

MECHANICAL SPECIFICATIONS

1) Provide all heating, ventilation and air conditioning items indicated on the drawings, described in this specification or required for a complete and proper installation.

2) Comply with all pertinent codes, ordinances and regulations. Refer to website for Dept. of Community Affairs for current Codes Editions.

3) The contractor shall not attempt to precisely scale dimensions from these drawings to obtain construction dimensions and clearances. The contractor shall verify all actual dimensions and clearances. Although these plans are diagrammatic in nature, they shall be followed as closely as site conditions, new construction, and work by other trades shall permit. Deviations from these drawings, which are required to conform to the available space or the actual building construction, shall be made at no additional cost to the owner.

4) Furnish without extra charge, any additional material and labor required to comply with the above codes and standards, even though the work may not be described in the contract documents. Where the requirements of the contract documents exceed the requirements of the above codes and standards, the contract documents shall take precedence.

5) All equipment and material shall be new and of first quality. Equipment and material shall be the same or equal to the basis of design listed on these drawings and shall be UL listed.

6) Cooperate and coordinate with other trades in order that all systems in the work may be installed in the best arrangement.

7) Examine the areas and conditions under which work of this section will be installed. Correct conditions detrimental to the proper and timely completion of the work. Notify Architect of any discrepancies. Do not proceed until unsatisfactory conditions have been corrected.

8) Avoid interference with structure, and with work of other trades. Install all equipment per manufacturer's instructions. Install accessible parts, including equipment, coils, valves, dampers, controls, and filters with adequate clearance for inspection, adjustments, repair and replacement.

9) All other materials not specifically described but required for a complete and proper installation shall be selected by the contractor subject to acceptance by the Engineer.

10) All ductwork shall be fabricated from galvanized sheet metal duct and conform to SMACNA "HVAC Duct Construction Standards-Metal and Flexible". Seal all joints in ductwork with mastic sealant.

11) Flexible duct: Flex master; Atco UPG43(R-6.0); Atco UPG43(R-8) or Thermeflex, Type 3, insulated. 5"-0" Maximum length unless noted otherwise. Class 1 rating with R-value of 8.0 when located inside building insulation envelope and R-8 when located outside building insulation envelope. Installed with no more than 135 degrees maximum of total bends per run. Maximum individual bend shall not exceed 45 degrees each. Support of five feet on each with hangers having at least 2-inches of width at duct contact points. Flexible connectors shall not pass through any wall, floor or ceiling weather rated or not. Provide 3-inches of metal duct at penetration of drop stops, fire walls and smoke walls.

12) Outside duct insulation: Insulate ducts and fittings with two, staggered layers of 7-inch foamed plastic sheet insulation, (Arma-Flex sheets) 6-pound density, having a thermal conductivity of not more than 0.28 at 72°F. Apply insulation with smooth side of coating both surfaces to be joined completely with a thin coat of waterproof instant bonding adhesive. Adjacent sheets shall fit between compression. Apply a 16-mil embossed aluminum jacket with a 2-inch overlap of longitudinal and transverse joints, secured in place with 7-inch by .015-inch aluminum bands on 18-inch centers. Overall insulation value must be R-8 for exterior duct as per ASHRAE 90.1 & ICC.

13) Duct Liner: Owens Corning Aeroflex Plus, or equivalent. Incombustible glass fiber complying with ASTM C 1071; flexible blanket; impregnated surface and edges coated with acrylic polymer shown to be fungous and bacterio resistant by testing to ASTM C 21. Apparent Thermal Conductivity: Maximum of 0.31 at 75 degrees F. Service Temperature: 250 degrees F. Density: 1.5 pounds/cubic foot. Install using adhesive (50% coverage) and galvanized steel fasteners with welded press-on head thickness: 1-inch.

14) Condensate drain piping shall be ASTM D2665 PVC with solvent welded fittings. Drain piping shall be no smaller than the drain connection size on equipment. Slope at 1/8 inch per foot continuously toward drains. All indoor condensate drain piping shall be insulated with preformed flexible plastic cellular foam. All outdoor condensate drain piping shall be primed and painted with a coating system recommended by the piping manufacturer for protection against deterioration from weather and UV-light exposure. All piping shall be adequately supported to maintain proper slope and avoid sagging.

15) Refrigerant piping shall conform to manufacturer's recommendations and installation instructions. Refrigerant piping shall be ASTM B280 Type ACR or ASTM B88 Type 11-draw copper tubing with wrought copper fittings. Insulate suction line with 1/2 thick foamed plastic cellular foam (Armaflex or equivalent). All piping shall be adequately supported. Insulation installed outdoors shall be painted with two coats of Armacell WB coating or equivalent. Refrigerant pipes shall be installed in accordance with ASHRAE standard 15-2022 section 9.13. Contractor shall issue a letter to design team stating that refrigerant pipes have been installed and tested under the referenced sections. Contractor shall refer to ASHRAE standard 15-2022 sections 9.10 and 9.11 for additional information regarding refrigerant piping. Penetration of refrigerant pipes shall be protected with a through penetration protection system. The through penetration protection shall be the same or higher rating than the assembly.

16) Thermostats: Provide 24 volt, programmable 24-hour, 7-day thermostat to control heating stages in sequence with delay between stages and supply fan to maintain temperature setting. For Heat Pumps include system selection switch heat-off-cool and fan control switch (auto-on), emergency heat switch (auxiliary/emergency heat indicator lights).

17) Provide fire and smoke rated flexible connections between fans and ducts. Material shall comply with NFPA 90A requirements for material in supply air stream.

18) Install all equipment in accordance with manufacturer's instructions and recommendations including clearances recommended for proper operation or service. All filters and serviceable parts shall be readily accessible.

19) Indoor duct insulation: foil-faced fiberglass, Owens Corning type 75 or equal, 2.2" thick(R-8), unless the insulated duct is outside building insulation envelope (crownspace or unconditioned space) in which case the duct insulation thickness shall be 3" thick(R-8). Duct shall have a flame spread rating of not more than 25 and smoke developed rating of not more than 50. Glass-Fiber Insulation: All service duct wraps with foil scrim and having buckling and a k-value of 0.30 at 75° F mean temperature and an average maximum density of 0.75 lb./cu. ft.

20) All supply, return and outside air ducts shall be insulated. Install acoustical duct liner on the interior surface of the first five (5) linear feet of supply duct downstream and the last five (5) linear feet of return duct upstream of all air handlers and rooftop units. Insulate the concealed tops of all ceiling mounted supply air diffusers with foil-faced fiberglass, 1.5#/cubic foot density, 2" thick. Seal edges to ceiling grid with foil tape to provide vapor tight seal.

21) All low-pressure duct branches shall contain manual balancing dampers. Manual balancing dampers shall also be installed in the continuation of the main, if the main duct is smaller or the same size as the branch duct, or if the continuation of the main serves only one device.

22) Make all duct elbows right angle type with single thickness turning vanes or construct with centerline radius 1-1/2 times the duct width.

23) Duct sizes shown on plans are clear, interior dimensions. Duct sizes shown shall be enlarge to allow for liner at locations of interior liner.

24) Do not cut into or reduce the size of any structural member without the permission of the Architect.

25) Provide weather-proof flashing at all duct and pipe penetrations through the building walls and roof. As a minimum, flashings shall be designed and installed in accordance with SMACNA standards. Flashings shall be guaranteed weatherproof.

26) Support all HVAC units, ductwork, piping and other appurtenances from structure, provide vibration isolation at all fans which are not internally isolated. Provide hanger rod with built in rubber-in-shear isolator. Between drain pan and unit provide 4 each rubber-in-shear isolator. Do not attach vibration isolator to drain pan. Do not screw or drive fasteners into non-structural components such as roof decks or non-load bearing walls.

27) Thoroughly clean all components and remove all dirt, scale, oil, and other foreign substances. Provide clean air filters for all equipment.

28) Perform all tests necessary to demonstrate the integrity of the complete installation to the approval of the Engineer and all other authorities having jurisdiction. Make all adjustments necessary and balance the completed system in accordance with the data shown. Balance the systems in accordance with NEBB or AACB standards. Acceptable tolerances shall be minus ten percent to plus five percent of all measurements. Balancing shall be done by an independent licensed (by NEBB or AACB) TAB contractor. Make the following tests and submit reports to the Architect:

- a) Airflow rate at each supply, return and exhaust outlet or inlet.
- b) Total airflow rate and total static pressure for each supply and exhaust fan. Test exhaust fans with room doors closed.
- c) Motor speed, for multiple speed fans (e.g. high, medium, low).
- d) For direct drive fans, provide speed settings and actual rpm, including ECM motor driven fans
- e) Provide fan and motor rpm for belt driven fans. Provide sheave sizes.
- f) Outside airflow rate to each HVAC unit and supply fan.
- g) Motor current (and compare with nameplate data) at all motors.
- h) Entering and leaving air dry-bulb and wet-bulb conditions at all cooling coils.
- i) Heat output capacity for unit heaters, heating devices and coils (kW or MBH).
- j) Manufacturer, model and serial number for each piece of HVAC equipment scheduled on drawings.
- k) Calibrate thermostats to be within one degree of actual temperature at thermostat.
- l) Verify that all HVAC devices operate as scheduled or indicated (i.e. ON-OFF, 2-stage, variable output (SCR heaters), etc.)

29) The entire system shall be warranted for a period of one (1) year beginning with Owner's acceptance of the work. Compressors shall include a minimum of five (5) year parts only warranty from the manufacturer. All labor and materials necessary to repair or replace the system or portions thereof, during that time shall be warranted for a period of one (1) year from the repair or replacement.

30) SUBMITTALS AND SUBMITTAL PROCEDURES:

- a. Contractor shall review the submittal data and check for the purpose of compliance with safety requirements, verification of dimensions, contract documents and methods and means prior to submitting to design professional. Contractor shall indicate approval by indicating such on the submittal.
- b. Transmit each submittal electronically in PDF format.
- c. Sequentially number submittals and transmittal form. Revise submittals with original number and a sequential alphabetic suffix. File names shall describe item included in file.
- d. Identify Project, the Contractor, Subcontractor or supplier, pertinent drawing and detail number, and specification section number, as appropriate on each copy. Each file shall include an index of items included in file.
- e. Apply the Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.
- f. Submit data for all items in project shall be submitted at one time. Submittal shall be divided into groups with file sizes not exceeding 6 MB. If there is unavoidable data such as control submittal, etc., these may be submitted later if not doing so would delay project progress. Data shall include capacities, complete installation instructions, dimensional data and electrical data, BHP, motor HP, operating weights and load distribution at mounting points.
- g. Deliver submittals electronically to the Design Professional.
- h. Schedule submittals to expedite the Project, and coordinate submittal of related items. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.
- i. Identify variations from Contract Documents. Product or system limitations that may be detrimental to successful performance of the completed Work.
- j. Provide space for the Contractor and the Architect/ review stamps.
- k. When revised for resubmission, identify all changes made since previous submission.
- l. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.
- m. Submittals not requested will not be recognized or processed.
- n. Provide files containing only related items (such as piping, equipment, air distribution, etc.)

31) Instruct Owner's representative in the operation of the systems, using the operation and maintenance manual as a teaching aid.

32) Provide an operation and maintenance manual. As a minimum, the manual shall contain:

- a. A complete list of all equipment and appurtenances with equipment designations (per Drawings), manufacturers, and catalog numbers.
- b. Copies of manufacturers' brochures and instructions for operation and maintenance of all mechanical equipment, including replacement parts lists.

c. Typed system operation and maintenance instructions, including inspection, lubrication, and service instructions and schedules.

d. List of names, addresses and phone numbers of distributors of all equipment and appurtenances.

e. Manufacturers' warranties.

33) Horizontal Air Handler unit: Indoor fan-cell unit shall be direct-expansion horizontal heat pump air handler with electric strip heat suspended from structure with auxiliary drip pan and condensate drain. Provide float switch in drip pan to shut down unit if pan begins to fill. Unit shall be complete with cooling coil, fan, fan motor, piping connectors, electrical controls, microprocessor control system, and integral temperature sensing. Cabinet shall be fully insulated for improved thermal and acoustic performance. Condensate pan shall have internal trap and auxiliary drip pan under coil header. Provide condensate trap recommended by manufacturer. Air filters shall be 1-inch-thick glass fiber, disposable type arranged for easy replacement. Provide number of stages as scheduled. Provide condensate overflow switch (Recessed Safe-T-Switch Model SSI or equivalent) wired to shut unit down in case of condensate overflow.

34) Vertical Air Handler unit: Indoor fan-cell unit shall be direct-expansion vertical heat pump air handler with electric strip heat mounted on plenum with auxiliary drip pan and condensate drain. Provide float switch in drip pan to shut down unit if pan begins to fill. Unit shall be complete with cooling coil, fan, fan motor, piping connectors, electrical controls, microprocessor control system, and integral temperature sensing. Cabinet shall be fully insulated for improved thermal and acoustic performance. Condensate pan shall have internal trap and auxiliary drip pan under coil header. Provide condensate trap recommended by manufacturer. Air filters shall be 1-inch-thick glass fiber, disposable type arranged for easy replacement. Provide number of stages as scheduled. Provide condensate overflow switch (Recessed Safe-T-Switch Model SSI or equivalent) wired to shut unit down in case of condensate overflow.

35) Small Split Air Handler unit (4 WAY): The unit shall be a four-way cassette style indoor unit that recesses into the ceiling with a ceiling grille. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, an emergency operation function and a test run switch. Indoor unit and refrigerant pipes shall be charged with dehydrated air and integral temperature sensing. Cabinet shall be fully insulated for improved thermal and acoustic performance. Condensate pan shall have internal trap and auxiliary drip pan under coil header. Provide condensate trap recommended by manufacturer. Air filters shall be 1-inch-thick glass fiber, disposable type arranged for easy replacement. Provide number of stages as scheduled. Provide condensate overflow switch (Recessed Safe-T-Switch Model SSI or equivalent) wired to shut unit down in case of condensate overflow.

36) Small Split Condensing unit: Ceiling: House components in welded steel frame with galvanized steel panels with weather resistant, baked enamel finish. Mount connectors and controls in weatherproof panel with full opening access doors. Provide removable access doors or panels with quick fasteners. Compressor: Hermetically sealed, 3600 rpm maximum, resiliently mounted with positive lubrication and internal motor protection. Compressor: Hermetic reciprocating type or Hermetic scroll type. Condenser Coils: Aluminum fins mechanically bonded to seamless copper tubing or all aluminum fins and tube. Air test under to 425 psig and vacuum dehydrate. Seal with holding charge of refrigerant. Coil Guard: Louvered or PVC coil steel wire. Fans and motors: Direct driven propeller type condenser fans with fan guard on discharge. Weatherproof motors suitable for outdoor use single phase permanent split capacitor with permanent lubricated ball bearings and built in thermal over protection. Fan Guard: PVC coil steel wire. Refrigerant circuit: For each refrigerant circuit, provide: Filter dry liquid line. Suction accumulator. Suction and liquid line service valves and gage ports. Charging valve. Condenser pressure relief mechanism. Factory wired with single point power connection. Factory wired controls shall include contactor, high- and low-pressure cutouts, internal winding thermostat for compressor, control circuit transformer, non-cycling reset relay. Provide a surge capacitor and lightning arrester in unit cabinet for protection from power surges due to lightning and switching transients. Provide controls to permit operation down to 0 degrees F ambient temperature were scheduled to include: Crankcase heater with thermostat. Head pressure switch to switch on fan motors in response to refrigerant condensing pressure. Solid state control to vary speed of one condenser fan motor in response to refrigerant condensing pressure. Refer to Schedule on Drawings for additional specifications.

37) Air Source Heat Pumps (HP): outdoor-mounted, air-cooled split system outdoor section suitable for rooftop installation, consisting of a hermetic compressor, an air-cooled coil, propeller-type blow-thru outdoor fans, accumulator, full refrigerant charge, and control box. Unit shall function as the outdoor component of an air-to-air cooling system and used in a refrigeration circuit matched to the indoor unit. Unit construction shall comply with ANSI/ASHRAE 15, latest revision, the NEC, and UL standards. Provide rail support system compatible with roofing system. Refer to Schedule on Drawings for additional specifications.

38) Provide a duct smoke detector on the supply duct of each air handling unit or rooftop unit with design airflow exceeding 2,000 CFM, and where smaller air handling units have common return ductwork or plenum and total air flow exceeds 2,000 CFM. Install detector in accordance with the International Mechanical Code section 606 Smoke Detection Control System with Georgia Amendments 2018. Detectors shall be provided by the electrical/ fire alarm subcontractor and shall be installed by the mechanical subcontractor. For other fans, such as exhaust fans with design airflow exceeding 2,000 CFM, coordinate with the electrical/ fire alarm subcontractor to provide room or duct smoke detectors. Where a fire alarm system is installed in building provide smoke detector, audio visual annunciation and trouble indicator in an approved location. Duct smoke detector trouble conditions shall activate a visible or audible signal in an approved location and shall be identified as duct detector trouble. Provide contacts to automatically shut down all such fan motors when smoke is detected, to indicate detector status to the fire alarm system, and to require a manual reset of the shut-down relay.

39) Fire damper: curtain type with blades outside air stream except where located behind grilles when blades may be in air stream. Provide 1-1/2 hr class unless noted otherwise, vertical or horizontal mounting as shown on drawings with re-placeable, rated, fusible link. Duct-Mounted Access Doors: Provide access doors for access to fire or smoke dampers having fusible links, doors shall be pressure relief access doors; and shall be outward operating for access doors installed upstream from dampers and inward operating for access doors installed downstream from dampers adjacent to and close enough to fire or smoke dampers, to reset or reinstate fusible links. Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-10, "Duct Access doors and Panels", and 2-11, "Access Panels - Round Duct".

40) Grilles, Registers and Diffusers: Grilles, registers, and diffusers as indicated on the drawings have been selected from the catalog of the manufacturer noted as the basis of design. Sizes, types, and performance of the devices to be provided must be coordinated to insure conformity with design basis. Sidewall supply grilles and registers shall have vertical front blades; sidewall return grilles shall have horizontal blades. Grilles and registers with borders shall have felt or rubber gaskets cemented to the back face and holding screws over 18 inches on centers around the perimeter. Holding screws shall be counter-sunk to fit flush with face of grille or register. Grilles passing air through partitions shall be designed for wall return grilles, one for each side of partition. Register dampers shall be of the gear-operated, opposed blade type, operated through the face of the register. Operating mechanism shall not project through the register face. Mounting shall be coordinated with architectural reflected ceiling plans. Construction shall be of steel or aluminum as specified, with frame type to match ceiling construction. Sidewall supply grilles and registers shall be double-decoration type, with vertical front faces. Construction shall be of steel, with 3/4-inch blade spacing. Return air grilles, return air registers, exhaust grilles, registers and transfer air grilles located in ceilings shall be constructed of aluminum with "egg-crate" design, with 1/2-inch x 1 1/2-inch x 1/2-inch grids. Frame style shall be compatible with ceiling construction. Install wall grilles and registers with horizontal edges parallel to ceiling. Concentric diffuser assembly at roof top shall have point-ready exterior finish and 1-inch lined supply and return ducts that transition to diffuser size within 24 inches vertically of the bottom of roof top unit.

41) Basic motor requirements: basic requirements apply to mechanical equipment motors, unless otherwise indicated. Motors 1/2 hp and larger: Polyphase, unless otherwise scheduled. Motors smaller than 1/2 hp: single phase. Frequency rating: 60 Hz. Service factor: according to NEMA MC-1, general purpose continuous duty, design type "B". Enclosure: open drip-proof, unless otherwise indicated. Efficiency: motors shall have a higher efficiency rating than industry standard overage motor as delineated in IEEE Standard 112, test method 13. Thermal protection: where indicated or required, interval protection automatically opens power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal protection device automatically resets when motor temperature returns to normal range, unless otherwise indicated.

42) Hangers and supports: Building attachments: concrete inserts or structural-steel fasteners appropriate for building materials, and beam clamps. Hanger materials: galvanized, sheet steel or round, threaded steel rod. Hangers installed in corrosive atmospheres: electro-galvanized, all-thread rod or galvanized rods with threads painted after installation. Straps and rod sizes: comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for sheet steel width and thickness and for rod or sheet diameters. Duct attachments: sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials. I-beam and angle support: galvanized steel shapes and plates: steel shapes complying with ASTM A 36/A 36M.

43) Sealing materials: joint and seam sealants: general: the term "sealant" is not limited to materials of adhesive or mastic nature but includes tapes and combinations of open-weave fabric strips and mastics. Joint and seam tape: 2 inches wide; glass-fiber fabric reinforced. Joint and seam sealant: one-part, nonsoy, solvent-release-curing, polymerized butyl, formulated with a minimum of 75 percent solids. Flanged joint mastics: one-part, acid-curing, silicone, elastomeric joint mastics, complying with ASTM C 920, type S, grade NS, class 25, use 0.

44) Packaged Top Units-Gas Heat: Outdoor packaged units, ground mounted, electronically controlled, 2-stage stage cooling with gas heat units, as scheduled. Unit shall scroll hermetic compressor(s) for cooling duty and an indirect fire gas furnace section for heating duty. Unit shall discharge air vertically. Unit shall exceed ASHRAE 90.1-2001 Energy Standard, be UL tested and certified in accordance with ANSI Z21.47 Standards. Factory assembled, single-piece heating and cooling unit. Contained within the unit enclosure shall be all factory wiring, piping, controls, refrigerant charge, and thermal expansion valve. Unit cabinet shall be constructed of galvanized steel, and shall be phosphated/bonded and coated with a pre-painted baked enamel finish on all externally exposed surfaces. Coils shall have aluminum fins mechanically bonded to copper tubing. Evaporator coil compartment interior cabinet surfaces shall be insulated with a minimum 1/2-in. thick, 1 lb. density, flexible fiberglass insulation, neoprene coated on the side. Cabinet insulation shall meet ASHRAE Standard 62.7. Aluminum foil-faced fiberglass insulation shall be used for heat gain compartment. Insulation and adhesives shall meet NFPA 90A requirements for flame spread and smoke generation. Cabinet panels shall be easily removable for servicing. Condenser coils shall have protective wire guards. Unit shall have a factory-installed, sloped condensate drain pan made of a non-corrosive material, with a minimum 3/4"-in.-in. NPT connection and shall comply with ASHRAE Standard 62. Unit shall have 2-inch pleated MERV 7 disposable filters a removable, filter access panel to provide filter access. Unit shall have standard thru-the-bottom utility connection capability and accessory power convenience receptacle. Provide matching pre-fabricated roof curb with direct, duct attachment capability. Provide low- and high-pressure safety switches, anti-short circuit safety, and low ambient operation. Provide microprocessor control panel and complete, factory-wired controls, including discharge air temperature sensor, and communications interface. Refer to schedule for layout basis. Substitutions shall match the features of specified model. Provide condensate overflow switch (Recessed Safe-T-Switch Model SSI or equivalent) wired to shut unit down in case of condensate overflow. Refer to Schedule on Drawings for additional specifications.

45) BI-POLAR IONIZATION DESIGN & PERFORMANCE CRITERIA:

The Bi-polar ionization system shall be capable of effectively killing microorganisms downstream of the bi-polar ionization equipment (mold, bacteria, virus, etc.). Controlling gas phase contaminants generated from human occupants, building structure and furnishings. Capable of reducing static space charges. Increasing the interior ion levels, both positive and negative, to a minimum of 800 ions/cm² measured 5 feet from the floor. Self-cleaning requires no maintenance or replacement parts. Producing a minimum of 160M ions/cc. The bi-polar ionization system shall operate in a manner such that equal amounts of positive and negative ions are produced. Uni-polar ion devices shall not be acceptable.

Velocity Profile: The air purification device shall not have maximum velocity profile.

Humidity: Plasma Generators shall not require preheat protection when the relative humidity of the entering air exceeds 85%. Relative humidity from 0 - 100% condensing, shall not cause damage, deterioration or dangerous conditions within the air purification system. Air purification system shall be capable of wash down duty.

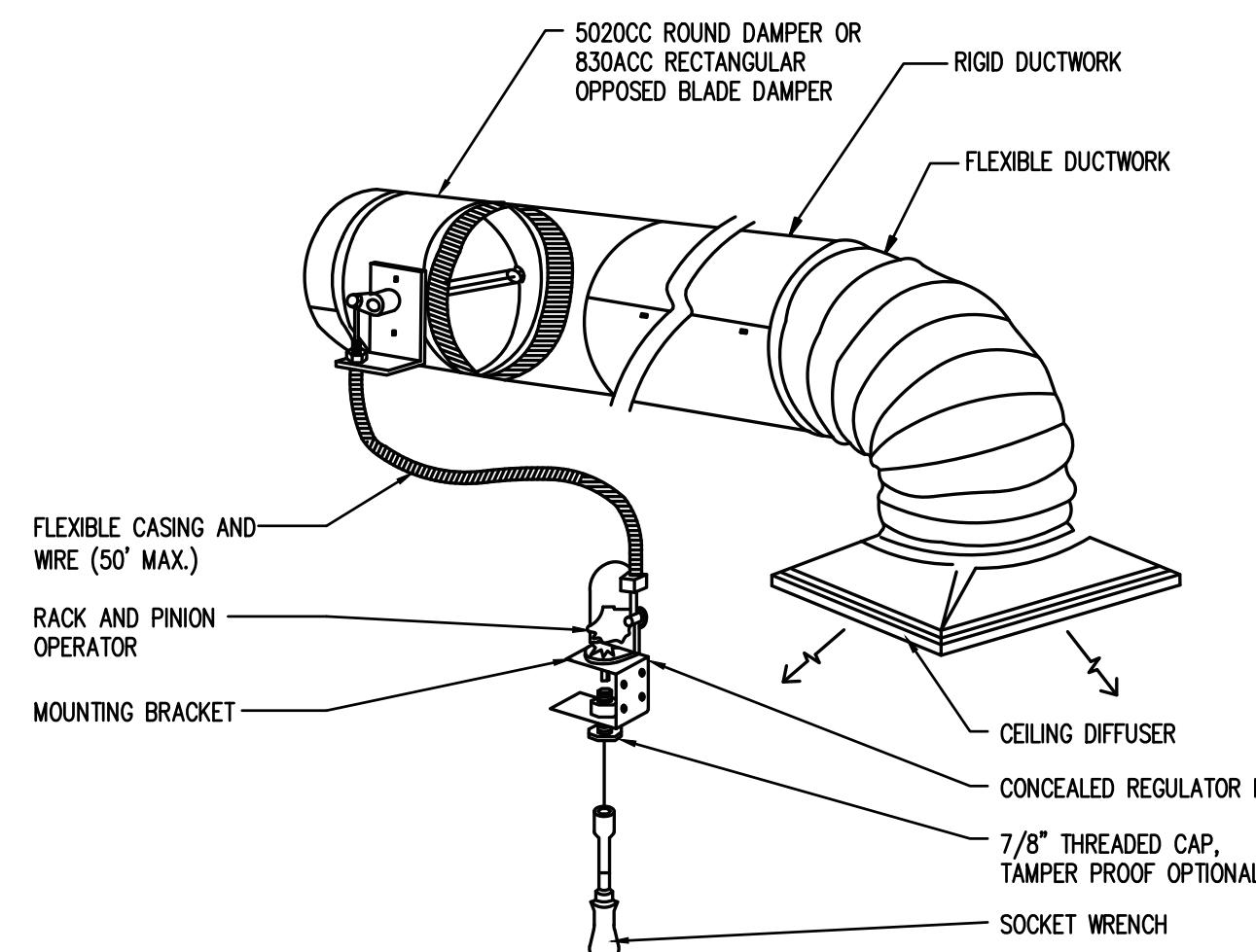
Equipment Requirements: Electrode Specifications (Bi-polar ionization). Each Plasma Generator with Bi-polar ionization output shall include the required number of electrodes and power generators sized to the air handling equipment capacity. A minimum of one electrode pair per 2,400 CFM of air flow shall be provided. Bi-polar ionization tubes manufactured of glass and steel mesh shall not be acceptable due to replacement requirements, maintenance, performance output during low temperature, ozone production and corrosion. Electrodes shall be energized when the main unit disconnect is turned on and the fan is operating. Electrodes shall be made from carbon fiber to prevent oxidation over time. Internal circuitry shall be provided to sense air flow across the electrode output/ionization system, requiring the use of a mechanical or pressure switch to cycle the electrodes only when the fan is operating shall not be acceptable due to high failure rates and pressure sensitivity. Electrodes shall provide a minimum of 160 million ions/cc per electrode centimeter as measured at 2 inches, both positive and negative ions, in equal quantities. Devices providing less than 160 million ions/cc per electrode pair shall not be acceptable. Each Plasma Generator shall be provided with a self-cleaning system that is field programmable to change the number of days between the cleaning cycle. Systems without a no-maintenance, self-cleaning system shall not be acceptable. Each electrode pair shall be designed with a banana style plug such that it can be field replaced, if necessary. Each Plasma Generator shall be provided with an on/off switch, universal voltage input (24VAC to 240VAC or DC), magnets for mounting to the fan inlet, replaceable carbon fiber emitters and a programmable self-cleaning system.

Air Handler & Plenum Mounted Units (non-ductless mini-split units): Where so indicated on the plans and/or schedules Plasma Generator(s) shall be supplied and installed. The mechanical contractor shall mount the Plasma Generator and wire it to the AHU control power (24VAC) as instructed by the Air Purification Manufacturer's instructions or line voltage source to power available. Each unit shall be designed with a molded casing, self-cleaning system, self-cleaning test button, power status LED and dry contacts to prove ion output is operating properly. The dry contacts shall close to prove the ion generator is working properly and may be delayed in closing in series such that only one dry contact per AHU is required to interface to the BAS or the optional DDC controller. Dry contacts prove power has been applied in lieu of the ion output is actually operating, are not acceptable. Manufacturers providing multiple ion modules that have alarm status wired in parallel, and not in series, shall not be acceptable.

Ionization Requirements: Plasma Generators with Bi-polar ionization output shall be capable of controlling gas phase contaminants and shall be provided for all equipment listed above.

The Bi-polar ionization system shall consist of Bi-Polar Plasma Generator and integral power supply. Bi-polar system shall be installed where indicated on the plans or specified to be installed. The device shall be capable of being powered by 24VAC to 240VAC without the use of an external transformer. Ionization systems requiring isolation transformers shall not be acceptable.</p

MARK	AIRFLOW	SUPPLY AIR CFM	MIN OUTSIDE AIR CFM	EXT. SP. IN. W.G.	NOMINAL TONS	EVAP. COIL ENTERING AIR DESIGN CONDITIONS		EVAP. COIL LEAVING AIR DESIGN CONDITIONS		SYSTEM COOLING MAX. REQUIREMENTS (MBH)	OUTSIDE AIR TEMP. CONDITIONS	GAS HEAT MBH		HEATING COIL @ OUTSIDE 25F ENT. TEMP LEAV. TEMP @ STG 1 @ STG 1	POWER VAC/PH	BASIS OF DESIGN: CARRIER	WEIGHT LBS	NOTES		
						DB F°	WB F°	DB F°	WB F°			STAGE 1 IN/OUT	STAGE 2 IN/OUT							
PU-1	HORIZONTAL	5,250	1000	1.0	15.0	78.5	65.5	55.0	54.0	180.0	135.0	95	144/118	180/146	61.5	87.5	208/3	48FEDN16M2A5-0A0A0	1800	1:2:3:4:5:6:7:8:9:10:11:12
PU-2	HORIZONTAL	5,250	1000	1.0	15.0	78.5	65.5	55.0	54.0	180.0	135.0	95	144/118	180/146	61.5	87.5	208/3	48FEDN16M2A5-0A0A0	1800	1:2:3:4:5:6:7:8:9:10:11:12
PU-3	HORIZONTAL	1,750	315	0.65	5.0	78.5	65.5	55.0	54.0	60.0	44.0	95	67/54	50/40	60.0	93.0	208/3	48GCDK06M2A5-0A0A0	700	1:2:3:4:5:6:7:8:9:10:12:13



1 BOWDEN CABLE CONTROL SYSTEM

SCALL.

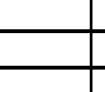
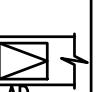
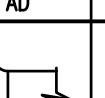
This technical diagram illustrates a vertical HVAC assembly. At the top, a 'LINED SUPPLY AIR DUCT' is shown with a 'SD' label. Below it is a '36" x 24" x 18" H LINED SHEET METAL PLENUM'. A 'MEZZANINE FLOOR' is indicated at the bottom. A central vertical duct contains a 'COMBINATION AUTOMATIC DAMPER AND MANUAL VOLUME DAMPER' with an 'INTERLOCK TO OPEN WHEN FAN IS ON'. To the right, an 'OUTSIDE AIR DUCT' is labeled 'REFER TO PLAN FOR SIZE.' A '1/2" x 1/2" x 1/8" ANGLE' is shown at a corner. A 'TYPICAL RETURN AIR DAMPER AND FIRE DAMPER' is located on the right side. A 'LINED RETURN AIR DUCT' is shown at the bottom right. An 'AUXILIARY DRAIN PAN' is at the bottom left, with a note: 'DRAIN PAN SHALL BE 3-INCHES LARGER THAN UNIT/PLENUM ASSEMBLY ON ALL SIDE. DRAIN PAN SHALL BE 2-INCHES DEEP.' A 'FLOAT SWITCH WIRED TO SHUT UNIT DOWN' is located at the bottom center.

2 AH-3 DETAIL
SCALE: N.T.S.

10 of 10

MECHANICAL SYMBOLS & ABBREVIATIONS LEGEND

	NEW PIPE, DUCTWORK OR EQUIPMENT
24x12 / 24x12	DUCT SIZE: FIRST DIMENSION IS SIDE DRAWN
~~~~~	FLEXIBLE ROUND DUCTWORK
[F- , SCD , SD]	FIRE DAMPER, SMOKE DAMPER, SMOKE DETECTOR
[X]	CEILING SUPPLY DIFFUSER
[ ]	CEILING RETURN OR EXHAUST AIR
~~~~~	S.A DUCT OUT OF TU BOX WITH DUCT LINER FOR THE FIRST FIVE FEET OF DUCT OUT OF TU BOX
~~~~~	SIDEWALL REGISTER OR GRILLE
~~~~~	CHANGE IN PIPE OR DUCT SIZE OR SHAPE
— R —	REFRIGERANT PIPING
— D —	CONDENSATE OR OTHER DRAIN PIPING
C — O —	ELBOW TURNED DOWN OR TURNED UP IN PIPING
(T) —>	THERMOSTAT, ARROW SHOWS CONTROL WIRING PATH
[TC]	TIME CLOCK
Ø	DIAMETER
U.C.	UNDER-CUT DOOR 3/4", UNLESS OTHER SIZE NOTED
[ZD] E16	INDICATES EQUIPMENT ON PLANS; TOP ITEM SHOWS TYPE OF EQUIPMENT AND BOTTOM ITEM SHOWS SPECIFIC MARK NUMBER
4 [S1] 8"Ø 300	ITEM IN HEXAGON SHOWS AIR DEVICE MARK NUMBER, ITEM ABOVE LINE SHOWS NECK SIZE, ITEM BELOW LINE SHOWS AIR FLOW THROUGH DEVICE, AND NUMBER IN FRONT SHOWS QUANTITY IF MORE THAN ONE
AFF	ABOVE FINISHED FLOOR
AH	AIR HANDLING UNIT
BD	BYPASS DAMPER
BTUH, MBH	BRITISH THERMAL UNITS, THOUSAND BRITISH THERMAL UNITS
CAP	CAPACITY
CFM	CUBIC FEET PER MINUTE
CLG	CEILING
CU	CONDENSING UNIT
DB, WB	DRY BULB TEMPERATURE, WET BULB TEMPERATURE
EA, EG	EXHAUST AIR, EXHAUST GRILLE
EF	EXHAUST FAN
EXT SP	EXTERNAL STATIC PRESSURE (USUALLY EXPRESSED IN INCHES OF WATER IN GAGE)
HP	HEAT PUMP UNIT
MVD, VD	MANUAL VOLUME DAMPER
OA	OUTSIDE AIR
RA, RG	RETURN AIR, RETURN GRILLE
RTU	PACKAGED ROOFTOP UNIT
SA	SUPPLY AIR
(A)	AUDIBLE/VISUAL ALARM DEVICE CONNECTED TO DUCT SMOKE DETECTOR
VAC, PH	VOLTS ALTERNATING CURRENT, NUMBER OF PHASES
W, KW	WATTS, KILOWATTS
AD	ACCESS DOOR
AD	AD
~~~~~	RADIUS ELBOW (R=1.5)
~~~~~	VANED ELBOW
~~~~~	MANUAL VOLUME DAMPER (MVD), MOTOR OPERATED DAMPER (MOD)

CAP	CAPACITY
CFM	CUBIC FEET PER MINUTE
CLG	CEILING
CU	CONDENSING UNIT
DB, WB	DRY BULB TEMPERATURE, WET BULB TEMPERATURE
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VAC, PH	VOLTS ALTERNATING CURRENT, NUMBER OF PHASES
W, KW	WATTS, KILOWATTS
	ACCESS DOOR
	RADIUS ELBOW (R=1.5)
	VANED ELBOW

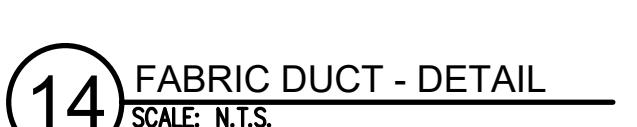
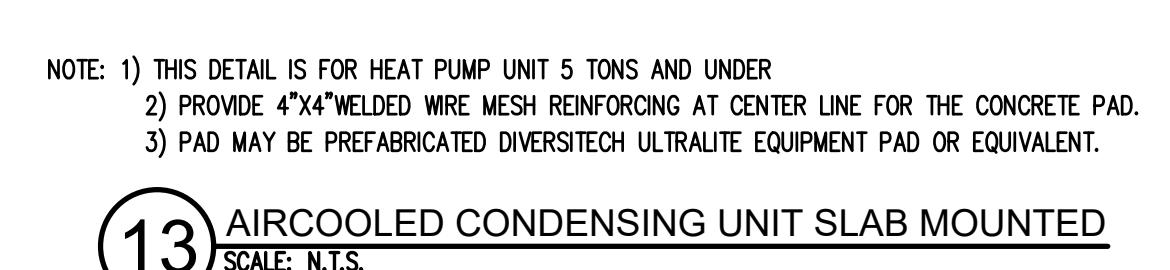
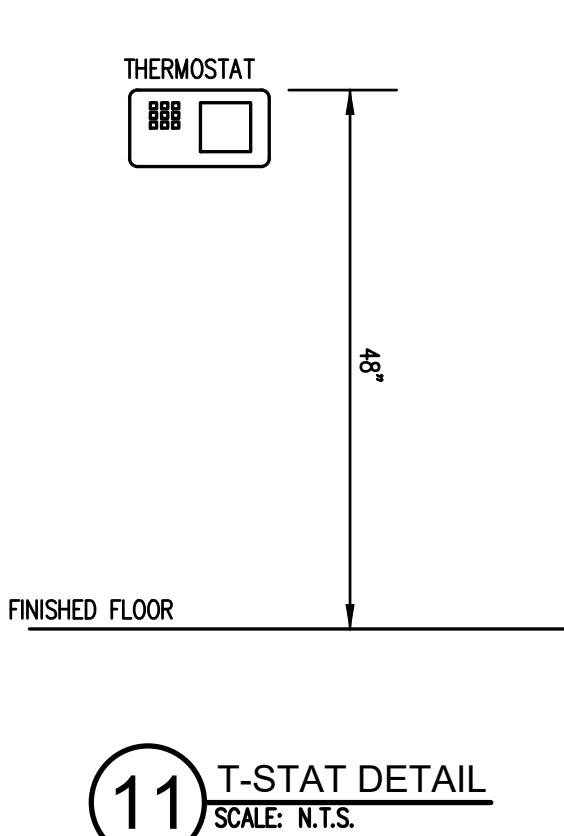
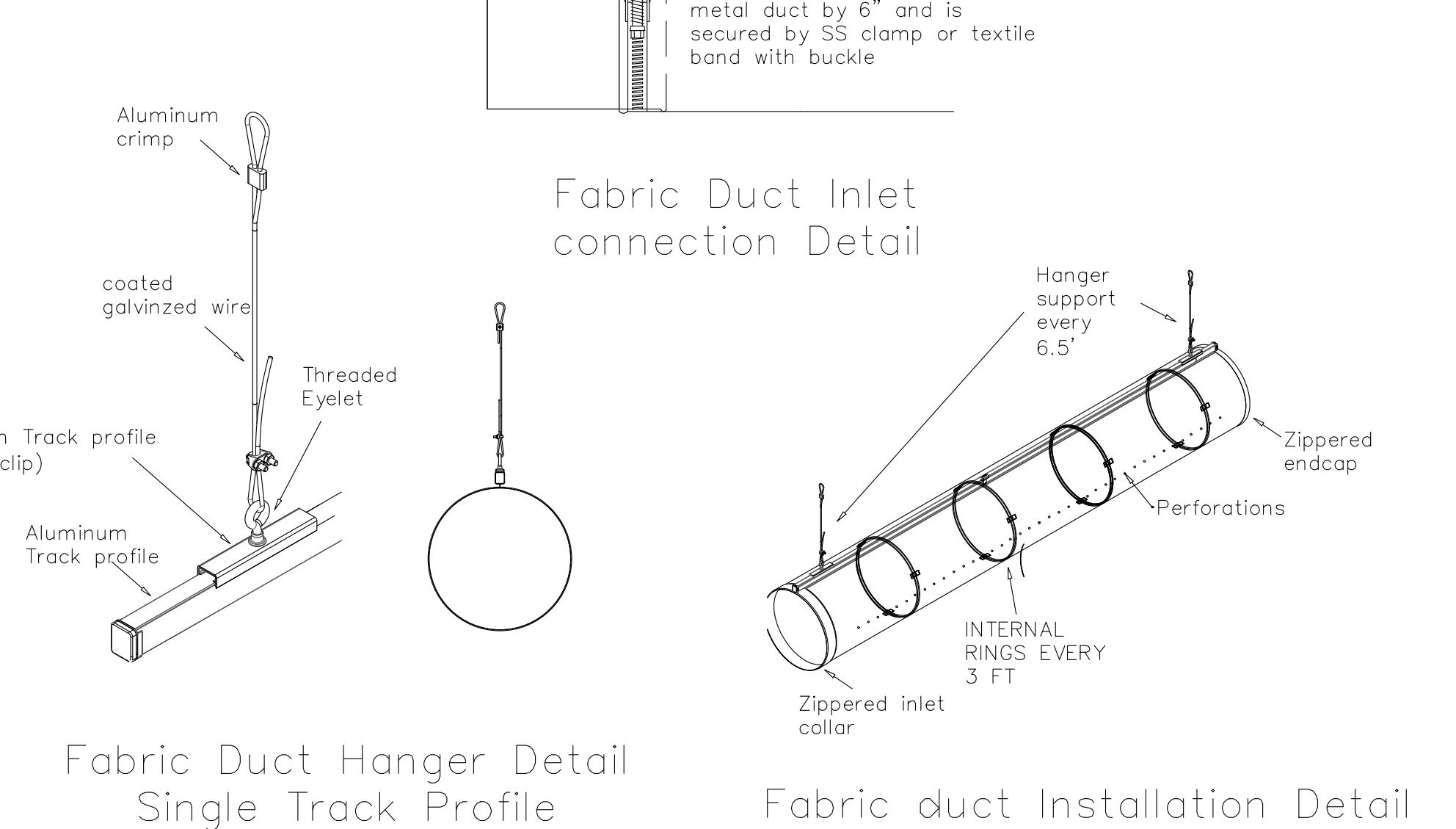
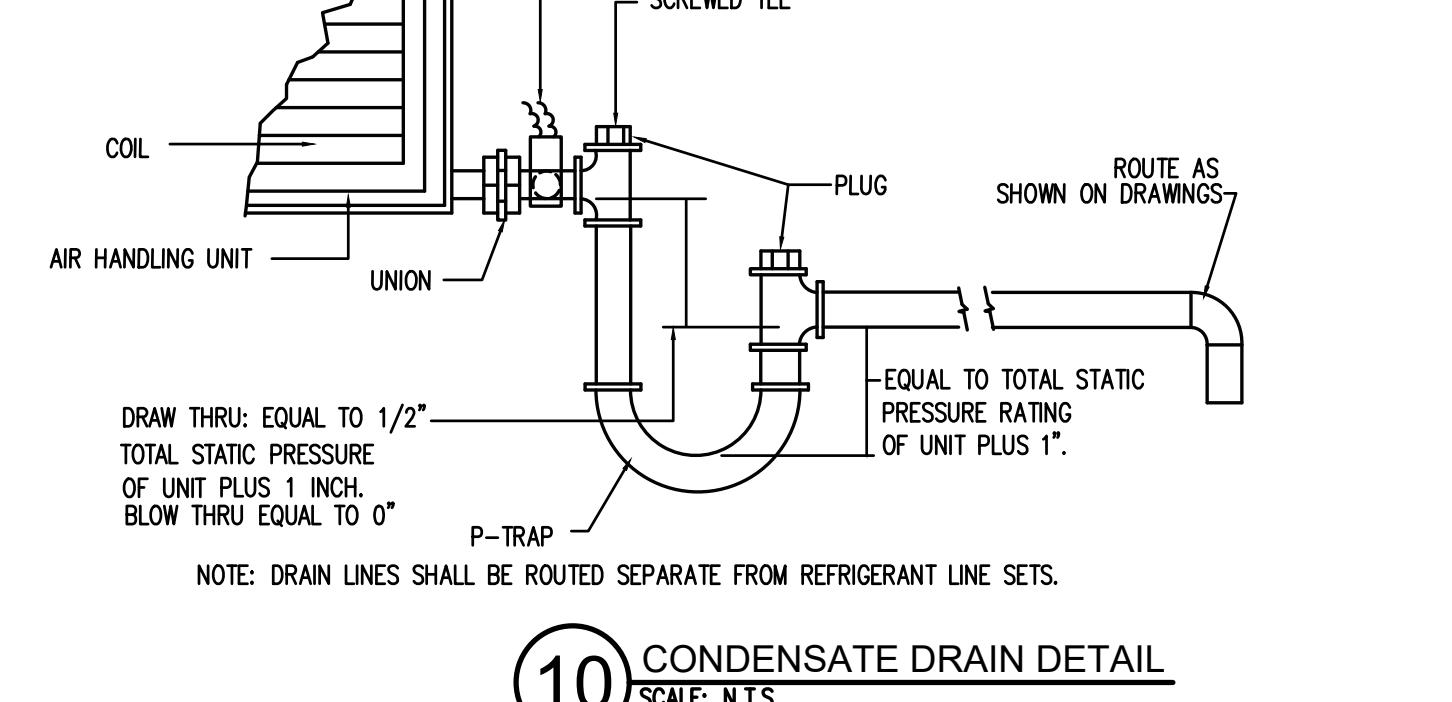
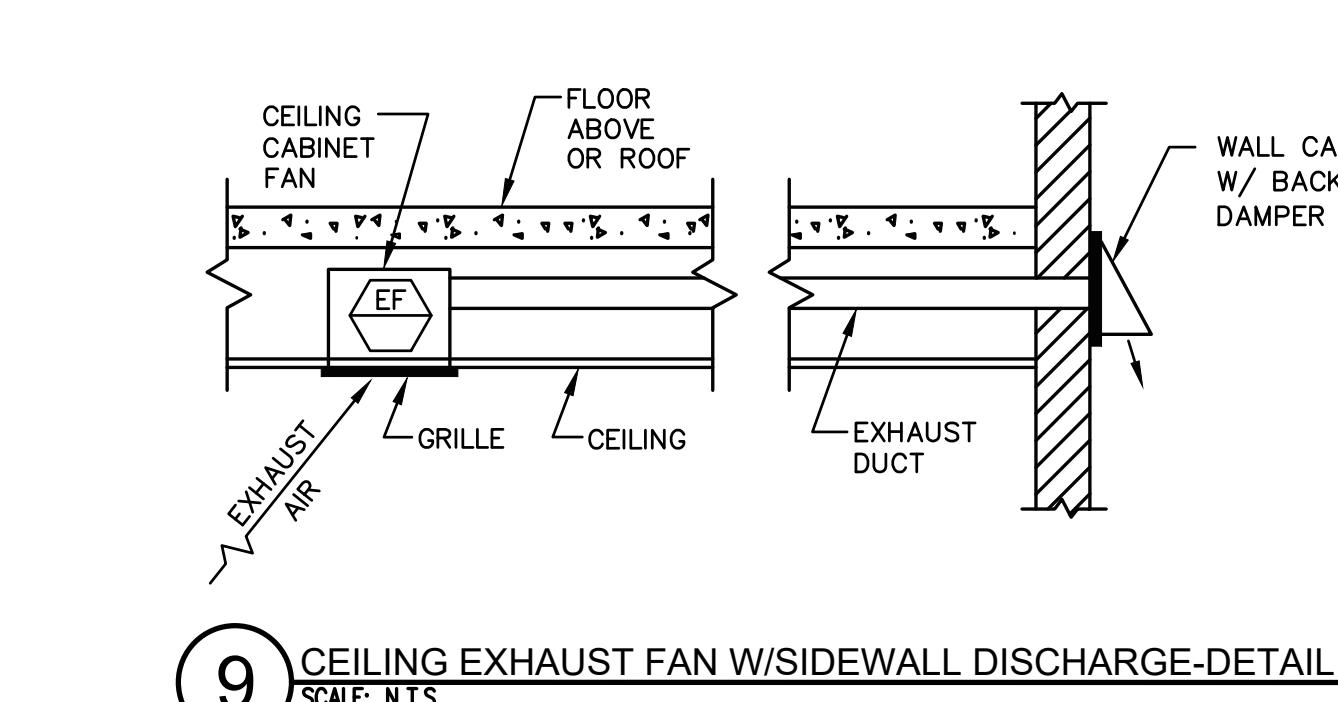
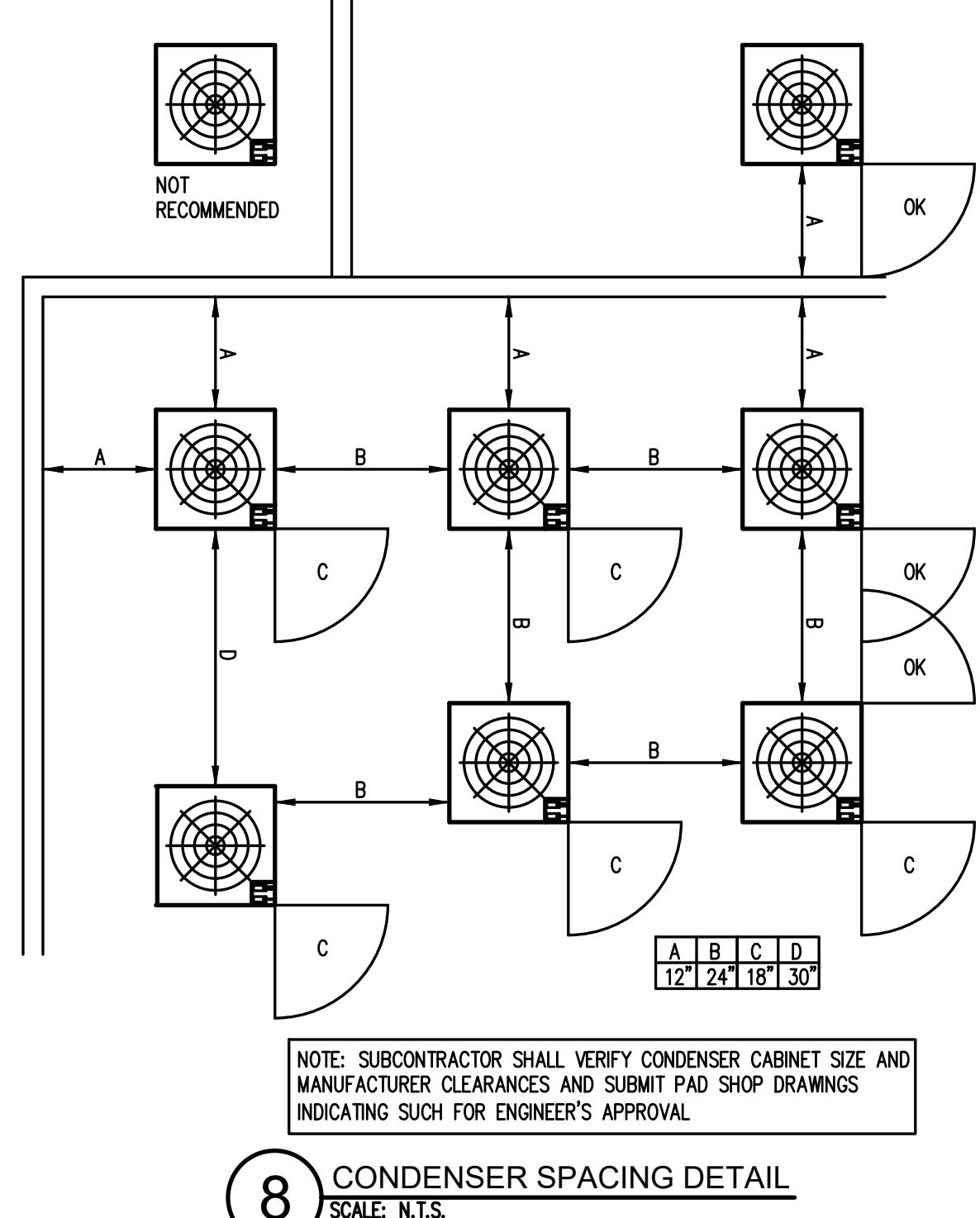
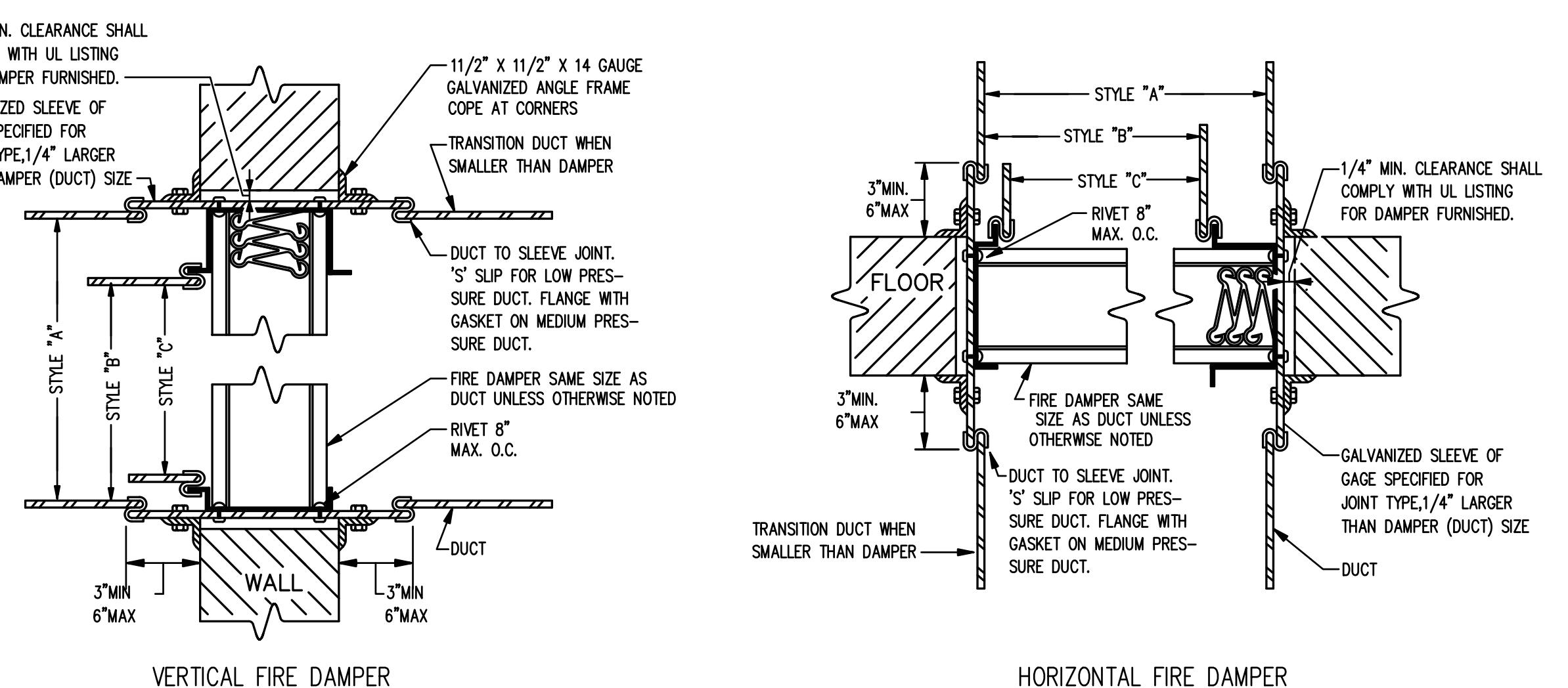
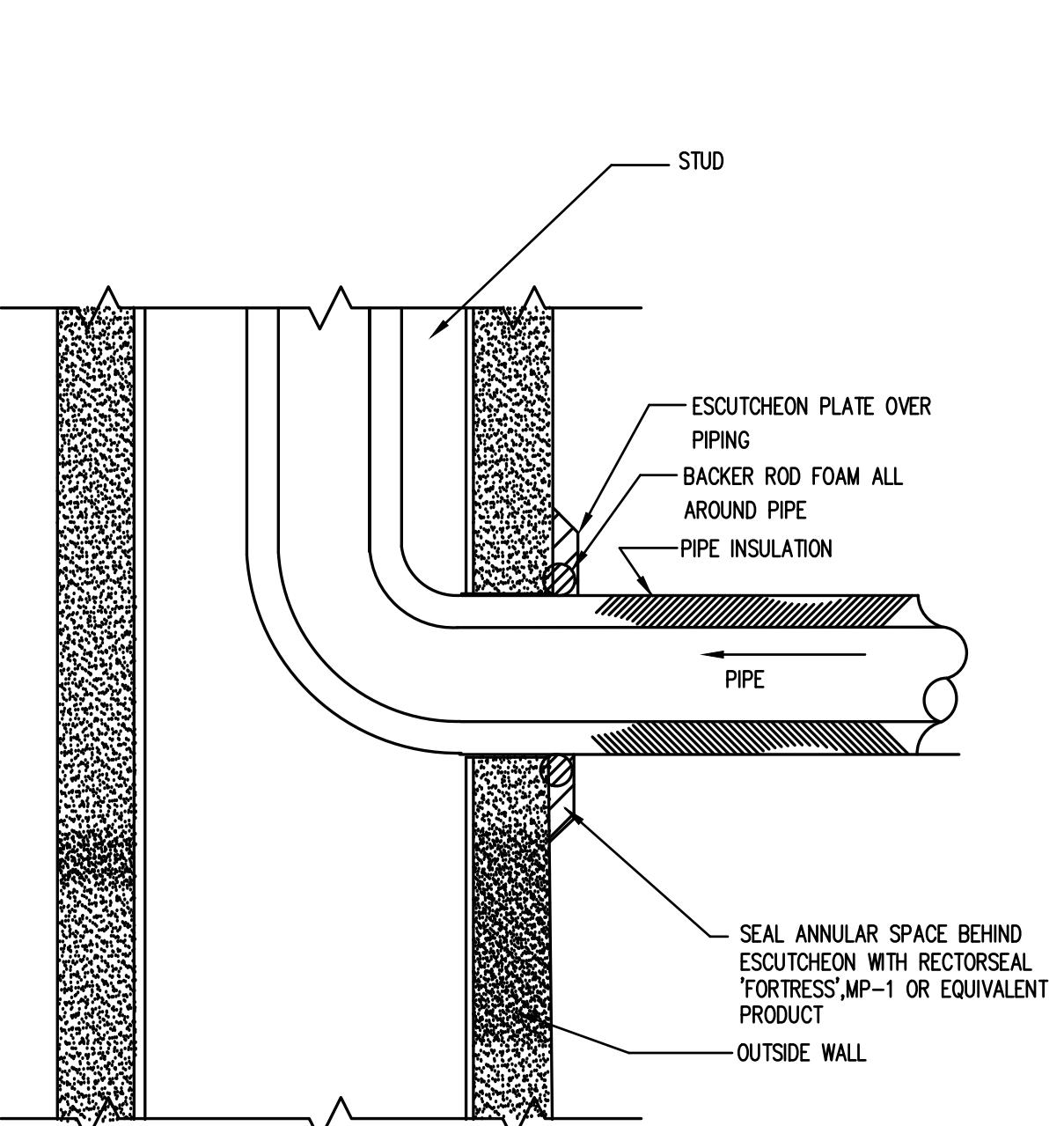
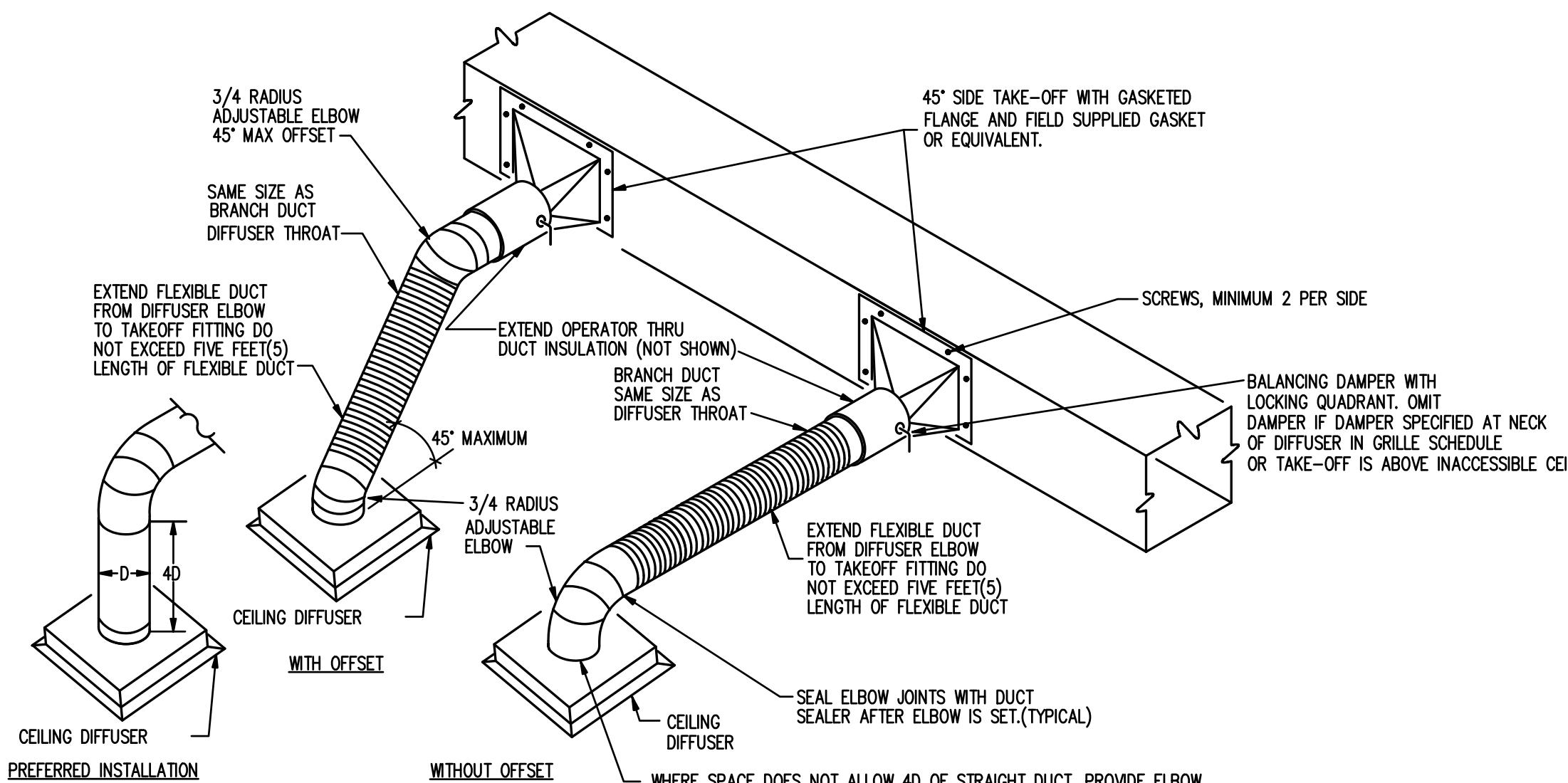
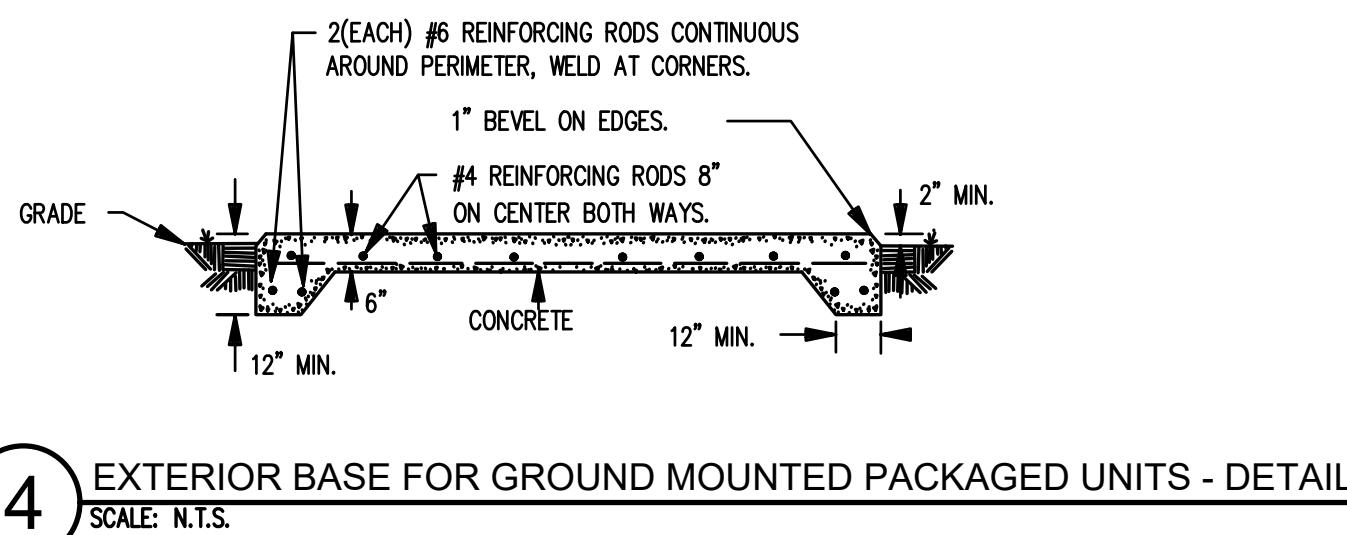
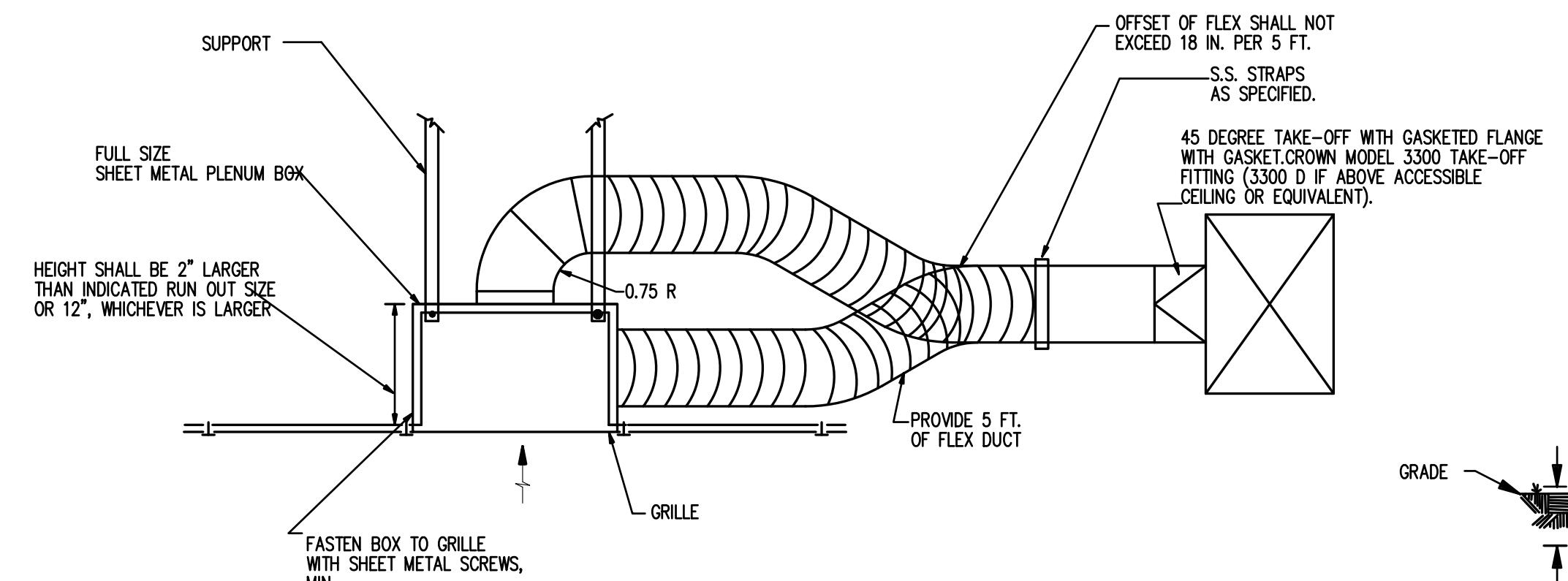
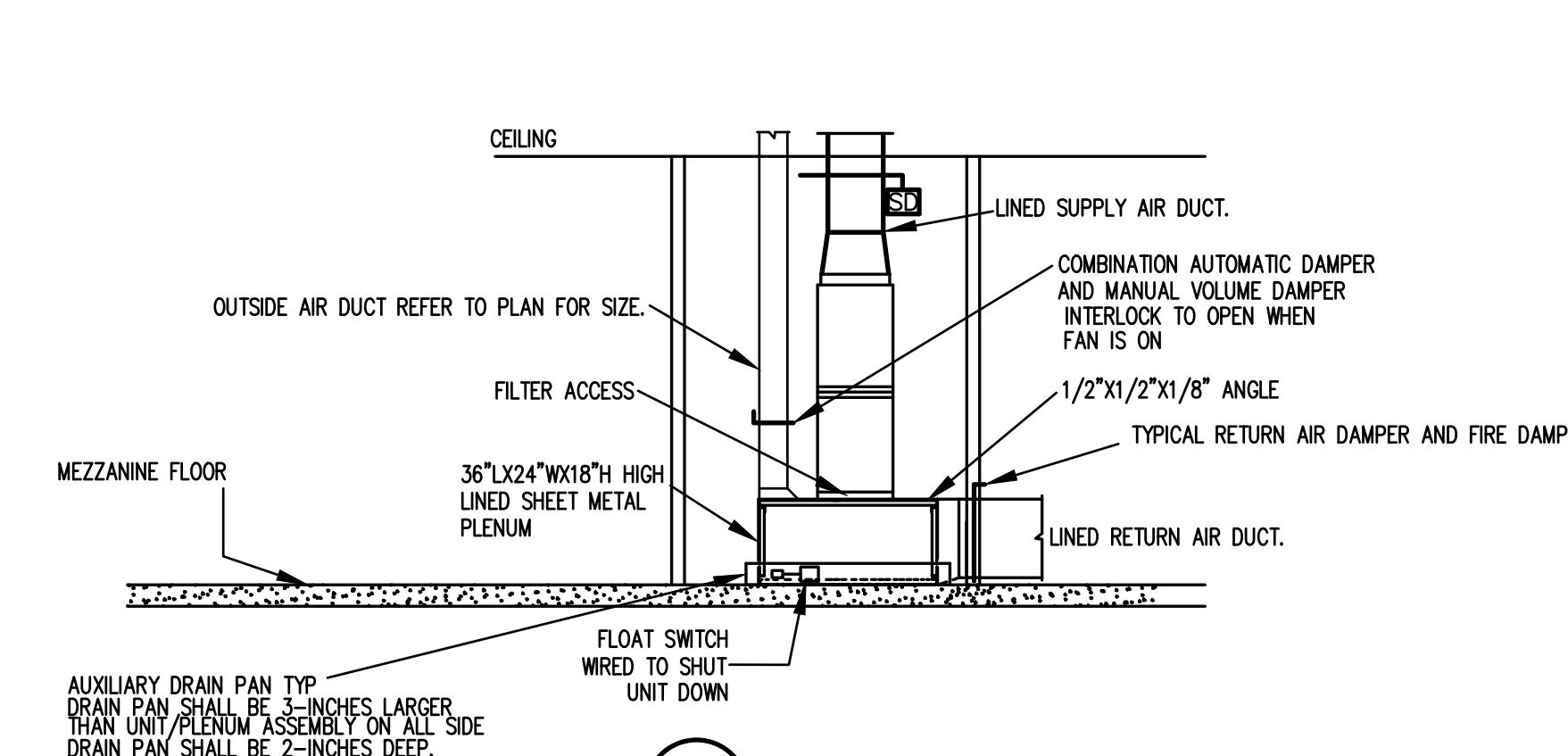
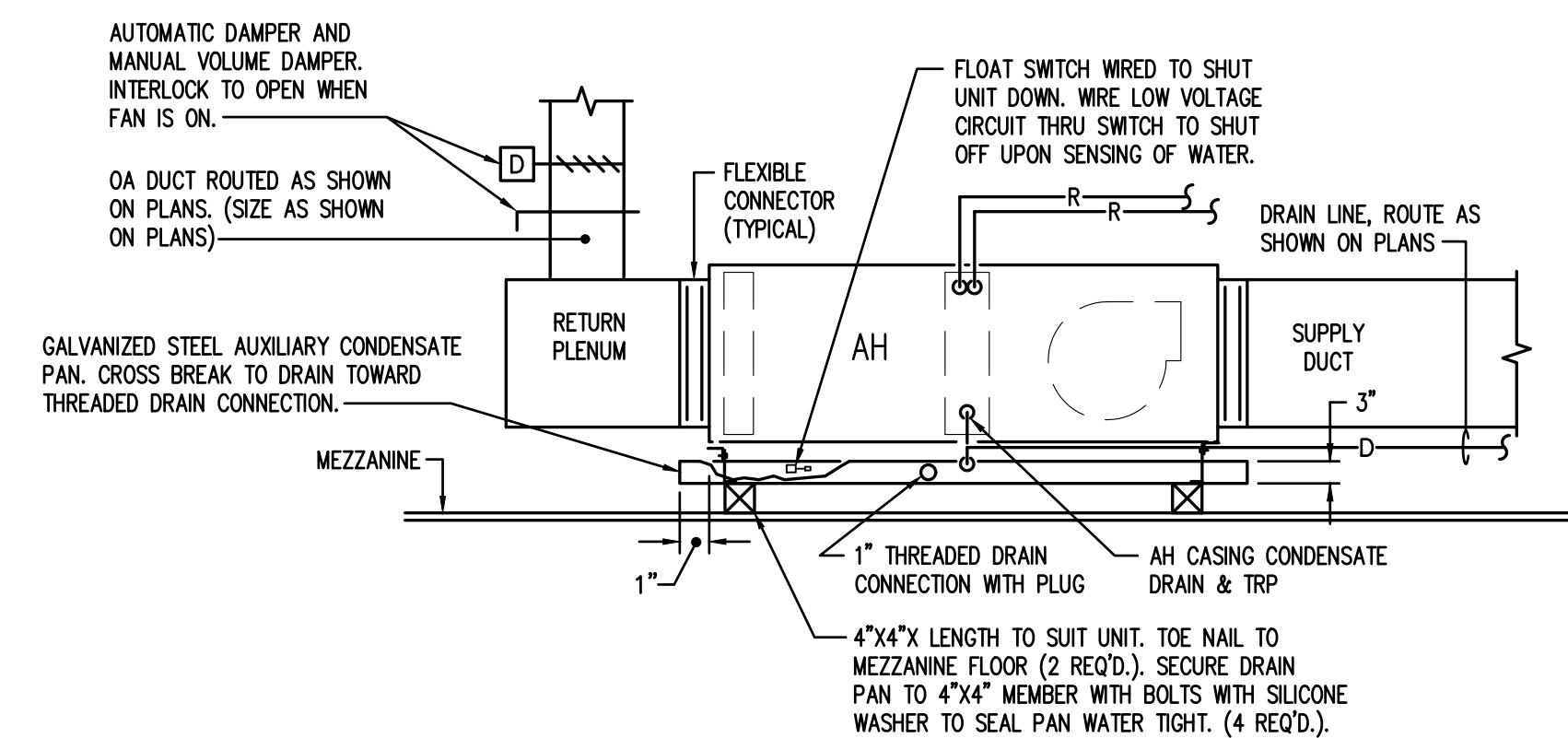
ELECTRIC CABINET HEATER SCHEDULE			
HEATER KW	VOLTS/PH	BASIS OF DESIGN	NOTES
1.5	120/1	BROAN 174	1:2:3

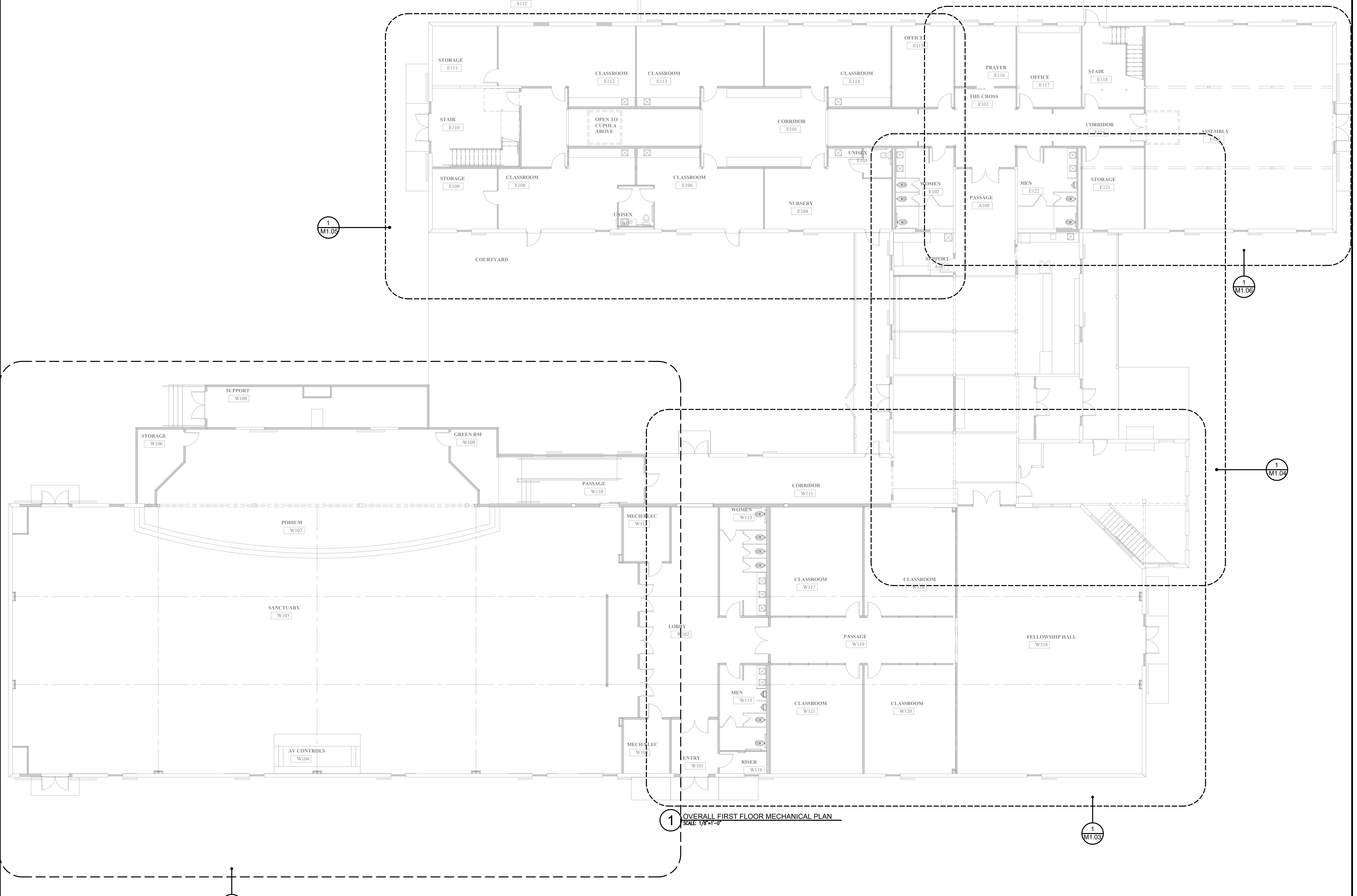
SELF-CLEANING IONIZATION SYSTEM SCHEDULE		
LOW CAPACITY A-MAX CFM	BASIS OF DESIGN GLOBAL PLASMA SOLUTIONS	NOTES
0-2400	GPS-FC24-AC	1: 2: 3: 4: 5
0-1200	GPS-FC	1: 4: 7: 8
0-8000	GPS-iMOD	1: 2: 3: 4: 6

MARK	CFM	EXT. SP IN W.G.	DRIVE TYPE	AMP/WATTS	SONES	POWER/PHASE	SERVES	BASIS OF DESIGN	NOTES
F-1	200	0.35	DIRECT	83.0 W	2.5	115/1	W115 MEN	GREENHECK SP-A250	1:2:3:4
F-2	200	0.30	DIRECT	47.0 W	2.0	115/1	W113 WOMEN	GREENHECK SP-A200	1:2:3:4
F-3	150	0.30	DIRECT	128.0 W	3.0	115/1	E124 MEN	GREENHECK SP-B150	1:2:3:4
F-4	150	0.30	DIRECT	128.0 W	3.0	115/1	E102 WOMEN	GREENHECK SP-B150	1:2:3:4
F-5	70	0.25	DIRECT	20.0 W	1.3	115/1	E103 UNISEX	GREENHECK SP-B90	1:2:3:5
F-6	70	0.25	DIRECT	20.0 W	1.3	115/1	E107 UNISEX	GREENHECK SP-B90	1:2:3:5

For more information, contact the Office of the Vice President for Research and Economic Development at 401-863-2300 or [opred@brown.edu](mailto:opred@brown.edu).

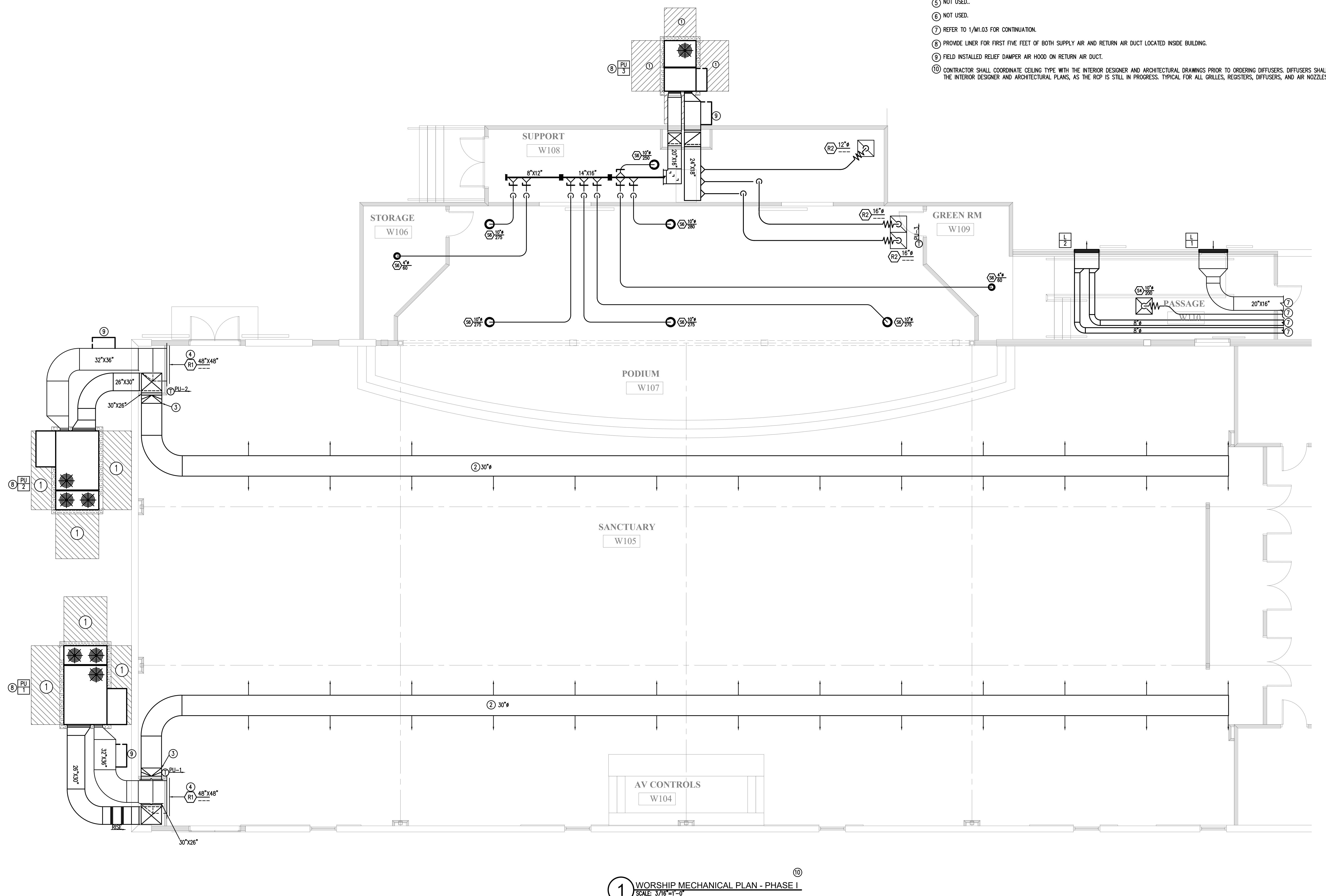
AIR DEVICE SCHEDULE									
IRK	SERVICE	NECK SIZE	FACE SIZE	MATERIAL	TYPE	PATTERN	MOUNTING TYPE	LAYOUT BASIS	NOTES
	SUPPLY	SEE PLANS	24" X 24"	STEEL	SQUARE CONC.	4-WAY	LAY-IN	TITUS TMS	1:2:4
	SUPPLY	SEE PLANS	NECK+1-3/4"	STEEL	DOUBLE DEFLECTION REGISTER	2-WAY	DUCT MOUNT	TITUS 300RS	1:2
	SUPPLY	SEE PLANS	NECK+1-3/4"	STEEL	DOUBLE DEFLECTION REGISTER	2-WAY	DUCT MOUNT	TITUS 300RS	3:4:5
	SUPPLY	SEE PLANS	24" X 24"	STEEL	SQUARE CONC.	4-WAY	SURFACE	TITUS TMS	1:2:4
	SUPPLY	SEE PLANS	48"-4 SLOT	ALUMINUM	LINEAR SLOT	1-WAY	SURFACE	TITUS ML-38	4:8:9
	SUPPLY	SEE PLANS	NECK+2-1/4"	ALUMINUM	AIR NOZZLE	1-WAY	SURFACE	AIR CONCEPTS ANC-RP	2:4:10:11
	RETURN	SEE PLANS	NECK+1-3/4"	ALUMINUM	FULL LOUVERED FACE	---	SURFACE	TITUS 350RL	3:6
	RETURN	SEE PLANS	24" X 24"	ALUMINUM	EGGCRATE	---	SURFACE	TITUS 50F	1:7
	RETURN	SEE PLANS	24" X 24"	ALUMINUM	EGGCRATE	---	LAY-IN	TITUS 50F	1:7





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1091 Confederate Highway  
Retrofit & Renovations for  
Madison Methodist ChurchJOB NO.: 02405  
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DATE: 12.02.24  
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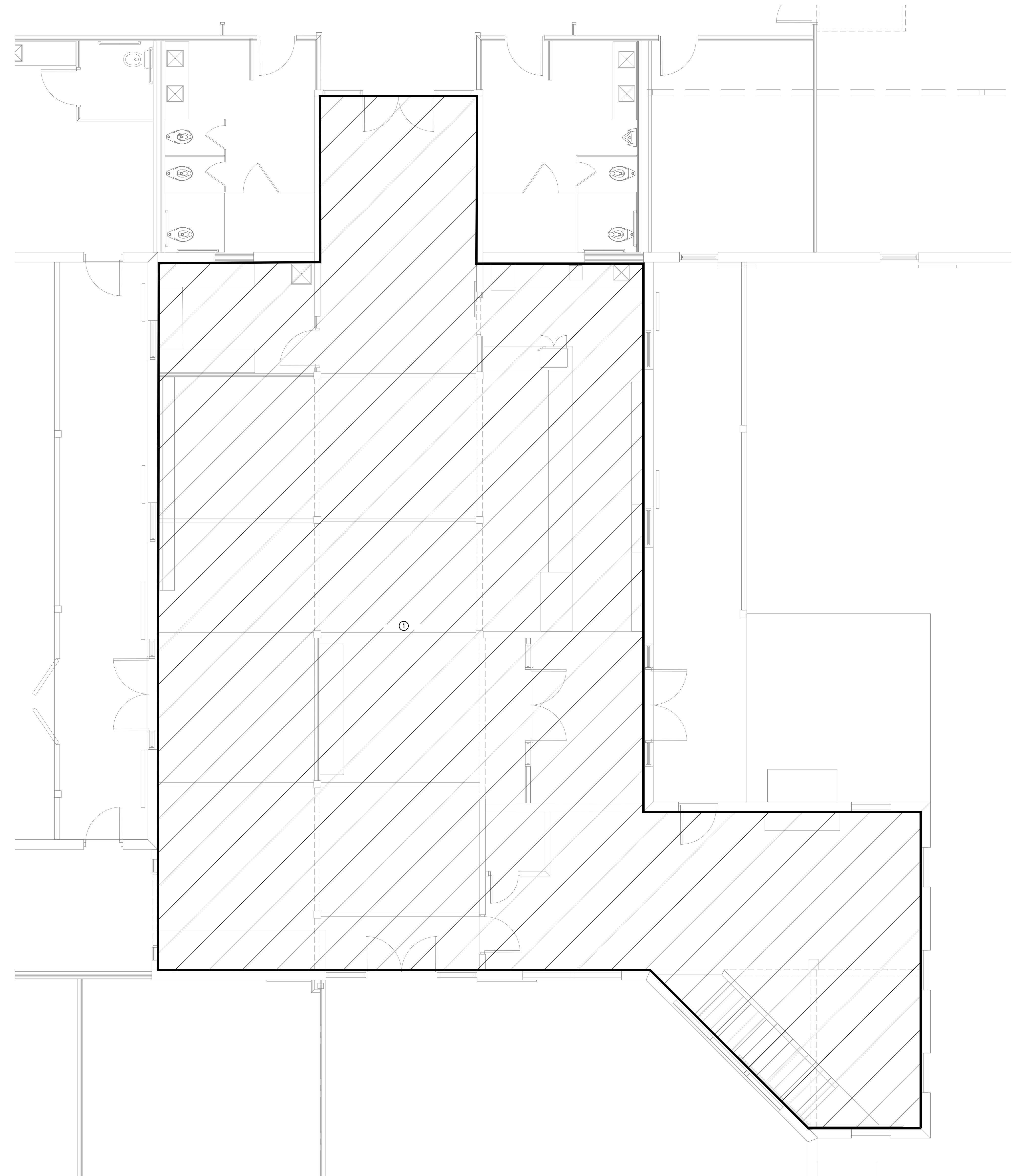
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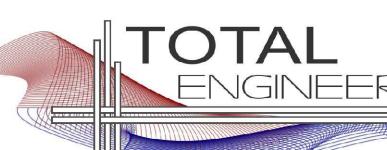
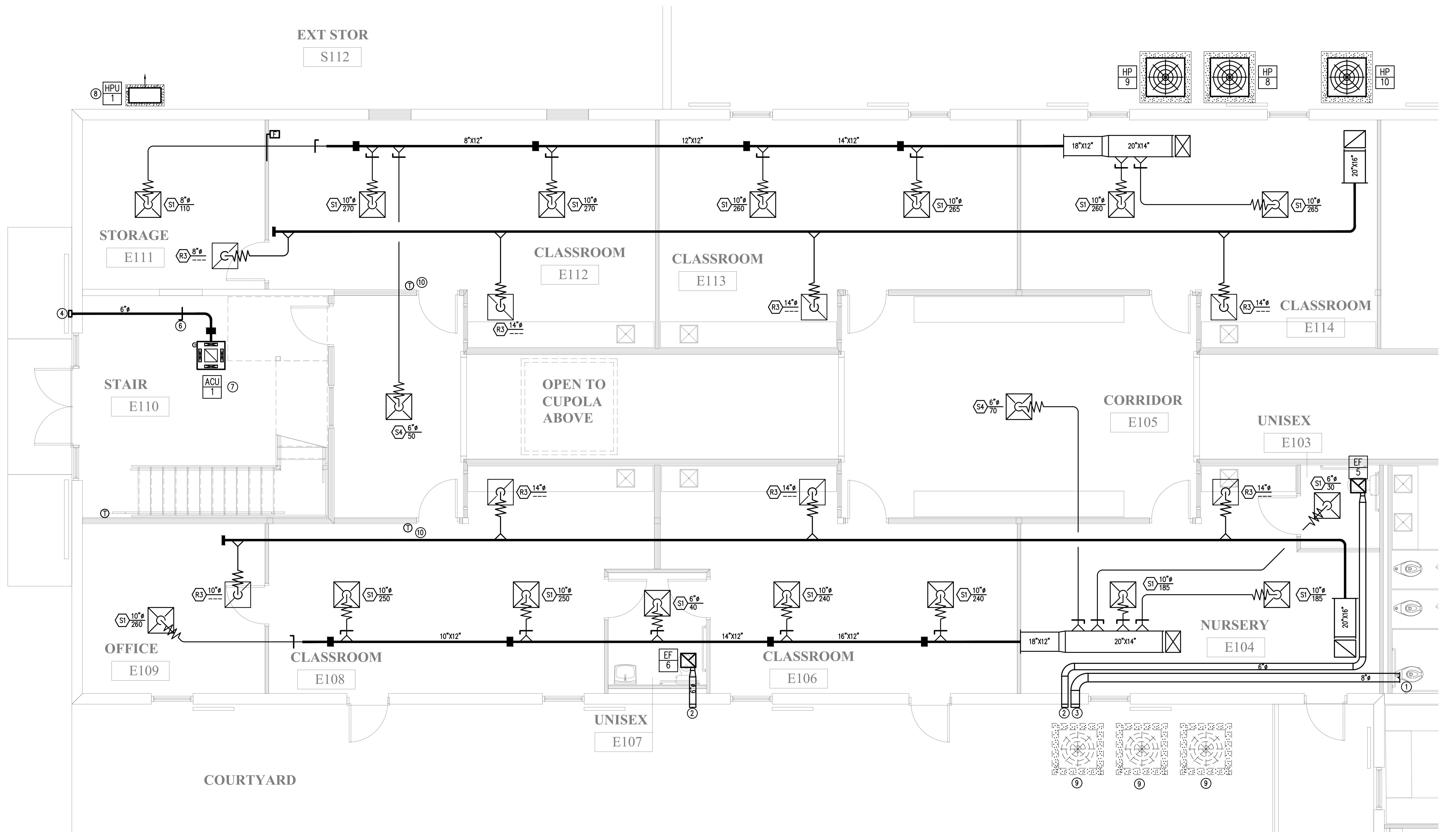
KEY NOTES (THIS SHEET ONLY):

- ① UNIT ACCESS SPACE.
- ② EXPOSED FABRIC SUPPLY AIR DUCTWORK. CONTRACTOR SHALL PROVIDE ROLLED EDGE AT FABRIC DUCT CONNECTION. REFER TO MANUFACTURER'S DETAIL AND SPECIFICATION FOR FURTHER INFORMATION. FABRIC DUCT LAYOUT BASIS: PRIMADA. DUCTWORK SHALL BE COORDINATED WITH MANUFACTURER. CONTRACTOR SHALL PROVIDE CORRECT AIRFLOW INFORMATION TO FABRIC DUCT MANUFACTURER TO CORRECTLY SIZE DUCT WORK PER MANUFACTURER'S CRITERIA. DUCTWORK SHALL BE NON-COLLAPSIBLE. REFER TO FABRIC DUCT SCHEDULE, LOCATE HIGH AT STRUCTURE. PROVIDE HIGH THROW DIFFUSERS. COORDINATE THE HEIGHT OF SPACE WITH MANUFACTURER.
- ③ STARTING POINT OF FABRIC DUCT WORK.
- ④ RETURN AIR GRILL AT 12" AFF. PROVIDE FULL SIZE LINED SHEET METAL PLENUM BEHIND GRILL.
- ⑤ NOT USED.
- ⑥ NOT USED.
- ⑦ REFER TO 1/M1.03 FOR CONTINUATION.
- ⑧ PROVIDE LINER FOR FIRST FIVE FEET OF BOTH SUPPLY AIR AND RETURN AIR DUCT LOCATED INSIDE BUILDING.
- ⑨ FIELD INSTALLED RELIEF DAMPER AIR HOOD ON RETURN AIR DUCT.
- ⑩ CONTRACTOR SHALL COORDINATE CEILING TYPE WITH THE INTERIOR DESIGNER AND ARCHITECTURAL DRAWINGS PRIOR TO ORDERING DIFFUSERS. DIFFUSERS SHALL BE COMPATIBLE WITH THE INTERIOR DESIGNER AND ARCHITECTURAL PLANS, AS THE RCP IS STILL IN PROGRESS. TYPICAL FOR ALL GRILLES, REGISTERS, DIFFUSERS, AND AIR NOZZLES.





1 GATHERING MECHANICAL PLAN - PHASE I  
SCALE: 1/4"=1'-0"

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COVINGTON, GA 30014  
770.786.3031EDUCATION SOUTH MECHANICAL PLAN - PHASE I  
1091 Confederate Highway  
Madison, Georgia 30650

① EDUCATION SOUTH MECHANICAL PLAN - PHASE I  
SCALE: 1/4"=1'-0"

LINE LEGEND	
	DEMOLITION
—	EXISTING TO REMAIN
—>	CONNECT TO EXISTING

KEY NOTES (THIS SHEET ONLY):

- REFER TO 1/A1.06 FOR CONTINUATION.
- 6" EXHAUST AIR WALL CAP. PAINT TO MATCH EXTERIOR WALL.
- 8" EXHAUST AIR WALL CAP. PAINT TO MATCH EXTERIOR WALL.
- 6" OUTSIDE AIR WALL CAP. PAINT TO MATCH EXTERIOR WALL.
- NOT USED.
- SET MOTORIZED OUTSIDE AIR DAMPER AT 40 CFM. INTERLOCK DAMPER TO CLOSE WHEN EVAPORATOR FAN IS OFF.
- ROUTE CONDENSATE DRAIN TO OUTSIDE TO 12-INCHES AFF. PROVIDE 45-DEGREE ELBOW AT DISCHARGE TO GUIDE CONDENSATE AWAY FROM EXTERIOR WALL. PROVIDE SPLASH BLOCK AT DISCHARGE. ROUTE CONDENSATE TOWARD CONDENSING UNITS. CONDENSATE PIPE SHALL BE HARD PVC.
- ROUTE REFRIGERANT PIPES TO RESPECTIVE AIR-HANDLING UNIT INSIDE BUILDING. ROUTE AND SIZE PER MANUFACTURER'S INSTRUCTIONS. TYPICAL FOR ALL HEAT PUMP CONDENSING UNITS.
- EXISTING HEAT PUMP UNIT SHALL BE REMAN AS IS WITH ALL ITS ACCESSORIES AND CONTROLS. COORDINATE WITH GC AND ARCHITECTURAL FOR ADDITIONAL WORK ON THE UNITS. UNITS ARE SERVING EXISTING AREA.
- TOP OF THERMOSTAT SHALL BE AT 48" AFF. PROVIDE BREATHABLE CLEAR PLASTIC, TAMPER PROOF AND LOCKABLE THERMOSTAT COVER.
- CONTRACTOR SHALL COORDINATE CEILING TYPE WITH THE INTERIOR DESIGNER AND ARCHITECTURAL DRAWINGS PRIOR TO ORDERING DIFFUSERS. DIFFUSERS SHALL BE COMPATIBLE WITH THE INTERIOR DESIGNER AND ARCHITECTURAL PLANS, AS THE RCP IS STILL IN PROGRESS. TYPICAL FOR ALL GRILLES, REGISTERS, DIFFUSERS, AND AIR NOZZLES.

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