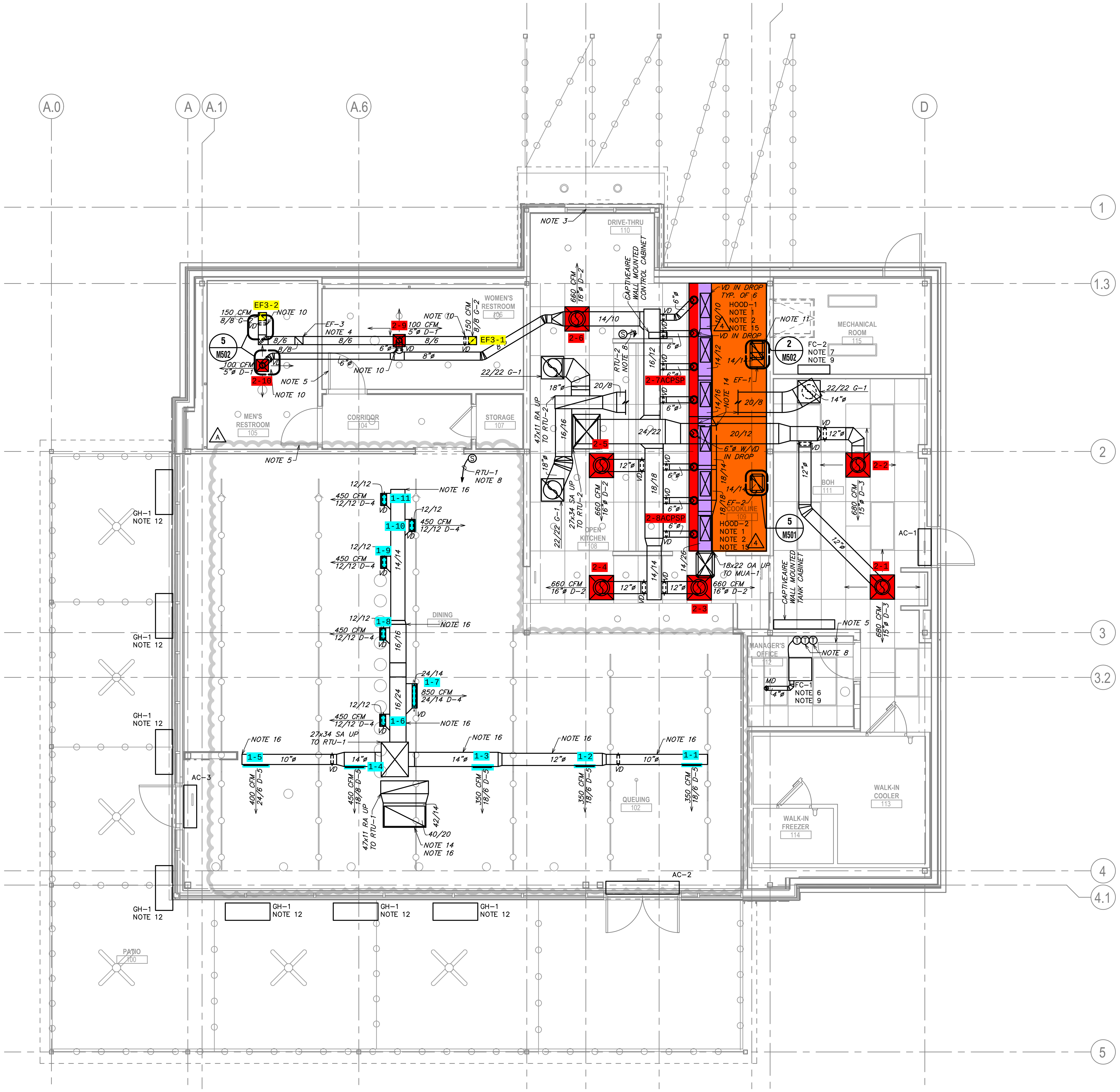

1 MECHANICAL FLOOR PLAN

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

N

GENERAL NOTES:

A. EXISTING CONDITIONS ARE BASED ON RECORD DRAWINGS PROVIDED BY THE OWNER. CONTRACTOR SHALL ADJUST TO ACTUAL FIELD CONDITIONS AT NO ADDITIONAL EXPENSE TO THE PROJECT.

B. CONTRACTOR SHALL BE RESPONSIBLE FOR FIELD VERIFICATION OF ALL EXISTING CONDITIONS PRIOR TO SUBMITTING THE BID. NO ADDITIONAL COMPENSATION WILL BE PROVIDED FOR ANY EXTRAS DUE TO THE CONTRACTOR'S FAILURE TO VISIT THE PROJECT SITE PRIOR TO SUBMITTING THE BID. ANY DISCREPANCIES SHALL BE IMMEDIATELY REPORTED TO THE ENGINEER FOR RESOLUTION.

C. ALL CONTRACTORS SHALL REVIEW A COMPLETE SET OF CONSTRUCTION DOCUMENTS.

D. CONTRACTORS SHALL FAMILIARIZE THEMSELVES WITH DEMOLITION WORK PRIOR TO BIDDING AND START OF WORK. CONTRACTOR IS RESPONSIBLE TO DEMOLISH ALL EXISTING AS REQUIRED FOR INSTALLATION/CONSTRUCTION OF NEW WORK.

E. ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH ALL APPLICABLE GOVERNMENT AND LOCAL CODES.

F. MECHANICAL CONTRACTOR SHALL FIELD COORDINATE WITH ELECTRICAL CONTRACTOR FOR ALL POWER REQUIREMENTS.

G. ALL CONTRACTORS SHALL REVIEW A COMPLETE SET OF CONSTRUCTION DOCUMENTS AND COOPERATE WITH THE OTHER TRADES SO THAT THE INSTALLATION OF ALL EQUIPMENT MAY BE PROPERLY COORDINATED.

H. ALL EQUIPMENT FURNISHED SHALL FIT THE SPACE AVAILABLE WITH CONNECTIONS IN THE REQUIRED LOCATIONS AND WITH ADEQUATE SPACE FOR OPERATING AND SERVICING. THE DRAWINGS ARE GENERALLY DIAGRAMMATIC AND INDICATE THE INTENT OF THE INSTALLATION WHILE THE SPECIFICATIONS AND EQUIPMENT LIST DENOTE THE TYPE AND QUALITY OF MATERIAL AND WORKMANSHIP TO BE USED. THE DRAWINGS SHALL NOT BE SCALED FOR EXACT MEASUREMENTS. WHERE A CONFLICT EXISTS BETWEEN THE DRAWINGS AND THE SPECIFICATIONS, THE HIGHER AND/OR MORE COSTLY STANDARD WILL APPLY. THE CONTRACTOR SHALL PROMPTLY NOTIFY THE ENGINEER WHOSE DECISION SHALL BE FINAL. NO ALLOWANCE WILL BE MADE SUBSEQUENTLY IN THIS REGARD ON BEHALF OF THE CONTRACTOR AFTER AWARD OF THE CONTRACT.

I. COORDINATE DUCT ROUTING AND HEIGHTS WITH GENERAL CONTRACTOR. VERIFY ALL CLEARANCES BEFORE STARTING WORK.

J. THE CONTRACTOR SHALL INSTALL ALL PIPING, DUCTWORK AND EQUIPMENT AS REQUIRED TO CONFORM TO THE STRUCTURE, AVOID OBSTRUCTIONS, PRESERVE CEILING HEIGHTS AND HEADROOM AND MAKE ALL EQUIPMENT REQUIRING MAINTENANCE OR REPAIR ACCESSIBLE.

K. ALL DUCT CONNECTIONS TO HVAC EQUIPMENT MUST BE MADE WITH FLEXIBLE CONNECTORS.

L. DO NOT ATTACH ANYTHING TO DECK ABOVE. ATTACH TO STRUCTURE (i.e. BEAMS, JOISTS) ONLY. DUCT HANGERS SHALL BE INSTALLED IN ACCORDANCE WITH LOCAL CODE. ALL CONNECTIONS TO JOISTS SHALL BE MADE AT THE TOP CORD.

M. ALL DUCT DIMENSIONS INDICATED ARE CLEAR INSIDE DIMENSIONS. ALL SUPPLY AND UNTEMPERED OUTDOOR AIR DUCTWORK SHALL BE LINED WITH 1" ACOUSTICAL DUCT LINER OR WRAPPED WITH 1-1/2" THICK FIRE RETARDANT FIBERGLASS WITH A REINFORCED ALUMINUM FOIL JACKET AND SHALL BE APPROVED FOR USE BY SMACNA AND NAIMA. RETURN AIR TRANSFER DUCTS AND RETURN DUCTWORK WITHIN 10 FEET OF THE UNIT FAN SHALL BE LINED WITH 1" ACOUSTICAL DUCT LINER.

N. ALL SUPPLY AND UNTEMPERED OUTDOOR AIR DUCTWORK VISIBLE TO THE PUBLIC SHALL BE INTERNALLY LINED AND PAINTED TO MATCH THE SURROUNDING AREA. DUCT WRAP INSULATION IS NOT PERMITTED IN THESE AREAS.

O. EXPOSED SPIRAL DUCT TO BE GALVANIZED FINISH, FREE FROM SCRATCHES, DENTS OR BLEMISHES AND PAINTED TO MATCH THE SURROUNDING AREA. DUCT SHALL BE INTERNALLY LINED AND SEALED WITH DUCT SEALER COMPLETELY CONCEALED WITHIN THE DUCT JOINT. NO EXPOSED SEALER OR TAPE WILL BE ACCEPTED.

P. ALL EXPOSED DUCTWORK SHALL BE INSTALLED TIGHT TO THE BOTTOM OF THE STRUCTURE.

Q. PROVIDE REMOTE VOLUME DAMPER CONTROL MANUFACTURED BY YOUNG REGULATOR OR UNITED ENERTECH FOR DAMPERS LOCATED ABOVE INACCESSIBLE CEILINGS. LOCATE CONTROLLER ABOVE ACCESSIBLE CEILING LOCATION.

R. REFRIGERANT PIPING SHALL BE SIZED PER MANUFACTURER'S RECOMMENDATIONS. PROVIDE ALL ACCESSORIES AS REQUIRED BY MANUFACTURER FOR COMPLETE WORKING SYSTEM, INCLUDING ANY ACCESSORIES ASSOCIATED WITH LONG LENGTH APPLICATIONS WHERE APPLICABLE.

S. TENANT'S CONTRACTOR SHALL BE RESPONSIBLE FOR THE FIELD VERIFICATION OF ALL UTILITY RUNS AND/OR OTHER IMPROVEMENTS LOCATED ON THE PREMISES PRIOR TO BIDDING. TENANT'S CONTRACTOR SHALL ALSO BE RESPONSIBLE FOR ALL COSTS RELATING TO THE RELOCATION OF, DAMAGE TO, REPAIR OF ANY EXISTING UTILITY RUNS AND/OR IMPROVEMENTS WHICH ARE DAMAGED AS A RESULT OF TENANT'S WORK IN OR AROUND THE PREMISES.

T. ALL ROOFING WORK SHALL BE PERFORMED BY LANDLORD'S APPROVED ROOFING CONTRACTOR AT TENANT'S EXPENSE, IF REQUIRED IN LEASE OR TENANT CRITERIA MANUAL.

U. ALL GREASE EXHAUST DUCTWORK SHALL BE PROVIDED WITH 3" FOIL FACED THERMAL-CERAMIC INSULATION FOR GREASE DUCTS. INSULATION SHALL MEET NFPA 96 AND ASTM E 2336 REQUIREMENTS.

V. GREASE DUCT LEAKAGE TESTING MUST BE PERFORMED PRIOR TO CONCEALMENT OF THE DUCTWORK.

W. MECHANICAL CONTRACTOR SHALL PROVIDE TENANT WITH A WRITTEN ONE (1) YEAR MANUFACTURER'S WARRANTY ON ALL HVAC EQUIPMENT PROVIDED AND / OR INSTALLED. THE WARRANTY SHALL INCLUDE ALL LABOR, MATERIALS AND THREE (3) ROUTINE SERVICES INCLUDING FILTER CHANGES DURING A ONE (1) YEAR PERIOD.

X. AT THE COMPLETION OF CONSTRUCTION AN NEBB, AABC OR TABB CERTIFIED AIR BALANCE REPORT SHALL BE SUBMITTED TO THE ENGINEER AND LANDLORD. PRIOR TO SCHEDULING BALANCING, COORDINATE WITH LANDLORD'S FIELD REPRESENTATIVE FOR THE VENDOR LISTED BELOW. IF APPROVED, THE BALANCING SHALL BE COMPLETED BY NATION TAB. CONTACT WILL TURNBOURH AT WILL@NATIONALTAB.COM OR 314-954-6244.

HVAC NOTES:

1. NEW CAPTIVEAIRE GREASE EXHAUST HOOD TO BE FURNISHED BY OWNER FOR INSTALLATION BY THE MECHANICAL CONTRACTOR. SEE CAPTIVEAIRE SHEETS M701 THROUGH M708 FOR ADDITIONAL INFORMATION. BALANCE HOOD MAKE-UP AIR, SUPPLY AIR, AND EXHAUST COLLARS AS NOTED ON THE HOOD SCHEDULE. PROVIDE FULL SIZE TRANSITION MAKE-UP AIR DUCT FROM COLLAR TO MAKE-UP AIR DUCT AND CONDITIONED AIR DUCT AS INDICATED ON PLANS. PROVIDE EACH DROP WITH VOLUME DAMPERS.
2. TRANSITION FROM HOOD EXHAUST COLLAR AS INDICATED ON PLANS AND EXTEND 14/14 KITCHEN HOOD GREASE EXHAUST DUCTWORK UP TO GREASE EXHAUST FAN ON ROOF. SEE SHEET M150 FOR CONTINUATION. GREASE DUCT SHALL BE WRAPPED WITH TWO (2) LAYERS OF THERMAL CERAMICS FAST WRAP XL, 1 1/2" THICK WITH 3" PERIMETER AND LONGITUDINAL OVERLAPS OR EQUIVALENT U.L. LISTED GREASE DUCT WRAP FOR ZERO CLEARANCE TO COMBUSTIBLES. REFER TO DETAIL ON SHEET M501 FOR ADDITIONAL INFORMATION.
3. AIR CURTAIN FOR SERVICE THRU WINDOW IS INTEGRAL TO THE WINDOW. REFER TO ARCHITECTURAL SHEETS FOR ADDITIONAL INFORMATION.
4. PROVIDE 8/8 EXHAUST AIR DUCT UP TO EF-1 ON ROOF.
5. CONTRACTOR SHALL UNDERCUT DOOR 3/4".
6. PROVIDE REFRIGERANT LINES FROM ASHP-1 ON ROOF TO FC-1 IN ROOM 112. LINES SHALL BE SIZED ACCORDING TO MANUFACTURER'S SPECIFICATIONS. PROVIDE ALL ACCESSORIES AS REQUIRED BY MANUFACTURER FOR COMPLETE WORKING SYSTEM, INCLUDING ANY ACCESSORIES ASSOCIATED WITH LONG LENGTH APPLICATIONS WHERE APPLICABLE.
7. PROVIDE REFRIGERANT LINES FROM ASHP-2 ON ROOF TO FC-2 IN ROOM 115. LINES SHALL BE SIZED ACCORDING TO MANUFACTURER'S SPECIFICATIONS. PROVIDE ALL ACCESSORIES AS REQUIRED BY MANUFACTURER FOR COMPLETE WORKING SYSTEM, INCLUDING ANY ACCESSORIES ASSOCIATED WITH LONG LENGTH APPLICATIONS WHERE APPLICABLE.
8. PROVIDE NEW FULLY DIGITAL 7 DAY PROGRAMMABLE TYPE THERMOSTAT WITH REMOTE SENSING CAPABILITIES, AUTO CHANGE OVER AND AUTO SET BACK. MOUNT THERMOSTAT AT 48" ABOVE FINISHED FLOOR. THERMOSTATS SERVING THE SAME TEMPERATURE ZONE SHALL BE INTERLOCKED TO PREVENT SIMULTANEOUS HEATING AND COOLING. PROVIDE REMOTE TEMPERATURE SENSORS AS INDICATED ON PLAN. COORDINATE LOCATION WITH WALL GRAPHICS LAYOUT.
9. PROVIDE NEW FC UNIT AS NOTED ON PLANS AND AS SCHEDULED ON SHEET M601.
10. PROVIDE REMOTE VOLUME DAMPER AS INDICATED ON PLANS. REFERENCE SHEET M502, DETAIL 5, FOR ADDITIONAL INFORMATION.
11. PROVIDE CLEANOUTS ON GREASE DUCTWORK AS REQUIRED BY CODE. REFERENCE SHEET M501, DETAIL 5 FOR ADDITIONAL INFORMATION. TYPICAL OF GREASE EXHAUST DUCTWORK.
12. PROVIDE NEW GAS HEATER AS NOTED ON PLANS AND SCHEDULED ON SHEET M601. INSTALL PER MANUFACTURER'S INSTRUCTIONS AND MAINTAIN ALL REQUIRED CLEARANCES. COORDINATE INSTALLATION LOCATION AND HEIGHTS WITH ARCHITECT.
13. TOP OPEN RETURN AIR DUCT. PROVIDE OPENING WITH 1/4" MESH GALVANIZED SCREEN.
14. ROUTE AND TRANSITION DUCTWORK AS REQUIRED TO AVOID STRUCTURAL OR CEILING CONFLICTS.
15. 4 HOOD MANUFACTURER TO PROVIDE A "KIT" TO FASTEN THE BOTTOM FLANGE OF THE HOOD TO THE WALL, WITH ONE FASTENER PER STUD WALL. SIL-BOND RTV 4500 ALUMINUM SILICONE SEALANT OR APPROVED SIMILAR, TO BE APPLIED BY GENERAL CONTRACTOR /HOOD INSTALLER FOR ANY REMAINING SMALL GAPS. HOOD FASTENING "KIT" DETAIL TO BE INCLUDED IN MANUFACTURER DRAWINGS. REFERENCE SHEET M502, DETAIL 14, FOR ADDITIONAL INFORMATION.
16. A ROUTE AND TRANSITION DUCTWORK AS REQUIRED TO AVOID STRUCTURAL OR CEILING CONFLICTS. DUCTWORK TO BE RUN BETWEEN THE TRUSSES OR WITHIN THE WEBBING. COORDINATE WITH THE ELECTRICAL CONTRACTOR AND NOTIFY THE ARCHITECT WITH ANY CONFLICTS.

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△	Date	Description
1	07/07/2022	ADDENDUM 1
2	09/22/2022	ADDENDUM 2
3	10/27/2022	ADDENDUM 3
4	02/07/2023	ISSUE FOR CONSTRUCTION
5	02/21/2023	FIELD NOTICE 1
A	04/05/2023	FIELD NOTICE 1

Seal / Signature

GREGORY R. SCHNACKEL
MECHANICAL
No. 14851
Expiration Date: 06/30/2024
Date: 04/05/23

Project Name
CRAIG ROAD

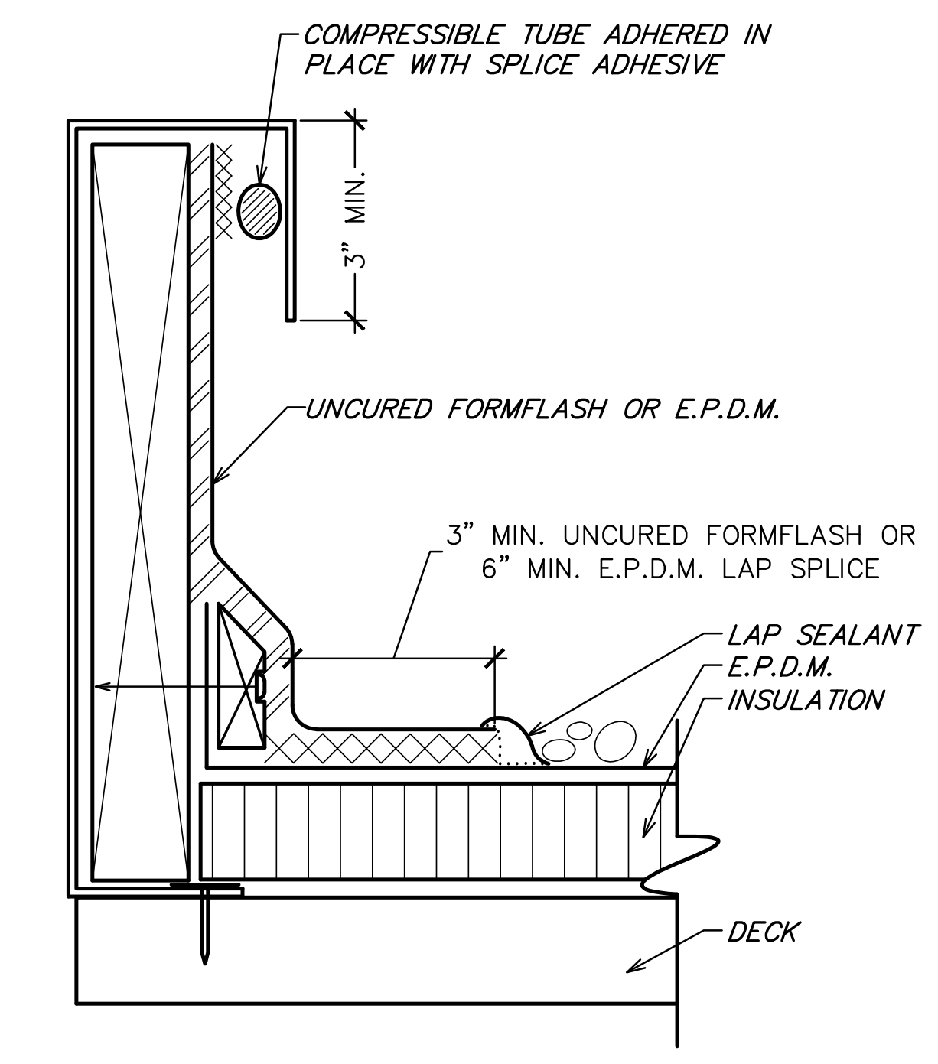
Project Number
005.3901.000

Description
MECHANICAL FLOOR PLAN

Scale
1/4" = 1'-0"

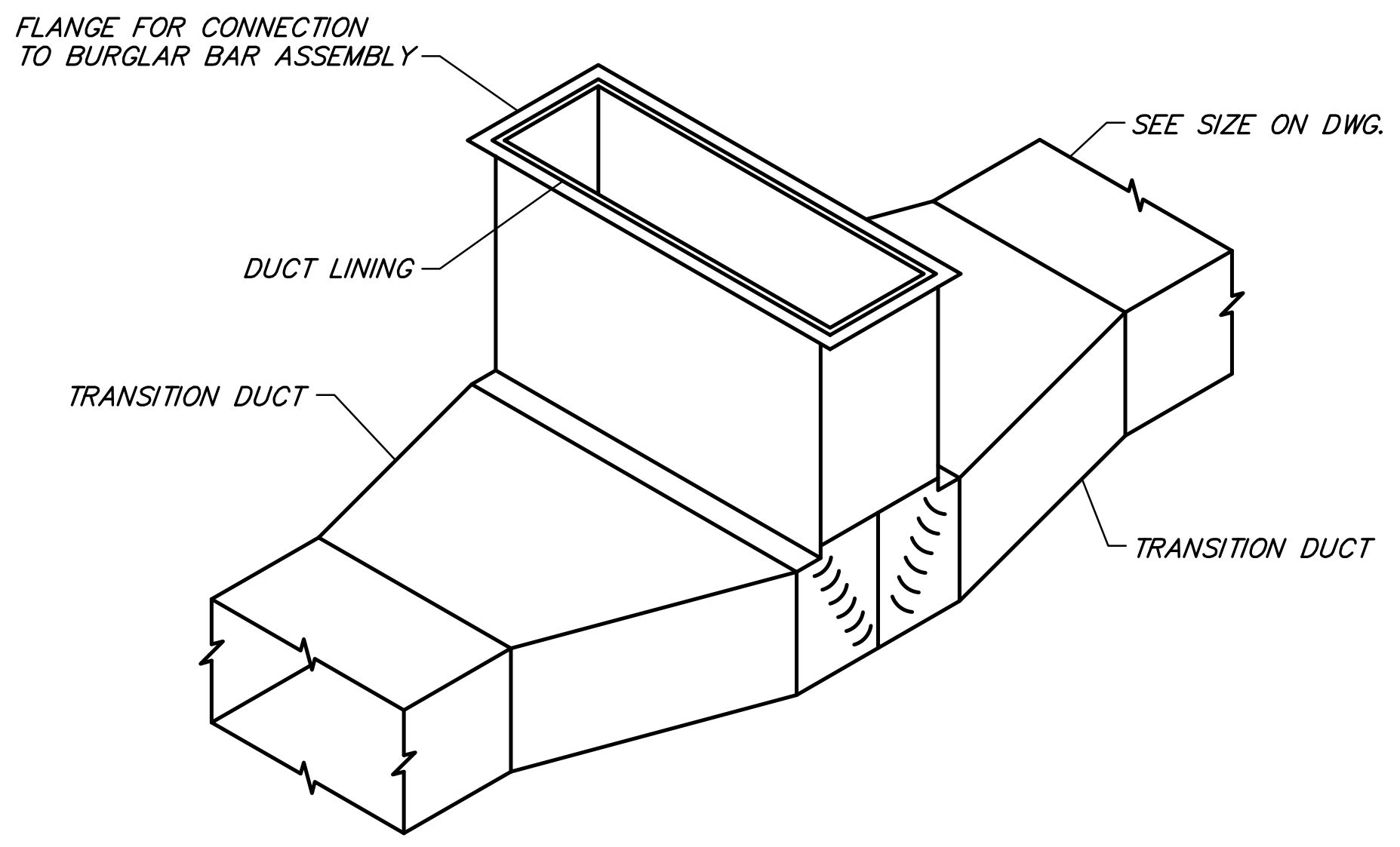
M101

SE JOB#: 210884



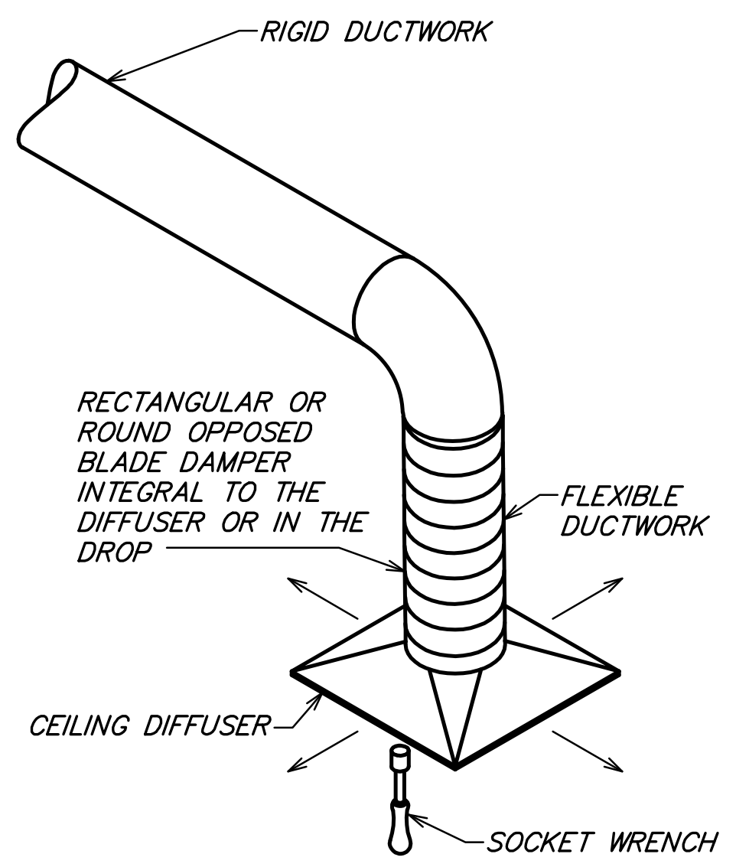
12 CURB FLASHING DETAIL

NOT TO SCALE



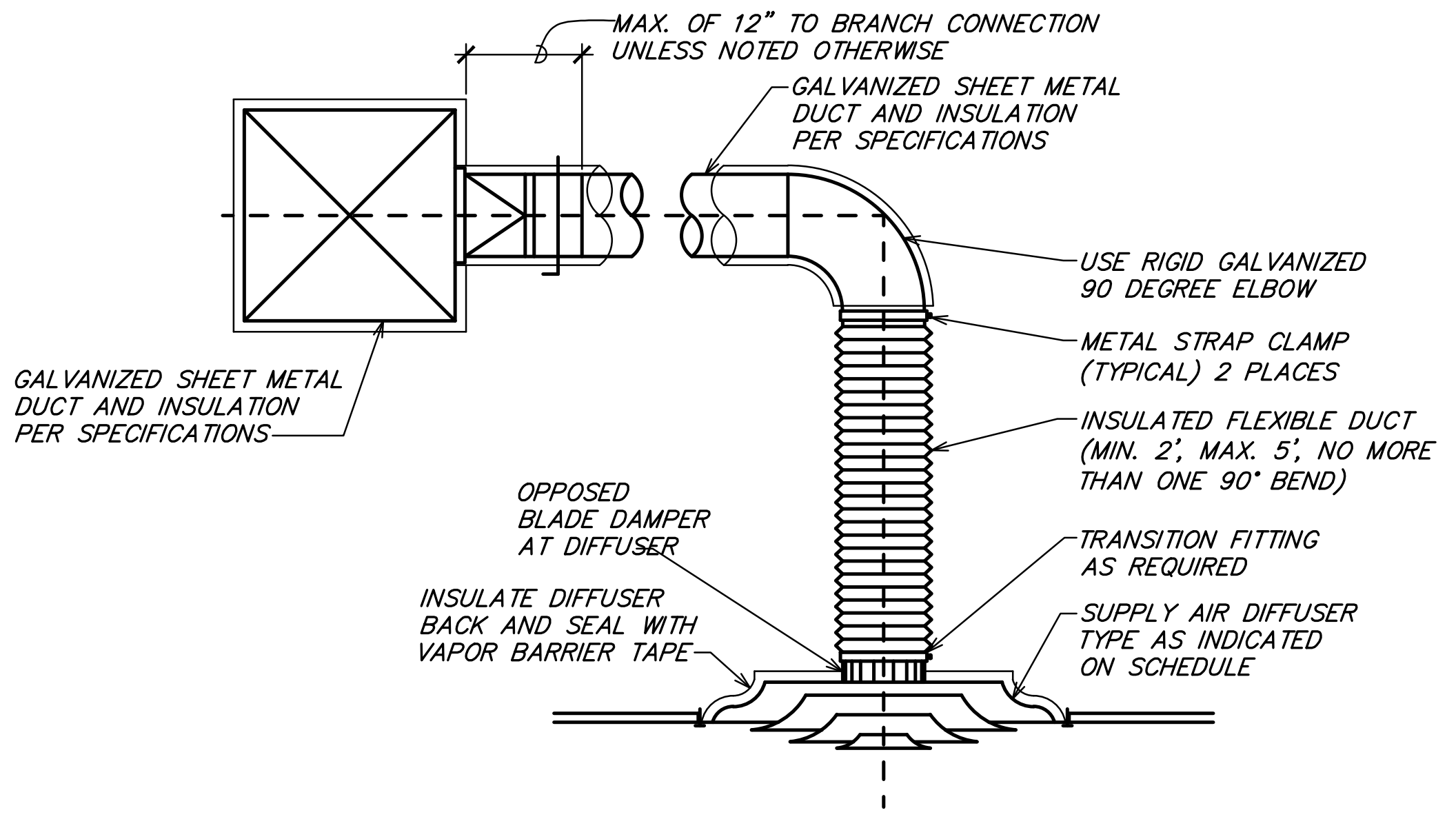
9 TYPICAL ROOF TOP UNIT TEE CONNECTION

NOT TO SCALE



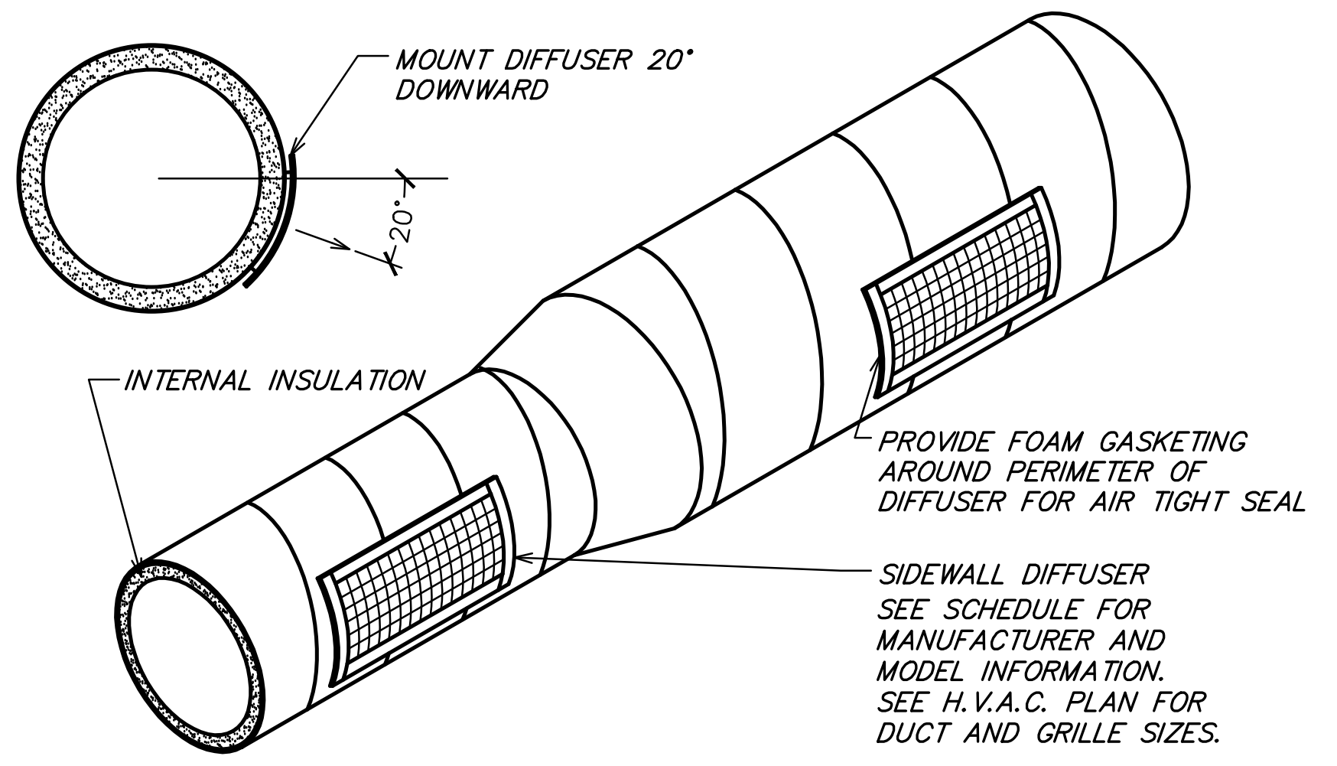
5 REMOTE VOLUME DAMPER CONTROLLER

NOT TO SCALE



1 TYPICAL DIFFUSER CONNECTION

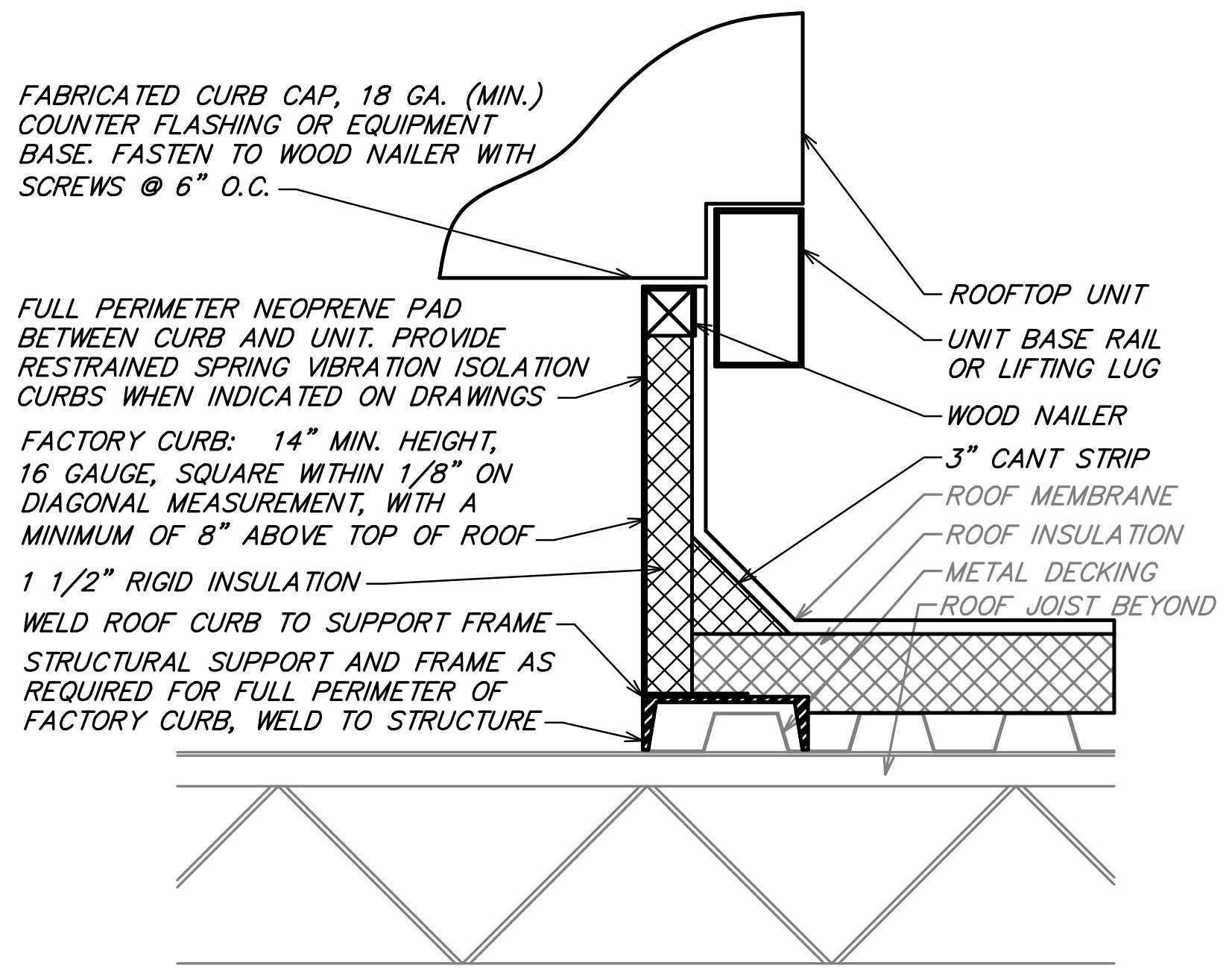
NOT TO SCALE



13 SPIRAL DUCT DIFFUSER DETAIL

NOT TO SCALE

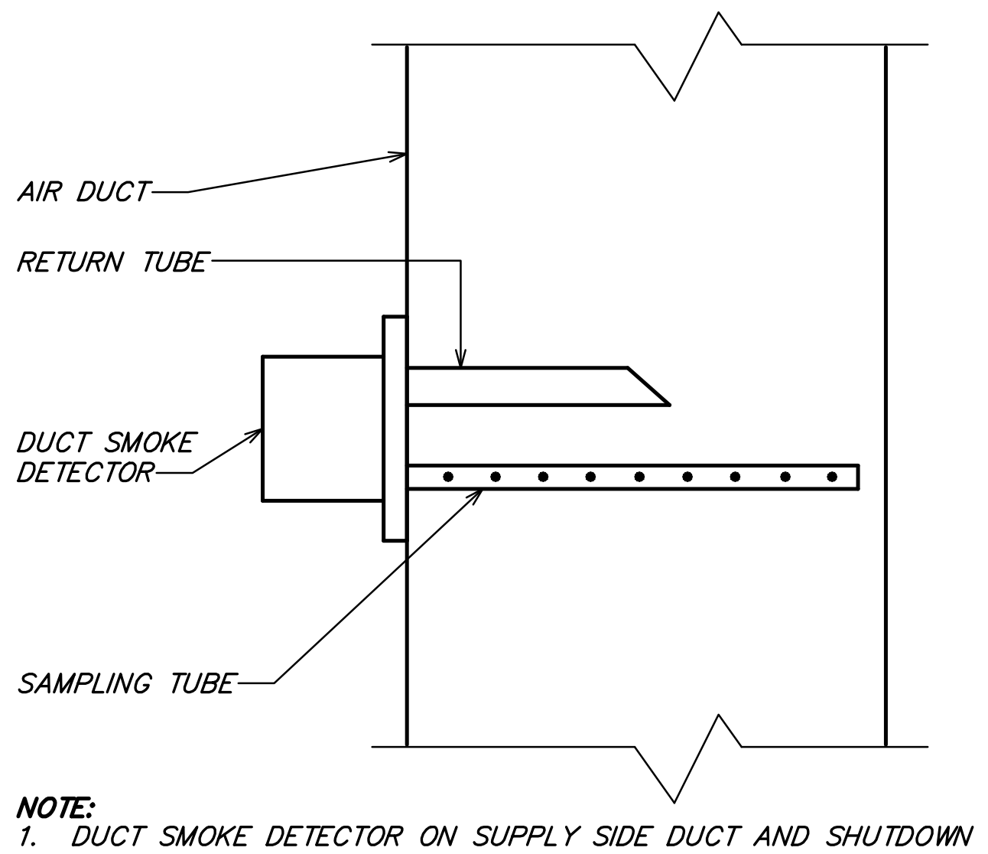
A



NOTES:
1. CUT AND PATCH EXISTING ROOFING AS REQUIRED FOR NEW CURB INSTALLATION.
2. CURB SHALL BE SHIMMED LEVEL. PROVIDE TAPERED ROOF CURB IF REQUIRED.
3. SECURELY INSTALL CURB TO ROOF STRUCTURE; USE FASTENERS AS REQUIRED BY ROOF CONSTRUCTION.

10 ROOF CURB DETAIL

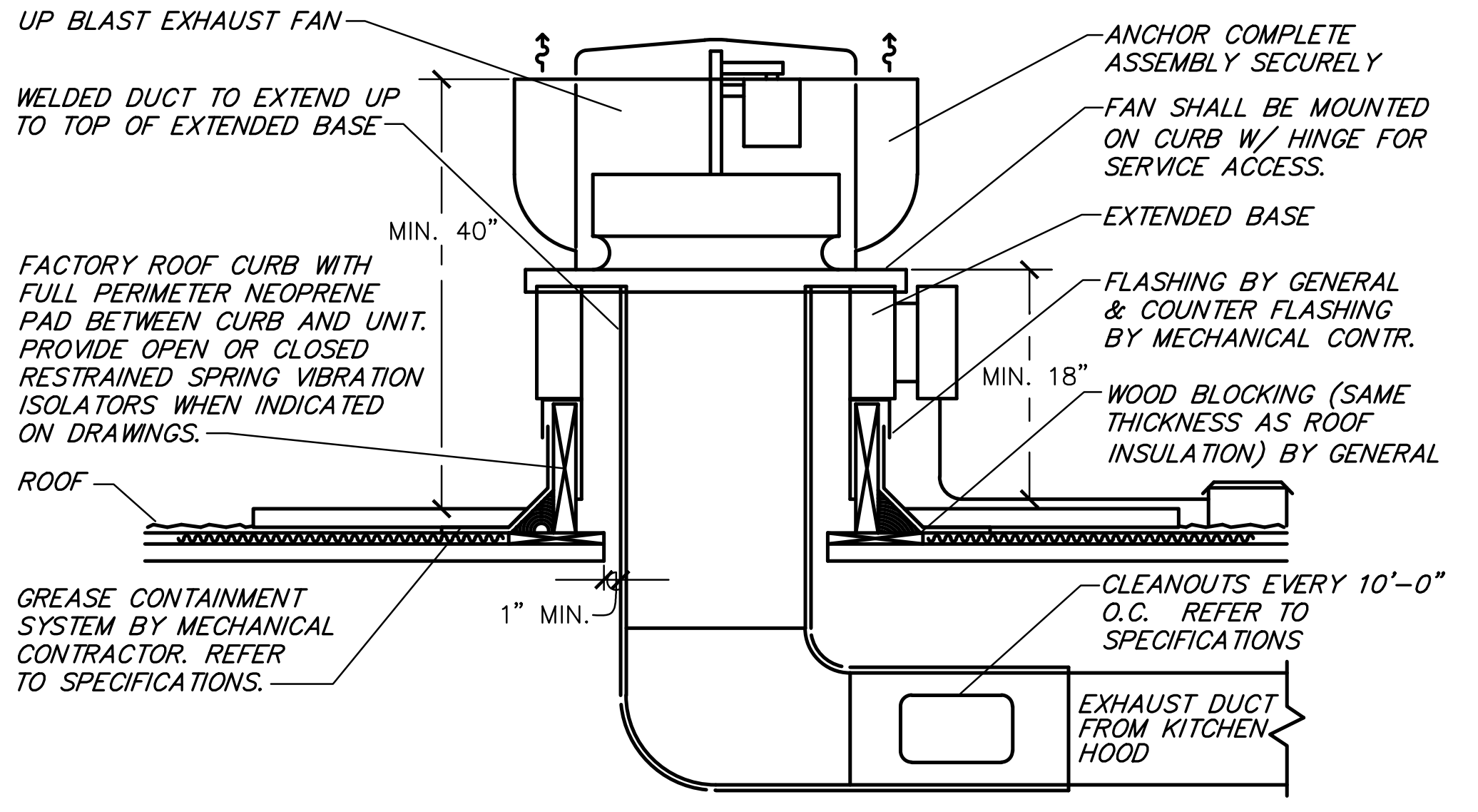
NOT TO SCALE



NOTE:
1. DUCT SMOKE DETECTOR ON SUPPLY SIDE DUCT AND SHUTDOWN RELAY SHALL BE FURNISHED BY THE ELECTRICAL CONTRACTOR FOR INSTALLATION BY THE MECHANICAL CONTRACTOR. ALL WIRING SHALL BE BY THE ELECTRICAL CONTRACTOR.

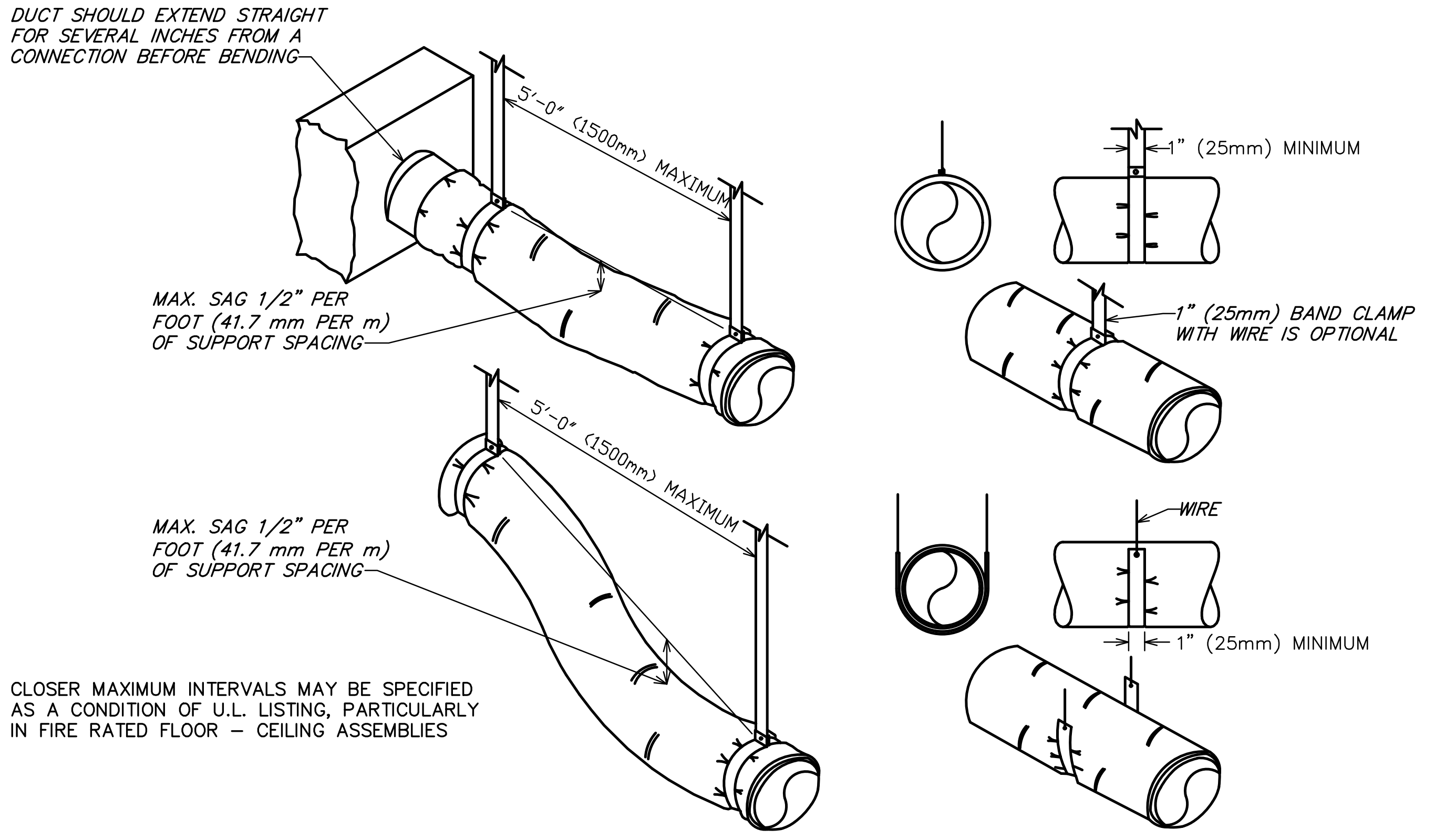
6 DUCT SMOKE DETECTOR DETAIL

NOT TO SCALE



2 KITCHEN HOOD EXHAUST FAN

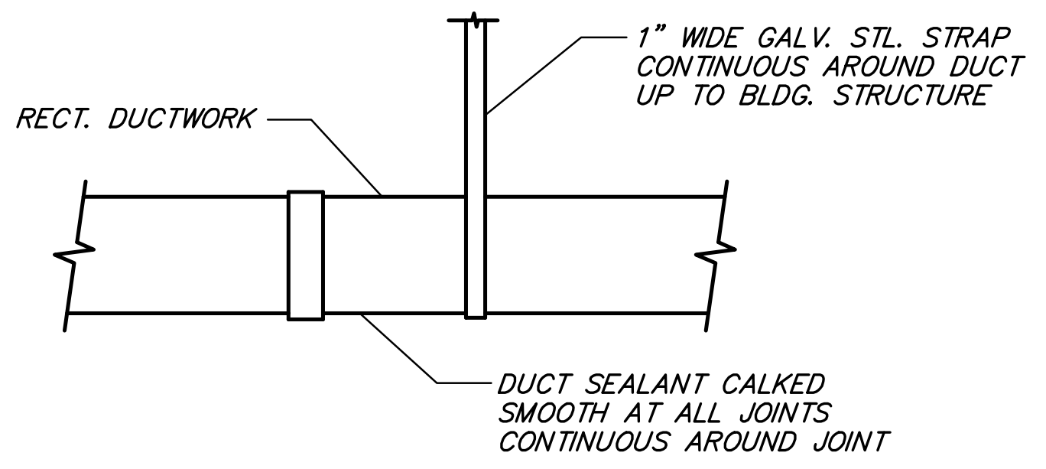
NOT TO SCALE



CLOSER MAXIMUM INTERVALS MAY BE SPECIFIED AS A CONDITION OF U.L. LISTING, PARTICULARLY IN FIRE RATED FLOOR – CEILING ASSEMBLIES

7 FLEXIBLE DUCT SUPPORTS

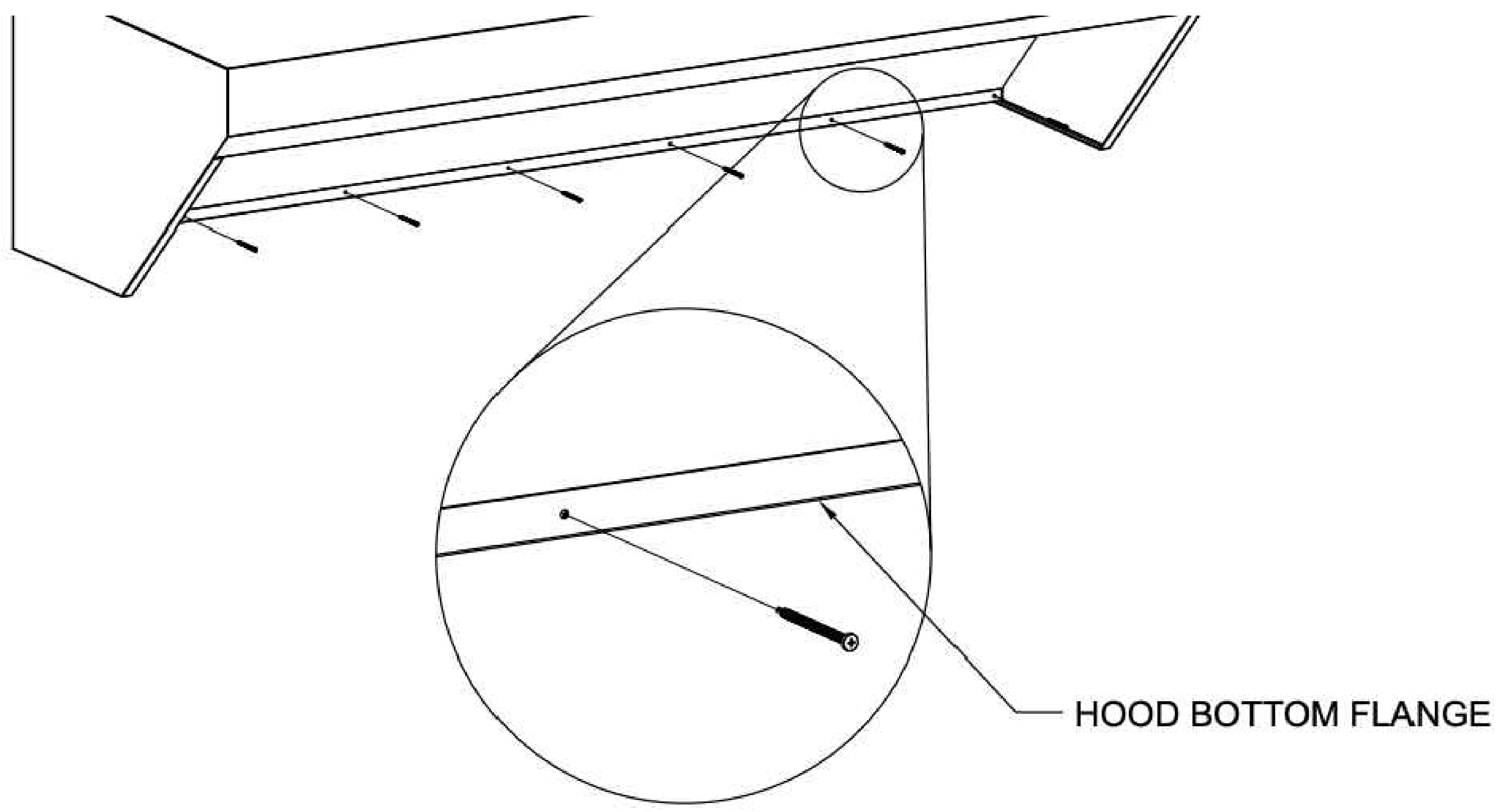
NOT TO SCALE



3 EXPOSED RECTANGULAR DUCT SUPPORT DETAIL

NOT TO SCALE

4



14 HOOD FASTENING DETAIL

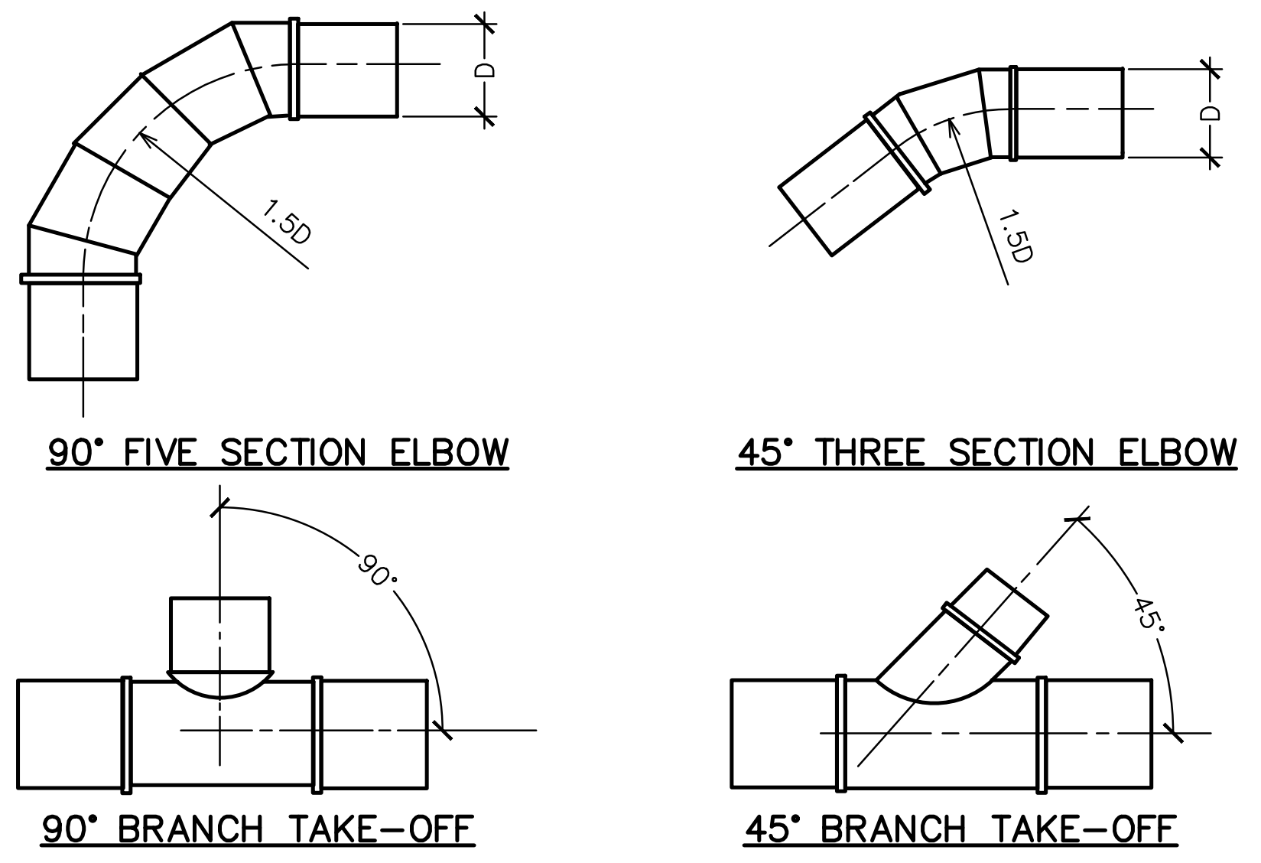
NOT TO SCALE

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.

8 ROUND DUCT HANGER TABLE

NOT TO SCALE



90° FIVE SECTION ELBOW

45° THREE SECTION ELBOW

90° BRANCH TAKE–OFF

45° BRANCH TAKE–OFF

4 TYPICAL ROUND DUCT FITTINGS

NOT TO SCALE

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Seal / Signature

GREGORY R. SCHNACKEL
MECHANICAL
No. 14851
Expiration Date: 06/30/2024
Date: 04/05/23

Project Name
CRAIG ROAD

Project Number
005.3901.000

Description
MECHANICAL DETAILS

Scale
1/4" = 1'-0"

M502

SE JOB#: 210884

3. Use line size on leaving side of liquid solenoid valves.
D. Refrigerant Charging (Packed Angle) Valve: Use in liquid line between receiver shut-off valve and expansion valve.
E. Filter-Driers:
1. Use a filter-drier immediately ahead of liquid-line controls, such as thermostatic expansion valves, solenoid valves, and moisture indicators.
2. Use a filter-drier on suction line just ahead of compressor.

1.03 REGULATORY REQUIREMENTS
A. Conform to ASME B31.9 for installation of piping system.
B. Welding Materials and Procedures: Conform to ASME (BPV IX) and applicable state labor regulations.
C. Welders Certification: In accordance with ASME (BPV IX).

PART 2 PRODUCTS

2.01 PIPING
A. Copper Tube: ASTM B 280, H58 hard drawn or 060 soft annealed.
1. Fittings: ASME B16.22 wrought copper.
2. Joints: Braze, AWS A5.8 BCuP silver/phosphorus/copper alloy.
B. Copper Tube to 7/8 inch OD: ASTM B 88 (ASTM B 88M), Type K (A), annealed.
1. Fittings: ASME B16.26 cast copper.
2. Joints: Flared.
C. Pipe Supports and Anchors:
1. Conform to ASME B31.5, ASTM F 708, MSS SP-58, MSS SP-69, and MSS SP-89.

2.02 REFRIGERANT
A. Provide refrigerant as specified by the manufacturer of the refrigeration equipment.

2.03 MOISTURE AND LIQUID INDICATORS
A. Manufacturers:
1. Henry Technologies; Parker Hannifin/Refrigeration and Air Conditioning; Sporlan Valve Company.
B. Indicators: Single port type, UL listed, with copper or brass body, flared or solder ends, sight glass, color coded paper moisture indicator with removable element cartridge and plastic cap; for maximum temperature of 200 degrees F and maximum working pressure of 500 psi.

2.04 FILTER-DRIERS
A. Manufacturers:
1. Flow Controls Division of Emerson Electric; Parker Hannifin/Refrigeration and Air Conditioning; Sporlan Valve Company.
B. Performance:
1. Flow Capacity - Liquid Line: As required by capacities indicated on the Drawings, minimum, rated in accordance with ARI 710.
2. Flow Capacity - Suction Line: As required by capacities indicated on the Drawings, minimum, rated in accordance with ARI 730.
3. Pressure Drop: 2 psi, maximum, when operating at full connected evaporator capacity.
4. Design Working Pressure: 350 psi, minimum.
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. Connections: 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; Sporlan 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 minimum 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 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 and replacement of the penetration systems at this Contractor's expense.
C. Follow ASHRAE Std 15 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. Kitchen hood ductwork, Type 1 grease hoods.
E. Duct cleaning.

1.02 PERFORMANCE REQUIREMENTS
A. No variation of duct configuration or sizes permitted except by written permission. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts, only after approval of the Engineer. Sizes shown on design drawings are air 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 adjustments in the 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 obstructions of other trades.
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 to 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 1008/A 1008M, Designation CS, cold-rolled commercial steel.
C. Aluminum Ducts: ASTM B 209 (ASTM B 209M); aluminum sheet, alloy 3003-H14. Aluminum Connectors and Bar Stock: Alloy 6061-T651 or of equivalent strength.
D. 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; aluminized vapor barrier film.
a. Pressure Rating: 10 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; aluminized vapor barrier film.
a. Pressure Rating: 4 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; aluminized vapor barrier film.
a. Pressure Rating: 10 inches WG positive and 1.0 inches 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.
5. UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound spring steel wire; fiberglass insulation; aluminized 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; aluminized 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 alone or with tape, 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 labeled.
5. Ductwork Exposed to the Weather: Hard cast VersaGrip 102, (VG-102), UL 181-AM compliant duct joint sealer, as manufactured by Carlisle, with fiberglass scrim tape reinforcement on all seams and joints, lateral and longitudinal.
F. Hanger Rod: 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 duct material, gages, 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 acoustical 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 Standard. Joints shall be minimum 4 inch cemented slip joint, brazed or electric welded. Prime coat welded joints.
E. Provide standard 45 degree lateral wye takeoffs unless otherwise indicated where 90 degree conical tee connections may be used.
F. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver 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. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
B. Round Spiral Ducts: Machine made 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 inner wall.
D. Transverse Duct Connection System: SMACNA "E" rated rigidly class connection, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips.

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 16 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 can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.
E. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
F. Use crimp joints with or without bead for joining round duct sizes 8 inch and smaller with crimp in direction of air flow.
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 strap or clamp. 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 regulatory 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. 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 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 dust 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. Kitchen Hood Exhaust, Type 1: Carbon Steel, Stainless Steel, Constructed per NFPA 96.
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: 1 inch.
4. General Exhaust: Scheduled System ESP +1.0", round up to next higher pressure class.
5. Outside Air Intake: 1 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. Multi-blade device with blades aligned in short dimension; steel or aluminum construction; with individually adjustable blades, mounting straps.

2.02 VOLUME CONTROL DAMPERS
A. Manufacturers: Louvers & Dampers, Inc.; Nailor Industries Inc.; Ruskin Company; Prefco Inc.
B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.
C. Single Blade Dampers: Fabricate for duct sizes up to 6 x 30 inch.
D. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 x 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
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 operator system shall be similar and equal to Young Regulator Company, "Bowden Cable Control" system including damper, flexible cable with casing and concealed ceiling regulator control.
2. Electrically operated damper control system shall be similar and equal to United Enertech Corporation, "Power Balance" system including motor operated damper, RJ-11 plenum rated cabling and flush ceiling or wall mounted RJ-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 strip.
1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz per sq yd.
a. Net Fabric Width: Approximately 2 inches wide.
2. Metal: 3 inches wide, 24 gage thick galvanized steel.

2.04 DUCT ACCESS DOORS
A. Manufacturers: Acudor Products Inc.; Nailor 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 inch thick insulation with sheet metal cover.
1. Less Than 12 inches Square: Secure with sash locks.
2. Up to 18 inches Square: Provide two hinges and two sash locks.
D. 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. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide minimum 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, and as indicated. Provide 4 x 4 inch for balancing dampers only. Review locations prior to fabrication.
C. Locate all dampers and control elements in accessible areas wherever possible to avoid access doors. Provide ceiling access doors for access to all dampers and control elements located above inaccessible ceiling areas. Provide minimum 12 x 12 inch size for hand access, 18 x 18 inch size for shoulder access, and as indicated. Provide 4 x 4 inch for balancing dampers only. Review locations prior to fabrication.
D. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.
E. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly. Do not locate dampers closer than 5 feet or 10 duct diameters from the air terminal device, whichever is greater.
F. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.
G. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.

AIR PURIFICATION DEVICES

Model: PHI-PKG14-24V Specifications

LISTING: UL 1598:2008 (3rd Edition)
FACTORY UV-PHI CELL
INSTALLATION: RTU PACKAGED UNIT / BLOWER CABINET

PART 1 GENERAL

1.1 SUMMARY

A. This section includes hydro-peroxide, Super-Oxide Ions, & Hydroxide Ion's delivered via PHI technology through packaged heating and cooling units capable of supplying 3,000 to 8,000 CFM of supply air to the indoor space.

1.2 QUALITY ASSURANCE

A. All models shall be UL listed and comply with safety standards UL 1598:2008 (3rd Edition) and CSA Standard C22.2 No. 250.0:2008.

1.3 WARRANTY

A. All units shall be provided with the following standard warranties:

i. 2-year or 18,000 hours from initial startup. National TAB provided service plan. The phi cell & UV light replacement 18,000 hour replacements are provide/installed at no cost if National TAB is providing Renew-Cx Service after initial installation.

B. This warranty shall not apply if:

ii. The equipment is not installed by a qualified installer per the manufacturer's installation instructions shipped with the product.
iii. The equipment is misused or neglected, or not maintained per the manufacturer's maintenance instructions.
iv. The equipment is not operated within its published capacity.
v. The invoice is not paid within the terms of the sales agreement.

PART 2 PRODUCTS

2.1 GENERAL

A. MULTI-ZONE one piece packaged PHI Unit-Air Purification System.

2.2 HOUSING

A. Unit(s) shall be constructed of aluminum structural pop-rivets. All metal shall be CNC bend for precise assembly.

i. Quad Metalic Target
ii. UV-C bulb
iii. Electronic Enclousre (24VAC input power Jack)
iv. Magnetic mounting feet for easy placement and installation in the Blower Cabinet.

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; CaptiveAire.

2.02 POWER VENTILATORS - GENERAL
A. Performance Ratings: Determined in accordance with AMCA 210 and bearing the AMCA Certified Rating Seal.
B. Sound Ratings: AMCA 301, tested to AMCA 300, and bearing AMCA Certified Sound Rating Seal.
C. Fabrication: Conform to AMCA 99.
D. UL Compliance: UL listed and labeled, designed, manufactured, and tested as suitable for the purpose specified and indicated.

2.03 ROOF EXHAUSTERS AND VENTILATORS
A. Fan Unit: V-belt or direct driven as indicated, with spun aluminum housing; resilient mounted motor; 1/2 inch mesh, 0.62 inch thick aluminum wire birdscreen; square base to suit roof curb with continuous curb gaskets.
B. Roof Curb: 20 inch high above the finished roof surface (compensate for roof insulation thickness at fan location) self-flashing of galvanized steel or aluminum construction with continuously welded seams, built-in cant strips, insulation and curb bottom, and factory installed nailer strip.
C. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor.
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. Sheaves: 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 tray, ventilated double wall curb and hinged curb adapter 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 sheaves required for final air balance at no 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. Counterflash duct to roof or wall opening.
E. Install backdraft dampers (gravity or motorized as depicted on design drawings) on inlet to roof and wall exhausters.
F. 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 and replacement of the penetration systems at this Contractor's expense.

END OF SECTION

A

SECTION 233700 – AIR OUTLETS AND INLETS

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Rectangular ceiling diffusers.
B. Perforated face ceiling diffusers.
C. Spiral duct mounted diffusers.
D. Grid core exhaust and return grilles.
E. Wall registers and grilles.

1.02 SUBMITTALS
A. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, accessories, and noise level.

1.03 QUALITY ASSURANCE
A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.
B. Test and rate louver performance in accordance with AMCA 500-L.
C. Code requirements shall supersede any conflicting requirements of this Section.

1.04 QUALIFICATIONS
A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this Section, with minimum five years of documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS
A. Titus; Krueger; Price Industries; Nailor Industries Inc.; Hart & Cooley; Ruskin, Greenheck.

2.02 RECTANGULAR CEILING DIFFUSERS
A. Type: Square, adjustable pattern, stamped, multi-core, or architectural plaque diffuser to discharge air in 360 degree pattern with sectorizing baffles where indicated.
B. Frame: Inverted T-bar type. In plaster ceilings, provide plaster frame and ceiling frame. (To allow lift-out removal of the diffuser without removal of the plaster frame.)
C. Fabrication: Steel with baked enamel off-white finish.
D. Accessories: Opposed blade damper and multi-louvered equalizing grid with damper adjustable from diffuser face.

2.03 PERFORATED FACE CEILING DIFFUSERS
A. Type: Perforated face with removable face.
B. Frame: Inverted T-bar type. In plaster ceilings, provide plaster frame and ceiling frame. (To allow lift-out removal of the diffuser without removal of the plaster frame.)
C. Fabrication: Steel with steel frame and baked enamel off-white finish.
D. Accessories: Opposed blade damper and multi-louvered equalizing grid with damper adjustable from diffuser face.

2.04 SPIRAL DUCT MOUNTED DIFFUSERS
A. Type: Streamlined and individually adjustable blades, 3/4 inch minimum depth, 3/4 inch maximum spacing with spring or other device to set blades, horizontal face, double deflection.
B. Frame: 1-3/8 inch margin with countersunk screw mounting and gasket.
C. Fabrication: Heavy duty extruded aluminum, with factory off-white enamel finish.
D. Damper: Air scoop damper/extractor shall be constructed of heavy duty aluminum. The air scoop damper to be operable from the face with a screwdriver.
E. Rough Service: Provide front pivoted or welded in place blades, securely fastened to be immobile.
F. Mount flush to duct surface. Confirm duct diameter with the sheet metal contractor (including internal insulation, if specified). Air dimensions are shown on the design drawings.

2.05 GRID CORE EXHAUST AND RETURN GRILLES
A. Type: Fixed grilles of 1/2 x 1/2 x 1 inch louvers.
B. Fabrication: Aluminum with factory off-white enamel finish.
C. Frame: 1-1/4 inch margin with countersunk screw mounting.
D. Frame: Channel lay-in frame for suspended grid ceilings where face size exceeds 18 x 18 inch.
E. Damper (if specified on drawings): Integral, gang-operated, opposed blade type with removable key operator, operable from face.

2.06 WALL SUPPLY REGISTERS/GRILLES
A. Type: Streamlined and individually adjustable blades, 3/4 inch minimum depth, 3/4 inch maximum spacing with spring or other device to set blades, horizontal face, double deflection.
B. Frame: 1-1/4 inch margin with countersunk screw mounting and gasket.
C. Fabrication: Steel with 20 gage minimum frames and 22 gage minimum blades, steel and aluminum with 20 gage minimum frame, or aluminum extrusions, with factory off-white enamel finish.
D. Damper: Integral, gang-operated opposed blade type with removable key operator, operable from face.
E. Rough Service: Provide front pivoted or welded in place blades, securely fastened to be immobile.

PART 3 EXECUTION

3.01 INSTALLATION
A. Install in accordance with manufacturer's instructions.
B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.
C. Install diffusers to ductwork with air tight connection.
D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.
E. Paint ductwork visible behind air outlets and inlets matte black.

END OF SECTION

SECTION 237413 – PACKAGED OUTDOOR ROOF TOP UNITS – GAS FIRED

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Packaged roof top units.
B. Thermostat controls.
C. Roof mounting curb and base.
D. Economizer.
E. Power exhaust.

PART 2 PRODUCTS

2.01 MANUFACTURERS
A. Carrier Corporation. No Exceptions

A

2.02 AIR CONDITIONING UNITS
A. General: Roof mounted units having gas burner and electric refrigeration.
B. Description: Self-contained, packaged, factory assembled and prewired, consisting of cabinet and frame, supply fan, heat exchanger and burner, controls, air filters, refrigerant cooling coil and compressor, dry bulb economizer and power exhaust fan where indicated on the Drawings, condenser coil and condenser fan.
C. Electrical Characteristics: As scheduled on the Drawings.
D. Disconnect Switch: Factory mount disconnect switch on equipment.

2.03 FABRICATION
A. Cabinet: Steel with baked enamel finish, including access panels with screwdriver operated flush cam type fasteners or doors with piano hinges with locking handles. Structural members shall be minimum 18 gage, with access doors or panels of minimum 20 gage.
B. Insulation: one inch thick neoprene coated glass fiber with edges protected from erosion.
C. Heat Exchangers: Aluminized steel or stainless steel where indicated on the Drawings, of welded construction.
D. Supply Fan: Forward curved centrifugal type, resiliently mounted with V-belt drive, adjustable variable pitch motor pulley, and rubber isolated hinge mounted motor or direct drive as indicated. Isolate complete fan assembly.
1. Fans for units with a mechanical cooling capacity greater than or equal to 65,000 Btu/h shall have not fewer than two stages of fan control.
E. Air Filters: 2 inch thick disposable media in metal frames.
F. Roof Mounting Curb: Galvanized steel, channel frame, insulated with gaskets, nailer strips. Provide roof curb of adequate height to provide a unit mounting height of 12" or greater above the top of the roof surface with the curb mounted to the building structure. Roof curb height must compensate for the roof insulation thickness to meet this requirement.
G. Vibration Isolation Curb: Only when indicated on the Drawings.

2.04 BURNER
A. Gas Burner: Induced draft or forced draft type burner with adjustable combustion air supply, pressure regulator, gas valves, manual shut-off, intermittent spark or glow coil ignition, flame sensing device, and automatic 100 percent shut-off pilot.
B. Gas Burner Safety Controls: Energize ignition, limit time for establishment of flame, prevent opening of gas valve until pilot flame is proven, stop gas flow on ignition failure, energize blower motor, and after air flow proven and slight delay, allow gas valve to open.
C. High Limit Control: Temperature sensor with fixed stop at maximum permissible setting, de-energize burner on excessive bonnet temperature and energize burner when temperature drops to lower safe value.
D. Supply Fan Control: Temperature sensor sensing bonnet temperatures and independent of burner controls, with provisions for continuous fan operation.

2.05 EVAPORATOR COIL
A. Provide copper tube aluminum fin coil assembly with galvanized drain pan and connection.
B. Provide capillary tubes or thermostatic expansion valves for units of 6 tons capacity and less, and thermostatic expansion valves and alternate row circuiting for units 7.5 tons cooling capacity and larger.

2.06 COMPRESSOR
A. Provide hermetic or semi-hermetic compressors, 3600 rpm maximum, resiliently mounted with positive lubrication, crankcase heater, high and low pressure safety controls, motor overload protection, suction and discharge service valves and gage ports, and filter drier.
B. Five minute timed off circuit to delay compressor start.
C. Outdoor thermostat to energize compressor above 35 degrees F ambient.

2.07 CONDENSER COIL
A. Provide copper tube aluminum fin coil assembly with subcooling rows and coil guard.
B. Provide direct drive propeller fans, resiliently mounted with fan guard, motor overload protection, wired to operate with compressor.

2.08 MIXED AIR CASING
A. Dampers: Provide outside, return, and relief dampers with damper operator and control package to automatically vary outside air quantity. Outside air damper to fail to closed position. Relief dampers may be gravity balanced.
B. Gaskets: Provide tight fitting dampers with edge gaskets maximum leakage 5 percent at 2 inches pressure differential.
C. Damper Operator: 24 volt with gear train sealed in oil.
D. Damper Operator, Units 7.5 Ton Cooling Capacity and Larger: 24 volt with gear train sealed in oil with spring return on.
E. Mixed Air Controls: Maintain selected supply air temperature and return dampers to minimum position on call for heating and above 75 degrees F ambient, or when ambient air temperature exceeds return air temperature.

2.09 INTEGRATED ECONOMIZER:
A. Economizer shall be furnished and installed complete with outside air and relief dampers and controls.
B. Provide low-leakage, opposed blade dampers
1. Meet all leakage requirements of applicable energy code.
C. Economizer shall be capable of introducing up to 100% outdoor air for minimum ventilation as well as free cooling.
D. Damper actuator shall be electronic, fully modulating design.
E. Economizer outdoor hood shall be pre-painted and fully integrated with the unit.
F. Dry Bulb Control: Provide dry bulb sensor capable of measuring temperature of outdoor air and controlling economizer cut-in point at the most economical level. High level cutoff shall be set per applicable energy code.
1. Provide economizer Fault Detection and Diagnostics (FDD).

2.10 POWER EXHAUST:
A. Package shall include exhaust fan(s) and damper for units with economizer to control over-pressurization of building including integral pressure controls.

2.11 WATER LEVEL MONITORING DEVICE:
A. A water-level monitoring device shall be installed inside the primary drain pan. This device shall shut off the equipment served in the event that the primary drain becomes restricted. Devices installed in the drain line shall not be permitted.

2.12

2.13 OPERATING CONTROLS
A. Provide low voltage, adjustable thermostat to control heater stages in sequence with delay between stages, compressor and condenser fan, and supply fan to maintain temperature setting.
1. Include system selector switch (off-heat-auto-cool) and fan control switch (auto-on).
2. The Mechanical Contractor shall provide all control wiring between thermostat and unit control panel and any required remote sensors.
3. Locate thermostat in room as shown.
4. Electric solid state microcomputer based room thermostat, located as indicated. Provide remote sensors when indicated on the Drawings.
a. Room thermostat shall incorporate:
1. Automatic switching from heating to cooling.
2. Preferential rate control to minimize overshoot and deviation from set point.
3. Automatic Start Capabilities: Controls shall be capable of automatically adjusting the daily start time of the HVAC system in order to bring each space to the desired occupied temperature immediately prior to scheduled occupancy.
4. Set-up for four separate temperatures per day.
5. Instant override of set point for continuous or timed period from one hour to 31 days.
6. Short cycle protection.
7. Programming based on weekdays, Saturday and Sunday.
8. Switch selection features including imperial or metric display, 12 or 24 hour clock, keyboard disable, remote sensor, fan on-auto.
b. Room thermostat display shall include:
1. Time of day.
2. Actual room temperature.
3. Programmed temperature.
4. Day of week.
5. System mode indication: heating, cooling, auto, off, fan auto, fan on.
6. Stage (heating or cooling) operation.

PART 3 EXECUTION

3.01 INSTALLATION
A. Install in accordance with manufacturer's instructions and NFPA 90A.
B. Mount units on factory built roof mounting curb providing watertight enclosure to protect ductwork and utility services. Install roof mounting curb level. Install roof mounting curb so that it bears on the building structure, not on top of the roof deck or roofing materials. Provide restraints where required by local codes.
C. Provide cooling condensate drain piping (and overflow piping if required) to approved location. Condensate piping shall be Schedule 40 galvanized steel pipe, Type L copper tube, or PVC. Contractor shall verify 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. Condensate piping located within the building shall be insulated with 1/2 inch thick glass fiber or flexible elastomeric cellular foam insulation. Only metallic piping systems will be allowed in return air plenum ceiling space.

END OF SECTION

SECTION 238127 – SMALL SPLIT-SYSTEM HEATING AND COOLING

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Air-source heat pumps.
B. Indoor ductless fan & coil units.
C. Controls.
1. Room thermostats.

PART 2 PRODUCTS

2.01 MANUFACTURERS
A. Carrier Corporation. No Exceptions.

A

2.02 SYSTEM DESIGN
A. Split-System Heating and Cooling Units: Self-contained, packaged, matched factory-engineered and assembled, pre-wired indoor and outdoor units; UL listed.
1. Provide refrigerant lines internal to units and between indoor and outdoor units, factory cleaned, dried, pressurized and sealed, with insulated suction line. Size as recommended by the manufacturer. All refrigerant line sizes indicated on the Drawings are approximate and shall be adjusted as required based on the actual equipment provided to meet the manufacturer's recommended line sizing at no additional expense.
B. Performance Requirements:.
1. Equipment performance, efficiency 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. Efficiency shall not be less than requirements of the units specified or indicated on the drawings, or the applicable local energy code.

2.03 INDOOR UNITS FOR DUCTLESS SYSTEMS
A. Indoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, evaporator coil, and controls; wired for single power connection with control transformer.
B. Evaporator Coils: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve.
1. Construction and Ratings: In accordance with ARI 210/240 and UL listed.

2.04 OUTDOOR UNITS
A. Outdoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, with compressor and condenser.
1. Cabinet: Steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner.
2. Construction and Ratings: In accordance with ARI 210/240 with testing in accordance with ASHRAE Std 23 and UL listed.
B. Compressor: ARI 520; hermetic, 3600 rpm, (multi-speed when indicated on the Drawings) resiliently mounted integral with condenser, with positive lubrication, crankcase heater, high pressure control, motor overload protection, service valves and drier. Provide time delay control to prevent short cycling.
C. Air Cooled Condenser: ARI 520; Aluminum fin and copper tube coil, with direct drive axial propeller fan resiliently mounted, galvanized fan guard.
D. Accessories: Filter drier, high pressure switch (manual reset), low pressure switch (automatic reset), service valves and gage ports, thermometer well (in liquid line).
1. Provide thermostatic expansion valves.
2. Provide heat pump reversing valves on all heat pump units.
E. Operating Controls:
1. Control by room thermostat to maintain room temperature setting.
2. Low Ambient Kit: On all systems not provided with economizer controls, provide refrigerant pressure switch to cycle condenser fan on when condenser refrigerant pressure is above 285 psig and off when pressure drops below 140 psig for operation to 0 degrees F.
F. Mounting Pad: Poured in place concrete, precast concrete or resin composite pad, minimum 4 inches thick, square.

2.05 ACCESSORY EQUIPMENT
A. Room Thermostat: Wall-mounted, electric solid state microcomputer based room thermostat with remote sensor to maintain temperature setting; low-voltage; with following features:
1. System selector switch (heat-off-cool) and fan control switch (auto-on).
2. Automatic switching from heating to cooling.
3. Preferential rate control to minimize overshoot and deviation from setpoint.
4. Automatic Start Capabilities: Controls shall be capable of automatically adjusting the daily start time of the HVAC system in order to bring each space to the desired occupied temperature immediately prior to scheduled occupancy.
5. Set-up for four separate temperatures per day.
6. Instant override of setpoint for continuous or timed period from one hour to 31 days.
7. Short cycle protection.
8. Programming based on every day of the week.
9. Selection features including degree F or degree C display, 12 or 24 hour clock, keyboard disable, remote sensor, fan on-auto.
10. Battery replacement without program loss.
11. Thermostat display:
a. Time of day.
b. Actual room temperature.
c. Programmed temperature.
d. Day of week.
e. System mode indication: heating, cooling, fan auto, off, and on, auto or on, off.

PART 3 EXECUTION

3.01 INSTALLATION
A. Install in accordance with manufacturer's instructions and requirements of local authorities having jurisdiction.
B. Install in accordance with NFPA 90A and NFPA 90B as applicable.
C. Provide cooling condensate drain piping (and overflow piping if required) to approved location. Condensate piping shall be Schedule 40 galvanized steel pipe, Type L copper tube, or PVC pipe (non-plenum applications). Contractor shall verify 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. Only metallic piping systems will be allowed in return air plenum ceiling space.
D. Install refrigeration systems in accordance with ASHRAE Std 15. Provide filter dryer, sight glass and solenoid valve on outdoor units and sight glass and expansion valve on indoor units.
E. All thermostat, humidistat (if required), damper interlock and other low voltage control wiring shall be installed by the Mechanical Contractor. The Electrical Contractor will furnish only the power system connections shown on the Electrical Drawings. All other control and interlock wiring is the responsibility of the Mechanical Contractor.

END OF SECTION

SHAKE SHACK

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△	Date	Description
1	07/07/2022	ADDENDUM 1
2	09/22/2022	ADDENDUM 2
3	10/27/2022	ADDENDUM 3
4	02/07/2023	ISSUE FOR CONSTRUCTION
5	02/21/2023	FIELD NOTICE 1
A	04/05/2023	FIELD NOTICE 1

Seal / Signature

PROFESSIONAL ENGINEER STATE OF NEVADA
GREGORY R. SCHNACKEL
MECHANICAL
No. 14851
Expiration Date: 06/30/2024
Date: 04/05/23

Project Name
CRAIG ROAD

Project Number
005.3901.000

Description
MECHANICAL SPECIFICATIONS

Scale
1/4" = 1'-0"

M592

SE JOB#: 210584

CODE: 2018 UNIFORM MECHANICAL CODE

SYSTEM 2 DINING

ROOM #	NAME	Az AREA (FT2)	TABLE 402.1 OCCUPANCY CATEGORY	TABLE 402.1 Rp PEOPLE OA (CFM/PER)	TABLE 402.1 Ra AREA OA (CFM/FT2)	TABLE 402.1 OCCUPANT DENSITY (#/1000 FT2)	Pz (#)	Rp*Pz	Ra*Az	Vbz (CFM)	TABLE 403.2.2 Ez	Voz (CFM)	Xs	Vpz MAX SUPPLY (CFM)	Vpzm MIN SUPPLY (CFM)	Zp	INTERPOLATED TABLE 403.5.2 Ev
103	DINING	1,364	CAFETERIA/FAST FOOD DINING	7.5	0.18	100	72	540	246	786	0.80	982	0.158	4800	4800	0.205	0.95
104	CORRIDOR	52	CORRIDORS	0.0	0.06	0	0	0	3	3	0.80	4	0.158	0	0	0.000	1.00
105	MENS RESTROOM	125	NO LISTING	0.0	0.00	0	0	0	0	0	0.80	0	0.158	100	100	0.000	1.00
106	WOMENS RESTROOM	136	NO LISTING	0.0	0.00	0	0	0	0	0	0.80	0	0.158	100	100	0.000	1.00
107	STORAGE	17	NO LISTING	0.0	0.00	0	0	0	0	0	0.80	0	0.158	0	0	0.000	1.00
		1,694					72	540	249	789		986		5000	5000	0.205	0.95

OUTDOOR AIR CALCULATIONS PER ASHRAE 62.1, APPENDIX A

SYMBOL	VALUE	DESCRIPTION
Ps =	72	SYSTEM POPULATION
SPz =	72	ZONE POPULATION
D =	1.000	OCCUPANT DIVERSITY
Vou =	789	UNCORRECTED OUTDOOR AIR INTAKE
Vps = SVpz	5000	SYSTEM PRIMARY AIRFLOW
Xs =	0.158	AVERAGE OUTDOOR AIR FRACTION
Ev = Evz (min)	0.95	ZONE VENTILATION EFFICIENCY
Ep =	TYPICAL 1.0, MAY VARY	PRIMARY AIR FRACTION TO THE ZONE
Er =	TYPICAL 0, MAY VARY	FRACTION OF SECONDARY RECIRCULATED AIR TO THE ZONE
Ez =	TYPICAL 0.8, MAY VARY	ZONE AIR DISTRIBUTION EFFECTIVENESS
Fa =	VARIES	FRACTION OF SUPPLY AIR TO THE ZONE FROM SOURCES OUTSIDE THE ZONE
Fb =	VARIES	FRACTION OF SUPPLY AIR TO THE ZONE FROM FULLY MIXED PRIMARY AIR
Fc =	VARIES	FRACTION OF OUTDOOR AIR TO THE ZONE FROM SOURCES OUTSIDE THE ZONE
Evz =	VARIES	ZONE VENTILATION EFFICIENCY
Ev =	VARIES	SYSTEM VENTILATION EFFICIENCY
Zd =	VARIES	THE OUTDOOR AIR FRACTION REQUIRED IN AIR DISCHARGED TO THE ZONE BASED ON THE MINIMUM DISCHARGE AIRFLOW
Vot =	827	CODE REQUIRED OUTDOOR AIRFLOW RATE, CFM
Vot =	830	DESIGN OUTDOOR AIRFLOW RATE, CFM

SYSTEM 3 KITCHEN

ROOM #	NAME	Az AREA (FT2)	TABLE 402.1 OCCUPANCY CATEGORY	TABLE 402.1 Rp PEOPLE OA (CFM/PER)	TABLE 402.1 Ra AREA OA (CFM/FT2)	TABLE 402.1 OCCUPANT DENSITY (#/1000 FT2)	Pz (#)	Rp*Pz	Ra*Az	Vbz (CFM)	TABLE 403.2.2 Ez	Voz (CFM)	Xs	Vpz MAX SUPPLY (CFM)	Vpzm MIN SUPPLY (CFM)	Zp	INTERPOLATED TABLE 403.5.2 Ev
108	OPEN KITCHEN	278	KITCHEN (COOKING)	7.5	0.12	20	6	45	33	78	0.80	98	0.049	1825	1825	0.054	1.00
109	COOKLINE	230	KITCHEN (COOKING)	7.5	0.12	20	5	38	28	65	0.80	81	0.049	1275	1275	0.064	1.00
110	DRIVE THRU	97	SALES	7.5	0.12	15	2	15	12	27	0.80	33	0.049	435	435	0.077	1.00
111	BOH	460	OCCUPIABLE STORAGE ROOMS (LIQUIDS, GELS)	5.0	0.12	2	4	20	55	75	0.80	94	0.049	1470	1470	0.064	1.00
		1,065					17	118	128	245		307		5005	5005	0.077	1.00

OUTDOOR AIR CALCULATIONS PER ASHRAE 62.1, APPENDIX A

SYMBOL	VALUE	DESCRIPTION
Ps =	17	SYSTEM POPULATION
SPz =	17	ZONE POPULATION
D =	1.000	OCCUPANT DIVERSITY
Vou =	245	UNCORRECTED OUTDOOR AIR INTAKE
Vps = SVpz	5005	SYSTEM PRIMARY AIRFLOW
Xs =	0.049	AVERAGE OUTDOOR AIR FRACTION
Ev = Evz (min)	0.97	ZONE VENTILATION EFFICIENCY
Ep =	TYPICAL 1.0, MAY VARY	PRIMARY AIR FRACTION TO THE ZONE
Er =	TYPICAL 0, MAY VARY	FRACTION OF SECONDARY RECIRCULATED AIR TO THE ZONE
Ez =	TYPICAL 0.8, MAY VARY	ZONE AIR DISTRIBUTION EFFECTIVENESS
Fa =	VARIES	FRACTION OF SUPPLY AIR TO THE ZONE FROM SOURCES OUTSIDE THE ZONE
Fb =	VARIES	FRACTION OF SUPPLY AIR TO THE ZONE FROM FULLY MIXED PRIMARY AIR
Fc =	VARIES	FRACTION OF OUTDOOR AIR TO THE ZONE FROM SOURCES OUTSIDE THE ZONE
Evz =	VARIES	ZONE VENTILATION EFFICIENCY
Ev =	VARIES	SYSTEM VENTILATION EFFICIENCY
Zd =	VARIES	THE OUTDOOR AIR FRACTION REQUIRED IN AIR DISCHARGED TO THE ZONE BASED ON THE MINIMUM DISCHARGE AIRFLOW

SYSTEM 4 MANAGERS

ROOM #	NAME	Az AREA (FT2)	TABLE 402.1 OCCUPANCY CATEGORY	TABLE 402.1 Rp PEOPLE OA (CFM/PER)	TABLE 402.1 Ra AREA OA (CFM/FT2)	TABLE 402.1 OCCUPANT DENSITY (#/1000 FT2)	Pz (#)	Rp*Pz	Ra*Az	Vbz (CFM)	TABLE 403.2.2 Ez	Voz (CFM)	Xs	Vpz MAX SUPPLY (CFM)	Vpzm MIN SUPPLY (CFM)	Zp	INTERPOLATED TABLE 403.5.2 Ev
112	MANAGERS OFFICE	64	OFFICE SPACE	5.0	0.06	5	1	5	4	9	0.80	11	0.025	350	350	0.032	1.00
		64					1	5	4	9		11		350	350	0.032	1.00

OUTDOOR AIR CALCULATIONS PER ASHRAE 62.1, APPENDIX A

SYMBOL	VALUE	DESCRIPTION
Ps =	1	SYSTEM POPULATION
SPz =	1	ZONE POPULATION
D =	1.000	OCCUPANT DIVERSITY
Vou =	9	UNCORRECTED OUTDOOR AIR INTAKE
Vps = SVpz	350	SYSTEM PRIMARY AIRFLOW
Xs =	0.025	AVERAGE OUTDOOR AIR FRACTION
Ev = Evz (min)	0.99	ZONE VENTILATION EFFICIENCY
Ep =	TYPICAL 1.0, MAY VARY	PRIMARY AIR FRACTION TO THE ZONE
Er =	TYPICAL 0, MAY VARY	FRACTION OF SECONDARY RECIRCULATED AIR TO THE ZONE
Ez =	TYPICAL 0.8, MAY VARY	ZONE AIR DISTRIBUTION EFFECTIVENESS
Fa =	VARIES	FRACTION OF SUPPLY AIR TO THE ZONE FROM SOURCES OUTSIDE THE ZONE
Fb =	VARIES	FRACTION OF SUPPLY AIR TO THE ZONE FROM FULLY MIXED PRIMARY AIR
Fc =	VARIES	FRACTION OF OUTDOOR AIR TO THE ZONE FROM SOURCES OUTSIDE THE ZONE
Evz =	VARIES	ZONE VENTILATION EFFICIENCY
Ev =	VARIES	SYSTEM VENTILATION EFFICIENCY
Zd =	VARIES	THE OUTDOOR AIR FRACTION REQUIRED IN AIR DISCHARGED TO THE ZONE BASED ON THE MINIMUM DISCHARGE AIRFLOW

① OUTSIDE AIR CALCULATIONS

Air System Sizing Summary for BLOCK LOAD

Project Name: 210884hvac_for_FA_20220324091812-FAFinal
Prepared by: Schnackel Engineers, Inc

03/24/2022
09:50AM

Air System Information

Air System Name	**BLOCK LOAD**	Number of zones	**1**
Equipment Class	**PKG ROOF**	Floor Area	**2926.0** ft²
Air System Type	**SZCAV**	Location	**Las Vegas, Nevada**

Sizing Calculation Information

Zone and Space Sizing Method:

Zone CFM	**Peak zone sensible load**	Calculation Months	**Jan to Dec**
Space CFM	**Individual peak space loads**	Sizing Data	**Calculated**

Central Cooling Coil Sizing Data

Total coil load	**20.7**	Tons	Load occurs at	**Jul 1600**	
Total coil load	**248.3**	MBH	OA DB / WB	**107.3 / 65.8**	°F
Sensible coil load	**248.3**	MBH	Entering DB / WB	**79.4 / 61.7**	°F
Coil CFM at Jul 1600	**10415**	CFM	Leaving DB / WB	**55.5 / 53.0**	°F
Max block CFM	**10415**	CFM	Coil ADP	**52.8**	°F
Sum of peak zone CFM	**10415**	CFM	Bypass Factor	**0.100**	
Sensible heat ratio	**1.000**		Resulting RH	**44**	%
ft²/Ton	**141.4**		Design supply temp.	**55.0**	°F
BTU/(hr-ft²)	**84.9**		Zone T-stat Check	**1 of 1**	OK
Water flow @ 10.0 °F rise	**N/A**		Max zone temperature deviation	**0.0**	°F

Central Heating Coil Sizing Data

Max coil load	**135.3**	MBH	Load occurs at	**Des Htg**	
Coil CFM at Des Htg	**10415**	CFM	BTU/(hr-ft²)	**46.2**	
Max coil CFM	**10415**	CFM	Ent. DB / Lvg DB	**66.9 / 79.9**	°F
Water flow @ 20.0 °F drop	**N/A**				

Supply Fan Sizing Data

Actual max CFM	**10415**	CFM	Fan motor BHP	**1.71**	BHP
Standard CFM	**9621**	CFM	Fan motor kW	**1.36**	kW
Actual max CFM/ft²	**3.56**	CFM/ft²	Fan static	**0.60**	in wg

② LOAD CALCULATIONS

RTU/ACU CONTROL MATRIX

SETPOINT/CONTROL	RTU-1 DINING	RTU-2 KITCHEN	FC-1 OFFICE	FC-2 MECH
SETPOINTS				
COOLING - OCCUPIED SETPOINT	75 F	75 F	75 F	80 F
COOLING - UNOCCUPIED SETPOINT	80 F	80 F	80 F	80 F
HEATING - OCCUPIED SETPOINT	70 F	70 F	70 F	40 F
HEATING - UNOCCUPIED SETPOINT	60 F	60 F	60 F	40 F
ECONOMIZER UPPER LIMIT SETPOINT	△1 75 F	75 F	NA	NA

ACCESSORIES				
HVAC SYSTEM OCCUPIED/UNOCCUPIED MODE - PROGRAMMABLE THERMOSTAT	YES	YES	YES	YES
REMOTE TEMPERATURE SENSOR	YES	YES	NO	NO
MOTORIZED OUTDOOR AIR DAMPER	YES	YES	YES	NO
INTEGRATED ECONOMIZER	YES	YES	NO	NO
ECONOMIZER FAULT DETECTION	YES	YES	NO	NO
BAROMETRIC RELIEF	NO	NO	NO	NO
POWERED EXHAUST RELIEF	YES	YES	NO	NO
DEHUMIDIFICATION (HOT GAS REHEAT)	NO	NO	NO	NO

SUPPLY FAN				
ON DURING OCCUPIED MODE	YES	YES	YES	NO
VARIALBE VOLUME - MODULATE FAN SPEED	YES	YES	YES	YES

SAFETIES AND INTERLOCKS				
RETURN AIR SMOKE DETECTOR	YES	YES	NO	NO
LOW LIMIT FREEZESTAT	YES	YES	YES	YES
FIRE ALARM CONTOL PANEL INTERLOCK	YES	YES	YES	NO
KITCHEN EXHAUST SYSTEM INTERLOCK	YES	YES	YES	NO

AIR BALANCE SCHEDULE

EQUIPMENT TAG	SUPPLY AIRFLOW (CFM)	OUTDOOR AIRFLOW (CFM)	RETURN AIRFLOW (CFM)	EXHAUST AIRFLOW (CFM)	OA/SA (%)	REMARKS
RTU-1	5,000	830	4,170		17%	
RTU-2	5,000	470	4,530		9%	
MUA-1	3,045	3,045	0		100%	
FC-1	350	15	335		4%	
FC-2	380	0	380		0%	
EF-1				1,900		
EF-2				1,910		
EF-3				300		
TOTAL =	13,775	4,360	9,415	4,110		
RESULTING BUILDING PRESSURIZATION =	250 CFM					
PRESSURIZATION PERCENTAGE =	1.8 %					

CARRIER EQUIPMENT SHALL BE OBTAINED THROUGH SHAKE SHACK NATIONAL ACCOUNT. CONTACT CARRIER CORPORATION FOR PROPOSALS:
BOB ECKWEILER
CARRIER RETAIL STRATEGIC ACCOUNTS
EMAIL: BOB.ECKWEILER@CARRIER.UTC.COM
PHONE: (973) 222-6742

△1 LANDLORD PROVIDED ROOF TOP UNITS

MARK	COOLING SEN (MBH)	COOLING TOT (MBH)	COOLING COOL (TON)	HEATING IN (MBH)	HEATING OUT (MBH)	SUPPLY AIR (CFM)	EXT. S.P. (IN)	FAN BHP	ELECTRICAL VOLT	PH	MCA	MOCP	WEIGHT (LBS)	SEER /EER	CARRIER MODEL NUMBER	REMARKS
RTU-1	110.2	148.8	12.5	240.0	195.0	5,000	0.70	2.2	208	3	63.0	80	1,952	/12.20	48HCFD14	[1-11]
RTU-2	110.2	148.8	12.5	240.0	195.0	5,000	0.70	2.2	208	3	63.0	80	1,952	/12.20	48HCFD14	[1-11]

CARRIER IS THE BASIS OF DESIGN. NO EXCEPTIONS.

COOLING CAPACITIES ARE BASED ON AHRI STANDARD 210/240 OR 340/360: 80°F DB/ 67°F WB INDOOR ENTERING AIR TEMPERATURE, 95°F DB AIR ENTERING OUTDOOR FAN. SCHEDULED UNIT MAY DIFFER FROM AHRI STANDARD CFM.

REMARKS:
1. PROVIDE EQUIPMENT WITH SCCR 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 FACTORY INSTALLED DISCONNECT, UNPOWERED CONVENIENCE OUTLET, THROUGH THE BASE ELECTRICAL CONNECTION.
3. PROVIDE WITH 14 INCH HEIGHT ROOF CURB.
4. PROVIDE WITH HIGH ALTITUDE CONVERSION KIT.
5. PROVIDE WITH DRY BULB ECONOMIZER AND POWER EXHAUST.
6. ECONOMIZER SHALL INCLUDE FAULT DETECTION DIAGNOSTICS (FDD). DAMPER LEAKAGE SHALL MEET APPLICABLE ENERGY CODE.
7. PROVIDE WITH CONDENSER COIL HAIL GUARD.
8. DUCT SMOKE DETECTOR ON THE SUPPLY SIDE DUCT AND SHUTDOWN RELAY SHALL BE FURNISHED BY THE ELECTRICAL CONTRACTOR FOR INSTALLATION BY THE MECHANICAL CONTRACTOR. ALL WIRING SHALL BE BY THE ELECTRICAL CONTRACTOR.
9. PROVIDE WATER LEVEL MONITORING DEVICE IN DRAIN PAN TO SHUT OFF UNIT IF THE DRAIN LINE BECOMES RESTRICTED.
10. UNITS WITH COOLING CAPACITY GREATER THAN OR EQUAL TO 65 MBH SHALL HAVE MULTI-STAGE CAPABILITY PER APPLICABLE ENERGY CODE.
11. ECONOMIZER SHALL MEET ALL LOCAL ENERGY CODE REQUIREMENTS.

AIR SOURCE HEAT PUMPS

MARK	LOCATION	SERVES	NOMINAL COOL (TONS)	HEATING AT 47F (MBH)	ELECTRICAL VOLT	PH	MCA	MOCP	SEER /EER	HSPF /COP	MANUFACTURER	MODEL NUMBER	REMARKS
ASHP-1	ROOF	FC-1	3/4	10.0	208	1	15.0	15	20.5/13.0	10.8/2.93	CARRIER	38MARBQ09	[1]
ASHP-2	ROOF	FC-2	1/2	7.4	208	1	13.0	15	26.5/15.8	14.0/3.90	CARRIER	38MARBQ06	[1]

REMARKS:
1. PROVIDE EQUIPMENT WITH SCCR 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.

DUCTLESS SPLIT SYSTEMS

MARK	COOLING NOMINAL (TONS)	COOLING TOT (MBH)	COOLING SEN (MBH)	HEATING OUT (MBH)	SUPPLY AIR (CFM)	FAN (WATT)	ELECTRICAL VOLT	PH	MCA	MOCP	SEER /EER	CARRIER MODEL NUMBER	REMARKS
FC-1	3/4	11.73	8.79	10.00	350	45	208	1	0.2	N/A	20.5/13.0	40MBCQ09	[1,2]
FC-2	1/2	12.24	8.62	7.40	380	24.6	208	1	0.3	N/A	26.5/15.8	40MAHQ06	[1,2]

REMARKS:
1. PROVIDE CONDENSATE PUMP.
2. INDOOR UNIT POWER PROVIDED FROM OUTDOOR UNIT.

EXHAUST FANS

MARK	LOCATION	SERVICE	AIRFLOW (CFM)	EXTERNAL STATIC (IN H2O)	SONES	MOTOR DATA FAN (HP)	VOLT	PH	RPM	MANUFACTURER	MODEL NUMBER	REMARKS
EF-1	ROOF	HOOD 1	–	–	–	–	–	–	–	CAPTIVEAIRE	–	[4]
EF-2	ROOF	HOOD 2	–	–	–	–	–	–	–	CAPTIVEAIRE	–	[4]
EF-3	ROOF	RESTROOMS	300	0.50	7.8	1/8	115	1	1,550	GREENHECK	G-095-D	[1-3]

REMARKS:
1. PROVIDE SOLID STATE SPEED CONTROL.
2. PROVIDE MOTORIZED BACKDRAFT DAMPER.
3. PROVIDE MINIMUM 12 INCH HEIGHT ROOF CURB.
4. REFERENCE CAPTIVEAIRE DRAWINGS FOR ADDITIONAL INFORMATION.

AIR CURTAINS

MARK	LENGTH (IN)	AIRFLOW (CFM)	HEATER IN (KW)	HEATER OUT (MBH)	HEATER TEMP RISE (F)	FANS QTY	FANS HP	ELECTRICAL CIRCUIT (QTY)	VOLT	PH	MANUFACTURER	MODEL NUMBER	REMARKS
AC-1	36.0	1,379	NA	NA	NA	1	1/2	1	115	1	MARS	STD236	[1-3]
AC-2	72.0	1,800	NA	NA	NA	1	1/6	1	115	1	MARS	LPV272	[1-4]
AC-3	42.0	1,050	NA	NA	NA	1	1/6	1	115	1	MARS	LPV242	[1-4]

REMARKS:
1. PROVIDE AUTOMATIC DOOR SWITCH.
2. PROVIDE UNIT MOUNTED CONTROL PANEL.
3. VERIFY FINAL COLOR/FINISH WITH ARCHITECT.
4. PROVIDE MOUNTING BRACKETS AS REQUIRED. COORDINATE FINAL MOUNTING LOCATION AND METHOD WITH ARCHITECT.

DIFFUSERS, GRILLES AND REGISTERS

MARK	SERVICE	LOCATION	CEILING TYPE	MOUNTING TYPE	MANUFACTURER	MODEL NUMBER	REMARKS
D-1	SUPPLY	CEILING	GYP. BOARD	LAY-IN	TITUS	TMSA XX 12x12 3 26	[1,2,4,6,7]
D-2	SUPPLY	CEILING	AC TILE	LAY-IN	TITUS	PAR XX 24x24 3 26	[1,2]
D-3	SUPPLY	CEILING	AC TILE	LAY-IN	TITUS	TMSA XX 24x24 3 26	[1,2]
D-4	SUPPLY	DUCT	NA	SURFACE	TITUS	300RL X X 1 26	[1,5-7]
D-5	SUPPLY	DUCT	NA	SURFACE	TITUS	S300FL X X 1 26 ASD	[1,5,6]
△A G-1	RETURN	CEILING	AC TILE	LAY-IN	TITUS	50F X X 3 26	[1,3,5]
G-2	EXHAUST	CEILING	GYP. BOARD	SURFACE	TITUS	50F X X 1 26	[1,3,5-7]

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 SHALL BE PREFINISHED TO MATCH CEILING/WALL/EXPOSED DUCT COLOR. COORDINATE WITH ARCHITECT.
7. PROVIDE DIFFUSERS AND GRILLES WITH NO EXPOSED MOUNTING SCREWS.

UV SYSTEMS

UNIT NO.	PLACEMENT	PHI CELL MODEL #	UV/CELL SIZE	RANGE	INDOOR PPM TARGET	SIZE	TRANSFORMER	POWER	IN-VOLT	OUT-VOLT	MCA	WEIGHT (LBS.)
RTU-1	BLOWER CABINET	PHI-PKG14-24V	14"	3,000-8000 CFM	< 0.02 PPM	2.25"W x 19.5"L x 1.75"D	SHIP LOOSE	11W	115 VAC	24 VAC	0.50A	2 LBS
RTU-2	BLOWER CABINET	PHI-PKG14-24V	14"	3,000-8000 CFM	< 0.02 PPM	2.25"W x 19.5"L x 1.75"D	SHIP LOOSE	11W	115 VAC	24 VAC	0.50A	2 LBS

UNIT HEATERS

MARK	LOCATION	HEATING INPUT (MBH)	ELECTRICAL VOLT	PH	MANUFACTURER	MODEL NUMBER	REMARKS
GH-1	OUTDOOR PATIO	39.8	110	1	BROMIC	BH00110003-1	[1-3]

REMARKS:
1. PROVIDE CEILING POLE MOUNT. VERIFY WITH ARCHITECT ON MOUNTING CONFIGURATION AND LOCATION.
2. PROVIDE WITH HEAT DEFLECTOR.
3. HEATER TO BE CONFIGURED FOR NATURAL GAS.
4. PROVIDE BH3130010-1 ON/OFF CONTROLLER AND WIRELESS MASTER REMOTE. COORINATE CONTROLS INSTALLATION WITH ELECTRIAL CONTRACTOR AND ARCHITECT.

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△	Date	Description
1	07/07/2022	ADDENDUM 1
2	09/22/2022	ADDENDUM 2
3	10/27/2022	ADDENDUM 3
4	02/07/2023	ISSUE FOR CONSTRUCTION
5	02/21/2023	FIELD NOTICE 1
A	04/05/2023	FIELD NOTICE 1

Seal / Signature

GREGORY R. SCHNACKEL
No. 14851
Expiration Date: 06/30/2024
Date: 04/05/23

Project Name
CRAIG ROAD

Project Number
005.3901.000

Description
MECHANICAL SCHEDULES

Scale
1/4" = 1'-0"

M601

SE JOB#: 210884