial and centrifugal
2. Condensing units and air source heat pumps
3. Furnaces and fan coil units

**1.02 SUBMITTALS**

A. Product Data: Provide schedule of vibration isolator type with location and load on each.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

A. Kinetics Technology, Inc.; Kinetics Noise Control, Inc.; Mason Industries.

**2.02 VIBRATION ISOLATORS**

A. Spring Hanger

1. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.
2. Housings: Incorporate neoprene isolation pad meeting requirements for compression pad stiffness and air or oil seals.
3. Misalignment: Capable of 20 degree hanger rod misalignment.
4. For Exterior and Humid Areas: Hot dipped galvanized housings and neoprene coated springs.

B. Neoprene Pad Isolators:

- a. Rubber neoprene waffle pads.
- b. Hardness: 30 durometer.
- c. Thickness: Minimum 1/2 inch.
- d. Maximum Loading: 50 psi.
- e. Rib Height: Minimum 0.7 times width.

2. Configuration: Single layer.

3. Rubber Mount or Hanger: Molded rubber designed for 0.4 inch deflection with threaded insert.

D. Glass Fiber Pads: Neoprene jacketed pre-compressed molded glass fiber.

**SECTION 230715 - DUCT INSULATION**

**1.01 SECTION INCLUDES**

A. Duct Insulation.

B. Duct liner.

C. Insulation jackets.

D. Supply, return or exhaust ducts in ceiling spaces.

E. Supply, return or exhaust ducts in interior unconditioned areas.

F. Supply, return or exhaust ducts in exposed locations.

G. Outside air intake ducts.

**1.02 FIELD CONDITIONS**

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation during the installation.

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

**PART 2 PRODUCTS**

**2.01 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION**

A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E 84, NFPA 255, or UL 723.

B. Manufacturer: Knauf Fiberglass; Johns Manville Corporation; Owens Corning Corp.; CertainTeed Corporation.

**2.02 GLASS FIBER, FLEXIBLE**

A. Insulation: ASTM C 553, flexible, noncompressible blanket.

1. "K" value: 0.31 at 75 degrees F, when tested in accordance with ASTM C 518.
2. Maximum Service Temperature: 450 degrees F.
3. Maximum Water Vapor Sorption: 0.0 percent by weight.

B. Vapor Barrier Jacket:

1. Kraft paper with glass fiber yarn and bonded to aluminum film.
2. Moisture Vapor Permeability: 0.029 ng/Pa s m (0.02 perm inch), when tested in accordance with ASTM E 96/E 989.
3. Seams: Seams shall be pressure sensitive tape.

C. Vapor Barrier Tape:

1. Kraft paper reinforced with glass fiber yarn and bonded to aluminum film, with pressure sensitive rubber based adhesive.

D. Outdoor Vapor Barrier Mastic:

1. Vinyl emulsion type acrylic or mastic, compatible with insulation, block color.

E. The Wire: Annealed steel, 16 gage.

**2.03 DUCT LINER**

A. Insulation: Incombustible glass fiber complying with ASTM C 1071; flexible blanket, rigid board, and preformed round liner boards; impregnated surface and edges coated with acrylic polymer shown to be fungus and bacteria resistant by testing to ASTM C 21.

1. Minimum Thermal Conductivity: Maximum of 0.31 at 75 degrees F.
2. Service Temperature: Up to 250 degrees F.
3. Rated Velocity on Coated Air Side for Air Erosion: 5,000 fpm, minimum.
4. Minimum Noise Reduction Coefficient:
  - a. 1/2 inch Thickness: 0.30.
  - b. 1 inch Thickness: 0.45.
  - c. 1-1/2 inch Thickness: 0.60.
  - d. 2 inch Thickness: 0.70.

B. Adhesive: Waterproof, fire-retardant type.

C. Liner Fasteners: Galvanized steel, self-adhesive pad or impact applied with integral, or press-on head.

**SECTION 230560 - TESTING, ADJUSTING, AND BALANCING FOR HVAC**

**1.01 SECTION INCLUDES**

A. Testing, adjustment, and balancing of air systems.

B. Air handling units; Packaged Thermal Cooling equipment; Fans (Exhaust and supply); Coils; Terminal equipment; Air inlets and outlets (Diffusers, grilles, louvers, etc.).

C. Measure dampers and accessories from damage to fittings, blades and finishes.

C. Independent agency requirements.

**1.02 SUBMITTALS**

A. Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract. Provide TAB Agency qualifications.

B. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance. Submit to the Construction Manager within two weeks after completion of testing, adjusting, and balancing.

C. Provide reports in bound manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and

indicating thermostat and equipment locations.

3. Include actual instrument list, with manufacturer name, serial number, and date of calibration.

4. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.

5. Test Reports: Provide Testing, Adjusting, and Balancing (TAB) reports to the Architect for review by the Engineer. All other reports shall be provided to the Owner.

**1.03 WARRANTY**

A. The Balancing Contractor shall be prepared to return to the site at no additional cost to re-adjust air quantities as required to provide uniform temperatures, eliminate drafts and objectionable noises during the first year of occupancy, including one full heating and one full cooling season, under the acceptance of the field balancing report.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION**

**3.01 GENERAL REQUIREMENTS**

A. Perform total system balance in accordance with one of the following:

1. AABC MN-1, AABC National Standards for Total System Balance.
2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
3. NEB Procedural Standards for Testing Adjusting Balancing of Environmental Systems.
4. SMACNA HVAC Systems Testing, Adjusting, and Balancing.

B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to substantial completion of the Project.

C. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authority having jurisdiction.

D. TAB Agency Qualifications:

1. Company specializing in the testing, adjusting, and balancing of systems specified in this Section with a minimum of five years experience.
2. Certified by one of the following:
  - a. AABC, Associated Air Balance Council; upon completion submit AABC National Performance Guarantees.
  - b. NEBS, National Environmental Balancing Bureau.
  - c. TABS, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute.
  - d. The TAB Agency must be a completely independent, third party balancing contractor.

E. TAB Supervision and Technician Qualifications: Certified by same organization as TAB agency.

**3.02 ADJUSTMENT TOLERANCES**

A. Air Handling Systems; Air Outlets and Inlets; Hydraulic Systems: Adjust to within plus or minus 15 percent of design.

**3.03 RECORDING AND ADJUSTMENT**

A. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

B. Mark on the Drawings the locations where traverse and other critical measurements were taken and cross reference the location in the final report.

**3.04 AIR SYSTEM PROCEDURE**

A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities.

B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross section of the duct.

C. Measure air quantities at air inlets and outlets.

D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

E. Use volume control devices to regulate air quantities only to extend that adjustment to not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters. Do not use registers, grille or register integral dampers for balancing adjustments unless the plans do not indicate duct mounted devices.

F. Verify total system air quantities by adjustment of fan speeds. Provide drive changes required at no additional expense to the Owner. Vary branch air quantities by damper regulation.

G. Measure static or pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters and coils. Balance volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.

**3.05 SCOPE**

A. Equipment Requiring Testing, Adjusting, and Balancing (if present on the project):

1. HVAC supply fans; All Air Handling Equipment; All Packaged Heating and/or Cooling Equipment; All Coils; All Heat Exchangers; Terminal Heat Transfer Units; Air Terminal Units; Air Inlets and Outlets

B. MINIMUM DATA TO BE REPORTED:

A. Report (as applicable to the project):

1. Summary Characteristics of system
  - a. Design versus field performance.
  - b. Noticeable characteristics of system.
  - c. Summary of outdoor and exhaust flows to indicate amount of building pressurization.
  - d. Nomenclature used throughout report and test conditions.
2. Manufacturer, Model/Frame; HP/BHP; Phase, voltage, amperage; nameplate, actual, no load, RPM; Service factor; Sheave Make/Size/Bore.
3. Belt Drive: Identification/location; Required driver RPM; Driven sheave, diameter and RPM; Belt, size and quantity.
4. Nomenclature used throughout report and test conditions.

B. Electric Motors and drives:

1. Manufacturer, Model/Frame; HP/BHP; Phase, voltage, amperage; nameplate, actual, no load, RPM; Service factor; Sheave Make/Size/Bore.
2. Belt Drive: Identification/location; Required driver RPM; Driven sheave, diameter and RPM; Belt, size and quantity.

**END OF SECTION**

Insulated ducts 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.

C. Insulated ducts conveying air above ambient temperature:

1. Provide with or without standard vapor barrier jacket.
2. Provide fittings and joints. Where service access is required, bevel and seal ends of insulation.

D. Extended Duct Insulation Application:

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

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

A. Fire resistant duct wrap for kitchen hood exhaust ventilation ducts (grease ducts).

B. Fireproofing at duct penetrations through fire rated walls and floors.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

A. Acceptable Manufacturer: 3M Fire Protection Products, Inc.; Unifrax FireWrap; Morgan Thermal Ceramics.

**2.02 MATERIALS**

A. Grease Duct Fireproofing: Material applied directly to metal ducts and achieving a two-hour fire rated separation when tested in accordance with UL 2221 or ASTM E2336

1. Surface Burning Characteristics: Flame spread index of 0 and smoke developed index of 0.
2. Combustibility: Non-combustible, when tested in accordance with ASTM E 136.
3. Flexibility: Capable of being formed around corners and shapes by hand.
4. Adhesive: Adhesive used for fire resistant separation seal at duct penetrations through fire rated assemblies.
5. Adhesive: Adhesive used for fire resistant separation seal at duct penetrations through fire rated assemblies.

B. Fasteners: Non-combustible; use one or both of the following to attach fireproofing to duct:

1. Bonding: Steel or stainless steel, 1/2 inch wide, minimum, and 0.015 inch thick.
2. Insulation Pins: Copper-coated steel implant pins, minimum 1/2 gage, for welded attachment with minimum 1/2 inch embedment in substrate. Pins, 1-1/2 inch square or diameter, or equivalent sized cup-head pins.

C. Access Panel Hardware: Galvanized threaded rods, sleeves, washers, and wing nuts as specified in manufacturer's instructions.

D. Type: Aluminum foil tape for sealing exposed fiber edges and repairing tears in fireproofing.

E. Fireproofing: Material tested in conjunction with fireproofing, in accordance with ASTM E 814 to achieve fire rated penetration seal at duct penetrations through fire rated assemblies.

F. Fasteners: Same or greater than rating of penetration assembly.

G. Access Panels: 3M Fire Barrier 1000 N/S, 1003 S/L, and 2000+ Silicone Sealants, as required by tested assembly.

**END OF SECTION**

**SECTION 230715.13 - GREASE DUCT FIREPROOFING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

A. Fire resistant duct wrap for kitchen hood exhaust ventilation ducts (grease ducts).

B. Fireproofing at duct penetrations through fire rated walls and floors.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

A. Acceptable Manufacturer: 3M Fire Protection Products, Inc.; Unifrax FireWrap; Morgan Thermal Ceramics.

**2.02 MATERIALS**

A. Grease Duct Fireproofing: Material applied directly to metal ducts and achieving a two-hour fire rated separation when tested in accordance with UL 2221 or ASTM E2336

1. Surface Burning Characteristics: Flame spread index of 0 and smoke developed index of 0.
2. Combustibility: Non-combustible, when tested in accordance with ASTM E 136.
3. Flexibility: Capable of being formed around corners and shapes by hand.
4. Adhesive: Adhesive used for fire resistant separation seal at duct penetrations through fire rated assemblies.
5. Adhesive: Adhesive used for fire resistant separation seal at duct penetrations through fire rated assemblies.

B. Fasteners: Non-combustible; use one or both of the following to attach fireproofing to duct:

1. Bonding: Steel or stainless steel, 1/2 inch wide, minimum, and 0.015 inch thick.
2. Insulation Pins: Copper-coated steel implant pins, minimum 1/2 gage, for welded attachment with minimum 1/2 inch embedment in substrate. Pins, 1-1/2 inch square or diameter, or equivalent sized cup-head pins.

C. Access Panel Hardware: Galvanized threaded rods, sleeves, washers, and wing nuts as specified in manufacturer's instructions.

D. Type: Aluminum foil tape for sealing exposed fiber edges and repairing tears in fireproofing.

E. Fireproofing: Material tested in conjunction with fireproofing, in accordance with ASTM E 814 to achieve fire rated penetration seal at duct penetrations through fire rated assemblies.

F. Fasteners: Same or greater than rating of penetration assembly.

G. Access Panels: 3M Fire Barrier 1000 N/S, 1003 S/L, and 2000+ Silicone Sealants, as required by tested assembly.

**END OF SECTION**

**SECTION 230719 - HVAC PIPING INSULATION**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

A. Cooling condensation drain piping insulation.

B. Refrigerant piping insulation.

**PART 2 PRODUCTS**

**2.01 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION**

A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E 84, NFPA 255, or UL 723.

B. Manufacturer: Knauf Insulation; Johns Manville Corporation; Owens Corning Corp.; CertainTeed Corporation.

**2.02 GLASS FIBER**

A. Manufacturers: Knauf Insulation; Johns Manville Corporation; Owens Corning Corp.; CertainTeed Corporation.

1. "K" value: ASTM C 177, 0.24 at 75 degrees F.
2. Maximum service temperature: 250 degrees F.
3. Maximum moisture absorption: 0.2 percent by volume.

B. Insulation:

1. "K" value: ASTM C 547 and ASTM C 795, semi-rigid, noncombustible, end grain insulation.
2. "K" value: ASTM C 177, 0.24 at 75 degrees F.
3. Maximum service temperature: 250 degrees F.
4. Maximum moisture absorption: 0.2 percent by volume.

C. Vapor Barrier Jacket:

1. Kraft paper with glass fiber yarn and bonded to aluminum film.
2. Moisture Vapor Permeability: 0.029 ng/Pa s m (0.02 perm inch), when tested in accordance with ASTM E 96/E 989.
3. Seams: Seams shall be pressure sensitive tape.

D. Vapor Barrier Tape:

1. Kraft paper reinforced with glass fiber yarn and bonded to aluminum film, with pressure sensitive rubber based adhesive.

E. Outdoor Vapor Barrier Mastic:

1. Vinyl emulsion type acrylic or mastic, compatible with insulation, block color.

F. The Wire: Annealed steel, 16 gage.

**2.03 DUCT LINER**

A. Insulation: Incombustible glass fiber complying with ASTM C 1071; flexible blanket, rigid board, and preformed round liner boards; impregnated surface and edges coated with acrylic polymer shown to be fungus and bacteria resistant by testing to ASTM C 21.

1. Minimum Thermal Conductivity: Maximum of 0.31 at 75 degrees F.
2. Service Temperature: Up to 250 degrees F.
3. Rated Velocity on Coated Air Side for Air Erosion: 5,000 fpm, minimum.
4. Minimum Noise Reduction Coefficient:
  - a. 1/2 inch Thickness: 0.30.
  - b. 1 inch Thickness: 0.45.
  - c. 1-1/2 inch Thickness: 0.60.
  - d. 2 inch Thickness: 0.70.

B. Adhesive: Waterproof, fire-retardant type.

C. Liner Fasteners: Galvanized steel, self-adhesive pad or impact applied with integral, or press-on head.

**END OF SECTION**

**SECTION 230719 - HVAC PIPING INSULATION**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

A. Cooling condensation drain piping insulation.

B. Refrigerant piping insulation.

**PART 2 PRODUCTS**

**2.01 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION**

A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E 84, NFPA 255, or UL 723.

B. Manufacturer: Knauf Insulation; Johns Manville Corporation; Owens Corning Corp.; CertainTeed Corporation.

**2.02 GLASS FIBER**

A. Manufacturers: Knauf Insulation; Johns Manville Corporation; Owens Corning Corp.; CertainTeed Corporation.

1. "K" value: ASTM C 177, 0.24 at 75 degrees F.
2. Maximum service temperature: 250 degrees F.
3. Maximum moisture absorption: 0.2 percent by volume.

B. Insulation:

1. "K" value: ASTM C 547 and ASTM C 795, semi-rigid, noncombustible, end grain insulation.
2. "K" value: ASTM C 177, 0.24 at 75 degrees F.
3. Maximum service temperature: 250 degrees F.
4. Maximum moisture absorption: 0.2 percent by volume.

C. Vapor Barrier Jacket:

1. Kraft paper with glass fiber yarn and bonded to aluminum film.
2. Moisture Vapor Permeability: 0.029 ng/Pa s m (0.02 perm inch), when tested in accordance with ASTM E 96/E 989.
3. Seams: Seams shall be pressure sensitive tape.

D. Vapor Barrier Tape:

1. Kraft paper reinforced with glass fiber yarn and bonded to aluminum film, with pressure sensitive rubber based adhesive.

E. Outdoor Vapor Barrier Mastic:

1. Vinyl emulsion type acrylic or mastic, compatible with insulation, block color.

F. The Wire: Annealed steel, 16 gage.

**2.03 DUCT LINER**

A. Insulation: Incombustible glass fiber complying with ASTM C 1071; flexible blanket, rigid board, and preformed round liner boards; impregnated surface and edges coated with acrylic polymer shown to be fungus and bacteria resistant by testing to ASTM C 21.

1. Minimum Thermal Conductivity: Maximum of 0.31 at 75 degrees F.
2. Service Temperature: Up to 250 degrees F.
3. Rated Velocity on Coated Air Side for Air Erosion: 5,000 fpm, minimum.
4. Minimum Noise Reduction Coefficient:
  - a. 1/2 inch Thickness: 0.30.
  - b. 1 inch Thickness: 0.45.
  - c. 1-1/2 inch Thickness: 0.60.
  - d. 2 inch Thickness: 0.70.

B. Adhesive: Waterproof, fire-retardant type.

C. Liner Fasteners: Galvanized steel, self-adhesive pad or impact applied with integral, or press-on head.

**END OF SECTION**

**SECTION 230719 - HVAC PIPING INSULATION**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

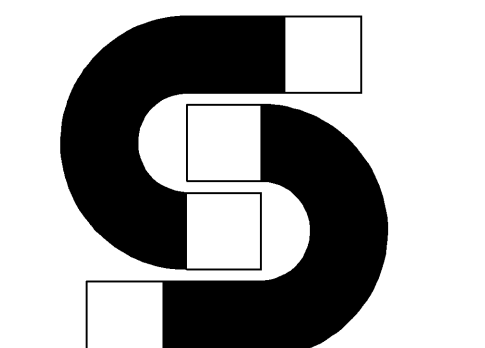
A. Cooling condensation drain piping insulation.

B. Refrigerant piping insulation.

**PART 2 PRODUCTS**

**2.01 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION**

A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E 84, NFPA 255,



STORE NO:  
#1758

ROSS PARK VILLAGE  
TEMP SPACE '12/13  
1000 ROSS PARK MARK DRIVE  
PITTSBURGH, PA 15227

SHAKE THE SHACK

SHAKE THE SHACK  
ROSS PARK VILLAGE  
TEMP SPACE '12/13  
1000 ROSS PARK MARK DRIVE  
PITTSBURGH, PA 15227

SHAKE THE SHACK

SHAKE THE SHACK  
ROSS PARK VILLAGE  
TEMP SPACE '12/13  
1000 ROSS PARK MARK DRIVE  
PITTSBURGH, PA 15227

SHAKE THE SHACK

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SHAKE THE SHACK

2. Jacket: One piece molded type fitting covers and sheet material, off-white color.  
a. Minimum Service Temperature: 0 degrees F.  
b. Maximum Service Temperature: 150 degrees F.  
c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E 96/E 96M.  
d. Thickness: 10 mil.  
e. Connections: Brush on welding adhesive.  
3. Covering Adhesive Mastic: Compatible with insulation.  
B. ABS Plastic:  
1. Jacket: One piece molded type fitting covers and sheet material, off-white color.  
a. Minimum Service Temperature: -40 degrees F.  
b. Maximum Service Temperature of 180 degrees F.  
c. Moisture Vapor Permeability: 0.012 perm inch, when tested in accordance with ASTM E 96/E 96M.  
d. Thickness: 30 mil.  
e. Connections: Brush on welding adhesive.

3.01 INSTALLATION  
A. Install in accordance with manufacturer's instructions.  
B. Install in accordance with NAIMA National Insulation Standards.  
C. Inserts and Shields:  
1. Application:  
a. Shields: Minimum 2 inches diameter or larger.  
b. Shields: Minimum 2 inches diameter or larger.  
c. Insert location: Between support shield and piping and under the finish jacket.  
d. Insert configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.  
e. Insert material: Hydraulic calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.  
D. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish all supports, as commissioned.  
E. Exposed Piping: Locate insulation and cover seams in least visible locations.

3.02 SCHEDULE  
A. Cooling Systems:  
1. Cold Condensate Drain:  
a. Gas Fiber Insulation:  
1. Pipe Size Range: All Sizes.  
a. Thickness: 1/2 inch.  
b. Flexible Elastomeric Cellular Foam Insulation:  
1. Pipe Size Range: All Sizes.  
a. Thickness: 1/2 inch.  
B. Refrigerant System:  
a. Gas Fiber Insulation:  
1. Pipe Size Range: All Sizes.  
a. Thickness: 1/2 inch.  
b. Flexible Elastomeric Cellular Foam Insulation:  
1. Pipe Size Range: All Sizes.  
a. Thickness: 3/4 inch.  
C. Refrigerant Hot Gas:  
a. Gas Fiber Insulation:  
1. Pipe Size Range: All Sizes.  
a. Thickness: 1/2 inch.  
b. Flexible Elastomeric Cellular Foam Insulation:  
1. Pipe Size Range: All Sizes.  
a. Thickness: 1/2 inch.

END OF SECTION

SECTION 230900 - COMMISSIONING OF HVAC

1.01 SUMMARY  
A. Commissioning to be completed by National Test and Balance. Coordinate with Will Lamour at 314-924-9274 or will@nattest.com.  
B. This section covers the Contractor's responsibilities for commissioning, each subcontractor is responsible for the installation of a particular system or equipment item to be commissioned is responsible for the commissioning activities relating to that system or equipment item.  
C. The Commissioning Authority coordinates all commissioning activities and provides Pre-functional Checklists and Functional Test Procedures for the Contractor's use.  
D. The entire HVAC system is to be commissioned, including commissioning activities for the following systems:  
1. Control system.  
2. Major and minor equipment items.  
3. Piping systems and equipment.  
4. Ductwork and accessories.  
5. Terminal units.  
6. Sound control devices.  
7. Variable frequency drives.  
8. Special Ventilation: Hoods, pressurization, exhaust, etc.  
9. Other equipment and systems not explicitly identified elsewhere in Contract Documents as requiring commissioning.  
10. Indoor Air Quality Procedures: The Commissioning Authority will coordinate Contractor will execute as Section 01 5719.  
E. The Pre-functional Checklist and Functional Test requirements specified in this section are in addition to, not a substitute for, inspection or testing specified in other sections.

1.02 RELATED REQUIREMENTS  
A. Section 23 0993 - Sequence of Operations for HVAC Controls.  
B. Section 23 0993 - Testing, Adjusting, and Balancing for HVAC.  
1.03 REFERENCE STANDARDS  
A. ASHRAE Guideline 1.1 - The HVAC Commissioning Process, 2012.  
1.04 SUBMITTALS  
A. Updated Submittals: Keep the Commissioning Authority informed of all changes to central system documentation made during programming and setup; revise and resubmit when substantial changes are made.  
B. TAB: Pre-functional Checklists and Functional Test Procedures for Control System: Detailed written plan indicating the procedures to be followed to test, checkout and adjust the control system prior to Commissioning Functional Testing; include at least the following for each type of equipment controlled:  
1. System name.  
2. List of devices.  
3. Step-by-step procedures for testing each controller after installation, including:  
a. Process of verifying proper hardware and wiring installation.  
b. Process of performing functional tests to local controllers and verifying that they are addressed correctly.  
c. Process of performing operational checks of each controlled component.  
d. Plan and process for calibrating valve and damper actuators and all sensors.  
e. Description of the expected field adjustments for transmitters, controllers and control actuators should control responses fall outside of expected values.  
4. Copy of proposed log and field checkout sheets to be used to document the process, include space for initial checkout and balancing data on each point and space to specifically indicate when a sensor or controller has "passed" and is operating within the contract parameters.  
5. Description of the instrumentation required for testing.  
6. Indicate what tests on what systems should be completed prior to TAB using the control system TAB and TAB contractor for this determination.  
7. Startup Reports, Pre-functional Checklists, and Trend Logs: Submit for approval of Commissioning Authority.  
D. HVAC Control System O&M Manual Requirements. In addition to documentation specified elsewhere, compile and organize at minimum the following data on the control system:  
1. Specific step-by-step instructions on how to perform and apply all functions, features, modes, etc. mentioned in the controls training sections of this specification and other features of this system. Provide an index and clear table of contents. Include the detailed technical manual for programming and customizing control loops and algorithms.  
2. Full as-built set of control drawings.  
3. Full as-built sequence of operations for each piece of equipment.  
4. Full points list: In addition to the information on the original points list submit, include a listing of all rooms with the following information for each room:  
a. Floor.  
b. Room number.  
c. Air handler unit ID.  
d. Reference drawing number.  
e. Air terminal unit tag ID.  
f. Heating and/or cooling valve tag ID.  
g. Minimum air flow rate.  
h. Maximum air flow rate.  
5. Full print out of all schedules and set points after testing and acceptance of the system.  
6. Full print out of software program.  
7. Electronic copy on disk of the entire program for this facility.  
8. Marking of all system sensors on the floor plan and floor plan and HVAC drawings with their control system designations.  
9. Maintenance instructions, including sensor calibration requirements and methods by sensor type, etc.  
10. Control equipment component submittals, parts lists, etc.  
11. Reference to applicable codes and standards.  
12. Copies of all checkout tests and calibrations performed by the Contractor (not equipment or systems) during testing and commissioning.  
13. Organize and subdivide the manual with permanently labeled tabs for each of the following data in the given order:  
a. Sequences of operation.  
b. Control drawings.  
c. Points lists.  
d. Controller and/or module data.  
e. Sensor and valve data.  
f. Sensors and DP switches.  
g. Thermostats and control actuators.  
h. Program setups (software program printouts).  
E. Project Record Documents as in the Commissioning Authority's Manual:  
1. Submit updated version of control system documentation, for inclusion with operation and maintenance data.  
2. Show actual locations of all static and differential pressure sensors (air, water and building pressure) and air-flow stations on project record drawings.  
F. Draft Training Plan:  
1. Follow the recommendations of ASHRAE Guideline 1.1.  
2. Control system manufacturer's recommended training.  
3. Demonstration and instruction on functional and overrides of any local packaged controls not controlled by the HVAC control system.  
G. Training Manuals:  
1. Provide three extra copies of the controls training manuals in a separate manual from the O&M manuals.

1.05 QUALITY ASSURANCE  
A. Design system under direct supervision of a Professional Engineer experienced in design of this work and licensed at the State in which the Project is located.  
B. Provide a copy of the Professional Engineer's seal and signature to the Commissioning Authority.  
C. Provide a copy of the Professional Engineer's seal and signature to the Commissioning Authority.  
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Z. Provide a copy of the Professional Engineer's seal and signature to the Commissioning Authority.

SECTION 230993 - SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

1.01 GENERAL  
A. This section defines the manner and method by which controls function.  
B. This section defines the manner and method by which controls function.  
C. This section defines the manner and method by which controls function.  
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SECTION 232300 - REFRIGERANT PIPING

1.01 SECTION INCLUDES  
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SECTION 230993 - SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

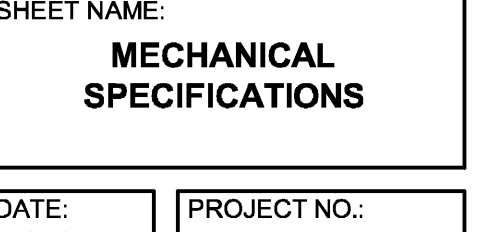
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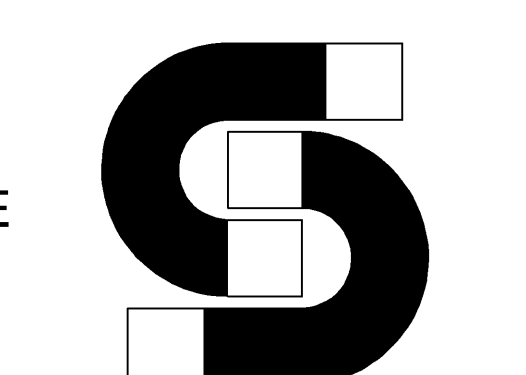
STATUS: IFC SET



FIELD VERIFICATION:  
The Contractor shall verify all dimensions and locations on the project site and notify Zebra Architecture, Inc. of any discrepancies before beginning or disturbing any work. No work shall be done.

COPYRIGHT © 2005:  
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SHEET NO.: MECHANICAL SPECIFICATIONS. DATE: 08/23/2025. PROJECT NO: 40403. DRAWN: SET. SCALE: AS NOTED.



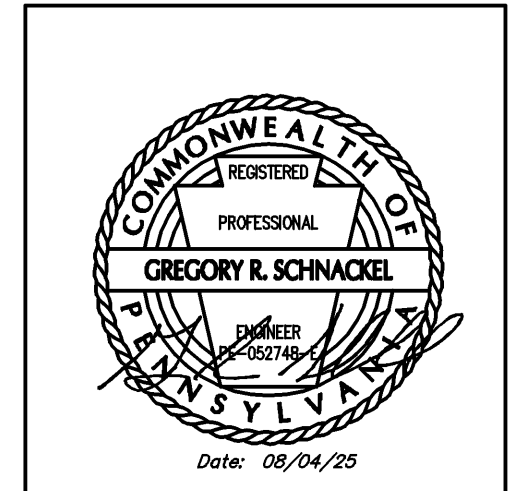
STORE NO:  
#1758

ROSS PARK VILLAGE  
TENNANT SPACE #C12A  
1000 ROSS PARK MALL DRIVE  
PITTSBURGH, PA 15227



Table with 2 columns: DATE, DESCRIPTION. Includes revision 1 on 08/23/2025.

Table with 2 columns: DATE, DESCRIPTION. Includes revision 1 on 08/23/2025.



FIELD VERIFICATION:  
The Contractor shall verify all dimensions and conditions on the project site with Zebra Architecture, PLLC. The project site information herein is to be reviewed, described, discussed or otherwise noted on the drawings.

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Zebra Architecture, PLLC shall retain all common law, statutory and/or contractual rights. No portion of these documents may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or by any information storage and retrieval system, without the prior written permission of Zebra Architecture, PLLC.

SHEET NAME:  
MECHANICAL SPECIFICATIONS

DATE: 08/23/2025 PROJECT NO: 40403  
DRAWN: SET SCALE: AS NOTED

SHEET NO.: M592

6 5 4 3 2 1

C. Cores: Molded or loose-fill molecular sieve desiccant compatible with refrigerant, activated alumina, activated charcoal, and filtration to 40 microns, with secondary filtration to 20 microns; of construction that will not pass into refrigerant lines.

D. Construction: UL listed.

1. Replaceable Core Type: Steel shell with removable cap.

2. Sealed Type: Copper shell.

3. Construction: As specified for applicable pipe type.

2.05 EXPANSION VALVES

A. Manufacturers:

1. Flow Controls Division of Emerson Electric; Parker Hannifin/Refrigeration and Air Conditioning; Sparan Valve Company.

B. Angle or Straight Through Type: ARI 750; design suitable for refrigerant, brass body, internal or external equalizer, bleed hole, adjustable superheat setting, replaceable inlet strainer, with non-replaceable capillary tube and remote sensing bulb.

C. Selection: Evaluate refrigerant pressure drop through system to determine available pressure drop across valve. Select valve for maximum load at design operating pressure and maintain 10 degrees F superheat. Select to avoid being undersized at full load and excessively oversized at part load.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install refrigeration specialties in accordance with manufacturer's instructions.

B. All rooftop penetrations shall be flashed and weather sealed by the roofing manufacturer's authorized roofing contractor at this Contractor's expense. This Contractor shall contract with the factory authorized roofing contractor for the specific roofing system applicable to this project. The use of an unauthorized roofing contractor may result in removal and replacement of the penetration systems at this Contractor's expense.

C. Follow ASHRAE 150 procedures for charging and purging of systems and for disposal of refrigerant.

D. Fully charge completed system with refrigerant after testing.

3.02 FIELD QUALITY CONTROL

A. Test refrigeration system in accordance with ASME B31.5.

END OF SECTION

SECTION 233100 - HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal ductwork.

B. Nonmetal ductwork.

C. Round spiral ductwork.

D. Medium and high velocity ductwork.

E. Kitchen hood exhaust ductwork, Type 1 grease hoods.

F. Dishwasher exhaust ductwork.

G. Duct cleaning.

1.02 PERFORMANCE REQUIREMENTS

A. No variation of duct configuration or sizes permitted except by written permission. Size round ducts in accordance with applicable ASHRAE table of equivalent rectangular and round ducts, only after approval of the Engineer. Sizes shown on design drawings are all dimensions. Contractor may increase duct size without engineer approval, provided all ceiling and shaft clearances can be maintained. Additional charges for increased duct size will not be accepted by the Owner.

B. Report all conflicts with structure or other obstructions, prior to fabrication of any ductwork, suitable alternative design sizes of ducts shall be accommodated without any additional expense to the Owner.

1.03 SUBMITTALS

A. Shop Drawings: Indicate duct fittings, particulars such as gages, sizes, welds, and configuration prior to start of work for all systems. No ductwork shall be fabricated until engineer approved shop drawings have been received by the Contractor. Identify on ductwork shop drawings any deviations in sizes or shapes made necessary by the obstruction.

B. Test Reports: Indicate pressure tests performed. Include date, section tested, test pressure, and leakage rate, following SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual.

1.04 REGULATORY REQUIREMENTS

A. Construct ductwork in accordance with NFPA 90A, NFPA 90B, and NFPA 96 standards.

B. Code or utility company requirements shall supersede any conflicting requirements of this Section.

1.05 FIELD CONDITIONS

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

B. Maintain temperatures within acceptable range during and after installation of duct sealants.

PART 2 PRODUCTS

2.01 MATERIALS

A. Galvanized Steel Ducts: Hot-dipped galvanized steel sheet, ASTM A 653/A 653M FS Type B, with G90/Z275 coating.

B. Steel Ducts: ASTM A 1008M, Designation CS, cold-rolled commercial steel.

C. Aluminum Ducts: ASTM B 209 (ASTM B 209M); aluminum sheet, alloy 3003-H14.

D. Aluminum Coatings and For Steel: Alloy K55 or of equivalent strength.

E. Insulated Flexible Ducts:

1. The Contractor may use any of the following ductwork materials, at his option, provided the selected material meets with the approval of all State, local authorities and utility company requirements. Verification of compliance of the selected ductwork material is the sole responsibility of the installing Contractor.

2. Two ply vinyl film supported by helically wound spring steel wire; fiberglass insulation; aluminum vapor barrier film.

a. Pressure Rating: 4.0 inches WG positive and 1.0 inches WG negative.

b. Maximum Velocity: 4000 fpm.

c. Temperature Range: -10 degrees F to 160 degrees F.

d. Minimum R-Value: 4.2 or greater as required by the applicable energy codes.

3. Black polymer film supported by helically wound spring steel wire; fiberglass insulation; aluminum vapor barrier film.

a. Pressure Rating: 4.0 inches WG positive and 0.5 inches WG negative.

b. Maximum Velocity: 4000 fpm.

c. Temperature Range: -20 degrees F to 175 degrees F.

d. Minimum R-Value: 4.2 or greater as required by the applicable energy codes.

4. Multiple layers of aluminum laminate supported by helically wound spring steel wire; fiberglass insulation; aluminum vapor barrier film.

a. Pressure Rating: 4.0 inches WG positive and 0.5 inches WG negative.

b. Maximum Velocity: 4000 fpm.

c. Temperature Range: -10 degrees F to 210 degrees F.

d. Minimum R-Value: 4.2 or greater as required by the applicable energy codes.

5. UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound spring steel wire; fiberglass insulation; aluminum vapor barrier film.

a. Pressure Rating: 10 inches WG positive and 1.0 inches WG negative.

b. Maximum Velocity: 4000 fpm.

c. Temperature Range: -20 degrees F to 210 degrees F.

d. Minimum R-Value: 4.2 or greater as required by the applicable energy codes.

6. UL 181, Class 0, interlocking spiral of aluminum foil; fiberglass insulation; aluminum vapor barrier film.

a. Pressure Rating: 8 inches WG positive or negative.

b. Maximum Velocity: 5000 fpm.

c. Temperature Range: -20 degrees F to 250 degrees F.

d. Minimum R-Value: 4.2 or greater as required by the applicable energy codes.

E. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.

1. Type: Heavy mastic or liquid used one or two coats, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.

2. VOC Content: Not more than 250 g/L, excluding water.

3. Surface Burning Characteristics: Flame spread of zero, smoke developed of zero, when tested in accordance with ASTM E 84.

4. For Use With Flexible Ducts: UL listed.

5. Ductwork Exposed to the Weather: Hard coat VersaPip 102, (W-102), UL 181-AM compliant duct joint compound, as manufactured by Castille, with fiberglass scrim tape reinforcement on all seams and joints, lateral and longitudinal.

F. Hanger Rods: ASTM A 36/A 36M; steel; threaded both ends, threaded one end, or continuously threaded.

2.02 DUCTWORK FABRICATION

A. Fabricate, support and seal in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated. Provide gaskets, sealers, reinforcing, and sealing for operating pressures indicated.

B. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide turning vanes. Where occasional lining is indicated, provide turning vanes of perforated metal with glass fiber insulation.

C. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

D. Fabricate continuously welded round and oval duct fittings two gages heavier than duct gages indicated in SMACNA Standards. Joints shall be minimum inch cemented slip joint, brazed or electric welded. Prime coat welded joints.

E. Provide standard 45 degree elbows unless otherwise indicated where 90 degree elbows are used. Connections may be used.

F. Where ducts are connected to other louvers and duct outlet is smaller than lower frame, provide blank-out panels sealing lower area around duct. Use same material as duct, painted black on exterior side, seal to lower frame and duct.

2.03 DUCT MANUFACTURERS

A. Metal-Fab, Inc.; SEMCO Incorporated; United McGill Corporation.

2.04 MANUFACTURED METAL DUCTWORK AND FITTINGS

A. Manufacture in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated. Do not provide ductwork with light reinforcing for operating pressures indicated.

B. Round Spiral Ductwork: Manufacture from round spiral lockseam duct with light reinforcing corrugations; fittings manufactured of at least two gages heavier metal than duct.

C. Double Wall Insulated Round Ducts: Round spiral lockseam duct with galvanized steel outer wall, 1 inch thick fiberglass insulation, perforated galvanized steel inner wall, fitting with solid lower wall.

D. Transverse Duct Connection System: SMACNA "E" rated rigidity class connection, interlocking angle and duct edge connection system with sealant, gasket, details, and corner caps.

2.05 KITCHEN HOOD EXHAUST DUCTWORK - TYPE 1

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and NFPA 96.

B. Construct of 18 gage carbon steel or 18 gage stainless steel, using continuous external welded joints.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine drawings for the Architectural, Structural, Electrical and all other trades prior to preparation of ductwork shop drawings and prior to the fabrication of any ductwork.

B. Resolve any conflicts encountered with the Engineer prior to fabrication.

C. Identify on ductwork shop drawings any deviations in sizes or shapes made necessary by the obstructions of other trades.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.

C. Install and seal metal and flexible ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

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

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

F. Use crimp joints and lock washers on threaded rod supports.

G. Use double nuts and lock washers on threaded rod supports.

H. Connect flexible ducts to metal ducts with draw bands.

I. Support flexible duct runs every five feet in the horizontal direction to avoid dips and sags.

J. Connect terminal units to supply ducts with one foot maximum length of flexible duct. Do not use flexible duct to change direction.

K. Connect diffusers to low pressure ducts directly or with 5 feet maximum length of flexible duct held in place with straps or clamps. Longer duct lengths are acceptable if depicted on the design drawings and allowed per local code. A maximum of one 90 degree bend, or equivalent, will be allowed in flexible duct runs.

L. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

M. All exposed ducts in finished areas must be completely free from all dents or imperfections in the galvanized coating and shall be sealed CAREFULLY AND NEATLY with duct sealer completely contained within the joint. Duct wrap will not be permitted in exposed locations.

N. Kitchen hood exhaust, Type 1: Use stainless steel for ductwork exposed to view and stainless steel or carbon steel for ducts where concealed.

O. For all hood systems, perform all required regurgity duct leakage and weld tests in the presence of the code official, including but not limited to light tests and smoke tests, to demonstrate the integrity of the duct construction prior to the installation of any insulation that prevents visual inspection of the ductwork on all sides.

P. Provide residue traps in kitchen hood exhaust ducts at base of vertical risers with provisions for clean out.

Q. Moisture laden vapor exhaust: Use stainless steel for ductwork exposed to view and stainless steel or Glass Fiber Reinforced Plastic where concealed and not located in return or plenums. If located in return or plenum spaces, use stainless steel ductwork. Weld or caulk all seams and joints water tight.

R. All rooftop penetrations shall be flashed and weather sealed by the roofing manufacturer's authorized roofing contractor at this Contractor's expense. This Contractor shall contract with the factory authorized roofing contractor for the specific roofing system applicable to this project. The use of an unauthorized roofing contractor may result in removal and replacement of the penetration systems at this Contractor's expense.

3.03 CLEANING

A. Clean duct system and force air at high velocity through duct to remove accumulated dirt or clean with high power vacuum machines. To obtain sufficient air, clean half the system at a time. Protect equipment which may be harmed by excessive dirt with temporary filters, or bypass during cleaning.

3.04 SCHEDULES

A. Ductwork Material:

B. The Contractor may use any of the following ductwork materials, at his option, provided the selected material meets with the approval of all State, local authorities and utility company requirements. Verification of compliance of the selected piping material is the sole responsibility of the installing Contractor.

1. Low Velocity Supply (Heating Systems): Galvanized Steel, Aluminum.

2. Low Velocity Supply (System with Cooling Coils): Galvanized Steel, Aluminum.

3. Return and Relief: Galvanized Steel, Aluminum.

4. General Exhaust: Galvanized Steel, Aluminum.

5. Outside Air Intake: Galvanized Steel.

6. Medium and High Velocity Supply: Galvanized Steel.

7. Kitchen Hood Exhaust, Type 1: Carbon Steel, Stainless Steel, Constructed per NFPA 96.

8. Dishwasher Exhaust: Stainless Steel, Glass Fiber Reinforced Plastic, seal or weld all joints water tight.

C. Ductwork Pressure Class:

1. Low Velocity Supply (Heating Systems): Scheduled System ESP+0.25", round up to next higher pressure class.

2. Low Velocity Supply (Systems with Cooling): Scheduled System ESP +0.5", round up to next higher pressure class.

3. Return and Relief: inch.

4. Kitchen Hood Exhaust: Scheduled System ESP +1.0", round up to next higher pressure class.

5. Medium and High Velocity Supply: Scheduled System ESP +1.0", round up to next higher pressure class.

6. Kitchen Hood Exhaust: See drawings for maximum fan static pressure plus 50% additional.

7. Dishwasher Exhaust: 2 inch.

END OF SECTION

SECTION 233300 - AIR DUCT ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Air turning devices/extractors.

B. Volume control dampers.

C. Flexible duct connections.

D. Duct access doors.

PART 2 PRODUCTS

2.01 AIR TURNING DEVICES/EXTRACTORS

A. Manufacturers: Krueger; Ruskin Company; Titus.

B. Interleaf heating coils.

C. Construction: with individually adjustable blades, mounting straps.

2.02 VOLUME CONTROL DAMPERS

A. Manufacturers: Louvers & Dampers, Inc.; Nalor Industries Inc.; Ruskin Company; Prefco Inc.

B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.

C. Flexible Duct Connections: Fabricate crimped into metal edging strap.

D. Multi-Blade Damper: Fabricate of stamped blade pattern with maximum blade sizes 8 x 12 inch. Assemble center and radiused sound power level for each of second through sixth octave bands at inlet static pressures of 1 to 4 inch wg.

E. End Bearings: Except in round ducts 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.

F. The contractor shall provide either a mechanical or electrical cable operated system wherever dampers are located in non-accessible areas.

1. Mechanical cable operated control system shall be similar and equal to Young Regulator Company, "Bowden Cable Control" system including damper, flexible cable with casing and concealed cabling regulator control.

2. Electrically operated damper control system shall be similar and equal to United Ene-Tech Corporation, "Power Balance" system including motor operated control, R-11 plenum rated cabling and flush ceiling or wall mounted R-11 jack in remote plate. Include one hand held battery pack operator pack to be delivered to the Owner upon completion of the balancing.

2.03 FLEXIBLE DUCT CONNECTIONS

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.

B. Flexible Duct Connections: Fabric crimped into metal edging strap.

1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz per sq yd.

2. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz per sq yd.

3. Metal: 3 inches wide, 24 gage thick galvanized steel.

2.04 DUCT ACCESS DOORS

A. Manufacturers: Acudor Products Inc.; Nalor Industries Inc.; Ruskin Company; SEMCO Incorporated.

B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.

C. Fabrication: Rigid and close-fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ducts, install minimum 1/2 inch thick insulation with steel metal cover.

D. Less than 12 inches Square: Secure with seal locks.

E. 2 up to 18 inches Square: Provide two hinges and two seal locks.

F. Access doors with sheet metal screw fasteners are not acceptable.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA HVAC Duct Construction Standards - Metal and Flexible. Duct construction and pressure class.

B. Fabricate in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA HVAC Duct Construction Standards - Metal and Flexible. Duct construction and pressure class.

C. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

D. Fabricate continuously welded round and oval duct fittings two gages heavier than duct gages indicated in SMACNA Standards. Joints shall be minimum inch cemented slip joint, brazed or electric welded. Prime coat welded joints.

E. Provide standard 45 degree elbows unless otherwise indicated where 90 degree elbows are used. Connections may be used.

F. Where ducts are connected to other louvers and duct outlet is smaller than lower frame, provide blank-out panels sealing lower area around duct. Use same material as duct, painted black on exterior side, seal to lower frame and duct.

2.03 DUCT MANUFACTURERS

A. Metal-Fab, Inc.; SEMCO Incorporated; United McGill Corporation.

2.04 MANUFACTURED METAL DUCTWORK AND FITTINGS

A. Manufacture in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated. Do not provide ductwork with light reinforcing for operating pressures indicated.

B. Round Spiral Ductwork: Manufacture from round spiral lockseam duct with light reinforcing corrugations; fittings manufactured of at least two gages heavier metal than duct.

C. Double Wall Insulated Round Ducts: Round spiral lockseam duct with galvanized steel outer wall, 1 inch thick fiberglass insulation, perforated galvanized steel inner wall, fitting with solid lower wall.

D. Transverse Duct Connection System: SMACNA "E" rated rigidity class connection, interlocking angle and duct edge connection system with sealant, gasket, details, and corner caps.

2.05 KITCHEN HOOD EXHAUST DUCTWORK - TYPE 1

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and NFPA 96.

B. Construct of 18 gage carbon steel or 18 gage stainless steel, using continuous external welded joints.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine drawings for the Architectural, Structural, Electrical and all other trades prior to preparation of ductwork shop drawings and prior to the fabrication of any ductwork.

B. Resolve any conflicts encountered with the Engineer prior to fabrication.

C. Identify on ductwork shop drawings any deviations in sizes or shapes made necessary by the obstructions of other trades.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.

C. Install and seal metal and flexible ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

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

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

F. Use crimp joints and lock washers on threaded rod supports.

G. Use double nuts and lock washers on threaded rod supports.

H. Connect flexible ducts to metal ducts with draw bands.

I. Support flexible duct runs every five feet in the horizontal direction to avoid dips and sags.

J. Connect terminal units to supply ducts with one foot maximum length of flexible duct. Do not use flexible duct to change direction.

K. Connect diffusers to low pressure ducts directly or with 5 feet maximum length of flexible duct held in place with straps or clamps. Longer duct lengths are acceptable if depicted on the design drawings and allowed per local code. A maximum of one 90 degree bend, or equivalent, will be allowed in flexible duct runs.

L. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

M. All exposed ducts in finished areas must be completely free from all dents or imperfections in the galvanized coating and shall be sealed CAREFULLY AND NEATLY with duct sealer completely contained within the joint. Duct wrap will not be permitted in exposed locations.

N. Kitchen hood exhaust, Type 1: Use stainless steel for ductwork exposed to view and stainless steel or carbon steel for ducts where concealed.

O. For all hood systems, perform all required regurgity duct leakage and weld tests in the presence of the code official, including but not limited to light tests and smoke tests, to demonstrate the integrity of the duct construction prior to the installation of any insulation that prevents visual inspection of the ductwork on all sides.

P. Provide residue traps in kitchen hood exhaust ducts at base of vertical risers with provisions for clean out.

Q. Moisture laden vapor exhaust: Use stainless steel for ductwork exposed to view and stainless steel or Glass Fiber Reinforced Plastic where concealed and not located in return or plenums. If located in return or plenum spaces, use stainless steel ductwork. Weld or caulk all seams and joints water tight.

R. All rooftop penetrations shall be flashed and weather sealed by the roofing manufacturer's authorized roofing contractor at this Contractor's expense. This Contractor shall contract with the factory authorized roofing contractor for the specific roofing system applicable to this project. The use of an unauthorized roofing contractor may result in removal and replacement of the penetration systems at this Contractor's expense.

3.03 CLEANING

A. Clean duct system and force air at high velocity through duct to remove accumulated dirt or clean with high power vacuum machines. To obtain sufficient air, clean half the system at a time. Protect equipment which may be harmed by excessive dirt with temporary filters, or bypass during cleaning.

3.04 SCHEDULES

A. Ductwork Material:

B. The Contractor may use any of the following ductwork materials, at his option, provided the selected material meets with the approval of all State, local authorities and utility company requirements. Verification of compliance of the selected piping material is the sole responsibility of the installing Contractor.

1. Low Velocity Supply (Heating Systems): Galvanized Steel, Aluminum.

2. Low Velocity Supply (System with Cooling Coils): Galvanized Steel, Aluminum.

3. Return and Relief: Galvanized Steel, Aluminum.

4. General Exhaust: Galvanized Steel, Aluminum.

5. Outside Air Intake: Galvanized Steel.

6. Medium and High Velocity Supply: Galvanized Steel.

7. Kitchen Hood Exhaust, Type 1: Carbon Steel, Stainless Steel, Constructed per NFPA 96.

8. Dishwasher Exhaust: Stainless Steel, Glass Fiber Reinforced Plastic, seal or weld all joints water tight.

C. Ductwork Pressure Class:

1. Low Velocity Supply (Heating Systems): Scheduled System ESP+0.25", round up to next higher pressure class.

2. Low Velocity Supply (Systems with Cooling): Scheduled System ESP +0.5", round up to next higher pressure class.

3. Return and Relief: inch.

4. Kitchen Hood Exhaust: Scheduled System ESP +1.0", round up to next higher pressure class.

5. Medium and High Velocity Supply: Scheduled System ESP +1.0", round up to next higher pressure class.

6. Kitchen Hood Exhaust: See drawings for maximum fan static pressure plus 50% additional.

7. Dishwasher Exhaust: 2 inch.

END OF SECTION

SECTION 233423 - HVAC POWER VENTILATORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Roof exhausters.

B. Kitchen range hood exhausters.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Greenheck; Loren Cook Company; PennBarry; CapitalAir.

2.02 POWER VENTILATORS - GENERAL

A. Performance shall conform to the following:

1. Certified Rating: Determined in accordance with AMCA 210 and bearing the AMCA Certified Rating Seal.

B. Sound Ratings: AMCA 300, tested to AMCA 300, and bearing AMCA Certified Sound Rating Seal.

C. Fabrication: Conform to AMCA 99.

D. Backdraft Damper: Motor actuated (or gravity damper if depicted on design drawings), aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked, and line voltage motor drive, power open, spring return.

E. Gaskets: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheave selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

F. Kitchen hood exhausters shall be upblast with grease trap, ventilated double wall curb and hinged curb, motor base for cleaning. Hood exhausters shall comply with requirements of NFPA 96.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide shaves required for final air balance at an additional expense to the project.

C. Secure roof and wall exhausters with cadmium plated steel lag screws to roof curb or structure.

D. Extend ducts to roof and wall exhausters into roof curb or wall structure.

E. Install backdraft dampers (gravity or motorized as depicted on design drawings) on inlet to roof and wall exhausters.

F. All rooftop penetrations shall be flashed and weather sealed by the roofing manufacturer's authorized roofing contractor at this Contractor's expense. This Contractor shall contract with the factory authorized roofing contractor for the specific roofing system applicable to this project. The use of an unauthorized roofing contractor may result in removal and replacement of the penetration systems at this Contractor's expense.

END OF SECTION

SECTION 233600 - AIR TERMINAL UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Single duct terminal units.

B. Interleaf heating coils.

1. Electric resistance.

1.02 SUBMITTALS

A. Product Data: Provide data indicating configuration, general assembly, and materials used in fabrication. Include catalog performance ratings that indicate airflow, static pressure, and NC designation. Include electrical characteristics and connection requirements.

B. Shop Drawings: Indicate and detail configuration, general assembly, and materials used in fabrication, and electrical characteristics and connection requirements.

1. Include schedules listing discharge and radiused sound power level for each of second through sixth octave bands at inlet static pressures of 1 to 4 inch wg.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Mechanical cable operated control system shall be similar and equal to Young Regulator Company, "Bowden Cable Control" system including damper, flexible cable with casing and concealed cabling regulator control.

2. Electrically operated damper control system shall be similar and equal to United Ene-Tech Corporation, "Power Balance" system including motor operated control, R-11 plenum rated cabling and flush ceiling or wall mounted R-11 jack in remote plate. Include one hand held battery pack operator pack to be delivered to the Owner upon completion of the balancing.

2.02 MANUFACTURED UNITS

A. Ceiling mounted supply air control terminals for connection to central air systems.

B. Electrically operated damper control system shall be similar and equal to Young Regulator Company, "Bowden Cable Control" system including damper, flexible cable with casing and concealed cabling regulator control.

2.03 SINGLE DUCT TERMINAL UNITS

A. Base Assembly:

1. Configuration: Air volume damper assembly inside unit casing. Locate control components inside protective metal shroud.

2. Volume Damper: Construct of galvanized steel with peripheral gasket and self lubricating bearings; maximum damper leakage: 2 percent of design airflow at 1 inches rated inlet static pressure.

3. Mount damper operator to position damper normally open.

C. Attenuator Section: Line attenuator sections with 2 inch thick insulation.

D. Multi Outlet Attenuator Section: With 6 inch diameter collars, each with butterfly balancing damper with lock.

E. Electric Heating Coil:

1. Construction: UL listed, slip-in type, open coil design, integral control box factory wired and installed, with:

a. Primary and secondary over-temperature protection.

b. Minimum airflow switch.

c. Magnetic contactor for each step of control.

F. Automatic Damper Operator:

1. Electric actuator, 24 volt with high limit.

G. Provide unit complete with manufacturer's standard DDC controller with wall mounted electric thermostat.

1. DDC controller shall sequence supply air damper for pressure independent control to compensate for varying inlet static pressures.

2. Provide adjustable minimum and maximum airflow limits set at control device.

3. Adjust to the values indicated on the Drawings.

4. Maintain airflow to within 5 percent of set point with inlet static pressure variations up to 2 inches (0.5 kPa).

5. Modulate heating coil control valve in response to a call for heating after the supply air damper has reached the minimum position. Provide dual maximum airflow on units equipped with heating coils. Adjust to the values indicated on the Drawings.

5. Slope electric heating coil in response to a call for heating after supply air damper has reached the minimum position. Provide dual maximum airflow on units equipped with heating coils.

H. Thermostat: Electric type with appropriate mounting hardware.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions. Support units individually from structure. Do not support from adjacent ductwork.

B. Provide ceiling access doors or locate units above easily removable ceiling components.

3.02 ADJUSTING

A. Test volume damper operator attached to assembly allowing flow range modulation from 100 percent of design flow to 0 percent full flow or to minimum circulation cfm as scheduled on the Drawings.

END OF SECTION

SECTION 233700 - AIR OUTLETS AND INLETS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Rectangular ceiling diffusers.

B. Perforated face ceiling diffusers.

C. Grid core exhaust and return grilles.

1.02 QUALITY ASSURANCE

A. This section includes hydro-peroxide, Super-Oxide Lites, & Hydroxide Lite's delivered via PH technology through packaged heating and cooling units capable of supplying 800 to 2,400 CFM of supply air to the indoor space.

PART 1 GENERAL

1.01 SUMMARY

A. This section includes hydro-peroxide, Super-Oxide Lites, & Hydroxide Lite's delivered via PH technology through packaged heating and cooling units capable of supplying 800 to 2,400 CFM of supply air to the indoor space.

1.02 QUALITY ASSURANCE

A. This section includes hydro-peroxide, Super-Oxide Lites, & Hydroxide Lite's delivered via PH technology through packaged heating and cooling units capable of supplying 800 to 2,400 CFM of supply air to the indoor space.

CODE: 2018 INTERNATIONAL MECHANICAL CODE

ROOM #	NAME	AREA (FT <sup>2</sup> )	TABLE 403.3.1.1 R <sub>p</sub> PEOPLE/CA (CFM/PER)	TABLE 403.3.1.1 R <sub>a</sub> AREA/CA (CFM/FT <sup>2</sup> )	TABLE 403.3.1.1 OCCUPANT DENSITY (#/1000 FT <sup>2</sup> )	P <sub>1</sub> (F)	R <sub>1</sub> P <sub>1</sub> (CFM)	R <sub>1</sub> A <sub>1</sub> (CFM)	V <sub>1</sub> (CFM)	TABLE 403.3.1.1.1.2 V <sub>1</sub> (CFM)	V <sub>1</sub> MAX SUPPLY (CFM)	V <sub>1</sub> MIN SUPPLY (CFM)	V <sub>1</sub> SUPPLY (CFM)	Z <sub>1</sub>	CALCULATED TABLE 403.3.1.1.2.3.2 E <sub>v</sub>
101	ORDERING AND CHECKOUT	209	7.5	0.12	15	4	30	25	55	0.80	69	200	200	0.344	0.81
102	DINING AREA	355	7.5	0.18	70	28	210	64	274	0.80	342	600	600	0.571	0.98
103	OPEN KITCHEN	286	7.5	0.12	20	6	45	32	77	0.80	96	1836	1836	0.282	1.00
104	COLD LINE	198	7.5	0.12	20	4	30	24	54	0.80	67	2920	2920	0.527	1.00
105	SUPPORT	328	7.5	0.12	20	7	53	39	92	0.80	118	200	200	0.574	0.98
106	DISH	184	7.5	0.12	20	4	30	22	52	0.80	65	640	640	0.102	1.00
107	BACK OF HOUSE	528	7.5	0.12	20	11	83	63	146	0.80	182	820	820	0.222	0.93
108	MANAGERS OFFICE	24	5.0	0.09	5	2	10	3	15	0.80	19	350	350	0.034	1.00
		2,152				66	490	275	755		956	7145	7145	0.574	0.98

OUTDOOR AIR CALCULATIONS PER EQUATION 4-1:

SYMBOL	VALUE	DESCRIPTION
P <sub>s</sub>	86	SYSTEM POPULATION
SP <sub>z</sub>	86	ZONE POPULATION
D	1,000	OCCUPANT DIVERSITY
V <sub>out</sub>	785	UNCORRECTED OUTDOOR AIR INTAKE
Z <sub>v</sub> (max)	0.574	ZONE PRIMARY OUTDOOR AIR FRACTION (MAXIMUM)
E <sub>v</sub>	0.58	SYSTEM VENTILATION EFFICIENCY
SP <sub>z</sub>	7150	ZONE PRIMARY AIRFLOW
V <sub>out</sub>	1,328	CODE REQUIRED OUTDOOR AIRFLOW RATE, CFM
V <sub>out</sub>	1,330	DESIGN OUTDOOR AIRFLOW RATE, CFM

① OUTSIDE AIR CALCULATIONS

SETPOINT/CONTROL	EX. VAV-1,-2,-3	VAV-4	FC-1 OFFICE
<b>*SETPOINTS*</b>			
COOLING - OCCUPIED SETPOINT	75 F	75 F	75 F
COOLING - UNOCCUPIED SETPOINT	80 F	80 F	80 F
HEATING - OCCUPIED SETPOINT	70 F	70 F	70 F
HEATING - UNOCCUPIED SETPOINT	60 F	60 F	60 F
ECONOMIZER UPPER LIMIT SETPOINT	65 F	65 F	NA
<b>*ACCESSORIES*</b>			
HVAC SYSTEM OCCUPIED/UNOCCUPIED MODE - PROGRAMMABLE THERMOSTAT	YES	YES	YES
REMOTE TEMPERATURE SENSOR	YES	YES	NO
MOTORIZED OUTDOOR AIR DAMPER	NO	NO	YES
INTEGRATED ECONOMIZER	NO	NO	NO
ECONOMIZER FAULT DETECTION	NO	NO	NO
BAROMETRIC RELIEF	NO	NO	NO
POWERED EXHAUST RELIEF	NO	NO	NO
DEHUMIDIFICATION (HOT GAS REHEAT)	NO	NO	NO
<b>*SUPPLY FAN*</b>			
ON DURING OCCUPIED MODE	NA	NA	YES
VARIABLE VOLUME - MODULATE FAN SPEED	NA	NA	YES
<b>*SAFETIES AND INTERLOCKS*</b>			
RETURN AIR SMOKE DETECTOR	NO	NO	NO
LOW LIMIT FREEZE/STAT	NO	NO	YES
FIRE ALARM CONTROL PANEL INTERLOCK	YES	YES	YES
KITCHEN EXHAUST SYSTEM INTERLOCK	YES	YES	YES

EQUIPMENT TAG	SUPPLY AIRFLOW (CFM)	OUTDOOR AIRFLOW (CFM)	RETURN AIRFLOW (CFM)	EXHAUST AIRFLOW (CFM)	OA/SA (%)	REMARKS
EX. VAV-1	2,000	500	1,500		25%	FOH
EX. VAV-2	2,000	500	1,500		25%	DINING
EX. VAV-3	2,000	500	1,500		25%	DINING
VAV-4	800	200	600		25%	DINING
FC-1	350	15	335		4%	OFFICE
EF-1				1,200		HOOD-1
EF-2				860		HOOD-2
EF-3				675		HOOD-3
TOTAL =	7,150	1,715	5,435	2,735		
RESULTING BUILDING PRESSURIZATION = -1,020 CFM						
PRESSURIZATION PERCENTAGE* = -14.3 %						
REMAINING MAKE-UP AIR IS TO BE PROVIDED BY MALL COMMONS AREA.						

CARRIER EQUIPMENT SHALL BE OBTAINED THROUGH SHAKE SHACK NATIONAL ACCOUNT. CONTACT CARRIER CORPORATION FOR PROPOSALS: KEN REVILLA  
 CARRIER RETAIL STRATEGIC ACCOUNTS  
 EMAIL: KEN.REVILLA@CARRIER.COM  
 PHONE: (954) 218-0070

MARK	LOCATION	SERVES	NOMINAL COOL (TONS)	HEATING AT 47F (MBH)	ELECTRICAL				SEER2	HSPF2	MANUFACTURER	MODEL NUMBER	REMARKS
					VOLT	PH	MCA	MOCP					
ASHP-1	ROOF	FC-1	3/4	9.8	208	1	15.0	15	20.5	10.3	CARRIER	38MARBQ09	[1,2]

REMARKS:  
 1. PROVIDE EQUIPMENT WITH SCOR GREATER THAN THE AVAILABLE FAULT CURRENT AT THE EQUIPMENT OR UPSTREAM PANELBOARD. REFER TO THE ELECTRICAL ONE LINE DIAGRAM AND PANEL SCHEDULES FOR AVAILABLE FAULT CURRENT AT UPSTREAM PANELBOARD.  
 2. PROVIDE WITH LOW AMBIENT CONTROL.

MARK	NOMINAL (TONS)	COOLING TON (MBH)	SEN (MBH)	HEATING OUT (MBH)	SUPPLY AIR (CFM)	FAN (WATT)	ELECTRICAL				SEER2	CARRIER MODEL NUMBER	REMARKS
							VOLT	PH	MCA	MOCP			
FC-1	3/4	11.73	8.79	9.80	350	45	208	1	0.2	N/A	20.5	40MBCQ09	[1,2]

REMARKS:  
 1. INDOOR UNIT POWER PROVIDED FROM OUTDOOR UNIT.  
 2. PROVIDE NEW, WIRED, FULLY DIGITAL, 7 DAY PROGRAMMABLE TYPE THERMOSTAT WITH AUTO CHANGE OVER AND AUTO SET BACK.

MARK	SERVICE	LOCATION	CEILING TYPE	MOUNTING TYPE	MANUFACTURER	MODEL NUMBER	REMARKS
D-2	SUPPLY	CEILING	AC TILE	LAY-IN	TITUS	PAR XX 24x24 3 26	[1,2,6]
D-3	SUPPLY	CEILING	AC TILE	LAY-IN	TITUS	OMNI XX 24x24 3 26	[1,2,4,6,7]
D-4	SUPPLY	CEILING	AC TILE	LAY-IN	TITUS	TMS XX 12x12 3 26	[1,2,4,6,7]
D-5	SUPPLY	CEILING	AC TILE	LAY-IN	TITUS	TDC XX 18x18 3 26 2	[1,2,6]
G-1	RETURN	CEILING	AC TILE	LAY-IN	TITUS	50F X X 3 26	[1,3,5,6]

REMARKS:  
 1. TITUS IS THE BASE OF DESIGN. KRUEGER, PRICE, NAILOR, CARNES ARE EQUAL. NO EXCEPTIONS.  
 2. SEE PLAN FOR NECK SIZE.  
 3. PROVIDE 1/2" X 1/2" X 1" CORE.  
 4. PROVIDE WITH MODEL TRM FRAME.  
 5. SEE PLAN FOR SIZE.  
 6. DIFFUSERS/GRILLES SHALL BE FINISHED TO MATCH CEILING/WALL/EXPOSED DUCT COLOR. COORDINATE WITH ARCHITECT.  
 7. PROVIDE DIFFUSERS AND GRILLES WITH NO EXPOSED MOUNTING SCREWS.

MARK	SERVES	COOL MAX (CFM)	COOL MIN (CFM)	HEAT MAX (CFM)	RAD SOUND (NC)	DIS SOUND (NC)	HEATING COIL			MANUFACTURER	MODEL NUMBER	REMARKS	
							KW	STEP	VOLT PH				
VAV-4	ORDER/SEATING	800	250	250	17	19	2.5	5	208	3	TITUS	DES12	1-4

REMARKS:  
 1. PROVIDE 24 VOLT CONTROL TRANSFORMER.  
 2. PROVIDE WITH AUTOMATIC THERMAL CUTOFF, MANUAL RESET, AIRFLOW SWITCH, MAGNETIC CONTACTOR, AND DISCONNECT SWITCH.  
 3. PROVIDE WITH INTEGRAL SOUND ATTENUATOR.  
 4. PROVIDE CONTROLS COMPATIBLE WITH MALL BUILDING MANAGEMENT SYSTEM.

MARK	LOCATION	SERVICE	AIRFLOW (CFM)	EXTERNAL STATIC (IN H2O)	MOTOR DATA				FEI	MANUFACTURER	MODEL NUMBER	REMARKS
					SONES	FAN (HP)	VOLT	PH				
EF-1	ROOF	HOOD-1										1
EF-2	ROOF	HOOD-2										1
EF-3	ROOF	HOOD-2										1

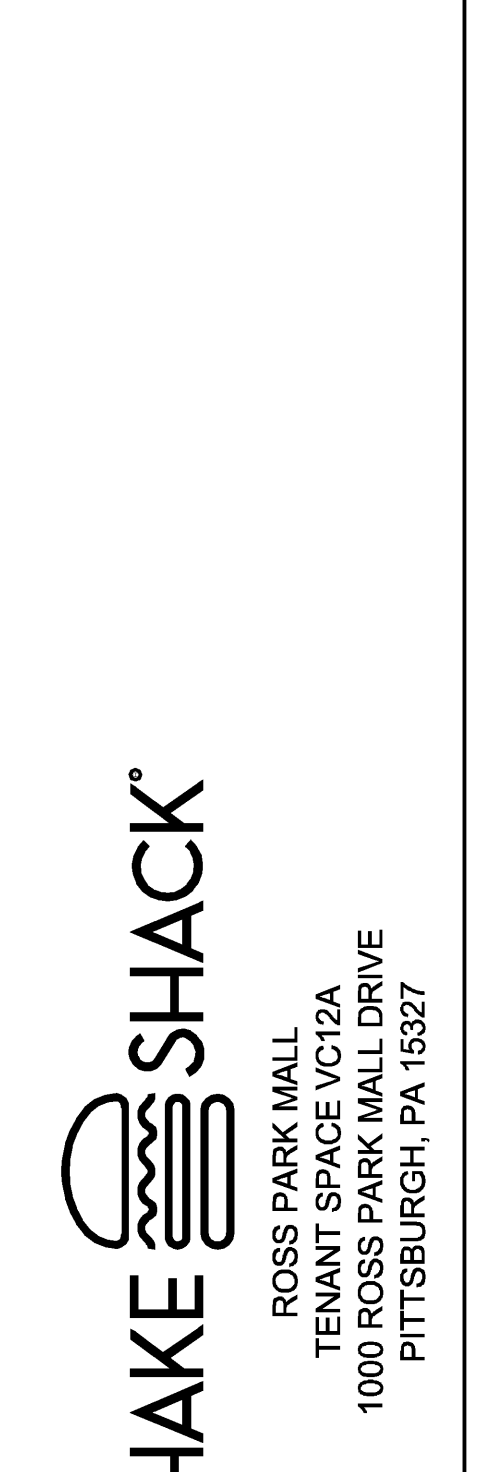
REMARKS:  
 1. REFERENCE CAPTIVEAIRE DRAWINGS FOR ADDITIONAL INFORMATION

UNIT NO.	PLACEMENT	PHI CELL MODEL #	UV/CELL SIZE	RANGE	INDOOR PPM TARGET	SIZE	TRANSFORMER	POWER	IN-VOLT	OUT-VOLT	MCA	WEIGHT (LBS.)
EX. VAV-2	SUPPLY AIR DUCT	REME HALO 24V	11"	250-2,400 CFM	< 0.02 PPM	6.50"W x 14.25"L x 7.50"D	SHIP LOOSE	17W	115 VAC	24 VAC	0.70A	6 LBS
EX. VAV-3	SUPPLY AIR DUCT	REME HALO 24V	11"	250-2,400 CFM	< 0.02 PPM	6.50"W x 14.25"L x 7.50"D	SHIP LOOSE	17W	115 VAC	24 VAC	0.70A	6 LBS
VAV-4	SUPPLY AIR DUCT	REME HALO 24V	11"	250-2,400 CFM	< 0.02 PPM	6.50"W x 14.25"L x 7.50"D	SHIP LOOSE	17W	115 VAC	24 VAC	0.70A	6 LBS

**LANDLORD COMMENTS:**  
 TENANT TO ENSURE SPACE HAS NEGATIVE PRESSURE TO MINIMIZE COOKING ODORS FROM ESCAPING THROUGH STOREFRONT.  
 ANY UN-USED HVAC EQUIPMENT, DUCTWORK, PIPING, WIRING, ETC. WITHIN OR SERVING THE DEMISED PREMISES MUST BE REMOVED.  
 ODOOR PRODUCING TENANTS:  
 TENANT SHALL INSTALL AN INDICATOR PILOT LAMP 12" ABOVE THERMOSTAT FOR THE PURPOSE OF VERIFYING EXHAUST FAN OPERATION.  
 ODOOR EXHAUST AND MAKEUP AIR FAN OPERATION SHALL BE CONTINUOUS DURING OCCUPIED HOURS.  
 TENANT TO ENSURE LATEST BMS TEMPERATURE CONTROLS CRITERIA IS INCORPORATED INTO DESIGN AND PLACED IN OPERATION. SEE BMS CONTROLS CRITERIA BULLETIN ON MALL DAM SITE: <https://dam.simon.com/s/o/qmNoXh06F7JZ0H>



STORE NO:  
**#1758**



REVISIONS	
NO.	DESCRIPTION
A	07/14/2025 REVISION A
T	08/04/2025 REVISION T

STATUS:  
 IFC SET

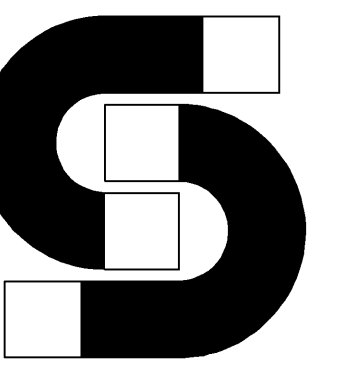


FIELD VERIFICATION:  
 The Contractor shall verify all physical dimensions and conditions at the project site and notify Zebra Architecture, PLLC of any discrepancies, omissions or discrepancies before beginning or fabricating any work. Do not scale from drawings.  
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SHEET NAME:	
MECHANICAL SCHEDULES	
DATE: 08/23/2025	PROJECT NO: 40403
DRAWN: SEI	SCALE: AS NOTED
SHEET NO: <b>M601</b>	







STORE NO:  
**#1758**

**SHAKE SHACK**  
ROSS PARK MALL  
TENANT SPACE VC12A  
1000 ROSS PARK MALL DRIVE  
PITTSBURGH, PA 15237

REVISIONS	
DESCRIPTION	DATE



Eastern, PA Mechanical  
225 E City Line Avenue, Suite #103, East Cynwyd, PA, 19004 PHONE: (267) 504 - 4126 EMAIL: reg108@captiveaire.com

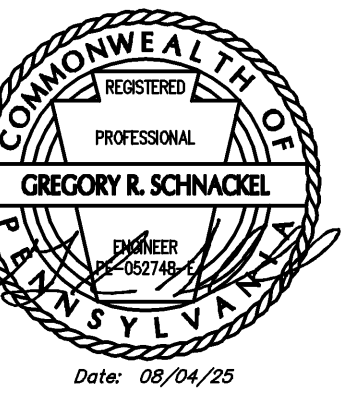
Shake Shack-1758- Rose Park Mall, PA  
PITTSBURGH, PA, 15237

DATE: 5/19/2025  
DWG #: 7528657  
DRAWN BY: Joe,shilba  
SCALE: 3/4" = 1'-0"  
MASTER DRAWING

SHEET NO.  
3

REVISIONS	
DATE	DESCRIPTION
07/14/2025	REVISION A
06/04/2025	REVISION 1

STATUS:  
IFC SET

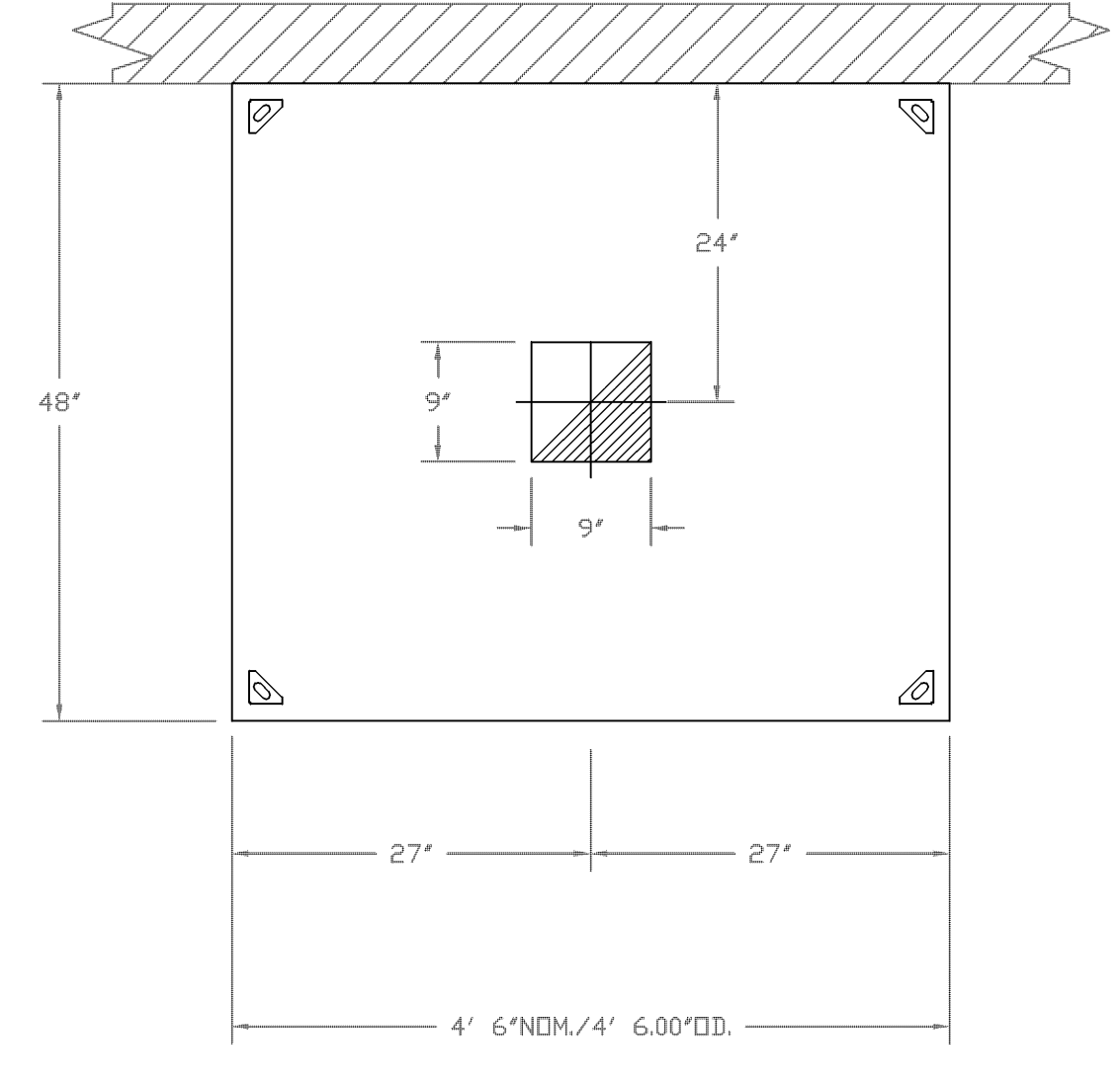


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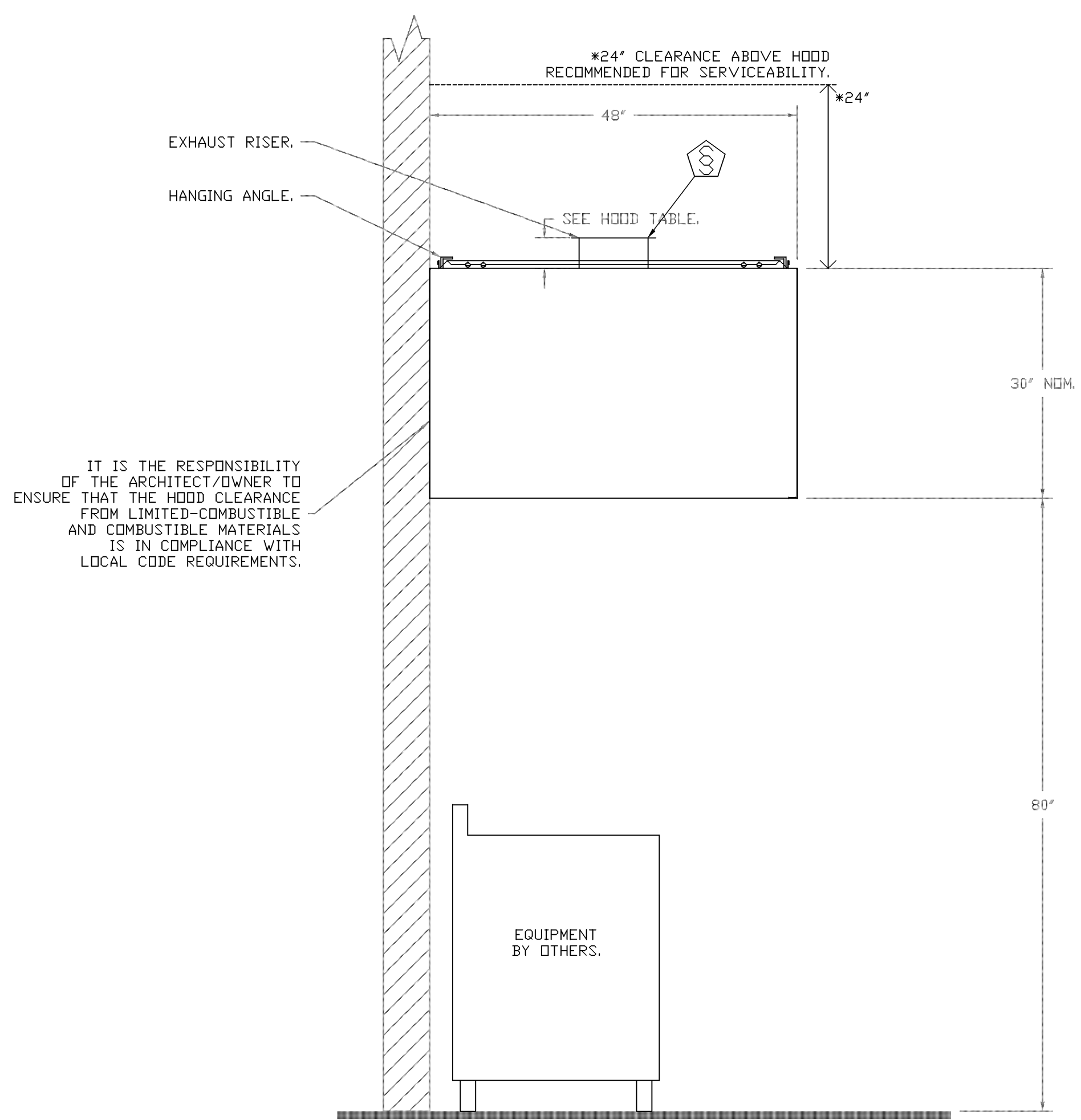
SHEET NAME:  
**CAPTIVEAIRE DRAWINGS**

DATE: 05/23/2025 PROJECT NO: 40403  
DRAWN: SEI SCALE: AS NOTED

SHEET NO.:  
**M703**



PLAN VIEW - HOOD #3 (Dish Hood)  
4' 6.00" LONG 4830VHB



IT IS THE RESPONSIBILITY OF THE ARCHITECT/OWNER TO ENSURE THAT THE HOOD CLEARANCE FROM LIMITED-COMBUSTIBLE AND COMBUSTIBLE MATERIALS IS IN COMPLIANCE WITH LOCAL CODE REQUIREMENTS.

SECTION VIEW - MODEL 4830VHB  
HOOD - #3 (Dish Hood)

E  
D  
C  
B  
A



**EXHAUST FAN INFORMATION - JOB#7528657**

FAN UNIT NO.	TAG	QTY	FAN UNIT MODEL #	MANUFACTURER	CFM	ESP	RPM	MOTOR ENCL.	HP	BHP	PHASE	VOLT	FLA	DISCHARGE VELOCITY	WEIGHT (LBS)	SDNES
1	KEF<GRILL>	1	DU85HFA	CAPTIVEAIRE	1188	1.200	1303	TEAD-ECM	0.750	0.3800	1	208	5.2	376 FPM	90	10.5
2	KEF<FRYER>	1	DU85HFA	CAPTIVEAIRE	860	1.200	1230	TEAD-ECM	0.750	0.3200	1	208	5.2	272 FPM	90	9.4
3	DISH EF	1	DR50HFA	CAPTIVEAIRE	675	1.000	1358	TEAD-ECM	0.500	0.2790	1	115	6.3		65	12.6

**FAN ACCESSORIES**

FAN UNIT NO.	TAG	EXHAUST				SUPPLY		
		GREASE CUP	GRAVITY DAMPER	WALL MOUNT	SIDE DISCHARGE	GRAVITY DAMPER	MOTORIZED DAMPER	WALL MOUNT
1	KEF<GRILL>	YES						
2	KEF<FRYER>	YES						
3	DISH EF		YES					

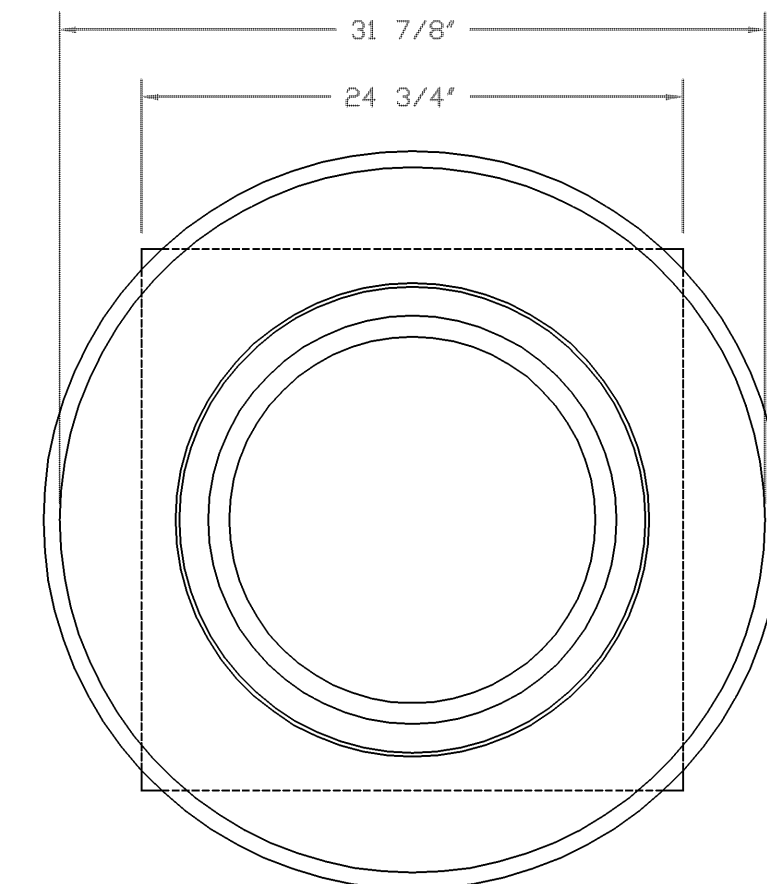
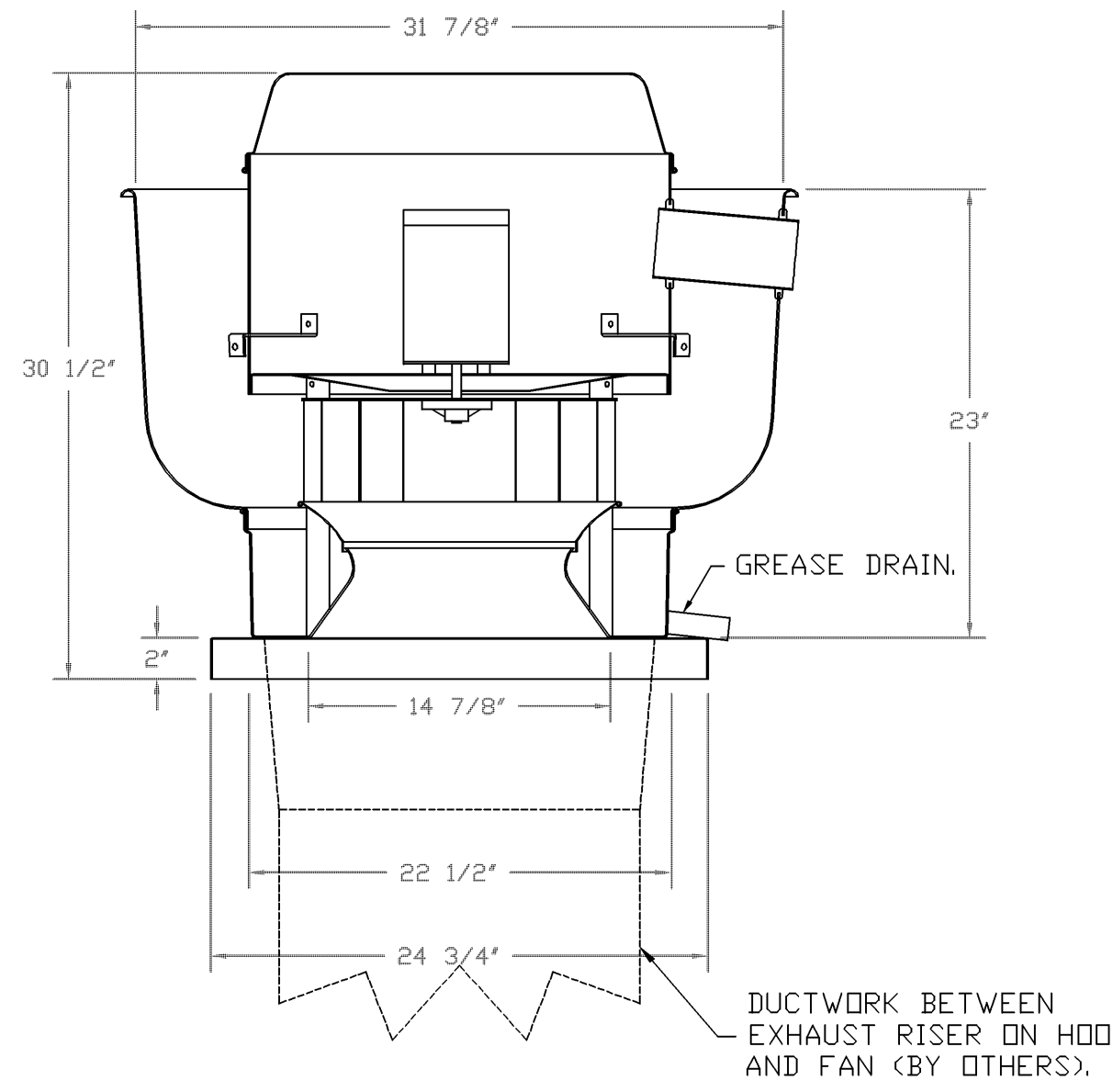
**CURB ASSEMBLIES**

NO	DN FAN	TAG	WEIGHT	ITEM	SIZE
1	# 1	KEF-1	36 LBS	CURB	23.000"W X 23.000"L X 20.000"H HINGED.
2	# 2	KEF<FRYER>	36 LBS	CURB	23.000"W X 23.000"L X 20.000"H HINGED.
3	# 3	DISH EF	22 LBS	CURB	19.500"W X 19.500"L X 14.000"H HINGED.

**FAN OPTIONS**

FAN UNIT NO.	TAG	QTY	DESCRIPTION
1	KEF<GRILL>	1	GREASE BOX
		1	FAN BASE CERAMIC SEAL - DU/DR85HFA - INSTALLED AT PLANT - FOR GREASE DUCTS
		1	ECM WIRING PACKAGE - EXHAUST - MODBUS CONTROL -MSC- <TELCD>, CCW ROTATION
2	KEF<FRYER>	1	2 YEAR PARTS WARRANTY
		1	GREASE BOX
		1	FAN BASE CERAMIC SEAL - DU/DR85HFA - INSTALLED AT PLANT - FOR GREASE DUCTS
3	DISH EF	1	ECM WIRING PACKAGE - EXHAUST - MODBUS CONTROL -MSC- <TELCD>, CCW ROTATION
		1	2 YEAR PARTS WARRANTY
		1	ECM WIRING PACKAGE - MANUAL OR 0-10VDC REFERENCE SPEED CONTROL -RTC- <TELCD MOTOR>, CCW ROTATION

FANS #1 <KEF<GRILL>>, #2 <KEF<FRYER>> - DURSHFA EXHAUST FAN



TOP VIEW

**FEATURES:**

- DIRECT DRIVE CONSTRUCTION (NO BELTS/PULLEYS).
- ROOF MOUNTED FANS.
- RESTAURANT MODEL.
- UL705 AND UL762 AND ULC-5645
- VARIABLE SPEED CONTROL.
- INTERNAL WIRING.
- THERMAL OVERLOAD PROTECTION (SINGLE PHASE).
- HIGH HEAT OPERATION 300°F (149°C).
- GREASE CLASSIFICATION TESTING.
- NEMA 3R SAFETY DISCONNECT SWITCH.

**NORMAL TEMPERATURE TEST**

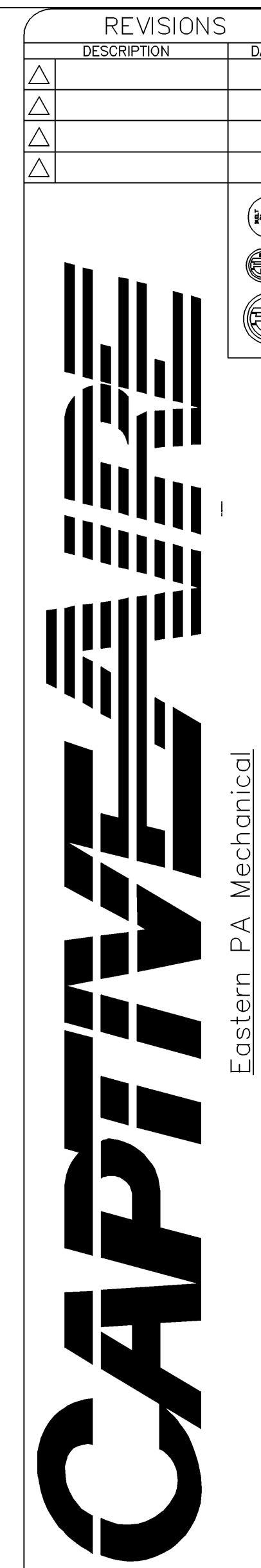
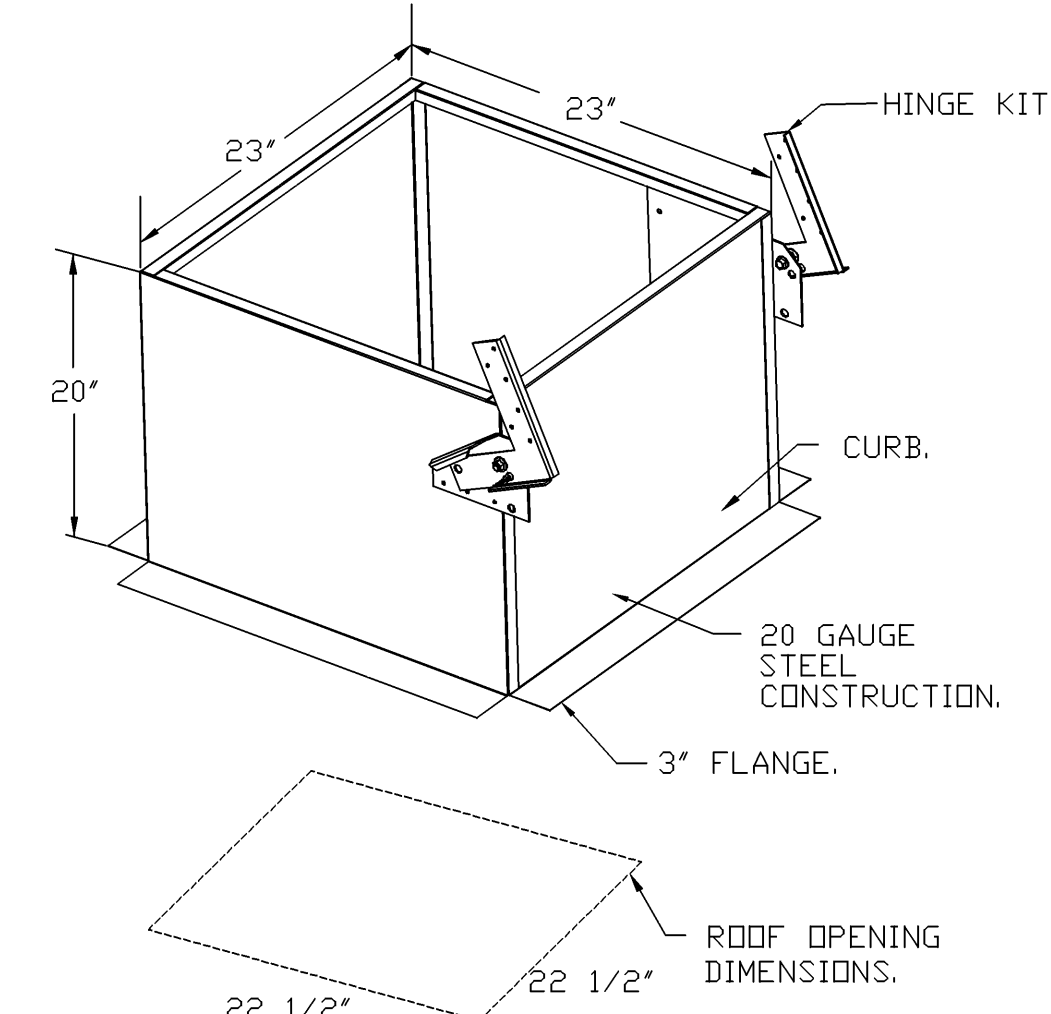
EXHAUST FAN MUST OPERATE CONTINUOUSLY WHILE EXHAUSTING AIR AT 300°F (149°C) UNTIL ALL FAN PARTS HAVE REACHED THERMAL EQUILIBRIUM, AND WITHOUT ANY DETERIORATING EFFECTS TO THE FAN WHICH WOULD CAUSE UNSAFE OPERATION.

**ABNORMAL FLAME-UP TEST**

EXHAUST FAN MUST OPERATE CONTINUOUSLY WHILE EXHAUSTING BURNING GREASE VAPORS AT 600°F (316°C) FOR A PERIOD OF 15 MINUTES WITHOUT THE FAN BECOMING DAMAGED TO ANY EXTENT THAT COULD CAUSE AN UNSAFE CONDITION.

**OPTIONS**

- GREASE BOX.
- FAN BASE CERAMIC SEAL - DU/DR85HFA - INSTALLED AT PLANT - FOR GREASE DUCTS.
- ECM WIRING PACKAGE - EXHAUST - MODBUS CONTROL -MSC- <TELCD>, CCW ROTATION.
- 2 YEAR PARTS WARRANTY.



Shake Shack-1758- Rose Park Mall, PA  
PITTSBURGH, PA, 15237

DATE: 5/19/2025

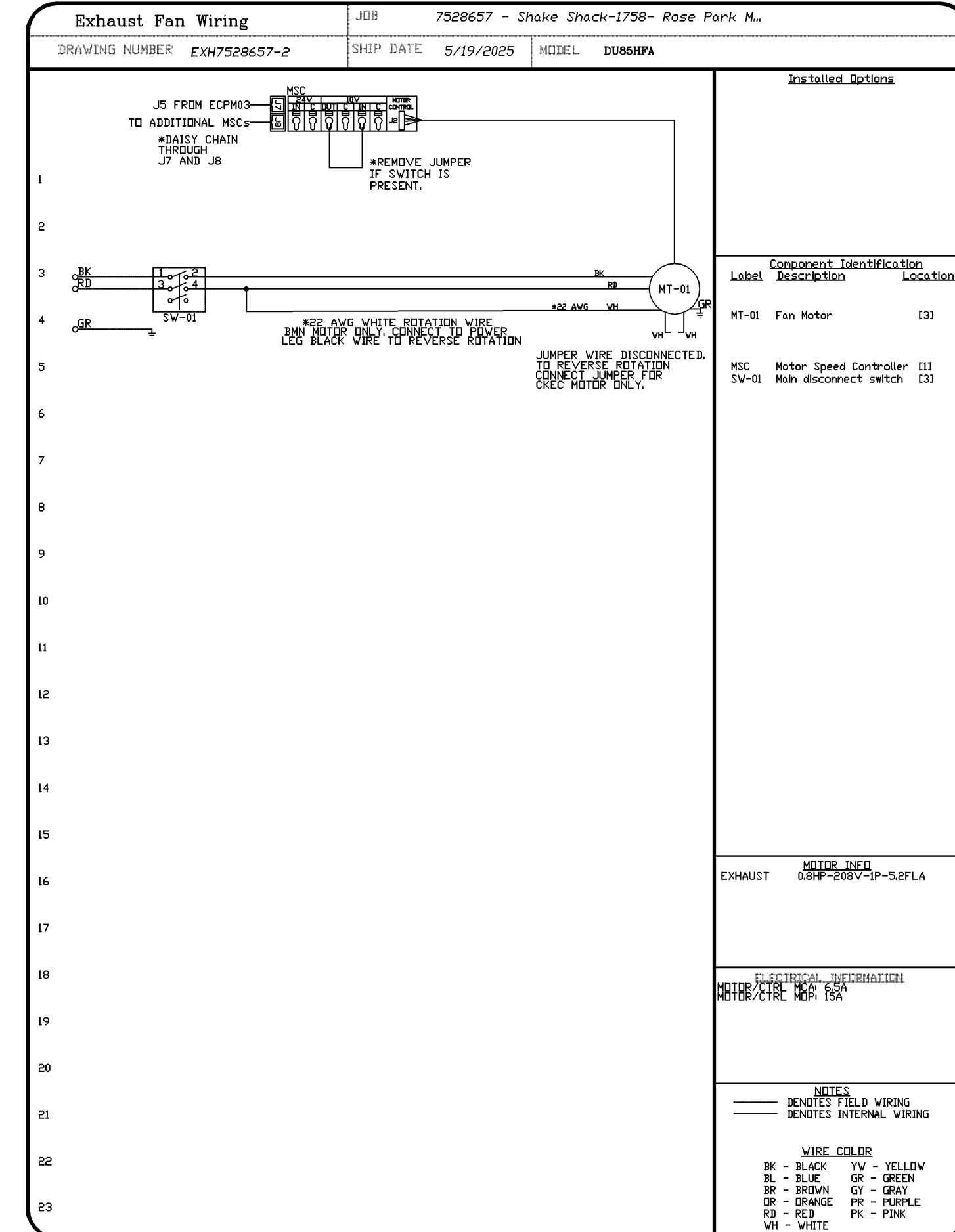
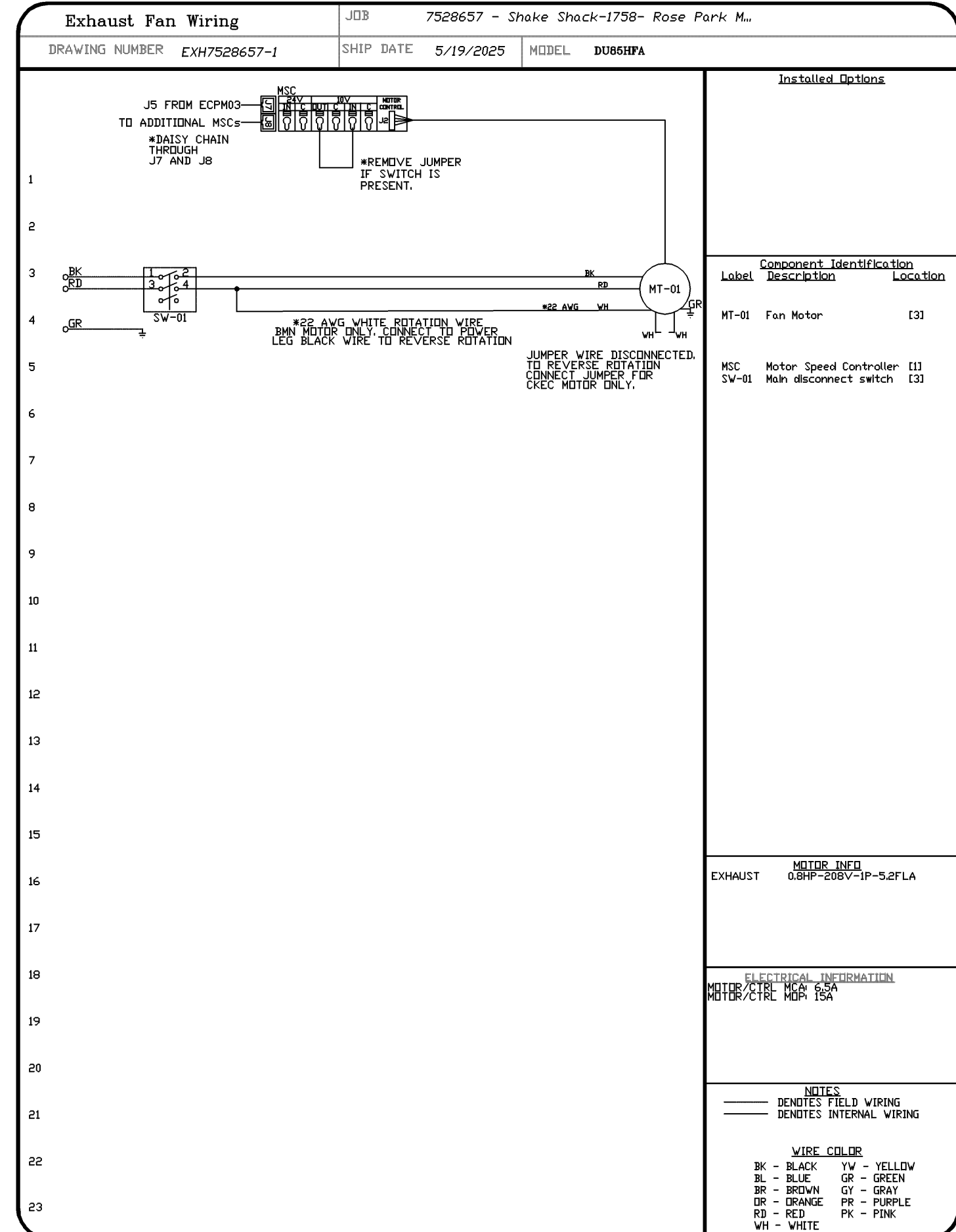
DWG #: 7528657

DRAWN BY: Joe.shilba

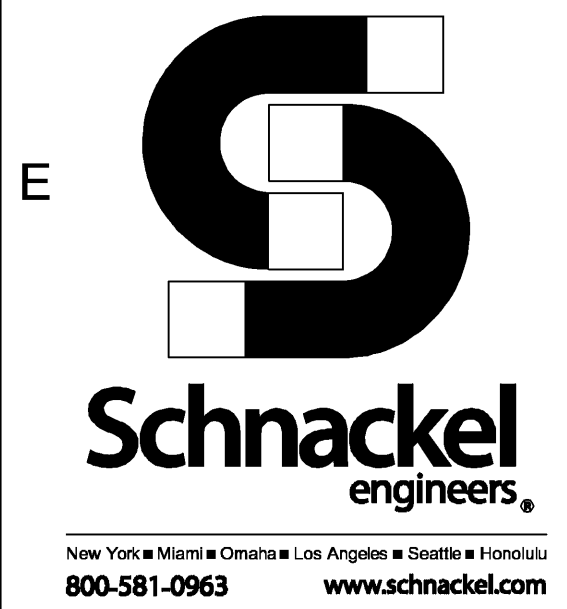
SCALE: 3/4" = 1'-0"

MASTER DRAWING

SHEET NO. 5



ZEBRA ARCHITECTURE, PLLC  
14614 N KIERLAND BLVD., SUITE N300  
SCOTTSDALE, ARIZONA 85254  
PHONE: 480.912.1169 zbrglobal

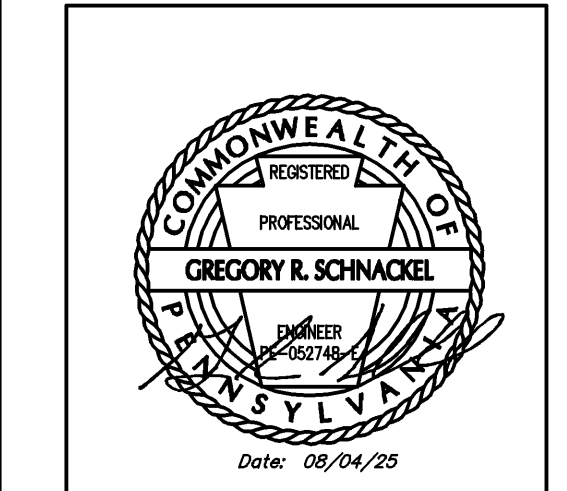


STORE NO:  
**#1758**

**SHAKE SHACK**  
ROSS PARK MALL  
TENANT SPACE VC12A  
1000 ROSS PARK MALL DRIVE  
PITTSBURGH, PA 15237

**REVISIONS**

NO.	DATE	DESCRIPTION
A	07/14/2025	REVISION A
T	05/24/2025	REVISION T



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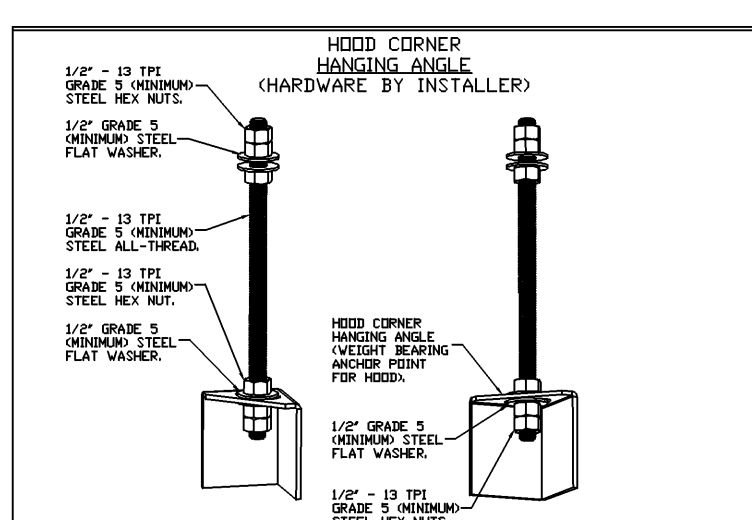
SHEET NAME:  
**CAPTIVEAIRE DRAWINGS**

DATE: 05/23/2025 PROJECT NO: 40403

DRAWN: SET SCALE: AS NOTED

SHEET NO.:  
**M705**





HANGING ANGLE DETAILS			
HOOD STYLE / MODEL	450 DEGREES CFM/FT.	600 DEGREES CFM/FT.	700 DEGREES CFM/FT.
CANOPY ND-2	150	200	250
CANOPY ND-2 W/ END PANELS	105	140	175
SLOPED SND-2	228	294	-
ISLAND ND-2WI	269	300	350
ISLAND ND-2I	346	422	475

**ETL HOOD LISTING DETAIL**

EXHAUST CFM = LENGTH OF HOOD X CFM/LIN.FT. (LQND)  
 SUPPLY CFM = EXHAUST CFM X PERCENTAGE REQUIRED  
 TOTAL DUCT AREA (sq. in.) = 144 X  $\frac{CFM}{FPM(\%)}$   
 DUCT LENGTH =  $\frac{TOTAL DUCT AREA}{DUCT WIDTH}$

\* CAPTIVEAIRE VENTILATION DUCT SIZES ARE CALCULATED USING AN EXHAUST VELOCITY OF 1500-1800 FPM AND A SUPPLY VELOCITY OF 1000 FPM.

**CALCULATIONS UTILIZED**

CAPTIVEAIRE HOODS BUILT IN COMPLIANCE WITH:

**BUILDING CODES**

CAPTIVEAIRE HOODS HAVE OPTIONAL CLEARANCE REDUCTION SYSTEMS AVAILABLE AS FOLLOWS:

MATERIAL	CLEARANCE REDUCTION SYSTEM
NON-COMBUSTIBLE	NONE REQUIRED
LIMITED-COMBUSTIBLE	3" UNINSULATED STANDOFF
COMBUSTIBLE	1" INSULATED STANDOFF

**CLEARANCE TO COMBUSTIBLES**

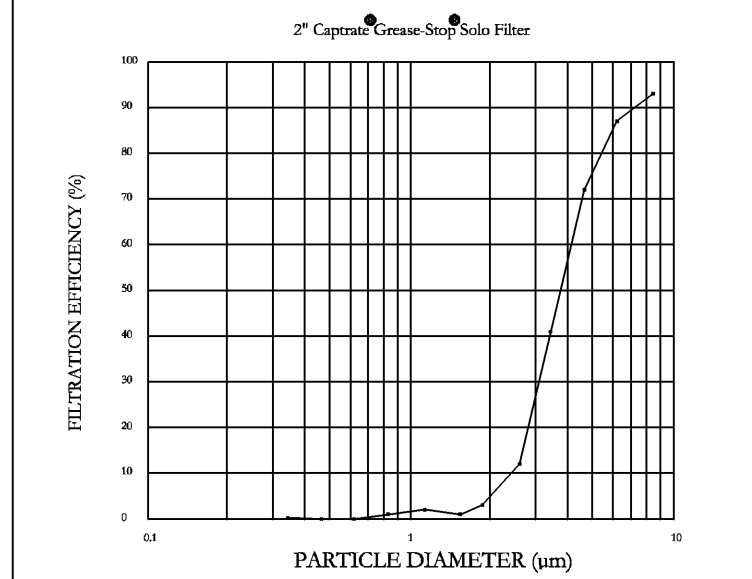
- INSTALLATION**
1. ALL ELECTRICAL "FIELD" CONNECTIONS AND RELATED INTERCONNECTIONS BY ELECTRICAL CONTRACTORS.
  2. ALL PLUMBING "FIELD" CONNECTIONS AND RELATED INTERCONNECTIONS BY PLUMBING CONTRACTORS.
  3. HANGING BRACKETS LOCATED AND WELDED AS SHOWN ON PLANS. ALL OTHER HANGING MATERIALS PROVIDED BY INSTALLING CONTRACTORS.
  4. ALL CONNECTIONS FROM CAPTIVEAIRE HOOD PER MECHANICAL CONTRACTOR'S PLANS.
  5. COOKING EQUIPMENT TO SHUT OFF IN EVENT OF FIRE.
  6. EXHAUST FANS TO TURN ON IN EVENT OF FIRE.
  7. ALL LIGHT FIXTURES SHOWN INSTALLED BY CAPTIVEAIRE ARE FACTORY PREMISED. INTERCONNECTIONS BETWEEN HOODS AND TO SWITCHES ARE BY ELECTRICAL CONTRACTOR.
  8. LAMPS FOR LIGHT FIXTURES BY INSTALLING CONTRACTORS.
  9. SEISMIC RESTRAINTS ARE RESPONSIBILITY OF INSTALLING CONTRACTOR.
  10. INSTALLING CONTRACTORS ASSUME ALL RELATED RESPONSIBILITY FOR VERIFICATION OF DIMENSIONAL DATA CONTAINED ON THESE DOCUMENTS FOR ACCURACY, INFORMATION AND ADMINISTRATION OF CODE REQUIREMENTS IN EFFECT PRIOR TO ANY RELEASE FOR PRODUCTION OF EQUIPMENT SHOWN.

- BALANCE**
11. KITCHEN HOODS MUST BE BALANCED WITH KITCHEN.
  12. KITCHEN SHALL BE NEGATIVE WITH RESPECT TO DRINK AREA.
  13. RESTAURANT SHALL BE POSITIVE WITH RESPECT TO AMBIENT PRESSURE.

**ADDITIONAL**

14. WRITTEN HOOD DIMENSIONS HAVE PRECEDENCE OVER SCALE.
15. SCHEMATIC APPROVED COPIES OF THIS DOCUMENT MUST BE RECEIVED BY THE FACTORY PRIOR TO COMMENCEMENT OF FABRICATION.

**GENERAL NOTES**



**FILTER DETAIL**

FOR QUESTIONS, CALL THE  
 Eastern PA Mechanical  
 REGION 108  
 PHONE: (267) 504 - 4126  
 EMAIL: reg108@captiveaire.com

**HOOD INFORMATION - JOB#7528657**

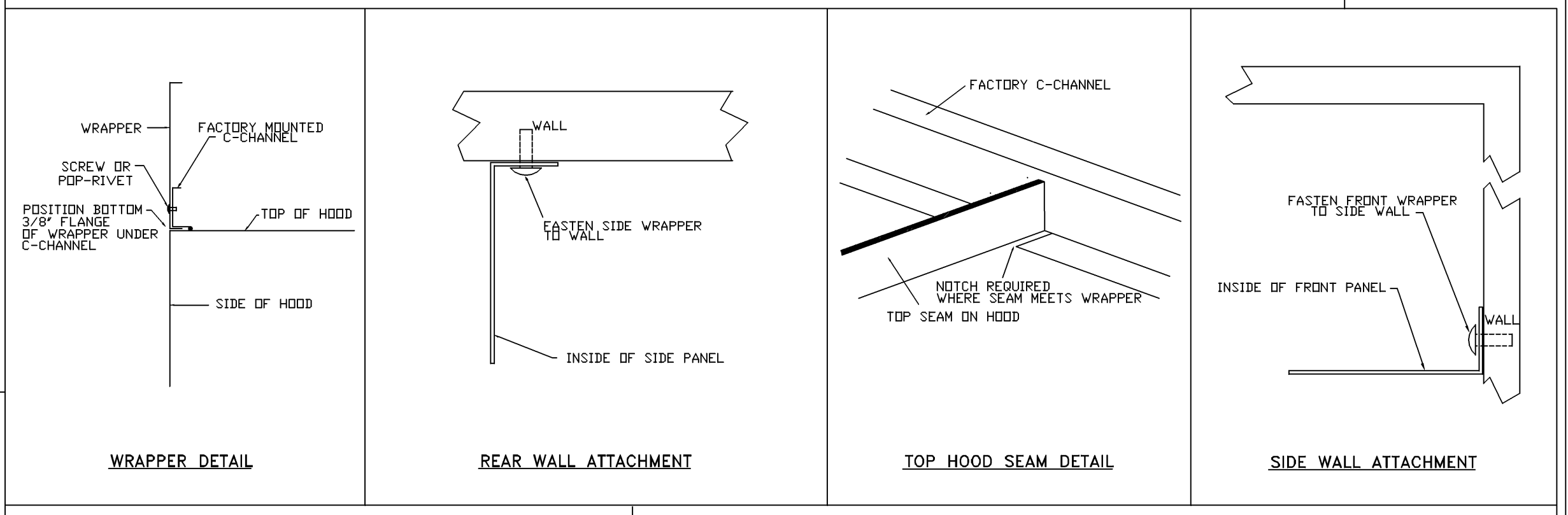
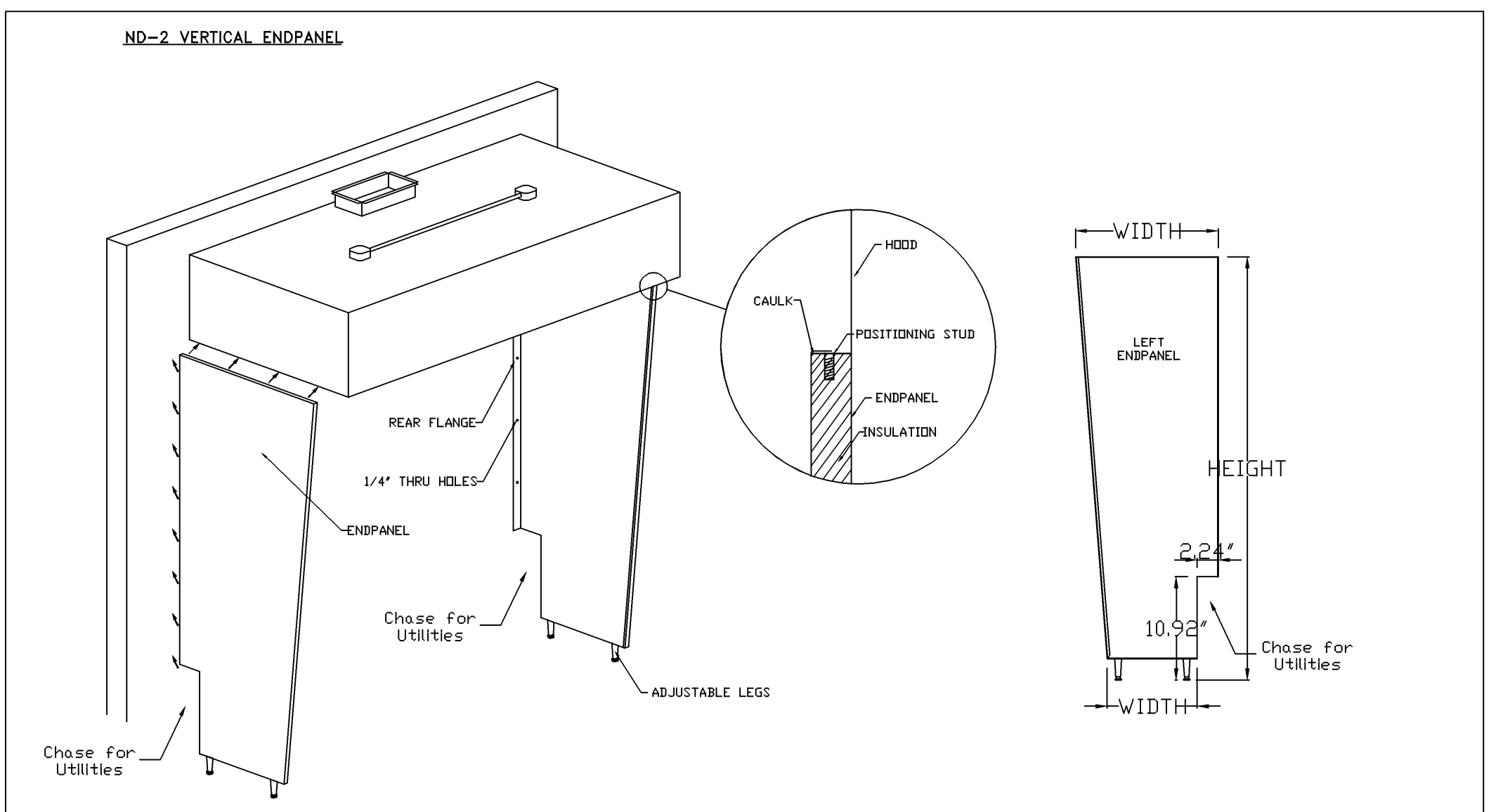
HOOD NO	TAG	MODEL	MANUFACTURER	LENGTH	MAX COOKING TEMP	TYPE	APPLIANCE DUTY	DESIGN CFM/FT	TOTAL EXH CFM	EXHAUST PLENUM RISER(S)				HOOD CONSTRUCTION	HOOD CONFIG			
										WIDTH	LENG	HEIGHT	DIA		CFM	VEL	SP	END TO END
1	Hood (Grill)	5430 ND-2	CAPTIVEAIRE	8' 0"	450 DEG	I	MEDIUM	150	1200	10"	11"	4"	1200	1571	-0.444'	430 SS WHERE EXPOSED	ALONE	ALONE
2	Hood (Fryer)	5430 ND-2	CAPTIVEAIRE	4' 11"	600 DEG	I	HEAVY	175	860	9"	9"	4"	860	1529	-0.494'	430 SS WHERE EXPOSED	ALONE	ALONE
3	Dish Hood	4830 VHB	CAPTIVEAIRE	4' 6"	700 DEG	II	N/A	150	675	9"	9"	4"	675	1200	-0.112'	430 SS 100%	ALONE	ALONE

**HOOD INFORMATION**

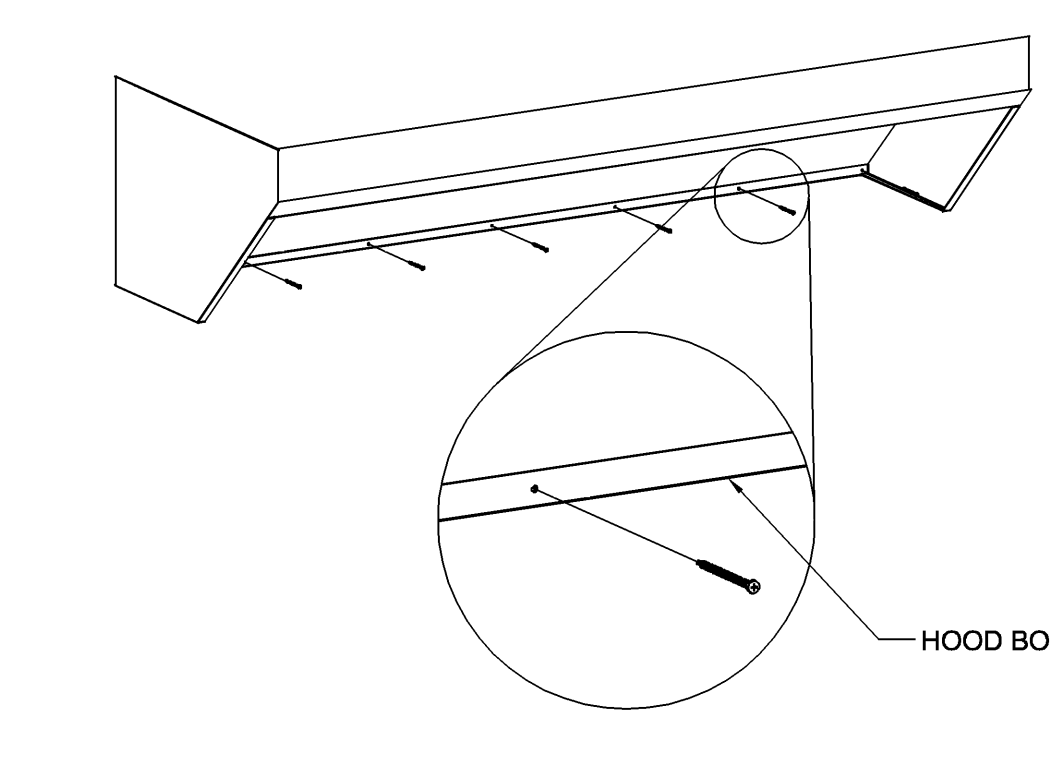
HOOD NO	TAG	TYPE	FILTER(S)			LIGHT(S)			UTILITY CABINET(S)			FIRE SYSTEM PIPING	HOOD HANGING WEIGHT				
			QTY	HEIGHT	LENGTH	EFFICIENCY @ 7 MICRONS	QTY	TYPE	WIRE GUARD	LOCATION	SIZE			TYPE	SIZE	MODEL #	QUANTITY
1	Hood (Grill)	CAPTRATE SOLD FILTER	5	20"	16"	85% SEE FILTER SPEC	2	RECESSED ROUND	NO				YES	558 LBS			
2	Hood (Fryer)	CAPTRATE SOLD FILTER	3	20"	16"	85% SEE FILTER SPEC	2	RECESSED ROUND	NO	RIGHT	12"x54"x30"	TANK FS	4.0/4.0/4.0	SC-320110MA	1 LIGHT 1 FAN	YES	748 LBS
3	Dish Hood						0						NO	179 LBS			

**HOOD OPTIONS**

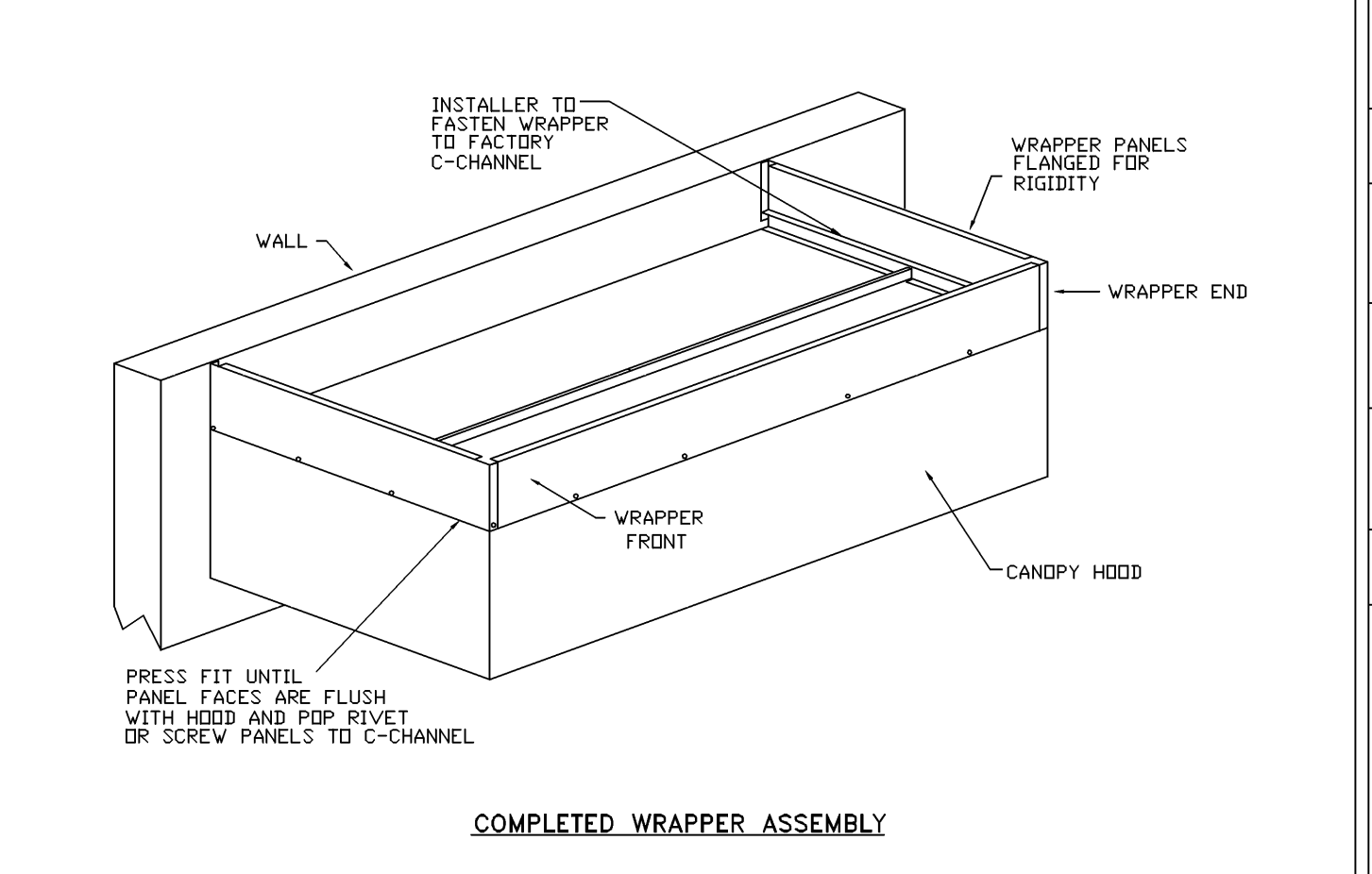
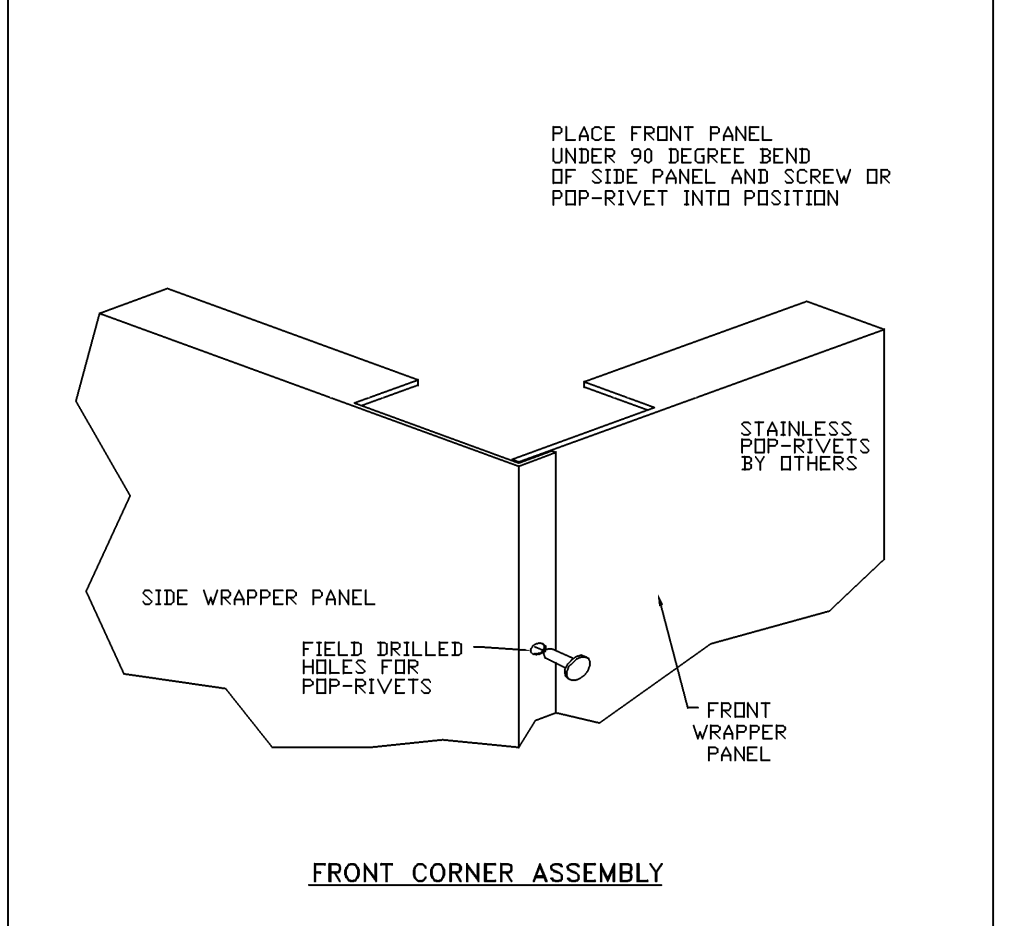
HOOD NO	TAG	OPTION
1	Hood (Grill)	FIELD WRAPPER 18.00" HIGH FRONT, LEFT, RIGHT. INSULATION FOR BACK OF HOOD. RISER SENSOR INSTALL 6IN PLEN. RIGHT VERTICAL END PANEL 27" TOP WIDTH, 21" BOTTOM WIDTH, 80" HIGH INSULATED 430 SS. GFCI DUPLEX OUTLET, 20A 125V - HOOD FRONT LEFT - HORIZONTAL - DIST FROM END: 3.50 DIST FROM BOTTOM: 4.00. LEFT WIDE VERTICAL END PANEL 42" TOP WIDTH, 36" BOTTOM WIDTH, 80" HIGH INSULATED 430 SS.
2	Hood (Fryer)	FIELD WRAPPER 12.00" HIGH FRONT, LEFT, RIGHT. RIGHT QUARTER END PANEL 23" TOP WIDTH, 0" BOTTOM WIDTH, 23" HIGH 430 SS. LEFT QUARTER END PANEL 23" TOP WIDTH, 0" BOTTOM WIDTH, 23" HIGH 430 SS. INSULATION FOR BACK OF HOOD. RISER SENSOR INSTALL 6IN PLEN.



**Bottom Flange Securing Detail**



Secure the bottom of the hood to the rear wall using 1404 Evergreen Quik-Fastener. Use a minimum of 1 fastener every 16" on the bottom flange. For walls with metal studs, use a minimum of 1 fastener on the bottom flange at each stud. Only Use SIL-BOND RTV 4500 silicone sealant on hood.



**REVISIONS**

NO.	DESCRIPTION	DATE

**CAPTIVEAIRE**

Eastern PA Mechanical  
 225 E City Line Avenue, Suite #103, Bala Cynwyd, PA, 19004 PHONE: (267) 504 - 4126 EMAIL: reg108@captiveaire.com

Shake Shack-1758- Rose Park Mall, PA  
 PITTSBURGH, PA, 15237

DATE: 5/19/2025  
 DWG #: 7528657  
 DRAWN BY: Joe.shilba  
 SCALE: 3/4" = 1'-0"  
 MASTER DRAWING

SHEET NO. 1

**zebra**

ZEBRA ARCHITECTURE, PLLC  
 14614 N KIERLAND BLVD., SUITE N300  
 SCOTTSDALE, ARIZONA 85254  
 PHONE: 480.912.1169 zbrglobal

**Schnackel engineers**

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STORE NO: #1758

**SHAKE SHACK**  
 ROSS PARK MALL  
 TENANT SPACE VC12A  
 1000 ROSS PARK MALL DRIVE  
 PITTSBURGH, PA 15237

**REVISIONS**

NO.	DATE	DESCRIPTION
A	07/14/2025	REVISION A
T	08/24/2025	REVISION T

STATUS: IFC SET

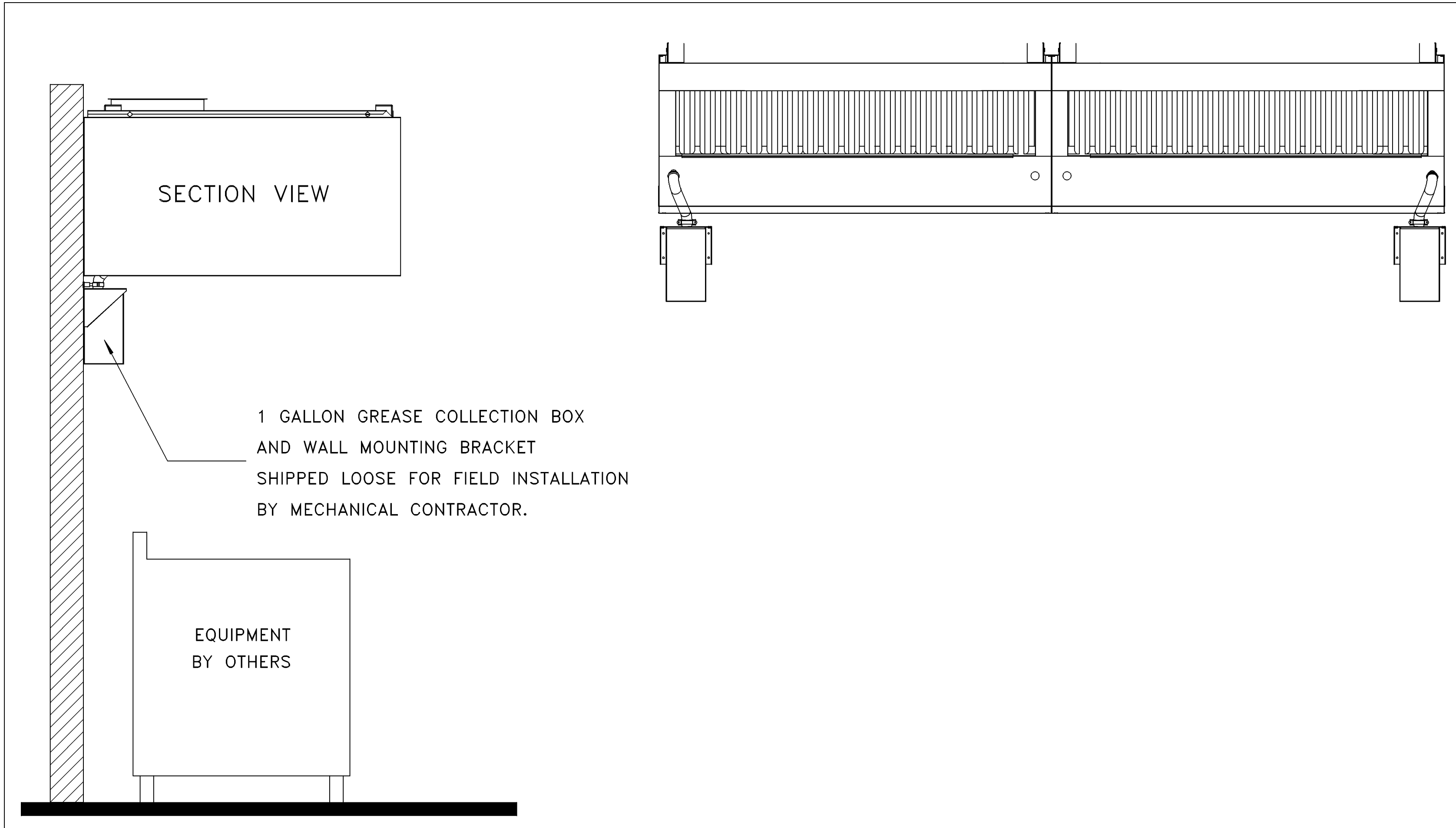
**PROFESSIONAL SEAL**  
 GREGORY R. SCHNACKEL  
 REGISTERED PROFESSIONAL ENGINEER  
 PENNSYLVANIA  
 Date: 08/29/25

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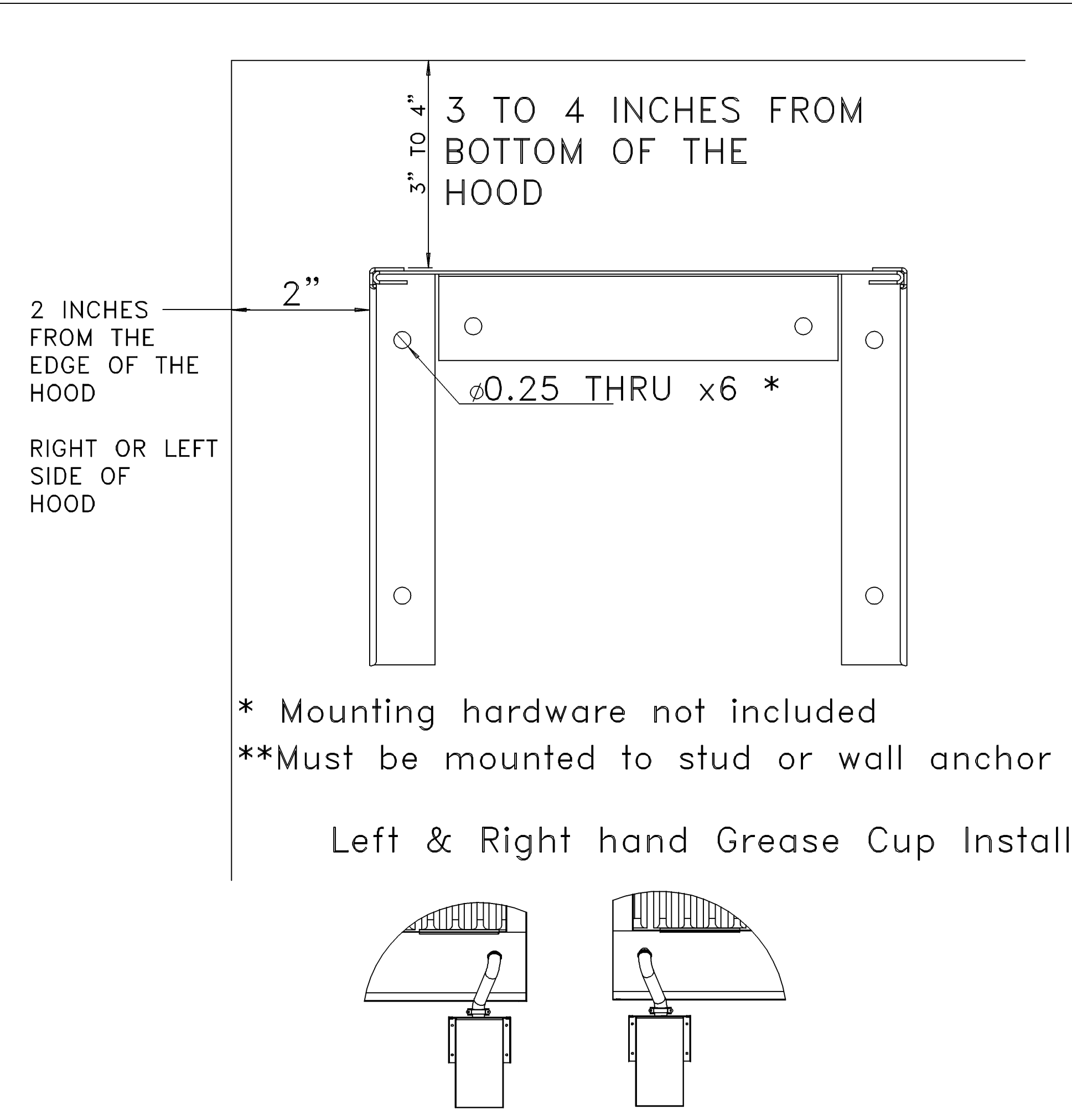
SHEET NAME: CAPTIVEAIRE DRAWINGS  
 DATE: 08/23/2025 PROJECT NO: 40403  
 DRAWN: SEI SCALE: AS NOTED  
 SHEET NO.: M707

E  
D  
C  
B  
A



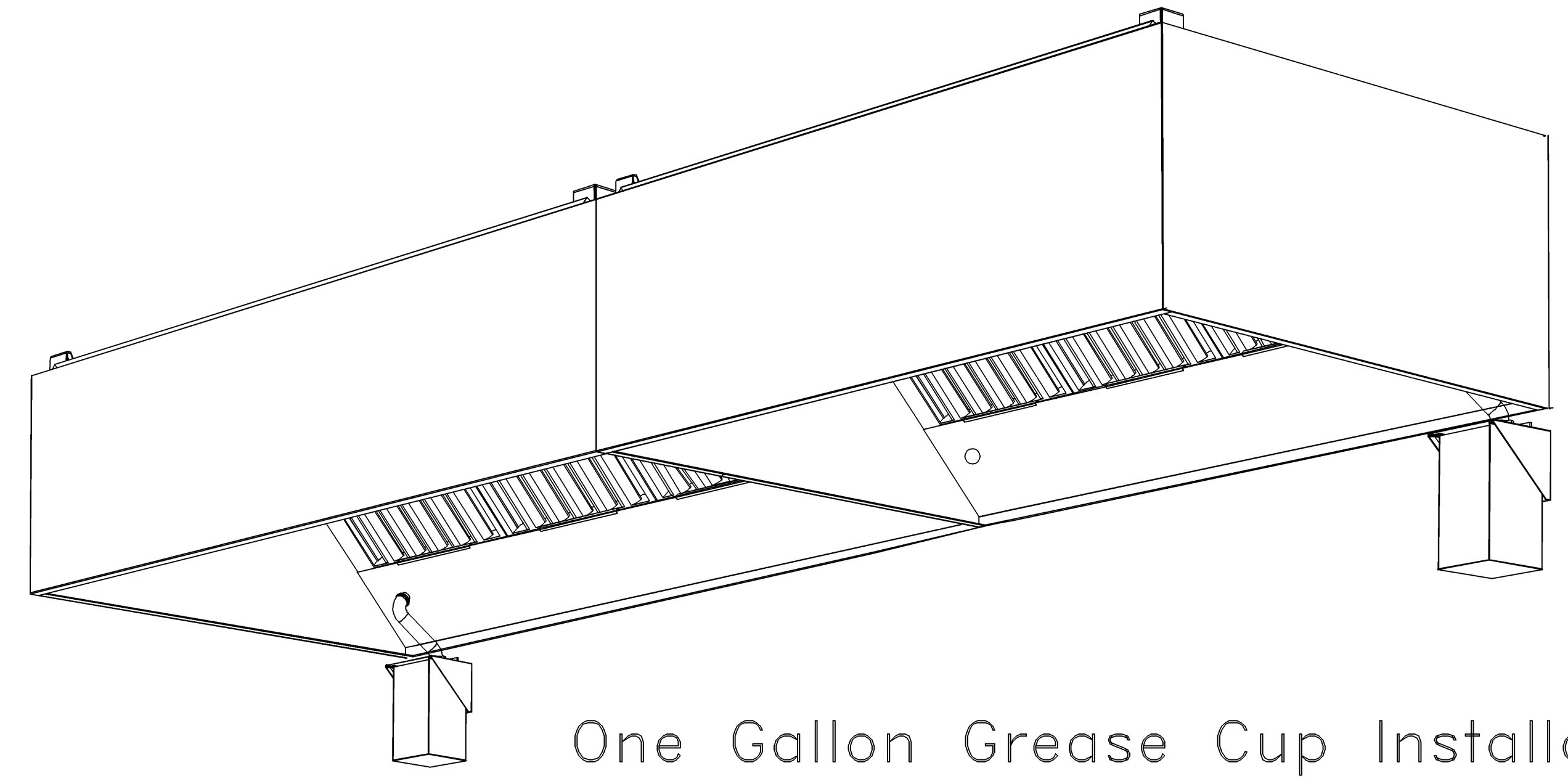
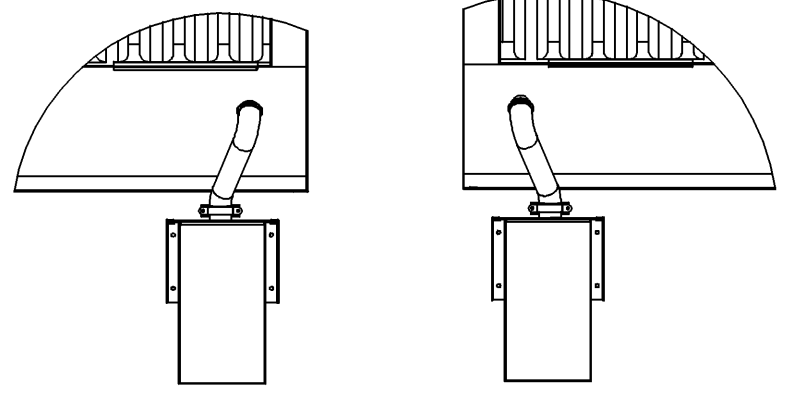
1 GALLON GREASE COLLECTION BOX AND WALL MOUNTING BRACKET SHIPPED LOOSE FOR FIELD INSTALLATION BY MECHANICAL CONTRACTOR.

EQUIPMENT BY OTHERS



\* Mounting hardware not included  
\*\*Must be mounted to stud or wall anchor

Left & Right hand Grease Cup Install

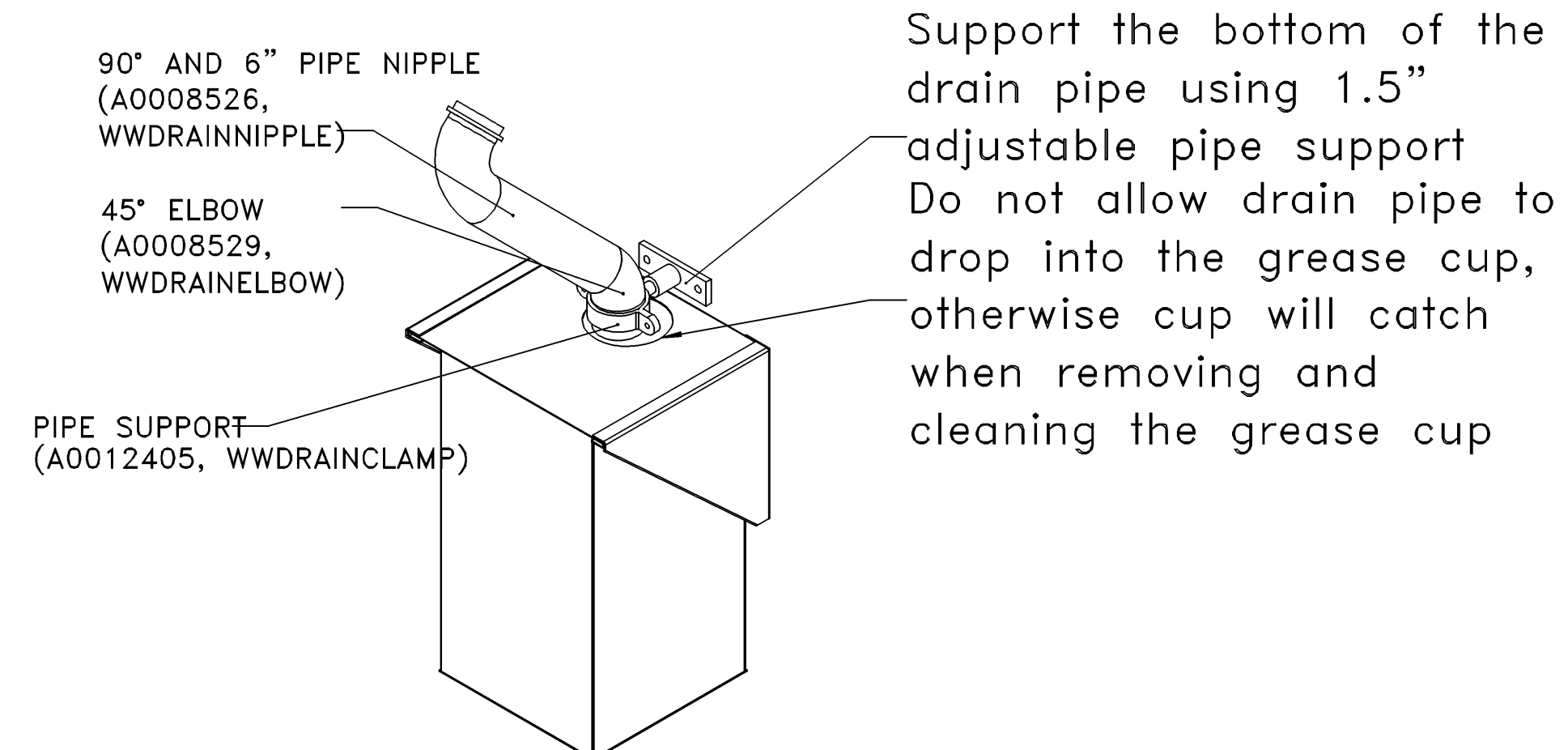


One Gallon Grease Cup Installation

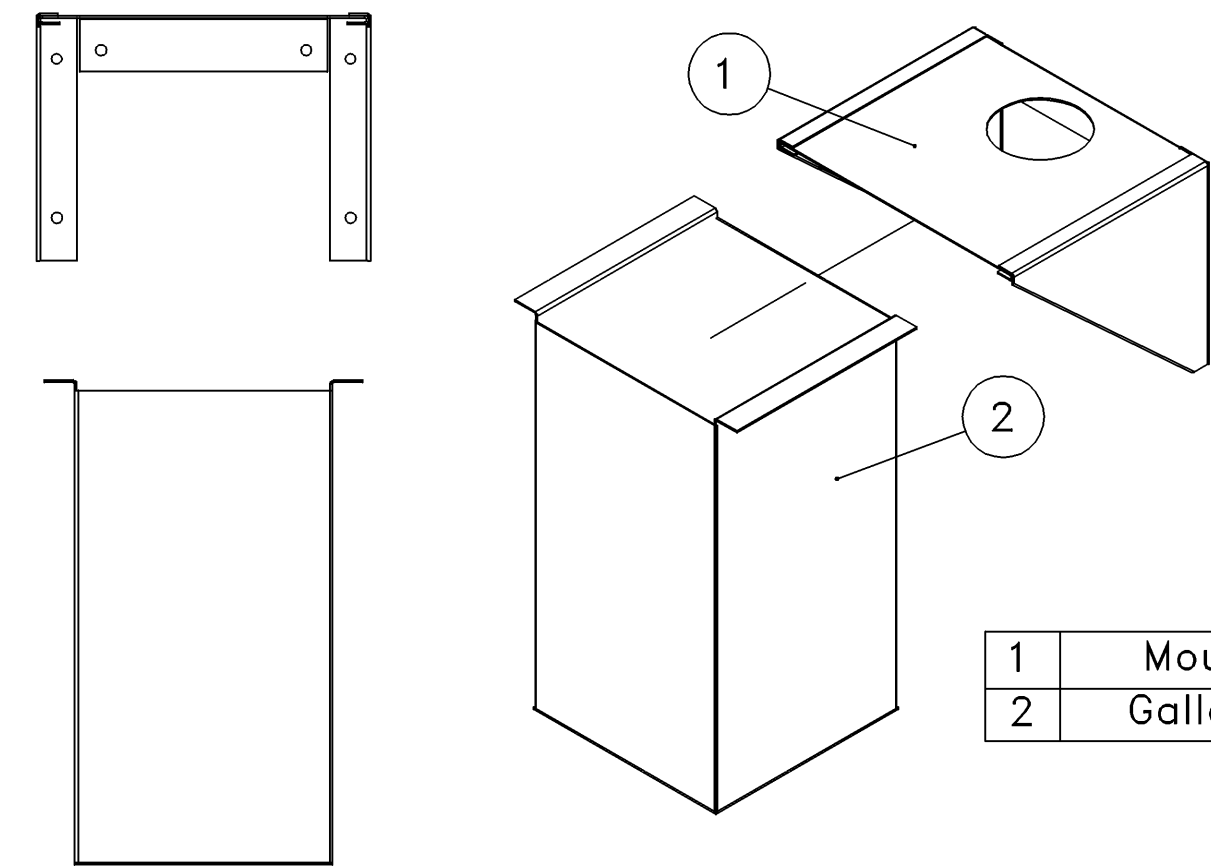
Instructions below outline single, or dual, one gallon grease cup installation for ND-2 hood models.

The one gallon grease cup comes as an assembly of stainless steel wall mounting bracket and one gallon cup. The mounting bracket should be installed 2" from the edge of the containment plenum and 3"-4" below the bottom of the hood.

Piping from the hood grease drain should route to the opening of the grease cup, but not into the cup, otherwise the cup will not be able to be removed and emptied.



Gallon Grease Cup Assembly



- 1 Mounting Bracket
- 2 Gallon Grease Cup

1 GALLON GREASE COLLECTION BOX AND WALL MOUNTING BRACKET SHIPPED LOOSE FOR FIELD INSTALLATION BY MECHANICAL CONTRACTOR.

REVISIONS	
DESCRIPTION	DATE

**CAPTIVE**

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Shake Shack-1758- Rose Park Mall, PA  
PITTSBURGH, PA, 15237

DATE: 5/19/2025  
DWG #: 7528657  
DRAWN BY: Joe.shilba  
SCALE: 3/4" = 1'-0"  
MASTER DRAWING

SHEET NO. 8

**zebra**  
ZEBRA ARCHITECTURE, PLLC  
14614 N KIERLAND BLVD., SUITE N300  
SCOTTSDALE, ARIZONA 85254  
PHONE: 480.912.1169 zbrglobal

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STORE NO: #1758

**SHAKE SHACK**  
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TENANT SPACE VC12A  
1000 ROSS PARK MALL DRIVE  
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REVISIONS	
DATE	DESCRIPTION
07/14/2025	REVISION A
06/24/2025	REVISION 1

STATUS: IFC SET

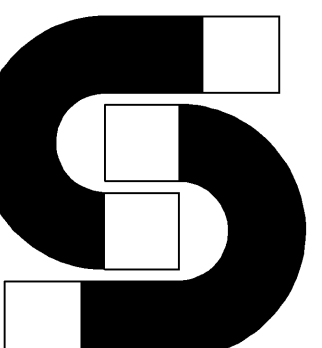
**PROFESSIONAL**  
GREGORY R. SCHNACKEL  
Date: 05/19/25

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SHEET NAME: CAPTIVEAIRE DRAWINGS  
DATE: 05/23/2025 PROJECT NO: 40403  
DRAWN: SEI SCALE: AS NOTED  
SHEET NO.: M708





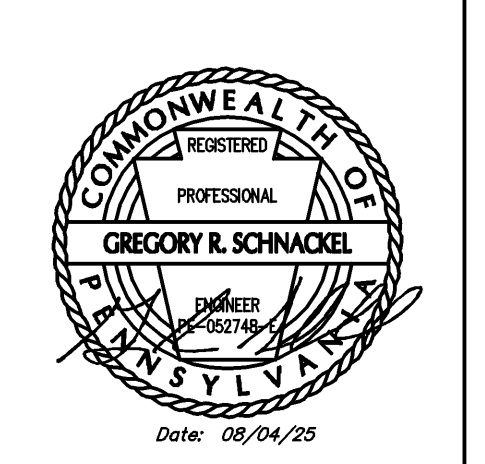
STORE NO:  
#1758

SHAKE SHACK  
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TENANT SPACE VC12A  
1000 ROSS PARK MALL DRIVE  
PITTSBURGH, PA 15227

Table with 2 columns: DATE, DESCRIPTION. Includes revision history for the document.

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SHEET NAME:  
MECHANICAL DEMOLITION SPECIFICATIONS

DATE: 08/23/2025 PROJECT NO: 40403  
DRAWN: M861 SCALE: AS NOTED

SHEET NO.: MD200

SECTION 230000 - HVAC GENERAL CONDITIONS

PART 1 GENERAL  
1.01 APPLICABILITY  
1.02 DEFINITION  
1.03 CODES AND STANDARDS  
1.04 PERMITS AND FEES  
1.05 CONTRACT DOCUMENTS  
1.06 EXISTING CONDITIONS  
1.07 SUBMITTALS  
1.08 QUALITY ASSURANCE  
1.09 DELIVERY, STORAGE, AND HANDLING  
1.10 WARRANTY AND GUARANTEE  
PART 2 PRODUCTS  
2.01 SUBSTITUTIONS  
PART 3 EXECUTION  
3.01 COORDINATION OF WORK

Manufacturer's authorized roofing contractor at this Contractor's expense. This Contractor shall contract with the factory authorized roofing contractor for the specific roofing system applicable to this project. The use of an unauthorized roofing contractor may result in removal and replacement of the penetration systems at this Contractor's expense.  
All temperature control wiring, thermostat wiring, damper interlock wiring, control panel interlock wiring and miscellaneous low voltage wiring associated with the equipment furnished or installed under this contract shall be furnished and installed by the mechanical contractor or his sub-contractor. All wiring installed under this contract shall be in full compliance with the National Electrical Code, all State and local codes and requirements of the Electrical Specifications for this project.  
Verify field measurements are as indicated on the Drawings.  
Verify all equipment locations prior to rough-in. Maintain adequate equipment service clearance per manufacturer and code.  
Verify routing of all ductwork and piping in field prior to fabrication or installation. Verify adequate clearance with structure, light fixtures, and ceiling heights.  
Verify that proper fuel and power supply is available for connection.  
Install all ductwork, pipe, equipment, and accessories to preserve fire resistance rating of partitions and other elements, using materials and methods specified.  
Provide tests as necessary to establish the adequacy, quality, safety, completed status, and suitable operation of each system. Tests shall be conducted under the supervision of the Architect.  
Clean fire suppression parts to remove harmful materials.  
Clean exposed surfaces of all ductwork pipe, equipment, and accessories of all dirt, debris, splatter, and other deleterious materials. Follow the manufacturer's recommendations for cleaning as applicable.  
Repair or replace damaged ductwork, pipe, equipment, and accessories, as directed by and to the satisfaction of the Architect, where marring or disfigurement has occurred. All pipe, equipment, and accessories shall be new.  
At project closeout, provide one printed copy and one electronic copy of the project record documents to the Owner. Record documents will not be reviewed by the Engineer.  
Record Drawings: Information contained on project record drawings shall include, as a minimum:  
1. Actual locations of all equipment, ductwork, air inlets/outlets, accessories, etc.  
2. Actual routing of ductwork with sizes and elevations.  
3. Actual locations of control devices including valves and volume dampers.  
Operation and Maintenance Data: Provide descriptive literature, maintenance and operation data for all hvac equipment, control systems, accessories, and materials used. Include maintenance procedures, intervals, and parts list of each item installed under this contract. Include all manufacturer's warranties and warranties.  
Maintenance Materials: At project closeout, furnish to the Owner the following:  
1. One set of replacement filters for all hvac equipment.  
2. The maintenance contract for the hvac system, if applicable.  
3. Test Reports: Submit to the Owner all testing reports.

END OF SECTION

SECTION 230501 - MECHANICAL DEMOLITION

PART 1 GENERAL  
1.01 SECTION INCLUDES  
PART 2 PRODUCTS  
2.01 MATERIALS AND EQUIPMENT  
PART 3 EXECUTION  
3.01 EXAMINATION  
3.02 PREPARATION  
3.03 DEMOLITION AND EXTENSION OF EXISTING MECHANICAL WORK  
3.04 CLEANUP AND REPAIR  
END OF SECTION

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