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ADDENDUM NO. 02

AUGUST 16, 2017

PROJECT: **School of Public Health MEP Renovation**

FROM: **Infrastructure Associates, Inc.**
6117 Richmond Ave.
Houston, Texas 77057

TO: **Prospective Bidders**

THE SOLICITATION MENTIONED ABOVE IS AMENDED AS SET FORTH BELOW.

This Addendum uses the "change-page" method as follows:

For Revisions to the Project Manual:

Remove obsolete pages and delete, replace. or add pages as indicated issued under this Addendum.

For Revisions to Drawings:

Remove obsolete sheets and replace or add sheets issued as indicated under this Addendum.

PART 1 - CHANGES TO PROJECT MANUAL

A. Add the following new specification sections to the project manual issued August 16, 2017 as Addendum #2:

1. 225000 – STEAM FIRED DOMESTIC WATER HEATERS
2. 238219 – FAN COIL UNITS

B. Replace the following specifications sections in their entirety with revised sections issued August 16, 2017 as Addendum #2:

1. 230620 – HYDRONIC SPECIALTIES
2. 230923 – DIRECT DIGITAL CONTROL SYSTEMS FOR HVAC
3. 232223 – STEAM CONDENSATE RETURN UNITS (formerly entitled STEAM CONDENSATE PUMPS)
4. 233100 – DUCTWORK
5. 235700 – HEAT EXCHANGERS FOR HVAC
6. 237323 – AIR HANDLING UNITS

C. Revise the following specification with replacement paragraphs issued August 18, 2018 as Addendum #2:

1. 261116 – SECONDARY UNIT SUBSTATIONS, page 5, paragraph 2.4 Dry-type Transformer Section

PART 2 - CHANGES TO DRAWINGS

D. Add the following new drawing sheets issued July 28, 2017 as Addendum #1:

1. M301 – ENLARGED PLAN TYPICAL 2ND-10TH FLOOR LOBBY TEMPORARY AHU INSTALLATION DETAILS
2. M706 – CONTROLS POINTS

E. Revise the following drawing sheets with drawing revisions issued August 16, 2017 as Addendum #2:

1 MEP100 - ROOF FLOOR PLAN - MEP – PROPOSED
2 M001 - NOTES AND LEGEND
3 M002 - SCHEDULES
4 M003 - SCHEDULES
5 M004 - SCHEDULES
6 M101 - BASEMENT FLOOR PLAN - HVAC - DEMO
7 M102 - 2ND FLOOR PLAN - HVAC - DEMO
8 M103 - 3RD FLOOR PLAN - HVAC - DEMO
9 M104 - 4TH FLOOR PLAN - HVAC - DEMO
10 M105 - 5TH FLOOR PLAN - HVAC - DEMO
11 M106 - 6TH FLOOR PLAN - HVAC - DEMO
12 M107 - 7TH FLOOR PLAN - HVAC - DEMO
13 M108 - 8TH FLOOR PLAN - HVAC - DEMO
14 M109 - 9TH FLOOR PLAN - HVAC - DEMO
15 M110 - 10TH FLOOR PLAN - HVAC - DEMO
16 M200 - BASEMENT FLOOR PLAN - HVAC - NEW
17 M201 - FIRST FLOOR PLAN - HVAC - PROPOSED
18 M202 - 2ND FLOOR PLAN - HVAC - PROPOSED
19 M203 - 3RD FLOOR PLAN - HVAC - PROPOSED
20 M204 - 4TH FLOOR PLAN -HVAC - PROPOSED
21 M205 - 5TH FLOOR PLAN - HVAC - PROPOSED
22 M206 - 6TH FLOOR PLAN - HAVC - PROPOSED
23 M207 - 7TH FLOOR PLAN - HVAC - PROPOSED
24 M207A - 7TH FLOOR PLAN - AIR FLOW DIAGRAM
25 M208 - 8TH FLOOR PLAN - HVAC - PROPOSED
26 M209 - 9TH FLOOR PLAN - HVAC - PROPOSED
27 M210 - 10TH FLOOR PLAN - HVAC - PROPOSED
28 M211 - PENTHOUSE - HVAC – PROPOSED
29 M300 – ENLARGED PLAN - TYPICAL 2ND-10TH FLOOR LOBBY – TEMPORARY AHU INSTALLATION
30 M400 - ENLARGED CENTRAL PLANT - BASEMENT FLOOR PLAN - DEMO
31 M401 - ENLARGED CENTRAL LANT - BASEMENT FLOOR PLAN - PROPOSED
32 M402 - ENLARGED BASEMENT FLOOR PLAN - MECHANICAL ROOMS
33 M403 - ENLARGED PLAN - 2ND FLOOR - MECHANICAL ROOM - DEMO
34 M404 - ENLARGED PLAN - 2ND FLOOR - MECHANICAL ROOM - PROPOSED
35 M405 - ENLARGED PLAN - 3RD FLOOR - MECHANICAL ROOM - DEMO
36 M406 - ENLARGED PLAN - 3RD FLOOR - MECHANICAL ROOM - PROPOSED
37 M407 - ENLARGED PLAN - TYPICAL 4TH-7TH FLOOR - MECHANICAL ROOM - DEMO
38 M408 - ENLARGED PLAN - TYPICAL 4TH-7TH FLOOR - MECHANICAL ROOM - PROPOSED
39 M409 - ENLARGED PLAN - TYPICAL 8th-10th FLOOR - MECHANICAL ROOM - DEMO
40 M410 - ENLARGED PLAN - TYPICAL 8TH-10TH FLOOR - MECHANICAL ROOM - PROPOSED
41 M411 – ALTERNATE #1 - ENLARGED PLAN - TYPICAL 8th-10th FLOOR- MECHANICAL ROOM - PROPOSED
42 M501 – SECTIONS – BASEMENT MECHANICAL ROOMS
43 M502 – SECTIONS – 2ND FLOOR MECHANICAL ROOM
44 M503 – SECTIONS – 3RD THRU 10TH FLOOR MECHANICAL ROOMS
45 M504 – ALTERNATE #1 SECTIONS – 8TH THRU 10TH FLOOR MECHANICAL ROOMS
46 M505 - CUSTOM AHU CONFIGURATIONS
47 M506 - CUSTOM AHU CONFIGURATIONS
48 M507 - CUSTOM AHU CONFIGURATIONS
49 M508 - CUSTOM AHU CONFIGURATIONS
50 M509 - CUSTOM AHU CONFIGURATIONS
51 M510 - CUSTOM AHU CONFIGURATIONS
52 M601 - PIPING DIAGRAM - CHILLED WATER
53 M602 - PIPING DIAGRAM - HOT WATER
54 M603 - HEAT EXCHANGER PIPING DIAGRAM
55 M604 – PIPING DIAGRAM - STEAM PRESSURE REDUCER
56 M701 - CONTROLS
57 M702 - CONTROLS
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M704 - CONTROLS
M705 - CONTROLS POINTS
M801 - DETAILS
M802 - DETAILS
M803 - DETAILS
M804 – DETAILS
E001 – NOTES, SYMBOLS, & LEGEND
E002 – DEMOLITION ONE LINE DIAGRAM
E003 – DEMOLITION ONE LINE DIAGRAM
E004 – DEMOLITION ONE LINE DIAGRAM
E007 – PROPOSED ONE LINE DIAGRAM
E007A – PROPOSED ONE LINE DIAGRAM ALTERNATE
E008 – PROPOSED ONE LINE DIAGRAM
E008A – PROPOSED ONE LINE DIAGRAM ALTERNATE
E011 – PROPOSED EMERGENCY ONE LINE DIAGRAM
E012 – DEMOLITION ELECTRICAL RISER DIAGRAM
E013 – PROPOSED ELECTRICAL RISER DIAGRAM
E014 – DEMOLITION EMERGENCY ELECTRICAL RISER DIAGRAM
E015 – PROPOSED EMERGENCY ELETRICAL RISER DIAGRAM
E020 – EXISTING BASEMENT PANEL SCHEDULES
E035 – PROPOSED PANEL SCHEDULES
E106 – EXISTING SIXTH FLOOR PLAN POWER
E107 – EXISTING SEVENTH FLOOR PLAN POWER
E114 – EXISTING SITE PLAN POWER
E200 – PROPOSED BASEMENT FLOOR PLAN POWER
E201 – PROPOSED FIRST FLOOR PLAN POWER
E202A – PROPOSED SECOND FLOOR PLAN POWER
E203 – PROPOSED THIRD FLOOR PLAN POWER
E204 – PROPOSED FOURTH FLOOR PLAN POWER
E205 – PROPOSED FIFTH FLOOR PLAN POWER
E206 – PROPOSED SIXTH FLOOR PLAN POWER
E207 – PROPOSED SEVENTH FLOOR PLAN POWER
E208 – PROPOSED EIGHTH FLOOR PLAN POWER
E209 – PROPOSED NINTH FLOOR PLAN POWER
E210 – PROPOSED TENTH FLOOR PLAN POWER
E212 – PROPOSED ENLARGED BASEMENT FLOOR PLANS POWER
E213 – PROPOSED ENLARGED SECOND FLOOR PLAN POWER
E213A – PROPOSED ENLARGED SECOND FLOOR PLAN POWER ALTERNATE
E500 – DETAILS
P001 – SCHEDULES, NOTES, AND LEGEND
P101 – BASEMENT FLOOR PLAN - PLUMBING
P201 – BASEMENT FLOOR PLAN – PLUMBING
P202 – FIRST FLOOR PLAN – PLUMBING
P203 – SECOND FLOOR PLAN – PLUMBING
P204 – THIRD FLOOR PLAN – PLUMBING
P205 – FOURTH FLOOR PLAN – PLUMBING
P206 – FIFTH FLOOR PLAN – PLUMBING
P207 – SIXTH FLOOR PLAN – PLUMBING
P208 – SEVENTH FLOOR PLAN – PLUMBING
P209 – EIGHTH FOOR PLAN – PLUMBING
P210 – NINTH FLOOR PLAN – PLUMBING
P211 – TENTH FLOOR PLAN – PLUMBING
P401 – ENLARGED FLLOR PLAN AND DETAILS - PLUMBING

- END -

SECTION 22 50 00

STEAM FIRED DOMESTIC WATER HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Division 22 Plumbing

C. Section 232000A Piping, Valves and Fittings

1.2 SUMMARY

A. This Section includes packaged tankless water heaters utilizing indirect steam heat exchange.

1.3 SUBMITTALS

A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings: Signed and sealed by a qualified professional engineer. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   1. Design Calculations: Calculate requirements for selecting seismic restraints and for designing bases.
   2. Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment.

C. Coordination Drawings: Equipment room, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
   1. Tube-removal space.
   2. Structural members to which heat exchangers will be attached.
   3. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
   4. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Operation and Maintenance Data: For heat exchangers to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, performance, and dimensional requirements of heat exchangers and are based on the specific equipment indicated. Refer to Division 01 Section "Product Requirements."

B. ASME Compliance: Fabricate and label heat exchangers to comply with ASME Boiler and Pressure Vessel Code: Section VIII, "Pressure Vessels," Division 1.

C. Registration: Fabricate and label shell-and-tube heat exchangers to comply with the Tubular Exchanger Manufacturers Association's standards where applicable.

D. All internal potable water surfaces shall comply with NSF61 standard for no lead.

1.5 MAINTENANCE

A. Provide twelve (12) months maintenance of all materials and equipment under this section. Cost of the twelve (12) month normal and preventive maintenance shall be included within this scope of work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 TANKLESS STEAM FIRED DOMESTIC WATER HEATERS

A. Manufacturers:
   1. ThermaFlo Engineering Company.
   2. Maxi-Therm, Inc.
   3. Cemline, Inc.
   4. PVI Watts, Inc..
   5. AO Smith, Inc..

B. Description: Pre-packaged, manufacturer assembled, pre-piped, domestic water heater system incorporating shell-and-tube type steam to water heat exchanger(s), safety relief valve, steam regulator valve(s), steam trap(s), integral digital temperature controller, instrumentation & sensors, and support frame.

C. Heat Exchanger
   1. Configuration: Horizontal or vertical oriented heat exchanger as indicated
   2. Pressure Class: as indicated
   3. ASME Code constructed in accordance with Section VIII, Division 1
   4. Shell: 304 or 316L stainless steel
   5. Steam Head: Removable cast iron or steel confirming with requirements of pressure classification.
   6. Tubes: 0.75” double wall seamless copper or 304 stainless steel
   7. Tube Sheet: 0.75” brass
   8. Insulation: Minimum 2” high-density insulation meeting the minimum requirements of ASHRAE 90.1 current version. Provide insulation with removable stainless steel jacketing.

D. Safety Relief Valves: Combination pressure-temperature ASME Code stamped bronze bodied.

E. Piping: Refer to Section 232000A Piping, Valves and Fittings

F. Temperature Regulator Valve
1. Cast iron or steel body as required by indicated pressure class requirements.
2. Stainless steel trim with renewable seals
3. Single soft-seat construction
4. Class VI shutoff rated
5. Electrically actuated with failsafe spring closure.
6. Manufacturer installed and pre-piped

G. Steam Trap
1. Float & thermostatic type
2. Cast iron body with renewable internals
3. Size for minimum 2:1 safety factor at not more than 1.0 psi differential pressure
4. Rated for maximum anticipated condensate temperature

H. Controls
1. UL listed digital microprocessor temperature controller with graphical interface, adjustable temperature controls, operating temperature indication, status indication, and over-temperature warning indication.
2. Manufacturer pre-programmed and tested.
3. Manufacturer installed in NEMA 4 enclosure with single point, 120 VAC power connection.
4. Manufacturer installed and prewired inlet and outlet platinum RTD temperature sensors with stainless steel thermal wells
5. Manufacturer prewired to steam regulator valve.

I. Frame: Galvanized or epoxy coated carbon steel with flanged footings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas for compliance with requirements for installation tolerances and for structural rigidity, strength, anchors, and other conditions affecting performance.
1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNIT INSTALLATION

A. Install units on concrete housekeeping pads.

B. Concrete Bases: Anchor unit to concrete base.
1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around full perimeter of base.
2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to supported equipment.
5. Cast-in-place concrete materials and placement requirements are specified in Division 03.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 and 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Maintain manufacturer's recommended clearances for service and maintenance. Install piping connections to allow service and maintenance of units.

C. Install shutoff valves at inlet and outlet connections.

D. Install relief valves on heat-exchanger heated-fluid connection and install pipe relief valves, full size of valve connection, to floor drain.

E. Install vacuum breaker at heat-exchanger steam inlet connection.

F. Install hose end valve to drain shell.

3.4 FIELD QUALITY CONTROL

A. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.5 CLEANING

A. After completing system installation, including outlet fitting and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finishes. Sterilize potable water surfaces Section 220500 Common Work Results for Plumbing

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain heat exchangers. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION

SECTION 23 06 20

HYDRONIC SPECIALTIES

PART 1 - GENERAL

1. 1 The following sections are to be included as if written herein:
   - A. Section 23 00 00 – Basic Mechanical Requirements
   - B. Section 23 05 29 – Sleeves, Flashings, Supports and Anchors
   - C. Section 23 05 53 – Mechanical Identification

1. 2 WORK INCLUDED
   - A. Expansion Tanks
   - B. Air Vents
   - C. Air Separators
   - D. Strainers
   - E. Gauges and Gauge Connections
   - F. Pump Suction Fittings
   - G. Relief Valves
   - H. Water Flow Measuring and Balancing System

1. 3 RELATED WORK
   - A. Section 22 13 16 - Plumbing Piping.
   - B. Section 23 21 00 - Hydronic Piping.

1. 4 REFERENCES
   - A. ANSI/ASME - Boilers and Pressure Vessels Code.

1. 5 REGULATORY REQUIREMENTS
   - A. Conform to ANSI/ASME Boilers and Pressure Vessels Code Section 8D for manufacture of tanks.

1. 6 QUALITY ASSURANCE
   - A. Manufacturer: For each product specified, provide components by same manufacturer throughout.

1. 7 SUBMITTALS
   - A. Submit shop drawings and product data under provisions of Section 23 00 00.
   - B. Submit shop drawings and product data for manufactured products and assemblies required for this project.

C. Include component sizes, rough-in requirements, service sizes, and finishes. Include product description, model and dimensions.

D. Submit manufacturer's installation instructions under provisions of Section 23 00 00.

1. 8 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Section 23 00 00.

B. Include installation instruction, assembly views, lubrication instructions, and replacement parts list.

1. 9 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Section 23 00 00.

B. Store and protect products under provisions of Section 23 00 00.

PART 2 - PRODUCTS

2. 1 EXPANSION TANKS

A. Construction: Closed, welded steel, tested and stamped in accordance with Section 8D of ANSI/ASME Code; 125 psi rating; cleaned, prime coated, and supplied with steel support saddles; with tappings for installation of accessories.

B. Gauge Glass Set: Brass compression stops, guard, and 3/4 inch red line glass, maximum 24 inches length, long enough to cover tank for 2 inches above bottom to 2 inches below top.

C. Quick Connect Air Inlet: Automotive tire valve type, manual air vent, tank drain, and pressure relief valve.

D. Automatic Cold Water Fill Assembly: Pressure reducing valve, reduced pressure double check back flow preventer, test cocks, strainer, vacuum breaker, and valved by-pass.

E. Hot Water Heating System: Set expansion tank pressure relief valve at 125 psi maximum and pressure reducing valve at 100 psi.

F. Chilled Water System: Set expansion tank pressure relief valve at 125 psi maximum and pressure reducing valve at 100 psi.

G. Size: Refer to drawings for capacity.

2. 2 AUTOMATIC AIR VENTS:

A. Provide at the highest points of the chilled water system and on the chilled water coils as shown on the Drawings, an automatic air vent, Armstrong No. 21AR or approved equal, with a pressure rating of 250 psig. Provide shut-off valve to facilitate maintenance of air vent. Locate all air vents and their discharge lines in accessible locations, preferably clustered.

2. 3 AIR SEPARATORS

A. Dip Tube Fitting: For 150 psig operating pressure; to prevent free air collected in boiler from rising into system.

B. In-line Air Separators: Cast iron for sizes 1-1/2 inch and smaller, or steel for sizes 2 inch and larger; tested and stamped in accordance with Section 8D of ANSI/ASME Code; for 150 psig operating pressure.

C. Selection shall be based upon system flow with pipe size as a minimum in accordance with the basis of design. In no case shall entering velocity exceed 10 feet per second. Separator shall be fabricated steel, rated for 150 psig working pressure, stamped and registered in accordance with ASME Section VIII, Division 1 for unfired pressure vessels, and include two equal chambers above and below the inlet / outlet nozzles.

D. Air separator Unit shall include internal Spirotube® elements filling the entire vessel to suppress turbulence and provide air elimination efficiency of 100% free air, 100% entrained air, and 99.6% dissolved air at the installed location. Dirt separation efficiency shall be a minimum of 80% of all particles 30 micron and larger within 100 passes. The elements must consist of a copper core tube with continuous wound copper wire medium permanently attached and followed by a separate continuous wound copper wire permanently affixed.

E. Basis of design for the air eliminator / dirt separator shall be the Spirovent® VDN or VHN Series as manufactured by Spirotherm, Inc., Glendale Heights, Illinois or approved equal. Unit shall include removable lower head for internal inspection. Alternate manufacturers such as Armstrong DAS – 150 PSI Model or Amtrol ADS – 150 PSI Model shall be acceptable, if the they comply with the specifications and performance.

F. Air Elimination Valve: Bronze, float operated, for 125 psig operating pressure.

G. Combination Air Separators/Strainers: Steel, tested and stamped in accordance with Section 8D of ANSI/ASME Code, for 150 psig operating pressure, with galvanized steel integral strainer with 3/16 inch perforations, tangential inlet and outlet connections, and internal stainless steel air collector tube.

2. 4 STRAINERS:

A. Each control valve for chilled water and heating water, and each pressure reducing valve assembly regardless of its size shall be preceded by a sediment strainer. The arrangement of these sediment strainers shall be such that the screens may be removed for cleaning with ease through a gasketed plug. Monel or stainless steel shall be used to fabricate the non-collapsible, lapped screens, which shall contain no soldered joints.

B. Sediment strainers shall be placed in piping systems wherever shown on the Drawings and at such other points as may be required for the removal of foreign material from the piping systems.

C. Strainers for water piping 2-1/2" and larger shall be Crane No. 989-1/2 Sediment Separators or approved equal. In piping two inches (2") and smaller, they shall be Crane No. 988-1/2, or approved equal.

D. Strainers, 2" and smaller, bronze body, screwed ends, No. 10 mesh strainer, screwed cap with bronze blow-off valve (size to be determined by standard tap size in cap). Cast iron body, 2 1/2" and larger, isolating type flanged ends where installed in copper lines, No. 7 perforated monel strainer, flanged cap with bronze ball blow-off valve (size of blow-off valve shall be determined by standard tap size in cap). Special Note: All strainers 6" and larger shall have studs mounted in the body flange in lieu of bolts for removal of cap. Baskets for strainers 6" and larger shall have stainless steel reinforcing bands at ends to prevent collapsing.

E. Full sized blow off valves shall be installed on all strainers in steam, condensate, chilled and hot water lines and a drain shall be installed from each valve to the nearest floor drain.

2. 5 GAUGES AND GAUGE CONNECTIONS:

A. Furnish and install Ashcroft No. 1279A Dura-gauges on both suction and discharge sides of pumps, complete with Ashcroft No. 1095 lever handle shut-off cocks, and Ashcroft No. 1106B pulsation piston type dampeners, or approved equal. Porous type will not be accepted. See pump Specifications. Gauges shall have stainless steel movement and 1/2 of 1% accuracy. Gauges shall have back connection when used on a panel;

otherwise they shall have bottom connections. The graduation of the dials and the arrangement of the mechanisms shall conform to the pressure range details shown on the Drawings.

B. Combination pressure or vacuum gauges shall be Ashcroft Dura-gauges No. 1279AC, or approved equal. The accessories for these gauges shall conform to those prescribed for pressure gauges.

C. Furnish and install, where noted or indicated on the accompanying Drawings or called for elsewhere in these Specifications, gauge connections complete with Ashcroft No. 1095 lever handle union shutoff cocks, or approved equal. All gauge connections shall be made up with brass pipe, nipples and brass screw fittings.

2. 6 THERMOMETER AND THERMOMETER WELLS:

A. Furnish and install thermometers of not less than 9" scale complete with brass separable sockets with extension neck to allow for insulation of piping. These thermometers shall be mercury red reading type in one piece glass tubes extending from top of scale to sensor, and shall be located so that they may be easily read. Field adjustable angle thermometers are acceptable. Thermometers shall in all cases be installed upright or at the proper angle to be read while standing on the floor. The wells for thermometers shall be located in vertical pipes where possible and when necessary in horizontal pipes they shall be installed in the side and not on the top of the pipe. They shall be Weksler Industrial Thermometers, or approved equal, with range of 0 to 100 degrees F. for chilled water, and 0 to 220 degrees F for hot water.

B. Thermometer wells and thermometers shall be located where noted on the accompanying Drawings and where called for in other sections of the Specifications. Thermometer test wells only shall be installed in a vertical position in horizontal lines and at 45 degrees, in vertical lines to hold a fluid in the well.

C. Thermometer test wells shall be 3/4" Weksler Thermal Wells, brass with stem of minimum length to extend beyond the mid-diameter of the pipe, 2-1/2" extension neck, and brass screw plug. Wells shall be suitable for use of industrial type thermometers.

D. Indicating thermometers shall be placed in lines wherever shown on the Drawings. These thermometers shall be Weksler Industrial Thermometers having stainless steel separable sockets and scales of the range shown on the Drawings.

2. 7 PUMP SUCTION FITTINGS:

A. Fitting: Angle pattern, cast-iron body, threaded for 2 inch and smaller, flanged for 2-1/2 inch and larger, rated for 175 psig working pressure, with inlet vanes, cylinder strainer with 3/16 inch diameter openings, disposable fine mesh strainer to fit over cylinder strainer, and permanent magnet located in flow stream and removable for cleaning.

B. Suction diffusers shall be Paco or approved equal, cast iron body and cover, steel diffuser, and stainless steel strainer, 125 pound ASA (flat face) flange for a working pressure of 175 psi and temperature of 300°F.

C. Accessories: Adjustable foot support, blowdown tapping in bottom, gauge tapping in side.

2. 8 WATER RELIEF VALVES:

A. The pressure relief valves installed for the protection of the water circulating circuits shall be McAlear No. 307 single seated diaphragm and spring type valves with screwed connections or approved equal. They shall be 3/4" size of bronze construction with bronze seat, composition shut-off disc and rubber diaphragm.

2. 9 BUILDING MAIN HOT WATER, CHILLED WATER and STEAM CONDENSATE INTEGRATING METERS:

A. Furnish and install complete transit time Controlotron Metering systems. Flow element shall be installed in a straight run of pipe in accordance to manufacturer's guidance for the specific installation in order to maintain rated accuracy.

B. Each flow station shall consist of dual flow sensor and carriers mounted in the 'transverse' arrangement with laminated or metal identification tag on chain giving pipe size, meter series, and station identification. Flow stations shall be of steel construction, welded in place.

C. Wall mounted meter shall be complete with adequate lengths of flow cables attached sensors, and installation and operating instructions. Meter shall operate on 115 VAC. Meter shall be backlit LCD, dual channel (one for chilled water, for hot water, the other for steam condensate. Each channel shall indicate:
1. Instantaneous flow rate in GPM, and total Gallons
2. Each channel shall have dual outputs for each of the displayed values. Out puts shall be 4-20 mA and TTL pulse rate, each proportional to display values, compatible and connected with building EMS.
3. Building EMS shall be programmed and capable of M & V protocol as required by LEED.
4. Meter shall have positive zero flow indication.

D. Unit shall accommodate the following fluid operating ranges:
1. Temperature: 36° to 250° F.
2. Pressure: 0 to 150 psi.

2. 10 DELETED

2.11 AUTOMATIC FLOW-CONTROL VALVES:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Flow Design Inc.
   b. Griswold Controls.

2. Body: Brass or ferrous metal.
3. Piston and Spring Assembly: Stainless steel, tamper proof, self cleaning, and removable.
4. Combination Assemblies: Include bonze or brass-alloy ball valve.
5. Identification Tag: Marked with zone identification, valve number, and flow rate.
6. Size: Same as pipe in which installed.
7. Performance: Maintain constant flow, plus or minus 5 percent over system pressure fluctuations.
8. Minimum CWP Rating: 175 psig or 300 psig.
9. Maximum Operating Temperature: 200 deg F or 250 deg F.

2.12 - DELETED -

PART 3 - EXECUTION

3. 1 INSTALLATION AND APPLICATION

A. Install specialties in accordance with manufacturer's instructions to permit intended performance.

B. Support tanks inside building from building structure in accordance with manufacturer's instructions.

C. Provide manual air vents at system high points and as indicated.

D. Provide manual air vents at entrance to all heating hot water coils, with a "cane" shaped discharge tube, positioned to permit draining to a portable receptacle.

E. For automatic air vents in ceiling spaces or other concealed locations, extend vent tubing to nearest drain.

F. Provide air separator on suction side of system circulation pump and connect to expansion tank.

G. Provide valved drain and hose connection on strainer blow down connection.

H. Provide pump suction fitting on suction side of base mounted centrifugal pumps. Remove temporary strainers after cleaning systems. Clean all permanent strainers after circulating systems for a minimum of 48 hours at full capacity.

I. Support pump fittings with floor mounted pipe and flange supports.

J. Provide relief valves on pressure tanks, low pressure side of reducing valves, heat exchangers, and expansion tanks.

K. Select system relief valve capacity so that it is greater than make-up pressure reducing valve capacity. Select equipment relief valve capacity to exceed rating of connected equipment.

L. Pipe relief valve outlet to nearest floor drain.

M. Where one line vents several relief valves, make cross sectional area equal to sum of individual vent areas.

END OF SECTION

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SECTION 23 09 23

DIRECT DIGITAL CONTROL SYSTEMS FOR HVAC

PART 1 - GENERAL

1. 1 WORK DESCRIPTION

A. Scope: This section contains general requirements for the supply and installation of a microprocessor based Energy Management System (EMS) as an extension of the existing Campus Johnson Building Technologies System.

B. Controls supplier shall be responsible for furnishing and installing all equipment and wiring for Building Automation Systems (Temperature and HVAC Equipment Control) for a complete and operable system as specified herein. All wiring shall be done in accordance with all local and national codes.

C. Work Included: It is the intent of this specification for the EMS to be installed as a complete package by Johnson Controls. The system shall include all computer software and hardware, controllers, sensors, transmission equipment, local panels, installation, engineering, supervision, commissioning, acceptance test, training, and warranty service. The work shall include all electrical power distribution and signal wiring required for a fully functional control system. Include all electrical power sources, raceways, conductors, etc. required for a fully functional system, in addition to electrical systems indicated on the drawings, at no additional cost to the owner.

1. 2 RELATED WORK SPECIFIED ELSEWHERE

A. Products connect to the EMS but not furnished or installed under this section include air flow stations, automatic dampers, valves, flow switches, flow sensors, thermos-wells and pressure taps to be installed by the Division 23 and/or 26.

1. Section 23 05 19 Meters and Gauges
2. Section 23 05 93 Testing adjusting and Balancing
3. Section 23 05 13 Motors and Variable Frequency Drives
4. Section 23 36 00 Air Terminal Unit

B. Coordination with electrical:

1. Installation of all line voltage power wiring including 120V power to each terminal unit and DDC panel by Division 26.
2. Each motor starter provided under Division 23 or 26, shall be furnished with individual control power transformer to supply 120volt control power and auxiliary contacts (one N.O. and one N.C.) for use by this section.

C. Not Used

1. 3 QUALIFICATIONS

A. System components shall be provided by Johnson Building Technologies.

B. The control system shall be furnished, engineered and installed by a Johnson owned branch office having factory trained technicians to provide instruction, routine maintenance, and emergency service within 24 hours upon receipt of request.

C. The control system components shall be new and in conformance with the following applicable standards for products specified:
   1. American Society for Testing and Materials, ASTM
   2. Institute of Electrical and Electronic Engineers, IEEE
   3. National Electrical Manufacturers Association, NEMA
   4. Underwriters Laboratory, UL (UL 916 & 864)
   5. FCC Regulation, Part 15, Section 156
   6. National Fire Protection Association, NFPA
   7. Local Building Codes

1. 4 SUBMITTALS

A. The controls contractor shall submit Auto CAD generated schematic drawings for the entire system for review and approval before work shall begin. Included in the submittal drawings shall be a one page diagram depicting the system architecture complete with a communications riser. Drawings shall include point-to-point wiring diagrams and any special connection information required for properly controlling the equipment. The submittal shall include a bill of material reference list as well as equipment sequences of operation.

B. The submittals shall include the manufacturer's catalog data describing, highlighting and specifically indicating each item of equipment or component provided and installed for the project.

1. 5 PROTECTION OF SOFTWARE RIGHTS

A. Prior to delivery of software, the Owner and the party providing the software will enter into a software license agreement with provisions for the following:
   1. Limiting use of software to equipment provided under these Specifications.
   2. Limiting copying.
   3. Preserving confidentiality.
   4. Prohibiting transfer to a third party.

PART 2 - PRODUCTS

2. 1 ACCEPTIBLE BIDDERS

A. The specifications are intended to describe the microprocessor based Energy Management System – Johnson Building Technologies is the acceptable manufacturer/installer. Lab controls shall be by “Phoenix Controls”. Controls contractor shall be responsible to provide interface between Phoenix controls and existing Johnson Controls.

2. 2 NETWORKING

A. The design of the EMS shall network operator workstations and stand-alone DDC Controllers. The network architecture shall consist of three levels, a campus-wide (Management Level Network - MLN) Ethernet network based on TCP/IP protocol, high performance peer-to-peer Building Level Network (BLN) and Application Specific Controller Floor Level Networks (FLN) with access being totally transparent to the user when accessing data or developing control programs.

B. The design of EMS shall allow the co-existence of new DDC Controllers with existing DDC Controllers in the same network without the use of gateways or protocol converters.

C. All operator devices either network resident or connected via dial-up modems shall have the ability to access all point status and application report data or execute control functions for any and all other devices via the peer-to-peer network. No hardware or software limits shall be imposed on the number of devices with global access to the network data at any time.

D. A single Workstation shall support a minimum of four (4) Building Level Networks (BLN). The BLN's can be any combination of direct or modem connected Networks. All Networks shall be dynamically connected to allow access to points on different BLN's simultaneously.

2. 3 DDC CONTROLLERS

A. DDC Controllers shall be stand-alone, multi-tasking, multi-user, real-time digital control processors with a minimum word size of 16 bits, minimum 48MHz clock and minimum 12MB memory consisting of modular hardware with plug-in enclosed processors, communication controllers, power supplies and input/output point modules (universal or discrete). Each major DDC Controller (PXC Modular) shall support a minimum of 96 FLN Devices.

B. Each DDC Controller shall support its own operating system and databases, including:
1. Control processes
2. Energy management applications
3. Alarm management applications including custom alarm messages for each level alarm for each point in the system.
4. Historical/trend data for points specified
5. Maintenance support applications
6. Custom processes
7. Operator I/O
8. Dial-up communications
9. Manual override monitoring

C. Each DDC Controller shall support any combination of industry standard inputs and outputs.

D. Provide all processors, power supplies and communication controllers so that the implementation of a point only requires the addition of the appropriate point input/output termination module and wiring.

E. DDC Controllers shall be provided with one RS-232C serial data communication port for the portable laptop operator's terminal. When a modem is required for remote operation, a second RS-232C serial data communication port shall be provided. DDC Controllers shall allow temporary use of portable devices without interrupting the normal operation of permanently connected modems, printers or terminals.

F. As indicated in the point I/O schedule, the operator shall have the ability to manually override automatic or centrally executed commands at the DDC Controller via local, point discrete, on-board hand/off/auto operator override switches for digital control type points and gradual switches for analog control type points.
1. Switches shall be mounted within the DDC Controllers key-accessed enclosure.
2. DDC Controllers shall monitor the status of all overrides and inform the operator that automatic control has been inhibited. DDC Controllers shall also collect override activity information for reports.

G. DDC Controllers shall provide local LED status indication for each digital input and output for constant, up-to-date verification of all point conditions without the need for an operator I/O device. Graduated intensity LED's for analog indication of value shall also be provided for each analog output. Status indication shall be visible without opening the panel door (MBC only).

H. Each DDC Controller shall continuously perform self-diagnostics, communication diagnosis and diagnosis of all panel components. The DDC Controller shall provide both local and remote annunciation of any detected component failures, low battery conditions or repeated failure to establish communication.

I. Isolation shall be provided at all peer-to-peer network terminations, as well as all field point terminations to suppress induced voltage transients consistent with IEEE Standards 587-1980.

J. In the event of loss of all power, there shall be an orderly shutdown of all DDC Controllers to prevent the loss of database or operating system software. Non-volatile memory shall be incorporated for all critical controller configuration data and battery backup shall be provided to support the real-time clock and all volatile memory for a minimum of 100 hours.
   1. Upon restoration of normal power, the DDC Controller shall automatically resume full operation without manual intervention.
   2. Should DDC Controller memory be lost for any reason, the user shall have the capability of reloading the DDC Controller via the local RS-232C port, via telephone line dial-in or automatically from the network workstation PC.

K. As a minimum, a separate DDC Controller shall be provided for each mechanical room.

2. 4 DDC CONTROLLER RESIDENT SOFTWARE

A. General:
   1. The software programs specified in this Section shall be provided as an integral part of DDC Controllers and shall not be dependent upon any higher level computer for execution.

B. Control Software Description:
   1. The DDC Controllers shall have the ability to perform the following pre-tested control algorithms:
      a. Two-position control
      b. Proportional control
      c. Proportional plus integral control
      d. Proportional, integral, plus derivative control
      e. Automatic tuning of control loops

C. DDC Controllers shall have the ability to perform any or all the following energy management routines:
   1. Time-of-day scheduling
   2. Calendar-based scheduling
   3. Holiday scheduling
   4. Temporary schedule overrides
   5. Start-Stop Time Optimization
   6. Automatic Daylight Savings Time Switchover
   7. Night setback control
   8. Enthalpy switchover (economizer)
   9. Peak demand limiting
   10. Temperature-compensated duty cycling

D. DDC Controllers shall be able to execute custom, job-specific processes defined by the user, to automatically perform calculations and special control routines.
   1. A single process shall be able to incorporate measured or calculated data from any and all other DDC Controllers on the network. In addition, a single process shall be able to issue commands to points in any and all other DDC Controllers on the network.

2. Processes shall be able to generate operator messages and advisories to operator I/O devices. A process shall be able to directly send a message to a specified device or cause the execution of a dial-up connection to a remote device such as a printer or pager.

E. Alarm management shall be provided to monitor and direct alarm information to operator devices. Each DDC Controller shall perform distributed, independent alarm analysis and filtering to minimize operator interruptions due to non-critical alarms, minimize network traffic and prevent alarms from being lost. At no time shall the DDC Controllers ability to report alarms be affected by either operator or activity at a PC workstation, local I/O device or communications with other panels on the network.
1. All alarm or point change reports shall include the point's English language description and the time and date of occurrence.
2. The user shall be able to define the specific system reaction for each point. Alarms shall be prioritized to minimize nuisance reporting and to speed operator response to critical alarms. A minimum of six priority levels shall be provided for each point. Point priority levels shall be combined with user definable destination categories (PC, printer, DDC Controller, etc.) to provide full flexibility in defining the handling of system alarms. Each DDC Controller shall automatically inhibit the reporting of selected alarms during system shutdown and start-up. Users shall have the ability to manually inhibit alarm reporting for each point.
3. Alarm reports and messages will be directed to a user-defined list of operator devices or PCs.
4. In addition to the point's descriptor and the time and date, the user shall be able to print, display or store a 200 character alarm message to more fully describe the alarm condition or direct operator response.
5. In dial-up applications, operator-selected alarms shall initiate a call to a remote operator device.

F. A variety of historical data collection utilities shall be provided to manually or automatically sample, store and display system data for points as specified in the I/O summary.
1. Any point, physical or calculated may be designated for trending. Any point, regardless of physical location in the network, may be collected and stored in each DDC Controllers point group. Two methods of collection shall be allowed: either by a pre-defined time interval or upon a pre-defined change of value. Sample intervals of l minute to 7 days shall be provided. Each DDC Controller shall have a dedicated RAM-based buffer for trend data. All trend data shall be available for use in 3rd party personal computer applications such as Excel 5.0.
2. DDC Controllers shall also provide high resolution sampling capability for verification of control loop performance. Operator-initiated automatic and manual loop tuning algorithms shall be provided for operator-selected PID control loops as identified in the point I/O summary.
a. Loop tuning shall be capable of being initiated either locally at the DDC Controller, from a network workstation or remotely using dial-in modems. For all loop-tuning functions, access shall be limited to authorized personnel through password protection.

G. DDC Controllers shall automatically accumulate and store run-time hours for digital input and output points and automatically sample, calculate and store consumption totals for analog and digital pulse input type points, as specified in the point I/O summary.

H. DDC Controllers shall be password protected. The user's Password and Privileges shall be identical to the Password and Privileges used at the EMS Workstation.

2. 5 APPLICATION SPECIFIC CONTROLLERS

A. TERMINAL EQUIPMENT CONTROLLERS (TEC)
1. Provide for control of each piece of equipment, including, but not limited to, the following:

a. VAV Terminal Units with heating coils
b. VAV Terminal Units without heating coils

2. The controllers shall include all inputs and outputs necessary to perform the specified control sequences. Analog outputs shall 24 volt floating.
3. Each controller performing space temperature control shall be provided with a matching room temperature sensor with a setpoint adjustment between 55 °F and 95°F.
4. Each room temperature sensor shall include a terminal jack integral to the sensor assembly. The terminal jack shall be used to connect a portable operator's terminal to control and monitor all hardware and software points associated with the respective controller.
5. Set point adjustment and override function shall have the ability to be locked out, overridden, or limited as to time or temperature through software by an authorized operator at the central workstations, at the DDC Controller, or via the portable operator's terminal.
6. Each controller shall perform its primary control function independent of the DDC Controller. The controller shall receive its real-time data from the DDC Controller time clock. Each controller shall include algorithms incorporating proportional, integral, and derivative (PID) gains for all applications. All PID gains and biases shall be adjustable by the user via terminals as specified herein. This functionality shall allow for tighter control and shall facilitate optimal occupant comfort and energy savings.
7. Provide each terminal equipment controller with sufficient memory to accommodate point databases and operating programs. All databases and programs shall be stored in non-volatile EEPROM, EPROM, and PROM. The controllers shall be able to return to full normal operation without user intervention after a power failure. Operating programs shall be selectable and may be modified to meet the user's exact control strategy requirements, allowing for additional system flexibility:
8. Controllers shall be powered from a 24 VAC source, and shall function normally under an operating range of 18 to 28 VAC (-25% to +17%), allowing for power source fluctuations and voltage drops. The controllers shall also function normally under ambient conditions of 32 Degrees to 122 Degree F and 10-95% RH (non-condensing). Provide each controller with a suitable cover or enclosure to protect the intelligence board assembly.
9. Pressure independent controllers shall include differential pressure transducers that shall connect to the terminal unit manufacturer's standard averaging air velocity sensor to measure the average differential pressure in the duct. The controller shall convert this value to actual airflow. The differential pressure transducer shall have a measurement range of 400 to 4,000 FMP and measurement accuracy of +/-5% at 400 FPM insuring primary air flow condition shall be controlled and maintained to within +/-5% of setpoint at the specified parameters. Each controller shall include provisions for manual and automatic calibration of the differential pressure transducer in order to maintain stable control and insuring against drift overtime. The controller requiring 24 hours a day operation shall calibrate the airflow sensor every 24 hours with the use of an auto-zero module to eliminate the requirement of closing the supply damper to calibrate the flow sensor. It shall not be necessary to remove the controller to remove the damper actuator.

2. 6 VALVES, DAMPERS AND ACTUATORS

A. VALVES:

1. Water valves shall be sized by the control manufacturer to produce the required capacity at a pressure loss of 5 psi. Nominal body rating shall be not less than ANSI Class 125 or as indicated otherwise. However, the valve body and packing selected shall be designed to withstand the system static head plus the maximum pump head and the maximum temperature of control medium and hot water, or as indicated. Single-seated valves shall have close-off

ratings equal to 125% of the system pressure encountered that is the maximum upstream pressure. The valve body and packing selected shall be designed to withstand the system static head plus the maximum pump head and the maximum temperature of control medium without leakage for hot water.

2. Two-Way and Three-Way Valves:
   a. Valves used for control of hot and chilled water shall be of the modulating globe type or linear characterized ball type.
   b. Valve sizes two inch and smaller shall be screwed and supplied with union fittings. The valves shall be constructed of bronze with stainless steel trim with equal percentage flow characteristics and have a rangeability of 50:1 or greater.
   c. Valve sizes 2.5 inch and larger shall be flanged. The valves shall be constructed of cast iron ASTM A126 Class B or as required otherwise for pressure class compliance. The trim shall be stainless steel with equal percentage flow characteristics. The valve range-ability shall be 100:1 or greater.
   d. Valves shall be of the straight-through type as required by the sequence or indicated on the drawings.
3. Low Pressure Steam Valves: Shall be rated as indicated. Valves for low-pressure steam shall be sized for 80% pressure drop of inlet pressure or as indicated. Valves shall be equipped with stainless steel trim and disc with linear flow characteristics. Applications, which require steam valves larger than 2", shall utilize two valves in a 1/3 - 2/3 parallel arrangement or as indicated.
4. With 2 control valves, modulate the 1/3 control valve to the 50% open position, sequence the 2/3 control valve when the 1/3 control valve is at 50% position, and modulate the 2/3 control valve at a faster rate than the 1/3 control valve as the load increases so that they both reach full open position at the same time. On a decrease in load, the 1/3 and 2/3 control valves shall modulate in the reverse sequence.
5. Approved manufacturers: JCI, Valve Solutions, Inc. Series V-port High Performance Ball Valve, Belimo B2, B3, B6, VB, VSS Series, and A-T Controls Triac "V" series.
6. Butterfly Valves: Where butterfly valves are indicated to be used as automatic control valves, they shall be line size and designed for motorized control operation with upper disc steam keyed or machined square for mating with the control operators linkage. All butterfly control valves over 8 inches shall be equipped with a manual, mechanical control actuator override, gear box operator for emergency manual control of the valve position. Provide required accessories to mechanically disengage automatic control actuator linkage and engage manual gear operator without dismantling the valve stem and stem extensions during changeover. Valves 4-20" and larger shall be tapped, full lug, cast iron body butterfly valves with aluminum bronze discs, stainless steel stem and EPDM seat. Design must incorporate top and bottom bushings between shafts and body of material suitable to provide a bearing surface to eliminate seizing or galling. Valves 4-20" must provide bubble-tight seal at 150 PSIG. Liners are to be resilient material suitable for 250 °F temperature or as indicated.
7. Valve Constant (Cv) Charts: Shop drawings shall indicate the valve constant (Cv rating) of all valves provided so that the valve pressure drop may be used for balancing and performance tests. Submittal data shall also state calculated shut-off pressure for each valve size.

B. DAMPERS:
1. The Temperature Control Manufacturer shall provide control dampers of the types and sizes indicated on the drawings, including but not limited to outside air, return, relief air dampers, isolation and exhaust system bypass dampers.
2. Damper frames shall be 5" X 1" 6063T5 extruded aluminum hat channel with .125" minimum wall thickness with mounting holes for flange and enclosed duct mounting.

3. Dampers shall be available in two-inch size increments from 8" horizontal and vertical to 48". Requirements over 48" shall be standard modules with interconnecting hardware (jack shafting).
4. All damper blades shall be 6" 6063T5 heavy gage extruded aluminum airfoil for high velocity performance. Blades on all dampers must be not over 6" wide. Blade bearing shall be molded synthetic with 1/2" hex plated steel shafts. All blade linkage hardware shall be of corrosion-resistant finish and readily accessible for maintenance after installation.
5. Extruded vinyl edging seals for outdoor dampers and flexible metal compressible type side seals for all dampers shall be provided.
6. Dampers and seals shall be suitable for temperature ranges of -50 Degrees F. to +250 Degrees F. at specified leakage ratings.
7. Dampers used for proportional control shall have opposed blades.
8. Leakage rates shall not exceed 6.25 CFM/Sq. Ft. at 4" wg. differential rated in accordance with AMCA 500.
9. Acceptable manufacturers are Ruskin, Arrow United Industries, American Warming and Ventilating, Inc. or approved equal.

C. DAMPER AND VALVE ACTUATORS:
1. Electronic actuators shall be of 0-10 VDC type. The minimum actuator impedance shall be 800 ohms even when more than one actuator is connected in parallel. Spring return shall be required for two-position (NO/NC) control sequence or for steam valve control. Non-spring return actuators shall be used for all modulating sequence of control. They shall conform to all requirements of sequence descriptions specified or scheduled. Main mechanical equipment actuators shall have a manual position dial to allow manual positioning of valve in absence of control power.
2. Size each actuator for the specific application. All digital control applications shall use electric actuators suitable for the application (chilled water, hot water, or steam). All electric actuators associated with the digital control system shall be of the same manufacturer throughout the project, except for 120 volt actuators required for high torque applications. Stacking two actuators to meet torque requirements is acceptable, when torque requirement exceeds rated torque for listed actuators.
3. Major equipment applications: Use 24 VAC power and a 0/2-10 VDC control signal. Each actuator shall have a maximum run time of 150 seconds and spring return time of less than 60 seconds and shall utilize brushless motor. Actuator shall be adjustable for reversing rotation without dismounting. Approved manufacturers and models: JCI, Belimo F or K series, or Promation/ Schischek Inc. D4/D5.S Series.
4. Terminal equipment applications: Use 24 VAC power and 0/2-10 VDC or floating point control signal, spring return or non-spring return, actuator. Actuator shall have a maximum run time of 150 seconds and spring return time of less than 60 seconds and shall utilize brushless motor. Actuator shall be adjustable for reversing rotation without dismounting. Approved manufacturer and model: Belimo or approved equal.
5. High torque applications: Use 120 VAC power and 2-10 VDC control signal, non-spring return, metal housing. Actuator shall have a minimum torque of 347 in-lb. with maximum run time of 25 seconds. Actuator shall be adjustable for reversing rotation without dismounting. Provide manual override of actuator. Approved manufacturers and models: Valve Solutions, Inc., Series 1000 and Promation/Schischek Inc. D4/D5.S Series.
6. Fail Positions: Unless otherwise specified, the fail (normal) positions for AHU automatic control valves shall be as follows: Preheat Coils – NO, Cooling Coils – NO, Heating Coils, NC.
7. Valve actuators shall be of sufficient size to close valves at system pressure drop across the valve plus 50%.

8. Actuators for Terminal Equipment Controllers shall be 24V floating point, 0-10Vdc or pneumatic depending on Sequence of Operation and required speed of response. Regardless of actuator type, they shall be modulating and their position shall be readable in percentage open at the Workstation.

2. 7 LABORATORY AND LAB SUPPORT SPACE, SUPPLY AND EXHAUST AIR TERMINALS.

A. Provide pressure independent air valves, as scheduled on the drawing. Flow control shall be accurate to plus or minus 5 percent over the scheduled range of operation.

B. Valve bodies shall be minimum 16-gauge spun aluminum. All exhaust valves serving fume hoods, bio-safety cabinets, wet exhaust, and H3 exhaust shall have corrosion-resistant baked phenolic coatings on aluminum surfaces exposed to the airstream.

C. Supply valves shall be shipped from the factory with duct transition and properly sized heating coils where such configurations are shown on the drawings. Supply valves shall be insulated at the factory with material meeting flame/smoke rating 25/50.

D. Laboratory Actuators: Actuators for VAV Laboratory Applications shall be provided for Laboratory Supply Air Terminals, Laboratory General Exhaust Terminals and Fume Hood Exhaust Terminals. The actuators shall be maintenance free high speed actuators capable of stroking in 1.0 second from minimum flow to 90% of maximum flow. The actuators shall have a fail-safe position based on Sequence of Operation. The actuators shall be capable of accepting either 3-position floating or 0-10 VDC signal.

E. Controls: Provide laboratory air terminals with manufacturer's microprocessor based, fast acting control systems. Provide air valve manufacturer's auxiliary control components as indicated such as room integrators, laboratory hood sensors and monitoring panels, room pressure monitoring panels, and room temperature sensors which are compatible with manufacturer's control systems.

F. Software: Provide laboratory air terminals with manufacturer's local and user interface software packages compatible with equipment provided. Include engineering, programming, configuration, setup, testing, commissioning, demonstration, and training for all software systems provided. Include all required software licensing in owner's name.

G. Integration: Provide laboratory control systems with local area network communication interfaces for communication with building automation system. Include all labor required to assist, coordinate, test, and demonstrate building automation controls interface.

H. Approved manufacturers: Phoenix approved for this project. Alternate manufacturer such as "Siemens" may be considered if prior approval by owner is provided.

2. 8 FUME HOOD EXHAUST TERMINAL

A. Provide a fume hood exhaust terminal (FHET) having an orifice ring flow sensor with two sets of pressure taps 90 degrees apart, offset from vertical by 45 degrees. The accuracy of the flow sensor shall be ±5% of the flow signal over the duct velocities of 600 FPM to 3000 FPM. The fume hood exhaust terminal shall be constructed of 20-gauge 316L stainless steel. The fume hood exhaust

terminal shall use a 90° butterfly damper without seal and the damper shaft shall be solid stainless steel with Teflon bearings. All joints and seams shall be sealed with RTV silicone.

B. The fume hood exhaust terminal shall be supplied with factory mounted airflow transmitter and electric/electronic damper actuator. The electric/electronic damper actuator and pressure transmitter shall be housed within a galvanized steel enclosure with exterior supply connection.

C. Provide a bio-safety cabinet/general exhaust terminal (GET) having an orifice ring flow sensor with two sets of pressure taps 90 degrees apart, offset from vertical by 45 degrees. The accuracy of the flow sensor shall be ±5% of the flow signal over the duct velocities of 600 FPM to 3000 FPM. The GET shall be constructed of 20-gauge galvanized steel. The GET shall use a 90° butterfly damper with peripheral neoprene gasket seal (gasket seal shall be scheduled on drawings) having leakage rating of 0.6% of flow at 2" wg, and the damper shaft shall be solid stainless steel with Teflon bearings. All joints and seams shall be sealed with RTV silicone.

D. The GET shall be supplied with factory mounted airflow transmitter and electric/electronic damper actuator. The electric/electronic damper actuator and pressure transmitter shall be housed within a galvanized steel enclosure with exterior supply connection.

2. 9 FLOW STATIONS

1. Provide where indicated on the plans airflow traverse probes mounted in the ductwork capable of continuously measuring the air volume of the respective ductwork.
2. The ductwork airflow traverse probes shall contain multiple total and static pressure sensors places at concentric area centers along the exterior surface of the cylindrical probe and internally connected to their respective averaging manifolds. Sensors shall not protrude beyond the surface of the probe, nor be adversely affected by particle contamination normally present in building system airflows.
3. The duct work airflow traverse probes (two per duct) shall have dual end support swivel brackets suitable for mounting in the fan inlet bell and symmetrical averaging signal takeoffs and fittings, and shall be of aluminum construction with hard anodized finish.
4. The airflow traverse probes shall not induce a measurable pressure drop, nor shall the sound level within the system be amplified by its presence in the ductwork. The probes shall be capable of producing steady, non-pulsating signals of standard total and static pressure, without need for flow corrections or factors, with an accuracy of 2% of actual flow. Traverse probes shall be Air Monitor or equal.

2. 10 FIELD SENSORS

A. Temperature Sensors:
1. The sensor shall be one of the following temperature sensor types:
   a. 1000 ohm (±0.2%) platinum resistance temperature detectors having a coefficient of resistivity of 0.00385 ohms/ohm/°C.
   b. Manufacturers: JCI Standard Premium RTD or equal.
   c. Immersion temperature sensors shall have 316 Stainless Steel wells and duct mounted sensors shall use averaging bulbs of not less than 24" and when mounted in the preheat or mixed air position the averaging bulb shall be twice the diagonal length of the coil or duct.

B. DUCT SENSERS

1. Duct Sensor: 10K thermistor, accurate to ±0.5˚F, over 0˚ to 130˚F range. All sensors in ducts shall be of the single point type and mounted on a standard duct bracket in location not affected by temperature stratification. Approved manufacturer and model: Precon ST-D series or Veris TJ series for plenum terminal units, or approved equal.

2. Averaging Sensor: 10K thermistor, accurate to ±0.5˚F, over 0˚ to 130˚F range. It must contain at least one sensor for every 3 feet, with a minimum tube length of 12 feet. See the Controls Diagram for installation locations. Approved manufacturer and model: Precon ST-FZ series or ACI A/AN-A-XX-GD series, or approved equal.

3. Immersion Sensors: 10K thermistor, accurate to ±0.5˚F, over 10˚ to 230˚F range. Sensors used in comparative applications shall be matched pairs. Provide stainless steel immersion well fitting, with Thread-o-let, for sensor and empty stainless steel well for test equipment. Pressure rating of well is to be consistent with the system pressure in which it is installed and must withstand the flow velocities in the pipe. Immersion length shall be ⅓ to ½ of the pipe diameter. Approved manufacturer and model: Precon ST-W Series or approved equal.

C. Dew point Sensors:
1. The sensor shall be a two-wire loop powered duct mounted relative humidity and temperature sensor having a measuring range 0 to 100% of R.H. with an accuracy no less than ±2.5%. The sensor will calculate dewpoint temperature between -20°C and 80°C. The output from the sensor shall be 4-20 ma. Dewpoint sensors shall be Vaisala HMT100 or equal.

D. Carbon Dioxide Sensors
1. Provide non-dispersive, infra-red (NDIR) carbon dioxide gas diffusion sensing and transmitting equipment, 4-20 ma and 0-5 VDC/0-10 VDC (selectable) analog output linear with CO2 measured. For duct-mounted applications, the CO2 sensing element shall be located in the airstream. The unit shall sense and transmit carbon dioxide readings from 0 to 2000 ppm linear with a minimum accuracy of ±5% of reading from 1000 to 2000 ppm and a repeatability of ±1% full scale. Input voltage shall be 24 VDC.
2. Approved manufacturers and models:
JCI, Veris CDLS (duct) or CWLS (wall) Series
BAPI BA/BS3F Series, combination CO2, temperature and RH sensors.
3. Provide sensors with one field calibration kit. Kit shall contain one tank with an 8-hour supply of 99.8% N2, one tank with an 8-hour supply of 1000 ppm CO2, one pressure regulator, one flow meter and a carrying case.
4. Wall mounted sensors shall be provided with LCD readout of CO2 sensed level and shall be mounted next to the room temperature sensor.

E. Liquid level Sensers

1. Enclosed and Open Pit Sumps: Float type switch suitable for fluid in which immersed. Switch shall be assembly mounted, designed, and located for ease of maintenance access, removal, and level adjustment.

2. Steam Condensate Receiver Tanks: Float type switch suitable for steam condensate. Coordinate location of tee into receiver vent pipe for sensor location. When receiver control package is equipped with local alarm, connect remote alarm indication into local alarm circuit. Provide interposing relay as required.

F. Pressure Sensors:
1. The sensor shall be an air differential pressure transducers with output of 4-20 ma proportional to pressure. The airflow transmitter will have an accuracy of at least ± 0.5% F.S for ve-

locity pressure applications and ± 1.0% F.S for static pressure applications. Airflow transmitter shall be either Dresser Industries Ashcroft Model XLDp or Setra C264 Lab.

2. The sensor shall be a water or steam differential pressure transducers with output of 4-20 ma proportional to pressure. The transmitter will have an accuracy of at least ±0.2% of the transmitter range. The transmitter shall be JCI or Rosemount Series 1151 or equal.
3. Duct Static: Accurate to ±0.1"wg over 0 to 5" range. Approved manufacturer: BaPI model ZPS series with display or approved equal.
4. Building or Room Static: Accurate to ±0.01"wg over 0 to 0.1" range. Approved manufacturer: BAPI model ZPS series with display or approved equal.
5. Filter Status Differential: Accurate to ±0.1"wg over 0 to 2" range. Approved manufacturer: JCI, BAPI model ZPS series with display or approved equal.
6. Steam: Provide transducer in watertight enclosure, with gauge, isolation valve, pressure snubber, and steam pigtail. Output signal to be 4-20 ma. Approved manufacturer:
   For low pressure, 0-30 psig range Kele PTX1EG-05 or approved equal.
   For medium pressure, 0-100 psig range, Kele PTX1EG-07 or approved equal.
7. Water: Provide transducer with stainless steel wetted parts, 0-10 VDC output, bi-directional, with range selected according to specific application. Provide three-valve manifold assembly with Pete's Plugs and flush ports on the supply and return tubes for zero and span calibration and maintenance of sensor. Provide ½" brass body, stainless steel ball isolation valves at locations where sensor lines tap into fluid. For chilled water applications, provide minimum schedule 40 stainless steel nipples extended past insulation, between isolation valves and pipe thread-o-let. Approved manufacturer: Veris PW2 series wet/wet differential pressure transmitter or approved equal.

G. Smoke Detectors:
   1. Smoke sensors are provided and installed under Division 28 to conform to local codes.

H. Low Limit Temperature Switch
   1. The sensor shall be a Low Limit Temperature Switch with minimum 20 ft. element for freeze protection as specified hereinafter. Element shall be serpentine across the face of the coil and shall be of sufficient length or number for three passes across the width of the coil it is protecting. Connect Low Limit Temperature Switch in series with other safety devices to de-energize fans serviced when a drop in temperature below setpoint is detected.

I. Differential Pressure Switches:
   1. The sensor shall be a pressure switch to monitor the pressure drops across each piece of equipment specifically a filter banks, fans and pumps.
   2. Design and sensitivity shall match application, with SPDT contacts to make/break from a field adjustable differential pressure setting for alarm reporting to the EMS. Switches utilized for filter banks and fans shall be JCI or Powers Static Pressure Air Flow Switches Series SW 141 or equal. Switches for pumps shall be Penn P74 differential pressure switch or equal.

J. Current Status Switch (CSS)
   1. The sensor shall be a high performance miniature split-core current status switch with adjustable set point. The current status switch shall have an operating range of between 1.25 – 50 amps and be able to detect belt loss and mechanical failure. CSS shall be JCI, Veris Hawkeye H908 or equal.

K. Pressure Electric Switch (PE)
   1. The sensor shall be a pressure operated snap switch that can actuate electrical circuits. The contact ratings shall be 8 amps at 240V inductive.

2. 11 LOCAL CONTROL PANELS

A. Provide control panels with suitable brackets for wall mounting, for each miscellaneous control system. Locate panel adjacent to systems served.

B. Fabricate panels of 14-gauge furniture-grade steel, or 6063-T5 extruded aluminum alloy, totally enclosed, with hinged doors and keyed lock, with manufacturer's standard shop-painted finish and color. Provide UL listed cabinets for use with line voltage devices.

C. Panel Mounted Equipment: Include temperature controllers, relays, and other devices excluded in the sequence of operation. Mount devices with adjustments accessible through the fronts of panels.

2. 12 Fume Hood Controllers (FHC)

A. The fume hood face velocity is controlled by monitoring the vertical/horizontal sash position utilizing Phoenix Sash Sensors. As the sash is raised and lowered the sash sensor sends a signal to the local Fume Hood Monitor for proper control modulation of the Phoenix Variable Volume Fume Hood Exhaust Valve. Local indication is provided the by the fume hood monitor to verify a safe working condition and alarm if there is problem detected. As the fume hood control modulates, the supply and general exhaust airflows modulate to maintain a proper balance and keep the desired offset set point

B. Provide a separate Variable Volume Fume Hood Controller (FHC) for each fume hood to work in conjunction with an exhaust air valve(s) to achieve the required turndown, accuracy, and speed of response. The FHC shall be a stand alone microprocessor, direct digital controller. The controller shall connect to sensors and its corresponding fume hood Operator Display Panel (ODP). It shall perform closed-loop control of fume hood exhaust airflow to maintain an Owner-selectable constant hood intake velocity in response to changes in sash height. The FHC shall be able to maintain control in the event of disconnection or failure of the ODP. The FHC shall be able to detect and indicate the failure of any of its sensor and maintain control in a degraded mode until the sensor is repaired.

C. For safety purposes, actual airflow shall be measured for each fume hood. Only closed loop measurement of actual airflow shall be provided and available to the operator through designated operator terminal and PC workstations.

D. FHC shall include an adjustable set point for minimum airflow through the hood. This set point shall be adjustable through the Portable Operator's Terminal (POT) and shall be set be the laboratory safety officer to provide minimum dilution and air changes with the fume hood based upon it specific use.

I. The FHC shall be capable of sampling and commanding all points ten times per second. The controller shall contain a minimum of 32K of memory. All programming in the controller shall be maintained in non-volatile EEPROM type of memory. Momentary or extended losses of power shall not change or affect any of the controller's set points, calibration settings, or emergency exhaust mode programming.

J. The FHC operates as an independent, stand-alone DDC controller and shall be connected on the Local Area Network (LAN) of the Laboratory Control System.

K. The FHC shall be UL 916 listed and CSA approved.

L. Provide an Operator Display Panel for each fume hood to comply with the laboratory safety standards.

M. The Operator Display Panel shall have selectable digital LCD display of average face velocity (FPM, MPS, or no indication) or of the type of alarm/emergency condition, indicating "LOW face velocity" or "HIGH face velocity" or "EMERGENCY" when the emergency purge has been enabled. A diagnostic message shall be provided to notify the hood operator of control function failure and/or sash sensor failure.

N. The Operator Display Panel shall have indicator lights – green, yellow, and red (normal, warning, alarm). In alarm (red), an audible horn will initiate. The horn shall be turned off as the red light is turned off. The ODP shall have a horn silence button. The indicator lights/horn sequence is intended to be the hood user's primary indication of safe operation. The face velocity setpoint, high/low warning and alarm limits, and time delays shall be capable of being set by safety personnel based on the type of chemicals being used in and the performance characteristics of each hood.

O. The Operator Display Panel shall have an "emergency purge" button. When pressed, the controller shall respond immediately by turning on the red alarm light and horn and sequencing the hood exhaust first to the maximum and, after an adjustable delay, to a selected airflow value. The selected airflow value must be adjustable and programmable value that can be changed from the BAS workstation. When the emergency purge button is pressed again, the emergency sequence shall be terminated and the controller shall revert to its normal operation. The airflow values and time delays shall be capable of being set by safety personnel based on the type of chemicals being used in each hood.

P. The Operator Display Panel shall have a terminal jack for connection to the portable operator's terminal to monitor/edit all points internal to the FHC. As a minimum, the following points must be available to be programmed and adjustable from the terminal jack: Face velocity, low alarm, high alarm, emergency alarm, general failure, face velocity setpoint, high alarm limit, high warning limit, low warning limit, low alarm limit, emergency setpoint, exhaust flow, flow setpoint and flow minimum.

2. 13 LABORATORY PRESSURIZATION CONTROLLER (LPC=RPC)

A. The supply air entering the lab space is controlled via the Phoenix Variable Volume makeup air valves to maintain the required volume of supply/makeup air as pressure INDEPENDENT devices, regardless of static pressure fluctuations from the supply air system. The volume of exhaust air leaving the lab space is controlled via the Phoenix Variable Volume air valves to maintain the required volume of exhaust air, as pressure INDEPENDENT devices, regardless of static pressure fluctuations from the exhaust air system. The total supply and general exhaust flows are summed to verify and provide the required offset for the space, thus providing the required pressurization. Each pressurization zone's differential pressure is Monitored via the Phoenix Pressure Monitor, as shown on the drawings, to generate local indication of the room differential pressure and generate a local alarm if the differential pressure is not maintained.

B. Provide a Laboratory Pressurization Controller (LPC) utilizing closed loop Direct Digital Control for laboratory space pressurization and temperature control to work in conjunction with an exhaust air valve(s) to achieve the required turndown, accuracy, and speed of response. The controller shall maintain a user defined differential airflow between the room air supply, Fume Hood Controller exhaust, Bio-Safety Cabinet controller exhaust and general exhaust terminals by measuring the airflow and controlling the damper position of the supply and general exhaust terminals. Temperature control is provided by measuring the room temperature and controlling the supply air heating coil valve.

C. The LPC operates as an independent, stand-alone DDC controller and shall be connected on the Local Area Network (LAN) of the Laboratory Control System.

D. The LPC shall consist of the controller module, three analog outputs (two for pressure control, one for temperature control), two auto-zero modules (for flow measurement), and a flush mounted wall enclosure. All assemblies are pre-mounted and pre-terminated (electric and pneumatic connections) within the enclosure.

E. The controller module includes a micro-processor-based assembly with preprogrammed control algorithm and on-board differential pressure transmitters for airflow measurement. Wiring terminations for point inputs and outputs, LAN communications, and power are provided via screw type terminal block connections. The room temperature sensor is connected to an on-board RJ-11 telephone style jack. A metal enclosure assembly supports the controller module, pneumatic transducers, auto-zero modules, and all electrical and pneumatic inter-connections. External connection for the pneumatic damper actuator and low sensors are located on the inside of the enclosure.

F. The airflow sensors shall be accurate to ±2% of actual airflow with velocities between 450 and 4000 FPM. The LPC shall calibrate the airflow sensor every 24 hours with the use of the auto-zero modules to eliminate the requirement of closing the supply and exhaust dampers to calibrate the flow sensors.

G. An MS-DOS based laptop computer shall serve as the Portable Operator's Terminal and shall communicate with the LPC through the plug-in jack on either the controller, the room temperature sensor associated with the LPC, or the DDC controller.

H. The controller shall contain a minimum of 32K of memory. All programming in the controller shall be maintained in non-volatile EEPROM type of memory. Momentary or extended losses of power shall not change or affect any of the controller's set points or calibration settings.

2. 14 LABORATORY ROOM CONTROLLER (LRC) / ROOM INTEGRATOR

A. Each supply and associated exhaust terminal shall be controlled to maintain an actual CFM airflow differential between total room exhaust and supply air that is equal to ±5% of the maximum laboratory room design airflow or 200 CFM, whichever is greater, to meet space pressure relationship requirements. For negatively pressurized rooms, supply airflow shall be controlled to equal the total room exhaust airflow less the required airflow differential. For positively pressurized rooms, total exhaust airflow shall track supply airflow less the required airflow differential.

B. Each laboratory room controller shall be specifically designed for control of laboratory temperature, (humidity and differential pressure monitoring where applicable) and room ventilation. Each controller shall be a microprocessor-based, multi-tasking, real-time digital control processor to work in conjunction with an exhaust air valve(s) to achieve the required turndown, accuracy, and speed of response. Control sequences shall be included as part of the factory supplied software. These sequences shall be field customized by adjusting parameters such as control loop algorithm gains, temperature setpoint, alarm limits, airflow differential setpoint, and pressurization mode. Closed loop Proportional Integral Derivative (PID) control algorithms shall be used to maintain temperature and airflow offset setpoints.

C. Controllers using a differential pressure switch to monitor differential pressure across control devices such as an air valve shall include provisions for manual and automatic zeroing in order to maintain stable control and ensure against drift over time.

D. Controller shall include all inputs and outputs necessary to perform all specified control sequences.

E. Each controller shall operate stand alone, performing its specified control responsibilities independently.

F. All databases and programs shall be stored in non-volatile EEPROM, EPROM and PROM memory, or a minimum of 72-hour battery backup shall be provided. All controllers shall return to full normal operation without any need for manual intervention after a power failure of unlimited duration.

G. Should a power failure or operational failure occur within the controller, the terminal unit damper shall automatically be positioned to the fully open or fully closed (failsafe) position as defined by the design.

2. 15 LABORATORY TEMPERATURE CONTROL

A. Provide temperature controllers and laboratory thermostats as part of laboratory terminal unit control package.

B. The temperature with the lab space is monitored by room temperature sensors to provide control by the respective existing dual duct terminal boxes and Phoenix supply air valve combination. As the temperature in the lab increases above the room setpoint, the corresponding dual duct terminal box dampers modulates to open to provide more cooling to the space. On a continued rise in room temperature the dual duct terminal boxes damper to provide additional airflow to the space and the general exhaust valve opens in concert to keep proper pressurization. The room offset is maintained at all times. As the temperature in the lab decreases below the room setpoint, dual duct terminal boxes supply air valve closes to it's minimum position with the Phoenix general exhaust valve tracking. The room offset is maintained at all times. On a continued drop in room temperature, the corresponding dampers in duel duct terminal heating damper shall modulate the open to provide more heating to the space.

C. The space temperature shall be controlled by the existing dual duct terminal boxes, where as the room pressure and off-set shall be controlled by new "Phoenix" supply air valve.

2. 16 OPRRATING SYSTEM SOFTWARE

A. Software needed for complete and functioning operation of each laboratory space shall be provided for all hardware. The server shall include all operating system, network, database, etc. software applications for complete functionality. Workstations shall include operating system and all application software including vendor specific software for complete functionality. Laptops shall include operating systems and all application graphical software including vendor specific software for functionality as a system service tool.

B. All controllers, network and ASC, shall utilize the same programming language for all applications including implementation of control algorithms, alarms, pseudo points, etc.

C. The Contractor shall use their standard software library for all system and controller programs.

D. The Contractor shall prepare, install, configure, and debug all software necessary for complete operation of the BAS and related systems, including the loop control statements, algorithms, and tuning constants required to achieve the Sequence of Operation. Control algorithms shall be manufacturer's standard PID control loops or other Engineer approved control algorithms.

E. All system data, controller programs, historical and trend data shall be archived in the system server database. System shall be provided with backup of this database. Backup shall include mirroring of data to backup server as well as provisions for removable media backup. Provide program which allows saving and restoring of operating data.

F. Operator Access Control: Restrict any operator commands through use of software password. Provide capability for a minimum of 5 levels of access related to system operational control, monitoring, and programming functions.

G. Information Access: Obtain point status information from any designated output device with access command. Point status consists of point identification, numerical value (analog points) and associated engineering units, and individual function label indicating that point is on or off or in Alarm Normal condition. Output includes date and time of execution.

2.16 WIRING AND CONDUIT

A. All wire shall be copper and meet the minimum wire size and insulation type listed below:

Wire/Cable Type	A Wire Size	Insulation Type	Maximum Capacitance	Typical Voltage
Power	#12	600 Volt		120 AC and above
Class 1	#14	600 Volt		120 AC and below
Class 2	#18	300 Volt, overall shield		24 DC and below
Communications	#24	300 Volt, overall shield	12.5 pf/ft	24 DC and below
Communications Network		Category 5e cable		

B. Where different wiring types terminate within or pass through the same enclosure, maintain clearances and install barriers per the National Electric Code.

C. Multi-conductor cables, which group independent BAS inputs or outputs, power conductors, communication circuits, etc. wiring into one jacketed sheath, are not acceptable. Each wiring circuit shall be run independently sheathed from other circuits.

D. Provide conduit types as follows:
   1. Electric Metallic Tubing (EMT): Concealed in interior finished spaces; exposed in interior unfinished spaces.
   2. Rigid Galvanized Metal Conduit: All exterior locations; interior locations subject to moisture.
   3. Flexible metallic conduit: For transitions from stationery structure or equipment to rotating or moving equipment and for final connections to field devices.
   4. Liquid-tight flexible metallic conduit: All exterior locations; interior locations subject to moisture for transitions from stationery structure or equipment to rotating or moving equipment and for final connections to field devices.

5. The minimum conduit size shall be ¾", except room temperature sensor and communication conduit, which may be ½". Use compression or threaded fittings. Watertight compression or screwed fittings shall be used for exterior locations and interior locations subject to moisture. Provide raceway seal-off fitting where exterior raceways enter the building or between areas of high temperature/moisture differential.
6. Flexible metallic conduit, maximum 3-foot length, shall be used for transitions between stationary and non-stationary equipment and/or structure (for example, motors, actuators, air handlers) and for final connections to sensors and control devices mounted on vibration producing equipment. Liquid-tight flexible conduit shall be used in exterior locations and interior locations subject to moisture.
7. Junction boxes shall be provided at all Power and Class 1 wire splices, equipment terminations, and transitions to flexible conduit. Interior dry location J-boxes shall be galvanized pressed steel, nominal four-inch square with blank cover. Exterior and damp location JH-boxes shall be cast alloy FS boxes with threaded hubs and gasketed covers.

PART 3 - EXECUTION

3. 1 PROJECT MANAGEMENT

A. Provide a project manager who shall, as a part of his duties, be responsible for the following activities:
1. Coordination between this Contractor and all other trades, Owner, local authorities and the design team.
2. Scheduling of manpower, material delivery, equipment installation and checkout.
3. Maintenance of construction records such as project scheduling and manpower planning and Auto CAD for project coordination and as-built drawings.

3. 2 INSTALLATION METHODS

A. Electrical Wiring
1. Install systems and materials in accordance with manufacturer's instructions, rough-in drawings and equipment details. Install electrical components and use electrical products complying with requirements of applicable Division 26 Sections of these Specifications except where specifically stated in this Section.
2. The term "control wiring" is defined to include providing of wire, conduit, and miscellaneous material as required for mounting and connecting electric or electronic control devices.
3. Install all control wiring in EMT conduit (minimum ¾" size) with compression fittings for electric/electronic control systems. Conceal wiring, except in mechanical rooms and areas where other conduit and piping are exposed. UL plenum rated cable shall be allowable above accessible lift out ceiling, in air plenums, and in other areas as approved by local and NEC codes.
4. Wall sensors shall be installed on electrical "J" boxes and conduit stubbed to above lift out ceilings. Plastic bushing shall be installed where the sensor wire exits the conduit to prevent damage.
5. Number-code or color-code conductors, excluding those used for individual zone controls, appropriately for future identification and servicing of control system.
6. This section shall provide all line voltage power wiring required because of substitution of equipment specified in this section.
7. Division 26 shall provide 120 volt power to all DDC Controllers specified in paragraph 2.3 of this Section.

8. Install all control wiring in galvanized rigid conduit and seal tight flex connectors where run outside the building structure or install in wet areas.

3. 3 IDENTIFICATION

A. Install permanent wire labels at each end. Label shall cross-reference exactly with as-built drawings.

B. All field device wiring shall be labeled consistent with that shown on the as-built drawings and shall include the point's name to which the wire connects. Provide a label at the field device and at the terminal strip in the BAS controller enclosure. Label shall be neatly typed and permanent.

C. Label all terminal strips. Terminal strips identification shall match the identification of the wire terminated.

D. Identify all pneumatic tubing with labeling tape or sleeves using words, letters, or numbers that can be exactly cross-referenced with as-built drawings.

E. Conduit: Provide conduit labels inscribed "CONTROLS" at the following locations:

1. Within 3 feet of all BAS enclosures
2. At 20-foot intervals along conduit runs
3. All pull and junction box covers shall be painted orange with the cover permanently labeled "CONTROL"

F. Provide nameplates at each BAS controller or group of controllers at the power wire terminal strip inside the enclosure that identifies the name and location (room number and building location) of the building electrical distribution panel where power for the BAS equipment is obtained.

G. All field device and controller enclosures shall be identified with a nameplate. Controller enclosure nameplates shall be engraved "HVAC CONTROLS," shall also identify each controller contained in the enclosure and mechanical equipment monitored or controlled by controllers located inside enclosure. Field Interface Panels nameplates shall be engraved "CONTROLS FIELD DEVICE" and indicate by name or function each control component in the enclosure. Equipment identification shall follow UT Facilities Maintenance standard nomenclature.

H. Label output transducers with the point name of the device controlled and the normal position and spring range of controlled device.

3. 4 SYSTEM ACCEPTANCE

A. General: The system installation shall be complete, tested, and commissioned for proper operation prior to acceptance testing for the Owner's authorized representative. A letter shall be submitted to the Architect requesting system acceptance. This letter shall certify all controls are installed and the software programs have been completely exercised for proper equipment operation. Acceptance testing will commence at a mutually agreeable time within ten (10) calendar days of request. When the

field test procedures have been demonstrated to the Owner's representative, the system will be accepted. The warranty period will start at this time.

B. Field Equipment Test Procedures: DDC control panels shall be demonstrated via a functional end-to-end test. Such that:
   1. All output channels shall be commanded (on/off, stop/start, adjust, etc.) and their operation verified.
   2. All analog input channels shall be verified for proper operation.
   3. Changing the state of the field device and observing the appropriate change of displayed value shall verify all digital input channels.
   4. If a point should fail testing, perform necessary repair action and retest failed point and all interlocked points.
   5. Introducing an error into the system and observing the proper corrective system response shall verify automatic control operation.
   6. Changing the schedule and observing the correct response on the controlled outputs shall verify selected time and setpoint schedules.

C. Workstation Test Procedures: The system workstation test procedures shall be as follows:
   1. Communication with each DDC control panel shall be demonstrated.
   2. Operator commands will be explained and demonstrated.
   3. Control sequences shall be demonstrated for proper operation.
   4. All available system reports and logs shall be demonstrated at the system workstation.
   5. Correct system start-up and shutdown procedures shall be demonstrated.
   6. All controllers shall be demonstrated to operate in a standalone mode.

D. Record Documentation: After a successful acceptance demonstration, the Contractor shall submit as-built drawings of the completed project for final approval. After receiving final approval, supply 6 copies of complete 11 x 17 as-built drawings sets and one (1) CD of ACAD drawings.

E. Operation and Maintenance Manuals: Submit three copies of operation and maintenance manuals. Include the following:
   1. Manufacturer's catalog data and specifications on sensors, transmitters, controllers, control valves, damper actuators, gauges, indicators, terminals and any miscellaneous components used in the system.
   2. An operator's manual that will include detailed instructions for all operations of the system.
   3. An operator's reference table listing the addresses of all connected input points and output points. Settings shall be shown where applicable.
   4. A programmer's manual that will include all information necessary to perform programming functions.
   5. A language manual that will include a detailed description of the language used and all routines used by the system.
   6. Complete program listing file and parameter listing file for all programs.
   7. A copy of the warranty.
   8. Operating and maintenance cautions and instructions.
   9. Recommended spare parts list.

3. 5 TRAINING

A. Contractor shall provide to the engineer a training class outline prior to any scheduled training.

B. Factory trained control engineers and technicians shall provide training sessions for the Owner’s personnel.

C. The control contractor shall conduct five six-hour training sessions on the DDC System for the designated Owner's personnel in the maintenance and operation of the Systems. The class shall be given upon system acceptance.

D. The course shall include instruction on specific systems and instructions for operating the installed system to include as a minimum:
   1. HVAC system overview
   2. Operation DDC Systems
   3. Function of each Component
   4. System Operating Procedures
   5. Programming Procedures
   6. Maintenance Procedures

3. 6 SERVICE AND GUARANTEE

A. This system specified under this Section of the Specifications shall be guaranteed from defects in workmanship and material under normal use and service for a period of twelve (12) months from the date of acceptance. If, during the one year period, any of the factory equipment or materials provided in the system is found to be defective in materials or workmanship, it shall be replaced or repaired by the DDC Manufacturer at no additional cost to the Owner.

B. Upon completion of the installation, the Contractor shall thoroughly inspect, check, adjust, calibrate, and make ready for use all devices/sensors comprising the control system and certify that they are installed in accordance with "Record" Drawings.

END OF SECTION

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SECTION 23 22 23

STEAM CONDENSATE RETURN UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Coordinate with Commissioning Requirements indicated in Section 019100. This contractor is responsible to comply with all requirements for the above section.

1.2 SUMMARY

A. This Section includes steam condensate pumping units.

1.3 SUBMITTALS

A. Product Data: Include certified performance curves and rated capacities, operating characteristics, furnished specialties, and accessories for each type of product indicated. Indicate pump's operating point on curves. Include receiver capacity and material.

B. Shop Drawings: Show pump layout and connections. Include setting drawings with templates for installing foundation and anchor bolts and other anchorages.
   1. Wiring Diagrams: Power, signal, and control wiring.

C. Operation and Maintenance Data: For pumps to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain steam condensate pumps through one source from a single manufacturer.

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of steam condensate pumps and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements."

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. ASME Compliance: Fabricate and label steam condensate pumps to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Manufacturer's Preparation for Shipping: Clean flanges and exposed machined metal surfaces and treat with anticorrosion compound after assembly and testing. Protect flanges, pipe openings, and nozzles with wooden flange covers or with screwed-in plugs.

B. Store steam condensate pumps in dry location.

C. Retain protective covers for flanges and protective coatings during storage.

D. Protect bearings and couplings against damage from sand, grit, and other foreign matter.

E. Comply with pump manufacturer's written rigging instructions.

1.6 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

1.7 MAINTENANCE

A. Provide twelve (12) months maintenance of all materials and equipment under this section. Cost of the twelve (12) month normal and preventive maintenance shall be included within this scope of work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 STEAM CONDENSATE RETURN UNITS

A. Description: Factory-fabricated, packaged, electric-driven pumps; with receiver, pump(s), controls, and accessories suitable for operation with steam condensate.

B. Configuration: Duplex floor-mounting pump with receiver and float switch(s); rated to pump 200 deg F (93 deg C) steam condensate.
   1. Manufacturers:
      a. Bell & Gossett
      b. Skidmore
      c. Aurora
      d. Spirax Sarco, Inc.
      e. Pentair Pump Group.
      f. Roth Pump Company.
      g. Spence Engineering Company, Inc.; Division of Circor International, Inc.
      h. Sterling, Inc.
      i. Cougar Systems
   2. Receiver: welded steel, min 3/16” thick; galvanized inside & outside with magnesium anode or 300 series stainless steel, externally adjustable float switch connections, and flanges for pump mounting.
   3. Pumps: Centrifugal single stage or vertical multi-stage turbine type, close coupled, permanently aligned, stainless steel shaft, bronze fitted; with replaceable bronze case ring (centrifugal type) and mechanical seal; mounted on receiver flange. Select pumps for non-

cavitating service at indicated temperature, but not less than 200 F. Size pumps for 100% capacity redundancy.

4. Controller: Manufacturer installed UL508 listed control panel in NEMA 12 enclosure. Provide with integral disconnect, motor starters, HOA switches, pump alternator, and indicator lights. Provide with fused control power transformer if line voltage exceeds 230V.
5. Wiring: Manufacturer pre-wired for single point, 480 VAC 3 phase electrical power connection unless otherwise indicated. Provide units with factory installed non-metallic raceways.
6. Sequence of Operation: Engage pumps automatically to maintain condensate level about float switch level setpoint. An increase in level acts to engage pump and vise-versa. Engage lag pump automatically in sequence with lead pump to maintain condensate level and vise versa. Automatically alternate lead lag pump designation to equalize pump operating time
7. Provide units complete with receiver, controls, pumps, valves, level switches, sight glass, and temperature gauge.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine equipment foundations and anchor-bolt locations for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Examine rough installation of steam condensate piping.

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

3.2 INSTALLATION

A. Install pumps to provide access for periodic maintenance including removing motors, impellers, couplings, and accessories.

B. Support pumps and piping separately so piping is not supported by pumps.

C. Install pumps on concrete bases. Anchor pumps to bases using inserts or anchor bolts.

D. Install thermometers and pressure gages.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to machine to allow service and maintenance.

C. Install gate and check valves on inlet and outlet of pressure-powered pumps.

D. Install check valve, gate valve, and globe valve at pump discharge connections for each electric-driven pump.

E. Pipe drain to nearest floor drain for overflow and drain piping connections.

F. Install full-size vent piping to outdoors, terminating in 180-degree elbow at point above highest steam system connection or as indicated.

G. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

H. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.4 STARTUP SERVICE

A. Verify that steam condensate pumps are installed and connected according to the Contract Documents.

B. Complete installation and startup checks according to manufacturer's written instructions.

C. Clean strainers.

D. Set steam condensate pump controls.

E. Set pump controls for automatic start, stop, and alarm operation.

F. Perform the following preventive maintenance operations and checks before starting:
1. Set float switches to operate at proper levels.
2. Set throttling valves on pump discharge for specified flow.
3. Check motors for proper rotation.
4. Test pump controls and demonstrate compliance with requirements.
5. Replace damaged or malfunctioning pump controls and equipment.
6. Verify that pump controls are correct for required application.

G. Start steam condensate pumps according to manufacturer's written startup instructions.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain steam condensate pumps. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION

Section 23 31 00

DUCTWORK

PART 1 - GENERAL

1.1 THE FOLLOWING SECTIONS ARE TO BE INCLUDED AS IF WRITTEN HEREIN:

A. Section 23 00 00 – Basic Mechanical Requirements

B. Section 23 05 29 – Sleeves, Flashings, Supports and Anchors

C. Section 23 05 53 – Mechanical Identification

1.2 WORK INCLUDED

A. Low Pressure Ducts

B. Medium and High Pressure Ductwork

C. Duct Cleaning

1.3 RELATED WORK

A. Division 09 Section, Painting, priming or coating of metal ductwork exposed to view.

B. Section 23 05 48 - Vibration Isolation

C. Section 23 07 13 - Duct Insulation

D. Section 23 33 00 - Ductwork Accessories

E. Section 23 36 00 - Air Terminal Units

F. Section 23 37 00 - Air Inlets and Outlets

G. Section 23 05 93.A - Testing, Adjusting and Balancing

1.4 REFERENCES

A. ASHRAE - Handbook of Fundamentals; Duct Design

B. ASHRAE - Handbook of HVAC Systems and Equipment; Duct Construction

C. ASTM A 90 - Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles

D. ASTM A 167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip

E. ASTM A 525 - General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process

F. ASTM A 527 - Steel Sheet, Zinc-Coated (Galvanized) by Hot-Dip Process, Lock Forming Quality

G. ASTM B209 - Aluminum and Aluminum Alloy Sheet and Plate

H. NFPA 45 – Laboratory Ventilating Systems and Hood Requirements

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

J. NFPA 90B - Installation of Warm Air Heating and Air Conditioning Systems

K. NFPA 96 - Installation of Equipment for the Removal of Smoke and Grease-Laden Vapors from Commercial Cooling Equipment

L. SMACNA – HVAC Duct Construction Standards, 1995

M. UL 181 - Factory-Made Air Ducts and Connectors

N. SMACNA Round Industrial Duct Construction Standards,.

O. Engineering Design Manual for Air Handling Systems, United McGill Corporation (UMC).

P. Assembly and Installation of Spiral Duct and Fittings, IMC.

Q. Engineering Report No. 132 (Spacing of Duct Hangers), IMC.

R. AWSD1.1 American Welding Society Structural Welding Code

1.5 DEFINITIONS

A. Duct Sizes: Inside clear dimensions. For lined ducts, maintain sizes inside lining.

B. Low Pressure: 3 inch WG positive or negative static pressure and velocities less than 1,500 fpm.

C. Medium Pressure: 6 inch WG positive static pressure and velocities greater than 1,500 fpm.

D. High Pressure: 10 inch WG positive static pressure and velocities greater than 2,500 fpm.

1.6 SUBMITTALS

A. Product Data

1. Provide product data for all ductwork systems to be used on project. Product data submittals shall include the following as a minimum:

   a. System name and type

   b. Duct system design pressure

   c. Hangers and supports, including materials, fabrication, methods for duct and building attachment.

   d. Sealant type.

B. Shop Drawings shall be submitted on all items of sheet metal work specified herein. Shop Drawings of ductwork at air units shall be submitted at a minimum scale of 3/8" equal to one foot. Shop drawings of ductwork located at all other locations shall be prepared at a scale of not less than ¼” = 1’-0”. Reproduction and submittal of the construction documents is not acceptable. Shop drawings shall include the following:

1. Clearance dimensions between ducts and dimensions above finished floors for bottom and tops of ducts.

2. Call out of duct materials other than galvanized including but not limited to stainless steel, aluminum, or prefabricated fire rated ductwork.

3. Shop Drawings shall indicate location of all supply, return, exhaust and light fixtures from the approved reflected ceiling plans.

4. Shop drawings shall identify all duct sizes, reinforcement and spacing.

5. Penetrations through fire rated and other partitions.

6. Show major equipment with ductwork connections.

C. Show all dampers, turning vanes, access doors, fire dampers and all other ductwork accessories to be provided. Submit shop drawings and product data under provisions of Section 23 00 00.

D. Submit two samples of stainless steel welded duct joint to Engineer and Owner for approval. After approval, sample shall remain at job site for reference. [NOTE TO ENGINEER: Discuss with owner to understand if other types of ductwork samples are required for project].

E. Welding Certificates. Provide for all welders including procedures and standards of acceptance.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Section 23 00 00.

B. Store and protect products under provisions of Section 23 00 00.

PART 2 - PRODUCTS

2.1 DUCTWORK GENERAL:

A. All ductwork indicated on the Drawings, specified or required for the air conditioning and ventilating systems shall be of materials as hereinafter specified unless indicated otherwise. All air distribution ductwork shall be fabricated, erected, supported, etc., in accordance with all applicable standards of SMACNA Duct Manuals where such standards do not conflict with NFPA 90A and where class of construction equals or exceeds that noted herein. All exhaust ductwork including toilet room exhausts shall be constructed and leak tested as specified for medium pressure supply ducts at negative pressure.

B. All ductwork shown on the Drawings, specified or required for the heating, ventilating and air conditioning systems shall be constructed and erected in a first class workmanlike manner. The work shall be guaranteed for a period of one (1) year from and after the date of acceptance of the job against noise, chatter, whistling, vibration, and free from pulsation under all conditions of operation. After the system is in operation, should these defects occur, they shall be corrected as directed by the Architect.

C. All duct sizes shown on the Drawings are air stream sizes. Allowance shall be made for internal lining where required, to provide the required cross sectional area.

D. All holes in ducts for damper rods and other necessary devices shall be either drilled or machine punched (not pin punched), and shall not be any larger than necessary. All duct openings shall be provided with sheet metal caps if the openings are to be left unconnected for any length of time.

E. Except for special ducts specified elsewhere herein, all sheet metal used on the project shall be constructed from prime galvanized steel sheets and/or coils up to 60" in width. Each sheet

shall be stenciled with manufacturer's name and gauge. Coils of sheet steel shall be stenciled throughout on ten foot (10') centers with manufacturer's name and must be visible after duct is installed. Sheet metal must conform to SMACNA sheet metal tolerances as outlined in SMACNA's "HVAC Duct Construction Standards."

F. Where ducts that are exposed to view (including equipment rooms), pass through walls, floors or ceilings, furnish and install sheet metal collars around the duct.

2.2 DUCTWORK LOW PRESSURE:

A. The scope of low pressure ductwork is defined as all ductwork downstream of terminal units. Construction of all low pressure duct shall be in accordance with Low Velocity Duct Construction Standards as published by Sheet Metal and Air Conditioning Contractors National Association (SMACNA) and shall be sealed and tested at 3" static with the same test procedures as medium pressure ductwork.

B. Spiral wound round duct shall be as manufactured by United McGill Sheet Metal Company or approved equal.

C. The metal gauges listed in the 1995 SMACNA HVAC Duct Construction Standards for Metal and Flexible Duct are the minimum which shall be used for this project. It shall be noted that the Contractor is responsible that the metal gauge selected is heavy enough to withstand the physical abuse of the installation.

D. Elbows shall be radius type and have a centerline radius of 1-1/2 times the duct diameter or width. Elbows in round ducts may be smooth radius as described above or 5-piece 90 degree elbows and 3-piece 45 degree elbows. Joints in round ducts shall be slip type with a minimum of three sheet metal screws. Joints in sectional elbows shall be sealed as specified for duct sealing. 90˚ mitered elbows are not acceptable unless approved by the Architect/Engineer or Project Manager.

E. SEALANT: All ductwork (except welded exhaust duct) shall be sealed with either "MP" (Multi-Purpose), Hardcast "Iron-grip 601", Polymer Adhesive "Airseal #11", or "United Duct Seal" (United McGill Corp.) water base, latex or acrylic type sealant. Note that, except as noted, oil or solvent based sealants are specifically prohibited for use on this project. <u>For exterior applications, "Uni-Thane " (United McGill Corp.) polyurethane based sealant shall be used. No other sealants may be used.</u> All seams and joints in shop and field fabricated ductwork shall be sealed by applying one layer of sealant, then immediately spanning the joint with a single layer of 3" wide open weave fiberglass tape. Sufficient additional sealant shall then be applied to completely imbed the cloth. All sealants shall be UL rated at no more than flame spread of 5 and smoke developed of 0. At contractor’s option, Hardcast 1602 sealant tape may be used in lap joints and flat seams.

2.3 DUCTWORK MEDIUM PRESSURE

A. The scope of medium pressure ductwork is defined as all ductwork downstream of all air handlers, up to and including terminal units, plus all return air ductwork, plus all general toilet room exhaust ductwork. Construction of all ducts shall be in accordance with High Velocity Construction Standards as published by SMACNA. All round and rectangular duct construction, duct fittings, dampers, etc., are covered in this manual and it is to be adhered to.

1. Spiral wound round duct shall be as manufactured by United McGill Sheet Metal Company or approved equal.

2. The metal gauges are listed herein for round duct and for rectangular duct.

B. All ductwork (except welded exhaust duct) shall be sealed with either "MP" (Multi-Purpose), Hardcast "Iron-grip 601", or "United Duct Seal" (United McGill Corp.) water base, latex or acrylic type sealant. Note that, except as noted, oil or solvent based sealants are specifically prohibited for use on this project. For exterior applications, "Uni-Thane" (United McGill Corp.) polyurethane based sealant shall be used. No other sealants may be used. All seams and joints in shop and field fabricated ductwork shall be sealed by applying one layer of sealant, then immediately spanning the joint with a single layer of 3" wide open weave fiberglass tape. Sufficient additional sealant shall then be applied to completely imbed the cloth. At contractor's option Hardcast 1602 sealant tape may be used in lap joints and flat seams.

C. Oval ducts shall be spiral flat oval or welded flat oval equal to those of United McGill Sheet Metal Company with gauges and reinforcing as recommended by the manufacturer for medium pressure or the ducts may be Shop fabricated of completely welded construction of the following gauge:

1. Major Axis 12 to 20 No. 24 gauge
2. Major Axis 20 to 30 No. 22 gauge
3. Major Axis 30 to 46 No. 20 gauge
4. Major Axis 46 to 50 No. 18 gauge
5. Major Axis 50 and Up No. 16 gauge

D. Oval fittings shall be equal to those of United McGill Sheet Metal Company with requirements, sealing, etc., similar to that specified for round medium pressure work.

E. Oval duct reinforcing methods shall be submitted as Shop Drawings for approval. Reinforcing galvanized angles shall be of sizes specified for same size rectangular ducts. Galvanized angles shall be used where standing seams are specified for rectangular ducts. Attaching methods shall be shown on Shop Drawings and submitted for approval.

F. Testing of Medium Pressure Ductwork: (Includes from fan discharge through to the discharge of terminal units.)

1. All medium pressure ducts shall be pressure tested according to SMACNA Chapter 10 test procedures. Design pressure for testing ductwork shall be six inches (6") of water. Total allowable leakage shall not exceed 1% of the total system design air flow rate. When partial sections of the duct system are tested, the summation of the leakage for all Sections shall not exceed the total allowable leakage.

2. The entire system of medium pressure ductwork shall be tested, including the VAV/Constant Volume Terminal Units (i.e. The ductwork shall be capped immediately prior to the Terminal Units, and tested as described above). After testing has proven that the ductwork is installed and performs as specified, the terminal units shall be connected to the ductwork and the connections sealed with extra care. The contractor shall inform the project inspector when the joints may be visually inspected for voids, splits, or improper sealing of the joints. If any leakage in the terminal unit connections/joints after the systems have been put into service, the leaks shall be repaired by: 1) complete removal of the sealing materials, 2) thorough cleaning of the joint surfaces, and 3) installation of multiple layers of sealing materials.

3. At the option of the Owner, the Contractor may be allowed to eliminate the terminal units from testing by capping the supply ductwork prior to the terminal units, then inspecting the connection to the terminal units when complete. This option may only be exercised by the Resident Construction Manager, and then only if documented in writing prior to testing.

G. All exhaust ductwork, including toilet room exhausts, shall be constructed as for medium pressure ducts and shall be tested for leaks in the same manner as for medium pressure supply ducts.

H. Contractor may use DUCTMATE or Ward flanged Duct Joint system, reference SMCNA FIG. 1-4 “Transverse Joints” T-25a or T-25b on rectangular ductwork. Slip-on duct flanges are not acceptable. Contractor may at his option (where space permits) use rectangular ductwork with DUCTMATE or Ward system in lieu of oval ductwork.

I. Rectangular 90 degree elbows shall be constructed with single thickness turning vanes mounted on an integral rail. Mitered 90 degree elbows are not allowed unless approved by the Engineer and Construction Manager. Radius type rectangular elbows shall have a centerline radius of 1-1/2 times the duct diameter or width. . Elbows in round or oval ducts may be smooth long radius as described above or 5-piece 90 degree elbows and 3-piece 45 degree elbows. Joints in round ducts shall be slip type with a minimum of three sheet metal screws. Joints in sectional elbows shall be sealed as specified for duct sealing.

2.4 ELBOWS:

A. Where rectangular elbows are shown, or are required for good air flow, contractor shall provide and install turning vanes. Turning vanes shall be factory fabricated with integral support rail. Radius elbows shall have a centerline radius of not less than one and one-half (1-1/2) times the duct width. Submit Shop Drawings on factory fabricated and job fabricated turning vanes. Provide turning vanes in all rectangular radius elbows and offsets.

B. All turning vanes shall be anchored to the cheeks of the elbow in such a way that the cheeks will not breathe at the surfaces where the vanes touch the cheeks.

2.5 FLEXIBLE DUCTS:

A. Low Pressure Insulated Flexible Duct may be used where shown on the drawings. Duct shall be made with factory preinsulated duct supported by a corrosion resistant metal spiral, or a coated spring steel helix and solid inner liner mechanically interlocked or permanently bonded to the helix wire,.covered with a minimum of 1-1/2" thick, 3/4 lb. density fiberglass blanket sheathed in a vapor barrier of fiberglass reinforced aluminum foil and Mylar laminate. The insulation shall have a minimum "K" factor of 0.29 at 60 degrees F. mean and a vapor barrier permeability rating of 0.05 per ASTM method E96-66, Procedure A. The C factor shall be 0.24 to meet HUD requirements. The duct shall be rated for a positive working pressure of 10" w.g. and a temperature of up to 250 degrees F. The duct shall comply with NFPA 90A and be listed and labeled by Underwriters Laboratories, Inc., as Class I Air Duct, Standard 181, and meet GSA, FHA and other U. S. Government standards; flame spread, not over 25; smoke developed, not over 50. Flexible ducts shall be not more than 5’-0” in length, shall be installed as indicated in the diffuser connection detail, and shall be Flexmaster Type 1M or approved equal.

1. The terminal ends of the duct core shall be secured by compression coupling or stainless steel worm gear type clamp equal to Ideal Series 56 Snaplock. The fittings on Air Devices and on sheet metal duct shall be coated with the sealant specified for low pressure ductwork, then flexible duct core slipped over duct and coupling or clamp tightened, then connection sealed with more sealant. Insulation of flexible duct shall be slipped over connection to point where insulation abuts mixing box or

insulation on duct. These insulation connections shall be sealed by imbedding fiberglass tape in the sealant specified for medium pressure ductwork and coating with more sealant to provide a vapor barrier. (This applies to all flex connections to diffusers, grilles, etc. when allowed on the drawings.)

2. Medium and High Pressure Insulated Flexible Duct shall be factory applied insulation of 1" minimum thickness, 3/4 lb. density with a permeability rating of 0.30. The duct shall be composed of dead soft, spiral wound, triple locked corrugated aluminum core covered with Ratings shall be as described for Low Pressure Duct above. Flexible ducts shall be not more than 2'-0" in length, used for alignment or sound/vibration purposes only, and may only be installed in straight runs. Flexible duct shall NOT be used for changes of direction of air flow,and shall be Flexmaster Type TL-M or approved equal. Installation, clamps and sealing shall be the same as specified for rigid duct.

2.6 DUCT LINER:

NOTE: ALL DUCTWORK SHALL BE EXTERNALLY INSULATED UNLESS OTHERWISE INDICATED ON THE PROJECT DRAWINGS. (SEE SECTION 23 07 19, FOR THE APPLICABLE INSULATION SPECIFICATION.)

A. Where indicated on the Drawings, ducts shall have lining equal to Fiberglass Aeroflex No. 150 duct liner. Duct liner shall be one inch (1") thick unless otherwise indicated. The liner shall be applied to the inside of the duct with heavy density side to the air stream and shall be secured in the duct with fireproof 3M #37 or St. Clair R41B adhesive, completely coating the clean sheet metal. All joints in the insulation shall be "buttered" and firmly butted tightly to the adjoining liner using fireproof adhesive. Where a cut is made for duct taps, etc., the raw edge shall be accurately and evenly cut and shall be thoroughly coated with fireproof adhesive. On ducts over twenty-four (24") in width or depth, the liner shall be further secured with mechanical fasteners. The fasteners shall be A. J. Gerrard Company pronged straps, or approved equal, secured to the ducts by fireproof adhesive. The clips shall be eighteen inch (18") maximum spacing and shall be pointed up with fireproof adhesive. Liner shall be accurately cut and ends thoroughly coated with fireproof adhesive so that when the duct section is installed, the liner shall make a firmly butted and tightly sealed joint. Where ducts are lined exterior insulation will not be needed unless otherwise noted, except that the two insulations shall not lap less than twenty-four inches (24"). Dimensions given on the Drawings are metal sizes. Refer to Section 23 00 00 for Flame-Spread Properties.

B. Duct liner in medium pressure ducts shall be the same except a perforated metal liner shall be used over duct liner for securement in lieu of fasteners.

2.7 FACTORY LINED ACOUSTICAL DUCTS

A. Where indicated on the Drawings, furnish and install double wall internally insulated duct and fittings.

B. Duct shall consist of outer metal pressure shell, 1" thick glass fiber insulation and internal perforated metal liner.

C. Duct and fittings shall be equal to Acousti-K 27 as manufactured by United McGill Sheet Metal Company.

2.8 LABORATORY EXHAUST DUCTWORK

A. Applies to stainless steel ductwork indicated in specification application table for Laboratory Exhaust Systems.

B. Provide exhaust ductwork of minimum gages:.

DUCT SIZE	GAGE
28-inch diameter or less	18
30-inch to 60-inch diameter	16
61-inch diameter or greater	14
Greater than 60 x 42 (rectangular or oval)	Comply with SMACNA

C. ALL LAB EXHAUST DUCTWORK SHALL HAVE LONGITUDINAL BUTT ("SOLID") WELD SEAMS WITH BUTT WELD JOINTS. Butt-weld all joints and fittings using Gas Tungsten Arc Welding ("TIG"). Welding procedures shall meet the requirements of AWSD1.1. Welds on exposed ductwork inside the building shall be ground and polished. Duct sealant shall not be used to seal ductwork

D. Provide required transitions from duct to equipment and make connections to equipment.

E. Fittings:

1. Refer to Round and Oval Ducts and Fittings General Requirements in this specification. Transverse and longitudinal seams shall be butt welded joints.

2. Refer to drawings for additional information.

F. Submit certification of welder's qualifications to perform the required welding operations and all project WPS for TIG welding sheet metal. All welder certifications shall be maximum 2 years prior to date of awarding contract.

2.9 ALUMINUM DUCTWORK:

A. Provide aluminum ductwork only where indicated on the drawings.

B. Duct joints shall be all soldered construction, one standard gauge heavier than for the same size galvanized steel ducts.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer also to requirements included in Part 2 of this specification.

B. Obtain manufacturer's inspection and acceptance of fabrication and installation of fiberglass ductwork prior to beginning of installation.

C. 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.

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

E. Slope underground ducts to plenums or low pump out points at 1:500. Provide access doors for inspection.

F. Coat buried, metal ductwork without factory jacket with one coat and seams and joints with additional coat of asphalt base protective coating.

G. Set plenum doors 6 to 12 inches above floor. Arrange door swings so that fan static pressure holds door in closed position.

H. Connect terminal units to medium or high pressure ducts directly or with two feet maximum length of flexible duct. Do not use flexible duct to change direction. Allow for a minimum of 3 diameters of straight duct to the entrance of all terminal units.

I. Connect diffusers with 5'-0" maximum length or troffer boots with 2' maximum length of flexible duct to low pressure ducts. Hold in place with strap or clamp, and seal as specified.

J. Provide residue traps in kitchen hood exhaust ducts at base of vertical risers with provisions for cleanout. Use stainless steel for ductwork exposed to view and stainless steel or galvanized steel for ducts where concealed.

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

3.2 LOW PRESSURE DUCT SUPPORTS:

A. See Section 23 05 29.

3.3 MEDIUM PRESSURE DUCT SUPPORTS:

A. See Section 23 05 29.

3.4 DUCTWORK APPLICATION SCHEDULE

AIR SYSTEM	MATERIAL
Untreated Outside Air Intake	316 Stainless Steel
Medium Pressure Supply	Galvanized Steel
Low Pressure Supply	Galvanized Steel
Return/Relief Air	Galvanized Steel
General Exhaust Air (Toilet Rooms)	Galvanized Steel
Lab Exhaust	316L Stainless Steel
Rooftop ductwork	316L Stainless Steel
Emergency Generator Exhaust	Double Wall or Black Steel

3.5 CLEANING OF SYSTEMS:

A. Before turning the installation over to the Owner, all ducts should be cleaned and blown free of all dust and dirt that has collected in the ducts.

END OF SECTION 23 31 00

SECTION 23 57 00

HEAT EXCHANGERS FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Coordinate with Commissioning Requirements indicated in Section 019100. This contractor is responsible to comply with all requirements for the above section.

1.2 SUMMARY

A. This Section includes shell-and-tube heat exchangers.

1.3 SUBMITTALS

A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings: Signed and sealed by a qualified professional engineer. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   1. Design Calculations: Calculate requirements for selecting seismic restraints and for designing bases.
   2. Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment.

C. Coordination Drawings: Equipment room, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
   1. Tube-removal space.
   2. Structural members to which heat exchangers will be attached.
   3. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
   4. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Operation and Maintenance Data: For heat exchangers to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, performance, and dimensional requirements of heat exchangers and are based on the specific equipment indicated. Refer to Division 01 Section "Product Requirements."

B. ASME Compliance: Fabricate and label heat exchangers to comply with ASME Boiler and Pressure Vessel Code: Section VIII, "Pressure Vessels," Division 1.

C. Registration: Fabricate and label shell-and-tube heat exchangers to comply with the Tubular Exchanger Manufacturers Association's standards.

1.5 MAINTENANCE

A. Provide twelve (12) months maintenance of all materials and equipment under this section. Cost of the twelve (12) month normal and preventive maintenance shall be included within this scope of work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 SHELL-AND-TUBE HEAT EXCHANGERS

A. Manufacturers:
   1. API Heat Transfer Inc.
   2. Armstrong Pumps, Inc.
   3. ITT Industries; Bell & Gossett.
   4. Taco, Inc.
   5. Thrush Company, Inc.
   6. Maxi-Therm

B. Configuration: U-tube with removable bundle.

C. Shell Materials: Steel.

D. Head:
   1. Materials: Fabricated steel with removable cover.
   2. Flanged and bolted to shell.

E. Tube:
   1. Seamless steel or 90/10 copper-nickel SB-111 alloy 706.
   2. Tube diameter is determined by manufacturer based on service.

F. Tube sheet Materials: Steel or 304L stainless steel tube sheets.

G. Baffles: Steel.

H. Piping Connections:
   1. Shell: Flanged inlet and outlet fluid connections, threaded drain, and vent connections.
   2. Head: Marine style water boxes with flanged inlet and outlet fluid connections.

I. Support Saddles (horizontal units):
   1. Fabricated of material similar to shell.
   2. Foot mount with provision for anchoring to support.

3. Fabricate attachment of saddle supports to pressure vessel with reinforcement strong enough to resist heat-exchanger movement during a seismic event when heat-exchanger saddles are anchored to building structure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas for compliance with requirements for installation tolerances and for structural rigidity, strength, anchors, and other conditions affecting performance of heat exchangers.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 HEAT-EXCHANGER INSTALLATION

A. Install shell-and-tube heat exchangers on saddle supports.

B. Install shell-and-tube heat exchangers on concrete base. Concrete base is specified in Division 23 Section "Common Work Results for HVAC," and concrete materials and installation requirements are specified in Division 03.

C. Concrete Bases: Anchor heat exchanger to concrete base.
   1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around full perimeter of base.
   2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
   3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   4. Install anchor bolts to elevations required for proper attachment to supported equipment.
   5. Cast-in-place concrete materials and placement requirements are specified in Division 03.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Maintain manufacturer's recommended clearances for service and maintenance. Install piping connections to allow service and maintenance of heat exchangers.

C. Install shutoff valves at heat-exchanger inlet and outlet connections.

D. Install relief valves on heat-exchanger heated-fluid connection and install pipe relief valves, full size of valve connection, to floor drain.

E. Install vacuum breaker at heat-exchanger steam inlet connection.

F. Install hose end valve to drain shell.

3.4 FIELD QUALITY CONTROL

A. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.5 CLEANING

A. After completing system installation, including outlet fitting and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finishes.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain heat exchangers. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION

SECTION 23 73 23

AIR HANDLING UNITS

PART 1 GENERAL

1.1 The following sections are to be included as if written herein:

A. Section 23 00 00 – Basic Mechanical Requirements

B. Section 23 05 29 – Sleeves, Flashings, Supports and Anchors

C. Section 23 05 53 – Mechanical Identification

1.2 SECTION INCLUDES

A. Custom Air Handling Units

B. Factory Installed Fans

C. Dampers

D. Filters

E. Coils

F. Drives

1.3 RELATED SECTIONS

A. Section 23 05 48 - Vibration Isolation

B. Section 22 13 16 - Plumbing Piping: Equipment Drains

C. Section 23 05 13.- Motors

D. Section 23 05 16 - Expansion Compensation

E. Section 23 07 13 - Ductwork Insulation

F. Section 23 29 23 – Variable Frequency Drives

G. Section 23 31 00 - Ductwork

H. Section 23 33 00 - Ductwork Accessories: Flexible Duct Connections

I. Section 23 34 16 - Fans

J. Section 23 41 00 - Filters

K. Section 23 82 16 - Air Coils

L. Section 26 05 19 - Cable, Wire and Connectors, 600 Volt

M. Section 26 27 26 - Wiring Devices and Floor Boxes

1.4 REFERENCES

A. AFBMA 9 - Load Ratings and Fatigue Life for Ball Bearings

B. AFBMA 11 - Load Ratings and Fatigue Life for Roller Bearings

C. AMCA 99 - Standards Handbook

D. AMCA 210 - Laboratory Methods of Testing Fans for Rating Purposes

E. AMCA 300 - Test Code for Sound Rating Air Moving Devices

F. AMCA 301 - Method of Publishing Sound Ratings for Air Moving Devices

G. AMCA 500 - Test Methods for Louver, Dampers, and Shutters

H. ARI 410 – Forced-Circulation Air-Cooling and Air-Heating Coils

I. ARI 430 – Central-Station Air-Handling Units

J. ARI 435 - Application of Central-Station Air-Handling Units

K. ARI 610 - Central System Humidifiers

L. NEMA MG1 - Motors and Generators

M. NFPA 70 - National Electrical Code

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

O. UL 900 - Test Performance of Air Filter Units

1.5 SUBMITTALS

A. Submit under provisions of Section 23 00 00.

B. Include with the initial submittal a letter signed by the manufacturer's national sales manager (or any corporate officer) and the production manager, acknowledging that this equipment is intended for a University of Texas facility and that all specification requirements shall be complied with. Submit copy of letter to OFPC engineer and Building Manager.

C. Shop Drawings: Indicate assembly, unit dimensions, weight loading, required clearances, construction details, field connection details, electrical characteristics, connection requirements, and.

D. Product Data:

1. Provide literature that indicates dimensions, weights, capacities, ratings, fan performance, gauges and finishes of materials, electrical characteristics and connection requirements.

2. Provide data of filter media, filter performance data, filter assembly, and filter frames as tested and certified per ASHRAE standards.

3. Provide fan curves with specified operating point clearly plotted, as tested and certified per AMCA standards. Ratings to include system effects. Bare fan ratings will not satisfy this requirement, but shall be submitted for comparison purposes.

4. Submit sound power level data for both fan outlet and casing radiation at rated capacity, as tested and certified per AMCA standards.

5. Provide data on all coils as tested and certified per ARI standards.

6. Submit electrical requirements for power supply wiring including wiring diagrams for interlock and control wiring, clearly indicating factory-installed and field-installed wiring.

7. All materials shall have NFPA-90 rating of 25/50 or better.

E. Manufacturer's Installation Instructions.

1.6 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 23 00 00.

B. Maintenance Data: Include instructions for lubrication, filter replacement, motor and drive replacement, spare parts lists, and wiring diagrams.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years documented experience, who issues complete catalog data on total product.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 23 00 00.

B. Accept products on site in factory-fabricated protective containers, with factory-installed shipping skids and lifting lugs. Inspect for damage.

C. Store in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation of the Owner's RCM.

1.10 EXTRA MATERIALS

A. Furnish under provisions of Section 23 00 00.

B. Manufacturer to provide three sets of filters for each unit. One set of filters is to be installed when unit is started up, and shall be protected from construction debris with additional media either at the first bank of filters, or covering each air intake (outside air and return air). The second set of filters is to be installed when test and balance activities begin. At substantial completion, OFPC RCM shall inspect filters to determine if the third set should be installed or delivered to campus operations personnel.

1.11 SCHEDULES ON DRAWINGS:

A. In general, all capacities of equipment, and motor and starter characteristics are shown in schedules on the drawings. Reference shall be made to the schedules for such information. The capacities shown are minimum capacities. Variations in the capacities of the scheduled equipment supplied under this contract will be permitted only with the written direction of the owner. All equipment shall be shipped to the job with not less than a prime coat of paint or as specified hereinafter. Insofar as is possible, all items of the same type (i.e., pumps, fans, etc.) shall be by the same manufacturer. Where installation instructions are not included in these specifications or on the drawings, the manufacturer's instructions

shall be followed. All equipment affected by altitude shall be rated to operate at the altitude where it is installed.

B. Warranty: Manufacturer shall provide the complete unit with a limited parts only warranty covering the first year of operation. The warranty period shall commence on the date of first equipment startup or six months after the date of shipment, whichever shall occur first.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Energy Labs – Basis of Design

B. ClimateCraft

C. Air Enterprises

D. Haakon

E. Nortek Air Solutions / Temtrol / Ventrol

F. Thermal Corporation

G. JCI York Custom

H. Substitutions: Under provisions of Section 23 00 00. The equipment as supplied by any of the acceptable manufacturers or an approved equal shall comply with all of the provisions of this specification.

2.2 GENERAL DESCRIPTION

A. Configuration: Fabricate with modular sections as scheduled. All custom air-handling units shall be “SITE BUILT” and fully commissioned under the supervision of AHU manufacturer, and shall consist of the following modules:
   i. Air mixing module with filters
   ii. Access module
   iii. Plug fan module with heating coil (hot deck)
   iv. Multi-zone module with cooling coil (cold deck – top discharge)
   v. Total unit dimensions must NOT exceed the size indicated on the drawings.

B. Performance Base: Sea level conditions

C. Fabrication: Conform to AMCA 99 and ARI 430 in the absence of direction in this specification.

D. Performance: Refer to schedule in drawings.

2.3 AIR HANDLER CASING AND GENERAL CONSTRUCTION:

A. Unit casing exterior (walls and roof) shall be a minimum 0.050 Type 5052 textured aluminum with mill applied, industrial grade, high solids polyurethane paint or powder coating. Paint shall provide a durable, "wet look" finish with excellent color and gloss retention, shall meet ASTM B117 salt spray performance criteria for a minimum rating of 1,000 hours, and shall be covered by a 10-year manufacturer's limited warranty. Walls shall be insulated internally, throughout (double wall construction with thermal break / no thru metal). Wall and roof panel insulation shall be 4" think, R-25 moisture resistant polyisocuyanurate foam protected by a solid interior linter. Interior liner shall be 0.040 Type 5052 smooth aluminum with mill applied, industrial grade, high solids polyurethane paint. All sheet metal joints throughout the air handler, and between panelized sections, shall be gasketed with closed cell, soft rubber gaskets, fabricated from neoprene, EPDM, or other approved material. Internal walls and roof outside shall be sealed such that there is no passage of air from inside the unit to the outer casing. Paint shall provide a durable, "wet look" finish with excellent color and gloss retention, shall meet ASTM B117 salt spray performance criteria for a minimum rating of 1,000 hours, and shall be covered by a 10-year manufacturer's limited warranty.

B. Individual panels of the fan section shall be removable without compromising the integrity of the unit. Casing assembly shall be configured to eliminate all thru-metal in portions of the unit subject to below ambient temperatures. Where fasteners are used in the assembly of the unit components, they shall not extend from the outside of the unit into the air stream.

C. Drain pan liners shall be constructed of No. 16-gauge 316-L stainless steel or heavier as standard with the manufacturer. Drain pan shall extend as indicated past the cooling coil (leaving airside) into the fan section on draw through units. Entire drain pan shall be insulated with R-14 closed cell rigid insulation. Drain pans shall be sloped to the outside edge of the unit. On units over six feet wide, slope to each side of the unit. The insulation shall be installed and sealed as is appropriate for the equipment construction. Provide walk-on aluminum grate over drain pans.

D. Unit shall have a complete perimeter channel base of at least 6"structural aluminum. All floors shall be insulated with R-14 insulation with 0.10" #3003 aluminum floor. An aluminum sheet shall enclose and form a vapor barrier for the insulation on the bottom of the unit. All points of contact between the floor, vapor barrier and structure shall be thermally isolated with gasketing of closed cell soft rubber or EPDM. Flooring shall be mechanically attached and feature a true thermal break.

E. Access doors shall be provided to allow access to both sides (upstream and downstream) of the filter racks, into the fan section, and both sides of all coils. Access doors shall be double wall, insulated the same as wall panels, and the opening framed with Class A

thermal break construction with no thermal bridging acceptable. Door size shall be as indicated. The construction of the access doors shall equal or exceed the quality and quantity of the air handler casing materials as specified herein. Each door shall have a minimum of an 8-inch by 12-inch wire reinforced double-glazed view window, capable of withstanding the total developed pressure of the unit. The doors shall be hinged using either heavy-duty stainless butt hinges, cast aluminum, or a continuous stainless steel piano hinge, extending along the entire edge of the door, except for a maximum of two inches at each end. If butt hinges are used, provide two per door for up to 36" high doors and three per door for longer doors. There shall be a minimum of two latches on doors longer than 18," and three latches in doors over 36" long. Latches shall be Ventlok 310, heavy-duty latch, or approved equal. All access doors shall open against air pressure.

F. Coils in the air-handling units shall be individually removable and shall not be used to provide structural stability for the casing. All coils shall be arranged for and piped to provide counter flow operation. All coil frames supplied in air handlers shall be fabricated of 316-L stainless steel to allow for removal of individual coils independently. The coils shall be completely enclosed within the coil housing of the air unit casing. All penetrations of the air handler casing shall be neatly sealed using a resilient sealant. Hinged gasketed quick access doors of adequate size for a man to enter shall be provided for each space between coils, filters and other components. Stacked coils shall have intermediate drain pans with at least 1" rigid drain piping and pipe supports to main drain pan.

G. Panels shall be reinforced with sufficient internal bracing to prevent excessive deflection of the panels to L/200 standard.

H. Not Used

I. Provide a unit housing, including joints, seams, and access doors, that will not condense moisture on the external surfaces of this housing when subjected to a surrounding ambient environment of 82°F dry-bulb / 75°F dew-point temperature air.

J. Not Used

K. Provide sealable test ports on either side of each filter bank and each coil section, in inlet plenum and discharge plenum, and suction and discharge side of all fans. Ports shall be equal to Ventfabrics test port Model 699-2.

2.4 FANS (See also Section 23 34 16)

A. Shall be both dynamically and statically balanced. Motors shall be high efficiency type per Section 23 05 13. The motor mounting for each unit shall be an integral part of the fan support frame. The fan / motor unit shall be mounted on spring isolators within the air handler casing. Housed fans shall have an appropriately designed fabric duct vibration isolator installed within the air handler casing. The unit shall be supplied with a factory installed and sealed flange for connection to ductwork.

B. After assembly, the unit manufacturer shall balance the fan (per ANSI/AMCA 204-96 fan application category BV-5) at design fan speed with belts and drives in place to a vibration

velocity less than or equal to 0.157 inches (0.100 inches for direct-drive applications) per second measured on horizontal, vertical, and axial planes at each bearing pad. Vibration amplitudes are in inches/second peak velocity. All values recorded are to be filter-in at the fan speed.

C. Plug fans installed in walk-in units shall be provided with a fan shut down switch in the access door. Provide plug fan inlets with coated steel safety bars.

D. Individual fan performance shall be based on tests run in an AMCA certified laboratory and administered in accordance with AMCA Standards 210 and 300. Fans shall be licensed to bear the AMCA seal for air and sound performance. Submitted fan performance shall be adjusted to reflect multiple fans running inside the cabinet and to reflect any affects from the unit cabinet and other internal components. Fans shall be minimum Class 3 construction.

E. The fan wheel shall be aluminum with extruded aluminum airfoil blades continuously welded to the fan side plates. The fan back plane shall be bolted to a cast aluminum fan hub with keyway. Fans not using airfoil blades, or using steel construction, will not be considered. Fan inlets shall be isolated from the cabinet by means of a neoprene-coated flexible connection.

F. Motors shall be premium efficiency to meet or exceed the requirements in EISA 2007. Motors shall be TEFC, NEMA frame, cast iron casing, ball bearing type complete with grease lubricated bearings and zerk fittings for field lubrication. Motors shall have a NEMA Class F insulation rating with Class B temperature rise, and have a 1.15 service factor. BHP values as shown on the Schedule are considered the maximum allowable.

G. Fans shall be provided with thrust restraints.

H. Each motor shall be provided with a shaft grounding device that will bleed potential induced motor shaft voltage to ground.

I. Factory engineered fan wall array systems may be provided in lieu of single plenum fans. All engineering, materials, and labor required for provision of fan wall systems shall be provided by contractor at no additional cost to the owner and shall be subject to technical review by the engineer of record. Fan wall array total motor HP must not exceed scheduled value and individual fan motors must be factory pre-wired and provided with individual electrical disconnect switches and motor overload protection for use with a single variable speed drive.

2.5 DAMPERS

A. All automatic control dampers and manual volume control dampers located within air handling unit shall be furnished by AHU manufacturer.

B. Mixing Boxes: Dampers shall be supplied with ultra-low leak extruded 6063T5 aluminum airfoil blades. Blades shall be supplied with dual durometer, Santoprene™, bulb type edge seals and stainless steel arc end seals. Edge seals shall be backed by the damper blade to assure a positive seal in the closed position. Dampers shall be provided with nylon bearings within extruded openings.

C. Damper Leakage: Maximum 6 CFM/Sq. Ft. at 5 inch WG differential pressure. Dampers shall be sized for 2000 fpm maximum face velocity.

D. Refer to Section 23 33 00-2.01 for additional requirements.

2.6 DRIVES

A. Plenum fans shall be direct drive and housed fans shall be belt drive with adjustable sheaves unless indicated otherwise.

B. Variable frequency drives: See Section 23 29 23.

2.7 COILS

Refer to Section 23 82 16 - Air Coils, and Unit Schedules for requirements.

2.8 FILTERS

Refer to Section 23 41 00 - Filters, and Unit Schedules for requirements. Provide aluminum or stainless steel filter racks.

2.9 ELECTRICAL

A. Fan motors shall be factory-mounted and wired to an external j-box adjacent to the motor access door. Fan motors shall be interlocked with fan access door to shut down when door is opened.

B. Vapor proof lights (ceiling or wall mounted so that fixture shall be no higher than 88" above floor) shall be provided in each compartment with access doors. Lights shall have a switch at each door into the compartment. Provide two GFI convenience outlets evenly spaced on the long dimension of the unit. Wire lights and outlets to two external 120v, 20a power connections (one for each service) by Division 16. All raceways and conductors shall be by Div 16 in the filed after the units are assembled.

C. All wiring shall be 600v rated type MTW/THWN stranded copper in EMT or LiquidTite conduit (max 3 feet). All junction boxes shall be UL approved and gasketed.

D. Motors – see Section 23 05 13 for additional requirements.

E. Provide in each section a electrical junction box with thru casing raceway by manufacturer for control wiring.

PART 3 EXECUTION

3.1 INSTALLATION

A. Field assembly of the unit shall be the responsibility of the mechanical contractor. Provide manufacturer field technician to oversee installation of the first unit. Coordinate with building operations for the schedule and length of down time.

B. Install in conformance with ARI 435.

C. Assemble high-pressure units by bolting sections together.

3.2 FIELD TESTING

D. Casing Leakage Test. With unit set in place, leveled and ready to receive duct work connections, unit shall be tested for casing leakage by sealing all openings and tested to criteria in Paragraph 3.02 B.1. Maximum allowable leakage rate is 1.5% of rated unit flow at 8" static pressure. Test is to be performed by the manufacturer using traceable flow measurement devices and shall be witnessed by a representative of the Owner's Test & Balance firm.

E. Test each AHU scheduled at 12,000 cfm or greater airflow capacity.

F. Fan/Motor Vibration Test. With the unit set in place, leveled, and ductwork attached, the manufacturer shall perform a final dynamic vibration trim balance to verify the fan/motor vibration velocity limit over the following operating speed range: Fans with VFDs shall be checked from 40 to 110% of the rated fan speed. Constant speed fans shall be checked at 100% of rated fan speed. 'Lock-out' ranges may be used to correct up to two ranges of excess vibration. The span of each 'lock-out' range shall be limited to an effective fan speed of 50 RPM. Any 'lock-out' range used shall be clearly identified in the test report and shall be prominently displayed on a typed, laminated legend mounted inside the VFD controller cabinet.

E. Failure of the leakage test shall require correction of the unit and retesting until criteria is met. Failure of the vibration limit shall require rebalancing and re-testing until criteria is met. Contractor shall bear all costs involved in the modifications, balancing, and re-testing.

END OF SECTION

SECTION 23 82 16

AIR COILS AND HEAT PIPES

PART 1 GENERAL

1.1 The following sections are to be included as if written herein:

A. Section 23 00 00 – Basic Mechanical Requirements

B. Section 23 05 29 – Sleeves, Flashings, Supports and Anchors

C. Section 23 05 53 – Mechanical Identification

1.2 SECTION INCLUDES

A. Water coils
B. Heat Pipes

1.3 RELATED SECTIONS

B. Section 23 07 19 - Piping Insulation

C. Section 23 06 20.13 - Hydronic Specialties

D. Section 23 22 00.A - Steam and Steam Condensate Specialties

E. Section 23 31 00 - Ductwork: Installation of duct coils

F. Section 23 09 00 - Controls and Instrumentation

G. Section 26 05 19 - Cable, Wire and Connectors, 600 Volt

H. Section 26 27 26 - Wiring Devices and Floor Boxes

1.4 REFERENCES

A. ANSI/ARI 410 - Forced-Circulation Air-Cooling and Air-Heating Coils

B. ANSI/NFPA 70 - National Electrical Code

C. ANSI/UL 1096 - Electric Central Air Heating Equipment

D. SMACNA - HVAC Duct Construction Standards, Metal and Flexible

1.5 SUBMITTALS

A. Submit shop drawings under provisions of Section 23 00 00.

B. Submit shop drawings indicating coil and frame configurations, dimensions, materials, rows, connections, and rough-in dimensions.

C. Submit product data under provisions of Section 23 00 00.

D. Submit product data indicating coil and frame configurations, dimensions, materials, rows, connections, and rough-in dimensions.

E. Submit manufacturer's installation instructions under provisions of Section 23 00 00.

F. Submit manufacturer's certificate under provisions of Section 23 00 00that coils are tested and rated in accordance with ANSI/ARI 410.

1.6 APPLICATION

A. The specifications and all other requirements shall be applicable to all chilled water and hot water coils installed within the air-handling units and installed outside the AHU in ductwork or plenums etc.

1.7 QUALIFICATIONS

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

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Section 23 00 00.

B. Store and protect products under provisions of Section 23 00 00.

C. Protect coil fins from crushing and bending by leaving in shipping cases until installation, and by storing indoors.

D. Protect coils from entry of dirt and debris with pipe caps or plugs.

PART 2 PRODUCTS

2.1 CHILLED AND HOT WATER COILS:

A. Water coil capacities, pressure drops and selection procedures shall be certified for the capacity scheduled in accordance with ARI Standard 410. Non-certified coils will not be accepted.

B. Chilled and hot water coils shall be of the extended surface type meeting all conditions and having the minimum face area and pressure drops scheduled on the Drawings, and shall have same-end supply and return connections unless otherwise indicated. Coils shall be constructed of copper tubes 5/8" O.D. with .035" thick minimum wall thickness and copper fins permanently bonded to the tubes by mechanical expansion. Coils shall have a maximum of 8 fins per inch, and a maximum of 6 rows. If additional capacity is necessary, the additional capacity shall be provided by an additional coil, with an additional access section between the coils, and the coils shall be piped in series, counter flow to the direction of air flow. Copper fins on plate coils shall be .006" thick.

C. Coil headers and connections shall be of I.P.S. brass or heavy gauge seamless hard drawn copper tubing with penetrations for connection of core tubing by die-formed intrusion process with resulting contact depth between the header wall and core tubing of not less than .090". Joints between core tubing and header shall be of recess swage design to allow a large mating area for build up of brazing materials to give increased strength to the joint. Supply and return connection of brass or copper shall be terminated with National Pipe Threads with wrench flats.

D. Coils shall be designed and certified by the manufacturer to operate to scheduled face velocity plus 10% without moisture carry over. Each coil section shall be provided with a 316-L Stainless Steel frame/casing, including tube sheets, no lighter than 16 gauge. Frame members shall extend over the ends and edges of the coils and shall be constructed with formed holes for tubes, permitting free expansion and contraction of coil sections while supported by an extended surface of the frame. Intermediate tube support sheets of 316-L stainless steel shall be provided in all coils having tube lengths in excess of 48": on long coil sections the spacing of coil supports shall not exceed 48". All intermediate supports shall be welded to coil frame members and fabricated with formed tube holes to support the penetrating tubes.

E. Condensate from chilled water coils shall be piped to the nearest convenient floor drain. The pipe size shall be 1" minimum diameter, insulated as specified for chilled water piping. A trap of a minimum depth of 6 inches shall be provided in this drain line to prevent the escape or entry of air through the drain piping.

F. Where blow-through units are provided without internal heating coils in the hot deck position, a perforated plate shall be provided in place of the heating coils to simulate the air flow resistance of the absent coil.

G. Pressure test all coils to 350 psi under water.

H. Chilled water and hot water coils in ductwork and plenum (outside the air-handling units) shall be installed within the manufacturer's supplied section / module with the casing as indicated in section 23 73 23 – air handling units.

2.2 WRAP-AROUND HEAT PIPE COIL

A. Heat pipe coil shall be of air-to-air heat transfer technology. Wrap-around heat pipe shall be "Colmac" or "Innergytech" heat pipe coils (heat exchangers) or equal and designed to efficiently transfer heat from a warm air stream to a colder one.

B. Heat pipe coil shall be Integral Fin Design with each heat pipe shall be made from one piece of material, with no discontinuities between fin and tube, to achieve the maximum heat transfer possible with minimum pressure drop. It also eliminates the possibility of corrosion at the tube and fin interface.

C. Integral fins will be fabricated from 1050 Aluminum Alloy. Heat pipes shall have a capillary wick structure integral to the heat pipe container wall.

D. The individual heat pipes coil shall consist of three elements: a sealed pipe, a capillary wick structure, and a refrigerant fluid, and all the pipes shall be sealed under a vacuum, with the working fluid is in equilibrium with its own vapor. The capillary wick shall distribute the working fluid over the inside of the pipe. Hot air flowing over one end of the pipe evaporates the working fluid. The vapor is then condensed at the cooler end, giving up its heat to the second air stream. The vapor flows back to the evaporator, completing the cycle.

E. The heat pipe coil shall be designed to be a sturdy, reliable unit. Individual "U" tubes shall be welded to each section of the heat pipe coil to ensure sound construction; individual tubes shall ensure that there is even distribution of working fluid in all heat pipes. Connections between the heat pipe sections shall be compact and located opposite to the dehumidification coil connections. The heat pipe coil shall be sized to closely wrap around the coil or to allow space between it and the cooling coil.

F. The heat pipe coils shall be sized in a manner similar to other heating/cooling coils, using a face velocity of 500 feet per minute. At this velocity, pressure drops across the heat pipe coil shall be modest when compared with other types of heat exchangers. If higher pressure drops can be tolerated, face velocities higher than 500 feet per minute can be used under proper conditions.

G. Heat pipe working fluids shall be R-134a, R-124, or be selected on the basis of heat pipe operating temperatures and compatibility with heat pipe container material.

H. Heat pipes shall be individually processed, charged, hermetically sealed and factory tested.

I. Heat pipe coil structural casing shall be fabricated from a minimum of Aluminum Alloy 5052, or 304 Stainless. The heat pipe coil shall be supplied with 4 flanges on the top and bottom along the front and back edges. Intermediate supports shall be furnished as required.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in ducts and casings in accordance with SMACNA HVAC Duct Construction Standards, Metal and Flexible.

C. Support coil sections independent of piping on steel channel or double angle frames and secure to casings. Provide frames for maximum three coil sections. Arrange supports to avoid piercing drain pans. Provide airtight seal between coil and duct or casing.

D. Protect coils to prevent damage to fins and flanges. Comb out bent fins.

E. Make connections to coils with unions and flanges.

F. On water coils, provide shut-off valve on supply line and lock shield balancing valve on return line. Locate water supply at bottom of supply header and return water connection at top. Provide float operated automatic air vents at high points complete with stopvalve. Ensure water coils are drainable and provide drain connection at low points.

G. On water [and glycol] heating coils, and chilled water cooling coils, connect water supply to leaving air side of coil (counter flow arrangement).

H. For cooling coils where air velocity exceeds 550 ft /min provide three break moisture eliminators of 24 gauge (0.60 mm) copper.

I. Provide drain pan and drain connection for cooling coils. Fabricate drain pan from minimum 18-gauge 316L stainless steel. Extend 3 inches from face of coil entering air side, 18 inches from face of coil leaving air side and 4 inches from face of eliminators.] Pipe drain pans individually to floor drain with water seal trap.

L. Insulate headers located outside air flow as specified for piping. Refer to Section 23 07 19.

M. Wire electric duct coils in accordance with ANSI/NFPA 70. Refer to Sections 26 05 19 and 26 27 26.

END OF SECTION

SECTION 238219

FAN COIL UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes fan-coil units and accessories.

1.3 DEFINITIONS

A. BAS: Building automation system.

1.4 SUBMITTALS

A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring.

C. Operation and Maintenance Data: For fan-coil units to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Maintenance schedules and repair part lists for motors, coils, integral controls, and filters.

D. Warranty: Special warranty specified in this Section.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.6 COORDINATION

A. Coordinate layout and installation of fan-coil units and suspension system components with other construction that penetrates or is supported by ceilings, including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

1.7 WARRANTY

1. Warranty Period: One year from date of Substantial Completion.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fan Belts: Furnish one spare fan belt for each unit installed.
2. Air Filters: One spare set for each unit installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

B. In the Fan-Coil-Unit Schedule where titles below are column or row headings that introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
3. Basis-of-Design Product: The design for each fan-coil unit is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

2.2 DUCTED FAN-COIL UNITS

A. Basis-of-Design Product: Trane or a comparable product by one of the following:

B. [Manufacturers:

1. Carrier Corporation.
2. Engineered Air Ltd.
3. Environmental Technologies, Inc.

4. First Co.
5. International Environmental Corporation.
6. Marshall Engineered Products Co., LLC (MEPCO); Dunham-Bush, Inc.
7. Daikin McQuay.
8. Trane.
9. YORK International Corporation.

C. Description: Factory-packaged and -tested units rated according to ARI 440, ASHRAE 33, and UL 1995.

D. Coil Section Insulation: 1-inch thick matte elastomeric insulation complying with ASTM C 1071 and attached with adhesive complying with ASTM C 916.

1. Fire-Hazard Classification: Insulation and adhesive shall have a combined maximum flame-spread index of 25 and smoke-developed index of 50 when tested according to ASTM E 84.

E. Drain Pans: Stainless steel formed to slope from all directions to the drain connection as required by ASHRAE 62.

F. Chassis: Galvanized steel where exposed to moisture, with baked-enamel finish and removable access panels.

G. Cabinets: Steel with baked-enamel finish in manufacturer's standard paint color.

1. Supply-Air Plenum: Sheet metal plenum finished and insulated to match the chassis.
2. Return-Air Plenum: Sheet metal plenum finished to match the chassis.
3. Dampers: Galvanized steel with extruded-vinyl blade seals, flexible-metal jamb seals, and interlocking linkage.

H. Filters: Minimum arrestance according to ASHRAE 52.1, and a minimum efficiency reporting MERV value as scheduled according to ASHRAE 52.2.

I. Hydronic Coils: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch, rated for a minimum working pressure of 200 psig. Include manual air vent and drain.

J. Direct-Driven Fans: Double width, forward curved, centrifugal; with permanently lubricated, electronically commutated (ECM) motor resiliently mounted in the fan inlet. Aluminum or painted-steel wheels, and painted-steel or galvanized-steel fan scrolls.

K. Belt-Driven Fans: Double width, forward curved, centrifugal; with permanently lubricated, electronically commutated (ECM) motor installed on an adjustable fan base resiliently mounted in the cabinet. Aluminum or painted-steel wheels, and painted-steel or galvanized-steel fan scrolls.

1. Motors: Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."

L. Control devices and operational sequence are specified in Division 23 Sections "Instrumentation and Control for HVAC" and "Sequence of Operations for HVAC Controls."

M. Electrical Connection: Factory wire motors and controls for a single electrical connection.

N. Capacities and Characteristics as scheduled.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive fan-coil units for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine roughing-in for piping and electrical connections to verify actual locations before fan-coil-unit installation.

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

3.2 INSTALLATION

A. Install fan-coil units level and plumb.

B. Install fan-coil units to comply with NFPA 90A.

C. Suspend fan-coil units from structure with elastomeric hangers. Vibration isolators are specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."

D. Install new filters in each fan-coil unit within two weeks after Substantial Completion.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties. Specific connection requirements are as follows:

1. Install piping adjacent to machine to allow service and maintenance.
2. Connect piping to fan-coil-unit factory hydronic piping package. Install piping package if shipped loose.
3. Connect condensate drain to indirect waste.

    a. Install condensate trap of adequate depth to seal against the pressure of fan. Install cleanouts in piping at changes of direction.

B. Connect supply and return ducts to fan-coil units with flexible duct connectors specified in Division 23 Section "Air Duct Accessories." Comply with safety requirements in UL 1995 for duct connections.

C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including connections. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
2. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace malfunctioning units and retest as specified above.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fan-coil units. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION 238219

c. Spares: Include three fuses in use and three spare fuses in storage clips in each switch.

B. Surge Arresters: Comply with IEEE C62.11, Distribution class; metal-oxide-varistor type, with ratings as indicated, connected in each phase of incoming circuit and ahead of any disconnecting device.

2.4 DRY-TYPE TRANSFORMER SECTION

A. Description: IEEE C57.12.01, IEEE C57.12.50, IEEE C57.12.51, IEEE C57.12.52, NEMA ST 20, and dry-type, 2-winding, secondary unit substation transformer.

B. Enclosure: Indoor, ventilated~~, cast coil/encapsulated coil, with primary and secondary windings individually cast in epoxy; with insulation system rated at 185 deg C with an 80 deg C average winding temperature rise above a maximum ambient temperature of 40 deg C.~~.

C. Cooling System: Class AA, air cooled, complying with IEEE C57.12.01.

D. Insulation Materials: IEEE C57.12.01, rated 220 deg C.

E. Insulation Temperature Rise: 150 deg C, maximum rise above 40 deg C.

F. Basic Impulse Level: ~~110~~ 10 kV LV and 30 kV HV.

G. Full-Capacity Voltage Taps: 4 nominal 2.5 percent taps, 2 above and 2 below rated primary voltage.

~~H. Full-Capacity Voltage Taps: 4 nominal 2.5 percent taps below rated primary voltage.~~

~~I.~~H. Sound level may not exceed 65 dBA level~~, without fans operating~~.

~~J.~~I. Impedance: ~~6~~ 5.75 percent.

J. High-Temperature Alarm: Sensor at transformer with local audible and visual alarm and contacts for remote alarm.

K. Energy efficient per DOE 2016.

2.5 SECONDARY DISTRIBUTION SECTION

A. Secondary Terminal Compartment: Bus for close coupling with busduct.

B. Secondary Distribution: Low-voltage switchboard as specified in Division 26 Section "Switchboards."

2.6 IDENTIFICATION DEVICES

A. Compartment Nameplates: Engraved, laminated-plastic or metal nameplate for each compartment, mounted with corrosion-resistant screws. Nameplates and label products are specified in Division 26 Section "Identification for Electrical Systems."

0 1/2" 1" 2"

MECHANICAL SYMBOLS LEGEND

1. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH ALL APPLICABLE CODES, STANDARDS AND AUTHORITIES HAVING JURISDICTION.
2. RECTANGULAR DUCT SIZES INDICATED ARE ACTUAL SHEET METAL DIMENSIONS IN INCHES ALL ROUND DUCT SIZES INDICATE NET FREE INSIDE DIAMETER AND DO NOT ACCOUNT FOR ANY INSULATION. ROUND DUCTS AND RECTANGULAR DUCTS ARE EXTERNALLY INSULATED PER SPECIFICATIONS UNLESS INDICATED OTHERWISE. ALL DUCTWORK SHALL BE INSTALLED AND MANUFACTURED IN ACCORDANCE WITH LATEST SMACNA STANDARDS.
3. SCHEDULED MANUFACTURERS ARE BASIS OF DESIGN. SEE SPECIFICATIONS FOR QUALIFICATION OF ACCEPTABLE MANUFACTURERS.
4. MAJOR EQUIPMENT SHOWN ON THE PLANS AND ELEVATIONS ILLUSTRATE GENERAL ARRANGEMENT AND SPACE ALLOCATIONS. FIELD VERIFY EXISTING CONDITIONS AND SPACE REQUIREMENTS FOR EACH SYSTEM COMPONENT USING MANUFACTURER CERTIFIED SHOP DRAWINGS. MAKE ADJUSTMENTS IN EQUIPMENT PLACEMENT AND CONNECTIONS NECESSARY TO INSTALL EQUIPMENT IN EXISTING SPACES.
5. REFER TO SPECIFICATIONS FOR SUPPORTS, ANCHOR BOLTS AND HANGERS FOR ALL EQUIPMENT. OTHER MISCELLANEOUS STEEL BRACING, SUPPORTS, AND REINFORCING STEEL REQUIRED TO SUPPORT EQUIPMENT SHALL BE FURNISHED AS PART OF THE SCOPE OF WORK OF DIVISION 23.
6. FLEX DUCTS SIZE SHALL BE OF SAME SIZE AS DIFFUSER NECK.
7. SEAL ALL PENETRATIONS OF FLOORS, SMOKE WALLS, FIRE WALLS, AND EXTERIOR WALLS.
8. DO NOT RUN DUCT OR PIPE OVER ELECTRICAL PANELS. COORDINATE LOCATION OF DUCTS AND EQUIPMENT IN MECHANICAL ROOMS WITH THE ELECTRICAL AND PLUMBING CONTRACTOR BEFORE INSTALLATION.
9. PROVIDE MANUAL BALANCE DAMPERS FOR ALL DUCT RUN-OUTS TO SUPPLY AND EXHAUST, AIR DEVICES. PROVIDE YOUNG REGULATORS WITH REMOTE ADJUSTMENT WHERE ABOVE CEILING IS INACCESSIBLE.
10. SECURE ALL PERMITS AND PROVIDE TEMPORARY AIR HANDLING UNITS AND TEMPORARY UTILITY CONNECTIONS.
11. MAXIMUM LENGTH OF FLEXIBLE DUCT SHALL NOT EXCEED 6'-0". PROVIDE RIGID ROUND INSULATED AIR DUCT RUN-OUT AS REQUIRED. FLEXIBLE DUCT SHALL HAVE THE EQUIVALENT OF ONLY TWO 90 DEG. ELBOWS MAXIMUM. FLEX DUCTS ARE SAME SIZE AS DIFFUSER NECK. PROVIDE RIGID ELBOW AT THE DIFFUSER NECK.
12. INSTALL SMOKE DETECTOR FOR ALL UNITS WITH CAPACITY OF 2200 CFM AND HIGHER AS REQUIRED BY CODE. FIRE ALARM CONTRACTOR TO FURNISH AND TERMINATE.
13. INSULATE EQUIPMENT, PIPING AND DUCTWORK PER SPECIFICATIONS AND AS INDICATED.
14. PROVIDED RECORD DRAWINGS OF THE ACTUAL INSTALLATION TO THE BUILDING OWNER OR THE DESIGNATED REPRESENTATIVE OF THE BUILDING OWNER. RECORD DRAWINGS SHALL INCLUDE AS A MINIMUM THE LOCATION AND PERFORMANCE DATA ON EACH PIECE OF EQUIPMENT. GENERAL CONFIGURATION OF DUCT AND PIPE DISTRIBUTION SYSTEM INCLUDING SIZES, AND THE TERMINAL AIR OR WATER DESIGN FLOW RATES.
15. PROVIDE OPERATING AND MAINTENANCE MANUALS TO THE BUILDING OWNER OR THE DESIGNATED REPRESENTATIVE OF THE BUILDING OWNER. THESE MANUALS SHALL BE IN ACCORDANCE WITH INDUSTRY-ACCEPTED STANDARDS, AND SHALL INCLUDE, AT A MINIMUM, THE FOLLOWING:
(A) SUBMITTAL DATA STATING EQUIPMENT SIZE AND SELECTED OPTIONS FOR EACH PIECE OF EQUIPMENT REQUIRING MAINTENANCE.
(B) OPERATION MANUALS AND MAINTENANCE MANUALS FOR EACH PIECE OF EQUIPMENT REQUIRING MAINTENANCE, EXCEPT EQUIPMENT NOT FURNISHED AS PART OF THE PROJECT. REQUIRED ROUTINE MAINTENANCE ACTIONS SHALL BE CLEARLY IDENTIFIED.
(C) NAMES AND ADDRESSES OF AT LEAST ONE SERVICE AGENCY.
(D) HVAC CONTROLS SYSTEM MAINTENANCE AND CALIBRATION INFORMATION, INCLUDING WIRING DIAGRAMS, SCHEMATICS, AND CONTROL SEQUENCE DESCRIPTIONS. DESIRED OR FIELD- DETERMINED SET-POINTS SHALL BE PERMANENTLY RECORDED ON CONTROL DRAWINGS AT CONTROL DEVICES OR, FOR DIGITAL CONTROL SYSTEMS, IN PROGRAMMING COMMENTS.
(E) A COMPLETE NARRATIVE OF HOW EACH SYSTEM IS INTENDED TO OPERATE, INCLUDING SUGGESTED SET-POINTS.
16. PRESSURE TEST DUCTWORK PER SPECIFICATIONS.
17. DUCTWORK AND PLENUMS SHALL BE SEALED IN ACCORDANCE WITH THE MECHANICAL CODE AND SMACNA METHOD AND ENERGY CONSERVATION CODE. SEAL ALL LONGITUDINAL AND TRAVERSE JOINTS.
18. COORDINATE INSTALLATIONS WITH OWNER'S INDEPENDENT TEST AND BALANCE AGENT. PROVIDE ADDITIONAL TEST PORTS AND BALANCING DEVICES AS IDENTIFIED BY TAB AGENCY.
19. TEST, COORDINATE, AND ADJUST CONTROL SYSTEMS AND FIELD DEVICES PRIOR TO SYSTEM COMMISSIONING AND DEMONSTRATIONS.
20. PROVIDE ROOM SENSOR, T-STATS, ETC. AS SPECIFIED AT INDICATED LOCATIONS. COORDINATED EXACT PLACEMENT WITH OTHER WALL MOUNTED DEVICES SUCH AS LIGHT SWITCHES, ETC.
21. FIRE SPRINKLER SHALL BE PROVIDED UNDER ALL DUCT WORK IN MECHANICAL ROOMS FROM 32" DUCT SIZE AND ABOVE.

1 CONTRACTOR TO CLEAN ALL EXISTING MEDIUM PRESSURE SUPPLY AIR DUCTWORK

MECHANICAL SYMBOLS LEGEND

	SUPPLY AIR DUCT UP (PLAN)	T	THERMOSTAT OR ROOM SENSOR - MOUNT 48" AFF		STRAINER W/BLOW DOWN VALVE
	SUPPLY AIR DUCT DOWN (PLAN)	H	HUMIDISTAT		THREE-WAY VALVE (ELECTRIC)
	RETURN OR OUTSIDE AIR DUCT UP (PLAN)	F	FIRESTAT		TWO-WAY VALVE (ELECTRIC)
	RETURN OR OUTSIDE AIR DUCT DOWN (PLAN)	ID	IONIZATION DETECTOR		FLEXIBLE CONNECTION
	EXHAUST AIR DUCT UP (PLAN)	SD	SMOKE DETECTOR	EJ	EXPANSION JOINT
	EXHAUST AIR DUCT DOWN (PLAN)	TCH	TEMPERATURE, CO2, HUMIDITY SENSOR		THERMOMETER
	RETURN AIR/TRANSFER AIR BOOT		PIPE UP		THERMOMETER WELL
	CEILING SUPPLY AIR DEVICE		PIPE DOWN		TEST PLUG
	SIDEWALL SUPPLY/EXHAUST REGISTER		CAP OR BLIND FLANGE		PRESSURE GAUGE W/GAUGE COCK
	CEILING RETURN REGISTER		90° ELBOW		MANUAL AIR VENT
	CEILING EXHAUST REGISTER		45° ELBOW		AUTOMATIC AIR VENT
	RETURN AIR GRILLE WITH BOOT		45° DOUBLE OFFSET	S	SOLENOID VALVE
	BRANCH DUCT TAP		TEE	FS	FLOW SWITCH
	DUCT SPLIT		TEE UP		STEAM TRAP
SD DIM	SPLITTER - DIMENSION AS NOTED ON DRAWING		TEE DOWN		STEAM MOISTURE SEPARATOR
BDD	BACK DRAFT DAMPER		TOP CONNECTION		RED. PRESS BACKFLOW PREVENTER
AD	ACCESS DOOR		CROSS	CHR	CHILLED WATER RETURN
	TRANSITION IN DUCT		UNION (SCREWED)	CHS	CHILLED WATER SUPPLY
	FLEXIBLE DUCT CONN. TO RECTANGULAR DUCT WITH SPIN-IN CONNECTOR		UNION (FLANGED)	CWR	CONDENSER WATER RETURN
AP	ACCESS PANEL	T	DUCT MOUNTED TEMPERATURE SENSOR	CWS	CONDENSER WATER SUPPLY
	DUCT ELBOW WITH TURNING VANES	P	DUCT MOUNTED PRESSURE SENSOR	HWR	HOT WATER RETURN
	DUCT ELBOW WITHOUT VANES	SD	DUCT MOUNTED SMOKE DETECTOR	HWS	HOT WATER SUPPLY
	FLEXIBLE CONNECTION, FLEXIBLE DUCT		PIPE BREAK	CD	CONDENSATE DRAIN
VD	VOLUME DAMPER		CONCENTRIC REDUCER	HRS	HEAT RECOVERY SUPPLY
M	MOTORIZED DAMPER		ECCENTRIC REDUCER	HRR	HEAT RECOVERY RETURN
F	FIRE DAMPER		PUMP	CR	STEAM CONDENSATE
SD	SMOKE DAMPER	OR	BALL VALVE	HPS	HIGH PRESSURE STEAM
FS	COMBINATION FIRE/SMOKE DAMPER		BUTTERFLY VALVE	MPS	MED PRESSURE STEAM
AFS	AIR FLOW SWITCH		ISOLATION VALVE OR GATE VALVE	LPS	LOW PRESSURE STEAM
	RISE IN DUCT ELEVATION		GATE VALVE WITH QUICK DISCONNECT		
	DROP IN DUCT ELEVATION		TWO-WAY VALVE (PNEUMATIC)		
UCD 1"	UNDERCUT DOOR 1"		THREE-WAY VALVE (PNEUMATIC)		
RE: 1/M-801	REFER TO DETAIL #1 ON DRAWING M-801		GLOBE VALVE OR BALANCING VALVE		
(N)	NEW		CHECK VALVE		
(D)	DEMOLISH EXISTING		PRESSURE RELIEF VALVE		
(E)	EXISTING TO REMAIN	PRV	PRESSURE REDUCING VALVE		
A 100 CFM	DIFFUSER TYPE, CFM		LOCK SHIELD		

NOTE:

NOT ALL ITEMS NOT NECESSARILY USED.

PRESSURE-TEMPERATURE OPERATING REQUIREMENTS

SERVICE	MAXIMUM WORKING PRESSURE (MWP)		MINIMUM PRESSURE CLASS
	PSIG	DEG F	
HIGH PRESSURE STEAM (HPS)	250	450	300
MEDIUM PRESSURE STEAM (MPS)	75	405	250
LOW PRESSURE STEAM (LPS)	15	387	150
CHILLED WATER	150	-	125
HOT WATER	150	200	150

Infrastructure Associates
INFRASTRUCTURE ASSOCIATES, INC.
6117 RICHMOND AVENUE, SUITE 200
HOUSTON, TEXAS 77057
TBPE REGISTRATION NO. F-4506
(713) 622-0120 PH (713) 622-0557 FAX
WWW.IAHOUSTON.COM

UTHealth™
The University of Texas
Health Science Center at Houston
School of Public Health
UT HEALTH SCIENCE SCHOOL OF PUBLIC HEALTH
1200 PRESSLER ST.
HOUSTON, TX 77030

STATE OF TEXAS
MATT A PLUKINGER
119970
LICENSED
PROFESSIONAL ENGINEER
8-16-2017

REVISIONS

05/31/2017	ISSUED FOR BID
07/28/2017	ADDENDUM 1
08/16/2017 1	ADDENDUM 2

Sheet Information

Date	31 MARCH 2017
Job Number	-
Drawn	KN, KT, CJT
Checked	IT, SK
Approved	MAF, SK

Title

NOTES AND LEGEND

Sheet

M001

ISSUED FOR BID

AIR HANDLING UNIT SCHEDULE (AHU/OAHU)

TAG	AREA SERVED	LOCATION	SYSTEM TYPE	SUPPLY CFM	O/A CFM	SUPPLY FAN	PRECOOL COIL	HEATPIPE COIL	COOLING COIL	PREHEAT COIL	HEATING COIL	O/A FILTER	PRE-FINAL FILTER	FINAL FILTER	MANUFACTURER	NOTES
AHU-BE	BSMT E	BASEMENT	DOUBLE DUCT	13,400	2,000	SF-BE	N/A	N/A	CC-BE	N/A	HC-BE	N/A	AF-1	AF-2	ENERGY LABS	ALL
AHU-BW	BSMT W	BASEMENT	DOUBLE DUCT	16,800	4,500	SF-BW	N/A	N/A	CC-BW	N/A	HC-BW	N/A	AF-1	AF-2	ENERGY LABS	ALL
AHU-BH	BSMT S	BASEMENT	VAV REHEAT	8,500	1,500	SF-BH	N/A	N/A	CC-BH	N/A	N/A	N/A	AF-1	AF-2	ENERGY LABS	ALL
AHU-1W	1ST FLOOR W	2ND FLOOR	DOUBLE DUCT	12,250	1,500	SF-1W	N/A	N/A	CC-1W	N/A	HC-1W	N/A	AF-1	AF-2	ENERGY LABS	ALL
AHU-1E	1ST FLOOR E	2ND FLOOR	DOUBLE DUCT	14,200	1,500	SF-1E	N/A	N/A	CC-1E	N/A	HC-1E	N/A	AF-1	AF-2	ENERGY LABS	ALL
AHU-1SE	1ST FLOOR SE	2ND FLOOR	DOUBLE DUCT	16,850	3,000	SF-1SE	N/A	N/A	CC-1SE	N/A	HC-1SE	N/A	AF-1	AF-2	ENERGY LABS	ALL
AHU-1SW	1ST FLOOR SW	2ND FLOOR	DOUBLE DUCT	16,850	2,500	SF-1SW	N/A	N/A	CC-1SW	N/A	HC-1SW	N/A	AF-1	AF-2	ENERGY LABS	ALL
AHU-2E	2ND FLOOR E	2ND FLOOR	DOUBLE DUCT	14,200	2,500	SF-2E	N/A	N/A	CC-2E	N/A	HC-2E	N/A	AF-1	AF-2	ENERGY LABS	ALL
AHU-2W	2ND FLOOR W	2ND FLOOR	DOUBLE DUCT	12,250	2,500	SF-2W	N/A	N/A	CC-2W	N/A	HC-2W	N/A	AF-1	AF-2	ENERGY LABS	ALL
AHU-3E	3RD FLOOR E	3RD FLOOR	DOUBLE DUCT	15,000	2,500	SF-3E	PC-3E	HP-3E	CC-3E	PH-3E	HC-3E	AF-1	AF-1	AF-2	ENERGY LABS	ALL
AHU-3W	3RD FLOOR W	3RD FLOOR	DOUBLE DUCT	15,000	8,000	SF-3W	PC-3W	HP-3W	CC-3W	PH-3W	HC-3W	AF-1	AF-1	AF-2	ENERGY LABS	ALL
AHU-4E	4TH FLOOR E	4TH FLOOR	DOUBLE DUCT	15,000	2,500	SF-4E	PC-4E	HP-4E	CC-4E	PH-4E	HC-4E	AF-1	AF-1	AF-2	ENERGY LABS	ALL
AHU-4W	4TH FLOOR W	4TH FLOOR	DOUBLE DUCT	15,000	8,000	SF-4W	PC-4W	HP-4W	CC-4W	PH-4W	HC-4W	AF-1	AF-1	AF-2	ENERGY LABS	ALL
AHU-5E	5TH FLOOR E	5TH FLOOR	DOUBLE DUCT	15,000	2,500	SF-5E	PC-5E	HP-5E	CC-5E	PH-5E	HC-5E	AF-1	AF-1	AF-2	ENERGY LABS	ALL
AHU-5W	5TH FLOOR W	5TH FLOOR	DOUBLE DUCT	15,000	8,000	SF-5W	PC-5W	HP-5W	CC-5W	PH-5W	HC-5W	AF-1	AF-1	AF-2	ENERGY LABS	ALL
AHW-6E	6TH FLOOR E	6TH FLOOR	DOUBLE DUCT	15,000	2,500	SF-6E	PC-6E	HP-6E	CC-6E	PH-6E	HC-6E	AF-1	AF-1	AF-2	ENERGY LABS	ALL
AHU-6W	6TH FLOOR W	6TH FLOOR	DOUBLE DUCT	15,000	10,000	SF-6W	PC-6W	HP-6W	CC-6W	PH-6W	HC-6W	AF-1	AF-1	AF-2	ENERGY LABS	ALL
AHU-7E	7TH FLOOR E	7TH FLOOR	DOUBLE DUCT	15,000	2,500	SF-7E	PC-7E	HP-7E	CC-7E	PH-7E	HC-7E	AF-1	AF-1	AF-2	ENERGY LABS	ALL
AHU-7W	7TH FLOOR W	7TH FLOOR	DOUBLE DUCT	15,000	10,000	SF-7W	PC-7W	HP-7W	CC-7W	PH-7W	HC-7W	AF-1	AF-1	AF-2	ENERGY LABS	ALL
AHU-8E	8TH FLOOR E	8TH FLOOR	DOUBLE DUCT	15,600	2,500	SF-8E	PC-8E	PC-8E	CC-8E	PH-8E	HC-8E	AF-1	AF-1	AF-2	ENERGY LABS	ALL
AHU-8W	8TH FLOOR W	8TH FLOOR	DOUBLE DUCT	15,600	2,500	SF-8W	PC-8W	PC-8W	CC-8W	PH-8W	HC-8W	AF-1	AF-1	AF-2	ENERGY LABS	ALL
AHU-9E	9TH FLOOR E	9TH FLOOR	DOUBLE DUCT	15,600	2,500	SF-9E	PC-9E	PC-9E	CC-9E	PH-9E	HC-9E	AF-1	AF-1	AF-2	ENERGY LABS	ALL
AHU-9W	9TH FLOOR W	9TH FLOOR	DOUBLE DUCT	15,600	2,500	SF-9W	PC-9W	PC-9W	CC-9W	PH-9W	HC-9W	AF-1	AF-1	AF-2	ENERGY LABS	ALL
AHU-10E	10TH FLOOR E	10TH FLOOR	DOUBLE DUCT	16,900	2,500	SF-10E	PC-10E	PC-10E	CC-10E	PH-10E	HC-10E	AF-1	AF-1	AF-2	ENERGY LABS	ALL
AHU-10W	10TH FLOOR W	10TH FLOOR	DOUBLE DUCT	16,900	2,500	SF-10W	PC-10W	PC-10W	CC-10W	PH-10W	HC-10W	AF-1	AF-1	AF-2	ENERGY LABS	ALL
AHU-11	PENTHOUSE	PENTHOUSE	SINGLE ZONE	5,000	0	SF-11	N/A	N/A	CC-11	N/A	N/A	N/A	N/A	AF-1	ENERGY LABS	ALL
OAHU-1	BSMT TO 2ND FLR	BSMT TO 2ND	OA PRETREAT	22,000	22,000	SF-OA1	N/A	N/A	CC-OA1	PH-OA1	N/A	AF-1	N/A	N/A	ENERGY LABS	ALL

NOTES: 1. PROVIDE WITH FACTORY WIRED SERVICE LIGHTING SYSTEM WITH SWITCH ENCLOSURE AND SINGLE POINT 120V, 1PH ELECTRICAL CONNECTION. SEAL INTERIOR & EXTERIOR OF ALL RACEWAY PENETRATIONS.
2. REFER TO M5XX SERIES DRAWINGS FOR CUSTOM AHU DRAWINGS AND CONFIGURATIONS.

AIR HANDLING UNIT FAN SCHEDULE (SF)

TAG	SYSTEM	LOCATION	MAX CFM	MIN CFM	ESP (IN WG)	TSP (IN WG)	FAN TYPE	DISCHARGE ORIENTATION	FAN CLASS	MECH EFF	MOTOR HP	MANUFACTURER	NOTES
SF-BE	AHU-BE	BASEMENT	13,400	4,020	3.30	5.60	OPEN BI	PLENUM	III	65%	25	ENERGY LABS	ALL
SF-BW	AHU-BW	BASEMENT	16,800	5,040	3.30	5.60	OPEN BI	PLENUM	III	65%	30	ENERGY LABS	ALL
SF-BH	AHU-BH	BASEMENT	8,500	2,550	2.30	3.75	HOUSED FC	TOP REAR	III	50%	15	ENERGY LABS	ALL
SF-1E	AHU-1E	2ND FLOOR	14,200	4,260	2.30	4.60	OPEN BI	PLENUM	III	65%	20	ENERGY LABS	ALL
SF-1W	AHU-1W	2ND FLOOR	12,250	3,675	2.30	4.60	OPEN BI	PLENUM	III	65%	20	ENERGY LABS	ALL
SF-1SW	AHU-1SW	2ND FLOOR	16,850	5,055	2.70	5.00	OPEN BI	PLENUM	III	65%	25	ENERGY LABS	ALL
SF-1SE	AHU-1SE	2ND FLOOR	16,850	5,055	2.70	5.00	OPEN BI	PLENUM	III	65%	25	ENERGY LABS	ALL
SF-2W	AHU-2W	2ND FLOOR	12,250	3,675	2.30	4.60	OPEN BI	PLENUM	III	65%	20	ENERGY LABS	ALL
SF-2E	AHU-2E	2ND FLOOR	14,200	4,260	2.30	4.60	OPEN BI	PLENUM	III	65%	20	ENERGY LABS	ALL
SF-3W	AHU-3W	3RD FLOOR	15,000	8,000	4.10	8.00	OPEN BI	PLENUM	III	65%	40	ENERGY LABS	ALL
SF-3E	AHU-3E	3RD FLOOR	15,000	4,500	3.10	7.00	OPEN BI	PLENUM	III	65%	40	ENERGY LABS	ALL
SF-4W	AHU-4W	4TH FLOOR	15,000	8,000	4.10	8.00	OPEN BI	PLENUM	III	65%	40	ENERGY LABS	ALL
SF-4E	AHU-4E	4TH FLOOR	15,000	4,500	3.10	7.00	OPEN BI	PLENUM	III	65%	40	ENERGY LABS	ALL
SF-5W	AHU-5W	5TH FLOOR	15,000	8,000	4.10	8.00	OPEN BI	PLENUM	III	65%	40	ENERGY LABS	ALL
SF-5E	AHU-5E	5TH FLOOR	15,000	4,500	3.10	7.00	OPEN BI	PLENUM	III	65%	40	ENERGY LABS	ALL
SF-6W	AHU-6W	6TH FLOOR	15,000	10,000	4.10	8.00	OPEN BI	PLENUM	III	65%	40	ENERGY LABS	ALL
SF-6E	AHW-6E	6TH FLOOR	15,000	4,500	3.10	7.00	OPEN BI	PLENUM	III	65%	40	ENERGY LABS	ALL
SF-7W	AHU-7W	7TH FLOOR	15,000	10,000	4.10	8.00	OPEN BI	PLENUM	III	65%	40	ENERGY LABS	ALL
SF-7E	AHU-7E	7TH FLOOR	15,000	4,500	3.10	7.00	OPEN BI	PLENUM	III	65%	40	ENERGY LABS	ALL
SF-8W	AHU-8W	8TH FLOOR	15,600	4,680	3.90	6.25	OPEN BI	PLENUM	III	65%	30	ENERGY LABS	ALL
SF-8E	AHU-8E	8TH FLOOR	15,600	4,680	3.90	6.25	OPEN BI	PLENUM	III	65%	30	ENERGY LABS	ALL
SF-9W	AHU-9W	9TH FLOOR	15,600	4,680	3.90	6.25	OPEN BI	PLENUM	III	65%	30	ENERGY LABS	ALL
SF-9E	AHU-9E	9TH FLOOR	15,600	4,680	3.90	6.25	OPEN BI	PLENUM	III	65%	30	ENERGY LABS	ALL
SF-10W	AHU-10W	10TH FLOOR	16,900	5,070	3.90	6.25	OPEN BI	PLENUM	III	65%	40	ENERGY LABS	ALL
SF-10E	AHU-10E	10TH FLOOR	16,900	5,070	3.90	6.25	OPEN BI	PLENUM	III	65%	40	ENERGY LABS	ALL
SF-11	AHU-11	PENTHOUSE	5,000	1,500	N/A	2.50	HOUSED FC	FRONT	III	50%	5	ENERGY LABS	ALL
SF-OA1	OAHU-1	BSMT TO 2ND	22,000	3,000	3.70	5.25	HOUSED AF	FRONT	III	60%	40	ENERGY LABS	ALL

NOTES: 1. PROVIDE 460V/3PH/60HZ PREMIUM EFFICIENCY FAN MOTORS
2. PROVIDE INVERTER DUTY MOTOR AND VARIABLE SPEED DRIVE
3. PROVIDE 24" MIN SECTION WITH DOOR ACCESS TO PLENUM FAN

CHILLED WATER PRECOOLING (PC) & COOLING (CC) COIL SCHEDULE

TAG	UNIT	AIR FLOW (CFM)	CAPACITY TOTAL (MBH)	CAPACITY SENSIBLE (MBH)	ENTERING AIR DB (DEG F)	ENTERING AIR WB (DEG F)	LEAVING AIR DB (DEG F)	LEAVING AIR WB (DEG F)	CHW EWT (DEG F)	CHW LWT (DEG F)	CHW FLOW (GPM)	CHW WPD (FT WG)	COIL QTY (EA)	COIL MIN ROWS	COIL MAX FPI	FINNED LEN (IN)	FINNED HEIGHT (IN)	FACE VEL (FPM)	MAX APD (IN WG)	MANUFACTURER	NOTES
CC-BE	AHU-BE	13,400	430	346	75.2	62.1	52.0	51.0	42	54	72	15	2	6	8	76	27.0	470	1.36	ENERGY LABS	ALL
CC-BW	AHU-BW	16,800	502	400	73.3	61.4	52.0	51.0	42	54	84	15	2	6	8	76	34.5	461	1.31	ENERGY LABS	ALL
CC-BH	AHU-BH	8,500	234	183	71.3	60.7	52.0	51.0	42	54	39	15	1	6	8	52	49.5	476	1.39	ENERGY LABS	ALL
CC-1E	AHU-1E	14,200	458	368	75.2	62.1	52.0	51.0	42	54	76	15	1	6	8	92	48.0	463	1.31	ENERGY LABS	ALL
CC-1W	AHU-1W	12,250	391	314	75.0	62.1	52.0	51.0	42	54	65	15	2	6	8	76	25.5	455	1.27	ENERGY LABS	ALL
CC-1SE	AHU-1SE	16,850	525	420	74.4	61.8	52.0	51.0	42	54	87	15	2	6	8	90	28.5	473	1.37	ENERGY LABS	ALL
CC-1SW	AHU-1SW	16,850	534	429	74.8	62.0	52.0	51.0	42	54	89	15	2	6	8	90	28.5	473	1.37	ENERGY LABS	ALL
CC-2E	AHU-2E	14,200	439	351	74.1	61.7	52.0	51.0	42	54	73	15	2	6	8	76	30.0	448	1.23	ENERGY LABS	ALL
CC-2W	AHU-2W	12,250	372	297	73.7	61.6	52.0	51.0	42	54	62	15	2	6	8	76	25.5	455	1.27	ENERGY LABS	ALL
PC-3E	AHU-3E	2,500	194	75	81.9	76.0	55.0	53.8	42	54	32	15	1	6	8	48	24.0	313	0.60	ENERGY LABS	ALL
CC-3E	AHU-3E	15,000	524	433	77.8	63.0	52.0	51.0	42	54	87	15	2	6	8	76	31.5	451	1.25	ENERGY LABS	ALL
PC-3W	AHU-3W	8,000	620	239	81.9	76.0	55.0	53.8	42	54	103	15	2	6	8	48	36.0	333	0.68	ENERGY LABS	ALL
CC-3W	AHU-3W	15,000	506	426	77.4	62.6	52.0	51.0	42	54	84	15	2	6	8	76	31.5	451	1.25	ENERGY LABS	ALL
PC-4E	AHU-4E	2,500	194	75	81.9	76.0	55.0	53.8	42	54	32	15	1	6	8	48	24.0	313	0.60	ENERGY LABS	ALL
CC-4E	AHU-4E	15,000	524	433	77.8	63.0	52.0	51.0	42	54	87	15	2	6	8	76	31.5	451	1.25	ENERGY LABS	ALL
PC-4W	AHU-4W	8,000	620	239	81.9	76.0	55.0	53.8	42	54	103	15	2	6	8	48	36.0	333	0.68	ENERGY LABS	ALL
CC-4W	AHU-4W	15,000	506	426	77.4	62.6	52.0	51.0	42	54	84	15	2	6	8	76	31.5	451	1.25	ENERGY LABS	ALL
PC-5E	AHU-5E	2,500	194	75	81.9	76.0	55.0	53.8	42	54	32	15	1	6	8	48	24.0	313	0.60	ENERGY LABS	ALL
CC-5E	AHU-5E	15,000	524	433	77.8	63.0	52.0	51.0	42	54	87	15	2	6	8	76	31.5	451	1.25	ENERGY LABS	ALL
PC-5W	AHU-5W	8,000	620	239	81.9	76.0	55.0	53.8	42	54	103	15	2	6	8	48	36.0	333	0.68	ENERGY LABS	ALL
CC-5W	AHU-5W	15,000	506	426	77.4	62.6	52.0	51.0	42	54	84	15	2	6	8	76	31.5	451	1.25	ENERGY LABS	ALL
PC-6E	AHU-6E	2,500	194	75	81.9	76.0	55.0	53.8	42	54	32	15	1	6	8	48	24.0	313	0.60	ENERGY LABS	ALL
CC-6E	AHU-6E	15,000	524	433	77.8	63.0	52.0	51.0	42	54	87	15	2	6	8	76	31.5	451	1.25	ENERGY LABS	ALL
PC-6W	AHU-6W	10,000	785	309	82.9	76.2	55.0	53.8	42	54	131	15	2	6	8	48	36.0	417	1.06	ENERGY LABS	ALL
CC-6W	AHU-6W	15,000	485	408	76.4	62.2	52.0	51.0	42	54	81	15	2	6	8	76	31.5	451	1.25	ENERGY LABS	ALL
PC-7E	AHU-7E	2,500	194	75	81.9	76.0	55.0	53.8	42	54	32	15	1	6	8	48	24.0	313	0.60	ENERGY LABS	ALL
CC-7E	AHU-7E	15,000	524	433	77.8	63.0	52.0	51.0	42	54	87	15	2	6	8	76	31.5	451	1.25	ENERGY LABS	ALL
PC-7W	AHU-7W	10,000	785	309	82.9	76.2	55.0	53.8	42	54	131	15	2	6	8	48	36.0	417	1.06	ENERGY LABS	ALL
CC-7W	AHU-7W	15,000	485	408	76.4	62.2	52.0	51.0	42	54	81	15	2	6	8	76	31.5	451	1.25	ENERGY LABS	ALL
PC-8E	AHU-7E	2,500	237	119	98.0	80.0	55.0	54.0	42	54	40	15	1	6	8	48	24.0	313	0.60	ENERGY LABS	ALL
CC-8E	AHU-8E	15,600	498	403	75.2	62.1	52.0	51.0	42	54	83	15	2	6	8	82	30.0	457	1.28	ENERGY LABS	ALL
PC-8W	AHU-8W	2,500	237	119	98.0	80.0	55.0	54.0	42	54	40	15	2	6	8	48	36.0	104	0.07	ENERGY LABS	ALL
CC-8W	AHU-8W	15,600	498	403	75.2	62.1	52.0	51.0	42	54	83	15	2	6	8	82	30.0	457	1.28	ENERGY LABS	ALL
PC-9E	AHU-9E	2,500	237	119	98.0	80.0	55.0	54.0	42	54	40	15	1	6	8	48	24.0	313	0.60	ENERGY LABS	ALL
CC-9E	AHU-9E	15,600	498	403	75.2	62.1	52.0	51.0	42	54	83	15	2	6	8	82	30.0	457	1.28	ENERGY LABS	ALL
PC-9W	AHU-9W	2,500	237	119	98.0	80.0	55.0	54.0	42	54	40	15	2	6	8	48	36.0	104	0.07	ENERGY LABS	ALL
CC-9W	AHU-9W	15,600	498	403	75.2	62.1	52.0	51.0	42	54	83	15	2	6	8	82	30.0	457	1.28	ENERGY LABS	ALL
PC-10E	AHU-10E	2,500	237	119	98.0	80.0	55.0	54.0	42	54	40	15	1	6	8	48	24.0	313	0.60	ENERGY LABS	ALL
CC-10E	AHU-10E	16,900	573	469	76.8	62.7	52.0	51.0	42	54	96	15	2	6	8	82	30.0	495	1.50	ENERGY LABS	ALL
PC-10W	AHU-10W	2,500	237	119	98.0	80.0	55.0	54.0	42	54	40	15	2	6	8	48	36.0	104	0.07	ENERGY LABS	ALL
CC-10W	AHU-10W	16,900	573	469	76.8	62.7	52.0	51.0	42	54	96	15	2	6	8	82	30.0	495	1.50	ENERGY LABS	ALL
CC-11	AHU-11	5,000	164	121	76.9	64.4	55.0	53.5	42	54	27	15	2	6	8	82	30.0	146	0.13	ENERGY LABS	ALL
CC-OA1	OAHU-1	22,000	2,089	1,049	98.0	80.0	55.0	54.0	42	54	348	20	2	6	8	88	42.0	429	1.13	ENERGY LABS	ALL

NOTES:
1. PROVIDE 300 SERIES STAINLESS STEEL COIL FRAMING, SUPPORTS, AND MOUNTING HARDWARE
2. CONFIGURE TUBE CIRCUITING FOR HIGH TURNDOWN RATIO

HEAT PIPE (HP) COIL SCHEDULE

TAG	UNIT	AIR FLOW (CFM)	SENSIBLE CAPACITY (MBH)	SENSIBLE EFF (PCT)	POSITION	ENTERING AIR DB (DEG F)	ENTERING AIR WB (DEG F)	LEAVING AIR DB (DEG F)	LEAVING AIR WB (DEG F)	COIL QTY (EA)	COIL MIN ROWS	COIL MAX FPI	FINNED LEN (IN)	FINNED HEIGHT (IN)	FACE VEL (FPM)	MAX APD (IN WG)	MANUFACTURER	NOTES
HP-3E	AHU-3E	2,500	43	37.4%	UPSTREAM	98.0	80.0	81.9	76.0	1	3	8	52	24.0	288	0.10	ENERGY LABS	ALL
					DOWNSTREAM	55.0	53.8	71.1	60.1	1	3	8	52	24.0	288	0.10	ENERGY LABS	ALL
HP-3W	AHU-3W	8,000	139	37.4%	UPSTREAM	98.0	80.0	81.9	76.0	2	3	8	52	37.5	295	0.11	ENERGY LABS	ALL
					DOWNSTREAM	55.0	53.8	71.1	60.1	2	3	8	52	37.5	295	0.11	ENERGY LABS	ALL
HP-4E	AHU-4E	2,500	43	37.4%	UPSTREAM	98.0	80.0	81.9	76.0	1	3	8	52	24.0	288	0.10	ENERGY LABS	ALL
					DOWNSTREAM	55.0	53.8	71.1	60.1	1	3	8	52	24.0	288	0.10	ENERGY LABS	ALL
HP-4W	AHU-4W	8,000	139	37.4%	UPSTREAM	98.0	80.0	81.9	76.0	2	3	8	52	37.5	295	0.11	ENERGY LABS	ALL
					DOWNSTREAM	55.0	53.8	71.1	60.1	2	3	8	52	37.5	295	0.11	ENERGY LABS	ALL
HP-5E	AHU-5E	2,500	43	37.4%	UPSTREAM	98.0	80.0	81.9	76.0	1	3	8	52	24.0	288	0.10	ENERGY LABS	ALL
					DOWNSTREAM	55.0	53.8	71.1	60.1	1	3	8	52	24.0	288	0.10	ENERGY LABS	ALL
HP-5W	AHU-5W	8,000	139	37.4%	UPSTREAM	98.0	80.0	81.9	76.0	2	3	8	52	37.5	295	0.11	ENERGY LABS	ALL
					DOWNSTREAM	55.0	53.8	71.1	60.1	2	3	8	52	37.5	295	0.11	ENERGY LABS	ALL
HP-6E	AHU-6E	2,500	43	37.4%	UPSTREAM	98.0	80.0	81.9	76.0	1	3	8	52	24.0	288	0.10	ENERGY LABS	ALL
					DOWNSTREAM	55.0	53.8	71.1	60.1	1	3	8	52	24.0	288	0.10	ENERGY LABS	ALL
HP-6W	AHU-6W	10,000	163	35.1%	UPSTREAM	98.0	80.0	82.9	76.2	2	3	8	52	37.5	369	0.16	ENERGY LABS	ALL
					DOWNSTREAM	55.0	53.8	70.1	59.7	2	3	8	52	37.5	369	0.16	ENERGY LABS	ALL
HP-7E	AHU-7E	2,500	43	35.1%	UPSTREAM	98.0	80.0	81.9	76.0	1	3	8	52	24.0	288	0.10	ENERGY LABS	ALL
					DOWNSTREAM	55.0	53.8	71.1	60.1	1	3	8	52	24.0	288	0.10	ENERGY LABS	ALL
HP-7W	AHU-7W	10,000	163	35.1%	UPSTREAM	98.0	80.0	82.9	76.2	2	3	8	52	37.5	369	0.16	ENERGY LABS	ALL
					DOWNSTREAM	55.0	53.8	70.1	59.7	2	3	8	52	37.5	369	0.16	ENERGY LABS	ALL
HP-8E	AHU-8E	2,500	43	37.4%	UPSTREAM	98.0	80.0	81.9	76.0	1	3	8	52	24.0	288	0.10	ENERGY LABS	ALL
					DOWNSTREAM	55.0	53.8	71.1	60.1	1	3	8	52	24.0	288	0.10	ENERGY LABS	ALL
HP-8W	AHU-8W	2,500	43	37.4%	UPSTREAM	98.0	80.0	81.9	76.0	1	3	8	52	24.0	288	0.10	ENERGY LABS	ALL
					DOWNSTREAM	55.0	53.8	71.1	60.1	1	3	8	52	24.0	288	0.10	ENERGY LABS	ALL
HP-9E	AHU-9E	2,500	43	37.4%	UPSTREAM	98.0	80.0	81.9	76.0	1	3	8	52	24.0	288	0.10	ENERGY LABS	ALL
					DOWNSTREAM	55.0	53.8	71.1	60.1	1	3	8	52	24.0	288	0.10	ENERGY LABS	ALL
HP-9W	AHU-9W	2,500	43	37.4%	UPSTREAM	98.0	80.0	81.9	76.0	1	3	8	52	24.0	288	0.10	ENERGY LABS	ALL
					DOWNSTREAM	55.0	53.8	71.1	60.1	1	3	8	52	24.0	288	0.10	ENERGY LABS	ALL
HP-10E	AHU-10E	2,500	43	37.4%	UPSTREAM	98.0	80.0	81.9	76.0	1	3	8	52	24.0	288	0.10	ENERGY LABS	ALL
					DOWNSTREAM	55.0	53.8	71.1	60.1	1	3	8	52	24.0	288	0.10	ENERGY LABS	ALL
HP-10W	AHU-10W	2,500	43	37.4%	UPSTREAM	98.0	80.0	81.9	76.0	1	3	8	52	24.0	288	0.10	ENERGY LABS	ALL
					DOWNSTREAM	55.0	53.8	71.1	60.1	1	3	8	52	24.0	288	0.10	ENERGY LABS	ALL

NOTES:
1. PROVIDE 300 SERIES STAINLESS STEEL COIL FRAMING, SUPPORTS, AND MOUNTING HARDWARE.
2. NOT USED.

AIR FILTER SCHEDULE (AF)

TAG	FACE VELOCITY (FPM)	FILTER UNITS EFFICIENCY RATING	DEPTH (IN)	MEDIA STYLE	FORM FACTOR	INITIAL APD (IN WG)	FINAL APD (IN WG)
AF-1	350	MERV 8	2"	PLEATED	PANEL	0.15	0.50
AF-2	350	MERV 13	4"	PLEATED	PANEL	0.30	1.00

NOTES:

HOT WATER PREHEAT (PH) & HEATING (HC) COIL SCHEDULE

TAG	UNIT	AIR FLOW (CFM)	HEATING CAP (MBH)	AIR TEMP EAT (DEG F)	AIR TEMP LAT (DEG F)	HOT WATER EWT (DEG F)	HOT WATER LWT (DEG F)	HOT WATER FLOW (GPM)	HOT WATER WPD (FT WG)	COIL QTY (EA)	COIL MIN ROWS	COIL MAX FPI	FINNED LENGTH (IN)	FINNED WIDTH (IN)	FACE VEL (FPM)	MAX APD (IN WG)	MANUFACTURER	NOTES
HC-BE	AHU-BE	10,000	267	65.3	90.0	180	150	17.8	5	1	1	8	45	45.0	711	0.18	ENERGY LABS	ALL
HC-BW	AHU-BW	12,750	369	63.2	90.0	180	150	24.6	5	1	1	8	60	45.0	680	0.17	ENERGY LABS	ALL
HC-1E	AHU-1E	10,650	275	66.1	90.0	180	150	18.3	5	1	1	8	88	25.5	683	0.17	ENERGY LABS	ALL
HC-1W	AHU-1W	9,200	240	65.8	90.0	180	150	16.0	5	1	1	8	45	45.0	654	0.15	ENERGY LABS	ALL
HC-1SE	AHU-1SE	12,650	344	64.8	90.0	180	150	23.0	5	1	1	8	90	28.5	710	0.18	ENERGY LABS	ALL
HC-1SW	AHU-1SW	12,650	337	65.3	90.0	180	150	22.5	5	1	1	8	90	28.5	710	0.18	ENERGY LABS	ALL
HC-2E	AHU-2E	10,650	289	64.8	90.0	180	150	19.3	5	1	1	8	60	45.0	568	0.12	ENERGY LABS	ALL
HC-2W	AHU-2W	9,200	255	64.3	90.0	180	150	17.0	5	1	1	8	45	45.0	654	0.15	ENERGY LABS	ALL
PH-3E	AHU-3E	2,500	108	20.0	60.0	180	150	7.2	5	1	1	8	48	24.0	313	0.04	ENERGY LABS	ALL
HC-3E	AHU-3E	11,250	304	65.0	90.0	180	150	20.3	5	1	1	8	60	45.0	600	0.13	ENERGY LABS	ALL
PH-3W	AHU-3W	8,000	346	20.0	60.0	180	150	23.0	5	2	1	8	48	36.0	333	0.04	ENERGY LABS	ALL
HC-3W	AHU-3W	11,250	384	58.4	90.0	180	150	25.6	5	1	1	8	60	45.0	600	0.13	ENERGY LABS	ALL
PH-4E	AHU-4E	2,500	108	20.0	60.0	180	150	7.2	5	1	1	8	48	24.0	313	0.04	ENERGY LABS	ALL
HC-4E	AHU-4E	11,250	304	65.0	90.0	180	150	20.3	5	1	1	8	60	45.0	600	0.13	ENERGY LABS	ALL
PH-4W	AHU-4W	8,000	346	20.0	60.0	180	150	23.0	5	2	1	8	48	36.0	333	0.04	ENERGY LABS	ALL
HC-4W	AHU-4W	11,250	384	58.4	90.0	180	150	25.6	5	1	1	8	60	45.0	600	0.13	ENERGY LABS	ALL
PH-5E	AHU-5E	2,500	108	20.0	60.0	180	150	7.2	5	1	1	8	48	24.0	313	0.04	ENERGY LABS	ALL
HC-5E	AHU-5E	11,250	304	65.0	90.0	180	150	20.3	5	1	1	8	60	45.0	600	0.13	ENERGY LABS	ALL
PH-5W	AHU-5W	8,000	346	20.0	60.0	180	150	23.0	5	2	1	8	48	36.0	333	0.04	ENERGY LABS	ALL
HC-5W	AHU-5W	11,250	384	58.4	90.0	180	150	25.6	5	1	1	8	60	45.0	600	0.13	ENERGY LABS	ALL
PH-6E	AHU-6E	2,500	108	20.0	60.0	180	150	7.2	5	1	1	8	48	24.0	313	0.04	ENERGY LABS	ALL
HC-6E	AHU-6E	11,250	304	65.0	90.0	180	150	20.3	5	1	1	8	60	45.0	600	0.13	ENERGY LABS	ALL
PH-6W	AHU-6W	10,000	432	20.0	60.0	180	150	28.8	5	2	1	8	48	36.0	417	0.06	ENERGY LABS	ALL
HC-6W	AHU-6W	11,250	413	56.0	90.0	180	150	27.5	5	1	1	8	60	45.0	600	0.13	ENERGY LABS	ALL
PH-7E	AHU-7E	2,500	108	20.0	60.0	180	150	7.2	5	1	1	8	48	24.0	313	0.04	ENERGY LABS	ALL
HC-7E	AHU-7E	11,250	304	65.0	90.0	180	150	20.3	5	1	1	8	60	45.0	600	0.13	ENERGY LABS	ALL
PH-7W	AHU-7W	10,000	432	20.0	60.0	180	150	28.8	5	2	1	8	48	36.0	417	0.06	ENERGY LABS	ALL
HC-7W	AHU-7W	11,250	413	56.0	90.0	180	150	27.5	5	1	1	8	60	45.0	600	0.13	ENERGY LABS	ALL
PH-8E	AHU-8E	2,500	108	20.0	60.0	180	150	7.2	5	1	1	8	48	24.0	313	0.04	ENERGY LABS	ALL
HC-8E	AHU-8E	11,750	316	65.1	90.0	180	150	21.1	5	1	1	8	60	45.0	627	0.14	ENERGY LABS	ALL
PH-8W	AHU-8W	2,500	108	20.0	60.0	180	150	7.2	5	1	1	8	48	24.0	313	0.04	ENERGY LABS	ALL
HC-8W	AHU-8W	11,750	316	65.1	90.0	180	150	21.1	5	1	1	8	60	45.0	627	0.14	ENERGY LABS	ALL
PH-9E	AHU-9E	2,500	108	20.0	60.0	180	150	7.2	5	1	1	8	48	24.0	313	0.04	ENERGY LABS	ALL
HC-9E	AHU-9E	11,750	316	65.1	90.0	180	150	21.1	5	1	1	8	60	45.0	627	0.14	ENERGY LABS	ALL
PH-9W	AHU-9W	2,500	108	20.0	60.0	180	150	7.2	5	1	1	8	48	24.0	313	0.04	ENERGY LABS	ALL
HC-9W	AHU-9W	11,750	316	65.1	90.0	180	150	21.1	5	1	1	8	60	45.0	627	0.14	ENERGY LABS	ALL
PH-10E	AHU-10E	2,500	108	20.0	60.0	180	150	7.2	5	1	1	8	48	24.0	313	0.04	ENERGY LABS	ALL
HC-10E	AHU-10E	12,750	340	65.3	90.0	180	150	22.6	5	1	1	8	60	45.0	680	0.17	ENERGY LABS	ALL
PH-10W	AHU-10W	2,500	108	20.0	60.0	180	150	7.2	5	1	1	8	48	24.0	313	0.04	ENERGY LABS	ALL
HC-10W	AHU-10W	12,750	340	65.3	90.0	180	150	22.6	5	1	1	8	60	45.0	680	0.17	ENERGY LABS	ALL
PH-OA1	OAHU-1	22,000	950	20.0	60.0	180	150	63.4	15	2	2	8	74	36.0	595	0.13	ENERGY LABS	ALL

NOTES:
1. PROVIDE 300 SERIES STAINLESS STEEL COIL FRAMING, SUPPORTS, AND HARDWARE
2. PROVIDE REDUCED FACE HEATING COIL AND BLANK-OFF PLATE AS REQUIRED TO ACHIEVE MINIMUM COIL FACE VELOCITY

TEMPORARY AIR HANDLING UNIT SCHEDULE

PLAN MARK	NUMBER OF UNITS	LOCATION (ROOM NO)	TYPE	TOTAL AIRFLOW (CFM)	MINIMUM OA (CFM)	SUPPLY FAN ESP/TSP (INWG)	SUPPLY FAN TYPE	SUPPLY FAN HP	CHW COIL CAPACITY TOTAL MBH	CAPACITY SENS MBH	MAX FACE VEL	EAT DB (°F)	EAT WB (°F)	LAT DB/WB (°F)	WATER FLOW (GPM)	EWT (°F)	LWT (°F)	MAX PD AIR (IN)	MAX PD WATER (FT)	MANUFACTURER	NOTES
TEMPORARY AHU	4	LOBBY	TOP DISHCHARGED	6,600	N/A	4.0/5.5	FC	10	381.2	222.9	550	83.1	70.3	52.8/53.3	63.1	42	54	1	20	TRANE	ALL

NOTES:
1. PROVIDE KNOCK-DOWN MODULAR UNITS WITH FILTER, COIL AND FAN SECTIONS.
2. UNIT MODULES MUST BE SIZED TO FIT INTO EXISTING FREIGHT ELEVATOR.
3. PROVIDE MERV-8 AIR FILTERS WITH MERV-3 BULK MEDIA. REPLACE AS REQUIRED THROUGHOUT PRE-FILTER TEMPORARY OPERATION.
4. NOT USED
5. PROVIDE POWER AT 460/3/60.
6. PROVIDE FANS WITH VFD.
7. CHILLED WATER COIL SHALL BE UTILIZED FOR HEATING ALSO DEPENDING ON UNIT OPERATION.

HOT WATER HEATING COIL SCHEDULE (DUCT MOUNTED)

MARK	SERVICE	NOMINAL CFM	COIL VEL. FPM	PD W. IN.	EAT	LAT	TOTAL. CAP. BTU/HR	EWT/LWT DEG F	FLOW GPM	MAKE	MODEL	REMARKS
HC-A	BASEMENT LAB	260	500	0.32	62	95	9,828	180/150	0.6	TRANE	TYPE D	1, 2, 3

NOTES:
1. PROVIDE NECESSARY BRACKETS TO SECURE COIL ONTO DUCTWORK.
2. COIL SIZE SHALL BE SAME AS DUCT SIZE. REFER THE DRAWINGS FOR DUCT SIZES.
3. COIL TO BE 2 ROWS WITH MAXIMUM OF 8 FINS PER INCH.

Infrastructure Associates
INFRASTRUCTURE ASSOCIATES, INC.
6117 RICHMOND AVENUE, SUITE 200
HOUSTON, TEXAS 77057
TBPE REGISTRATION NO. F-4506
(713) 622-0120 PH (713) 622-0557 FAX
WWW.IAHOUSTON.COM

UTHealth
The University of Texas Health Science Center at Houston
School of Public Health

UT HEALTH SCIENCE SCHOOL OF PUBLIC HEALTH

1200 PRESSLER ST.
HOUSTON, TX 77030

STATE OF TEXAS — MATT A FLUKINGER — 119970 — LICENSED PROFESSIONAL ENGINEER
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REVISIONS

05/31/2017	ISSUED FOR BID
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Title
SCHEDULES

Sheet
M002
ISSUED FOR BID

VARIABLE AIR VOLUME TERMINAL SCHEDULE

MARK	LOCATION	INLET SIZE	SUPPLY AIR FLOW RATE (CFM)		HOT WATER RE-HEAT COIL							BASIS OF DESIGN		REMARKS
		INCHES	MAX	MIN	CAPACITY (BTUH)	FLOW (GPM)	EWT (F)	LWT (F)	WPD (FT)	ROWS	APD (IN-WG)	MANUFACTURER	MODEL	
VAV BH-1-1	BASEMENT	14	1500	450	17,010	1.70	180	160	0.33	2	0.2"	TITUS	DESV	1
VAV BH-1-2	BASEMENT	8	620	180	6,804	0.68	180	160	0.33	2	0.2"	TITUS	DESV	1
VAV BH-1-3	BASEMENT	6	435	130	4,914	0.49	180	160	0.33	2	0.2"	TITUS	DESV	1
VAV BH-1-4	BASEMENT	9	900	270	10,206	1.02	180	160	0.33	2	0.2"	TITUS	DESV	1
VAV BH-1-5	BASEMENT	9	810	240	9,072	0.91	180	160	0.65	2	0.2"	TITUS	DESV	1
VAV BH-1-6	BASEMENT	10	1130	340	12,852	1.29	180	160	0.65	2	0.2"	TITUS	DESV	1
VAV BH-1-7	BASEMENT	9	820	250	9,450	0.95	180	160	0.33	2	0.2"	TITUS	DESV	1
VAV BH-1-8	BASEMENT	10	980	300	11,340	1.13	180	160	0.33	2	0.2"	TITUS	DESV	1
VAV BH-1-9	BASEMENT (MECH ROOM)	5	300	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TITUS	DESV	1
VAV 2-1	2ND FLOOR	7	515	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TITUS	DESV	1
VAV 2-2	2ND FLOOR	7	515	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TITUS	DESV	1
VAV 3-1	3RD FLOOR	9	850	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TITUS	DESV	1
VAV 4-1	4TH FLOOR	9	850	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TITUS	DESV	1
VAV 5-1	5TH FLOOR	9	850	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TITUS	DESV	1
VAV 6-1	6TH FLOOR	9	850	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TITUS	DESV	1
VAV 7-1	7TH FLOOR	9	850	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TITUS	DESV	1
VAV 8-1	8TH FLOOR	9	850	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TITUS	DESV	1
VAV-8-2	8TH FLOOR	10	1000	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TITUS	DESV	1
VAV-8-3	8TH FLOOR	10	1000	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TITUS	DESV	1
VAV-8-4	8TH FLOOR	10	1000	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TITUS	DESV	1
VAV 9-1	9TH FLOOR	9	850	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TITUS	DESV	1
VAV 10-1	10TH FLOOR	9	850	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	TITUS	DESV	1

NOTES
1. PROVIDE UNITS WITH FACTORY MOUNTED BAS CONTROLLERS

PUMP SCHEDULE

MARK	LOCATION	SYSTEM	PUMP TYPE	PUMP			MOTOR			CASING			MANUFACTURER	MODEL	NOTES
				FLOW (GPM)	HEAD (FT WG)	EFFICIENCY (%)	HP	V/P/H	RPM	SUCT (IN)	DISCH (IN)	IMPEL (IN)			
HWP-1	CENTER PLANT ROOM/ BASEMENT	HOT WATER	END SUCTION	1,100	125	80	50	480/3/60	1,770	6	5	12.125	B & G	E-1510 5GB	1, 2, 3
HWP-2	CENTER PLANT ROOM/ BASEMENT	HOT WATER	END SUCTION	1,100	125	80	50	480/3/60	1,770	6	5	12.125	B & G	E-1510 5GB	1, 2, 3
OAPH-P-OA-I	3RD FLOOR/MECHANICAL ROOM	HOT WATER (FRZ PROT)	IN-LINE	60	5	70	1/2	115/1/60	1,750	1.5	1.5	4.25	B & G	PL-36	4
OAPH-P-3E	3RD FLOOR/MECHANICAL ROOM	HOT WATER (FRZ PROT)	IN-LINE	7.2	5	70	1/6	115/1/60	1,750	1.5	1.5	3	B & G	PL-36	4
OAPH-P-3W	3RD FLOOR/MECHANICAL ROOM	HOT WATER (FRZ PROT)	IN-LINE	23	5	70	1/6	115/1/60	1,750	1.5	1.5	4.25	B & G	PL-36	4
OAPH-P-4E	4TH FLOOR/MECHANICAL ROOM	HOT WATER (FRZ PROT)	IN-LINE	7.2	5	70	1/6	115/1/60	1,750	1.5	1.5	3	B & G	PL-36	4
OAPH-P-4W	4TH FLOOR/MECHANICAL ROOM	HOT WATER (FRZ PROT)	IN-LINE	23	5	70	1/6	115/1/60	1,750	1.5	1.5	4.25	B & G	PL-36	4
OAPH-P-5E	5TH FLOOR/MECHANICAL ROOM	HOT WATER (FRZ PROT)	IN-LINE	7.2	5	70	1/6	115/1/60	1,750	1.5	1.5	3	B & G	PL-36	4
OAPH-P-5W	5TH FLOOR/MECHANICAL ROOM	HOT WATER (FRZ PROT)	IN-LINE	23	5	70	1/6	115/1/60	1,750	1.5	1.5	4.25	B & G	PL-36	4
OAPH-P-6E	6TH FLOOR/MECHANICAL ROOM	HOT WATER (FRZ PROT)	IN-LINE	7.2	5	70	1/6	115/1/60	1,750	1.5	1.5	3	B & G	PL-36	4
OAPH-P-6W	6TH FLOOR/MECHANICAL ROOM	HOT WATER (FRZ PROT)	IN-LINE	23	5	70	1/6	115/1/60	1,750	1.5	1.5	4.25	B & G	PL-36	4
OAPH-P-7E	7TH FLOOR/MECHANICAL ROOM	HOT WATER (FRZ PROT)	IN-LINE	7.2	5	70	1/6	115/1/60	1,750	1.5	1.5	3	B & G	PL-36	4
OAPH-P-7W	7TH FLOOR/MECHANICAL ROOM	HOT WATER (FRZ PROT)	IN-LINE	23	5	70	1/6	115/1/60	1,750	1.5	1.5	4.25	B & G	PL-36	4
OAPH-P-8E	7TH FLOOR/MECHANICAL ROOM	HOT WATER (FRZ PROT)	IN-LINE	7.2	5	70	1/6	115/1/60	1,750	1.5	1.5	3	B & G	PL-36	4
OAPH-P-8W	7TH FLOOR/MECHANICAL ROOM	HOT WATER (FRZ PROT)	IN-LINE	7.2	5	70	1/6	115/1/60	1,750	1.5	1.5	3	B & G	PL-36	4
OAPH-P-9E	7TH FLOOR/MECHANICAL ROOM	HOT WATER (FRZ PROT)	IN-LINE	7.2	5	70	1/6	115/1/60	1,750	1.5	1.5	3	B & G	PL-36	4
OAPH-P-9W	7TH FLOOR/MECHANICAL ROOM	HOT WATER (FRZ PROT)	IN-LINE	7.2	5	70	1/6	115/1/60	1,750	1.5	1.5	3	B & G	PL-36	4
OAPH-P-10E	7TH FLOOR/MECHANICAL ROOM	HOT WATER (FRZ PROT)	IN-LINE	7.2	5	70	1/6	115/1/60	1,750	1.5	1.5	3	B & G	PL-36	4
OAPH-P-10W	7TH FLOOR/MECHANICAL ROOM	HOT WATER (FRZ PROT)	IN-LINE	7.2	5	70	1/6	115/1/60	1,750	1.5	1.5	3	B & G	PL-36	4

NOTES:
1. PROVIDE WITH PREMIUM HIGH EFFICINECY TEFC MOTORS
2. PROVIDE PUMP WITH WALL MOUNTED VFD AND INVERTER DUTY MOTOR
3. PROVIDE PUMP WITH SUCTION DIFFUSER
4. PROVIDE PUMP WITH HOA MOTOR STARTER

EXPANSION TANK SCHEDULE

PLAN MARK	TYPE	LOCATION	SERVICE	MINIMUM TANK VOLUME (GAL)	MINIMUM ACCEPT VOLUME (GAL)	INITIAL FILL PRESSURE (PSI)	MAXIMUM PRESSURE (PSI)	MAX. TEMPERATURE	ASME M.W.P. (PSI)	MAKE AND MODEL	NOTES
ET-1	BLADDER	PENTHOUSE	HOT WATER	340	210	13	56	200	150	B &G B-1400	ALL

NOTES:
1. PROVIDE TANK WITH 75 PSIG RELIEF VALVE.
2. EXPASNION TANK SHALL BE VERTICAL CONFIGURATION.

EXHAUST FAN SCHEDULE

FAN TAG	SERVICE	AIR VOLUME CFM	FAN TYPE	DRIVE TYPE	ESP (IN-WC)	FAN SPEED RPM	MOTOR			MANUFACTURER & MODEL	LOCATION	REMARKS
							HP	V/PH/Hz	RPM			
EF-7-1	7TH FLOOR - W	4,000	HI-PLUME LAB EXHAUST	BELT	2.75	2,821	5	460/3/60	3,600	GREENHECK VECTOR	ROOF	1, 2, 3, 4, 5, 8
EF-7-2	7TH FLOOR - W	4,000	HI-PLUME LAB EXHAUST	BELT	2.75	2,821	5	460/3/60	3,600	GREENHECK VECTOR	ROOF	1, 2, 3, 4, 5, 8
EF-BY-PASS	LAB	45,000	MEDIUM PRESSURE AXIAL	BELT	3.00	1,226	50	460/3/60	1,725	GREENHECK TBI-FS-5L48-250	ROOF	2, 3, 4, 5, 6
EF-10N	STAIRWELL	3,850	CENTRIFUGAL	BELT	1.00	1,236	2	460/3/60	1,325	GREENHECK OR EQ	ROOF	4, 5, 6, 7
EF-PI	PENTHOUSE	5,000	CENTRIFUGAL	BELT	1.00	1,236	5	460/3/60	1,325	GREENHECK OR EQ	ROOF	4, 5, 7, 8

NOTES:
1. PROVIDE FACTORY ASSEMBLED LAB EXHAUST SYSTEMS INCLUDING FAN DISCHARGE NOZZLE, PLENUM, BYPASS DAMPERS, AND CONTROLLERS & AIR FLOR MONITORING STATION
2. PROVIDE HIGH WIND FAN SYSTEMS CERTIFIED FOR TDI #RV-88 COMPLIANCE
3. PROVIDE FAN WHEEL AND INTERIOR FAN HOUSING COATED WITH HEAT-CURED PHENOLIC HERESITE.
4. PROVIDE FAN SYSTEMS WITH UNIT MOUNTED DISCONNECT SWITCH & SINGLE POINT ELECTRICAL CONNECTION.
5. PROVIDE PREMIUM HIGH EFFICIENCY TEFC FAN MOTOR.
6. PROVIDE UNIT WITH WALL MOUNTED HOA STARTER
7- PROVIDE MOTORIZED DAMPER AND CONTORLS WITH THE FAN
8. PROVIDE UNIT WITH WALL MOUNTED VFD AND INVERTER DUTY FAN MOTOR.

STEAM TO HOT WATER HEAT EXCHANGER SCHEDULE (HX)

TAG	LOCATION	SYSTEM SERVED	LENGTH (IN)	DIA (IN)	U-VALUE (BTU/SF °F)	AREA (SF)	PASSES	HEATED WATER (TUBES)					STEAM (SHELL)					MANUFACTURER	NOTES
								EWT (DEG F)	LWT (DEG F)	FLOW (GPM)	WPD (FT WG)	ASME PRESSURE CLASS	PRESSURE (PSIG)	TEMP. (F)	HEAT LOAD (MBH)	STEAM FLOW (LB/HR)	ASME PRESS CLASS		
HX-1	CENTER PLANT ROOM BASEMENT	HEATING SYSTEM	94.7	20"	740	194	2	150	165	1100	5	150	60	400	8,250	7,600	250	B & G	ALL
HX-2	CENTER PLANT ROOM BASEMENT	HEATING SYSTEM	94.7	20"	740	194	2	165	180	1100	5	150	60	400	8,250	7,800	250	B & G	ALL

NOTES
1. PROVIDE HEAT EXCHANGERS WITH MARINE WATER BOX CONNECTIONS

CONDENSATION RETURN UNIT SCHEDULE

MARK	LOCATION	SYSTEM	PUMP TYPE	CAPACITY (PPH)	RECEIVER (GAL)	MAXIMUM TEMP (°F)	PUMP			MOTOR			MANUFACTURER	MODEL	NOTES
							FLOW (GPM)	HEAD (PSIG)	EFFICIENCY (%)	HP	V/P/H	RPM			
CRU-1	PUMP ROOM	BUILDING	DUPLEX	22,500	75	200	90	50	76	5	480/3/60	3500	B & G	120CBE90-50	1, 2, 3
CRU-2	PUMP ROOM	BUILDING	DUPLEX	22,500	75	200	90	50	76	5	480/3/60	3500	B & G	120CBE90-50	1, 2, 3

NOTES:
1. PROVIDE PRE-WIRED UNIT COMPLETEW ITH MANUFACTURER'S CONTROL PANEL & SINGLE POINT ELECTRICAL CONNECTION.
2. PROVIDE UNITS WITH EPOXY COATED OR STAINLES STEEL RECEIVERS, FLOAT SWITCHES, SIGHT GLASS & DIAL THERMOMETERS.
3. PROVIDE MANUFACTURERS PRE-PIPED UNITS COMPLETE WITH DUTY/STANDBY PUMPS, STRAINERS, CHECK VALVES, ISOLATION VALVES, & DISCHARGE PRESSURE GAUGE.

FAN COIL UNIT SCHEDULE

MARK	LOCATION	AIRFLOW (CFM)	UNIT CONFIGURATION	FAN			CHILLED WATER COIL								MAKE	NOTES
				E.S.P. (IN. WC.)	MOTOR (HP)	MOTOR V/PH/HZ	CAPACITY		FACE VELOCITY (FPM)	ENTERING AIR TEMPERATURE		LEAVING AIR TEMPERATURE		WATER FLOW (GPM)	EWT (°F)	LWT (°F)	MAX PRESSURE DROP WATER (FT)		
							TOTAL (MBH)	SENSIBLE (MBH)		DB (°F)	WB (°F)	DB (°F)	WB (°F)						
FCU-B-1	BASEMENT	2,000	HORIZONTAL	0.5	1	460/3/60	90.0	61.0	514	75.0	62.0	52.0	51.2	15.0	42	54	10	TRANE	1,2,3,4,5,6,8
FCU-B-2	BASEMENT	2,000	HORIZONTAL	0.5	1	460/3/60	90.0	61.0	514	75.0	62.0	52.0	51.2	15.0	42	54	10	TRANE	1,2,3,4,5,6,8
FCU-2-1A	2ND FLOOR (ELEC. ROOM)	1,500	VERTICAL	0.5	1.5	460/3/60	62.3	41.5	450	75.0	62.0	54.4	53.6	10.3	42	54	15	TRANE (TEMPSPEC VUF)	2,3,5,6,7,8,9,10,11
FCU-2-1B	2ND FLOOR (ELEC. ROOM)	1,500	VERTICAL	0.5	1.5	460/3/60	62.3	41.5	450	75.0	62.0	54.4	53.6	10.3	42	54	15	TRANE (TEMPSPEC VUF)	2,3,5,6,7,8,9,10,11
FC4W-1	4TH FLOOR	1,300	HORIZONTAL	1.0	1	460/3/60	54.0	35.9	488	75.0	62.0	52.0	51.2	10.8	42	54	10	TRANE	1,2,3,4,5,6,8
FC4W-2	4TH FLOOR	1,400	HORIZONTAL	1.0	1	460/3/60	54.2	38.7	525	75.0	62.0	52.0	51.2	11.4	42	54	10	TRANE	1,2,3,4,5,6,8
FC4W-3	4TH FLOOR	4,150	HORIZONTAL	0.5	3	460/3/60	172.3	114.8	500	75.0	62.0	52.0	51.2	13.5	42	54	15	TRANE	1,2,3,4,5,6,8
FC4W-4	4TH FLOOR	1,630	HORIZONTAL	1.0	1	460/3/60	67.7	45.1	500	75.0	62.0	52.0	51.2	4.8	42	54	15	TRANE	1,2,3,4,5,6,8
FC5W-1	5TH FLOOR	1,400	HORIZONTAL	1.0	1	460/3/60	35.0	38.7	500	75.0	62.0	52.0	51.2	4.6	42	54	15	TRANE	1,2,3,4,5,6,8
FC5W-2	5TH FLOOR	2,500	HORIZONTAL	1.0	1	460/3/60	103.9	69.2	500	75.0	62.0	52.0	51.2	8.1	42	54	15	TRANE	1,2,3,4,5,6,8
FC5W-3	5TH FLOOR	2,400	HORIZONTAL	1.0	1	460/3/60	99.7	66.4	500	75.0	62.0	52.0	51.0	7.8	42	54	15	TRANE	1,2,3,4,5,6,8

NOTES:
1. INSTALL AUXILIARY DRAIN PAN UNDER UNIT.
2. PROVIDE MERV-8 (2") DEEP FLAT FILTER WITH THE UNIT.
3. PROVIDE UNIT WITH SINGLE POINT POWER CONNECTION.
4. PROVIDE SUSPENDED UNIT WITH SPRING ISOLATOR.
5. PROVIDE UNIT WITH STAINLESS STEEL DRAIN PAN.
6. PROVIDE WATER SENSING DEVICE IN THE PRIMARY DRAIN PAN.
7. PROVIDE CONDENSATE PUMP WITH THE UNIT.
8. PROVIDE UNIT WITH ECM MOTORS
9. PROVIDE UNIT WITH FACTORY ACOUSTIC PLENUM, WITH FREE DISCHARGE GRILLE.

STEAM TRAP SCHEDULE

MARK	SERVICE	TYPE	MIN CAP (PPH)	MIN DIFF. PRES (PSID)	SIZE (IN)	ANSI CLASS	NOTES
ST-1A	HX-1	FLOAT & THERMOSTATIC	24,000	0.5	2 1/2	125	1
ST-1B	HX-1	FLOAT & THERMOSTATIC	24,000	0.5	2 1/2	125	1
ST-2A	HX-2	FLOAT & THERMOSTATIC	24,000	0.5	2 1/2	125	1
ST-2B	HX-2	FLOAT & THERMOSTATIC	24,000	0.5	2 1/2	125	1
ST-M1	MAIN	THERMODYNAMIC	384	200	1/2	300	
ST-M2	MAIN	THERMODYNAMIC	250	50	1/2	150	
ST-M3	MAIN	THERMODYNAMIC	250	50	1/2	150	
ST-M4	MAIN	THERMODYNAMIC	250	50	1/2	150	

NOTES:
1- SELECT FLOAT LEVER FOR 60 PSIG MAXIMUM OPERATION INLET PRESSURE.

STEAM TEMPERATURE REGULATOR SCHEDULE

MARK	SERVICE	SIZE (IN)	MIN Cv	ANSI CLASS	SETPOINT (°F)	NOTES
STR-1A	HX-1PRIMARY	2	34	125	155	1,2
STR-1B	HX-1 SECONDARY	4	82	125	165	1,2
STR-2A	HX-2 PRIMARY	2	34	125	170	1,2
STR-2B	HX-2 SECONDARY	4	82	125	180	1,2

NOTES:
1- PROVIDE PILOT OPERATED ADJUSTABLE TEMPERATURE REGULATORS.
2- PROVIDE REGULATORS WITH OUTLET NOISE DIFFUSERS

STEAM PRESSURE REGULATOR SCHEDULE

MARK	SERVICE	VALVE BODY		CAPACITY			INLET STEAM		MAX	PILOT PRES		NOTES
		SIZE (IN)	ANSI CLASS	FLOW (PPH)	PORT TYPE	MIN Cv	PRES (PSIG)	TEMP (F)	PRES (PSIG)	RANGE (PSIG)	SETPOINT (PSIG)	
SPR-1A	MPS PONY	0.5	300	1,500	FULL	3.5	250	450	400	10-100	65	1,2
SPR-1B	MPS PRI	2	300	7,900	REDUCED	17.5	250	450	400	10-100	61	1,2
SPR-1C	MPS SEC	3	300	25,000	REDUCED	55	250	450	400	10-100	59	1,2

NOTES:
1. PROVIDE PILOT OPERATED ADJUSTIBLE PRESSURE REGULATORS
2. PROVIDE REGULATORS WITH OUTLET NOISE DIFFUSERS

STEAM PRESSURE RELIEF VALVE SCHEDULE

MARK	SERVICE	ASME	RELIEF			MIN BODY LIMITS		INLET		OUTLET		NOTES
		CODE SECTION	SETTING (PSIG)	ORIFICE LETTER	CAPACITY (PPH)	PRES (PSIG)	TEMP (F)	SIZE (IN)	ANSI CLASS	SIZE (IN)	ANSI CLASS	
PRV-1	MPS	VIII	75	Q	40,000	250	406	6	250	8	125	1
PRV-2	HX-1	VIII	125	L	15,000	250	406	2.5	250	4	125	1
PRV-3	HX-2	VIII	125	L	15,000	250	406	2.5	250	4	125	1

NOTES:
1. COORDINATE FINAL RELIEF CAPACITY WITH ACTUAL STEAM REGULATORS PROVIDED.

COALESCING AIR SEPARATOR SCHEDULE (AS)

MARK	LOCATION	SYSTEM	PIPE CONNECTIONS		FLOW (GPM)	WPD (FT. W.G.)	MANUFACTURER	MODEL	NOTES
			INLET (IN)	OUTLET (IN)					
AS-1	PUMP ROOM	HOT WATER	10	10	1100	5	SPIROTHERM	4900 SERIES	1

NOTES:
1. PROVIDE AIR SEPARATOR WITH 125 PSI RELIEF VALVE.

AIR OUTLET SCHEDULE

MARK	MAKE	MODEL	TYPE	FACE SIZE (INCH)	NECK SIZE	NUMBER OF SLOTS	SLOT WIDTH (INCH)	MATERIAL	FINISH	MOUNTING	REMARKS
A1	TITUS	OMNI-AA	SUPPLY	24" x 24"	SEE NECK SCHEDULE	N/A	N/A	ALUMINUM	NOTE 4	CEILING	1, 2, 3
B1	TITUS	45F	RETURN	24" x 24"	SEE NECK SCHEDULE	N/A	N/A	ALUMINUM	NOTE 4	CEILING	1, 2, 3
B2	TITUS	45F	RETURN	12" x 12"	SEE NECK SCHEDULE	N/A	N/A	ALUMINUM	NOTE 4	CEILING	1, 2, 3
C1	TITUS	350FS	EXHAUST	18" x 12"	SAME AS FACE SIZE	N/A	N/A	ALUMINUM	NOTE 4	SURFACE	2
D1	TITUS	272FS	SUPPLY	12" x 6"	SAME AS FACE SIZE	N/A	N/A	ALUMINUM	NOTE 4	SURFACE	2
D2	TITUS	272FS	SUPPLY	18" x 6"	SAME AS FACE SIZE	N/A	N/A	ALUMINUM	NOTE 4	SURFACE	2
D3	TITUS	272FS	SUPPLY	24" x 6"	SAME AS FACE SIZE	N/A	N/A	ALUMINUM	NOTE 4	SURFACE	2
D4	TITUS	272FS	SUPPLY	18" x 10"	SAME AS FACE SIZE	N/A	N/A	ALUMINUM	NOTE 4	SURFACE	2
D5	TITUS	272FS	SUPPLY	24" x 16"	SAME AS FACE SIZE	N/A	N/A	ALUMINUM	NOTE 4	SURFACE	2
F1	TITUS	350FS	RETURN	24" x 10"	SAME AS FACE SIZE	N/A	N/A	ALUMINUM	NOTE 4	SURFACE	2
G1	TITUS	PAR	EXHAUST	24" x 24"	SEE NECK SCHEDULE	N/A	N/A	ALUMINUM	NOTE 4	CEILING	2

NOTES:
1. PROVIDE ROUND NECK ADAPTER WHERE REQUIRED
2. REFER TO PLANS FOR AIR FLOW RATES
3. REFER TO DIFFUSER NECK-DUCT SIZE SCHEDULE FOR TAKE OFF BRANCH SIZES
4. COORDINATE WITH FINISH WITH ARCHITECT
5. PROVIDE VAV DIFFUSER WITH 120V TRANSFORMER, CONTROLLER AND THERMOSTAT
6. PROVIDE LOUVER WITH BIRD SCREEN

Infrastructure Associates
INFRASTRUCTURE ASSOCIATES, INC.
6117 RICHMOND AVENUE, SUITE 200
HOUSTON, TEXAS 77057
TBPE REGISTRATION NO. F-5506
(713) 622-0120 PH (713) 622-0557 FAX
WWW.IAHOUSTON.COM

UTHealth
The University of Texas Health Science Center at Houston
School of Public Health
UT HEALTH SCIENCE SCHOOL OF PUBLIC HEALTH
1200 PRESSLER ST.
HOUSTON, TX 77030

STATE OF TEXAS
MATT A PLUNKINGER
119970
LICENSED
PROFESSIONAL ENGINEER
8-16-2017

REVISIONS

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Title

SCHEDULES

Sheet

M003

ISSUED FOR BID

AIR HANDLING UNIT SCHEDULE (AHU/OAHU)- ALTERNATE #1

TAG	AREA SERVED	LOCATION	SYSTEM TYPE	SUPPLY CFM	O/A CFM	SUPPLY FAN	PRECOOL COIL	HEATPIPE COIL	COOLING COIL	PREHEAT COIL	HEATING COIL	O/A FILTER	PRE-FINAL FILTER	FINAL FILTER	MANUFACTURER	NOTES
AHU-8	8TH FLOOR E	8TH FLOOR	DOUBLE DOCT	15,600	2,500	SF-8E	N/A	N/A	CC-8E	N/A	HC-8E	N/A	AF-1	AF-2	ENERGY LABS	ALL
	8TH FLOOR W	8TH FLOOR	DOUBLE DOCT	15,600	2,500	SF-8W	N/A	N/A	CC-9W	N/A	HC-9W	N/A	AF-1	AF-2	ENERGY LABS	ALL
AHU-9	9TH FLOOR E	9TH FLOOR	DOUBLE DOCT	15,600	2,500	SF-9E	N/A	N/A	CC-9E	N/A	HC-9E	N/A	AF-1	AF-2	ENERGY LABS	ALL
	9TH FLOOR W	9TH FLOOR	DOUBLE DOCT	15,600	2,500	SF-9W	N/A	N/A	CC-9W	N/A	HC-9W	N/A	AF-1	AF-2	ENERGY LABS	ALL
AHU-10	10TH FLOOR E	10TH FLOOR	DOUBLE DOCT	16,900	2,500	SF-10E	N/A	N/A	CC-10E	N/A	HC-10E	N/A	AF-1	AF-2	ENERGY LABS	ALL
	10TH FLOOR W	10TH FLOOR	DOUBLE DOCT	16,900	2,500	SF-10W	N/A	N/A	CC-10W	N/A	HC-10W	N/A	AF-1	AF-2	ENERGY LABS	ALL
OAHU-8	8TH FLOOR	8TH FLOOR	OA PRETREAT	5,000	5,000	SF-OA8	N/A	N/A	CC-OA8	PH-OA8	N/A	AF-1	N/A	N/A	ENERGY LABS	ALL
OAHU-9	9TH FLOOR	9TH FLOOR	OA PRETREAT	5,000	5,000	SF-OA9	N/A	N/A	CC-OA9	PH-OA9	N/A	AF-1	N/A	N/A	ENERGY LABS	ALL
OAHU-10	10TH FLOOR	10TH FLOOR	OA PRETREAT	5,000	5,000	SF-OA10	N/A	N/A	CC-OA10	PH-OA10	N/A	AF-1	N/A	N/A	ENERGY LABS	ALL

NOTES: 1. PROVIDE WITH FACTORY WIRED SERVICE LIGHTING SYSTEM WITH SWITCH ENCLOSURE AND SINGLE POINT 120V, 1PH ELECTRICAL CONNECTION. SEAL INTERIOR & EXTERIOR OF ALL RACEWAY PENETRATIONS.
2. REFER TO M5XX SERIES DRAWINGS FOR CUSTOM AHU DRAWINGS AND CONFIGURATIONS.

AIR HANDLING UNIT FAN SCHEDULE (SF)- ALTERNATE #1

TAG	SYSTEM	LOCATION	MAX CFM	MIN CFM	ESP (IN WG)	TSP (IN WG)	FAN TYPE	DISCHARGE ORIENTATION	FAN CLASS	MECH EFF	MOTOR HP	MANUFACTURER	NOTES
SF-8E	AHU-8	8TH FLOOR	15,600	4,680	3.9	6.25	OPEN BI	PLENUM	III	65%	30	ENERGY LABS	ALL
SF-8W		8TH FLOOR	15,600	4,680	3.9	6.25	OPEN BI	PLENUM	III	65%	30	ENERGY LABS	ALL
SF-9E	AHU-9	9TH FLOOR	15,600	4,680	3.9	6.25	OPEN BI	PLENUM	III	65%	30	ENERGY LABS	ALL
SF-9W		9TH FLOOR	15,600	4,680	3.9	6.25	OPEN BI	PLENUM	III	65%	30	ENERGY LABS	ALL
SF-10E	AHU-10	10TH FLOOR	16,900	5,070	3.9	6.25	OPEN BI	PLENUM	III	65%	40	ENERGY LABS	ALL
SF-10W		10TH FLOOR	16,900	5,070	3.9	6.25	OPEN BI	PLENUM	III	65%	40	ENERGY LABS	ALL
SF-OA8	OAHU-8	8TH FLOOR	5,000	1,000	1.15	2.50	HOUSED FC	TOP FRONT	III	50%	5	ENERGY LABS	ALL
SF-OA9	OAHU-9	9TH FLOOR	5,000	1,000	1.15	2.50	HOUSED FC	TOP FRONT	III	50%	5	ENERGY LABS	ALL
SF-OA10	OAHU-10	10TH FLOOR	5,000	1,000	1.15	2.50	HOUSED FC	TOP FRONT	III	50%	5	ENERGY LABS	ALL

NOTES: 1. PROVIDE 460V/3PH/60HZ PREMIUM EFFICIENCY FAN MOTORS
2. PROVIDE INVERTER DUTY MOTOR AND VARIABLE SPEED DRIVE
3. PROVIDE 24" MIN SECTION WITH DOOR ACCESS TO PLENUM FAN

CHILLED WATER PRECOOLING (PC) & COOLING (CC) COIL SCHEDULE - ALTERNATE #1

TAG	UNIT	AIR FLOW (CFM)	CAPACITY TOTAL (MBH)	CAPACITY SENSIBLE (MBH)	ENTERING AIR DB (DEG F)	ENTERING AIR WB (DEG F)	LEAVING AIR DB (DEG F)	LEAVING AIR WB (DEG F)	CHILLED WATER EWT (DEG F)	CHILLED WATER LWT (DEG F)	CHILLED WATER FLOW (GPM)	CHILLED WATER WPD (FT WG)	COIL QTY (EA)	COIL MIN ROWS	COIL MAX FPI	FINNED LEN (IN)	FINNED HEIGHT (IN)	FACE VEL (FPM)	MAX APD (IN WG)	MANUFACTURER	NOTES
CC-8E	AHU-8	15,600	498	403	75.2	62.1	52.0	51.0	42	54	83	15	2	6	8	82	30.0	457	1.28	ENERGY LABS	ALL
CC-8W		15,600	498	403	75.2	62.1	52.0	51.0	42	54	83	15	2	6	8	82	30.0	457	1.28	ENERGY LABS	ALL
CC-9E	AHU-9	15,600	498	403	75.2	62.1	52.0	51.0	42	54	83	15	2	6	8	82	30.0	457	1.28	ENERGY LABS	ALL
CC-9W		15,600	498	403	75.2	62.1	52.0	51.0	42	54	83	15	2	6	8	82	30.0	457	1.28	ENERGY LABS	ALL
CC-10E	AHU-10	16,900	573	469	76.8	62.7	52.0	51.0	42	54	96	15	2	6	8	82	30.0	495	1.50	ENERGY LABS	ALL
CC-10W		16,900	573	469	76.8	62.7	52.0	51.0	42	54	96	15	2	6	8	82	30.0	495	1.50	ENERGY LABS	ALL
CC-OA8	OAHU-8	5,000	475	238	98.0	80.0	55.0	54.0	42	54	14	15	1	6	8	38	48.0	395	0.96	ENERGY LABS	ALL
CC-OA9	OAHU-9	5,000	475	238	98.0	80.0	55.0	54.0	42	54	14	15	1	6	8	38	48.0	395	0.96	ENERGY LABS	ALL
CC-OA10	OAHU-10	5,000	475	238	98.0	80.0	55.0	54.0	42	54	14	15	1	6	8	38	48.0	395	0.96	ENERGY LABS	ALL

NOTES:
1. PROVIDE 300 SERIES STAINLESS STEEL COIL FRAMING, SUPPORTS, AND MOUNTING HARDWARE
2. CONFIGURE TUBE CIRCUITING FOR HIGH TURNDOWN RATIO

HOT WATER PREHEAT (PH) & HEATING (HC) COIL SCHEDULE - ALTERNATE #1

TAG	UNIT	AIR FLOW (CFM)	HEATING CAP (MBH)	AIR TEMP EAT (DEG F)	AIR TEMP LAT (DEG F)	HOT WATER EWT (DEG F)	HOT WATER LWT (DEG F)	HOT WATER FLOW (GPM)	HOT WATER WPD (FT WG)	COIL QTY (EA)	COIL MIN ROWS	COIL MAX FPI	FINNED LENGTH (IN)	FINNED WIDTH (IN)	FACE VEL (FPM)	MAX APD (IN WG)	MANUFACTURER	NOTES
HC-8E	AHU-8	11,750	316	65.1	90.0	180	150	21.1	5	1	1	8	60	45.0	627	0.14	ENERGY LABS	ALL
HC-8W		11,750	316	65.1	90.0	180	150	21.1	5	1	1	8	60	45.0	627	0.14	ENERGY LABS	ALL
HC-9E	AHU-9	11,750	316	65.1	90.0	180	150	21.1	5	1	1	8	60	45.0	627	0.14	ENERGY LABS	ALL
HC-9W		11,750	316	65.1	90.0	180	150	21.1	5	1	1	8	60	45.0	627	0.14	ENERGY LABS	ALL
HC-10E	AHU-10	12,750	340	65.3	90.0	180	150	22.6	5	1	1	8	60	45.0	680	0.17	ENERGY LABS	ALL
HC-10W		12,750	340	65.3	90.0	180	150	22.6	5	1	1	8	60	45.0	680	0.17	ENERGY LABS	ALL
PH-OA8	OAHU-8	5,000	216	20.0	60.0	180	150	14.4	5	1	1	8	34	36.0	597	0.13	ENERGY LABS	ALL
PH-OA9	OAHU-9	5,000	216	20.0	60.0	180	150	14.4	5	1	1	8	34	36.0	597	0.13	ENERGY LABS	ALL
PH-OA10	OAHU-10	5,000	216	20.0	60.0	180	150	14.4	5	1	1	8	34	36.0	597	0.13	ENERGY LABS	ALL

NOTES:
1. PROVIDE 300 SERIES STAINLESS STEEL COIL FRAMING, SUPPORTS, AND HARDWARE
2. PROVIDE REDUCED FACE HEATING COIL AND BLANK-OFF PLATE AS REQUIRED TO ACHIEVE MINIMUM COIL FACE VELOCITY

PUMP SCHEDULE - ALTERNATE #1

MARK	LOCATION	SYSTEM	PUMP TYPE	PUMP FLOW (GPM)	PUMP HEAD (FT WG)	PUMP EFFICIENCY (%)	MOTOR HP	MOTOR V/P/H	MOTOR RPM	CASING SUCT (IN)	CASING DISCH (IN)	CASING IMPEL (IN)	MANUFACTURER	MODEL	NOTES
OAPH-P-8	8TH FLOOR/MECHANICAL ROOM	HOT WATER (FRZ PROT)	IN-LINE	14.4	15	80	1/6	115/1/60	1750	1.5	1.5	3	B & G	PL-36	1
OAPH-P-9	9TH FLOOR/MECHANICAL ROOM	HOT WATER (FRZ PROT)	IN-LINE	14.4	15	80	1/6	115/1/60	1750	1.5	1.5	3	B & G	PL-36	1
OAPH-P-10	10TH FLOOR/MECHANICAL ROOM	HOT WATER (FRZ PROT)	IN-LINE	14.4	15	80	1/6	115/1/60	1750	1.5	1.5	3	B & G	PL-36	1

NOTES:
1. PROVIDE PUMP WITH HOA MOTOR STARTER

AIR VALVE SCHEDULE

MARK	LOCATION	SERVICE	VALVE TYPE	INLET SIZE	DESIGN AIRFLOW (CFM)	MINIMUM AIRFLOW (CFM)	MANUFACTURER	MODEL	NOTES
SAV-B-1	BASEMENT	SUPPLY ROOM	VAV	8"	260	0	PHOENIX	MAV A I 8 M	ALL
SAV-B-2	BASEMENT	SUPPLY ROOM	VAV	8"	440	0	PHOENIX	MAV A I 8 M	ALL
SAV-B-3	BASEMENT	SUPPLY ROOM	VAV	8"	440	0	PHOENIX	MAV A I 8 M	ALL
EAV-B-1-1	BASEMENT	FUME HOOD	VAV	10"	660	150	PHOENIX	EXV C I 10 M	ALL
EAV-B-1-2	BASEMENT	GENERAL EXHAUST	VAV	8"	150	0	PHOENIX	EXV A I 8 M	ALL
EAV-B-2-1	BASEMENT	FUME HOOD	VAV	10"	640	150	PHOENIX	EXV C I 10 M	ALL
EAV-B-3-1	BASEMENT	FUME HOOD	VAV	10"	640	160	PHOENIX	EXV C I 10 M	ALL
SAV-3-1	3RD FLOOR	SUPPLY ROOM	VAV	14"	1700	350	PHOENIX	MAV A I 14 M	ALL
SAV-3-2	3RD FLOOR	SUPPLY ROOM	VAV	8"	300	0	PHOENIX	MAV A I 8 M	ALL
SAV-3-3	3RD FLOOR	SUPPLY ROOM	VAV	8"	300	0	PHOENIX	MAV A I 8 M	ALL
EAV-3-1-1	3RD FLOOR	FUME HOOD	VAV	10"	800	160	PHOENIX	EXV C I 10 M	ALL
EAV-3-1-2	3RD FLOOR	FUME HOOD	VAV	8"	500	100	PHOENIX	EXV C I 8 M	ALL
EAV-3-1-3	3RD FLOOR	FUME HOOD	VAV	10"	800	160	PHOENIX	EXV C I 10 M	ALL
EAV-3-1-4	3RD FLOOR	GENERAL EXHAUST	VAV	8"	150	0	PHOENIX	EXV A I 8 M	ALL
EAV-3-2-1	3RD FLOOR	FUME HOOD	VAV	8"	500	150	PHOENIX	EXV C I 8 M	ALL
EAV-3-3-1	3RD FLOOR	FUME HOOD	VAV	8"	500	150	PHOENIX	EXV C I 8 M	ALL
SAV-4-1	4TH FLOOR	SUPPLY ROOM	VAV	8"	400	50	PHOENIX	MAV A I 8 M	ALL
EAV-4-1	4TH FLOOR	GENERAL EXHAUST	VAV	8"	550	150	PHOENIX	EXV A I 8 M	ALL
EAV-4-2	4TH FLOOR	GENERAL EXHAUST	VAV	10"	600	250	PHOENIX	EXV A I 10 M	ALL
SAV-6-1	6TH FLOOR	SUPPLY ROOM	VAV	14"	1700	350	PHOENIX	MAV A I 14 M	ALL
SAV-6-2	6TH FLOOR	SUPPLY ROOM	VAV	8"	300	0	PHOENIX	MAV A I 8 M	ALL
EAV-6-1-1	6TH FLOOR	FUME HOOD	VAV	10"	800	160	PHOENIX	EXV C I 10 M	ALL
EAV-6-1-2	6TH FLOOR	FUME HOOD	VAV	8"	500	100	PHOENIX	EXV C I 8 M	ALL
EAV-6-1-3	6TH FLOOR	FUME HOOD	VAV	10"	800	160	PHOENIX	EXV C I 10 M	ALL
EAV-6-1-4	6TH FLOOR	GENERAL EXHAUST	VAV	14"	1500	0	PHOENIX	EXV A I 14 M	ALL
EAV-6-2-1	6TH FLOOR	FUME HOOD	VAV	8"	500	100	PHOENIX	EXV C I 8 M	ALL
SAV-7-1	7TH FLOOR	SUPPLY ROOM	VAV	8"	470	0	PHOENIX	EXV C I 8 M	ALL
SAV-7-2	7TH FLOOR	SUPPLY ROOM	VAV	8"	100	0	PHOENIX	MAV A I 8 M	ALL
SAV-7-3	7TH FLOOR	SUPPLY ROOM	VAV	8"	100	0	PHOENIX	MAV A I 8 M	ALL
SAV-7-4	7TH FLOOR	SUPPLY ROOM	VAV	14"	1700	600	PHOENIX	MAV A I 14 M	ALL
SAV-7-5	7TH FLOOR	SUPPLY ROOM	VAV	12"	850	350	PHOENIX	MAV A I 12 M	ALL
SAV-7-6	7TH FLOOR	SUPPLY ROOM	VAV	8"	100	0	PHOENIX	MAV A I 8 M	ALL
SAV-7-7	7TH FLOOR	SUPPLY ROOM	VAV	8"	320	0	PHOENIX	MAV A I 8 M	ALL
SAV-7-8	7TH FLOOR	SUPPLY ROOM	VAV	10"	700	180	PHOENIX	MAV A I 10 M	ALL
SAV-7-9	7TH FLOOR	SUPPLY ROOM	VAV	8"	100	0	PHOENIX	MAV A I 8 M	ALL
SAV-7-10	7TH FLOOR	SUPPLY ROOM	VAV	8"	180	0	PHOENIX	MAV A I 8 M	ALL
SAV-7-11	7TH FLOOR	SUPPLY ROOM	VAV	8"	100	0	PHOENIX	MAV A I 8 M	ALL
SAV-7-12	7TH FLOOR	SUPPLY ROOM	VAV	8"	400	0	PHOENIX	MAV A I 8 M	ALL
SAV-7-13	7TH FLOOR	SUPPLY ROOM	VAV	8"	340	100	PHOENIX	MAV A I 8 M	ALL
SAV-7-14	7TH FLOOR	SUPPLY ROOM	VAV	8"	100	0	PHOENIX	MAV A I 8 M	ALL
SAV-7-15	7TH FLOOR	SUPPLY ROOM	VAV	8"	100	0	PHOENIX	MAV A I 8 M	ALL
EAV-7-1-1	7TH FLOOR	FUME HOOD	VAV	10"	670	150	PHOENIX	EXV C I 10 M	ALL
EAV-7-1-2	7TH FLOOR	GENERAL EXHAUST	VAV	8"	520	50	PHOENIX	EXV A I 8 M	ALL
EAV-7-2-1	7TH FLOOR	GENERAL EXHAUST	VAV	8"	175	100	PHOENIX	EXV A I 8 M	ALL
EAV-7-3-1	7TH FLOOR	GENERAL EXHAUST	VAV	8"	175	100	PHOENIX	EXV A I 8 M	ALL
EAV-7-4-1	7TH FLOOR	GENERAL EXHAUST	VAV	14"	1800	700	PHOENIX	EXV A I 14 M	ALL
EAV-7-4-2	7TH FLOOR	FUME HOOD	VAV	8"	550	150	PHOENIX	EXV C I 8 M	ALL
EAV-7-4-3	7TH FLOOR	FUME HOOD	VAV	10"	650	150	PHOENIX	EXV C I 10 M	ALL
EAV-7-5-1	7TH FLOOR	GENERAL EXHAUST	VAV	10"	750	50	PHOENIX	EXV A I 10 M	ALL
EAV-7-5-2	7TH FLOOR	FUME HOOD	VAV	8"	525	150	PHOENIX	EXV C I 8 M	ALL
EAV-7-5-3	7TH FLOOR	FUME HOOD	VAV	8"	525	150	PHOENIX	EXV C I 8 M	ALL
EAV-7-6-1	7TH FLOOR	GENERAL EXHAUST	VAV	8"	250	125	PHOENIX	EXV A I 8 M	ALL
EAV-7-7-1	7TH FLOOR	FUME HOOD	VAV	8"	520	150	PHOENIX	EXV C I 8 M	ALL
EAV-7-8-1	7TH FLOOR	FUME HOOD	VAV	12"	900	180	PHOENIX	EXV C I 12 M	ALL
EAV-7-8-2	7TH FLOOR	GENERAL EXHAUST	VAV	8"	400	100	PHOENIX	EXV A I 8 M	ALL
EAV-7-8-3	7TH FLOOR	GENERAL EXHAUST	VAV	8"	400	100	PHOENIX	EXV A I 8 M	ALL
EAV-7-9-1	7TH FLOOR	GENERAL EXHAUST	VAV	8"	150	75	PHOENIX	EXV A I 8 M	ALL
EAV-7-10-1	7TH FLOOR	GENERAL EXHAUST	VAV	8"	330	175	PHOENIX	EXV A I 8 M	ALL
EAV-7-11-1	7TH FLOOR	GENERAL EXHAUST	VAV	8"	175	75	PHOENIX	EXV A I 8 M	ALL
EAV-7-12-1	7TH FLOOR	FUME HOOD	VAV	10"	800	200	PHOENIX	EXV C I 10 M	ALL
EAV-7-12-2	7TH FLOOR	GENERAL EXHAUST	VAV	10"	600	0	PHOENIX	EXV A I 10 M	ALL
EAV-7-13-1	7TH FLOOR	GENERAL EXHAUST	VAV	8"	270	150	PHOENIX	EXV A I 8 M	ALL
EAV-7-13-2	7TH FLOOR	GENERAL EXHAUST	VAV	8"	270	150	PHOENIX	EXV A I 8 M	ALL
EAV-7-14-1	7TH FLOOR	GENERAL EXHAUST	VAV	8"	150	50	PHOENIX	EXV A I 8 M	ALL
EAV-7-15-1	7TH FLOOR	GENERAL EXHAUST	VAV	8"	175	100	PHOENIX	EXV A I 8 M	ALL

NOTES:
1. INLET DUCT SIZE SHALL BE SAME AS UNITS INLET.
2. PROVIDE VALVES WITH CELERIS DIGITAL HIGH SPEED CONTROL SYSTEM.

Infrastructure Associates
INFRASTRUCTURE ASSOCIATES, INC.
6117 RICHMOND AVENUE, SUITE 200
HOUSTON, TEXAS 77057
TBPE REGISTRATION NO. F-4506
(713) 622-0120 PH (713) 622-0557 FAX
WWW.IAHOUSTON.COM

UTHealth
The University of Texas Health Science Center at Houston
School of Public Health
UT HEALTH SCIENCE SCHOOL OF PUBLIC HEALTH
1200 PRESSLER ST.
HOUSTON, TX 77030

STATE OF TEXAS
MATT A FLUKINGER
119970
LICENSED PROFESSIONAL ENGINEER
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08/16/2017	ADDENDUM 2

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SCHEDULES

Sheet

M004

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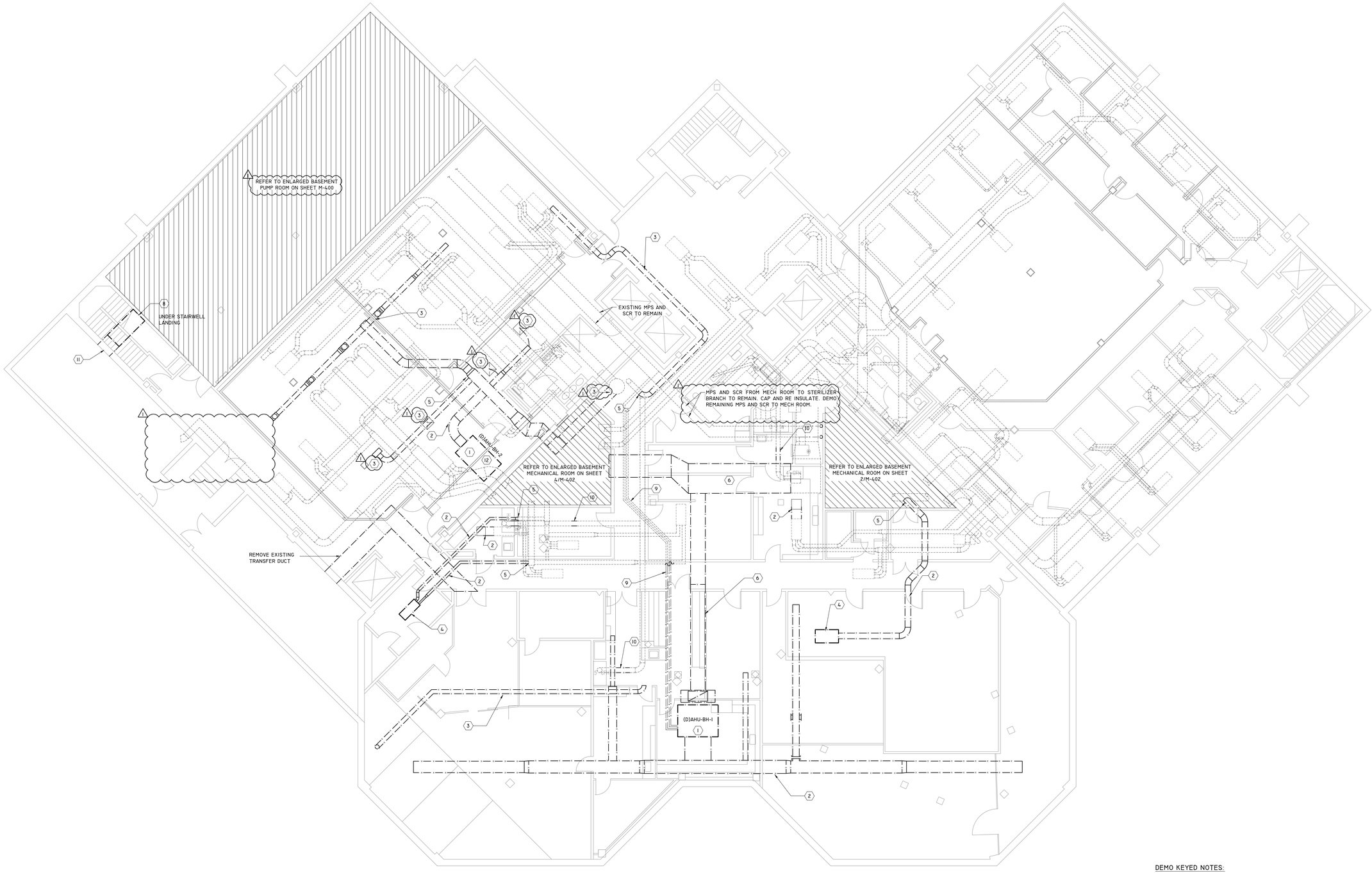

1 BASEMENT FLOOR PLAN - DEMO

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

DEMO KEYED NOTES:

1. REMOVE EXISTING AIR HANDLING UNITS (AHU-BH-1 AND AHU-BH-2).
2. REMOVE EXISTING SUPPLY DUCTS AND AIR DEVICES.
3. REMOVE EXISTING EXHAUST DUCT AND EXHAUST GRILLES.
4. REMOVE EXISTING TERMINAL UNITS AND DOWNSTREAM AIR DISTRIBUTION COMPONENTS.
5. CAP AND REINSULATE EXISTING DUCT CONNECTION.
6. REMOVE EXISTING OUTSIDE AIR DUCT.
7. NOT USED.
8. REMOVE EXISTING FAN COIL UNIT SUPPORTS, CONTROLS, PIPING , AND DUCT CONNECTIONS. CAP PIPING AT BRANCH CONNECTIONS AND REINSULATE.
9. REMOVE EXISTING CHW PIPING. COORDINATE CHW DEMO WITH RECONNECTION TO NEW AHU (REF 1/M200) REMOVE STEAM AND COND RET PIPING BACK TO MAINS. CAP AND REINSULATE BRANCH CONNECTION.
10. REMOVE PORTION OF EXHAUST DUCT AS REQUIRED TO ACCOMMODATE NEW AIR VALVE. REF 1/M200
11. PATCH EXISTING WALL OPENING. REF ARCHITECTURAL.
12. DEMO CHILLED WATER SUPPLY/RETURN AND STEAM SUPPLY/CONDENSATE RETURN LINES BACK TO MAIN(NOT SHOWN) AND CAP & SEAL.

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Date	31 MARCH 2017
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BASEMENT FLOOR PLAN - HVAC - DEMO

Sheet

M101

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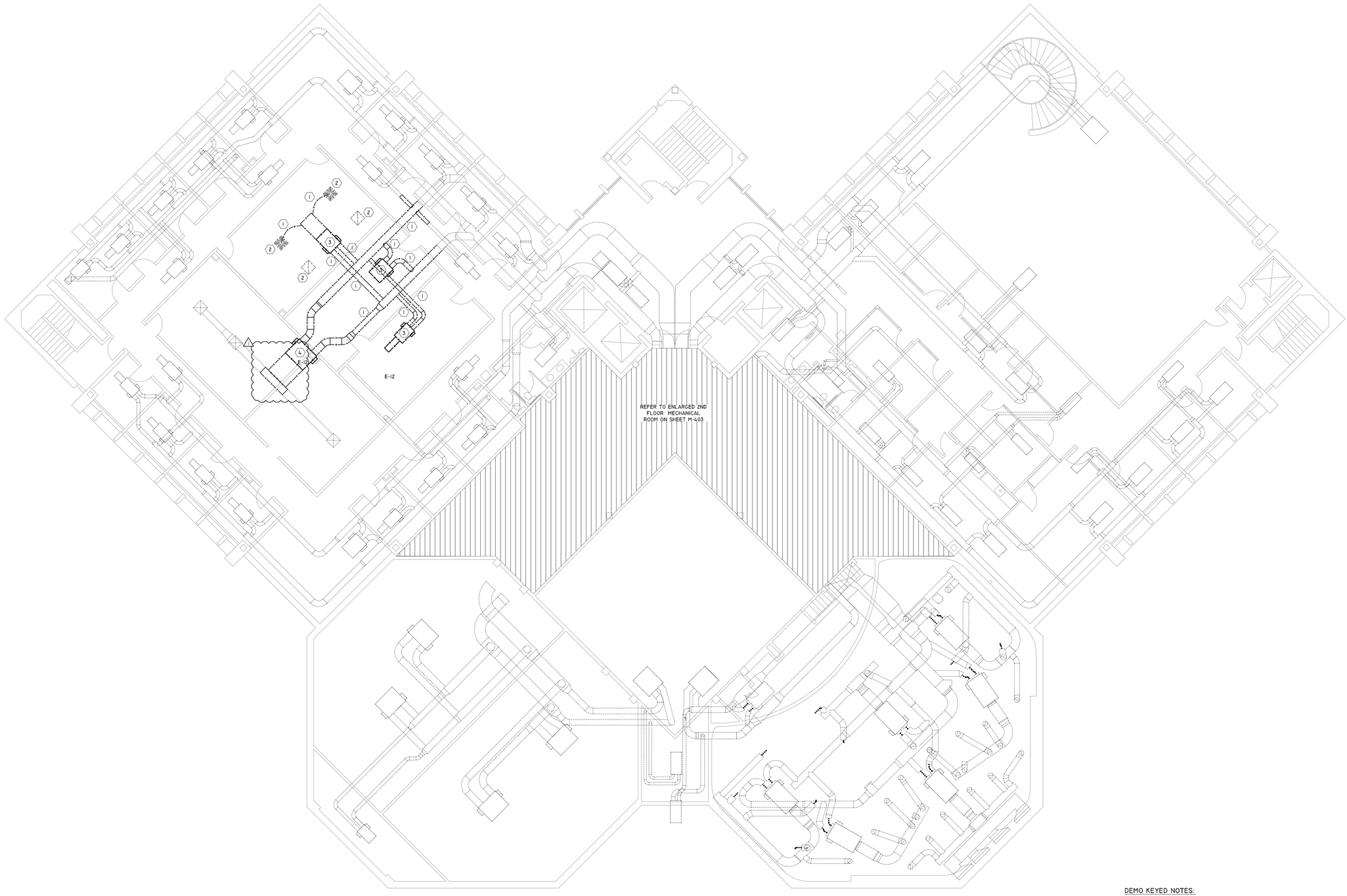

DEMO KEYED NOTES:

1. REMOVE SUPPLY AIR DUCTS UP AS REQUIRED. REFER M202 FOR PROPOSED WORK
2. REMOVE SUPPLY AIR AND RETURN AIR DIFFUSERS.
3. REMOVE MIXING BOX AND ALL DOWNSTREAM DUCTWORK AND AIR DISTRIBUTION COMPONENTS.
4. REMOVE THE MIXING BOX FOR RELOCATING TO NEW LOCATION. REFER M202 FOR PROPOSED WORK

1 2ND FLOOR PLAN - HVAC - DEMO

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

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2ND FLOOR PLAN - HVAC - DEMO

Sheet

M102

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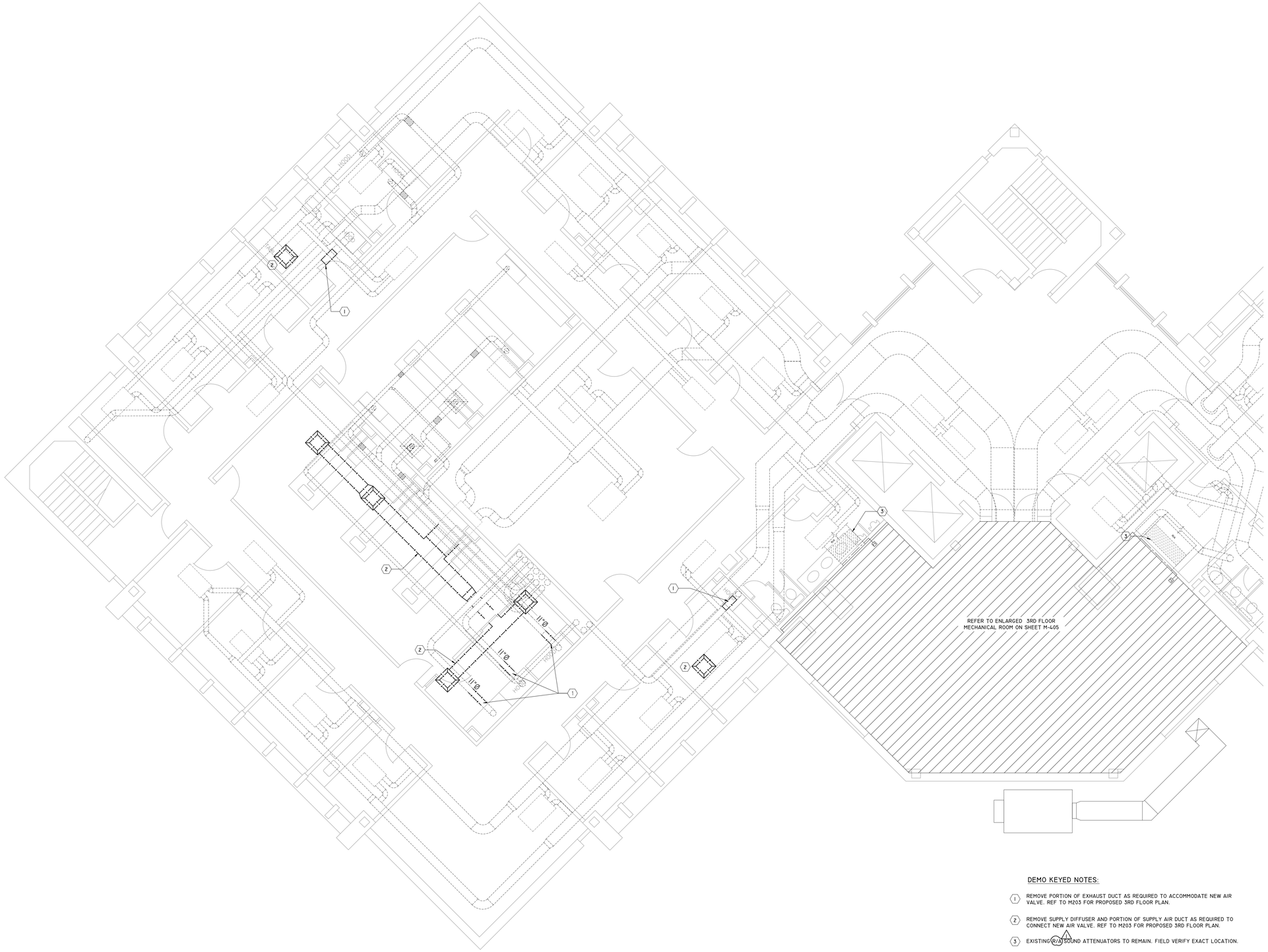
0 1/2" 1" 2"



DEMO KEYED NOTES:

1. REMOVE PORTION OF EXHAUST DUCT AS REQUIRED TO ACCOMMODATE NEW AIR VALVE. REF TO M203 FOR PROPOSED 3RD FLOOR PLAN.
2. REMOVE SUPPLY DIFFUSER AND PORTION OF SUPPLY AIR DUCT AS REQUIRED TO CONNECT NEW AIR VALVE. REF TO M203 FOR PROPOSED 3RD FLOOR PLAN.
3. EXISTING R/A SOUND ATTENUATORS TO REMAIN. FIELD VERIFY EXACT LOCATION.

1 PARTIAL 3RD FLOOR PLAN - HVAC - DEMO

SCALE: 3/16" = 1'-0"

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3RD FLOOR PLAN - HVAC - DEMO

Sheet

M103

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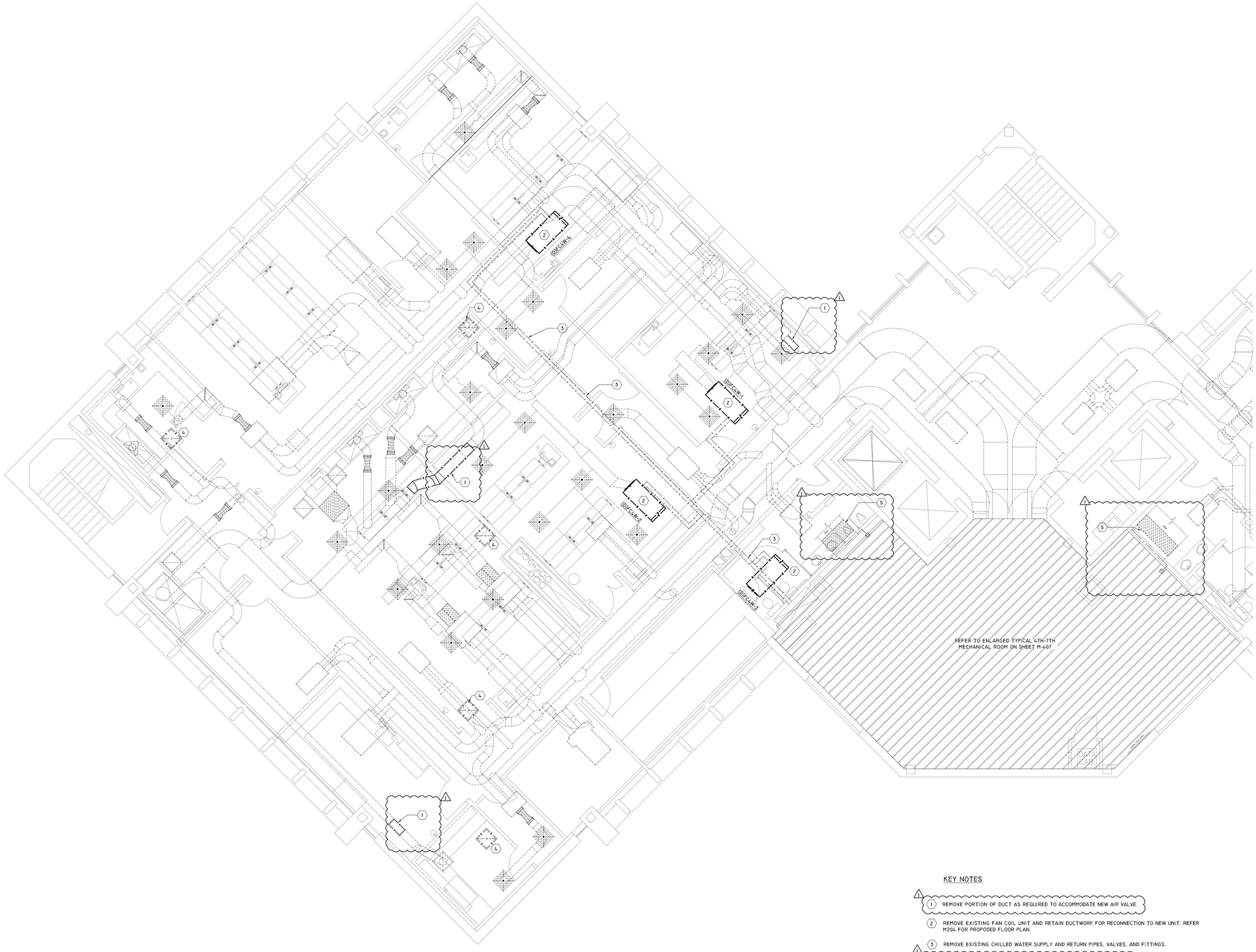

KEY NOTES

1. REMOVE PORTION OF DUCT AS REQUIRED TO ACCOMMODATE NEW AIR VALVE.
2. REMOVE EXISTING FAN COIL UNIT AND RETAIN DUCTWORK FOR RECONNECTION TO NEW UNIT. REFER M204 FOR PROPOSED FLOOR PLAN.
3. REMOVE EXISTING CHILLED WATER SUPPLY AND RETURN PIPES, VALVES, AND FITTINGS.
4. REMOVE EXISTING R/A GRILLE AND PATCH CEILING
5. EXISTING R/A SOUND ATTENUATORS. FIELD VERIFY EXACT LOCATION.

1 PARTIAL 4TH FLOOR PLAN - HVAC - DEMO

SCALE: 3/16" = 1'-0"

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4TH FLOOR PLAN - HVAC - DEMO

Sheet

M104

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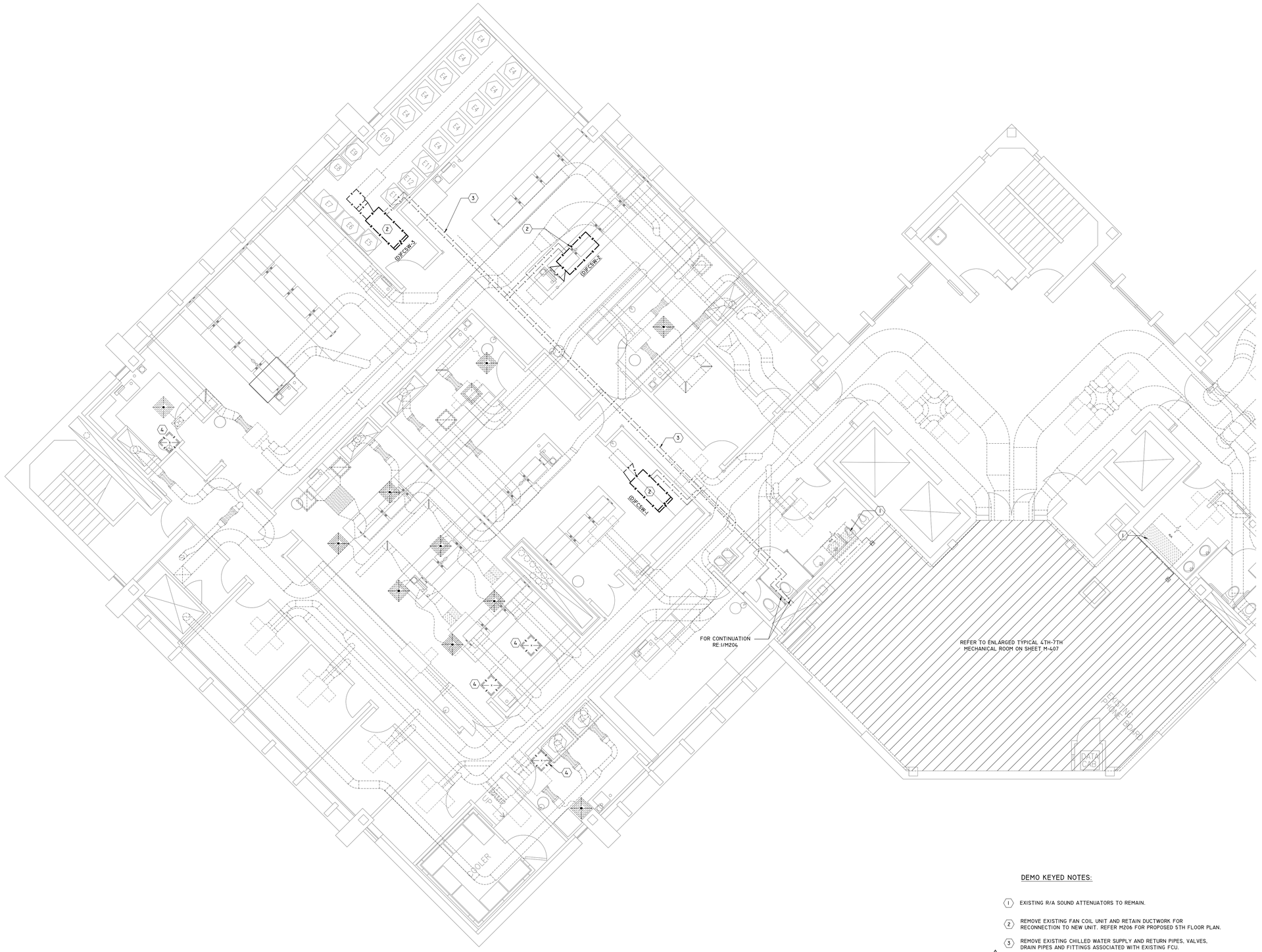

DEMO KEYED NOTES:

1. EXISTING R/A SOUND ATTENUATORS TO REMAIN.
2. REMOVE EXISTING FAN COIL UNIT AND RETAIN DUCTWORK FOR RECONNECTION TO NEW UNIT. REFER M206 FOR PROPOSED 5TH FLOOR PLAN.
3. REMOVE EXISTING CHILLED WATER SUPPLY AND RETURN PIPES, VALVES, DRAIN PIPES AND FITTINGS ASSOCIATED WITH EXISTING FCU.
4. REMOVE EXISTING EXHAUST GRILLE & PATCH CEILING.

1 PARTIAL 5TH FLOOR PLAN - HVAC - DEMO

SCALE: 3/16" = 1'-0"

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5TH FLOOR PLAN - HVAC - DEMO

Sheet

M105

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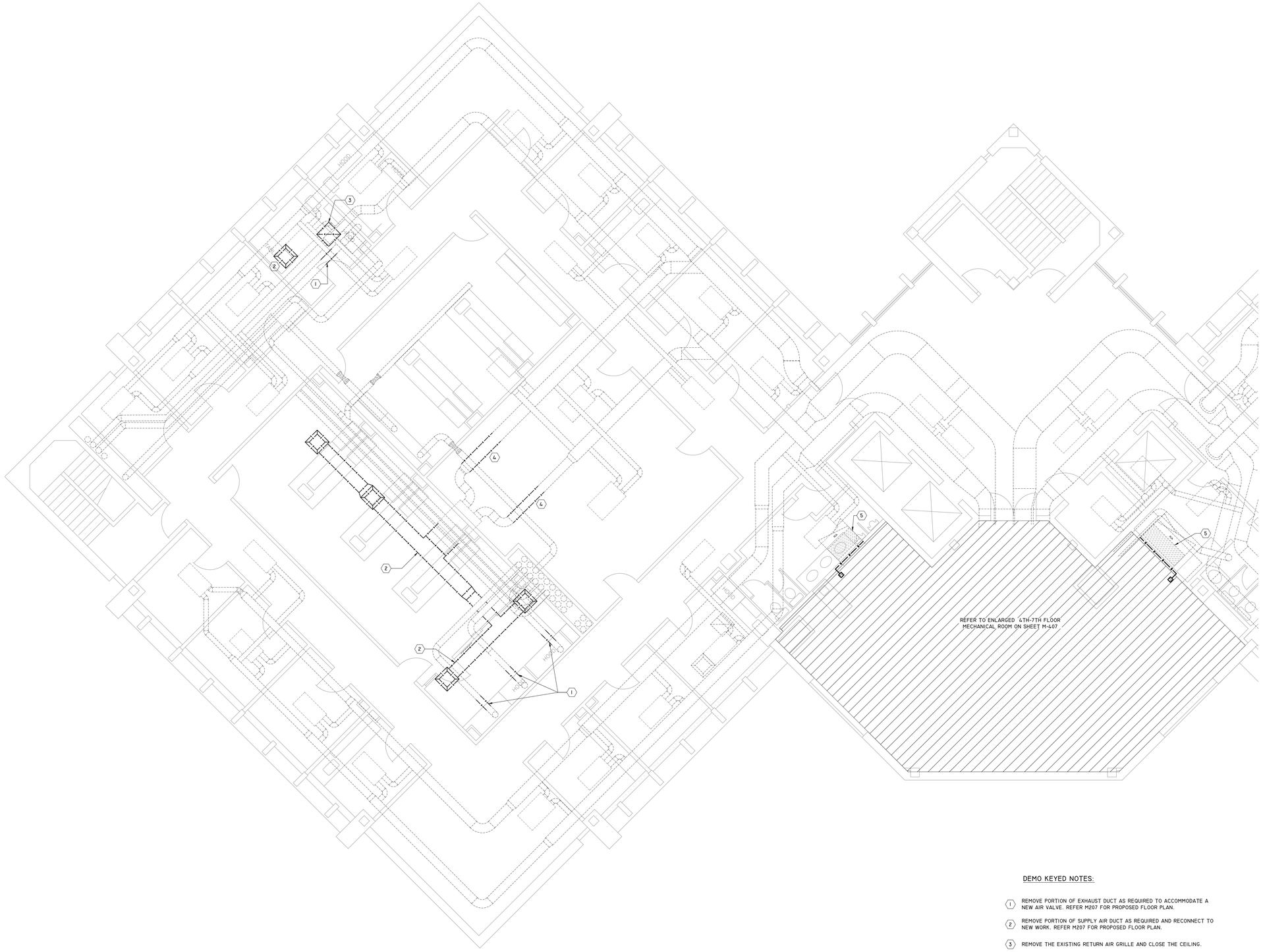

1 PARTIAL 6TH FLOOR PLAN - HVAC - DEMO

SCALE: 3/16" = 1'-0"

DEMO KEYED NOTES:

1. REMOVE PORTION OF EXHAUST DUCT AS REQUIRED TO ACCOMMODATE A NEW AIR VALVE. REFER M207 FOR PROPOSED FLOOR PLAN.
2. REMOVE PORTION OF SUPPLY AIR DUCT AS REQUIRED AND RECONNECT TO NEW WORK. REFER M207 FOR PROPOSED FLOOR PLAN.
3. REMOVE THE EXISTING RETURN AIR GRILLE AND CLOSE THE CEILING.
4. REMOVE PORTION OF SUPPLY AIR BRANCH DUCTS AS REQUIRED TO RELOCATE EXISTING TERMINAL BOX. REFER M207 FOR PROPOSED FLOOR PLAN.
5. EXISTING R/A SOUND ATTENUATORS TO REMAIN. FIELD VERIFY EXACT LOCATION.

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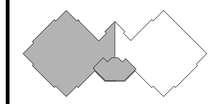

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6TH FLOOR PLAN - DEMO

Sheet

M106

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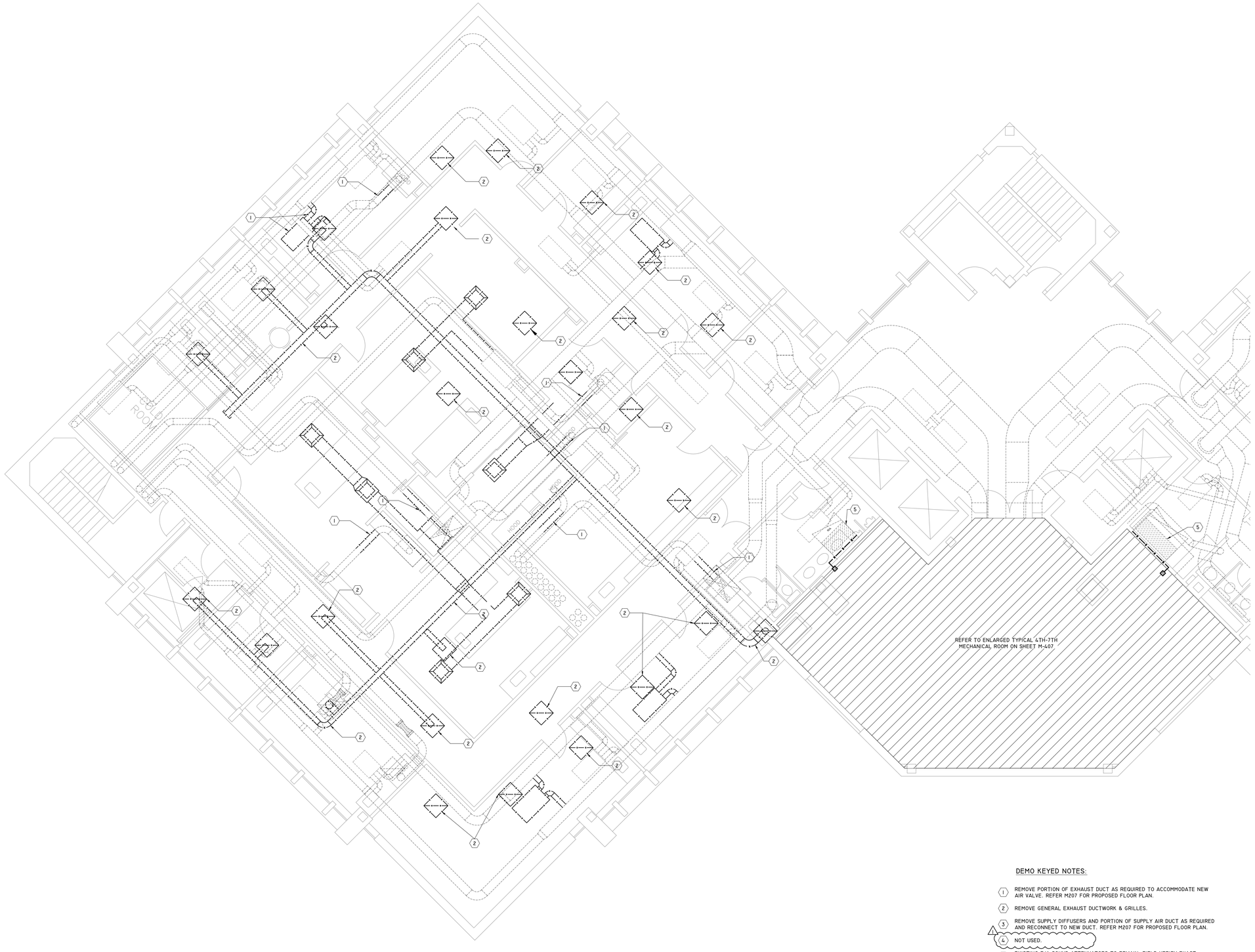

1 7TH FLOOR PLAN - HVAC - DEMO

SCALE: 3/16" = 1'-0"

DEMO KEYED NOTES:

1. REMOVE PORTION OF EXHAUST DUCT AS REQUIRED TO ACCOMMODATE NEW AIR VALVE. REFER M207 FOR PROPOSED FLOOR PLAN.
2. REMOVE GENERAL EXHAUST DUCTWORK & GRILLES.
3. REMOVE SUPPLY DIFFUSERS AND PORTION OF SUPPLY AIR DUCT AS REQUIRED AND RECONNECT TO NEW DUCT. REFER M207 FOR PROPOSED FLOOR PLAN.
4. NOT USED.
5. EXISTING R/A SOUND ATTENUATORS TO REMAIN. FIELD VERIFY EXACT LOCATION.

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7TH FLOOR PLAN - HVAC - DEMO

Sheet

M107

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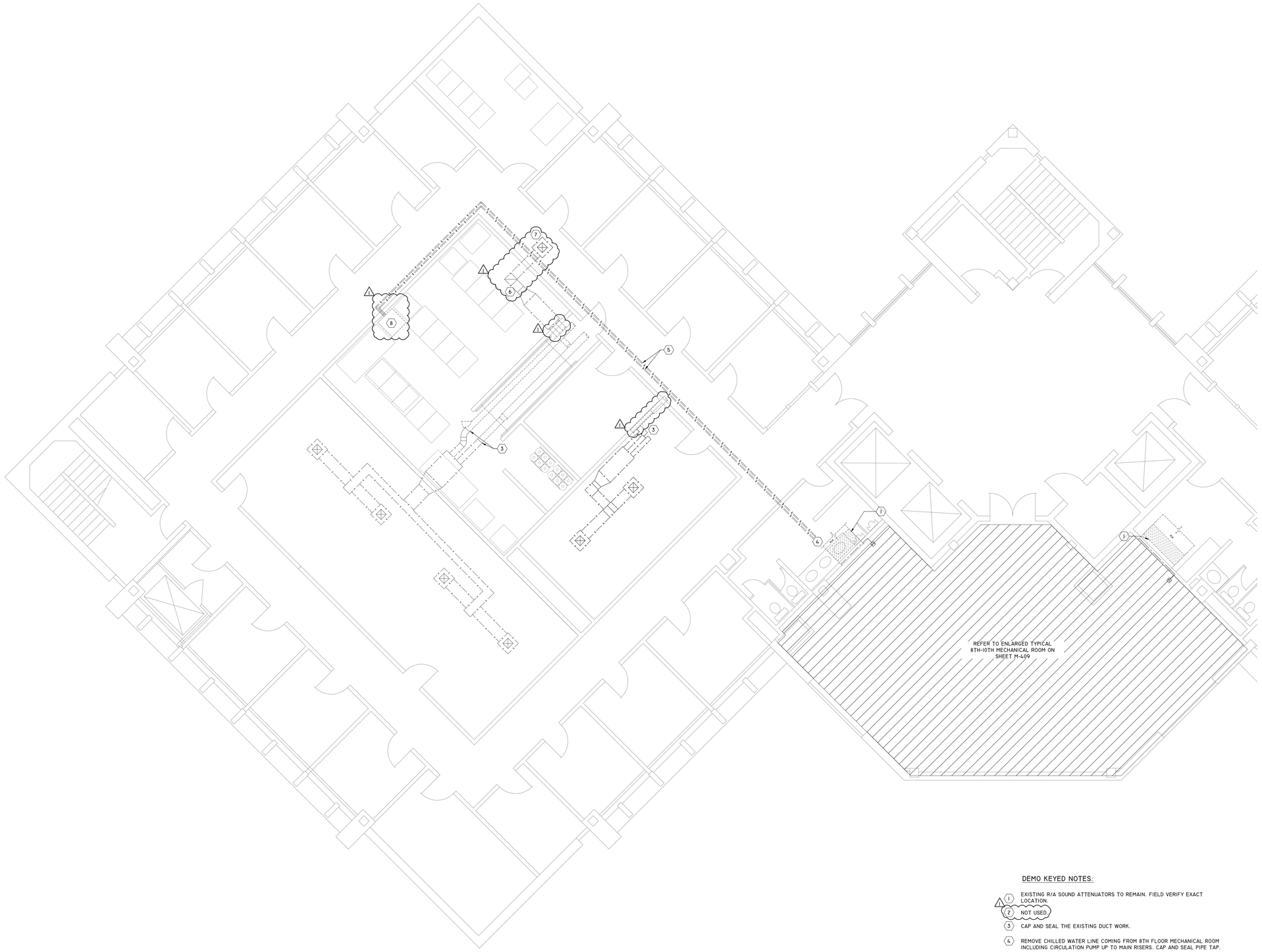

1 8TH FLOOR PLAN - HVAC - DEMO

SCALE: 3/16" = 1'-0"

DEMO KEYED NOTES:

1. EXISTING R/A SOUND ATTENUATORS TO REMAIN. FIELD VERIFY EXACT LOCATION.
2. NOT USED.
3. CAP AND SEAL THE EXISTING DUCT WORK.
4. REMOVE CHILLED WATER LINE COMING FROM 8TH FLOOR MECHANICAL ROOM INCLUDING CIRCULATION PUMP UP TO MAIN RISERS. CAP AND SEAL PIPE TAP.
5. DEMO EXISTING 1-1/2" CHWS&R LINE SERVING TO SERVER ROOM AC UNIT.
6. REMOVE EXISTING MIXING BOX AND RELOCATE IT IN NEW LOCATION. REFER TO SHEET M208.
7. RETAIN EXISTING DIFFUSER TO BE REUSED. REFER TO SHEET M208 FOR NEW LOCATION.
8. EXISTING SERVER ROOM AHU TO REMAIN.

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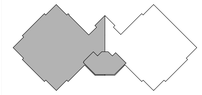

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8TH FLOOR PLAN - HVAC - DEMO

Sheet

M108

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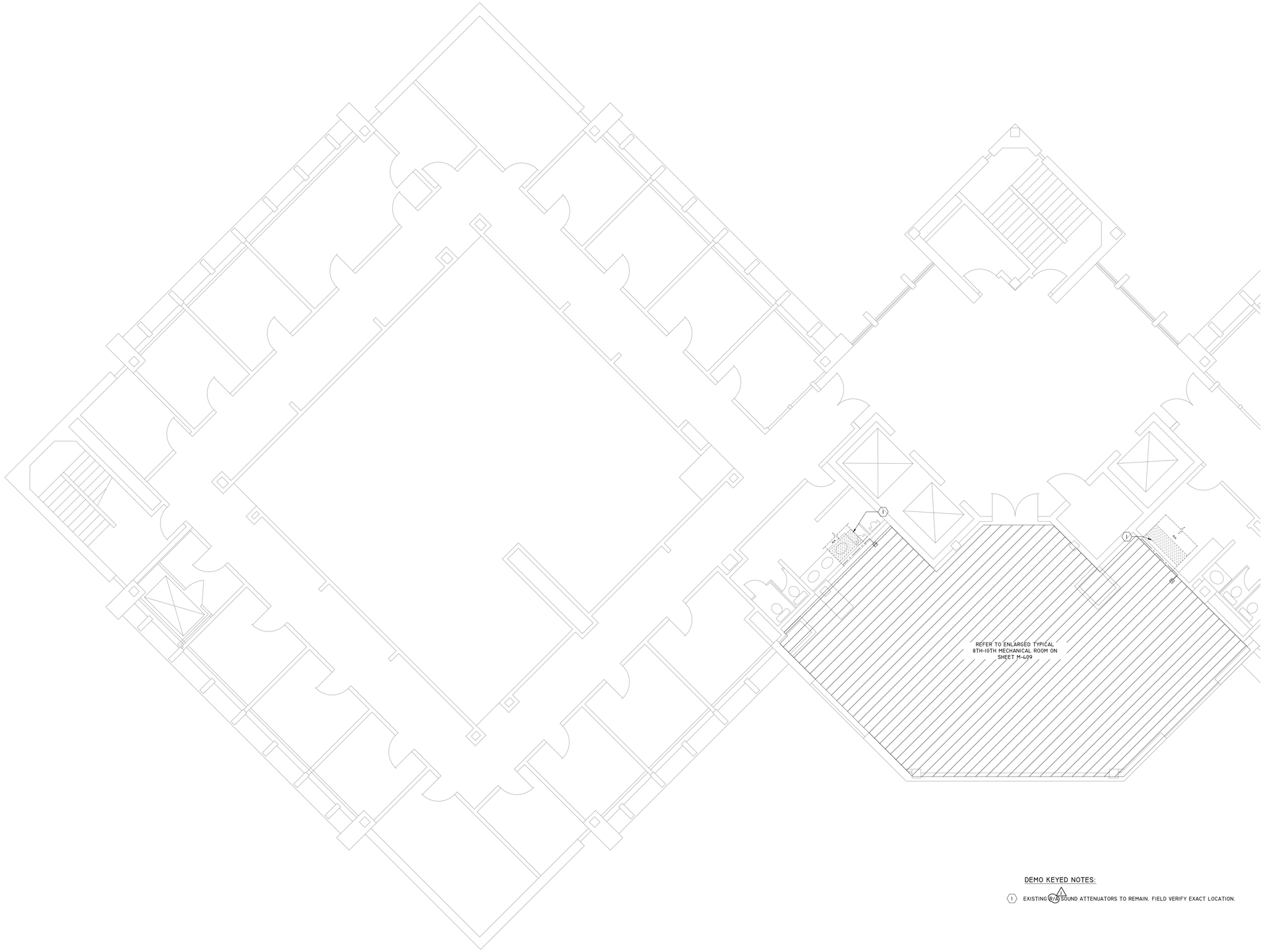
0 1/2" 1" 2"



DEMO KEYED NOTES:

(1) EXISTING (2A) SOUND ATTENUATORS TO REMAIN. FIELD VERIFY EXACT LOCATION.

1 9TH FLOOR PLAN - HVAC - DEMO

SCALE: 3/16" = 1'-0"

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9TH FLOOR PLAN - HAVC - DEMO

Sheet

M109

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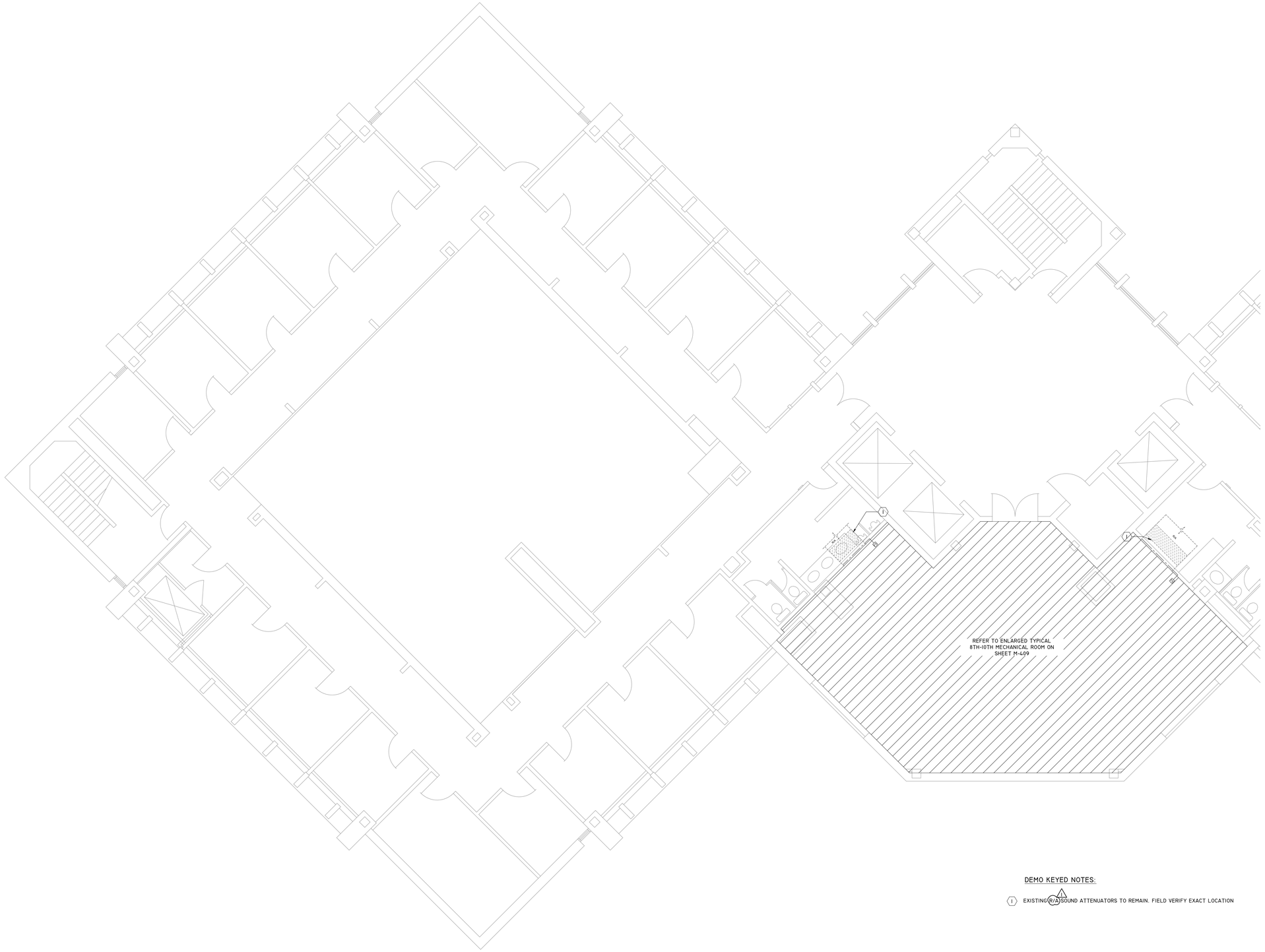
0 1/2" 1" 2"



DEMO KEYED NOTES:

1 EXISTING R/A SOUND ATTENUATORS TO REMAIN. FIELD VERIFY EXACT LOCATION

1 10TH FLOOR PLAN - HVAC - DEMO

SCALE: 3/16" = 1'-0"

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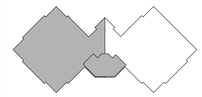

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10TH FLOOR PLAN - HAVC - DEMO

Sheet

M110

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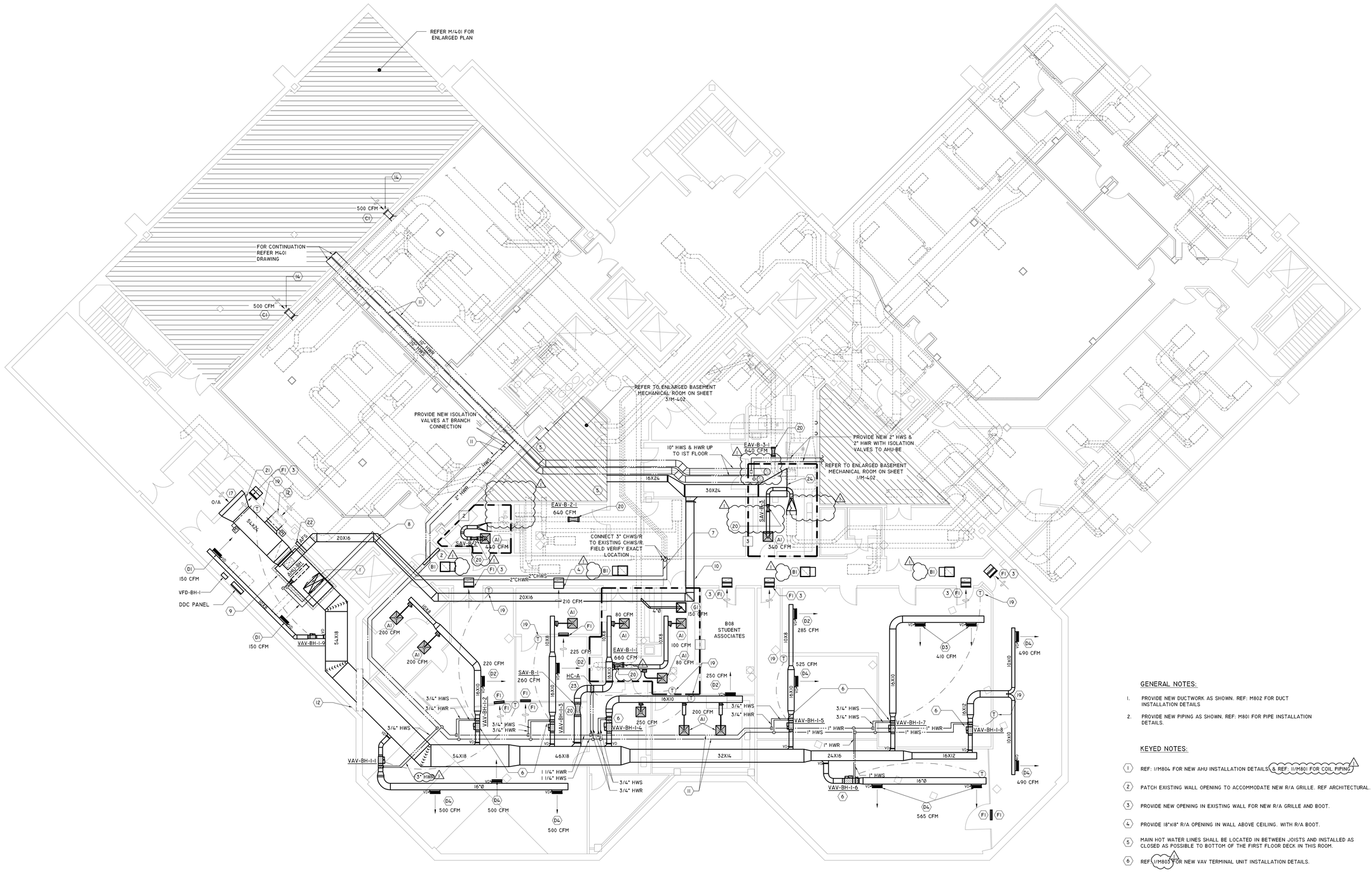

1 BASEMENT FLOOR PLAN - PROPOSED

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

19 PROVIDE NEW ROOM TEMP SENSOR AT WALL LOCATION SHOWN.

20 PROVIDE NEW AIR VALVE AND CONNECT TO NEW OR EXISTING DUCT AS INDICATED. RE: 3/M804 FOR INSTALLATION.

21 TRANSITION OUTSIDE AIR DUCT TO NEW LOUVERED OPENING.

22 PROVIDE NEW AIR FLOW STATION (AFS) AT PRETREATED OUTSIDE AIR DUCT.

23 REF 1/M802 FOR DUCT MTD HEATING COIL PIPING.

24 CONNECT TO EXISTING O/A DUCT COMING FROM UNIT OA-1.

GENERAL NOTES:

1. PROVIDE NEW DUCTWORK AS SHOWN. REF: M802 FOR DUCT INSTALLATION DETAILS
2. PROVIDE NEW PIPING AS SHOWN. REF: M801 FOR PIPE INSTALLATION DETAILS.

KEYED NOTES:

1 REF: 1/M804 FOR NEW AHU INSTALLATION DETAILS, & REF: 11/M801 FOR COIL PIPING

2 PATCH EXISTING WALL OPENING TO ACCOMMODATE NEW R/A GRILLE. REF ARCHITECTURAL.

3 PROVIDE NEW OPENING IN EXISTING WALL FOR NEW R/A GRILLE AND BOOT.

4 PROVIDE 18"x18" R/A OPENING IN WALL ABOVE CEILING. WITH R/A BOOT.

5 MAIN HOT WATER LINES SHALL BE LOCATED IN BETWEEN JOISTS AND INSTALLED AS CLOSED AS POSSIBLE TO BOTTOM OF THE FIRST FLOOR DECK IN THIS ROOM.

6 REF: 1/M803 FOR NEW VAV TERMINAL UNIT INSTALLATION DETAILS.

7 PROVIDE NEW CHS & CHR PIPING TO AHU-BH-1. COORDINATE CONNECTION TO EXISTING PIPING WITH PIPING DEMOLITION.

8 PROVIDE NEW 20"x16" OUTSIDE AIR DUCT.

9 PROVIDE 6" HOUSEKEEPING PAD FOR NEW AHU.

10 TRANSITION NEW 20"x16" OUTSIDE AIR DUCT AND CONNECT TO EXISTING 36"x24" OUTSIDE AIR DUCT. COORDINATE WITH DUCT DEMOLITION.

11 PROVIDE NEW HWS & HWR PIPING.

12 ENLARGE EXISTING WALL OPENING TO PROVIDE 9.0 S.F. FREE AREA. COORDINATE ASPECT RATIO WITH EXISTING CONDITIONS. TRANSITION R/A DUCT TO FINAL OPENING AS REQUIRED.

13 NOT USED.

14 PROVIDE NEW 18"x12" HEEL TAP WITH BALANCE DAMPER IN EXISTING EXHAUST. DUCT & EXTEND THROUGH MECH ROOM WALL.

15 PROVIDE NEW 6" CONCRETE HOUSEKEEPING PAD. REFER TO SHEET M505 FOR AHU INSTALLATION.

16 REF: 3/M803 FOR FCU INSTALLATION DETAILS.

17 NEW 80X60 DRAINABLE LOUVER REFERENCE ARCHITECTURAL.

18 PROVIDE NEW VFD AND DDC PANELS AND LOCATE THEM AS SHOWN.

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BASEMENT FLOOR PLAN - HVAC - PROPOSED

Sheet

M200

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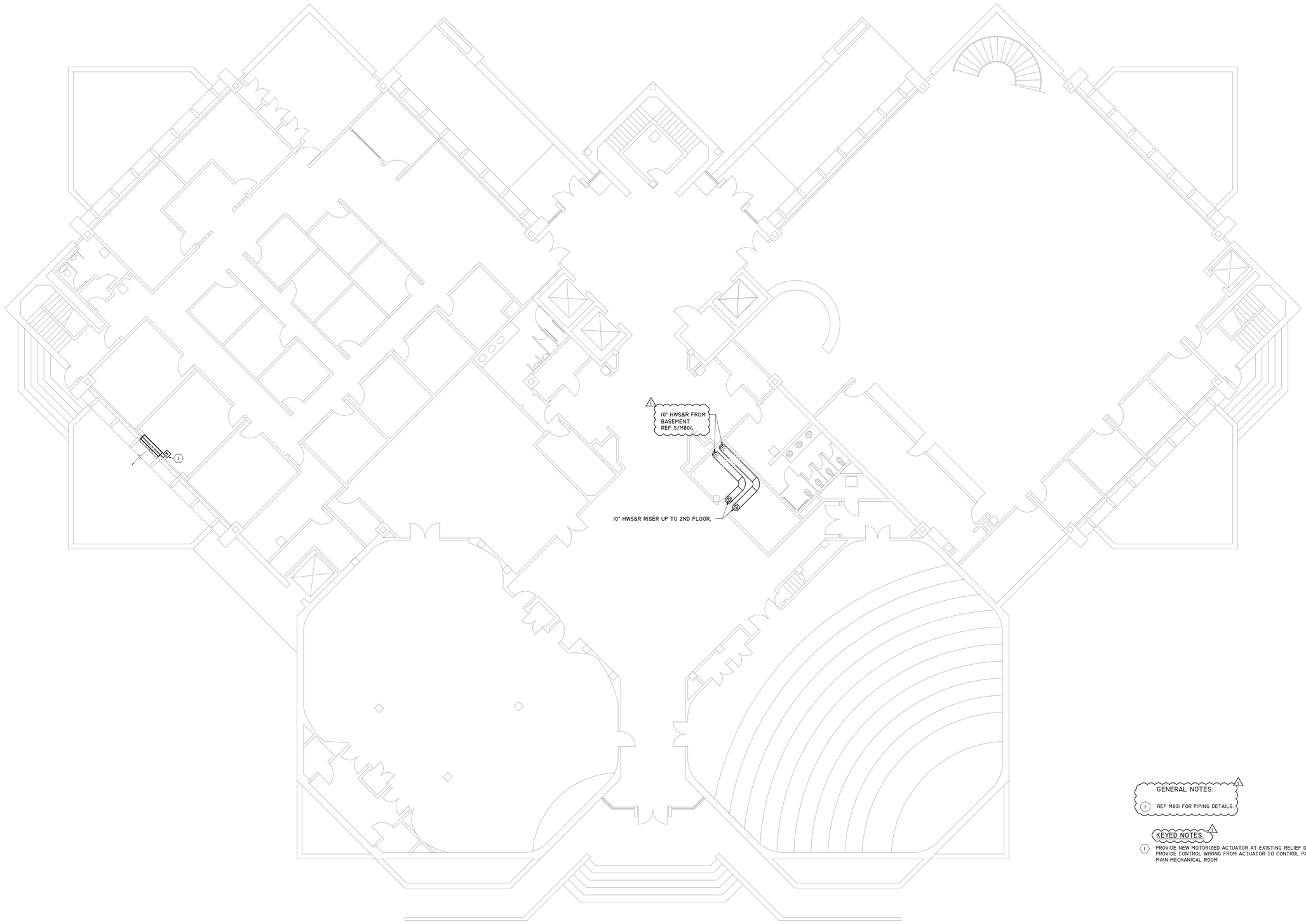

GENERAL NOTES:

1. REF M801 FOR PIPING DETAILS.

KEYED NOTES:

1. PROVIDE NEW MOTORIZED ACTUATOR AT EXISTING RELIEF DAMPER. PROVIDE CONTROL WIRING FROM ACTUATOR TO CONTROL PANEL IN MAIN MECHANICAL ROOM

1 1ST FLOOR PLAN - PROPOSED

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

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119970
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8-16-2017

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1ST FLOOR PLAN - HVAC - PROPOSED

Sheet

M201

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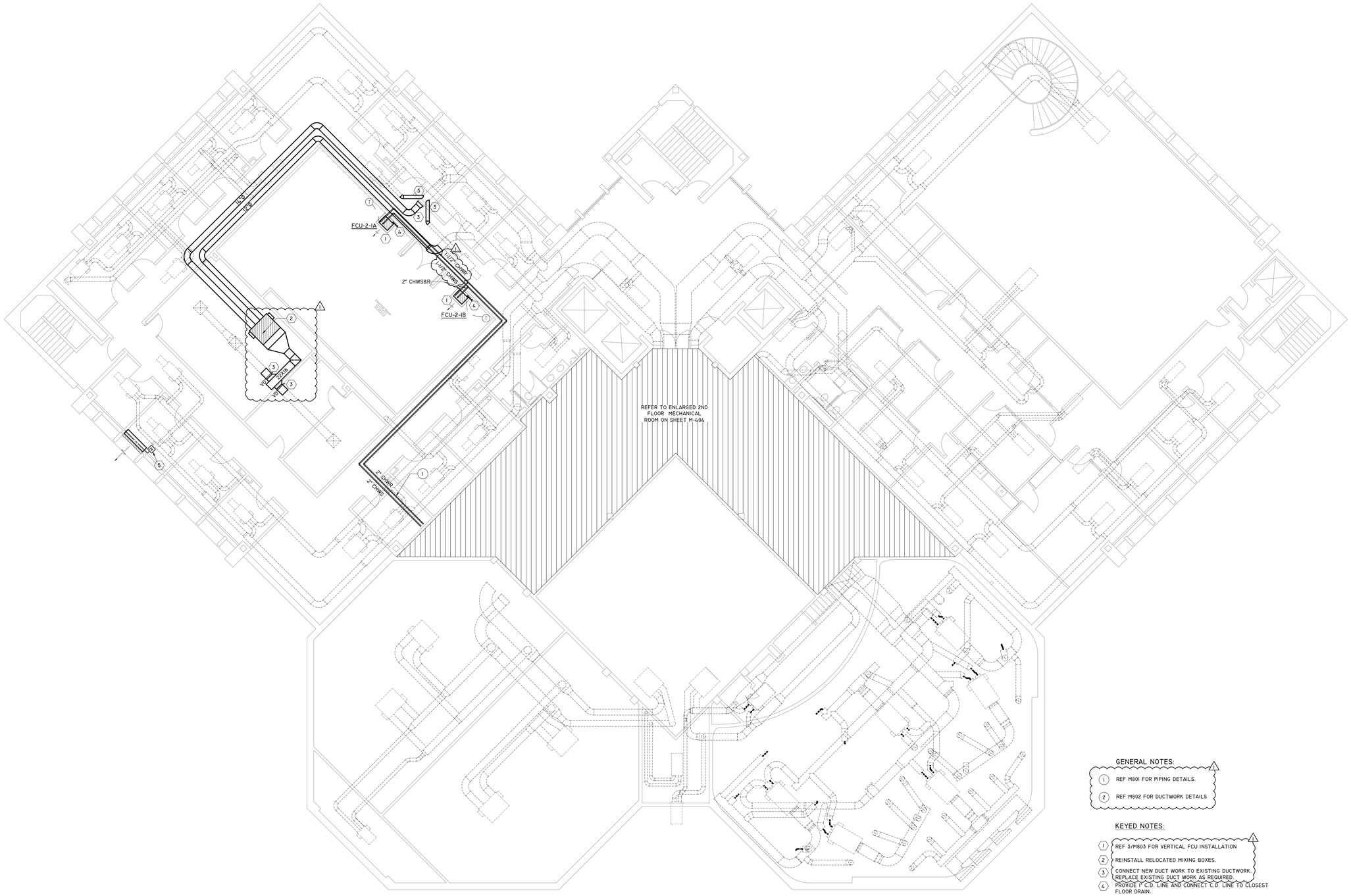

1 2ND FLOOR PLAN - HVAC - PROPOSED

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

GENERAL NOTES:

1. REF M801 FOR PIPING DETAILS.
2. REF M802 FOR DUCTWORK DETAILS

KEYED NOTES:

1. REF 3/M803 FOR VERTICAL FCU INSTALLATION
2. REINSTALL RELOCATED MIXING BOXES.
3. CONNECT NEW DUCT WORK TO EXISTING DUCTWORK. REPLACE EXISTING DUCT WORK AS REQUIRED.
4. PROVIDE 1" C.D. LINE AND CONNECT C.D. LINE TO CLOSEST FLOOR DRAIN.
5. PROVIDE NEW MOTORIZED ACTUATOR AT EXISTING RELIEF DAMPER. PROVIDE CONTROL WIRING FROM ACTUATOR TO CONTROL PANEL IN MAIN MECHANICAL ROOM

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2ND FLOOR PLAN - HVAC - PROPOSED

Sheet

M202

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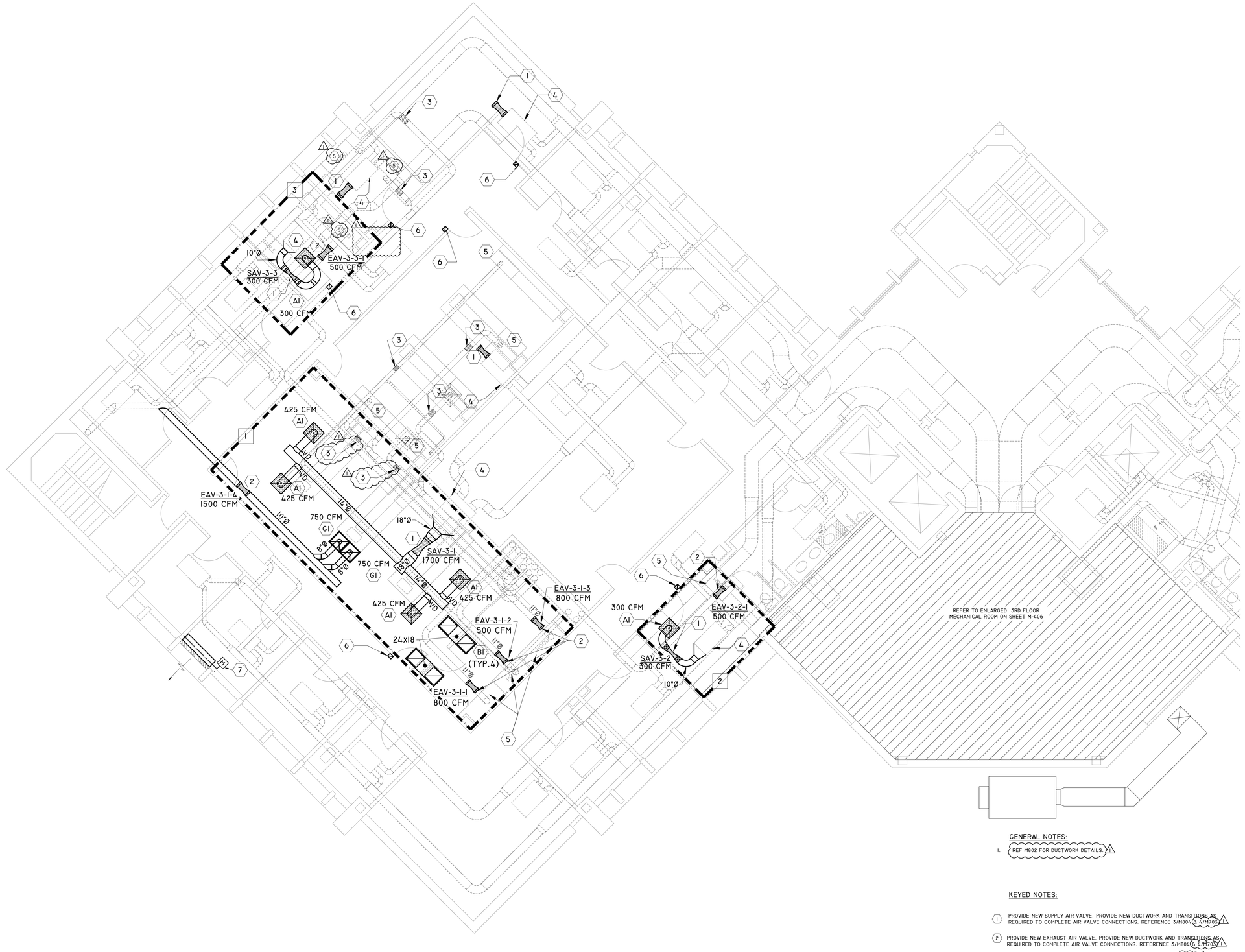

1 3RD FLOOR PLAN - HVAC - PROPOSED

SCALE: 3/16" = 1'-0"

GENERAL NOTES:

1. REF M802 FOR DUCTWORK DETAILS. (1)

KEYED NOTES:

1. PROVIDE NEW SUPPLY AIR VALVE. PROVIDE NEW DUCTWORK AND TRANSITIONS AS REQUIRED TO COMPLETE AIR VALVE CONNECTIONS. REFERENCE 3/M804 & 4/M703 (1)
2. PROVIDE NEW EXHAUST AIR VALVE. PROVIDE NEW DUCTWORK AND TRANSITIONS AS REQUIRED TO COMPLETE AIR VALVE CONNECTIONS. REFERENCE 3/M804 & 4/M703 (1)
3. RETROFIT EXISTING AIR VALVE WITH NEW CONTROLS. REFERENCE 6/M703 (1)
4. RETROFIT EXISTING DUAL DUCT TERMINAL UNIT WITH NEW CONTROLS. REFERENCE 2/M703.
5. RETROFIT EXISTING FUME HOOD WITH NEW SASH POSITION SENSOR AND NEW CONTROLS. REFERENCE 4/M703.
6. PROVIDE NEW DIFFERENTIAL PRESSURE SENSOR AND ROOM CONTROL MONITORING PANEL. REFERENCE 1/M703. (1)
7. PROVIDE NEW MOTORIZED ACTUATOR AT EXISTING RELIEF DAMPER. PROVIDE CONTROL WIRING FROM ACTUATOR TO CONTROL PANEL IN MAIN MECHANICAL ROOM

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3RD FLOOR PLAN - HVAC - PROPOSED

Sheet

M203

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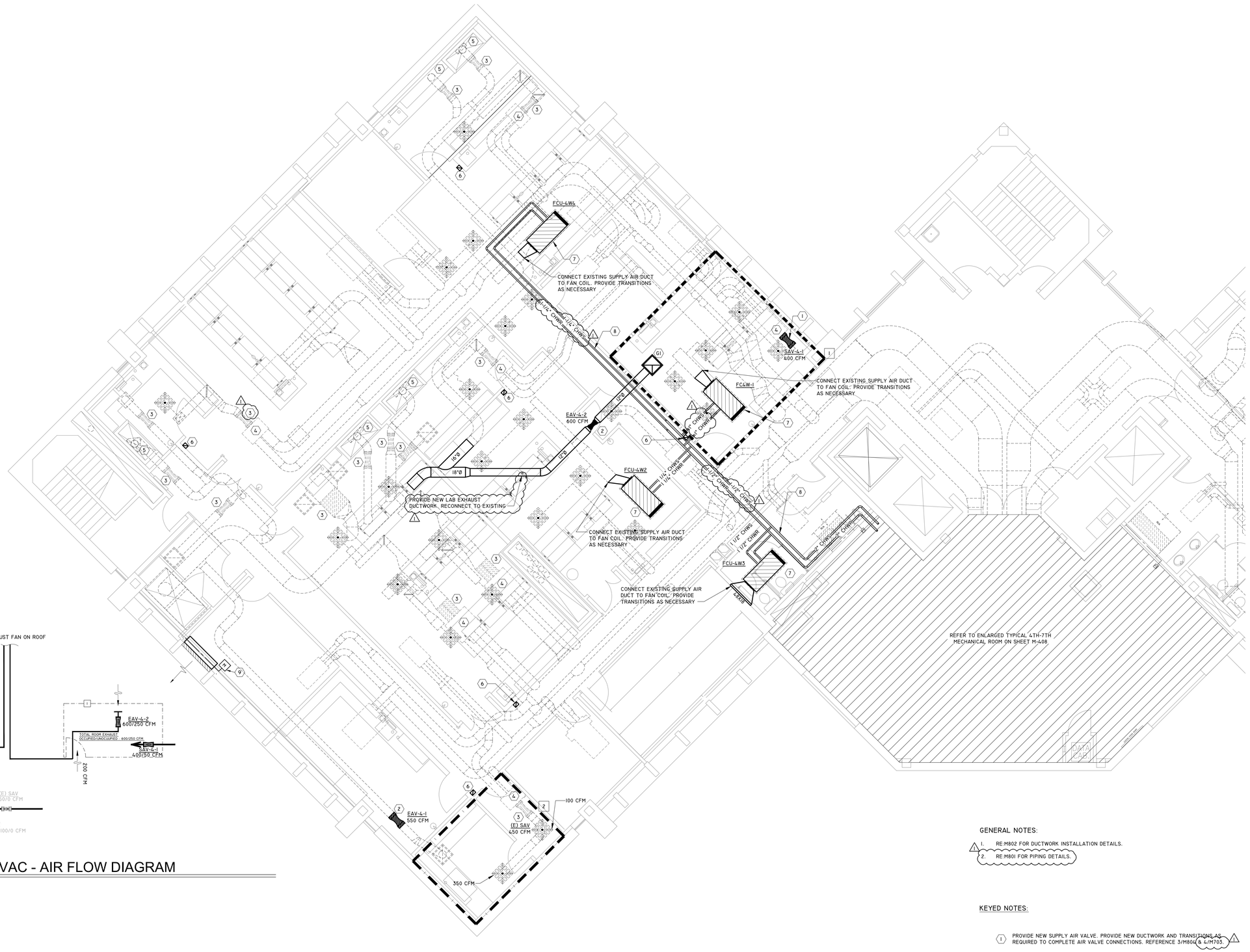

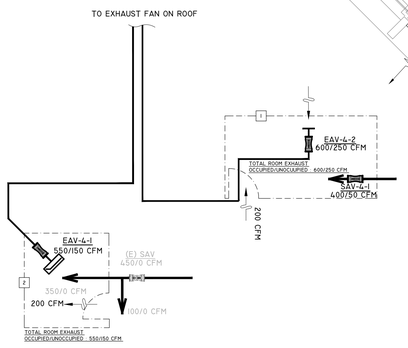

2 4TH FLOOR PLAN - HVAC - AIR FLOW DIAGRAM

SCALE: NTS

1 4TH FLOOR PLAN - HVAC - PROPOSED

SCALE: 3/16" = 1'-0"

GENERAL NOTES:

1. RE:M802 FOR DUCTWORK INSTALLATION DETAILS.
2. RE:M801 FOR PIPING DETAILS.

KEYED NOTES:

1. PROVIDE NEW SUPPLY AIR VALVE. PROVIDE NEW DUCTWORK AND TRANSITIONS AS REQUIRED TO COMPLETE AIR VALVE CONNECTIONS. REFERENCE 3/M804 & 4/M703.
2. PROVIDE NEW EXHAUST AIR VALVE. PROVIDE NEW DUCTWORK AND TRANSITIONS AS REQUIRED TO COMPLETE AIR VALVE CONNECTIONS. REFERENCE 3/M804 & 4/M703.
3. RETROFIT EXISTING AIR VALVE WITH NEW CONTROLS. REFERENCE 4/M703.
4. RETROFIT EXISTING DUAL DUCT TERMINAL UNIT WITH NEW CONTROLS. REFERENCE 2/M703.
5. RETROFIT EXISTING FUME HOOD WITH NEW SASH POSITION SENSOR AND NEW CONTROLS. REFERENCE 4/M703.
6. PROVIDE NEW DIFFERENTIAL PRESSURE SENSOR AND ROOM CONTROL MONITORING PANEL. REFERENCE 1/M703.
7. NEW REPLACEMENT FAN COIL UNIT. INSTALL FAN COIL AT THE LOCATION SHOWN AND RECONNECT TO EXISTING DUCTWORK. PROVIDE NEW CONDENSATE P-TRAP AND CONNECT TO EXISTING CONDENSATE DRAIN LINE. RE: 4/M804 FOR INSTALLATION DETAILS.
8. PROVIDE NEW CHILLED WATER PIPING.
9. PROVIDE NEW MOTORIZED ACTUATOR AT EXISTING RELIEF DAMPER. PROVIDE CONTROL WIRING FROM ACTUATOR TO CONTROL PANEL IN MAIN MECHANICAL ROOM

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4TH FLOOR PLAN - HVAC - PROPOSED

Sheet

M204

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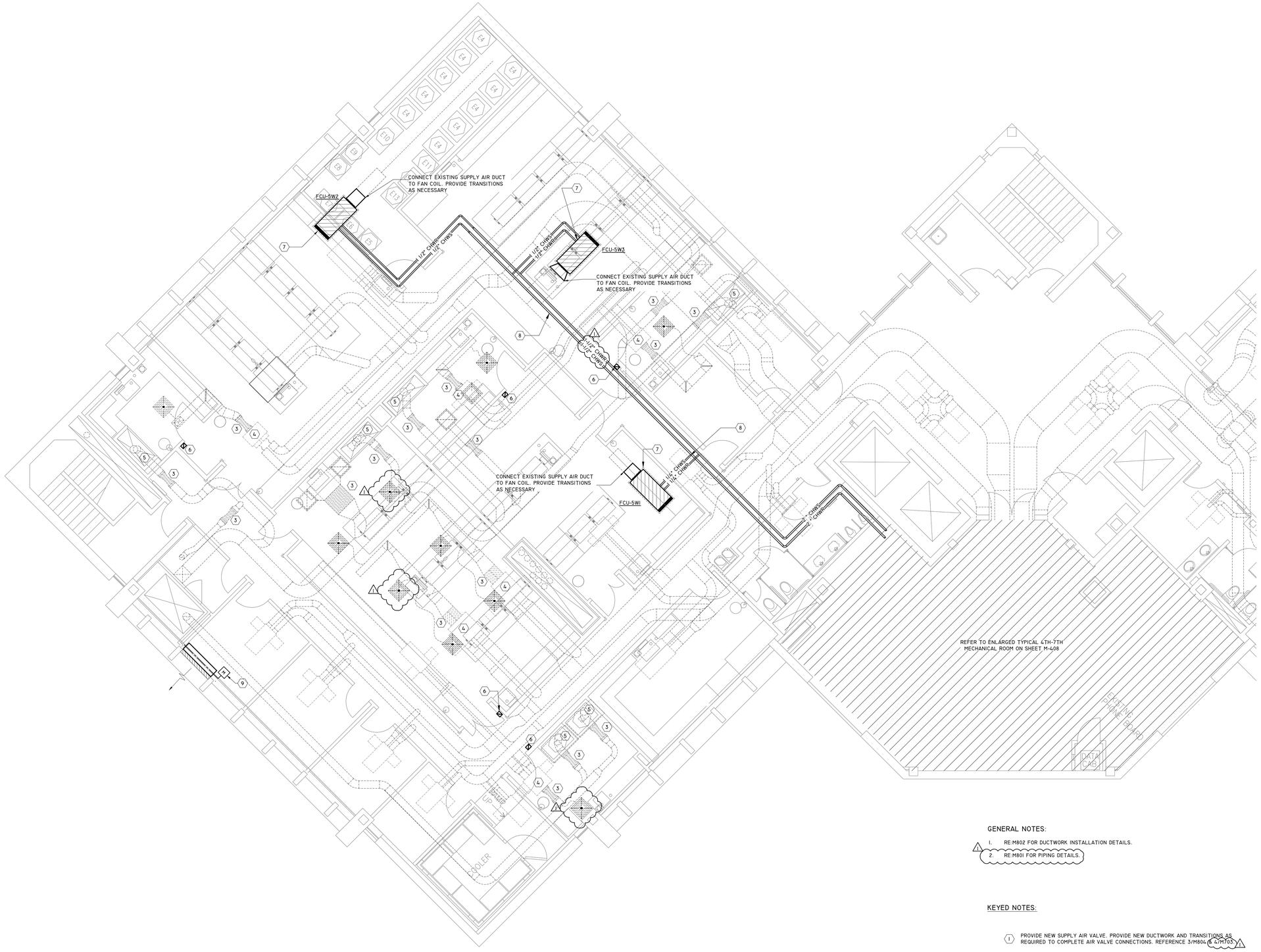

1 5TH FLOOR PLAN - HVAC - PROPOSED

SCALE: 3/16" = 1'-0"

GENERAL NOTES:

1. RE:M802 FOR DUCTWORK INSTALLATION DETAILS.
2. RE:M801 FOR PIPING DETAILS.

KEYED NOTES:

1. PROVIDE NEW SUPPLY AIR VALVE. PROVIDE NEW DUCTWORK AND TRANSITIONS AS REQUIRED TO COMPLETE AIR VALVE CONNECTIONS. REFERENCE 3/M804 & 4/M703.
2. PROVIDE NEW EXHAUST AIR VALVE. PROVIDE NEW DUCTWORK AND TRANSITIONS AS REQUIRED TO COMPLETE AIR VALVE CONNECTIONS. REFERENCE 3/M804 & 4/M703.
3. RETROFIT EXISTING AIR VALVE WITH NEW CONTROLS. REFERENCE 4/M703.
4. RETROFIT EXISTING DUAL DUCT TERMINAL UNIT WITH NEW CONTROLS. REFERENCE 2/M703.
5. RETROFIT EXISTING FUME HOOD WITH NEW SASH POSITION SENSOR AND NEW CONTROLS. REFERENCE 4/M703.
6. PROVIDE NEW DIFFERENTIAL PRESSURE SENSOR AND ROOM CONTROL MONITORING PANEL. REFERENCE 1/M703.
7. NEW REPLACEMENT FAN COIL UNIT. INSTALL FAN COIL AT THE LOCATION SHOWN AND RECONNECT TO EXISTING DUCTWORK. PROVIDE NEW CONDENSATE P-TRAP AND CONNECT TO EXISTING CONDENSATE DRAIN LINE. RE: 4/M804 FOR INSTALLATION DETAILS.
8. PROVIDE NEW CHILLED WATER PIPING.
9. PROVIDE NEW MOTORIZED ACTUATOR AT EXISTING RELIEF DAMPER. PROVIDE CONTROL WIRING FROM ACTUATOR TO CONTROL PANEL IN MAIN MECHANICAL ROOM

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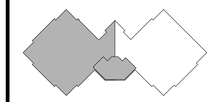

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5TH FLOOR PLAN - HVAC - PROPOSED

Sheet

M205

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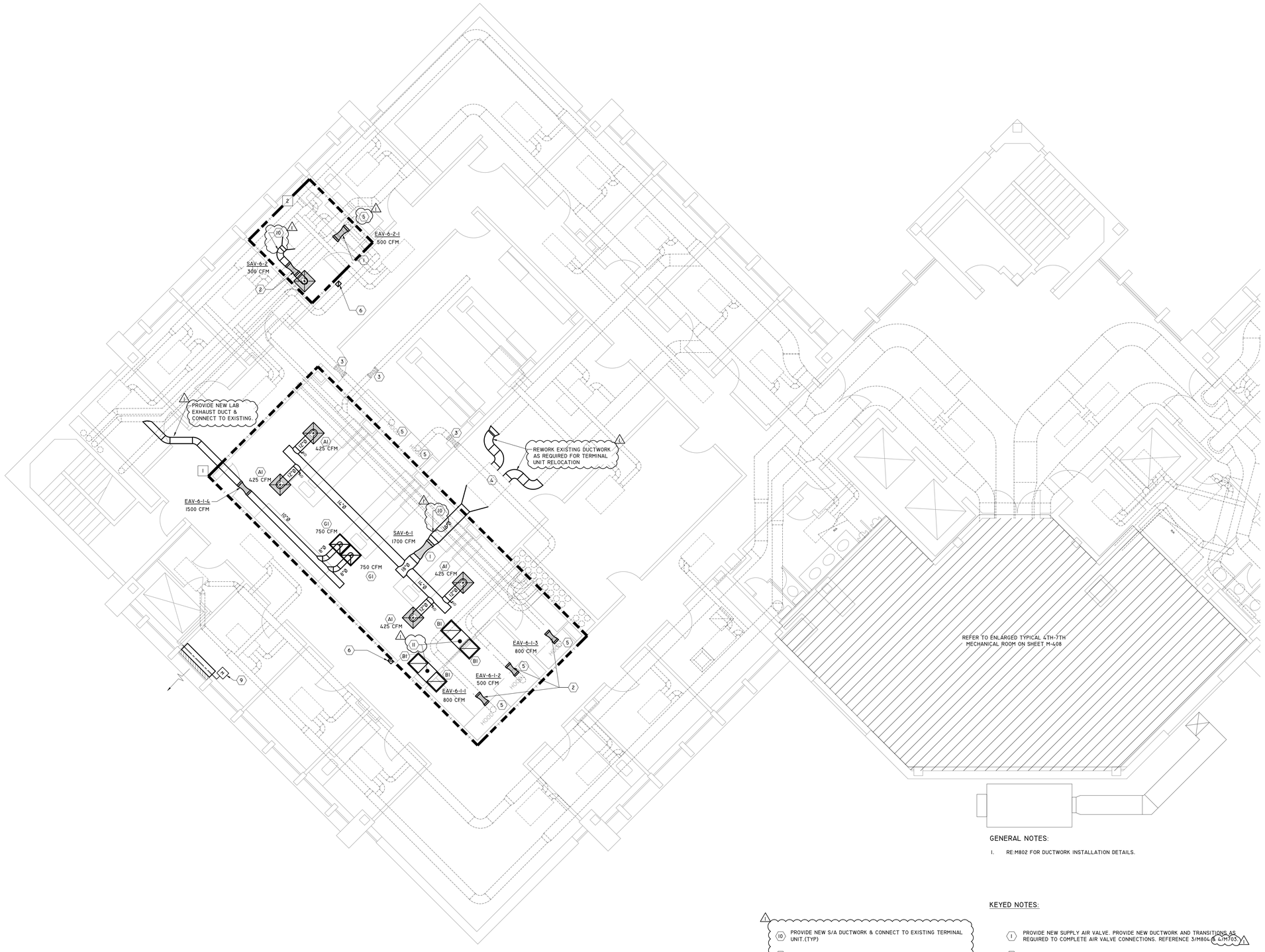

1 6TH FLOOR PLAN - HVAC - PROPOSED

SCALE: 3/16" = 1'-0"

GENERAL NOTES:

1. RE:M802 FOR DUCTWORK INSTALLATION DETAILS.

KEYED NOTES:

(10) PROVIDE NEW S/A DUCTWORK & CONNECT TO EXISTING TERMINAL UNIT.(TYP)

(11) PROVIDE NEW 24X18 TRANSFER DUCTS.

(1) PROVIDE NEW SUPPLY AIR VALVE. PROVIDE NEW DUCTWORK AND TRANSITIONS AS REQUIRED TO COMPLETE AIR VALVE CONNECTIONS. REFERENCE 3/M804 & 4/M703. (1)

(2) PROVIDE NEW EXHAUST AIR VALVE. PROVIDE NEW DUCTWORK AND TRANSITIONS AS REQUIRED TO COMPLETE AIR VALVE CONNECTIONS. REFERENCE 3/M804 & 4/M703. (1)

(3) RETROFIT EXISTING AIR VALVE WITH NEW CONTROLS. REFERENCE 4/M703. (1)

(4) RETROFIT EXISTING DUAL DUCT TERMINAL UNIT WITH NEW CONTROLS. REFERENCE 2/M703.

(5) RETROFIT EXISTING FUME HOOD WITH NEW SASH POSITION SENSOR AND NEW CONTROLS. REFERENCE 4/M703.

(6) PROVIDE NEW DIFFERENTIAL PRESSURE SENSOR AND ROOM CONTROL MONITORING PANEL. REFERENCE 1/M703. (1)

(7) REPLACE EXISTING FAN COIL UNIT. FIELD VERIFY EXISTING CONDITION AND COORDINATE REPLACEMENT FCU SELECTION. FOR BEST POSSIBLE SERVICE ACCESS. RECONNECT EXISTING DUCTWORK TO REPLACE FCU. RE: 4/M804 FOR INSTALLATION DETAILS. (1)

(8) PROVIDE NEW CHILLED WATER PIPING. (1)

(9) PROVIDE NEW MOTORIZED ACTUATOR AT EXISTING RELIEF DAMPER. PROVIDE CONTROL WIRING FROM ACTUATOR TO CONTROL PANEL IN MAIN MECHANICAL ROOM

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6TH FLOOR PLAN - HVAC - PROPOSED

Sheet

M206

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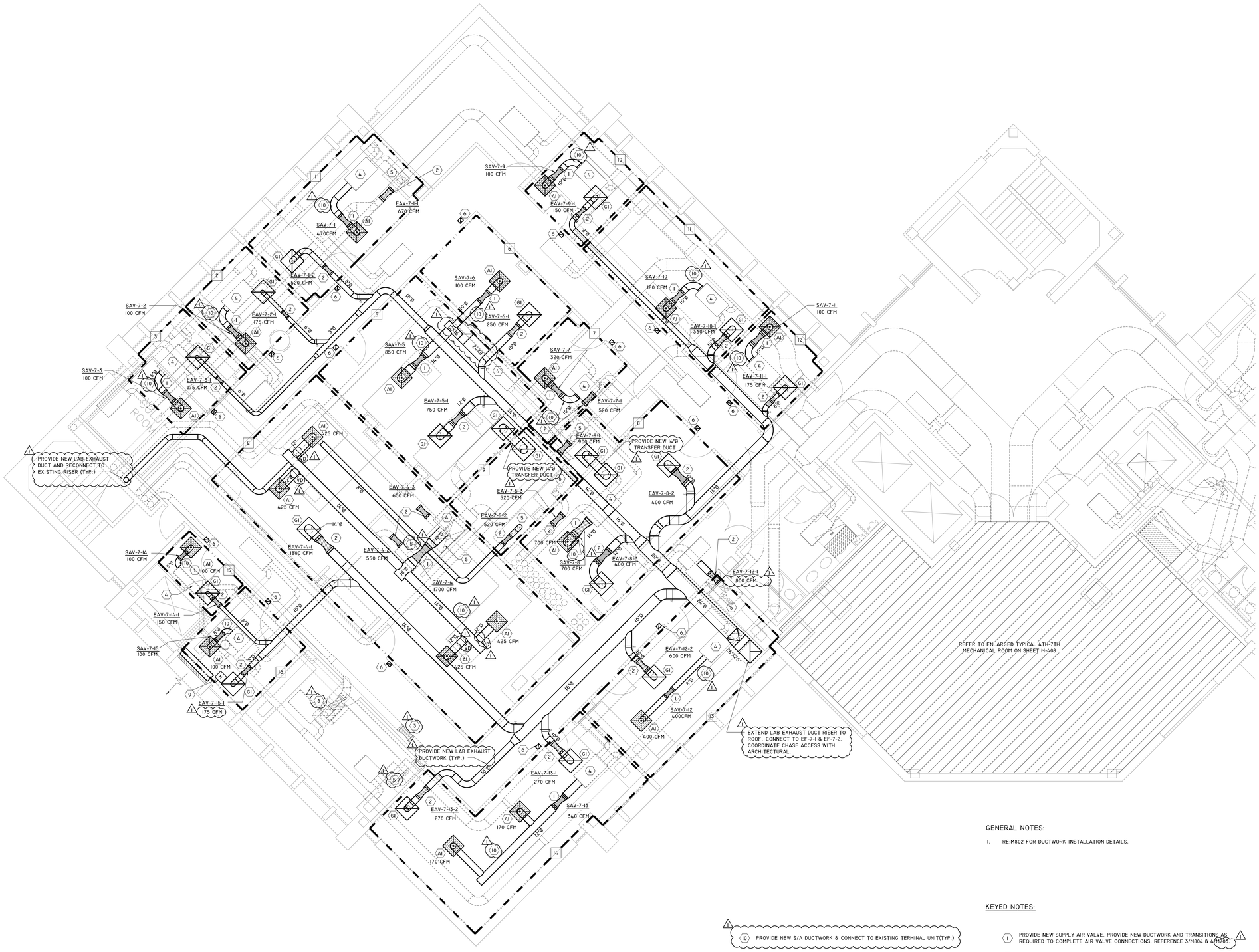

1 7TH WEST FLOOR PLAN - HVAC - PROPOSED

SCALE: 3/16" = 1'-0"

GENERAL NOTES:

1. RE:M802 FOR DUCTWORK INSTALLATION DETAILS.

KEYED NOTES:

(10) PROVIDE NEW S/A DUCTWORK & CONNECT TO EXISTING TERMINAL UNIT(TYP.)

1. PROVIDE NEW SUPPLY AIR VALVE. PROVIDE NEW DUCTWORK AND TRANSITIONS AS REQUIRED TO COMPLETE AIR VALVE CONNECTIONS. REFERENCE 3/M804 & 4/M703.
2. PROVIDE NEW EXHAUST AIR VALVE. PROVIDE NEW DUCTWORK AND TRANSITIONS AS REQUIRED TO COMPLETE AIR VALVE CONNECTIONS. REFERENCE 3/M804 & 4/M703.
3. RETROFIT EXISTING AIR VALVE WITH NEW CONTROLS. REFERENCE 4/M703.
4. RETROFIT EXISTING DUAL DUCT TERMINAL UNIT WITH NEW CONTROLS. REFERENCE 2/M703.
5. RETROFIT EXISTING FUME HOOD WITH NEW SASH POSITION SENSOR AND NEW CONTROLS. REFERENCE 4/M703.
6. PROVIDE NEW DIFFERENTIAL PRESSURE SENSOR AND ROOM CONTROL MONITORING PANEL. REFERENCE 1/M703.
7. NOT USED.
8. PROVIDE NEW CHILLED WATER PIPING.
9. PROVIDE NEW MOTORIZED ACTUATOR AT EXISTING RELIEF DAMPER. PROVIDE CONTROL WIRING FROM ACTUATOR TO CONTROL PANEL IN MAIN MECHANICAL ROOM

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7TH WEST FLOOR PLAN - HVAC - PROPOSED

Sheet

M207

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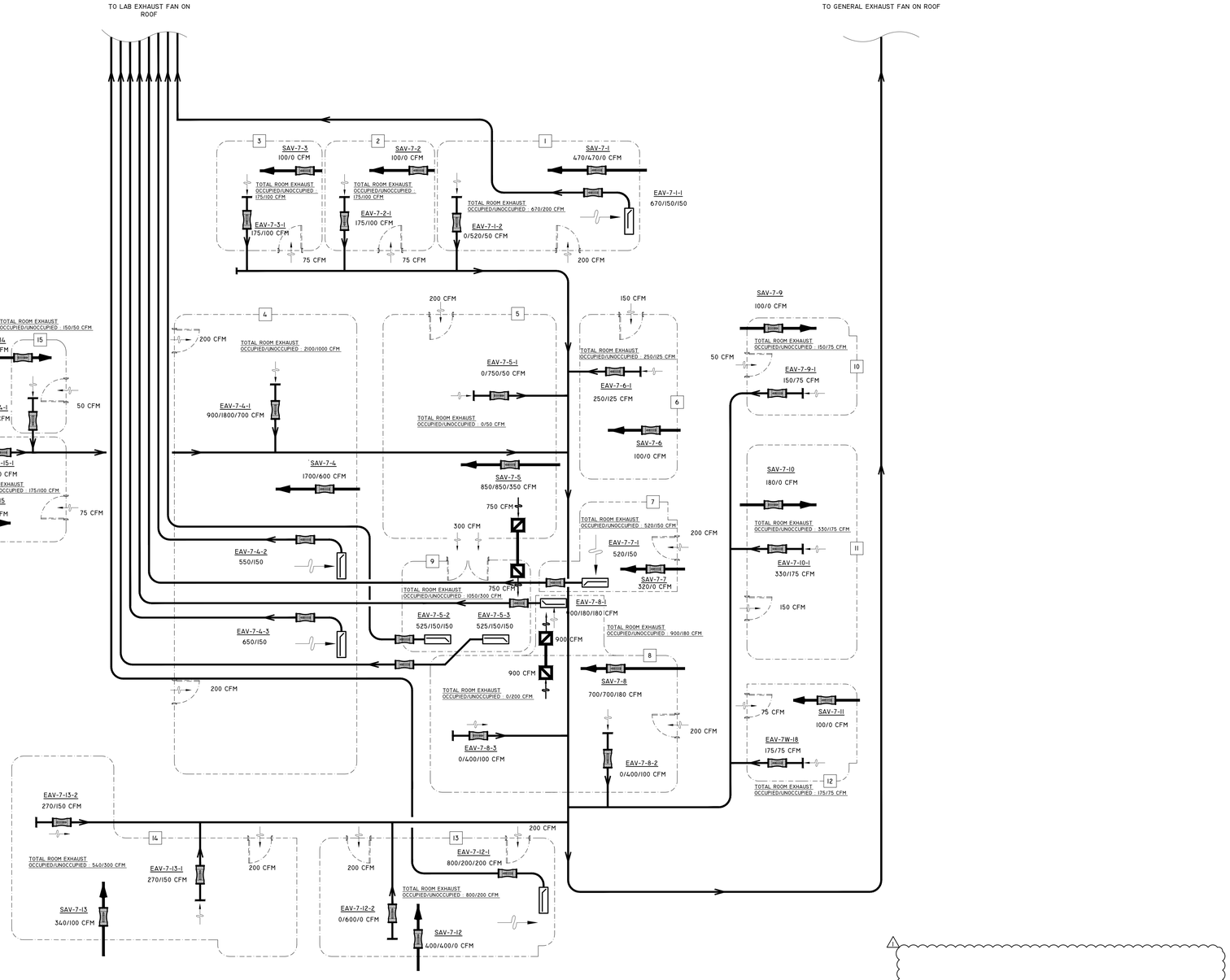

1 7TH WEST FLOOR PLAN - AIR FLOW DIAGRAM

SCALE: NTS

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7TH WEST FLOOR PLAN - AIR FLOW DIAGRAM

Sheet

M207A

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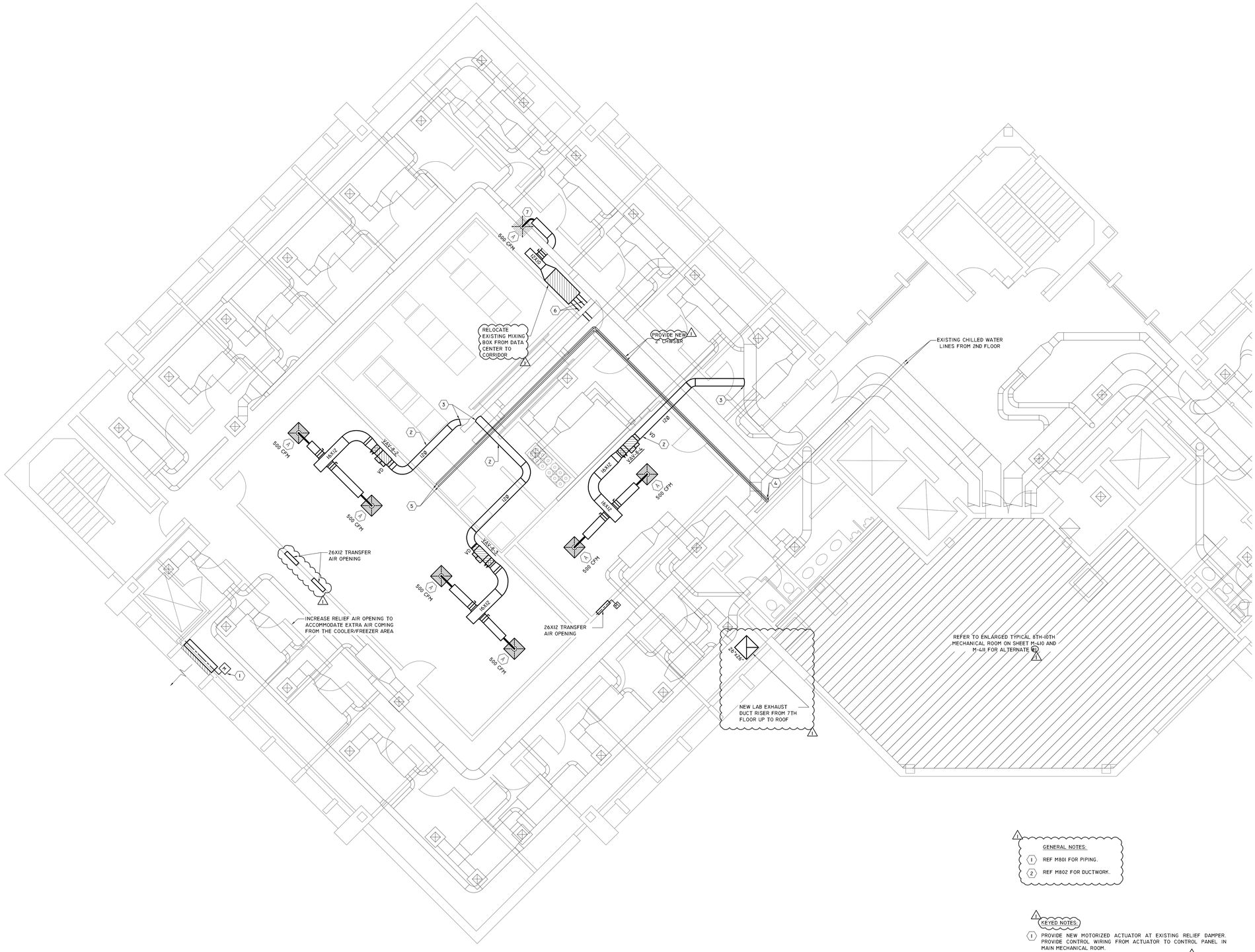

1 8TH WEST FLOOR PLAN - HVAC - PROPOSED

SCALE: 3/16" = 1'-0"

GENERAL NOTES:

1. REF M80I FOR PIPING.
2. REF M802 FOR DUCTWORK.

KEYED NOTES:

1. PROVIDE NEW MOTORIZED ACTUATOR AT EXISTING RELIEF DAMPER. PROVIDE CONTROL WIRING FROM ACTUATOR TO CONTROL PANEL IN MAIN MECHANICAL ROOM.
2. PROVIDE NEW 12" SUPPLY DUCT TO NEW TERMINAL UNIT.
3. CONNECT NEW DUCT TO EXISTING COLD DUCT BRANCH.
4. CONNECT NEW CHWS&R PIPING TO EXISTING CHILLED WATER MAINS COMING FROM 2ND FLOOR LOCATED ABOVE THE CEILING.
5. CONNECT NEW 2" CHWS&R LINE TO SERVER ROOM AC UNIT.
6. EXTEND HOT AND COLD DUCTS TO RELOCATED TERMINAL UNIT.
7. RELOCATE EXISTING DIFFUSER AS INDICATED. PROVIDE NEW S/A DUCT AS REQUIRED.

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8TH WEST FLOOR PLAN - HVAC - PROPOSED

Sheet

M208

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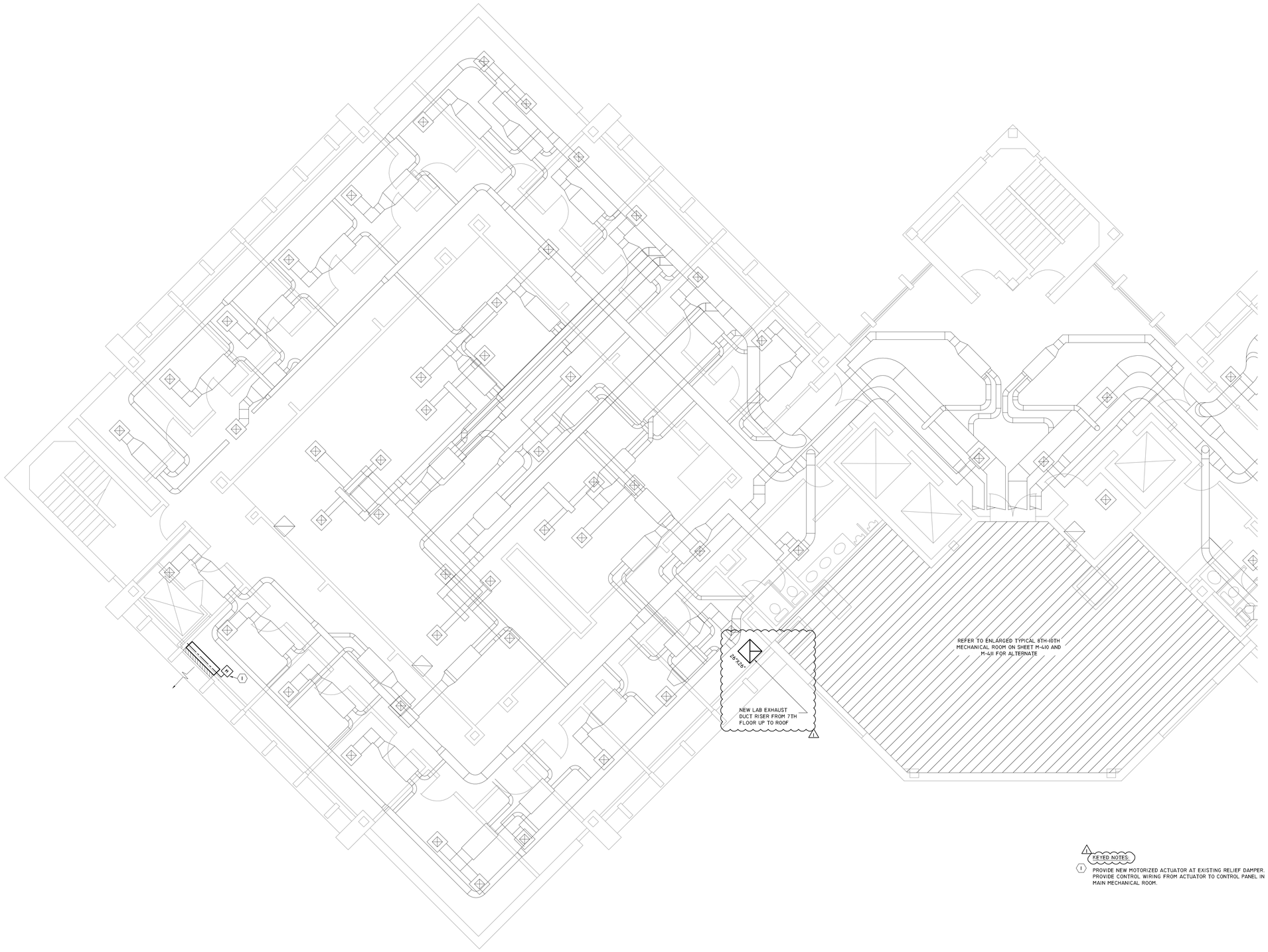

KEYED NOTES:

1 PROVIDE NEW MOTORIZED ACTUATOR AT EXISTING RELIEF DAMPER. PROVIDE CONTROL WIRING FROM ACTUATOR TO CONTROL PANEL IN MAIN MECHANICAL ROOM.

1 9TH WEST FLOOR PLAN - HVAC - PROPOSED

SCALE: 3/16" = 1'-0"

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9TH WEST FLOOR PLAN - HVAC - PROPOSED

Sheet

M209

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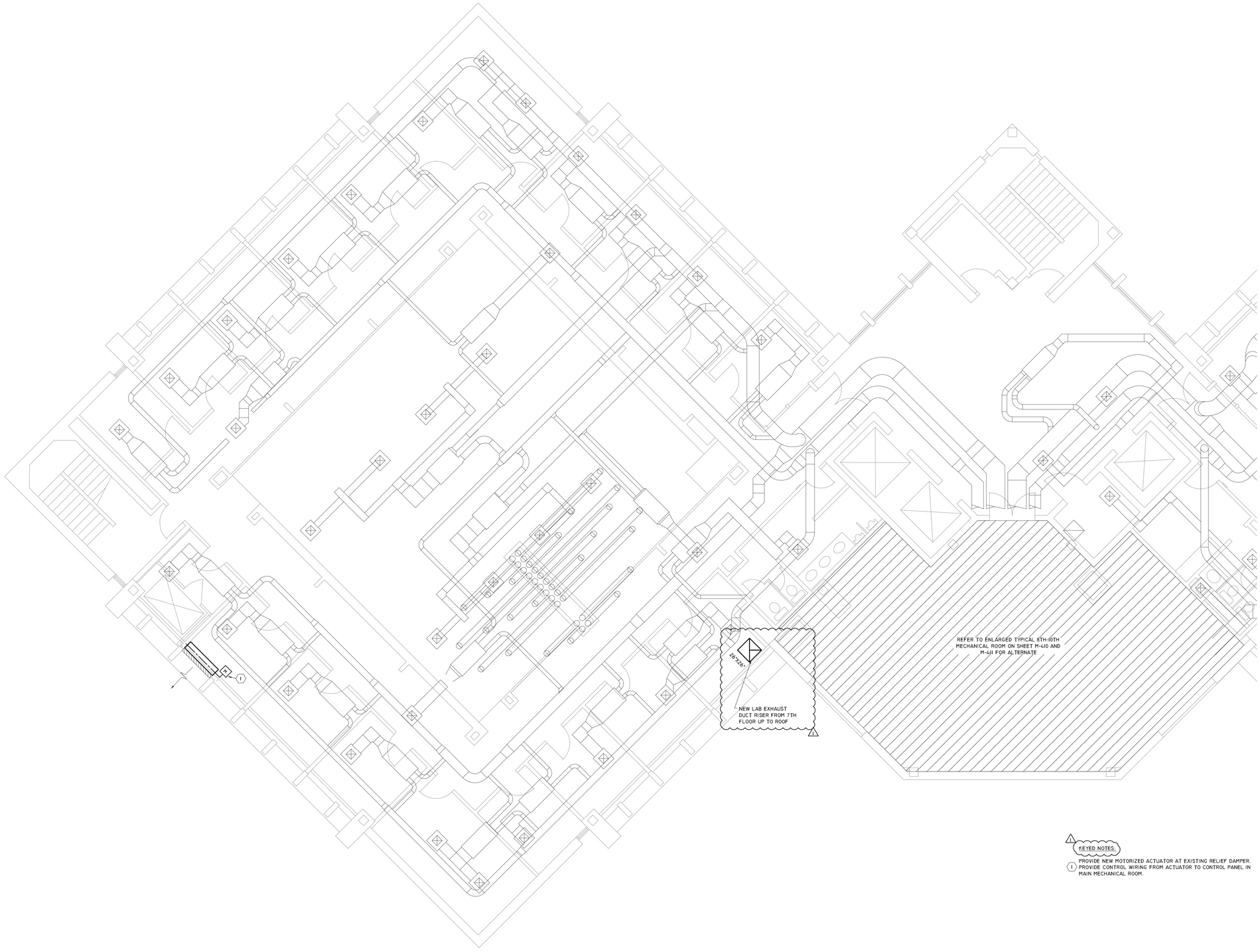
0 1/2" 1" 2"



KEYED NOTES:

1 PROVIDE NEW MOTORIZED ACTUATOR AT EXISTING RELIEF DAMPER. PROVIDE CONTROL WIRING FROM ACTUATOR TO CONTROL PANEL IN MAIN MECHANICAL ROOM.

1 10TH WEST FLOOR PLAN - HVAC - PROPOSED

SCALE: 3/16" = 1'-0"

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LICENSED
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10TH WEST FLOOR PLAN - HVAC - PROPOSED

Sheet

M210

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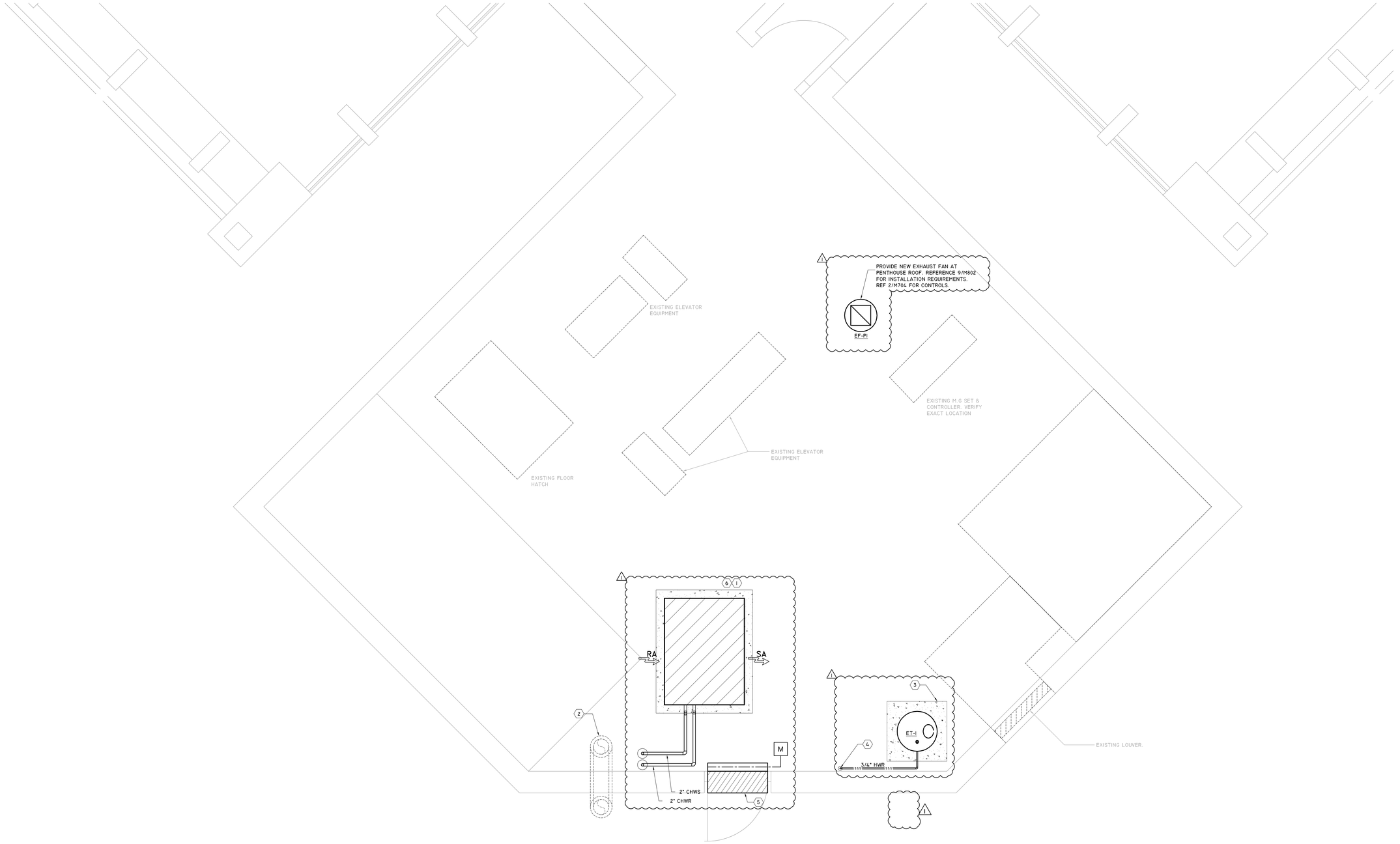

1 PENTHOUSE FLOOR PLAN - HVAC - PROPOSED

SCALE: 1/2" = 1'-0"

KEYED NOTES:

1. RE: 1/M804 FOR NEW AHU INSTALLATION. MODIFY EXISTING HOUSE KEEPING PAD TO ACCOMMODATE NEW AHU. REF 2/M704 FOR CONTROLS.
2. REPLACE EXISTING MEDIUM PRESSURE STEAM RELIEF VALVE. RECONNECT TO EXISTING PIPING. REF 7/M804.
3. PROVIDE NEW EXPANSION TANK FOR HOT WATER SYSTEM. REF 1/M801.
4. ROUTE 3/4" HOT WATER LINE TO MAIN HOT WATER RISER AT 10TH FLOOR BELOW.
5. PROVIDE 36X24 CS GROUP MODEL RS-7315 LOUVER ABOVE EXISTING DOOR.
6. PROVIDE NEW CONDENSATE TRAP & DRAIN PIPING EQUAL TO UNIT CONNECTION. REFER TO SHEET 11/M8.02.

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KEY PLAN

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MATT A FLUHRER
119970
LICENSED
PROFESSIONAL ENGINEER
8-16-2017

REVISIONS

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08/16/2017	ADDENDUM 2
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PENTHOUSE FLOOR PLAN - HVAC - PROPOSED

Sheet

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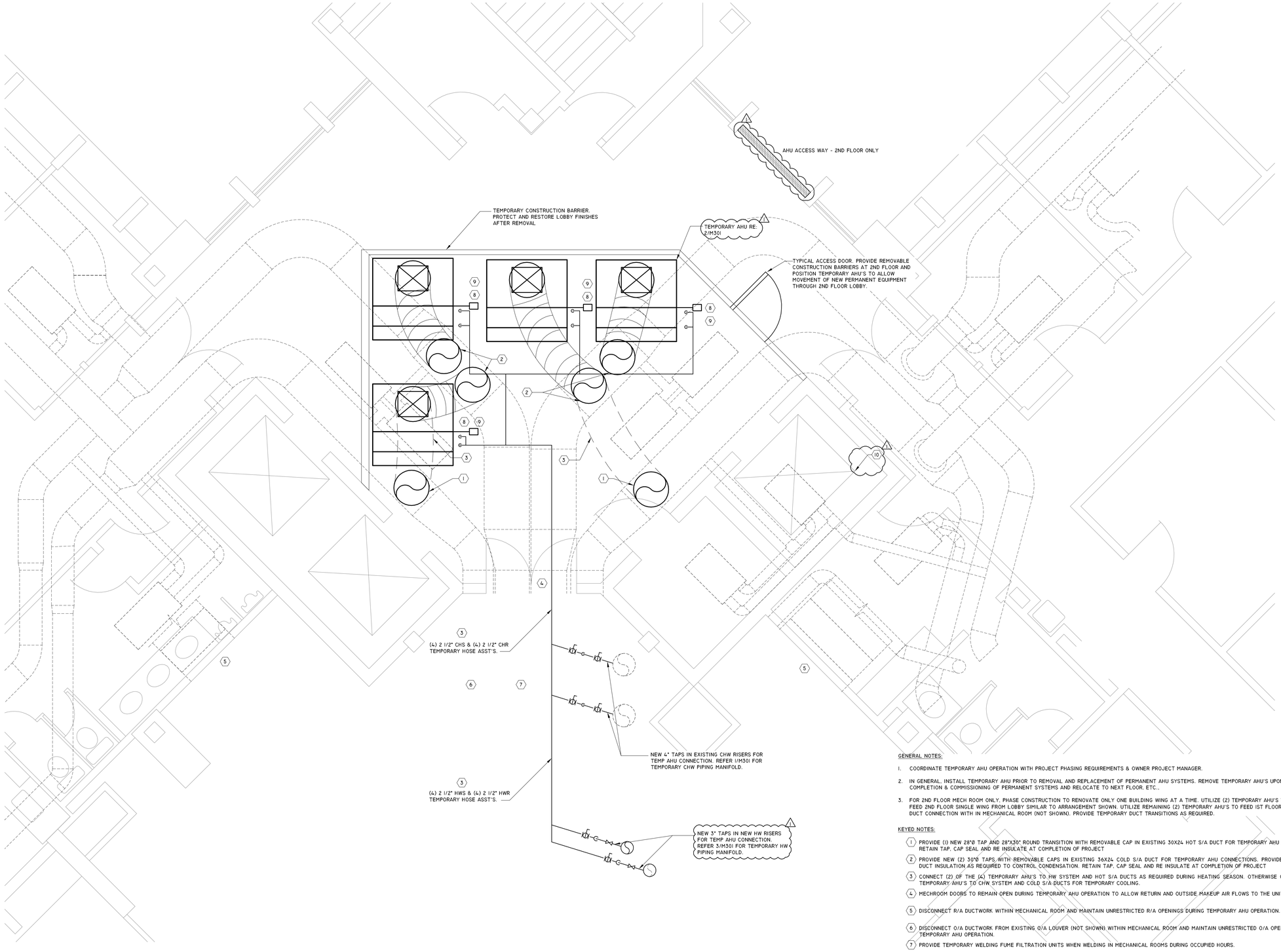

1 ENLARGED PLAN - TYPICAL 2ND-10TH FLOOR - LOBBY - TEMPORARY AHU INSTALLATIONS

SCALE: 3/8" = 1'-0"

GENERAL NOTES:

1. COORDINATE TEMPORARY AHU OPERATION WITH PROJECT PHASING REQUIREMENTS & OWNER PROJECT MANAGER.
2. IN GENERAL, INSTALL TEMPORARY AHU PRIOR TO REMOVAL AND REPLACEMENT OF PERMANENT AHU SYSTEMS. REMOVE TEMPORARY AHU'S UPON COMPLETION & COMMISSIONING OF PERMANENT SYSTEMS AND RELOCATE TO NEXT FLOOR, ETC..
3. FOR 2ND FLOOR MECH ROOM ONLY, PHASE CONSTRUCTION TO RENOVATE ONLY ONE BUILDING WING AT A TIME. UTILIZE (2) TEMPORARY AHU'S TO FEED 2ND FLOOR SINGLE WING FROM LOBBY SIMILAR TO ARRANGEMENT SHOWN. UTILIZE REMAINING (2) TEMPORARY AHU'S TO FEED 1ST FLOOR DUCT CONNECTION WITH IN MECHANICAL ROOM (NOT SHOWN). PROVIDE TEMPORARY DUCT TRANSITIONS AS REQUIRED.

KEYED NOTES:

1. PROVIDE (1) NEW 28"Ø TAP AND 28"X30" ROUND TRANSITION WITH REMOVABLE CAP IN EXISTING 30X24 HOT S/A DUCT FOR TEMPORARY AHU CONNECTION. RETAIN TAP, CAP SEAL AND RE INSULATE AT COMPLETION OF PROJECT
2. PROVIDE NEW (2) 30"Ø TAPS WITH REMOVABLE CAPS IN EXISTING 36X24 COLD S/A DUCT FOR TEMPORARY AHU CONNECTIONS. PROVIDE TEMPORARY DUCT INSULATION AS REQUIRED TO CONTROL CONDENSATION. RETAIN TAP, CAP SEAL AND RE INSULATE AT COMPLETION OF PROJECT
3. CONNECT (2) OF THE (4) TEMPORARY AHU'S TO HW SYSTEM AND HOT S/A DUCTS AS REQUIRED DURING HEATING SEASON. OTHERWISE CONNECT ALL TEMPORARY AHU'S TO CHW SYSTEM AND COLD S/A DUCTS FOR TEMPORARY COOLING.
4. MECHROOM DOORS TO REMAIN OPEN DURING TEMPORARY AHU OPERATION TO ALLOW RETURN AND OUTSIDE MAKEUP AIR FLOWS TO THE UNITS.
5. DISCONNECT R/A DUCTWORK WITHIN MECHANICAL ROOM AND MAINTAIN UNRESTRICTED R/A OPENINGS DURING TEMPORARY AHU OPERATION.
6. DISCONNECT O/A DUCTWORK FROM EXISTING O/A LOUVER (NOT SHOWN) WITHIN MECHANICAL ROOM AND MAINTAIN UNRESTRICTED O/A OPENINGS DURING TEMPORARY AHU OPERATION.
7. PROVIDE TEMPORARY WELDING FUME FILTRATION UNITS WHEN WELDING IN MECHANICAL ROOMS DURING OCCUPIED HOURS.
8. PROVIDE TEMPORARY CONDENSATE PUMPING UNIT AT EACH TEMPORARY AHU. PROVIDE DISCHARGE HOSE & ROUTE TO MECH ROOM FLOOR DRAIN. INSULATE AS REQUIRED TO PREVENT CONDENSATION. PROVIDE TEMPORARY POWER TO CONDENSATE UNITS FROM EXISTING 110 VAC. CONVENIENCE OUTLETS.
9. PROVIDE TEMPORARY 40AT/3P 480 VAC, 30 BREAKERS IN AVAILABLE ELECTRICAL PANEL WITH #8/4 SOOW CORD OR MC CABLE TO EACH TEMPORARY AHU VFD.
10. EXISTING SERVICE ELEVATOR. APPROXIMATE CAB DIMENSIONS: 76"W X 49"D X 88"H. APPROXIMATE DOOR DIMENSIONS: 40"W X 84"H. LABELED CAPACITY: 3000LB. FIELD VERIFY EXACT ELEVATOR DIMENSIONS AND CAPACITIES.

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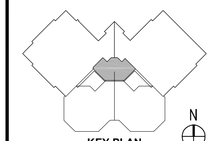

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ENLARGED PLAN - TYPICAL 2ND-10TH FLOOR - LOBBY- TEMPORARY AHU INSTALLATION

Sheet

M300

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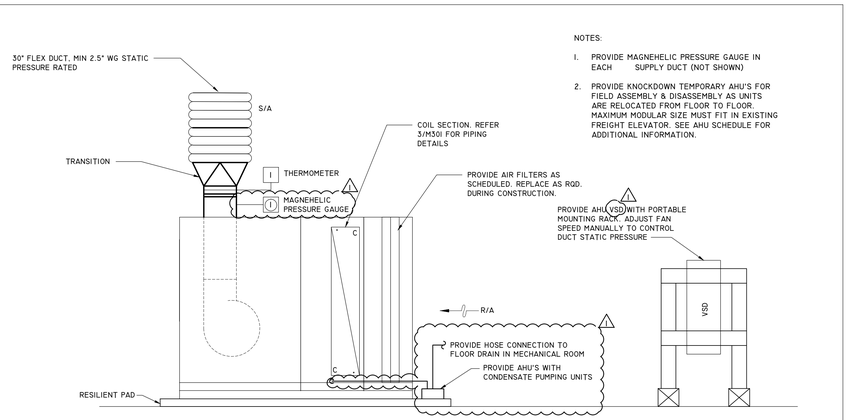
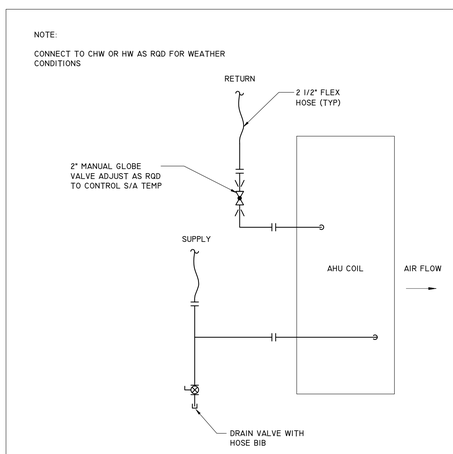
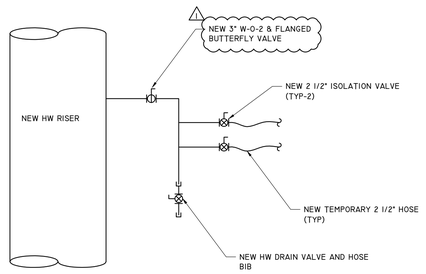
0 1/2" 1" 2"



TEMPORARY AHU INSTALLATION | NOT TO SCALE | 2

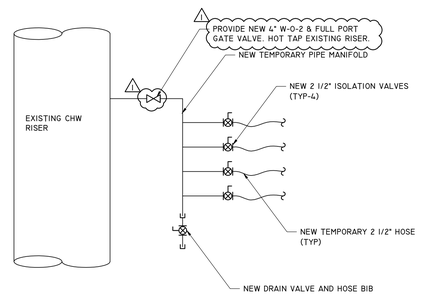


TEMPORARY AHU COIL PIPING | NOT TO SCALE | 4



NOTE: REMOVE TEMPORARY MANIFOLD & TURN OVER TO OWNER UPON COMPLETION. PROVIDE BLIND FLANGE AT RISER. TAP ISOLATION VALVE & REINSULATE

TEMPORARY HW PIPING MANIFOLD | NOT TO SCALE | 3



NOTE: REMOVE TEMPORARY MANIFOLD & TURN OVER TO OWNER UPON COMPLETION. PROVIDE BLIND FLANGE AT RISER. TAP ISOLATION VALVE & REINSULATE

TEMPORARY CHW PIPING MANIFOLD | NOT TO SCALE | 1

1 ENLARGED PLAN - TYPICAL 2ND-10TH FLOOR - LOBBY - TEMPORARY AHU INSTALLATIONS DETAILS

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

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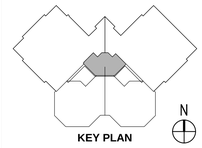

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ENLARGED PLAN - TYPICAL 2ND-10TH FLOOR - LOBBY- TEMPORARY AHU INSTALLATION DETAILS

Sheet

M301

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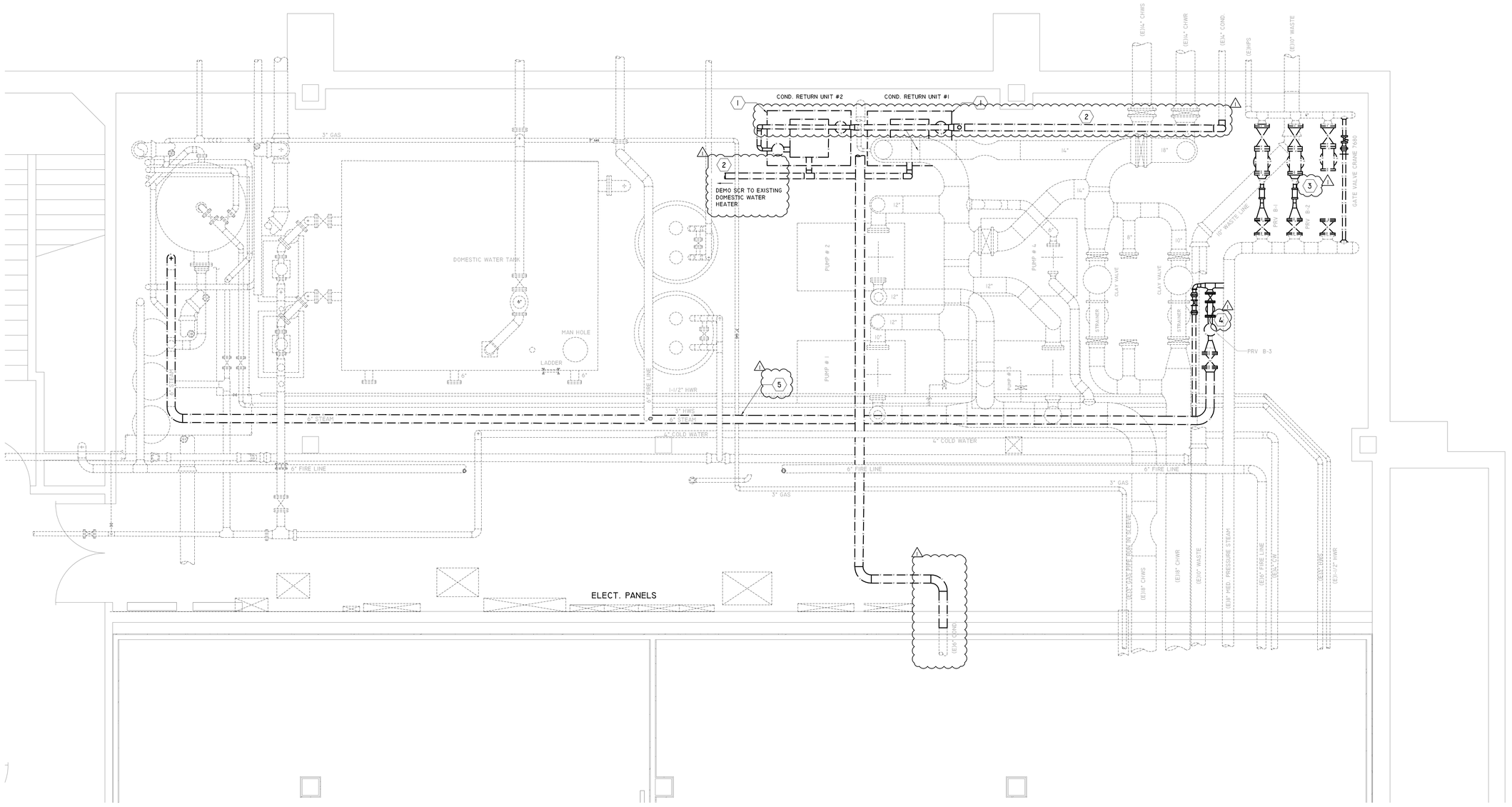

1 ENLARGED CENTRAL PLANT - BASEMENT FLOOR PLAN - DEMO

SCALE: 3/8" = 1'-0"

GENERAL NOTES:

1. MAINTAIN ONE CONDENSATE RETURN SYSTEM OPERATING AT ALL TIMES.

DEMO KEYED NOTES:

1. DEMO EXISTING CONDENSATE RETURN UNIT AND PROVIDE NEW CONDENSATE UNIT IN PHASED SEQUENCE. MAINTAIN EXISTING UNITS IN SERVICE UNTIL SWITCHOVER TO NEW UNITS.
2. DEMO EXISTING STEAM CONDENSATE RETURN PIPING.
3. DEMO EXISTING MP STEAM PRESSURE REDUCING STATION COMPONENTS.
4. DEMO EXISTING LP STEAM PRESSURE REDUCING STATION COMPONENTS.
5. DEMO EXISTING LP STEAM PIPING.

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ENLARGED CENTRAL PLANT - BASEMENT FLOOR PLAN - DEMO

Sheet

M400

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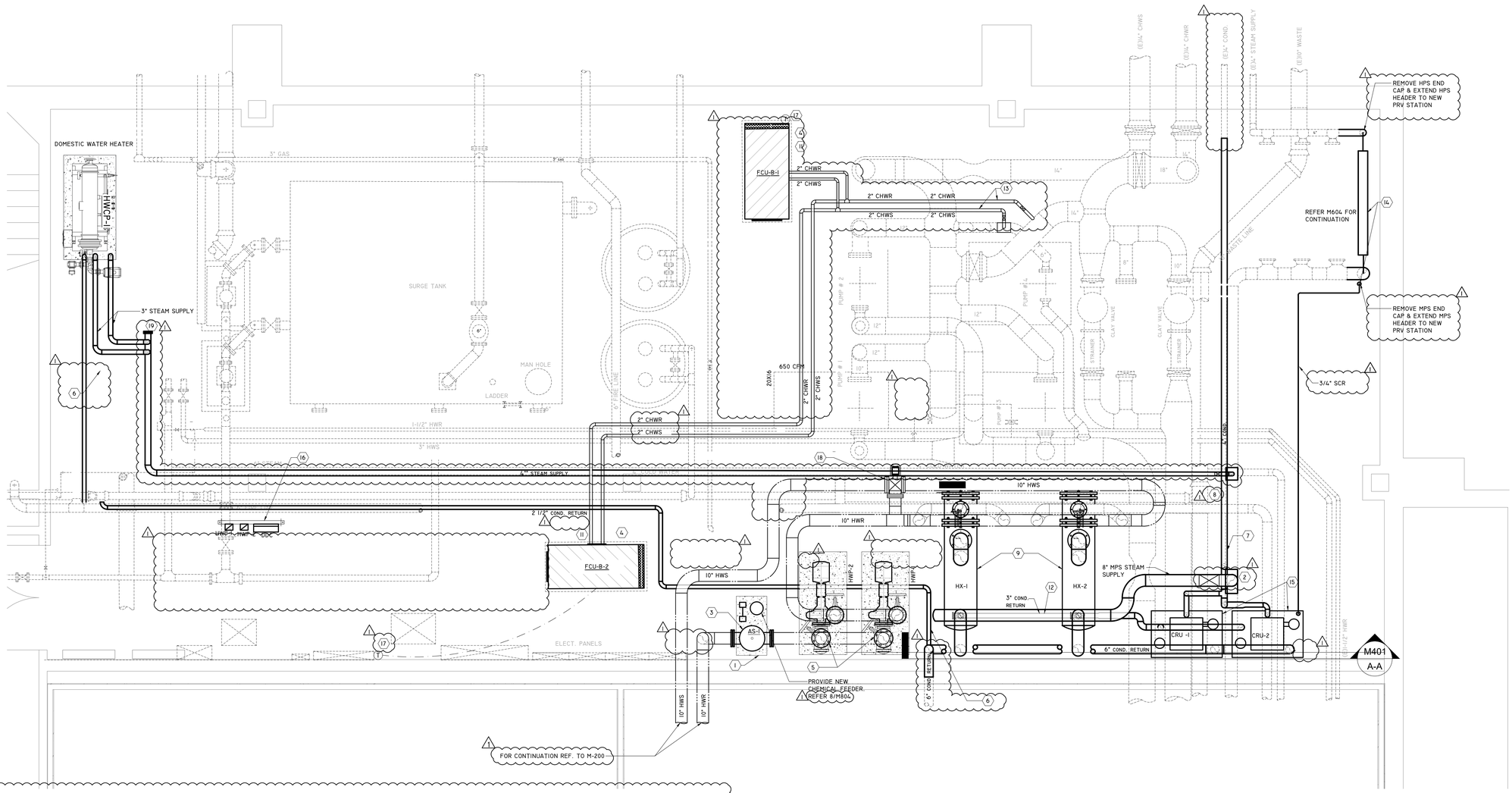
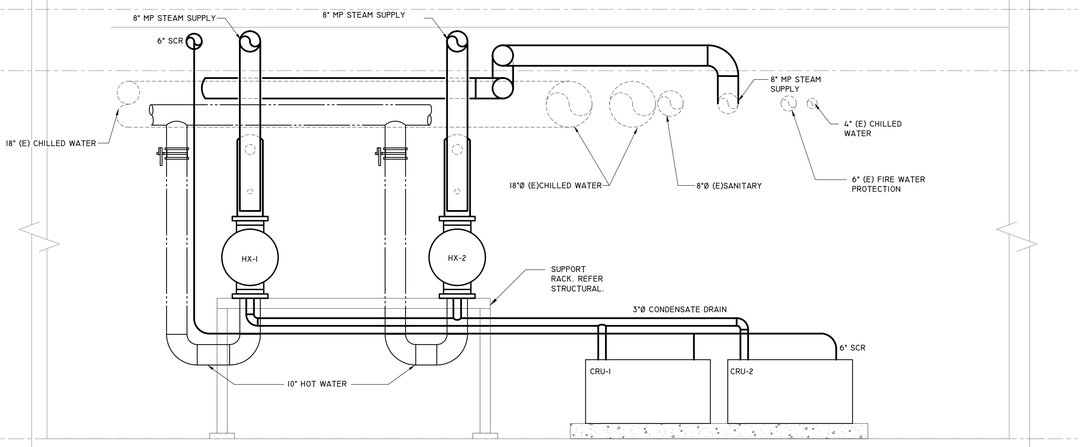


1 ENLARGED CENTRAL PLANT - BASEMENT FLOOR PLAN - PROPOSED

SCALE: 3/8" = 1'-0"



1 SECTION A-A

SCALE: 1/2"=1'-0"

KEYED NOTES:

1. PROVIDE 6" HOUSE KEEPING PAD
2. PROVIDE NEW 8" TEE FITTING & NEW 8" OS&Y GATE VALVE IN EXISTING 8" MPS. MAIN ON STEAM OUTAGE. EXTEND NEW 8" MPS PIPING TO NEW HVAC HEAT EXCHANGERS.
3. REF 4/M801 FOR AIR SEPERATOR & MAKEUP WATER PIPING.
4. SUSPENDE FAN COIL UNITS FROM STRUCTURE WITH VIBRATION ISOLATORS. PROVIDE AUXILIARY DRAIN PAN UNDER UNIT WITH FLOAT SWITCH. RE:4/M804 FOR MORE INFORMATION.
5. RE:6/M801 FOR PUMP INSTALLATION.
6. PROVIDE 2 1/2" STEAM CONDENSATE RETURN PIPING FROM DOMESTIC WATER HEATERS TO 6" SCR
7. PROVIDE NEW 4" STEAM CONDENSATE RETURN PIPING FROM RETURN UNIT DISCHARGE TO EXISTING 4" PLANT RETURN.
8. PROVIDE NEW 4" W-O-L, 4" OS&Y FULL PORT GATE VALVE & TAP EXISTING MPS STEAM HEADER UNDER STEAM OUTAGE. EXTEND 4" MPS BRANCH TO NEW DOMESTIC WATER HEATERS.
9. RE: M603 AND 6/M803 FOR HEAT EXCHANGER INSTALLATION.
10. NOT USED.
11. PROVIDE NEW 1" CONDENSATE DRAIN PIPING FROM FCU TO NEAREST FLOOR DRAIN (NOT SHOWN).
12. PROVIDE 3" STEAM CONDENSATE PIPING FROM HEAT EXCHANGER TO NEW CONDENSATE RETURN UNIT (FIELD VERIFIED).
13. PROVIDE NEW 2" T-O-L, FULL PORT BALL VALVE & HOT TAP EXISTING CHW MAINS. ROUTE NEW 2" CHW PIPING TO NEW FCU'S.
14. PROVIDE NEW PRV STATION. REFER M604
15. PROVIDE NEW CONDENSATION RETURN UNITS PER SCHEDULE.
16. PROVIDE VFD AND DDC PANELS FOR NEW HOT WATER PUMPS AS SHOWN.
17. PROVIDE NEW THERMOSTAT FOR NEW A/C EQUIPMENTS AS SHOWN.
18. PROVIDE NEW 8" MOTORIZED MIXING VALVE. REFER CONTROLS.
19. PROVIDE STEAM CONDENSATE DRIP LEG & STEAM TRAP ST-M4 AT END OF 4" MPS STEAM BRANCH. REFER 10/M804.

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ENLARGED CENTRAL PLANT - BASEMENT FLOOR PLAN - PROPOSED

Sheet

M401

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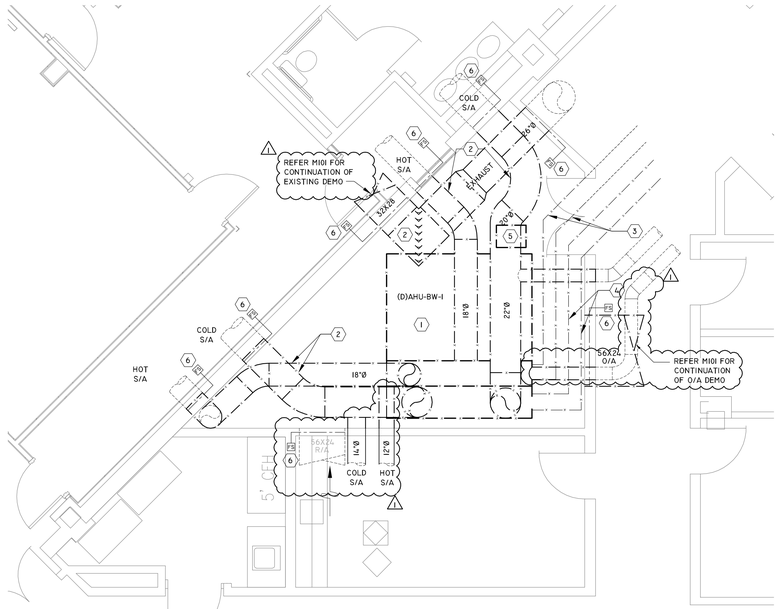
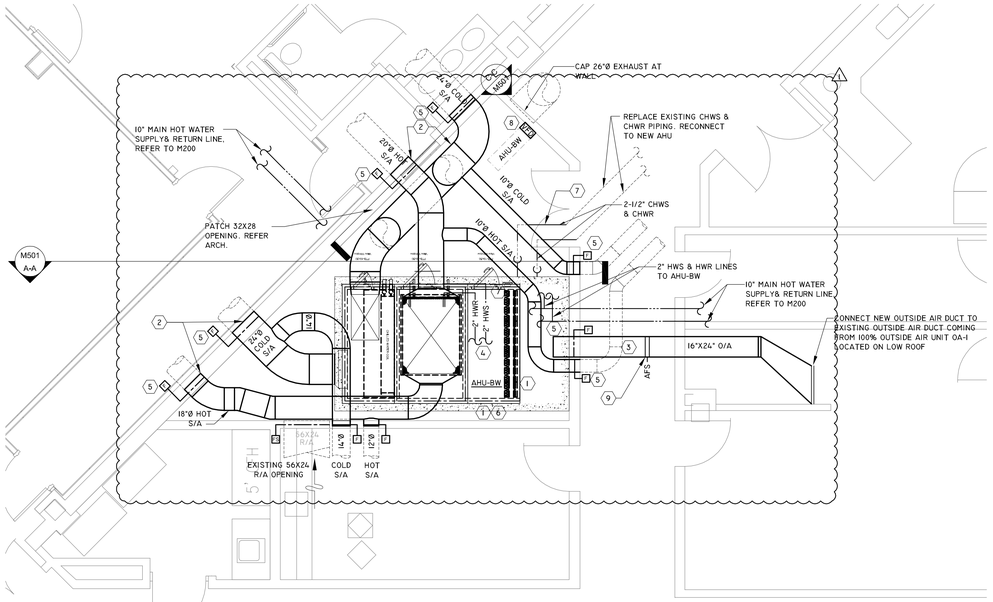


DEMO KEYED NOTES:

1. REMOVE EXISTING AIR HANDLING UNIT.
2. REMOVE COLD & HOT SUPPLY AIR DUCTS SHOWN AS REQUIRED FOR REPLACEMENT.
3. REMOVE CHILLED WATER PIPES AS REQUIRED FOR AHU REPLACEMENT.
4. REMOVE STEAM & CONDENSATE PIPING FROM AHU BACK TO MAIN. REF: M101.
5. REMOVE EXISTING STEAM CONDENSATE RETURN UNIT.
6. REMOVE EXISTING FIRE/SMOKE DAMPER.

ENLARGED BASEMENT FLOOR PLAN - MECHANICAL ROOM (B02) WEST - DEMO

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

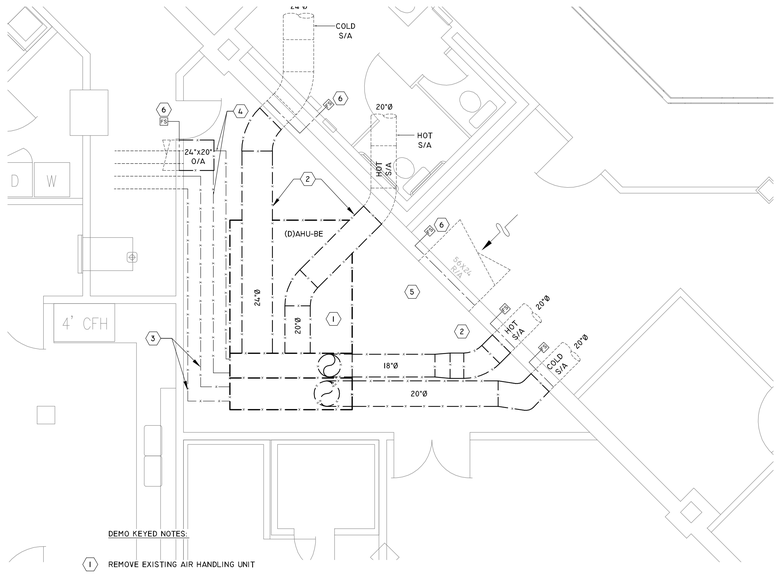


KEYED NOTES:

1. REF 1/M804 FOR AHU INSTALLATION DETAIL.
2. PROVIDE NEW COLD & HOT DUCTS AND CONNECT TO EXISTING.
3. PROVIDE NEW OUTSIDE AIR DUCT.
4. PROVIDE NEW 2" HOT WATER SUPPLY & RETURN PIPING TO 10" HOT WATER MAINS. REFER TO SHEET M200 FOR CONTINUATION.
5. PROVIDE NEW FIRE DAMPER & ACCESS DOOR. REF 9/M804.
6. MODIFY EXISTING HOUSE KEEPING PAD AS REQUIRED TO ACCOMMODATE NEW AHU
7. REF: M801 FOR PIPING INSTALLATION DETAIL.
8. PROVIDE NEW VFD FOR AHU FAN MOTOR. COORDINATE WITH ELECTRICAL.
9. PROVIDE NEW AIR FLOW STATION.

ENLARGED BASEMENT FLOOR PLAN - MECHANICAL ROOM (B02) WEST - NEW

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

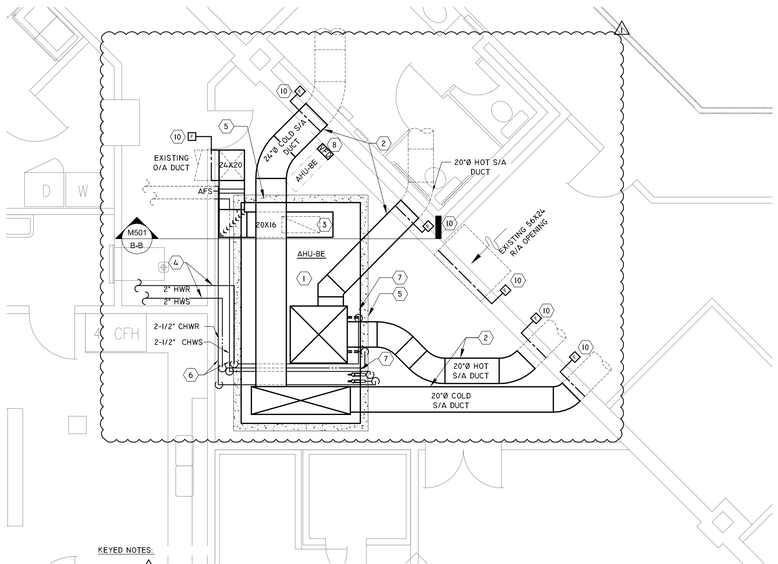


DEMO KEYED NOTES:

1. REMOVE EXISTING AIR HANDLING UNIT
2. REMOVE COLD & HOT SUPPLY AIR DUCTS SHOWN AS REQUIRED FOR REPLACEMENT.
3. REMOVE CHILLED WATER PIPES AS REQUIRED FOR REPLACEMENT
4. REMOVE STEAM & CONDENSATE PIPING FROM AHU BACK TO MAIN. REF: M101.
5. REMOVE EXISTING STEAM & CONDENSATE RETURN UNIT.
6. REMOVE EXISTING FIRE/SMOKE DAMPER.

ENLARGED BASEMENT FLOOR PLAN - MECHANICAL ROOM (B10A) EAST - HVAC - DEMO

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



KEYED NOTES:

1. REF 1/M804 FOR AHU INSTALLATION DETAIL.
2. PROVIDE NEW COLD & HOT DUCTS AND CONNECT TO EXISTING
3. PROVIDE NEW OUTSIDE AIR DUCT
4. PROVIDE NEW 1-1/2" HOT WATER SUPPLY & RETURN PIPING TO 10" HOT WATER MAINS. REFER TO SHEET M200 FOR CONTINUATION.
5. MODIFY EXISTING HOUSE KEEPING PAD AS REQUIRED TO ACCOMMODATE NEW AHU
6. REPLACE EXISTING CHILLED WATER SUPPLY & RETURN PIPING. RECONNECT TO EXISTING.
7. REF: M801 FOR PIPING INSTALLATION DETAIL.
8. PROVIDE NEW VFD FOR AHU FAN MOTOR. COORDINATE WITH ELECTRICAL.
9. AIR FLOW STATION. REFERENCE 6/M703.
10. PROVIDE NEW FIRE DAMPER & ACCESS DOOR. REF 9/M804.

ENLARGED BASEMENT FLOOR PLAN - MECHANICAL ROOM (B10A) EAST - HVAC - NEW

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

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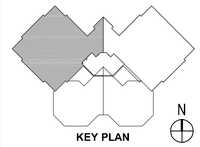

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ENLARGED BASEMENT FLOOR PLAN - MECHANICAL ROOMS

Sheet

M402

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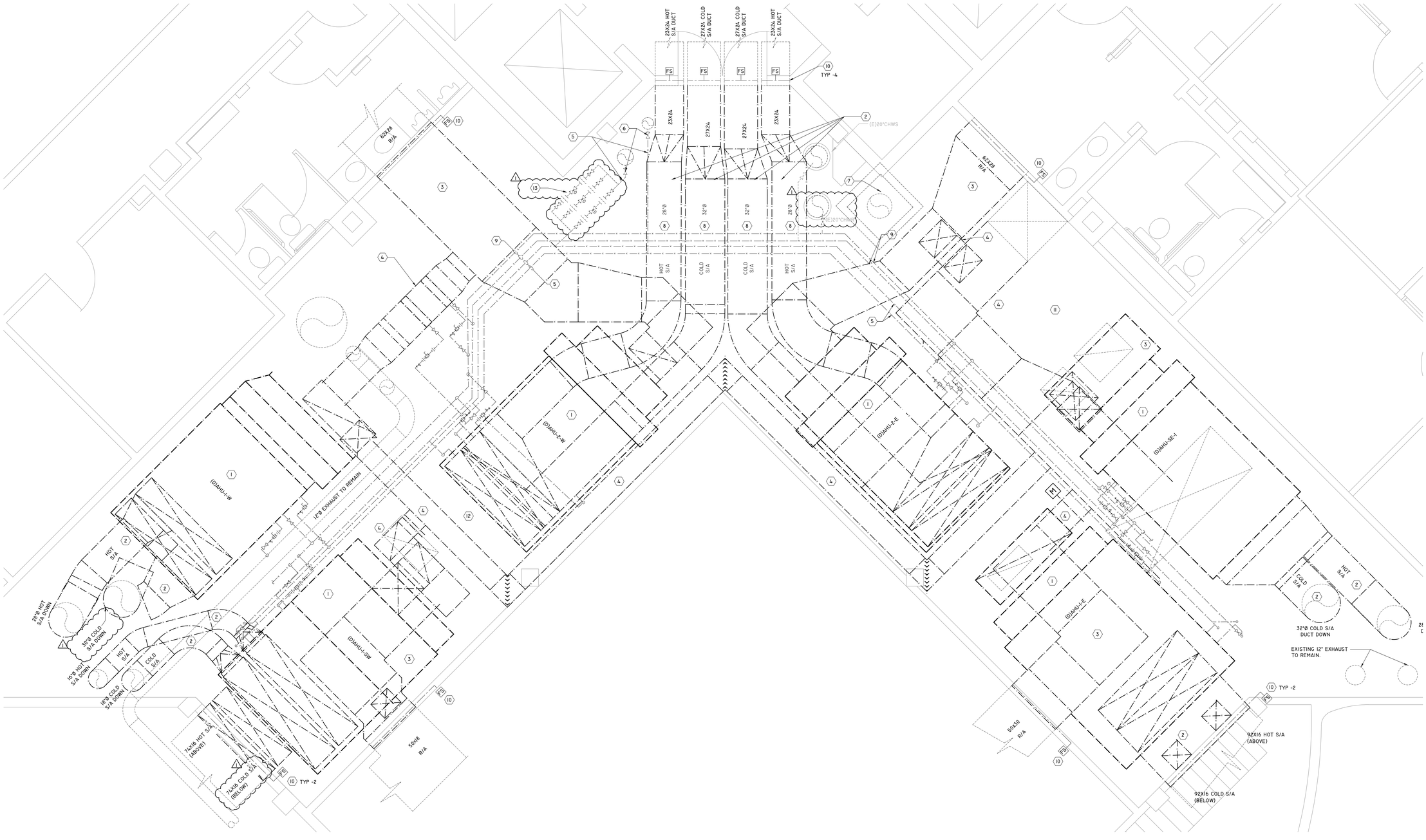
0 1/2" 1" 2"

DEMO KEYED NOTES:

1. DEMO AIR HANDLING UNIT
2. DEMO COLD AND HOT SUPPLY AIR DUCT AS REQUIRED FOR REPLACEMENT
3. DEMO RETURN AIR DUCT AS REQUIRED FOR REPLACEMENT.
4. DEMO O/A DUCT AS REQUIRED FOR REPLACEMENT.
5. DEMO EXISTING STEAM & CONDENSATE RETURN BRANCH PIPING.
6. CAP STEAM SUPPLY & CONDENSATE RETURN PIPES AT EXISITING ISOLATION VALVE.
7. RETAIN EXISTING EXHAUST DUCTWORK IN PLACE.
8. DEMO EXISTING DUCT SILENCERS.
9. DEMO CHILLED WATER SUPPLY AND RETURN PIPING AS REQUIRED FOR REPLACEMENT.
10. DEMO EXISTING FIRE/SMOKE DAMPER.
11. COORDINATE WORK WITH DEMO OF EXISTING ABANDONED TELECOM EQUIPMENT & CABLING BY OWNER IN THIS AREA
12. COORDINATE WORK WITH DEMO OR EXISTING ELECTRICAL BUS DUCT IN THIS AREA. REF ELECTRICAL
13. DEMO EXITING STEAM REGULATION STATION.



1 ENLARGED PLAN - 2ND FLOOR - MECHANICAL ROOM - DEMO

SCALE: 3/8" = 1'-0"

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REVISIONS

05/31/2017	ISSUED FOR BID
07/28/2017	ADDENDUM 1
08/16/2017	ADDENDUM 2

Sheet Information

Date	31 MARCH 2017
Job Number	-
Drawn	KN, KT, CJT
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Approved	MAF, SK

Title

ENLARGED PLAN - 2ND FLOOR - MECHANICAL ROOM - DEMO

Sheet

M403

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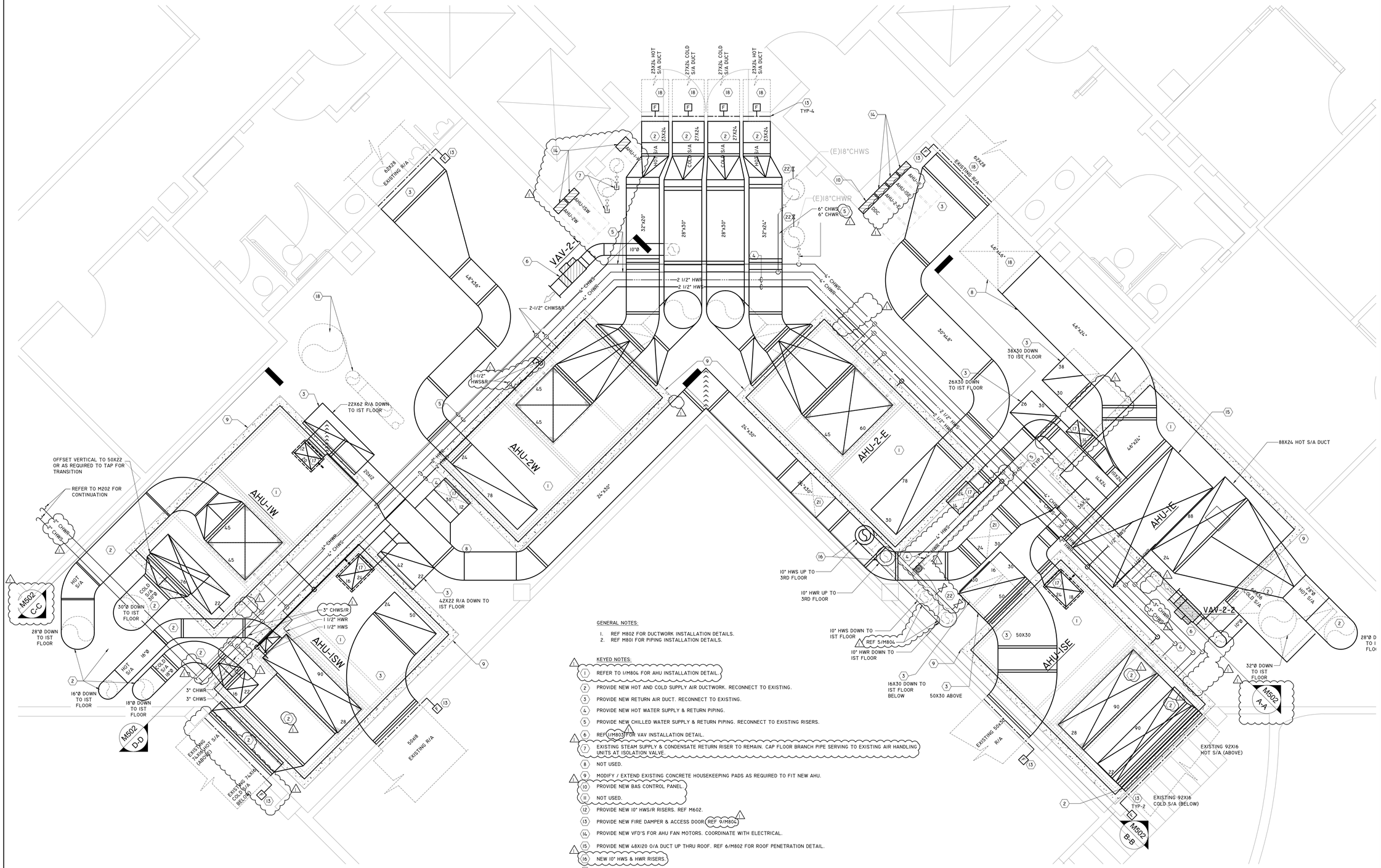

GENERAL NOTES:

1. REF M802 FOR DUCTWORK INSTALLATION DETAILS.
2. REF M801 FOR PIPING INSTALLATION DETAILS.

KEYED NOTES:

1. REFER TO 1/M804 FOR AHU INSTALLATION DETAIL.
2. PROVIDE NEW HOT AND COLD SUPPLY AIR DUCTWORK. RECONNECT TO EXISTING.
3. PROVIDE NEW RETURN AIR DUCT. RECONNECT TO EXISTING.
4. PROVIDE NEW HOT WATER SUPPLY & RETURN PIPING.
5. PROVIDE NEW CHILLED WATER SUPPLY & RETURN PIPING. RECONNECT TO EXISTING RISERS.
6. REF 1/M803 FOR VAV INSTALLATION DETAIL.
7. EXISTING STEAM SUPPLY & CONDENSATE RETURN RISER TO REMAIN. CAP FLOOR BRANCH PIPE SERVING TO EXISTING AIR HANDLING UNITS AT ISOLATION VALVE.
8. NOT USED.
9. MODIFY / EXTEND EXISTING CONCRETE HOUSEKEEPING PADS AS REQUIRED TO FIT NEW AHU.
10. PROVIDE NEW BAS CONTROL PANEL.
11. NOT USED.
12. PROVIDE NEW 10" HWS/R RISERS. REF M602.
13. PROVIDE NEW FIRE DAMPER & ACCESS DOOR REF 9/M804
14. PROVIDE NEW VFD'S FOR AHU FAN MOTORS. COORDINATE WITH ELECTRICAL.
15. PROVIDE NEW 48X120 O/A DUCT UP THRU ROOF. REF 6/M802 FOR ROOF PENETRATION DETAIL.
16. NEW 10" HWS & HWR RISERS.
17. PROVIDE NEW AIR FLOW STATION IN O/A DUCT DROP TO AHU.
18. EXISTING DUCTWORK TO REMAIN.
19. NOT USED.
20. NOT USED.
21. OFFSET 24X36 O/A DUCTWORK BELOW NEW 10" HW RISER PENETRATIONS TO 3RD FLOOR.
22. PROVIDE NEW TAPS ON RISERS FOR TEMPORARY AHU SERVICE. REF M301.

1 ENLARGED PLAN - 2ND FLOOR - MECHANICAL ROOM - PROPOSED

SCALE: 3/8" = 1'-0"

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KEY PLAN

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119970
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M404

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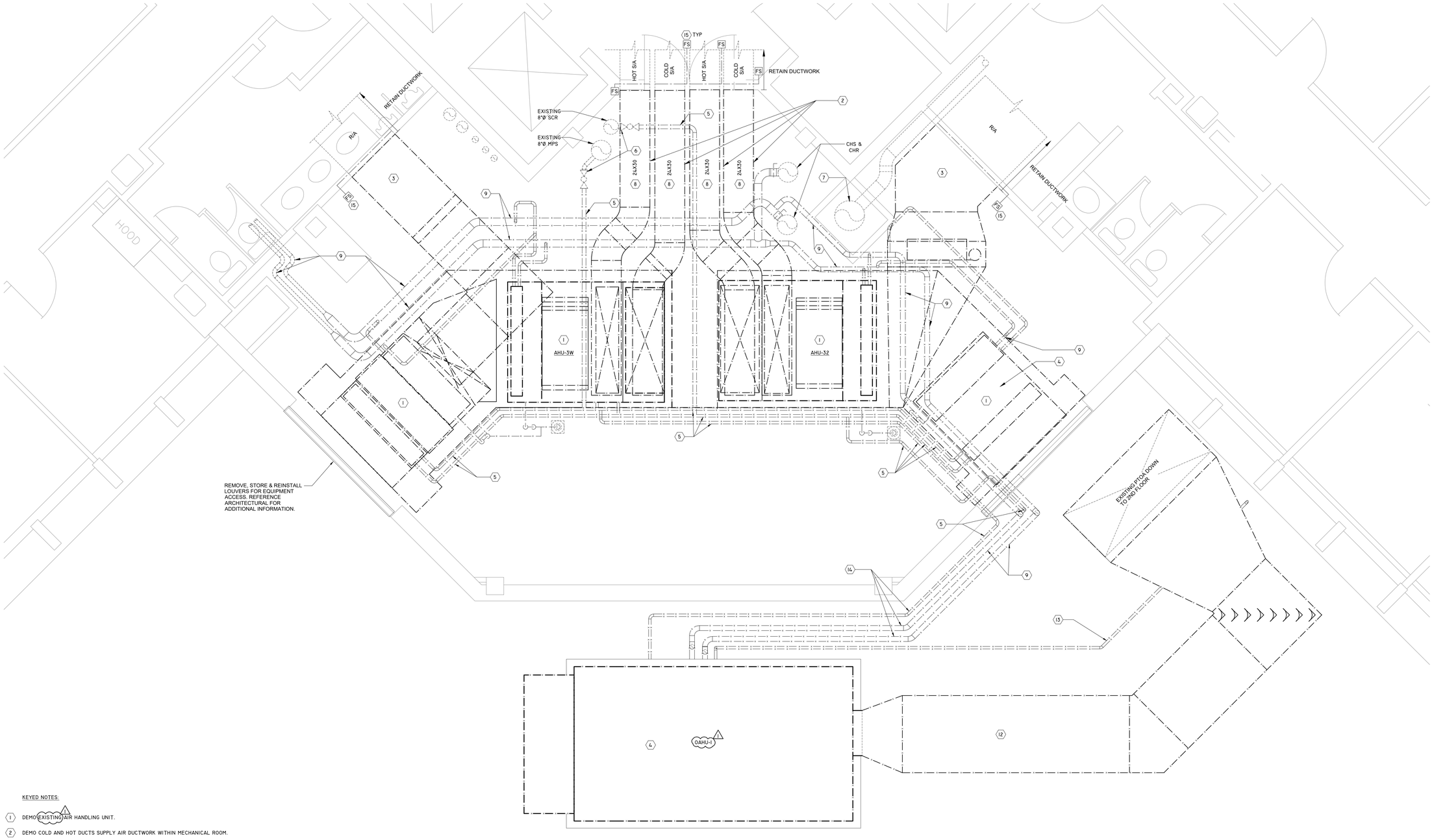

KEYED NOTES:

1. DEMO EXISTING AIR HANDLING UNIT.
2. DEMO COLD AND HOT DUCTS SUPPLY AIR DUCTWORK WITHIN MECHANICAL ROOM.
3. DEMO RETURN AIR DUCTWORK WITHIN MECHANICAL ROOM.
4. DEMO OUTSIDE AIR HANDLING UNIT AT 2ND FLOOR ROOF.
5. DEMO STEAM & CONDENSATE RETURN PIPING BACK TO RISER.
6. CAP STEAM SUPPLY & CONDENSATE RETURN PIPES AT ISOLATION VALVE.
7. RETAIN EXISTING EXHAUST DUCTWORK.
8. DEMO DUCT SILENCERS.
9. DEMO EXISTING CHILLED WATER SUPPLY AND RETURN PIPING TO COOLING COILS.
10. NOT USED.
11. NOT USED.
12. DEMO EXISTING OUTSIDE AIR SUPPLY DUCT AT ROOF UP TO THE ROOF PENETRATION. RETAIN EXISTING DUCT SUPPORTS.
13. DEMO EXISTING CONDENSATE DRAIN PIPING AT 2ND FLOOR ROOF.
14. RETAIN EXISTING PIPING SUPPORT STRUCTURE FOR REUSE.
15. DEMO EXISTING FIRE/SMOKE DAMPERS.

2 ENLARGED PLAN - 3RD FLOOR - MECHANICAL ROOM - DEMO

SCALE: 3/8" = 1'-0"

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ENLARGED PLAN - 3RD FLOOR - MECHANICAL ROOM - DEMO

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M405

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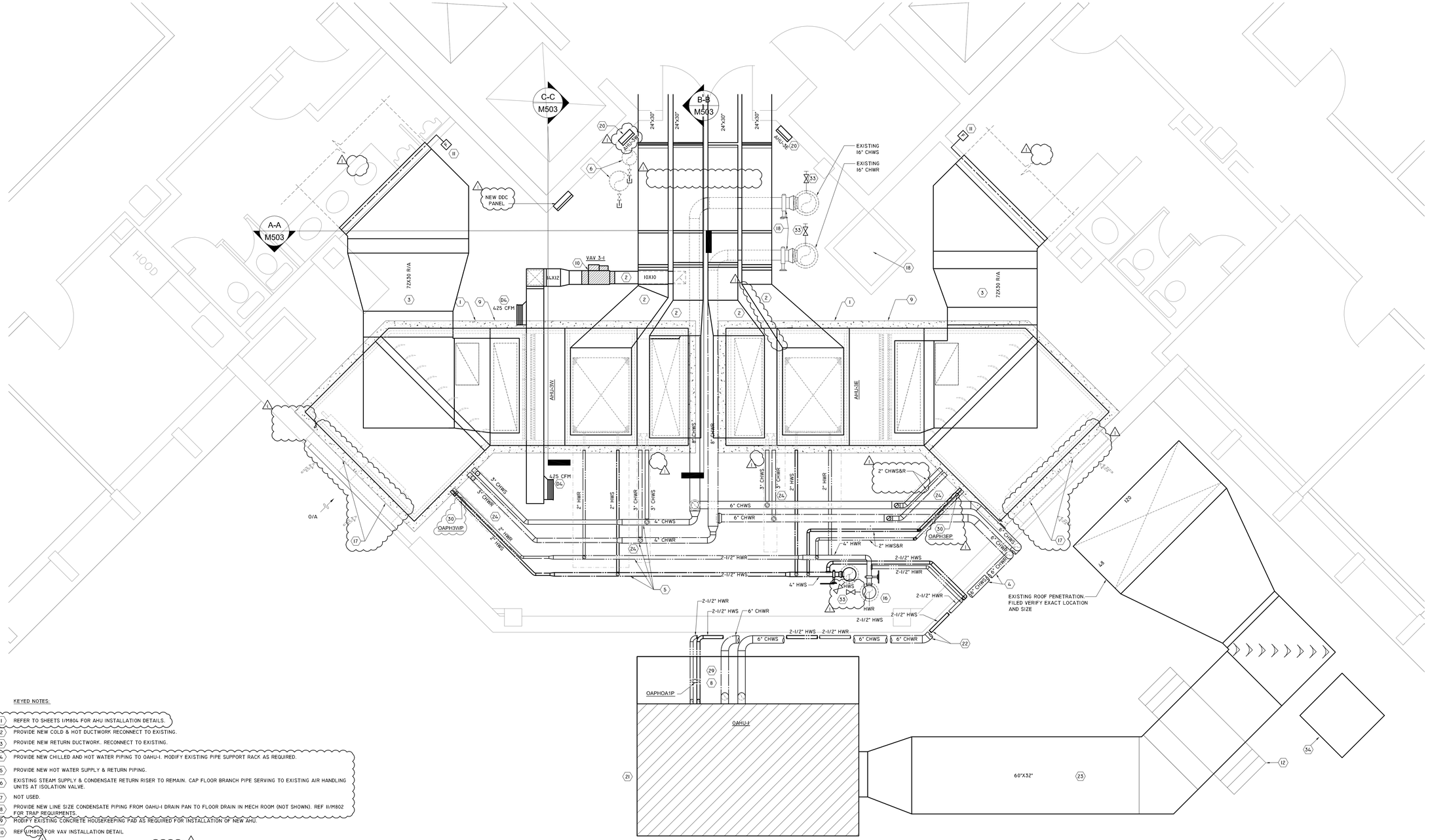

KEYED NOTES:

1. REFER TO SHEETS I/M804 FOR AHU INSTALLATION DETAILS.
2. PROVIDE NEW COLD & HOT DUCTWORK RECONNECT TO EXISTING.
3. PROVIDE NEW RETURN DUCTWORK. RECONNECT TO EXISTING.
4. PROVIDE NEW CHILLED AND HOT WATER PIPING TO OAHU-1. MODIFY EXISTING PIPE SUPPORT RACK AS REQUIRED.
5. PROVIDE NEW HOT WATER SUPPLY & RETURN PIPING.
6. EXISTING STEAM SUPPLY & CONDENSATE RETURN RISER TO REMAIN. CAP FLOOR BRANCH PIPE SERVING TO EXISTING AIR HANDLING UNITS AT ISOLATION VALVE.
7. NOT USED.
8. PROVIDE NEW LINE SIZE CONDENSATE PIPING FROM OAHU-1 DRAIN PAN TO FLOOR DRAIN IN MECH ROOM (NOT SHOWN). REF II/M802 FOR TRAP REQUIREMENTS.
9. MODIFY EXISTING CONCRETE HOUSEKEEPING PAD AS REQUIRED FOR INSTALLATION OF NEW AHU.
10. REF I/M803 FOR VAV INSTALLATION DETAIL
11. PROVIDE NEW FIRE DAMPER AND DUCT ACCESS DOOR. REF 9/M804.
12. PROVIDE OSHA APPROVED PRE MANUFACTURED CROSSOVER RAMP COMPLYING WITH IBC & ASCE REQUIREMENTS. ATTACH RAMP TO ROOF PER MANUFACTURER INSTRUCTIONS & PATCH ROOF.
13. NOT USED.
14. NOT USED
15. NOT USED.
16. NEW 10" HWS & HWR RISERS.
17. PROVIDE BLANK OFF PLATE & FLEX CONNECTIONS TO CONNECT OUTDOOR AIR INTAKE OF NEW UNIT TO EXISTING LOUVER.
18. RETAIN EXISTING DUCT WORK IN PLACE.
19. NOT USED.
20. PROVIDE NEW VFD FOR AHU FAN MOTORS. COORDINATE WITH ELECTRICAL.
21. PROVIDE NEW OUTSIDE AHU ON EXISTING STRUCTURAL STEEL RACK. MODIFY STRUCTURAL STEEL RACK AS REQUIRED FOR INSTALLATION.
22. NOT USED.
23. PROVIDE NEW EXTERIOR DUCTWORK PER SPECIFICATIONS. RECONNECT TO EXISTING ROOF PENETRATION. REUSE EXISTING DUCT SUPPORTS & MODIFY AS REQUIRED.
24. COIL PULL SPACE.
25. NOT USED.
26. NOT USED.
27. NOT USED.
28. NOT USED.
29. PROVIDE COIL PIPING, CONTROLS, AND CIRCULATION PUMP IN AHU PIPING VESTIBULE.
30. PROVIDE INLINE HOT WATER FREEZE PROTECTION PUMP.
31. NOT USED.
32. NOT USED.
33. PROVIDE TAPS ON RISERS FOR TEMPORARY AHU SERVICE. REF M30I.
34. PROVIDE 48"X48" RELIEF HOOD WITH 18" ROOF CURB AND MOTORIZED BACK-DRAFT DAMPER. CUT AND PATCH ROOF AS REQUIRED FOR INSTALLATION. COORDINATE EXACT LOCATION TO AVOID STRUCTURE BELOW. REFERENCE 6/M804 FOR INSTALLATION DETAILS.

1 ENLARGED PLAN - 3RD FLOOR - MECHANICAL ROOM - PROPOSED

SCALE: 3/8" = 1'-0"

GENERAL NOTES:

1. REF M80I FOR PIPING INSTALLATION DETAILS..
2. REF M802 FOR DUCTWORK INSTALLATION DETAILS.

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ENLARGED PLAN - 3RD FLOOR - MECHANICAL ROOM - PROPOSED

Sheet

M406

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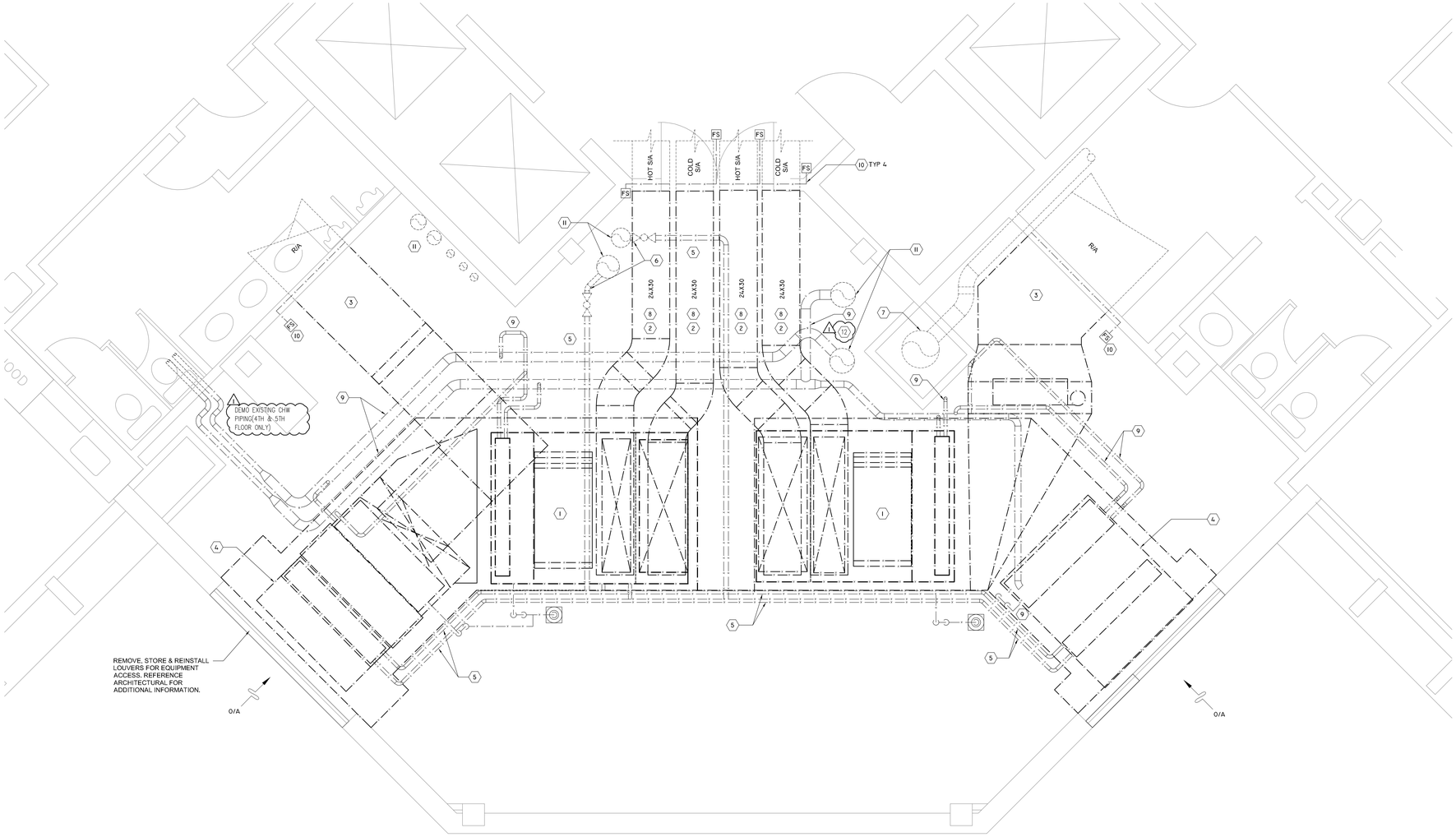

1 ENLARGED PLAN - TYPICAL 4TH-7TH FLOOR - MECHANICAL ROOM - DEMO

SCALE: 3/8" = 1'-0"

KEYED NOTES :

1. DEMO EXISTING AIR HANDLING UNIT.
2. DEMO COLD AND HOT SUPPLY AIR DUCTWORKS WITHIN MECHANICAL ROOM.
3. DEMO RETURN AIR DUCTWORK WITHIN MECHANICAL ROOM.
4. DEMO PRE-TREATEMENT COILS AND OUTSIDE AIR DUCTWORK UP TO OUTSIDE AIR LOUVER.
5. DEMO STEAM & CONDENSATE RETURN PIPING BACK TO RISERS.
6. CAP STEAM SUPPLY & CONDENSATE RETURN PIPES AT ISOLATION VALVES.
7. RETAIN EXISTING EXHAUST DUCTWORK.
8. DEMO DUCT SILENCERS.
9. DEMO EXISTING CHILLED WATER SUPPLY AND RETURN BRANCH PIPING TO COOLING COILS.
10. DEMO FIRE/SMOKE DAMPERS.
11. RETAIN EXISTING RISER PIPING IN PLACE.
12. DEMO EXISTING IN-LINE CHW PUPM AND REMOVE & CAP PIPING TO FAN COIL UNITS/CRAC UNITS AT 8TH FLOOR.

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ENLARGED PLAN - TYPICAL 4TH-7TH FLOOR - MECHANICAL ROOM - DEMO

Sheet

M407

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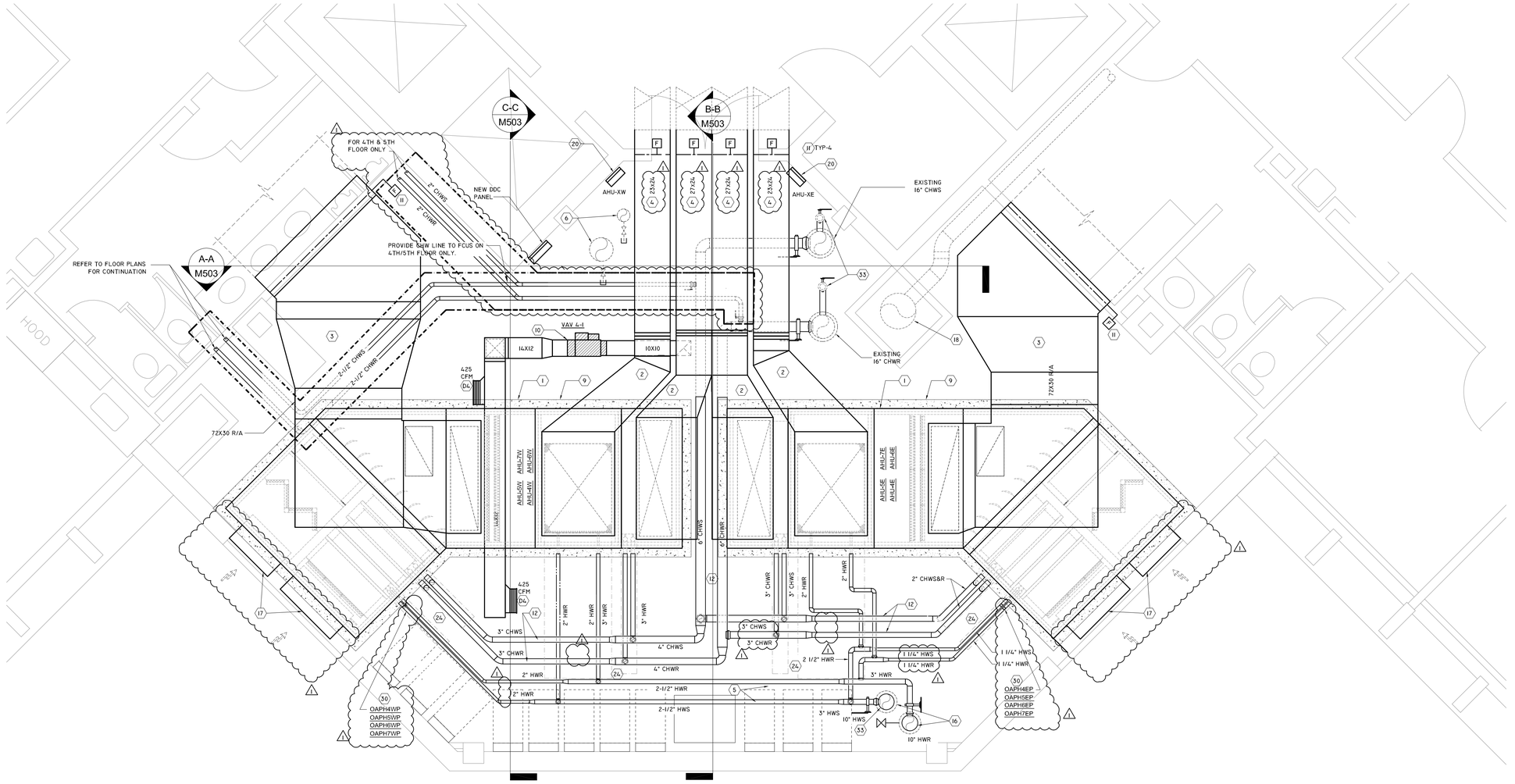

GENERAL NOTES:

1. REF M802 FOR DUCTWORK INSTALLATION DETAILS.
2. REF M801 FOR PIPING INSTALLATION DETAILS.

KEYED NOTES:

1. REFER TO 1/M804 FOR AHU INSTALLATION DETAILS.
2. PROVIDE NEW COLD & HOT DUCTWORK RECONNECT TO EXISTING.
3. PROVIDE NEW RETURN DUCTWORK. RECONNECT TO EXISTING.
4. SUPPLY AIR DUCT SIZE TO BE 24X30 ON 4TH AND 5TH FLOORS.
5. PROVIDE NEW HOT WATER SUPPLY & RETURN PIPING.
6. EXISTING STEAM SUPPLY & CONDENSATE RETURN RISER TO REMAIN. CAP FLOOR BRANCH PIPE SERVING TO EXISTING AIR HANDLING UNITS AT ISOLATION VALVE.
7. NOT USED.
8. NOT USED.
9. MODIFY EXISTING CONCRETE HOUSEKEEPING PAD AS REQUIRED FOR INSTALLATION OF NEW AHU.
10. REF 1/M8.03 FOR VAV INSTALLATION DETAIL
11. PROVIDE NEW FIRE DAMPER AND DUCT ACCESS DOOR. REF 9/M804.
12. PROVIDE NEW CHWS & CHWR PIPING. RECONNECT TO EXISTING CHW RISERS.
13. NOT USED.
14. NOT USED.
15. NOT USED.
16. NEW 10" HWS & HWR RISERS. REF 5/M804.
17. PROVIDE BLANK OF PLATE AND FLEX CONNECTIONS TO CONNECT OUTDOOR NEW UNIT INTAKE TO EXISTING LOUVER.
18. RETAIN EXISTING DUCT WORK IN PLACE.
19. NOT USED.
20. PROVIDE NEW VFD FOR AHU FAN MOTORS. COORDINATE WITH ELECTRICAL.
21. NOT USED.
22. NOT USED.
23. NOT USED.
24. COIL PULL SPACE.
25. NOT USED.
26. NOT USED.
27. NOT USED
28. NOT USED.
29. NOT USED.
30. PROVIDE INLINE HOT WATER FREEZE PROTECTION PUMP.
31. NOT USED.
32. NOT USED.
33. PROVIDE NEW HOT TAPS ON RISERS FOR TEMPORARY AHU SERVICE. REF M301.

1 ENLARGED PLAN - TYPICAL 4TH-7TH FLOOR - MECHANICAL ROOM - PROPOSED

SCALE: 3/8" = 1'-0"

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ENLARGED PLAN - TYPICAL 4TH-7TH FLOOR - MECHANICAL ROOM - PROPOSED

Sheet

M408

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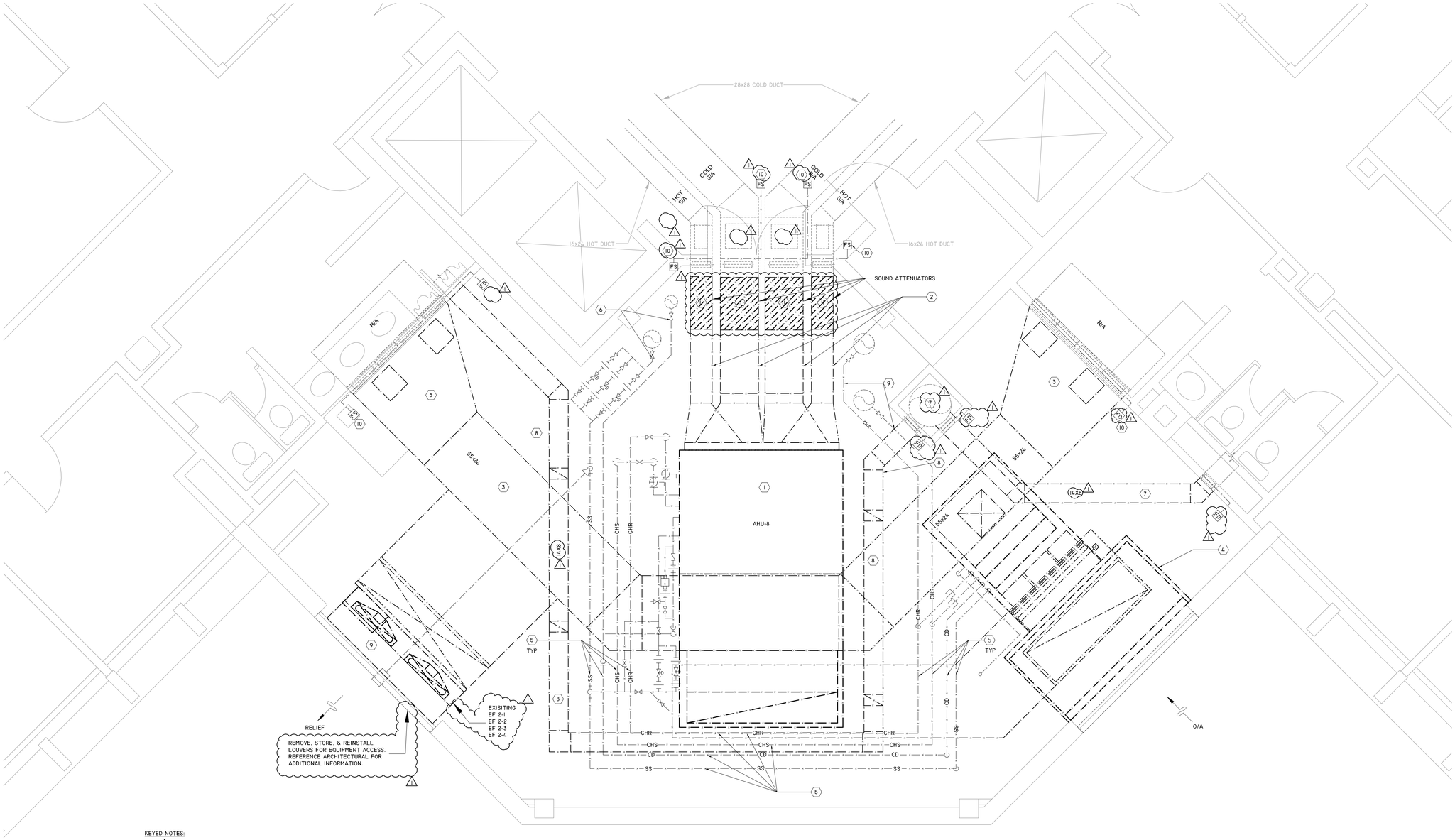

KEYED NOTES:

1. DEMO EXISTING AIR HANDLING UNIT.
2. DEMO COLD & HOT SUPPLY DUCTS WITHIN MECHANICAL ROOM.
3. DEMO RETURN AIR DUCT WITHIN MECHANICAL ROOM.
4. DEMO EXISTING OUTSIDE AIR PRE-TREATEMENT UNIT AND ASSOCIATED DUCTWORK.
5. DEMO EXISTING CHILLED WATER, STEAM AND CONDENSATE RETURN BRANCH PIPING BACK TO RISERS.
6. CAP STEAM SUPPLY & CONDENSATE RETURN PIPES AT ISOLATION VALVES.
7. RETAIN EXISTING EXHAUST DUCTWORK IN PLACE.
8. DEMO EXISTING EXHAUST DUCTWORK.
9. DEMO EXISTING RELIEF FANS & RELIEF DUCTWORK. (BASE BID) REMOVE, STORE, & REINSTALL RELIEF FANS (ALTERNATE #1).
10. DEMO EXISTING FIRE/SMOKE DAMPERS.
11. DEMO EXISTING SOUND ATTENUATOR.

1 ENLARGED PLAN - TYPICAL 8TH-10TH FLOOR - MECHANICAL ROOM - DEMO

SCALE: 3/8" = 1'-0"

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ENLARGED PLAN - TYPICAL 8TH-10TH FLOOR - MECHANICAL ROOM - DEMO

Sheet

M409

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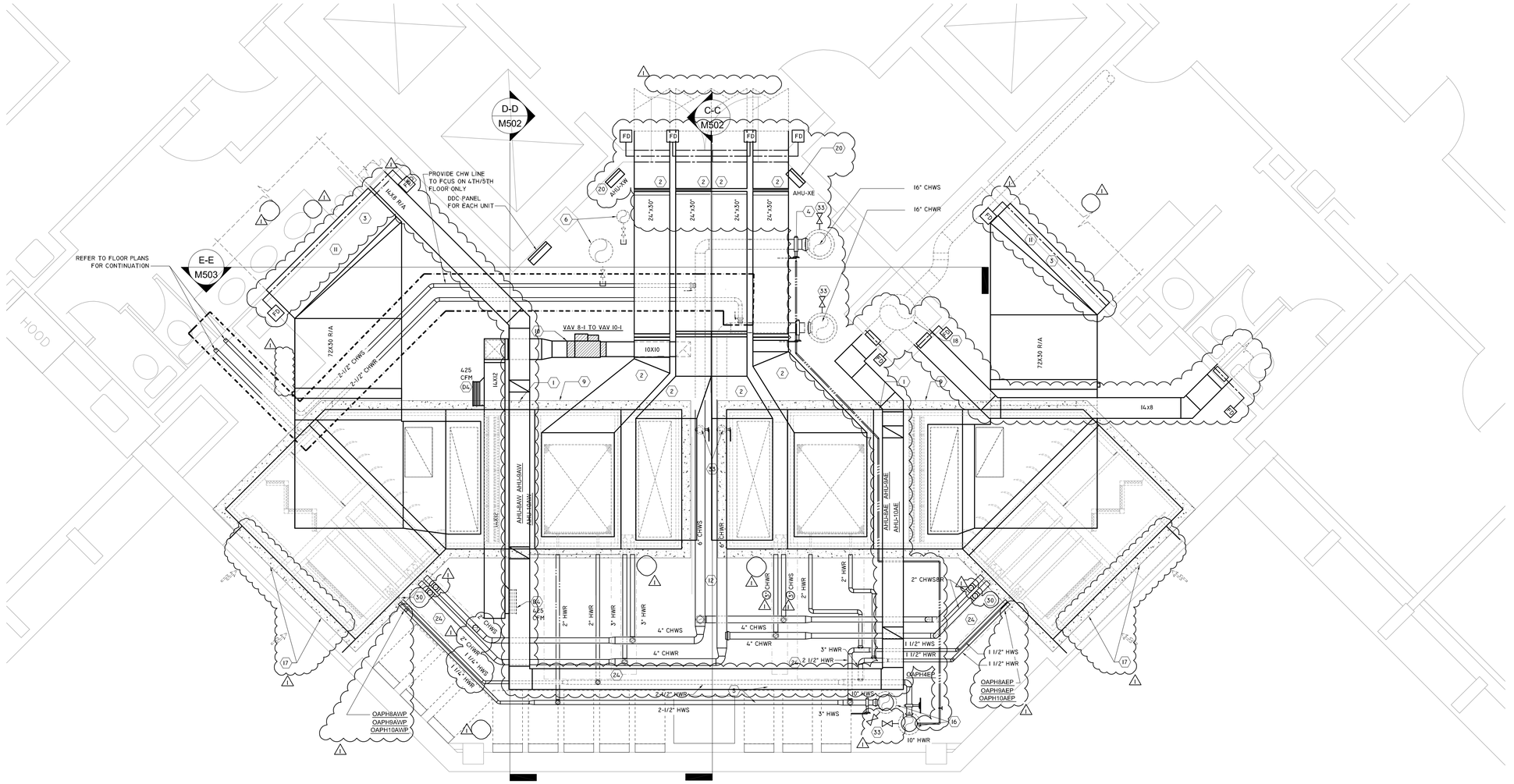

GENERAL NOTES:

1. REF M509, 1/M804 & M510 FOR AHU INSTALLATION.
2. REF M801 FOR PIPING INSTALLATION DETAILS.

KEYED NOTES:

1. REFER TO SHEETS 1/M804 FOR AHU INSTALLATION DETAILS.
2. PROVIDE NEW COLD & HOT DUCTWORK RECONNECT TO EXISTING.
3. PROVIDE NEW RETURN DUCTWORK. RECONNECT TO EXISTING.
4. 1-1/4" HWR PIPE TO ET-1 ON PENTHOUSE.
5. PROVIDE NEW HOT WATER SUPPLY & RETURN PIPING AND FIRE PROOF FLOOR PENETRATIONS.
6. EXISTING STEAM SUPPLY & CONDENSATE RETURN RISER TO REMAIN. CAP FLOOR BRANCH PIPE SERVING TO EXISTING AIR HANDLING UNITS AT ISOLATION VALVE.
7. NOT USED.
8. NOT USED.
9. PROVIDE NEW CONCRETE HOUSEKEEPING PAD AS REQUIRED FOR INSTALLATION OF NEW AHU.
10. REF 1/M803 FOR VAV INSTALLATION DETAIL.
11. PROVIDE NEW FIRE DAMPER AND DUCT ACCESS DOOR. REF 9/M804.
12. PROVIDE NEW CHWS & CHWR PIPING. RECONNECT TO EXISTING CHW RISERS.
13. NOT USED.
14. NOT USED.
15. NOT USED.
16. NEW 10" HWS & HWR RISERS. REF 5/M804.
17. PROVIDE BLANK OFF PLATE AND FLEX CONNECTION TO CONNECT OUTDOOR NEW UNIT INTAKE TO EXISTING LOUVER.
18. RETAIN EXISTING DUCT WORK IN PLACE.
19. NOT USED.
20. PROVIDE NEW VFD FOR AHU FAN MOTORS. COORDINATE WITH ELECTRICAL.
21. NOT USED.
22. NOT USED.
23. NOT USED.
24. COIL PULL SPACE.
25. NOT USED.
26. NOT USED.
27. NOT USED.
28. NOT USED.
29. NOT USED.
30. PROVIDE INLINE HOT WATER FREEZE PROTECTION PUMP.
31. NOT USED.
32. NOT USED.
33. PROVIDE NEW TAPS ON RISERS FOR TEMPORARY AHU SERVICE. REF M301.

1 ENLARGED PLAN - TYPICAL 8TH-10TH FLOOR - MECHANICAL ROOM - PROPOSED

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

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ENLARGED PLAN - TYPICAL 8TH-10TH FLOOR - MECHANICAL ROOM - PROPOSED

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M410

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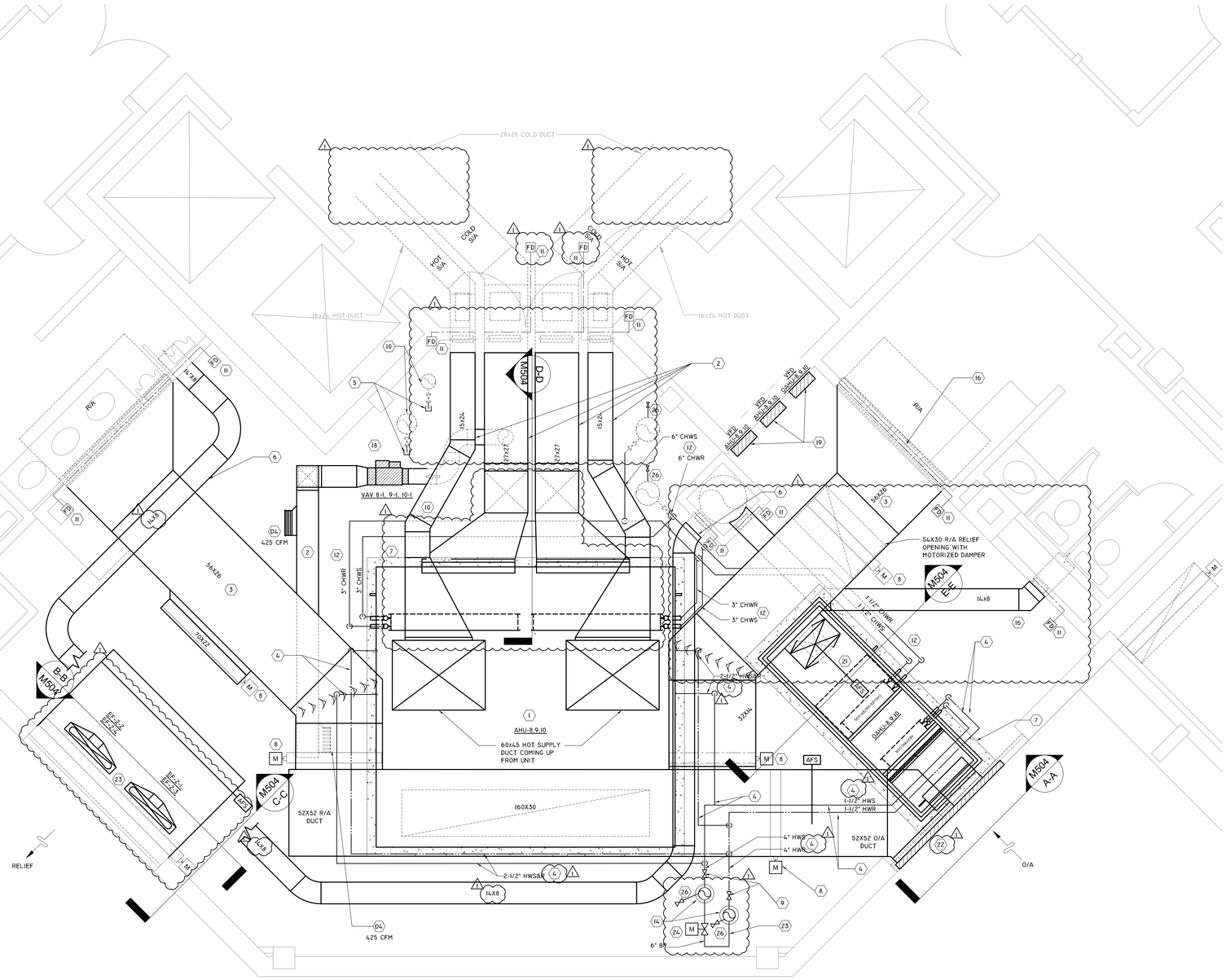

GENERAL NOTES

1. REF M802 FOR DUCT INSTALLATION DETAILS.
2. REF M801 FOR PIPING INSTALLATION DETAILS.

KEYED NOTES

1. REFER TO 1/M804 FOR AHU INSTALLATION DETAILS
2. PROVIDE NEW COLD & HOT SUPPLY AIR DUCTWORK . RECONNECT TO EXISTING.
3. PROVIDE NEW RETURN AIR DUCTWORK. RECONNECT TO EXISTING.
4. PROVIDE NEW HOT WATER SUPPLY & RETURN PIPING.
5. STEAM SUPPLY & CONDENSATE PIPES SHALL BE CAPPED AFTER THE VALVE
6. PROVIDE NEW EXHAUST DUCTWORK. RECONNECT TO EXISTING.
7. MODIFY EXISTING CONCRETE PAD AS REQUIRED FOR NEW AHU INSTALLATION.
8. PROVIDE NEW MOTORIZED DAMPER.
9. NOT USED.
10. EXISITING STEAM SUPPLY AND CONDENSATE RETURN RISER TO REMAIN.
11. PROVIDE NEW FIRE DOOR DAMPER AND DUCT ACCESS DOOR. REF 9/M804.
12. PROVIDE NEW CHWS & CHWR PIPING. RECONNECT TO EXISTING CHW RISERS.
13. NOT USED.
14. NEW HOT WATER S/R RISERS. REF 5/M804.
15. NOT USED.
16. RETAIN EXISTING EXHAUST DUCTWORK IN PLACE.
17. NOT USED.
18. REFER 1/M803 FOR VAV INSTALLATION.
19. PROVIDE NEW VFD FOR AHU SUPPLY FAN. COORDINATE WITH ELECTRICAL.
20. NOT USED.
21. PROVIDE NEW O/A SUPPLY DUCT FROM OAHU-8 DISCHARGE & TRANSITION TO NEW RETURN AIR DUCT. SEE SECTION.
22. CONNECT NEW OUTSIDE AIR DUCTS TO EXISTING 72X52 O/A LOUVER. PROVIDE BLANK-OFF AS REQUIRED.
23. REINSTALL EXISTING LOUVER AND FANS. PROVIDE NEW MOTORIZED DAMPERS & DUCT EXTENSION AS REQUIRED.
24. PROVIDE NEW LINE SIZE MOTORIZE BYPASS CONTROL VALVE AT 10TH FLOOR ONLY.
25. NOT USED.
26. PROVIDE NEW TAPS ON RISERS. REFER M301

1 ALTERNATE ENLARGED PLAN - TYPICAL 8TH-10TH FLOOR - MECHANICAL ROOM - PROPOSED

SCALE: 3/8" = 1'-0"

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KEY PLAN

STATE OF TEXAS
MATT A FLUKINGER
119970
LICENSED
PROFESSIONAL ENGINEER
8-16-2017

REVISIONS

05/31/2017	ISSUED FOR BID
07/28/2017	ADDENDUM 1
08/16/2017	ADDENDUM 2

Sheet Information

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Title

ALTERNATE #1 ENLARGED PLAN - TYPICAL 8TH-10TH FLOOR - MECHANICAL ROOM - PROPOSED

Sheet

M411

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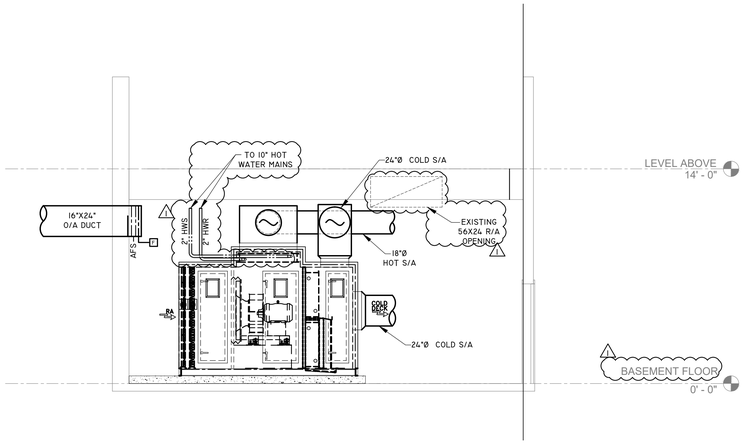
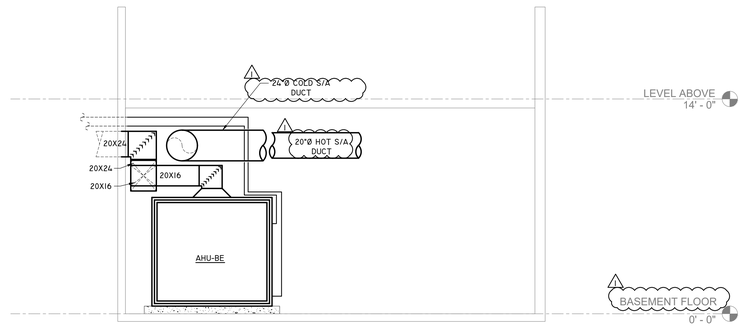


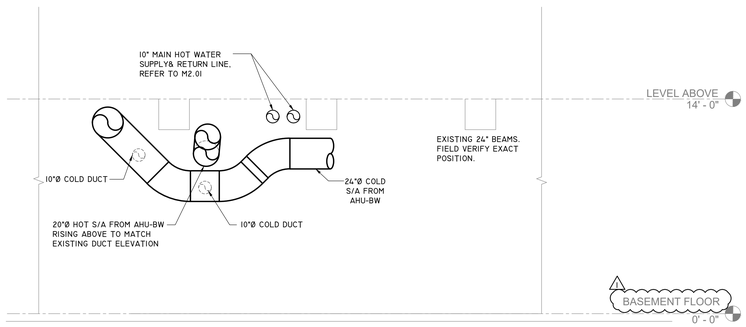
1 SECTION A-A

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



2 SECTION B-B

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



3 SECTION C-C

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

SECTIONS - BASEMENT MECHANICAL ROOMS

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SECTIONS - BASEMENT MECHANICAL ROOM

Sheet

M501

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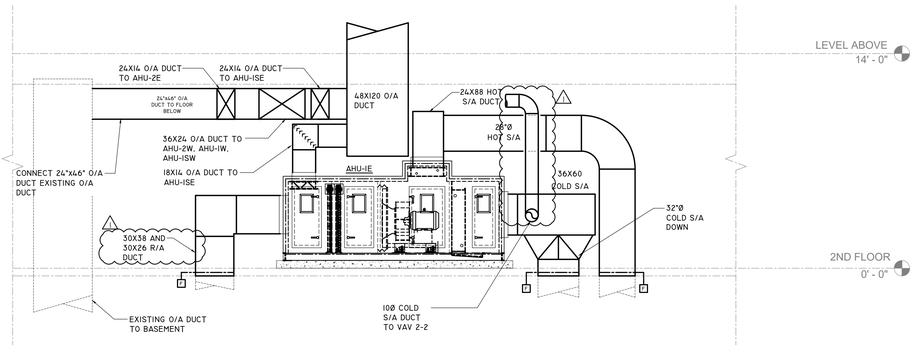
0 1/2" 1" 2"



1 SECTION A-A

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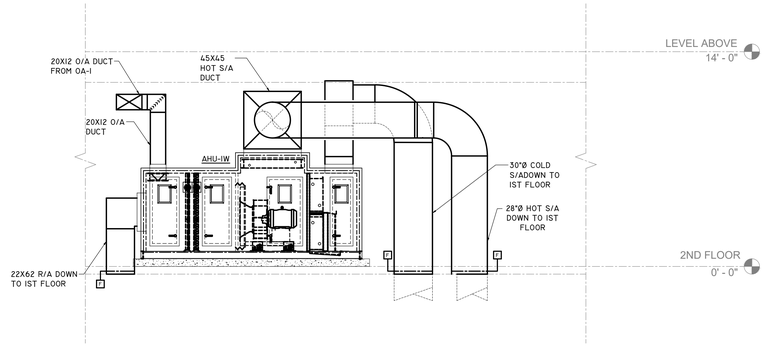
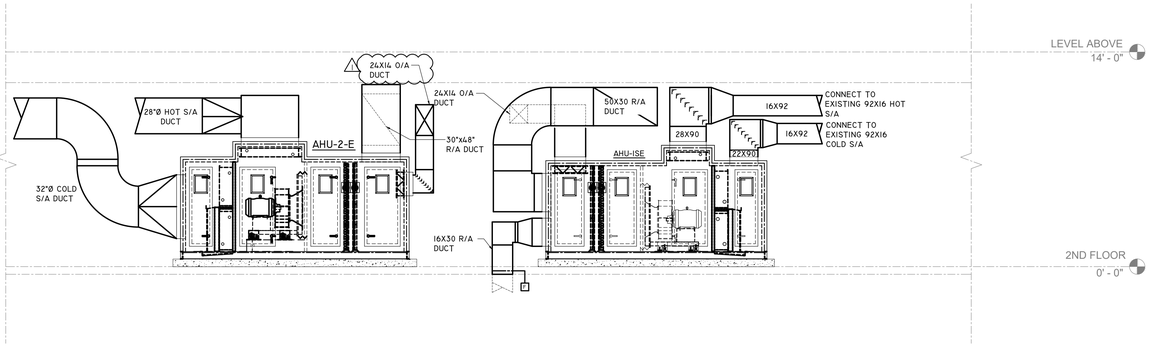


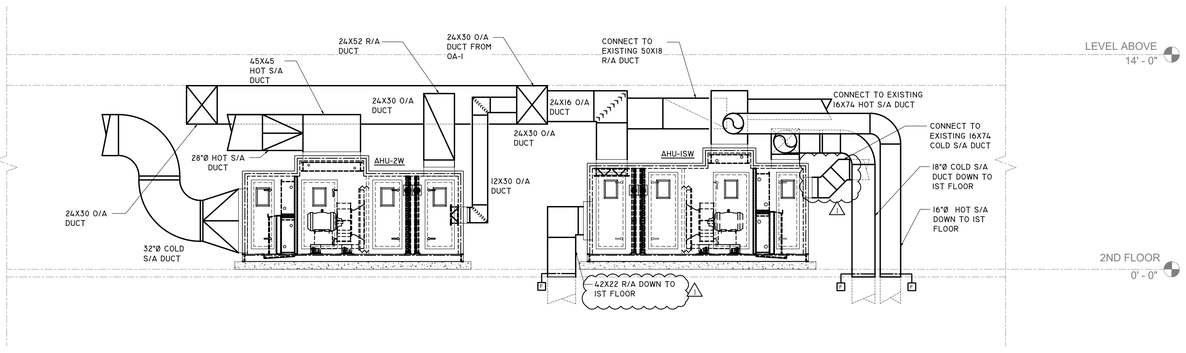
4 SECTION C-C

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



2 SECTION B-B

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



3 SECTION D-D

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

SECTIONS - 2ND FLOOR MECHANICAL ROOM

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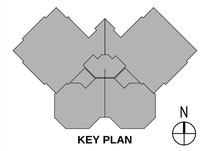

KEY PLAN

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SECTIONS - 2ND FLOOR MECHANICAL ROOM

Sheet

M502

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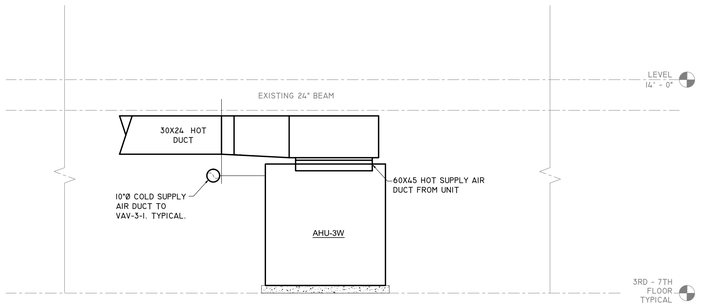
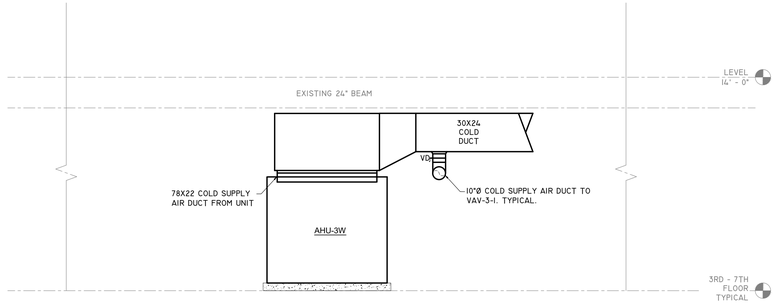


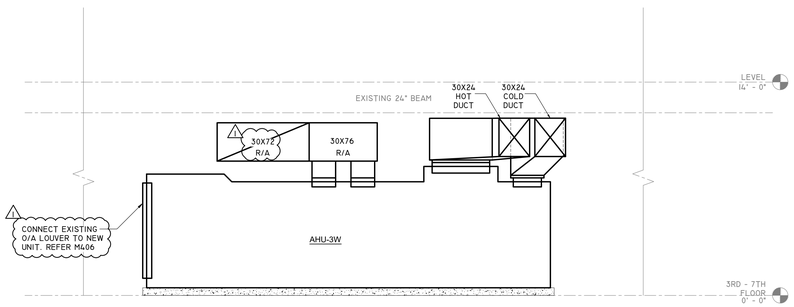
1 SECTION C-C

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



2 SECTION B-B

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



3 SECTION A-A

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

SECTIONS - 3RD THRU 10TH FLOOR MECHANICAL ROOMS

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SECTIONS - 3RD THRU 10TH FLOOR MECHANICAL ROOMS

Sheet

M503

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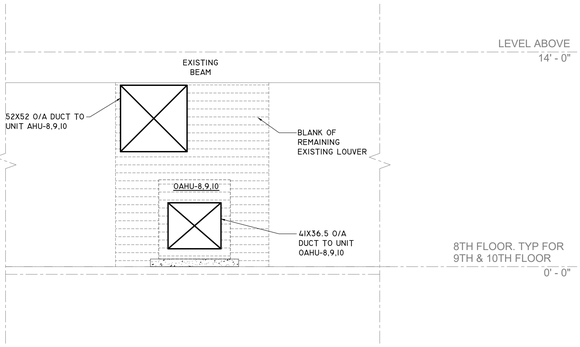
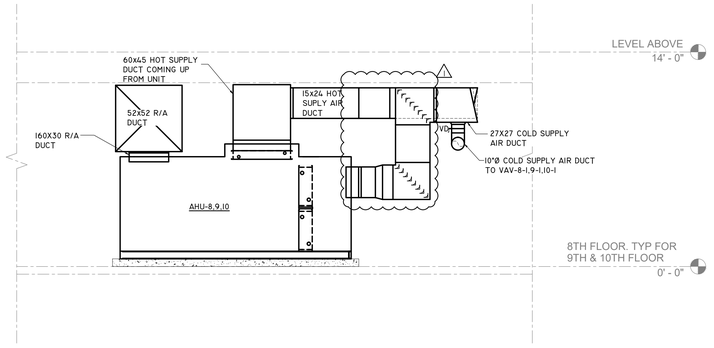


1 SECTION A-A

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

2 NOT USED

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

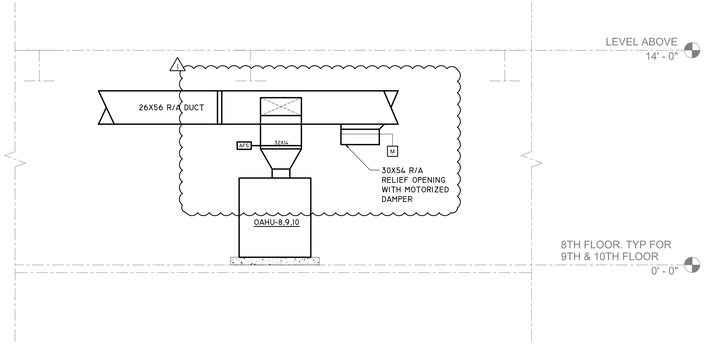


3 NOT USED

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

4 SECTION D-D

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



5 SECTION E-E

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

SECTIONS - 8TH THRU 10TH FLOOR MECHANICAL ROOMS

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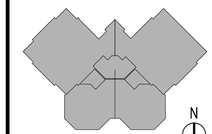

KEY PLAN

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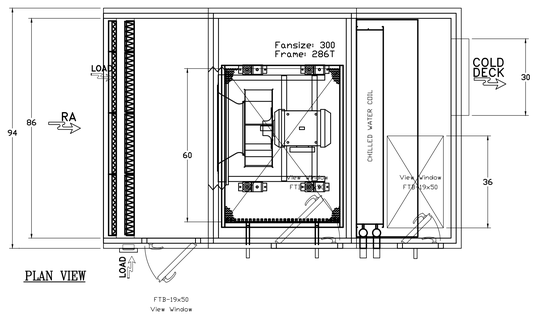
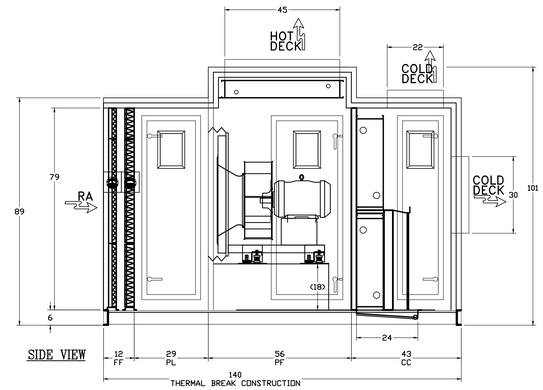
1 ALTERNATE #1
SECTIONS - 8TH THRU 10TH FLOOR MECHANICAL ROOMS

Sheet

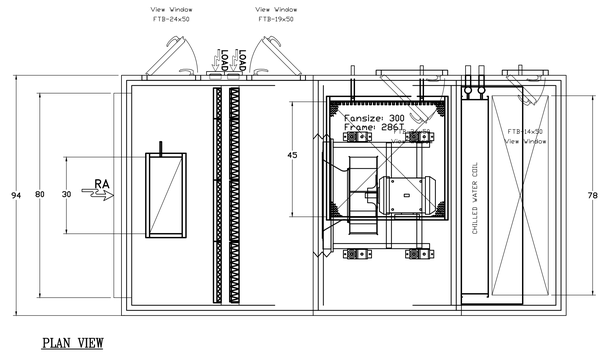
M504

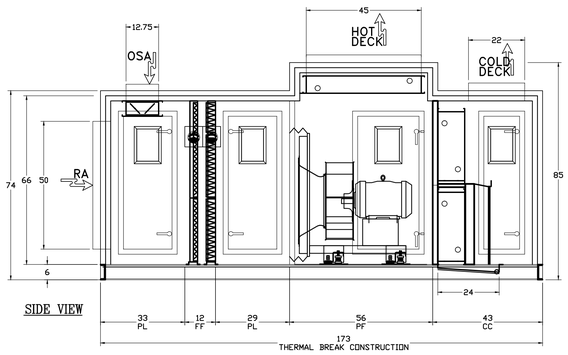
ISSUED FOR BID



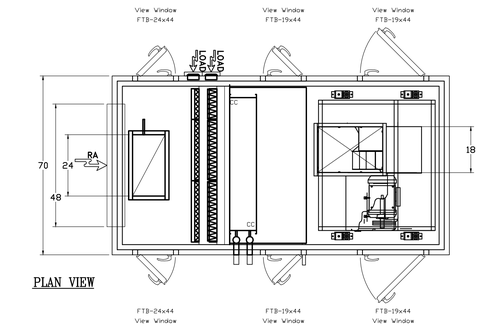


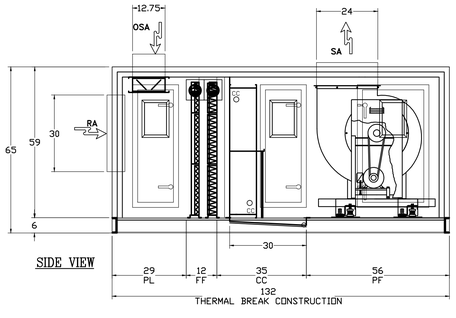
AHU-BW INSTALLATION DETAIL | SCALE: 1/2" = 1'-0" | 4





AHU-BE INSTALLATION DETAIL | SCALE: 1/2" = 1'-0" | 2





AHU-BH INSTALLATION DETAIL | SCALE: 1/2" = 1'-0" | 3

LEGENDS

OSA = OUTSIDE AIR
RA = RETURN AIR
NS = NEAR SIDE
HS = HIGH SIDE

SECTIONS:

AB = AIR BLENDER
CC = COOLING COIL
CU = CONDENSING UNIT
DE = DIRECT EVAPORATIVE
DF = DWDI FAN
DX = DX COIL
EC = ECONOMIZER
FF = FINAL FILTER
FU = FURNACE
HC = HEAITING COIL
IE = INDIRECT EVAPORATIVE

SA = SUPPLY AIR
EA = EXHAUST AIR
FS = FAR SIDE
LS = LOW SIDE

MB = MIXING BOX
MS = MOISTURE SEPARATOR
MZ = MULTI ZONE
PF = PLENUM FAN
PFF = PRE / FINAL FILTER
PL = PLENUM
PR = PRE-FILTER
SC = STEAM COIL
ST = SOUND TRAP
VF = VEE FILTER

NOTES:

1. ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.
2. OPENING DIMENSION TOLERANCES ARE ± 0.50, ALL OTHER CABINET DIMENSION TOLERANCES ARE ± 1.00.
3. LIFTING LUG LOCATIONS ON MECHANICAL DRAWINGS ARE FOR REPRESENTATION ONLY.

CUSTOM AHU CONFIGURATIONS

1 SCALE: 1/2"=1'-0"

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CUSTOM AHU CONFIGURATIONS

Sheet

M505

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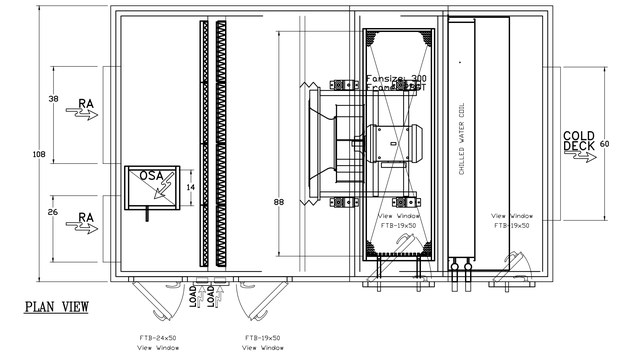
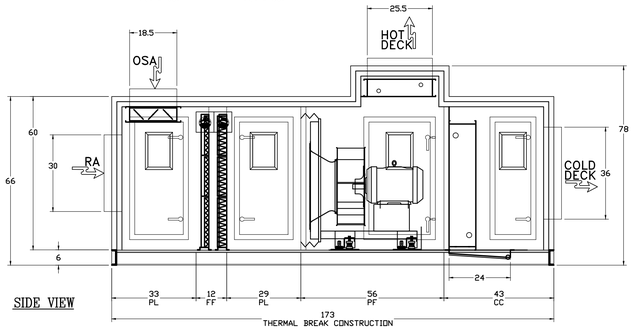


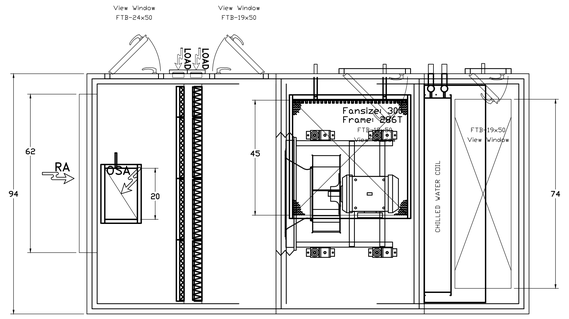
PLAN VIEW



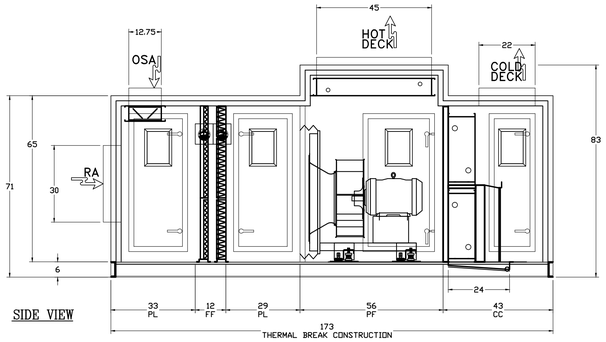
SIDE VIEW

AHU-IE

AHU-IE INSTALLATION DETAIL	SCALE: 1/2" = 1'-0"	4



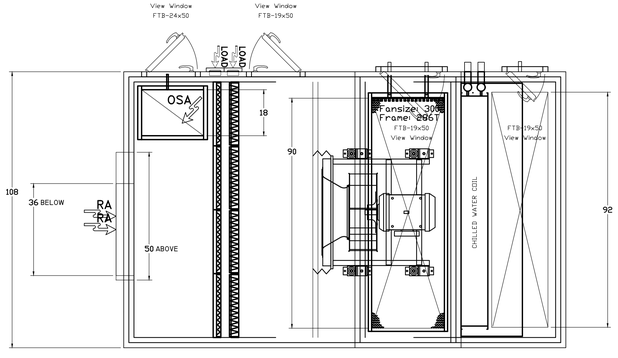
PLAN VIEW



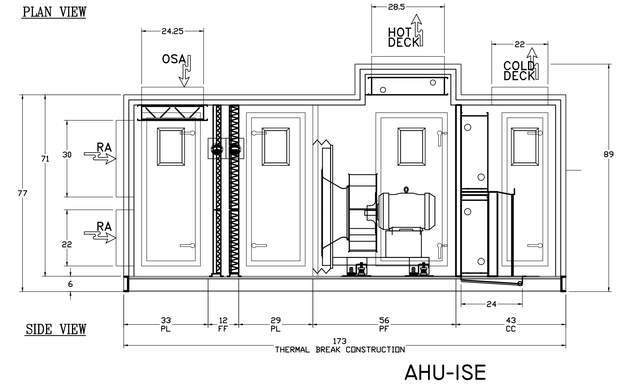
SIDE VIEW

AHU-IW

AHU-IW INSTALLATION DETAIL	SCALE: 1/2" = 1'-0"	2



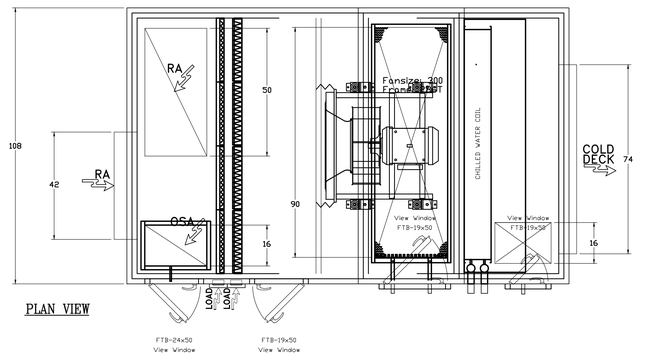
PLAN VIEW



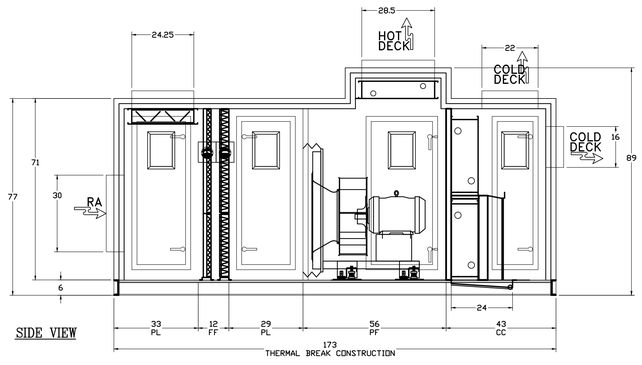
SIDE VIEW

AHU-ISE

AHU-ISE INSTALLATION DETAIL	SCALE: 1/2" = 1'-0"	3



PLAN VIEW



SIDE VIEW

AHU-ISW

AHU-ISW INSTALLATION DETAIL	SCALE: 1/2" = 1'-0"	1

CUSTOM AHU CONFIGURATIONS

1 SCALE: 1/2"=1'-0"

LEGENDS	
OSA = OUTSIDE AIR RA = RETURN AIR NS = NEAR SIDE HS = HIGH SIDE	SA = SUPPLY AIR EA = EXHAUST AIR FS = FAR SIDE LS = LOW SIDE
SECTIONS: AB = AIR BLENDER CC = COOLING COIL CU = CONDENSING UNIT DE = DIRECT EVAPORATIVE DF = DWDI FAN DX = DX COIL EC = ECONOMIZER FF = FINAL FILTER FU = FURNACE HC = HEAITING COIL IE = INDIRECT EVAPORATIVE	MB = MIXING BOX MS = MOISTURE SEPARATOR MZ = MULTI ZONE PF = PLENUM FAN PFF = PRE / FINAL FILTER PL = PLENUM PR = PRE-FILTER SC = STEAM COIL ST = SOUND TRAP VF = VEE FILTER

NOTES:

1. ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.
2. OPENING DIMENSION TOLERANCES ARE ± 0.50, ALL OTHER CABINET DIMENSION TOLERANCES ARE ± 1.00.
3. LIFTING LUG LOCATIONS ON MECHANICAL DRAWINGS ARE FOR REPRESENTATION ONLY.

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CUSTOM AHU CONFIGURATIONS

Sheet

M506

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0 1/2" 1" 2"

LEGENDS	
OSA = OUTSIDE AIR RA = RETURN AIR NS = NEAR SIDE HS = HIGH SIDE	SA = SUPPLY AIR EA = EXHAUST AIR FS = FAR SIDE LS = LOW SIDE
SECTIONS: AB = AIR BLENDER CC = COOLING COIL CU = CONDENSING UNIT DE = DIRECT EVAPORATIVE DF = DWDI FAN DX = DX COIL EC = ECONOMIZER FF = FINAL FILTER FU = FURNACE HC = HEAITING COIL IE = INDIRECT EVAPORATIVE	MB = MIXING BOX MS = MOISTURE SEPARATOR MZ = MULTI ZONE PF = PLENUM FAN PFF = PRE / FINAL FILTER PL = PLENUM PR = PRE-FILTER SC = STEAM COIL ST = SOUND TRAP VF = VEE FILTER

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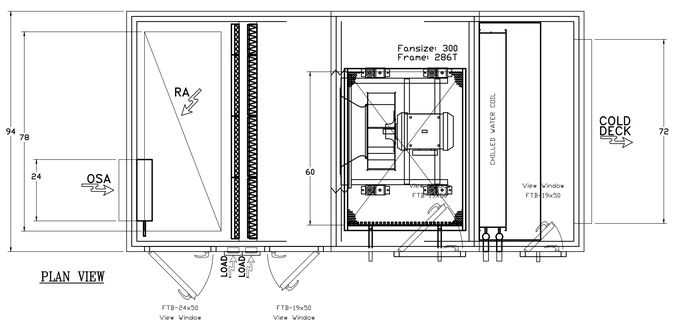
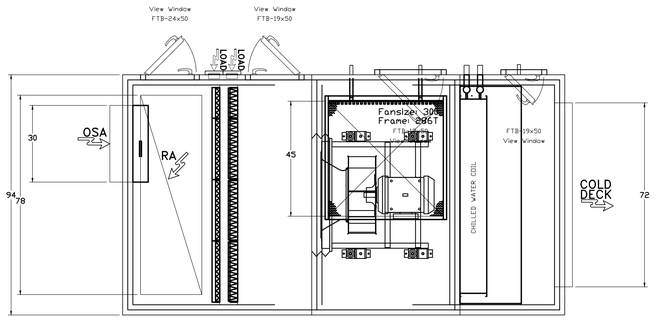
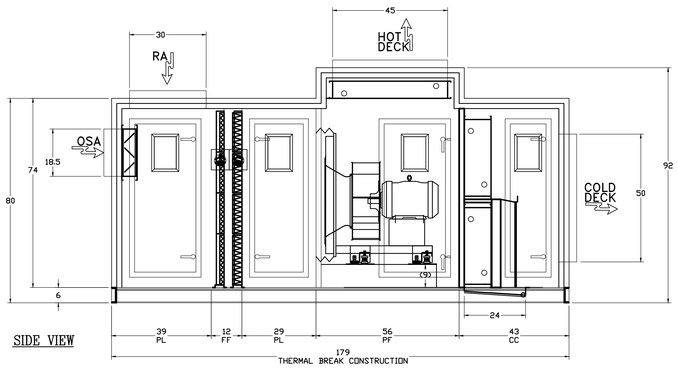


PLAN VIEW

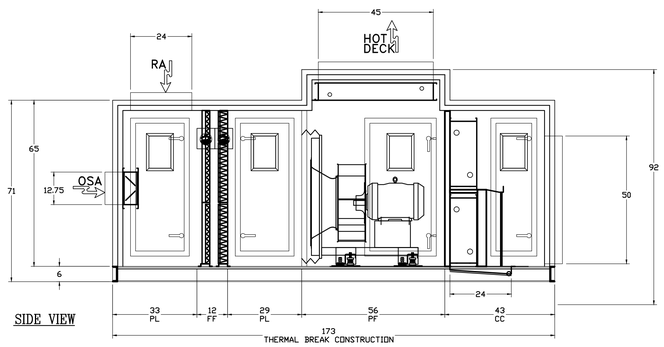


PLAN VIEW



SIDE VIEW

AHU-2E



SIDE VIEW

AHU-2W

AHU-2E INSTALLATION DETAIL	SCALE: 1/2" = 1'-0"	2	AHU-2W INSTALLATION DETAIL	SCALE: 1/2" = 1'-0"	1

1 CUSTOM AHU CONFIGURATIONS

SCALE: 1/2"=1'-0"

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8-16-2017

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07/28/2017	ADDENDUM 1
08/16/2017	ADDENDUM 2

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CUSTOM AHU CONFIGURATIONS

Sheet

M507

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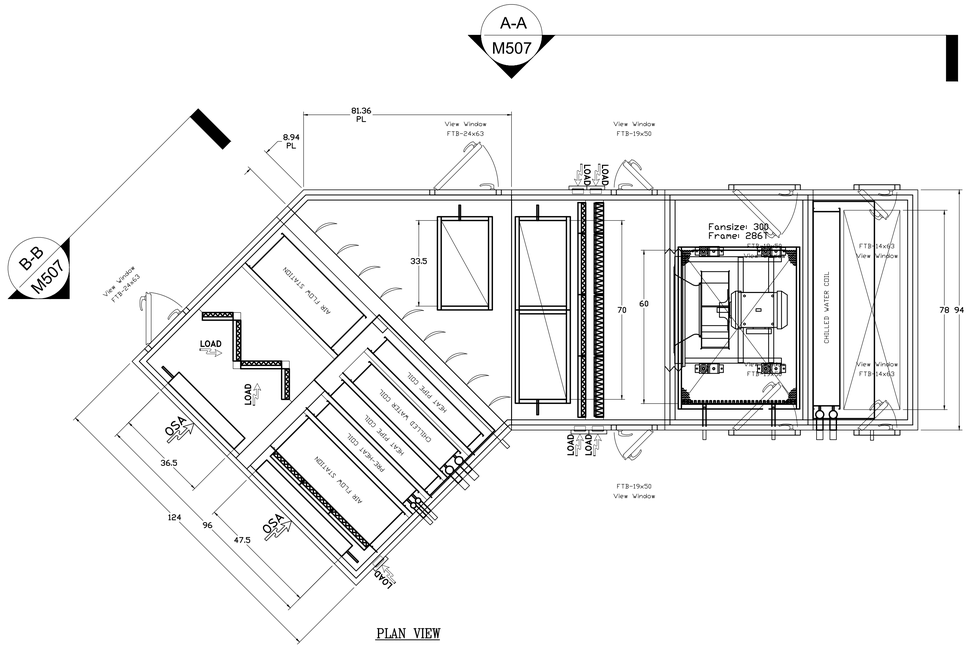
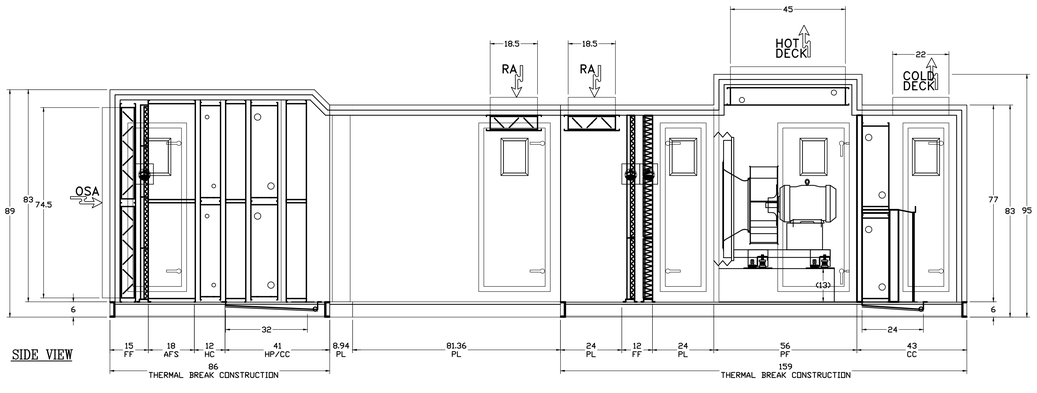


PLAN VIEW



SIDE VIEW

SIDE VIEW

AHU-3W THRU 7W

AHU-3W THRU 7W INSTALLATION DETAIL | SCALE: 1/2" = 1'-0" | 1

LEGENDS	
OSA = OUTSIDE AIR RA = RETURN AIR NS = NEAR SIDE HS = HIGH SIDE	SA = SUPPLY AIR EA = EXHAUST AIR FS = FAR SIDE LS = LOW SIDE
SECTIONS: AB = AIR BLENDER CC = COOLING COIL CU = CONDENSING UNIT DE = DIRECT EVAPORATIVE DF = DWDI FAN DX = DX COIL EC = ECONOMIZER FF = FINAL FILTER FU = FURNACE HC = HEAITING COIL IE = INDIRECT EVAPORATIVE	MB = MIXING BOX MS = MOISTURE SEPARATOR MZ = MULTI ZONE PF = PLENUM FAN PFF = PRE / FINAL FILTER PL = PLENUM PR = PRE-FILTER SC = STEAM COIL ST = SOUND TRAP VF = VEE FILTER

NOTES:

1. ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.
2. OPENING DIMENSION TOLERANCES ARE ± 0.50, ALL OTHER CABINET DIMENSION TOLERANCES ARE ± 1.00.
3. LIFTING LUG LOCATIONS ON MECHANICAL DRAWINGS ARE FOR REPRESENTATION ONLY.

CUSTOM AHU CONFIGURATIONS

1 SCALE: 1/2"=1'-0"

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CUSTOM AHU CONFIGURATIONS

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M509

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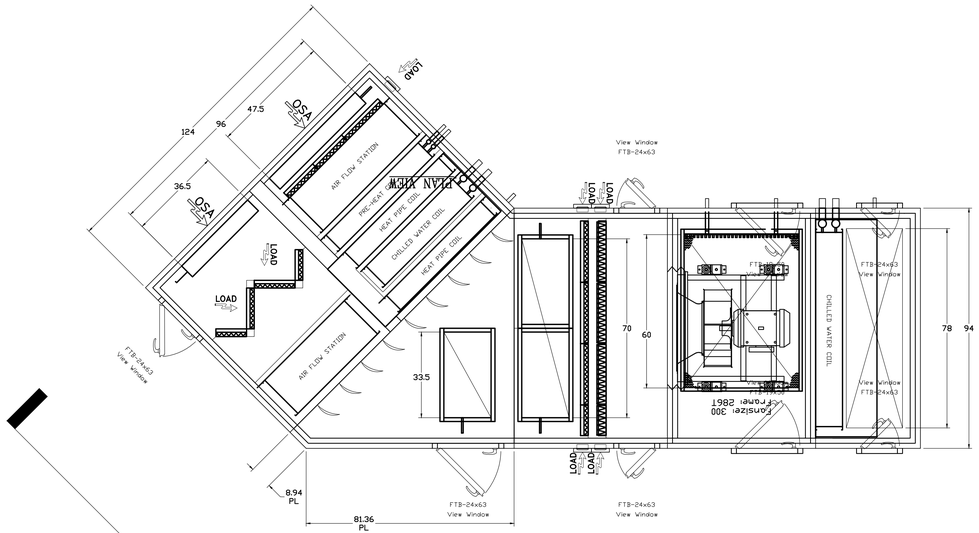

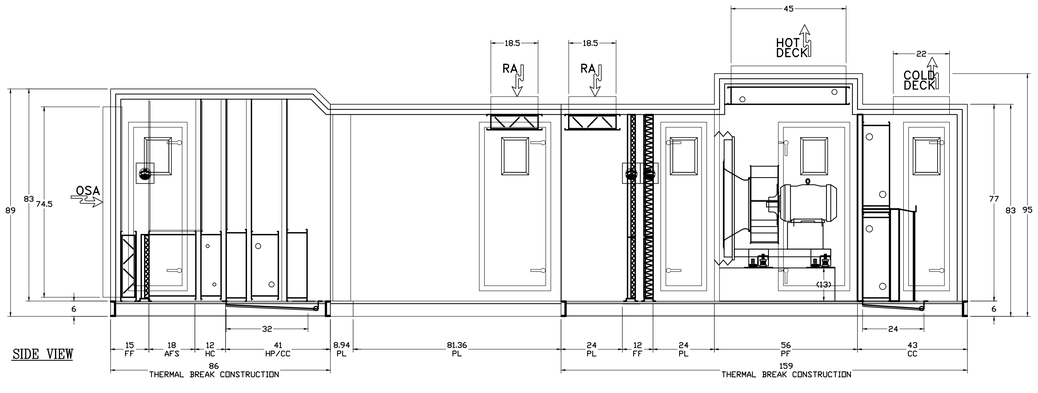

SIDE VIEW

AHU-3E THRU 7E

AHU-3E THRU 7E INSTALLATION DETAIL | SCALE: 1/2" = 1'-0" | 1

LEGENDS	
OSA = OUTSIDE AIR RA = RETURN AIR NS = NEAR SIDE HS = HIGH SIDE	SA = SUPPLY AIR EA = EXHAUST AIR FS = FAR SIDE LS = LOW SIDE
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CUSTOM AHU CONFIGURATIONS

1 SCALE: 1/2"=1'-0"

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CUSTOM AHU CONFIGURATIONS

Sheet

M510

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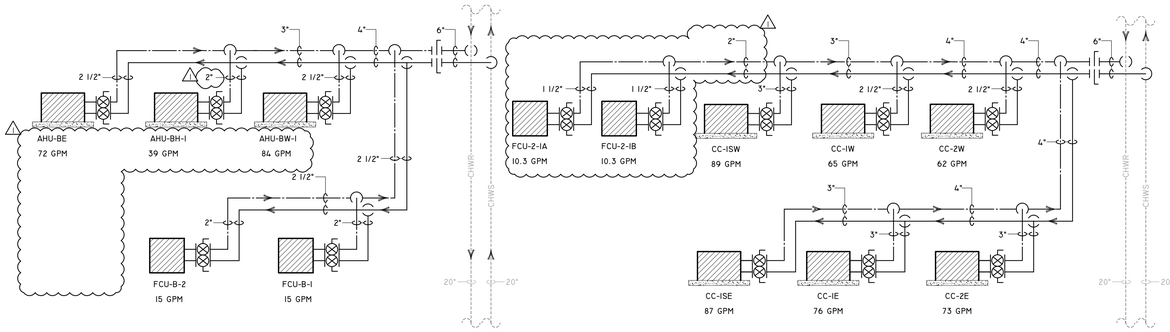
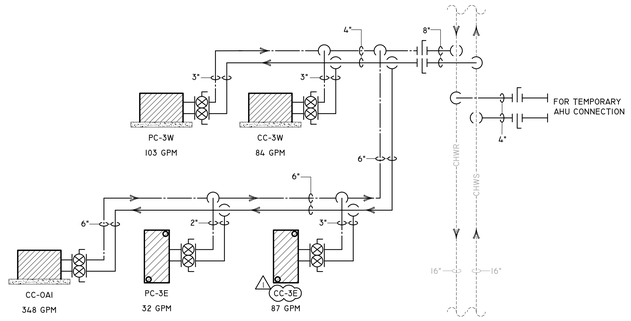
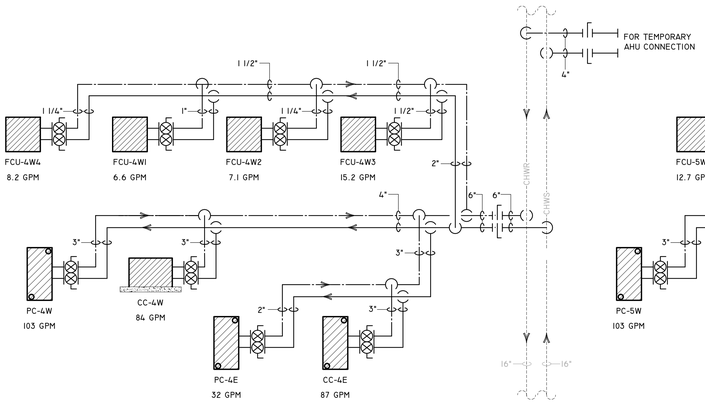


BASEMENT FLOOR

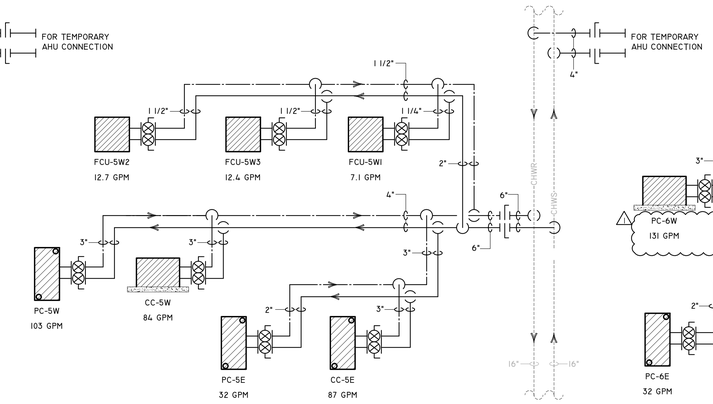
2ND FLOOR



3RD FLOOR



4TH FLOOR



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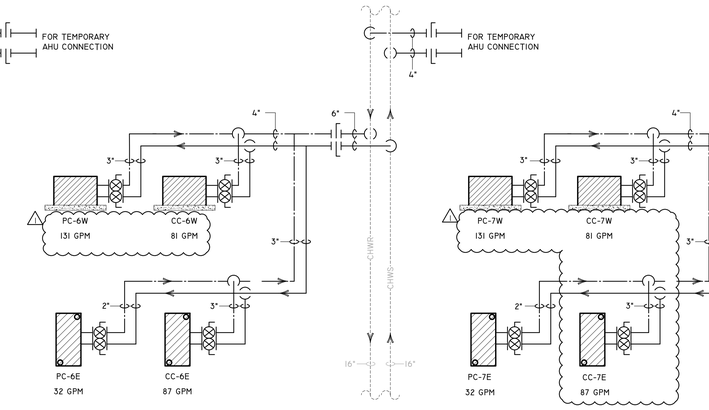
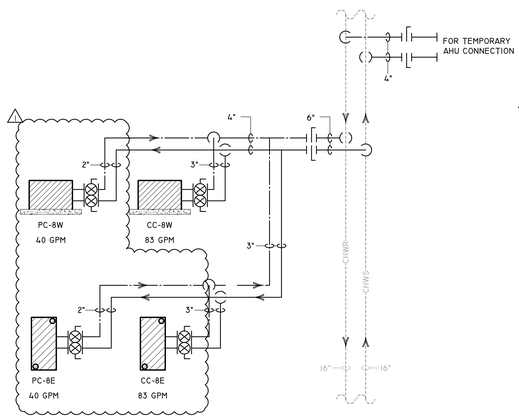
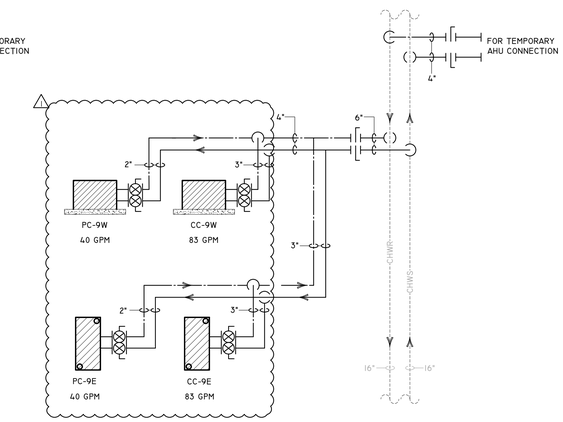


6TH FLOOR

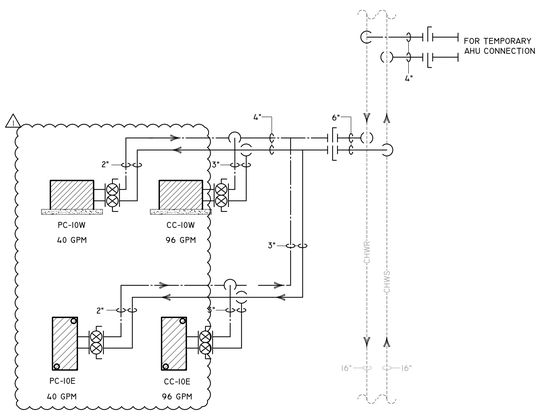
7TH FLOOR



8TH FLOOR



9TH FLOOR



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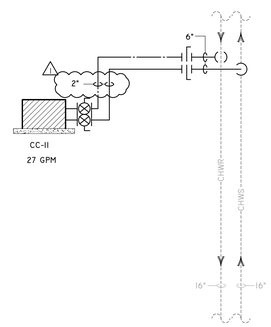

PENTHOUSE

1 CHILLED WATER PIPING DIAGRAM

SCALE: N.T.S.

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PIPING DIAGRAM - CHILLED WATER

Sheet

M601

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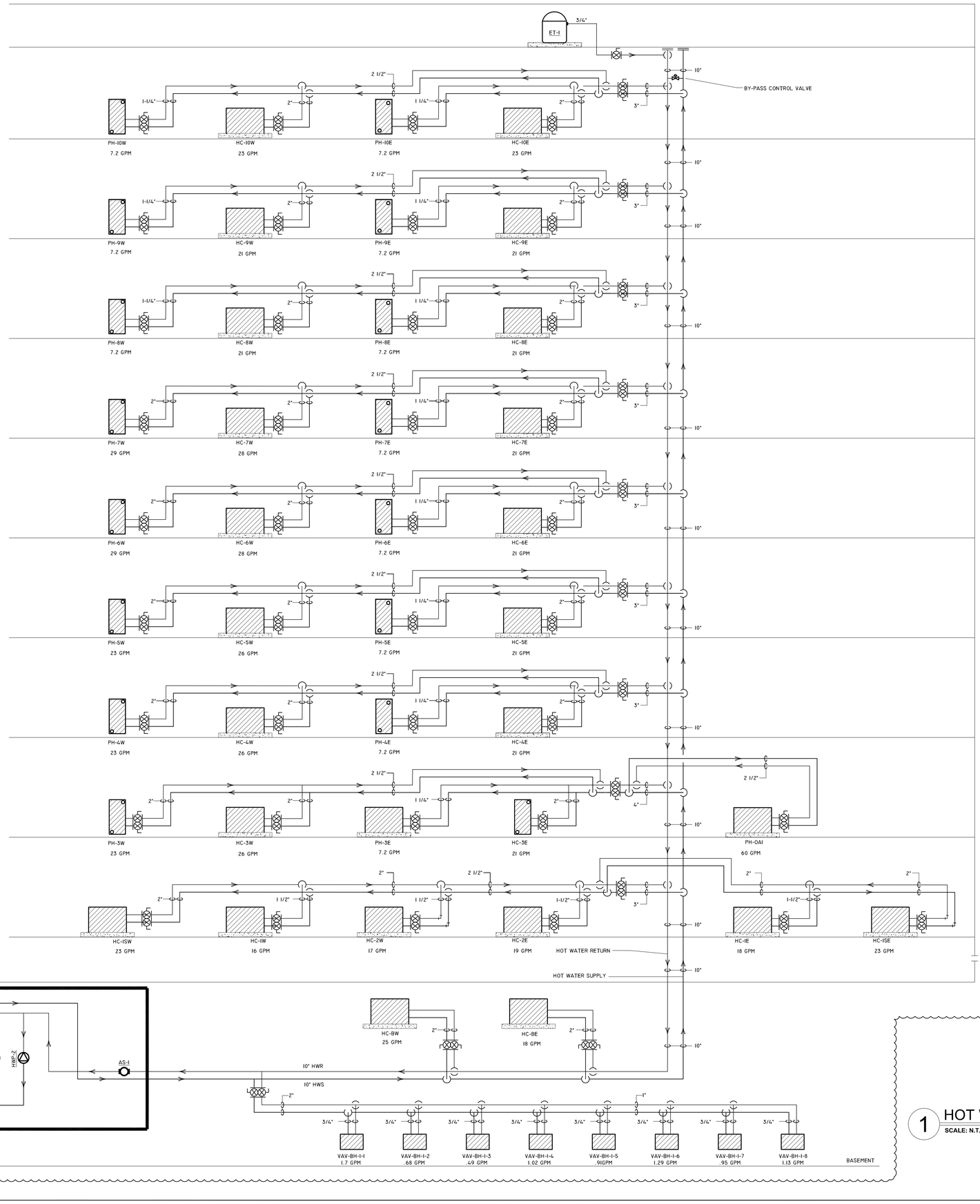

1 HOT WATER PIPING DIAGRAM

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KEY PLAN

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PIPING DIAGRAM - HOT WATER

Sheet

M602

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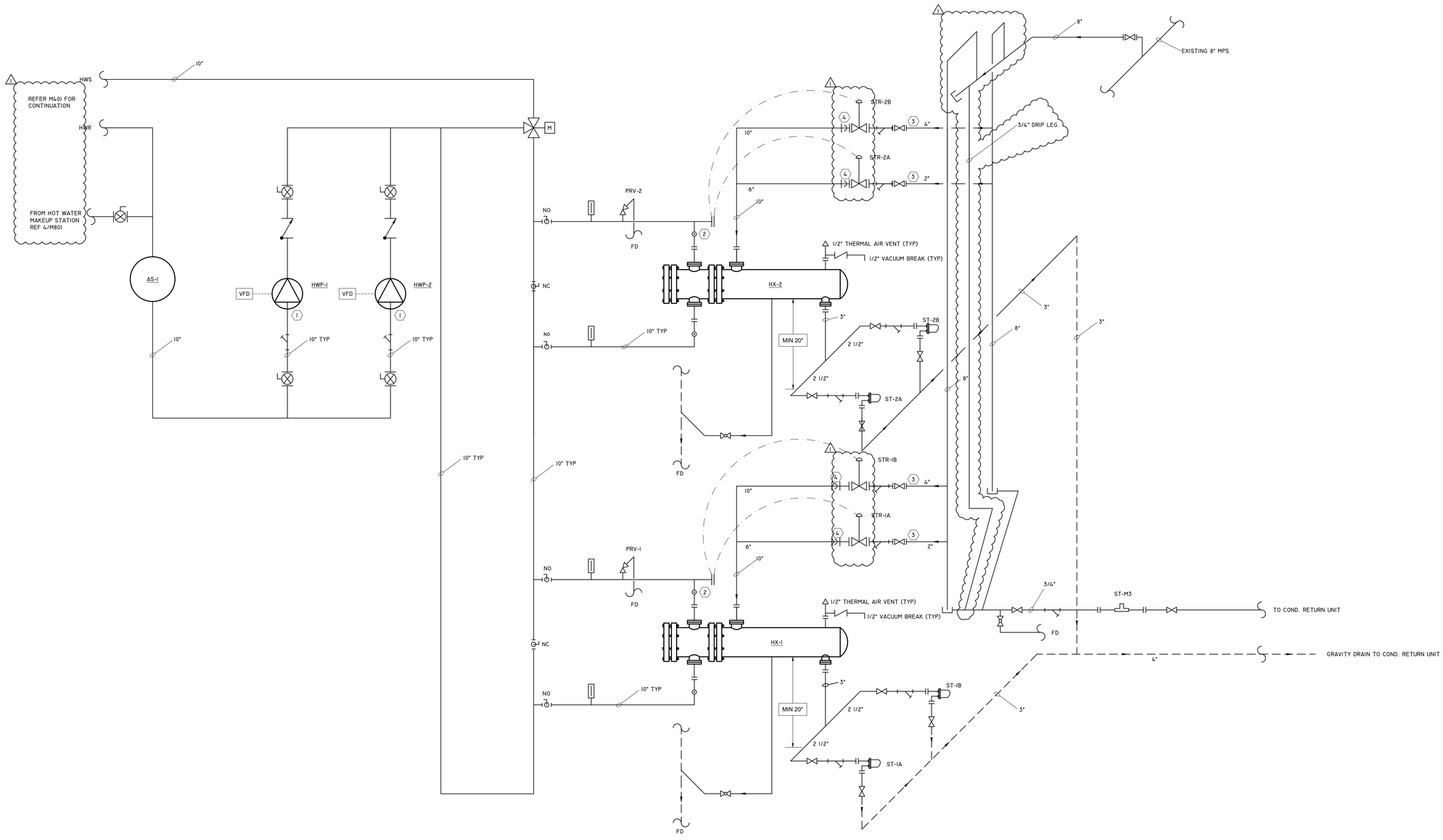

KEY NOTES:

1. REFER 7/M801 FOR PUMP DETAIL
2. PROVIDE (2) 3/4" T-O-L IN 10" BLIND FLANGE FOR TEMP PILOT SENSING ELEMENTS THERMAL WELLS. COORDINATE THERMAL WELL REQUIREMENTS WITH REGULATOR MRG.
3. MOUNT STRAINERS BASKET LEGS IN THE HORIZONTAL POSITION.
4. PROVIDE NOISE DIFFUSER. REFER TO DETAIL 5/M803.

1 HEAT EXCHANGER STEAM TO HOT WATER DIAGRAM

SCALE: N.T.S.

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HEAT EXCHANGER PIPING DIAGRAM

Sheet

M603

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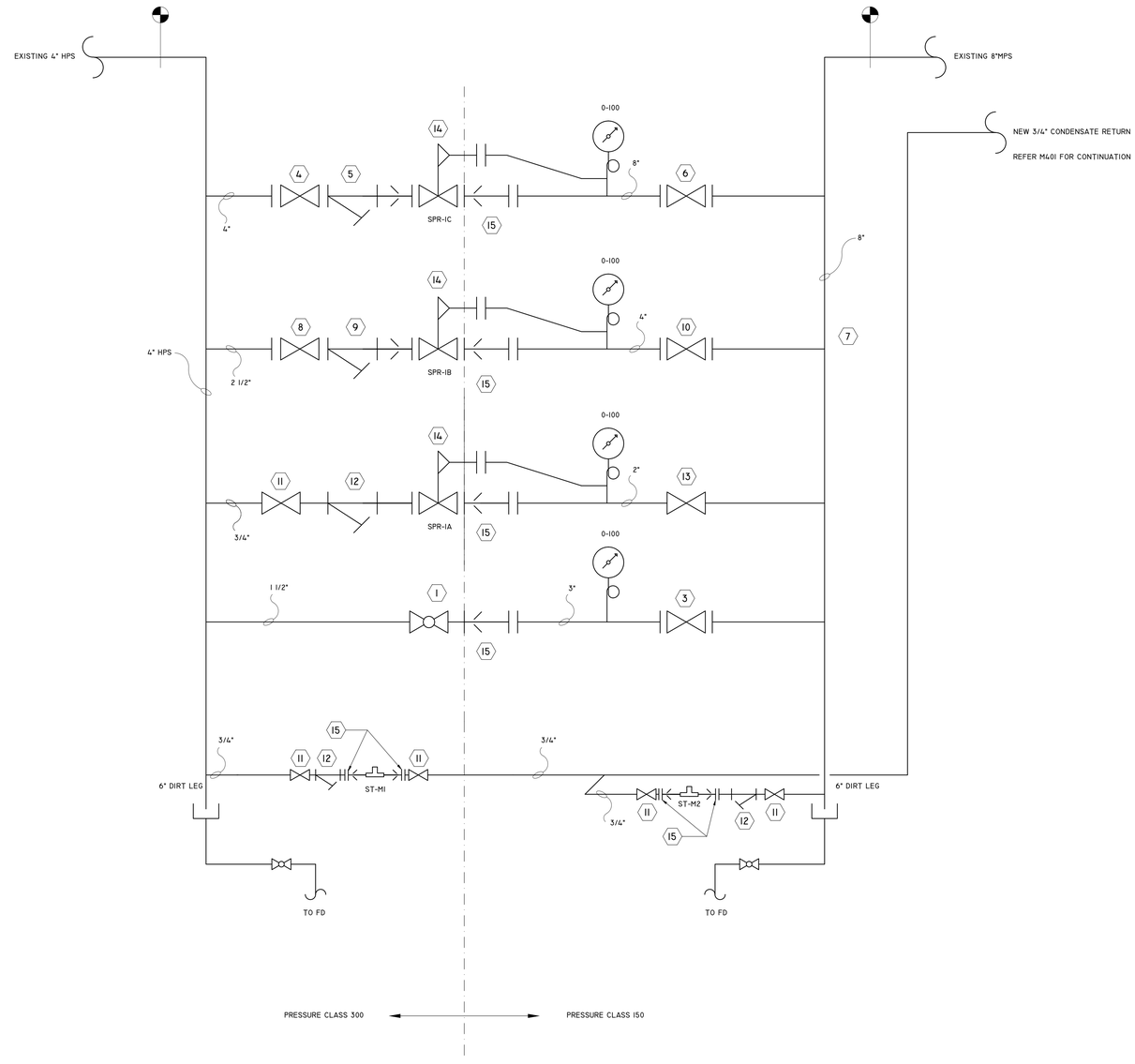

KEYED NOTES:

1. PROVIDE 1 1/2" OS&Y GLOBE VALVE.
2. PROVIDE NEW 3"X1/2" THREADED COMPANION FLANGED CONNECTION.
3. PROVIDE 3" FLANGED OS &Y GATE VALVE.
4. PROVIDE 4" FLANGED OS & Y GATE VALVE .
5. PROVIDE 4" STRAINER. INSTALL STRAINER WITH BASKET IN HORIZONTAL POSITION.
6. PROVIDE 8" OS &Y GATE VALVE.
7. NOT USED.
8. PROVIDE 2 1/2" FLANGED OS &Y GATE VALVE .
9. PROVIDE 2 1/2" FLANGED STRAINER. INSTALL STRAINER WITH BASKET IN HORIZONTAL POSITION.
10. PROVIDE 4" FLANGED OS &Y GATE VALVE.
11. PROVIDE 3/4" THREADED OS &Y GATE VALVE.
12. PROVIDE 3/4" THREADED STRAINER.
13. PROVIDE 2" THREADED OS &Y GATE VALVE.
14. PROVIDE PRESSURE REGULATOR VALVE AS SCHEDULED.
15. PROVIDE NOISE DIFFUSER. REFER TO DETAIL 5/M803.

1 STEAM PRESSURE REDUCER DIAGRAM

SCALE: N.T.S.

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PIPING DIAGRAM - STEAM PRESSURE REDUCER

Sheet

M604

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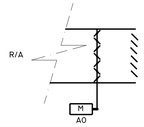
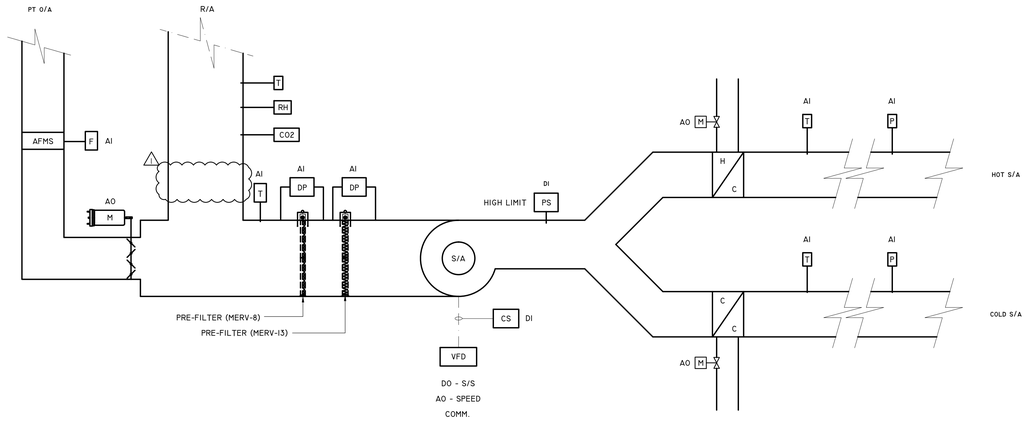
0 1/2" 1" 2"

REMOTE RELIEF DAMPER (TYP QTY 3)



1 SEQUENCE OF OPERATION:

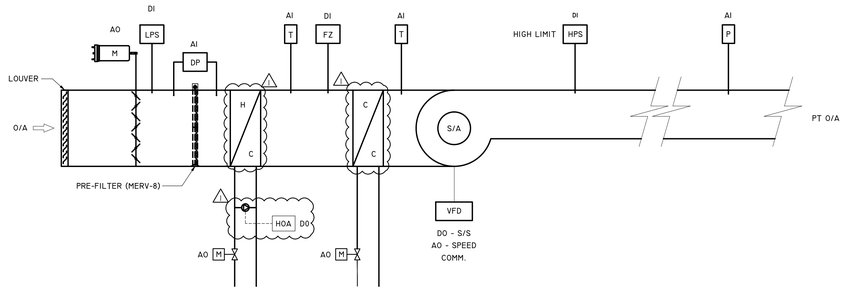
ENGAGE AHU FAN ON DEMAND, SCHEDULE, OR MANUAL OVERRIDE. MODULATE FAN SPEED TO MAINTAIN MINIMUM DUCT STATIC PRESSURE BETWEEN THE HOT AND COLD SUPPLY DUCTS. PROVIDE A SOFTWARE DISCRIMINATOR TO GRANT CONTROL AUTHORITY TO THE SENSOR INDICATING THE LOWEST PRESSURE. AN INCREASE IN STATIC PRESSURE ACTS TO DECREASE FAN SPEED AND VISE VERSA. DISENGAGE SUPPLY FAN AND ALARM ON HIGH STATIC PRESSURE LIMIT. DISENGAGE AND ALARM ON PERSISTENT FAN STATUS FAILURE.
MODULATE MAIN COOLING COIL TO MAINTAIN COLD DUCT TEMPERATURE. AN INCREASE IN TEMPERATURE ACTS TO OPEN THE CHW CONTROL VALVE AND VISE VERSA. ALARM ON PERSISTENT HIGH OR LOW COLD SUPPLY AIR TEMPERATURE.
MODULATE MAIN HEATING COIL TO MAINTAIN HOT DUCT TEMPERATURE. AN INCREASE IN TEMPERATURE ACTS TO CLOSE THE HW CONTROL VALVE AND VISE VERSA. RESET HOT DUCT TEMPERATURE SETPOINT PER OUTSIDE AIR TEMPERATURE LOOKUP SCHEDULE. LOOKUP SCHEDULE VALUES TO BE DETERMINED BY OWNER. ALARM ON PERSISTENT HIGH OR LOW HOT SUPPLY AIR TEMPERATURE.
MODULATE OUTSIDE AIR DAMPER TO MAINTAIN OUTIDE AIRFLOW DURING SCHEDULED OCCUPIED MODE. AN INCREASE IN OUTSIDE AIRFLOW ACTS TO DECREASE FAN SPEED AND VISE VERSA. RESET OUTSIDE AIRFLOW FROM MIN TO MAX AND RETURN AIR CO2 INCREASES FROM 700 TO 1100 PPM (ADJ).
MONITOR AND DISPLAY RETURN AIR TEMPERAURE, RH, AND CO2. ALARM ON PERSISTENT HIGH RH OR CO2.
MONITOR AND DISPLAY AIR FILTER DIFFERENTIAL PRESSURES. ALARM ON PERSISTENT HIGH LIMITS.



DUAL DUCT AHU CONTROL DIAGRAM - APPLICABLE FOR 2ND FLOOR AHU | NOT TO SCALE | 4

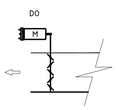
1 SEQUENCE OF OPERATION:

OPEN UNIT INLET DAMPER AND ENGAGE FAN ON DEMAND, SCHEDULE, OR MANUAL OVERRIDE. INTERLOCK FAN TO DELAY START UNTIL UNIT INLET DAMPER INDICATES FULL OPEN AND VISE VERSA.
MODULATE FAN SPEED TO MAINTAIN DUCT STATIC PRESSURE. AN INCREASE IN STATIC PRESSURE ACTS TO DECREASE FAN SPEED AND VISE VERSA. DISENGAGE SUPPLY FAN AND ALARM ON HIGH SUPPLY STATIC PRESSURE LIMIT. DISENGAGE AND ALARM ON PERSISTENT FAN STATUS FAILURE.
MODULATE PRE-HEATING COIL TO MAINTAIN PRETREATED HOT-DECK TEMPERATURE. AN INCREASE IN HOT DECK TEMPERATURE ACTS TO DECREASE HW FLOW AND VISE VERSA. ENGAGE HW CIRCULATION PUMP AS OUTSIDE AIR DECREASES BELOW 35F AND VISE VERSA. ALARM ON PERSISTENT HIGH OR LOW HOT-DECK TEMPERATURE.
MODULATE PRE-COOLING COIL TO MAINTAIN PRETREATED COLD-DECK TEMPERATURE. AN INCREASE IN COLD-DECK TEMPERATURE ACTS TO INCREASE CHW FLOW AND VISE VERSA. ALARM ON PERSISTENT HIGH OR LOW COLD DECK TEMPERATURE.
ALARM AND DISENGAGE FAN, CLOSE INLET DAMPER, OPEN PRE-HEATING VALVE, OPEN PRE-COOLING VALVE, AND ENGAGE HW CIRCULATION PUMP UPON FREEZE-STAT ACTIVATION.
MONITOR AND DISPLAY AIR FILTER DIFFERENTIAL PRESSURES. ALARM ON PERSISTENT HIGH LIMITS.



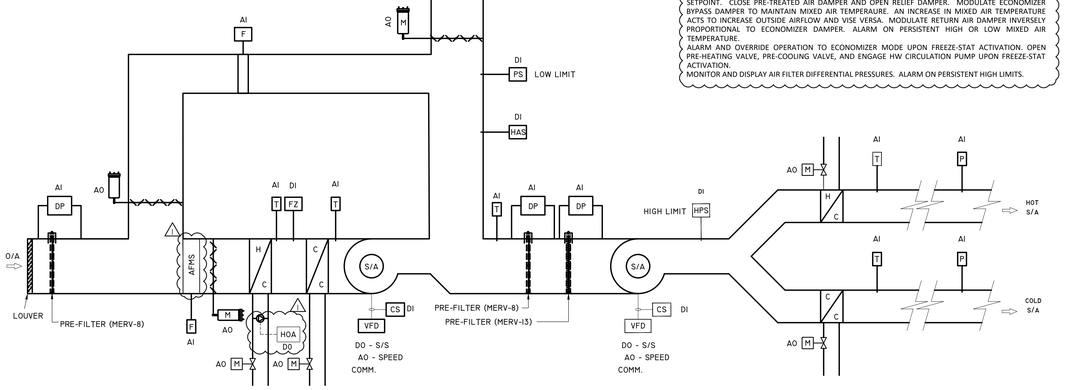
OAHU CONTROL DIAGRAM | NOT TO SCALE | 2

REMOTE RELIEF DAMPER



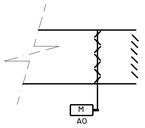
1 SEQUENCE OF OPERATION:

ENGAGE AHU FAN ON DEMAND, SCHEDULE, OR MANUAL OVERRIDE. MODULATE FAN SPEED TO MAINTAIN MINIMUM DUCT STATIC PRESSURE BETWEEN THE HOT AND COLD SUPPLY DUCTS. PROVIDE A SOFTWARE DISCRIMINATOR TO GRANT CONTROL AUTHORITY TO THE SENSOR INDICATING THE LOWEST PRESSURE. AN INCREASE IN STATIC PRESSURE ACTS TO DECREASE FAN SPEED AND VISE VERSA. DISENGAGE SUPPLY FAN AND ALARM ON HIGH STATIC PRESSURE LIMIT. DISENGAGE AND ALARM ON PERSISTENT FAN STATUS FAILURE.
MODULATE MAIN COOLING COIL TO MAINTAIN COLD DUCT TEMPERATURE. AN INCREASE IN TEMPERATURE ACTS TO OPEN THE CHW CONTROL VALVE AND VISE VERSA. ALARM ON PERSISTENT HIGH OR LOW COLD SUPPLY AIR TEMPERATURE.
MODULATE MAIN HEATING COIL TO MAINTAIN HOT DUCT TEMPERATURE. AN INCREASE IN TEMPERATURE ACTS TO CLOSE THE HW CONTROL VALVE AND VISE VERSA. RESET HOT DUCT TEMPERATURE SETPOINT PER OUTSIDE AIR TEMPERATURE LOOKUP SCHEDULE. LOOKUP SCHEDULE VALUES TO BE DETERMINED BY OWNER. ALARM ON PERSISTENT HIGH OR LOW HOT SUPPLY AIR TEMPERATURE.
OPEN PRETREATED OUTSIDE AIR DAMPER AND ENGAGE OAHU FAN DURING SCHEDULED OCCUPIED MODE. INTERLOCK FAN TO DELAY START UNTIL UNIT INLET DAMPER INDICATES FULL OPEN AND VISE VERSA. MODULATE FAN SPEED TO MAINTAIN OUTSIDE AIRFLOW. AN INCREASE IN OUTSIDE AIRFLOW ACTS TO DECREASE FAN SPEED AND VISE VERSA. RESET OUTSIDE AIRFLOW FROM MIN TO MAX AND RETURN AIR CO2 INCREASES FROM 700 TO 1100 PPM (ADJ).
MODULATE PREHEATING COIL TO MAINTAIN PRETREATED HOT-DECK TEMPERATURE. AN INCREASE IN HOT-DECK TEMPERATURE ACTS TO DECREASE HW FLOW AND VISE VERSA. ENGAGE HW CIRCULATION PUMP AS OUTSIDE AIR DECREASES BELOW 35F AND VISE VERSA. ALARM ON PERSISTENT HIGH OR LOW HOT-DECK TEMPERATURE.
MODULATE PRE-COOLING COIL TO MAINTAIN PRETREATED COLD DECK TEMPERATURE AT COOLING COIL OUTLET (UPSTREAM OF HEAT PIPE COIL). AN INCREASE IN COLD DECK TEMPERATURE ACTS TO INCREASE CHW FLOW AND VISE VERSA. ALARM ON PERSISTENT HIGH OR LOW COLD DECK TEMPERATURE.
ENGAGE ECONOMIZER MODE WHEN OUTSIDE AIR TEMPERATURE DECREASES TO LESS OWNER DEFINED SETPOINT. CLOSE PRE-TREATED AIR DAMPER AND OPEN RELIEF DAMPER. MODULATE ECONOMIZER BYPASS DAMPER TO MAINTAIN MIXED AIR TEMPERAURE. AN INCREASE IN MIXED AIR TEMPERATURE ACTS TO INCREASE OUTSIDE AIRFLOW AND VISE VERSA. MODULATE RETURN AIR DAMPER INVERSELY PROPORTIONAL TO ECONOMIZER DAMPER. ALARM ON PERSISTENT HIGH OR LOW MIXED AIR TEMPERATURE.
ALARM AND OVERRIDE OPERATION TO ECONOMIZER MODE UPON FREEZE-STAT ACTIVATION. OPEN PRE-HEATING VALVE, PRE-COOLING VALVE, AND ENGAGE HW CIRCULATION PUMP UPON FREEZE-STAT ACTIVATION.
MONITOR AND DISPLAY AIR FILTER DIFFERENTIAL PRESSURES. ALARM ON PERSISTENT HIGH LIMITS.



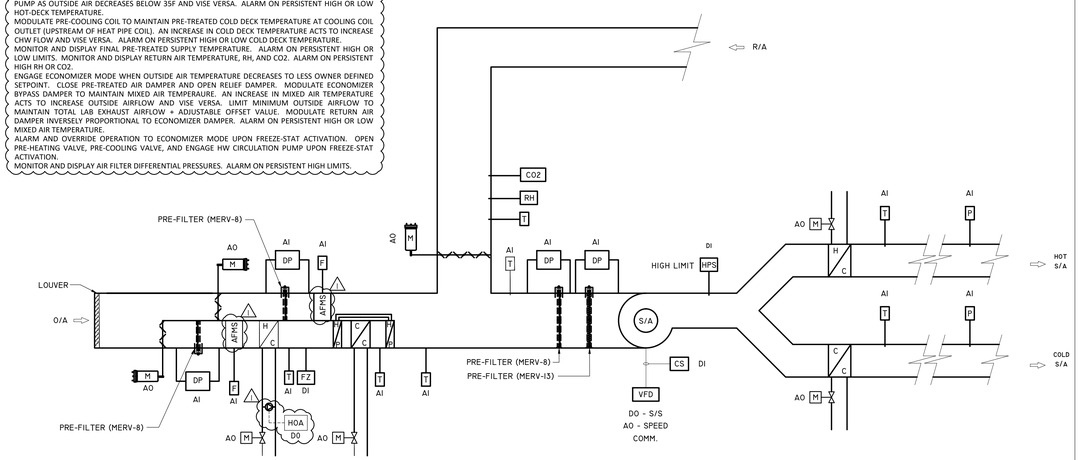
DUAL DUCT AHU CONTROL DIAGRAM - APPLICABLE FOR 8TH TO 10TH FLOOR AHU - ALTERNATE ONLY | NOT TO SCALE | 3

REMOTE RELIEF DAMPER (TYP QTY 1 EACH FLOOR)



1 SEQUENCE OF OPERATION:

ENGAGE FAN ON DEMAND, SCHEDULE, OR MANUAL OVERRIDE. MODULATE FAN SPEED TO MAINTAIN MINIMUM DUCT STATIC PRESSURE BETWEEN THE HOT AND COLD SUPPLY DUCTS. PROVIDE A SOFTWARE DISCRIMINATOR TO GRANT CONTROL AUTHORITY TO THE SENSOR INDICATING THE LOWEST PRESSURE. AN INCREASE IN STATIC PRESSURE ACTS TO DECREASE FAN SPEED AND VISE VERSA. DISENGAGE SUPPLY FAN AND ALARM ON HIGH STATIC PRESSURE LIMIT. DISENGAGE AND ALARM ON PERSISTENT FAN STATUS FAILURE.
MODULATE MAIN COOLING COIL TO MAINTAIN COLD DUCT TEMPERATURE. AN INCREASE IN TEMPERATURE ACTS TO OPEN THE CHW CONTROL VALVE AND VISE VERSA. ALARM ON PERSISTENT HIGH OR LOW COLD SUPPLY AIR TEMPERATURE.
MODULATE MAIN HEATING COIL TO MAINTAIN HOT DUCT TEMPERATURE. AN INCREASE IN TEMPERATURE ACTS TO CLOSE THE HW CONTROL VALVE AND VISE VERSA. RESET HOT DUCT TEMPERATURE SETPOINT PER OUTSIDE AIR TEMPERATURE LOOKUP SCHEDULE. LOOKUP SCHEDULE VALUES TO BE DETERMINED BY OWNER. ALARM ON PERSISTENT HIGH OR LOW HOT SUPPLY AIR TEMPERATURE.
MODULATE PRETREATED OUTSIDE AIR DAMPER TO MAINTAIN OUTSIDE AIR FLOW. AN INCREASE IN OUTSIDE AIRFLOW ACTS TO CLOSE DAMPER AND VISE VERSA. MODULATE RETURN AIR DAMPER INVERSELY PROPORTIONAL TO PRE-TREATED OUTSIDE AIR DAMPER. RESET OUTSIDE AIRFLOW SETPOINT TO TRACK TOTAL LAB EXHAUST AIRFLOW + ADJUSTABLE OFFSET VALUE.
MODULATE PREHEATING COIL TO MAINTAIN PRETREATED HOT-DECK TEMPERATURE. AN INCREASE IN HOT DECK TEMPERATURE ACTS TO DECREASE HW FLOW AND VISE VERSA. ENGAGE HW CIRCULATION PUMP AS OUTSIDE AIR DECREASES BELOW 35F AND VISE VERSA. ALARM ON PERSISTENT HIGH OR LOW HOT-DECK TEMPERATURE.
MODULATE PRE-COOLING COIL TO MAINTAIN PRE-TREATED COLD DECK TEMPERATURE AT COOLING COIL OUTLET (UPSTREAM OF HEAT PIPE COIL). AN INCREASE IN COLD DECK TEMPERATURE ACTS TO INCREASE CHW FLOW AND VISE VERSA. ALARM ON PERSISTENT HIGH OR LOW COLD DECK TEMPERATURE.
MONITOR AND DISPLAY FINAL PRE-TREATED SUPPLY TEMPERATURE. ALARM ON PERSISTENT HIGH OR LOW LIMITS. MONITOR AND DISPLAY RETURN AIR TEMPERATURE, RH, AND CO2. ALARM ON PERSISTENT HIGH RH OR CO2.
ENGAGE ECONOMIZER MODE WHEN OUTSIDE AIR TEMPERATURE DECREASES TO LESS OWNER DEFINED SETPOINT. CLOSE PRE-TREATED AIR DAMPER AND OPEN RELIEF DAMPER. MODULATE ECONOMIZER BYPASS DAMPER TO MAINTAIN MIXED AIR TEMPERAURE. AN INCREASE IN MIXED AIR TEMPERATURE ACTS TO INCREASE OUTSIDE AIRFLOW AND VISE VERSA. LIMIT MINIMUM OUTSIDE AIRFLOW TO MAINTAIN TOTAL LAB EXHAUST AIRFLOW + ADJUSTABLE OFFSET VALUE. MODULATE RETURN AIR DAMPER INVERSELY PROPORTIONAL TO ECONOMIZER DAMPER. ALARM ON PERSISTENT HIGH OR LOW MIXED AIR TEMPERATURE.
ALARM AND OVERRIDE OPERATION TO ECONOMIZER MODE UPON FREEZE-STAT ACTIVATION. OPEN PRE-HEATING VALVE, PRE-COOLING VALVE, AND ENGAGE HW CIRCULATION PUMP UPON FREEZE-STAT ACTIVATION.
MONITOR AND DISPLAY AIR FILTER DIFFERENTIAL PRESSURES. ALARM ON PERSISTENT HIGH LIMITS.



DUAL DUCT AHU CONTROL DIAGRAM - APPLICABLE FOR 3RD TO 7TH FLOOR AHU, 8TH TO 10TH FLOOR (BASE BID) | NOT TO SCALE | 1

Infrastructure Associates
INFRASTRUCTURE ASSOCIATES, INC.
6117 RICHMOND AVENUE, SUITE 200
HOUSTON, TEXAS 77057
TBPE REGISTRATION NO. F-4506
(713) 622-0120 PH (713) 622-0557 FAX
WWW.IAHOUSTON.COM

UTHealth
The University of Texas
Health Science Center at Houston
School of Public Health

UT HEALTH SCIENCE SCHOOL OF PUBLIC HEALTH
1200 PRESSLER ST.
HOUSTON, TX 77030

STATE OF TEXAS
MATT A FLUKINGER
119970
LICENSED
PROFESSIONAL ENGINEER
8-16-2017

REVISIONS

05/31/2017	ISSUED FOR BID
07/28/2017	ADDENDUM 1
08/16/2017	ADDENDUM 2

Sheet Information

Date	31 MARCH 2017
Job Number	-
Drawn	KN, KT, CJT
Checked	IT, SK
Approved	MAF, SK

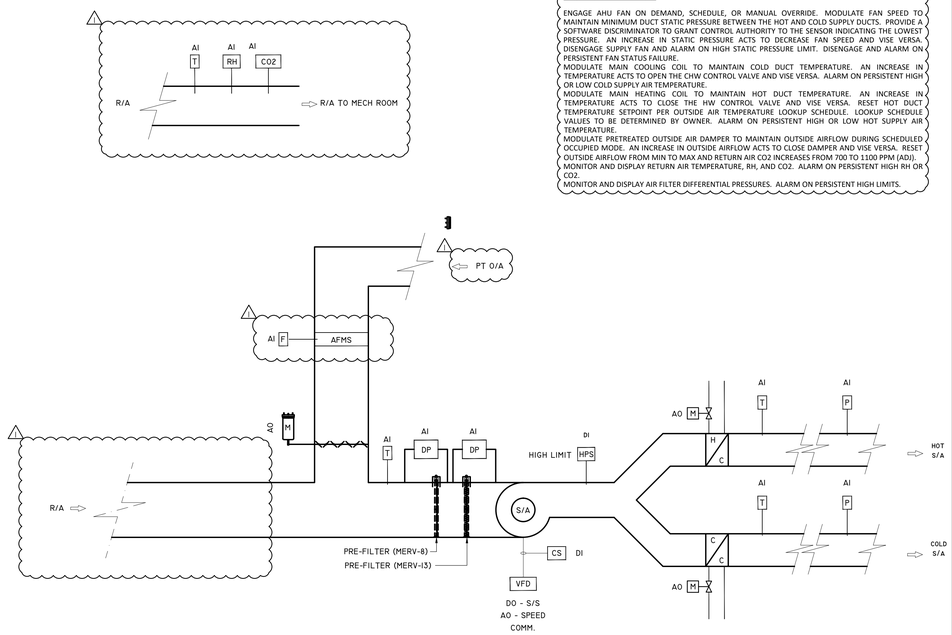
Title

CONTROLS

Sheet

M701

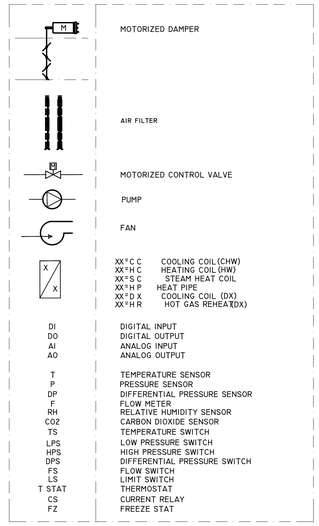
ISSUED FOR BID



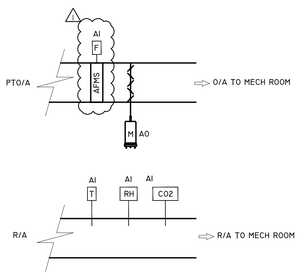
SEQUENCE OF OPERATION:

ENGAGE AHU FAN ON DEMAND, SCHEDULE, OR MANUAL OVERRIDE. MODULATE FAN SPEED TO MAINTAIN MINIMUM DUCT STATIC PRESSURE BETWEEN THE HOT AND COLD SUPPLY DUCTS. PROVIDE A SOFTWARE DISCRIMINATOR TO GRANT CONTROL AUTHORITY TO THE SENSOR INDICATING THE LOWEST PRESSURE. AN INCREASE IN STATIC PRESSURE ACTS TO DECREASE FAN SPEED AND VISE VERSA. DISENGAGE SUPPLY FAN AND ALARM ON HIGH STATIC PRESSURE LIMIT. DISENGAGE AND ALARM ON PERSISTENT FAN STATUS FAILURE.
MODULATE MAIN COOLING COIL TO MAINTAIN COLD DUCT TEMPERATURE. AN INCREASE IN TEMPERATURE ACTS TO OPEN THE CHW CONTROL VALVE AND VISE VERSA. ALARM ON PERSISTENT HIGH OR LOW COLD SUPPLY AIR TEMPERATURE.
MODULATE MAIN HEATING COIL TO MAINTAIN HOT DUCT TEMPERATURE. AN INCREASE IN TEMPERATURE ACTS TO CLOSE THE HW CONTROL VALVE AND VISE VERSA. RESET HOT DUCT TEMPERATURE SETPOINT PER OUTSIDE AIR TEMPERATURE LOOKUP SCHEDULE. LOOKUP SCHEDULE VALUES TO BE DETERMINED BY OWNER. ALARM ON PERSISTENT HIGH OR LOW HOT SUPPLY AIR TEMPERATURE.
MODULATE PRETREATED OUTSIDE AIR DAMPER TO MAINTAIN OUTSIDE AIRFLOW DURING SCHEDULED OCCUPIED MODE. AN INCREASE IN OUTSIDE AIRFLOW ACTS TO CLOSE DAMPER AND VISE VERSA. RESET OUTSIDE AIRFLOW FROM MIN TO MAX AND RETURN AIR CO2 INCREASES FROM 700 TO 1100 PPM (ADJ). MONITOR AND DISPLAY RETURN AIR TEMPERATURE, RH, AND CO2. ALARM ON PERSISTENT HIGH RH OR CO2.
MONITOR AND DISPLAY AIR FILTER DIFFERENTIAL PRESSURES. ALARM ON PERSISTENT HIGH LIMITS.

DUAL DUCT AHU CONTROL DIAGRAM - APPLICABLE FOR BASEMENT BE-I AHU | NOT TO SCALE



4 CONTROL SYMBOLS & LEGENDS | NOT TO SCALE



SEQUENCE OF OPERATION:

ENGAGE AHU FAN ON DEMAND, SCHEDULE, OR MANUAL OVERRIDE. MODULATE FAN SPEED TO MAINTAIN MINIMUM DUCT STATIC PRESSURE BETWEEN THE HOT AND COLD SUPPLY DUCTS. PROVIDE A SOFTWARE DISCRIMINATOR TO GRANT CONTROL AUTHORITY TO THE SENSOR INDICATING THE LOWEST PRESSURE. AN INCREASE IN STATIC PRESSURE ACTS TO DECREASE FAN SPEED AND VISE VERSA. DISENGAGE SUPPLY FAN AND ALARM ON HIGH STATIC PRESSURE LIMIT. DISENGAGE AND ALARM ON PERSISTENT FAN STATUS FAILURE.
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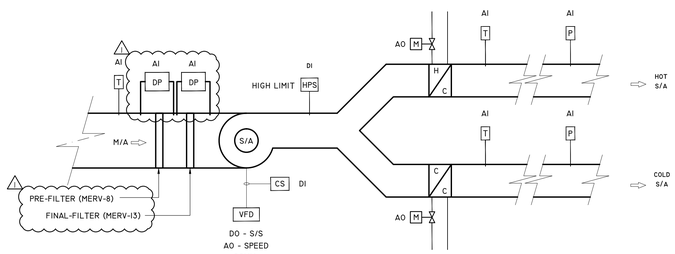
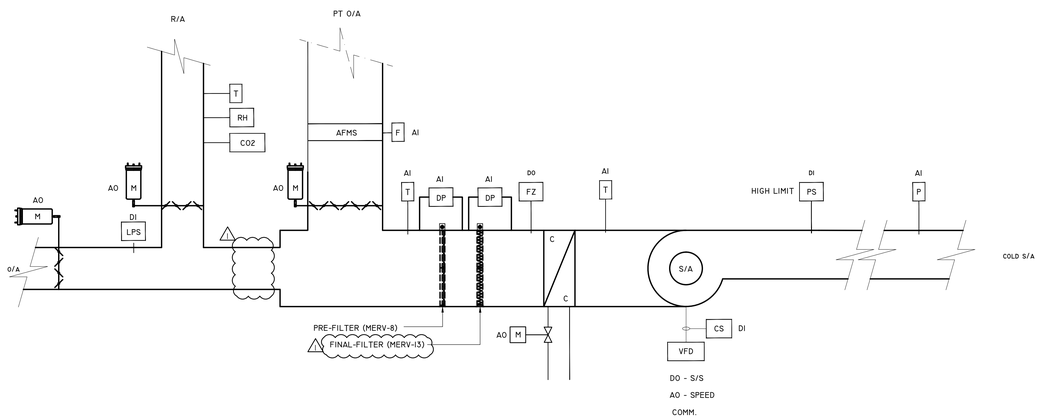
MODULATE MAIN HEATING COIL TO MAINTAIN HOT DUCT TEMPERATURE. AN INCREASE IN TEMPERATURE ACTS TO CLOSE THE HW CONTROL VALVE AND VISE VERSA. RESET HOT DUCT TEMPERATURE SETPOINT PER OUTSIDE AIR TEMPERATURE LOOKUP SCHEDULE. LOOKUP SCHEDULE VALUES TO BE DETERMINED BY OWNER. ALARM ON PERSISTENT HIGH OR LOW HOT SUPPLY AIR TEMPERATURE.
MODULATE PRETREATED OUTSIDE AIR DAMPER TO MAINTAIN OUTSIDE AIRFLOW DURING SCHEDULED OCCUPIED MODE. AN INCREASE IN OUTSIDE AIRFLOW ACTS TO CLOSE DAMPER AND VISE VERSA. RESET OUTSIDE AIRFLOW FROM MIN TO MAX AND RETURN AIR CO2 INCREASES FROM 700 TO 1100 PPM (ADJ). MONITOR AND DISPLAY RETURN AIR TEMPERATURE, RH, AND CO2. ALARM ON PERSISTENT HIGH RH OR CO2.
MONITOR AND DISPLAY AIR FILTER DIFFERENTIAL PRESSURES. ALARM ON PERSISTENT HIGH LIMITS.



DUAL DUCT AHU CONTROL DIAGRAM - APPLICABLE FOR BASEMENT BW-I AHU | NOT TO SCALE

SEQUENCE OF OPERATION:

ENGAGE AHU FAN ON DEMAND, SCHEDULE, OR MANUAL OVERRIDE. MODULATE FAN SPEED TO MAINTAIN DUCT STATIC PRESSURE. AN INCREASE IN STATIC PRESSURE ACTS TO DECREASE FAN SPEED AND VISE VERSA. DISENGAGE SUPPLY FAN AND ALARM ON HIGH DISCHARGE STATIC PRESSURE LIMIT OR LOW SUCTION STATIC LIMIT. DISENGAGE AND ALARM ON PERSISTENT FAN STATUS FAILURE.
MODULATE MAIN COOLING COIL TO MAINTAIN COLD DUCT TEMPERATURE. AN INCREASE IN TEMPERATURE ACTS TO OPEN THE CHW CONTROL VALVE AND VISE VERSA. ALARM ON PERSISTENT HIGH OR LOW COLD SUPPLY AIR TEMPERATURE.
MODULATE PRETREATED OUTSIDE AIR DAMPER DURING SCHEDULED OCCUPIED MODE TO MAINTAIN OUTSIDE AIRFLOW. AN INCREASE IN OUTSIDE AIRFLOW ACTS TO DECREASE FAN SPEED AND VISE VERSA. RESET OUTSIDE AIRFLOW FROM MIN TO MAX AND RETURN AIR CO2 INCREASES FROM 700 TO 1100 PPM (ADJ).
MONITOR AND DISPLAY RETURN AIR TEMPERATURE, RH, AND CO2. ALARM ON PERSISTENT HIGH RH OR CO2.
ENGAGE ECONOMIZER MODE WHEN OUTSIDE AIR TEMPERATURE DECREASES TO OWNER DEFINED SETPOINT. CLOSE PRETREATED AIR DAMPER AND MODULATE ECONOMIZER BYPASS DAMPER TO MAINTAIN MIXED AIR TEMPERAURE. AN INCREASE IN MIXED AIR TEMPERATURE ACTS TO INCREASE OUTSIDE AIRFLOW AND VISE VERSA. MODULATE RETURN AIR DAMPER INVERSELY PROPORTIONAL TO ECONOMIZER DAMPER. ALARM ON PERSISTENT HIGH OR LOW MIXED AIR TEMPERATURE.
ALARM AND OVERRIDE OPERATION TO ECONOMIZER MODE UPON FREEZE-STAT ACTIVATION. OPEN PRE-HEATING VALVE, PRE-COOLING VALVE, AND ENGAGE HW CIRCULATION PUMP UPON FREEZE-STAT ACTIVATION.
MONITOR AND DISPLAY AIR FILTER DIFFERENTIAL PRESSURES. ALARM ON PERSISTENT HIGH LIMITS.



VAV AHU CONTROL DIAGRAM - APPLICABLE FOR BASEMENT BH-I AHU | NOT TO SCALE

Infrastructure Associates
INFRASTRUCTURE ASSOCIATES, INC.
6117 RICHMOND AVENUE, SUITE 200
HOUSTON, TEXAS 77057
TBPE REGISTRATION NO. F-4506
(713) 622-0120 PH (713) 622-0557 FAX
WWW.IAHOUSTON.COM

UTHealth
The University of Texas Health Science Center at Houston
School of Public Health
UT HEALTH SCIENCE SCHOOL OF PUBLIC HEALTH
1200 PRESSLER ST.
HOUSTON, TX 77030

STATE OF TEXAS
MATT A FLUHINGER
119970
LICENSED
PROFESSIONAL ENGINEER
8-16-2017

REVISIONS

05/31/2017	ISSUED FOR BID
07/28/2017	ADDENDUM 1
08/16/2017 1	ADDENDUM 2

Sheet Information

Date	31 MARCH 2017
Job Number	-
Drawn	KN, KT, CJT
Checked	IT, SK
Approved	MAF, SK

Title

CONTROLS

Sheet

M702

ISSUED FOR BID

0 1/2" 1" 2"

SEQUENCE OF OPERATION:

ENGAGE HYDRONIC HEATING SYSTEM AUTOMATICALLY UPON CALL FOR DEMAND, USER DEFINED SCHEDULE, OR MANUAL OVER-RIDE.

UPON SYSTEM ENGAGEMENT, ENGAGE PRIMARY HW PUMP AND VISE VERSA. MODULATE PUMP SPEED TO MAINTAIN DIFFERENTIAL HW PRESSURE ABOUT 15 PSIG SET POINT (ADJ). A DECREASE IN DIFFERENTIAL PRESSURE ACTS TO INCREASE PUMP SPEED AND VISE VERSA. DISENGAGE PRIMARY HW PUMP, ENGAGE SECONDARY HW PUMP, AND INITIATE ALARM UPON PERSISTENT STATUS FAILURE OF PRIMARY PUMP. ROTATE PRIMARY AND SECONDARY HWP DESIGNATIONS AUTOMATICALLY TO EQUALIZE ACCUMULATED RUN HOURS.

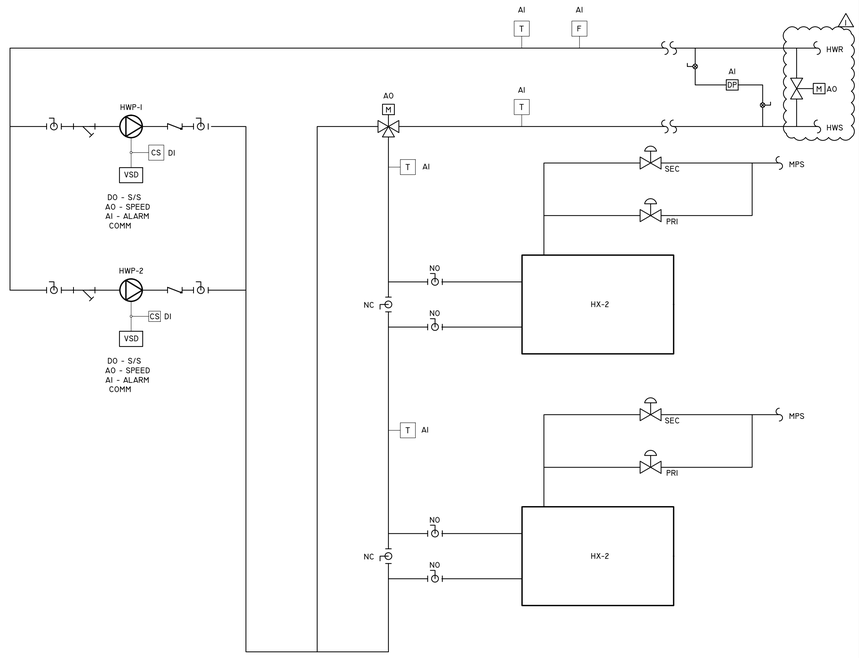
UPON HW SYSTEM ENGAGEMENT, ENGAGE HX-1 PRIMARY AND SECONDARY STEAM VALVE SOLENOIDS AS HW MIXING VALVE OPENS TO 5% (ADJ) FLOW THROUGH HEAT EXCHANGERS AND VISE VERSA. ENGAGE HX-2 PRIMARY AND SECONDARY STEAM VALVE SOLENOIDS AS HX-1 LEAVING WATER TEMP DROPS PERSISTENTLY BELOW 173F (ADJ). DISENGAGE HX-2 PRIMARY AND SECONDARY STEAM VALVE SOLENOIDS AS HX-1 LEAVING WATER TEMP RISES PERSISTENTLY ABOVE 178 F (ADJ).

MODULATE HW MIXING VALVE TO MAINTAIN HWS TEMP ABOUT HWS SETPOINT. A DECREASE IN HWS TEMP ACTS TO INCREASE FLOW THROUGH HEAT EXCHANGERS AND DECREASE BYPASS FLOW. AN INCREASE IN HWS TEMP ACTS TO DECREASE FLOW THROUGH HEAT EXCHANGERS AND INCREASE BYPASS FLOW. RESET HWS SETPOINT FROM 120F TO 180F AS O/A TEMP DECREASES FROM 60F TO 30F (ALL POINTS USER ADJ).

1 MODULATE REMOTE HW BYPASS VALVE TO MAINTAIN SYSTEM HW FLOW ABOVE MIN FLOW SETPOINT(150 GPM ADJ). A DECREASE IN FLOW ACTS TO OPEN BYPASS VALVE AND VICE VERSA.

MONITOR AND DISPLAY ALL FIELD DEVICE INPUT AND OUTPUT VARIABLES. INITIATE ALARMS UPON ANY OF THE FOLLOWING CONDITIONS:

- HIGH HW SYSTEM DIFFERENTIAL PRESSURE
- LOW HW SYSTEM DIFFERENTIAL PRESSURE
- HIGH HX-1 LEAVING WATER TEMP
- LOW HX-1 LEAVING WATER TEMP
- HIGH HX-2 LEAVING WATER TEMP
- LOW HX-2 LEAVING WATER TEMP
- HIGH HWS TEMP
- LOW HWS TEMP
- HWP-1 STATUS FAILURE
- HWP-1 VSD ALARM
- HWP-2 STATUS FAILURE
- HWP-2 VSD ALARM



HOT WATER SYSTEM CONTROL DIAGRAM | NOT TO SCALE | 3

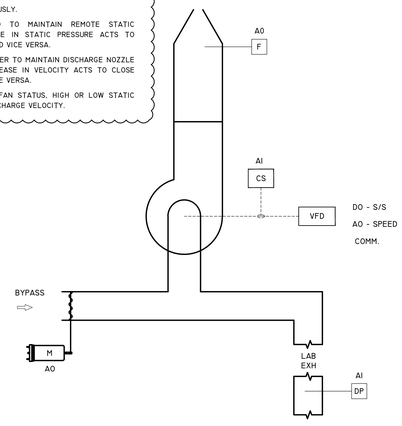
1 SEQUENCE OF OPERATION:

SYSTEMS RUN CONTINUOUSLY.

MODULATE FAN SPEED TO MAINTAIN REMOTE STATIC PRESSURE. AN INCREASE IN STATIC PRESSURE ACTS TO INCREASE FAN SPEED AND VICE VERSA.

MODULATE BYPASS DAMPER TO MAINTAIN DISCHARGE NOZZLE AIR VELOCITY. AN INCREASE IN VELOCITY ACTS TO CLOSE BYPASS DAMPER AND VICE VERSA.

ALARM UPON LOSS OF FAN STATUS, HIGH OR LOW STATIC PRESSURE, AND LOW DISCHARGE VELOCITY.

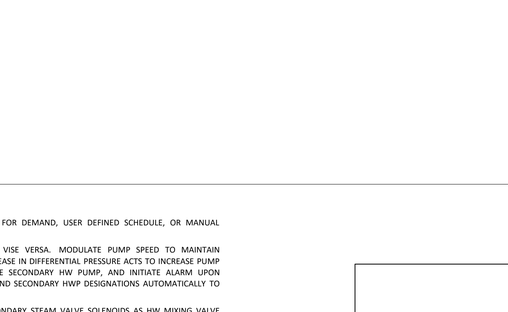


EF-7-1 & 7-2 CONTROL DIAGRAM | NOT TO SCALE | 6

TYPICAL FUME HOOD CONTROL SYSTEM

MODULATE FUME HOOD EAV AIRFLOW TO MAINTAIN INSTANTANEOUS SASH OPENING AIR VELOCITY (AS INDICATED BY VERTICAL/HORIZANTAL SASH POSITION SENSOR ABOUT SET POINT. AN INCREASE IN SASH VELOCITY ACTS TO DECREASE AIR FLOW AND VISE VERSA. MODULATE EAV DAMPER POSITION TO MAINTAIN EAV AIRFLOW TARGET. AN INCREASE IN EAV AIRFLOW ACTS TO CLOSE EAV DAMPER AND VICE VERSA. DISPLAY SASH VELOCITY LOCALLY AND ALARM LOCALLY ON LOW OR HIGH SASH VELOCITY CONDITION. ALARM TO BAS ON PERSISTENT LOW AIR VELOCITY CONDITION.

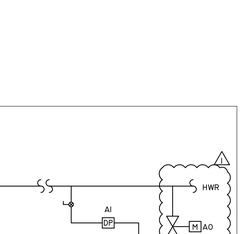
NOTE: PROVIDE NEW 18GA 304 STAINLESS STEEL BLANK-OFF PLATE. APPROX 48"X24" AT BYPASS OPENINGS OF EXISTING BYPASS HOODS. FIELD VERIFY EXACT DIMENSIONS AND ATTACH WITH 18-8 STAINLESS HARDWARE. INCLUDE UNIT COST FOR PROVISION OF BLANK-OFF PLATES AS UNIT PRICE.



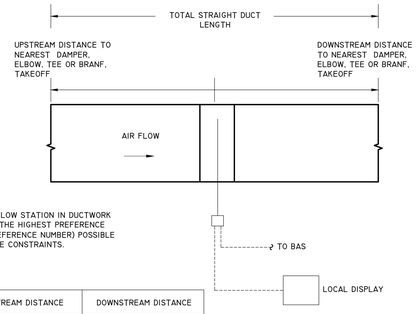
TYPICAL AIR VALVE & FUME HOOD CONTROLS RETROFIT | NOT TO SCALE | 4

NOTE:

1. PROVIDE NEW DAMPER MOTOR ACTUATORS AT HOT & COLD DAMPERS. NEW FLOW SENSORS, NEW TEMP SENSORS, AND TERMINAL UNIT CONTROLLER FOR RETROFIT TERMINAL UNITS.
2. PROGRAM MINIMUM AIR FLOW LIMIT AT 30% OF MAX (20 CFM/PERSON) LIMIT UNLESS NOTED OTHERWISE
3. PROGRAM MAXIMUM LIMIT PER TERMINAL UNIT SCHEDULE.
4. REF. PLANS FOR T STATE LOCATION.



DUAL DUCT VAV CONTROL DIAGRAM (NON LABORATORY APPLICATION) | NOT TO SCALE | 2



PREFERENCE	UPSTREAM DISTANCE	DOWNSTREAM DISTANCE
1	PER MFG RECOMMENDATION	PER MFG RECOMMENDATION
2	10 X MAX DUCT DIMENSION	5 X MAX DUCT DIMENSION
3	2/3 OF TOTAL STRAIGHT DUCT LENGTH	1/3 OF TOTAL STRAIGHT DUCT LENGTH

AIR FLOW STATION INSTALLATION | NOT TO SCALE | 5

TYPICAL LABORATORY CONTROL SEQUENCES WITH FUME HOOD(S)

MODULATE HOOD EXHAUST AIR VALVES PER 4/M703.

MODULATE GENERAL EXHAUST AIR VALVES SUCH THAT HOOD EXHAUST AIRFLOW PLUS GENERAL EXHAUST AIRFLOW EQUALS CONSTANT TOTAL ROOM EXHAUST VALUE. A DECREASE IN HOOD AIRFLOW ACTS TO INCREASE GENERAL EXHAUST AIRFLOW AND VISE VERSA. MODULATE GENERAL EXHAUST EAV DAMPER TO MAINTAIN GENERAL EXHAUST AIRFLOW. AN INCREASE IN GENERAL EXHAUST AIRFLOW ACTS TO CLOSE THE GENERAL EXHAUST EAV DAMPER AND VISE VERSA. REFERENCE AIRFLOW DIAGRAMS FOR OCCUPIED AND UNOCCUPIED TOTAL ROOM EXHAUST VALUES. ALARM ON PERSISTENT HIGH OR LOW TOTAL ROOM EXHAUST AIRFLOW.

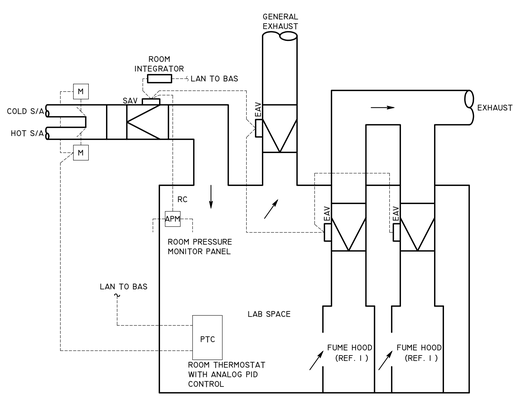
MODULATE SUPPLY AIR VALVE SUCH THAT SUPPLY AIRFLOW EQUALS THE SUM OF HOOD EXHAUST AIRFLOWS PLUS THE GENERAL EXHAUST AIRFLOW MINUS A FIXED OFFSET. PROGRAM THE INITIAL DEFAULT VALUE OF THE FIXED OFFSET EQUAL TO THE NUMBER OF DOORS INTO THE LAB MULTIPLIED BY 200 CFM EACH. MODULATE THE SUPLY AIR VALVE DAMPER TO MAINTAIN SUPPLY AIR FLOW. AN INCREASE IN AIRFLOW ACTS TO CLOSE THE DAMPER AND VISE VERSA.

MONITOR AND DISPLAY ROOM DIFFERENTAL PRESSURE WITH RESPECT TO ADJACENT CORRIDOR. ALARM LOCALLY ON PERSISTENT HIGH OR LOW DIFFERENTAL PRESSURE. DISPLAY DIAGNOSTIC AIRFLOW DATA AT MONITORING PANEL.

MODULATE TERMINAL UNIT AIR DAMPERS TO MAINTAIN SPACE TEMPERATURE ABOUT ADJUSTABLE SETPOINT. AN INCREASE IN SPACE TEMPERATURE ACTS TO OPEN THE COLD SUPPLY AIR DAMPER AND VISE VERSA. MODULATE HOT SUPPLY AIR DAMPER SIMALTANEOUSLY INVERSELY PROPORTIONAL TO COLD SUPPLY AIR DAMPER WITHOUT OFFSET. DISPLAY LOCAL SPACE TEMPERATURE AND SETPOINT AT ROOM THERMOSTAT. ALARM ON PERSISTENT HIGH OR LOW TEMPERATURE.

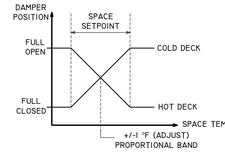
INTERFACE LOCAL LABORATORY AIRFLOW, PRESSURE, AND TEMPERATURE CONTROLS TO FACILITY LOCAL AREA NETWORK. INTEGRATE MONITORING AND DIAGNOSTIC DATA INTO BUILDING AUTOMATION GRAPHICAL USER INTERFACE.

FOR SAV-BI ONLY: MODULATE REHEAT COIL TO MAINTAIN SPACE TEMP ABOUT SET POINT. A DECREASE IN SPACE TEMP ACTS TO INCREASE HOT WATER FLOW AND VICE VERSA.



TYPICAL LABORATORY CONTROL SEQUENCES WITHOUT FUME HOODS

MODULATE ROOM EXHAUST EAV AIRFLOW TO EQUAL THE INSTANTANEOUS SUM OF: S/A SAV AIRFLOW, PLUS A FIXED OFFSET OF 200 CFM PER DOORWAY LEADING INTO THE LAB.
MONITOR DIFFERENTIAL PRESSURE BETWEEN THE LAB AND SURROUNDING ACCESS CORRIDOR. ALARM ON PERSISTENT LOW CONDITION. MONITOR ALL SAV AND EAV'S AND ALARM TO BAS ON FAULT CONDITION.



TYPICAL LABORATORY CONTROL WITH FUME HOODS | NOT TO SCALE | 1

Infrastructure Associates
INFRASTRUCTURE ASSOCIATES, INC.
6117 RICHMOND AVENUE, SUITE 200
HOUSTON, TEXAS 77057
TBPE REGISTRATION NO. F-4506
(713) 622-0120 PH (713) 622-0557 FAX
WWW.IAHOUSTON.COM

UTHealth™
The University of Texas Health Science Center at Houston
School of Public Health
UT HEALTH SCIENCE SCHOOL OF PUBLIC HEALTH
1200 PRESSLER ST.
HOUSTON, TX 77030

STATE OF TEXAS
MATT A FLUKINGER
119970
LICENSED
PROFESSIONAL ENGINEER
8-16-2017

REVISIONS

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07/28/2017	ADDENDUM 1
08/16/2017	ADDENDUM 2
1	

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Approved	MAF, SK

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CONTROLS

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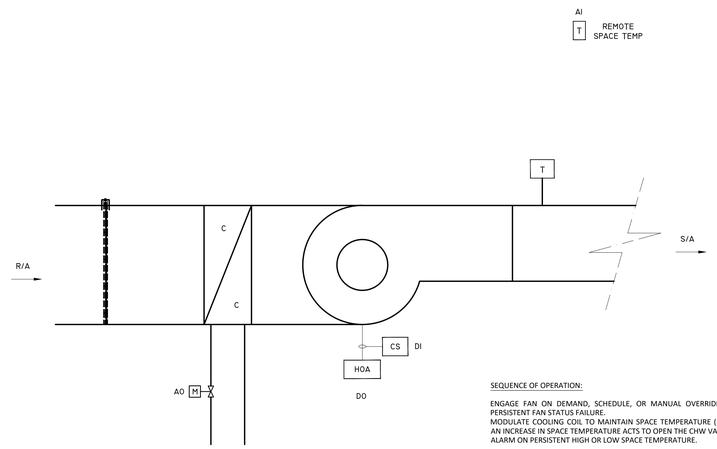
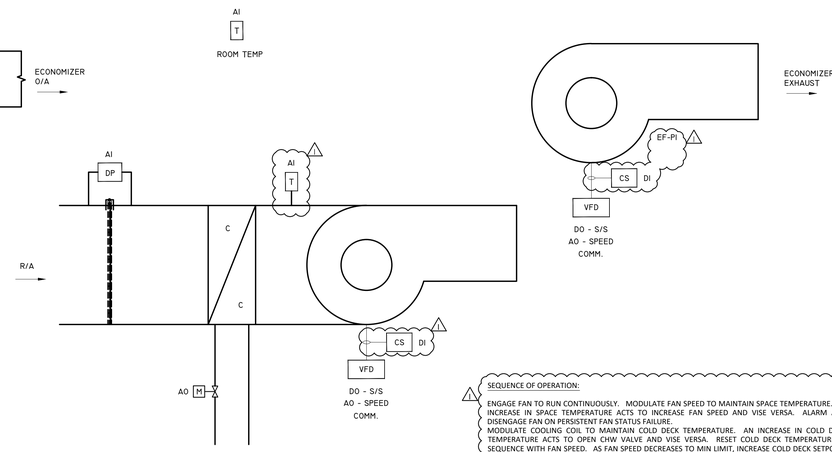


SEQUENCE OF OPERATION:

ENGAGE FAN ON DEMAND, SCHEDULE, OR MANUAL OVERRIDE. ALARM AND DISENGAGE FAN ON PERSISTENT FAN STATUS FAILURE.
MODULATE COOLING COIL TO MAINTAIN SPACE TEMPERATURE (IN SEQUENCE WITH TERMINAL UNIT). AN INCREASE IN SPACE TEMPERATURE ACTS TO OPEN THE CHW VALVE AND VISE VERSA.
ALARM ON PERSISTENT HIGH OR LOW SPACE TEMPERATURE.

TYP FAN COIL UNIT CONTROL DIAGRAM | NOT TO SCALE | 3



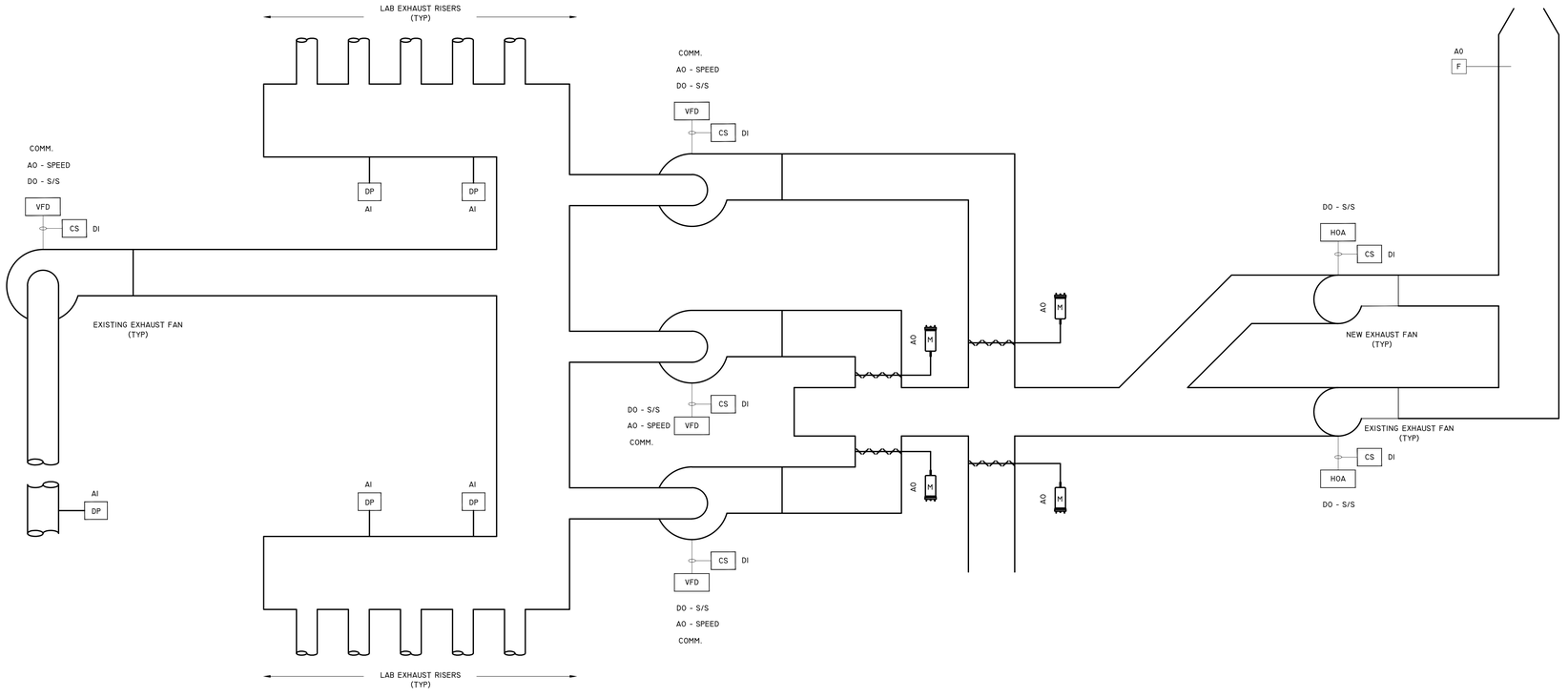
SEQUENCE OF OPERATION:

ENGAGE FAN TO RUN CONTINUOUSLY. MODULATE FAN SPEED TO MAINTAIN SPACE TEMPERATURE. AN INCREASE IN SPACE TEMPERATURE ACTS TO INCREASE FAN SPEED AND VISE VERSA. ALARM AND DISENGAGE FAN ON PERSISTENT FAN STATUS FAILURE.
MODULATE COOLING COIL TO MAINTAIN COLD DECK TEMPERATURE. AN INCREASE IN COLD DECK TEMPERATURE ACTS TO OPEN CHW VALVE AND VISE VERSA. RESET COLD DECK TEMPERATURE IN SEQUENCE WITH FAN SPEED. AS FAN SPEED DECREASES TO MIN LIMIT, INCREASE COLD DECK SETPOINT TEMPERATURE AND VISE VERSA.
ENGAGE ECONOMIZER SEQUENCE AS OUTSIDE AIR TEMPERATURE DECREASES BELOW SEPOINT DEFINED BY OWNER. DISENGAGE AHU FAN IN ECONOMIZER MODE. OPEN ECONOMIZER DAMPER AND ENGAGE EXHAUST FAN. MODULATE EXHAUST FAN SPEED TO MAINTAIN SPACE TEMPERATURE. AN INCREASE IN SPACE TEMPERATURE ACTS TO INCREASE EXHAUST FAN SPEED AND VISE VERSA. ALARM AND TERMINATE ECONOMIZER MODE UPON PERSISTENT EXHAUST FAN STATUS FAILURE.
MONITOR AND DISPLAY SPACE TEMPERATURE AND FILTER DIFFERENTIAL PRESSURE. ALARM ON HIGH SPACE TEMPERATURE LIMIT OR HIGH FILTER DIFFERENTIAL PRESSURE LIMIT.

PENTHOUSE AHU-11-1 CONTROL DIAGRAM | NOT TO SCALE | 2

SEQUENCE OF OPERATION:

OPEN PRIMARY LAB EXHAUST FAN DAMPER AND ENGAGE PRIMARY LAB EXHAUST FANS CONTINUOUSLY. INTERLOCK DAMPERS TO FANS TO DELAY FAN OPERATION UNTIL DAMPER IS FULL OPEN AND VISE VERSA. ALARM ON FAN STATUS FAILURE. MODULATE PRIMARY LAB FAN SPEEDS IN TANDEM TO MAINTAIN DUCT STATIC PRESSURE. PROVIDE SOFTWARE DISCRIMINATOR TO GRANT CONTROL AUTHORITY TO THE SENSOR INDICATING THE HIGHEST PRESSURE. AN INCREASE IN STATIC PRESSURE ACTS TO INCREASE FAN SPEED AND VISE VERSA.
ENGAGE LEAD STACK EXHAUST FAN CONTINUOUSLY. ENGAGE LAG STACK EXHAUST FAN UPON LEAD STACK FAN FAILURE. AUTOMATICALLY ALTERNATE LEAD AND LAG DESIGNATIONS PERIODICALLY TO EQUALIZE FAN RUN TIME. MODULATE BYPASS DAMPERS IN SEQUENCE TO MAINTAIN STACK DISCHARGE AIR VELOCITY. A DECREASE IN STACK VELOCITY ACTS TO OPEN BYPASS DAMPERS IN SEQUENCE AND VISE VERSA. ALARM ON PERSISTENT LOW STACK AIR VELOCITY.



MAIN LAB EXHAUST SYSTEM CONTROL DIAGRAM | NOT TO SCALE | 1

Infrastructure Associates
INFRASTRUCTURE ASSOCIATES, INC.
6117 RICHMOND AVENUE, SUITE 200
HOUSTON, TEXAS 77057
TBPE REGISTRATION NO. F-4506
(713) 622-0120 PH (713) 622-0557 FAX
WWW.IAHOUSTON.COM

UTHealth
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CONTROL POINT & FIELD DEVICE SCHEDULE - EXHAUST SYSTEMS

SYS TYPE	EQ LOCATION	AREA SERVED	EQUIPMENT	POINT DESCRIPTOR	AI	AO	DI	DO	HW	FIELD DEVICE	NOTES
HIGH PLUME LAB EXHAUST	ROOF	LABS	EF-7-1 EF-7-2	EF-7-1 S/S				X		NEW VSD	
				EF-7-1 STATUS			X			NEW CURRENT SENSOR	
				EF-7-1 SPEED CONTROL		X				NEW VSD SPEED CONTROL	
				EF-7-2 S/S				X		NEW VSD	
				EF-7-2 STATUS			X			NEW CURRENT SENSOR	
				EF-7-2 SPEED CONTROL		X				NEW VSD SPEED CONTROL	
				EF-7 BYPASS DAMPER		X				NEW DAMPER ACTUATOR	
				EF-7-1 PLUME VELOCITY	X					NEW AIR FLOW SENSOR	
				EF-7-2 PLUME VELOCITY	X					NEW AIR FLOW SENSOR	
				EF-7 DP	X					NEW DP SENSOR	REMOTE IN RISER AT 7TH FLOOR
MAIN LAB EXHAUST SYSTEM	ROOF	LABS	UNTAGGED	LAB EXH FAN S/S				X		NEW VSD	
				LAB EXH FAN STATUS			X			NEW CURRENT SENSOR	
				LAB EXH FAN SPEED CONTROL		X				NEW VSD SPEED CONTROL	
				LAB EXH FAN S/S				X		NEW VSD	
				LAB EXH FAN STATUS			X			NEW CURRENT SENSOR	
				LAB EXH FAN SPEED CONTROL		X				NEW VSD SPEED CONTROL	
				LAB EXH FAN S/S				X		NEW VSD	
				LAB EXH FAN STATUS			X			NEW CURRENT SENSOR	
				LAB EXH FAN SPEED CONTROL		X				NEW VSD SPEED CONTROL	
				LAB EXH FAN S/S				X		NEW MOTOR STARTER	
				LAB EXH FAN STATUS			X			NEW CURRENT SENSOR	
				LAB EXH FAN S/S				X		NEW MOTOR STARTER	
				LAB EXH FAN STATUS			X			NEW CURRENT SENSOR	
				LAB EXH DP	X					NEW DP SENSOR	
				LAB EXH DP	X					NEW DP SENSOR	
				LAB EXH DP	X					NEW DP SENSOR	
				LAB EXH DP	X					NEW DP SENSOR	
				LAB EXH DP	X					NEW DP SENSOR	REMOTE IN RISER AT 4TH FLOOR
				LAB EXH DAMPER		X				NEW DAMPER ACTUATOR	
				LAB EXH DAMPER		X				NEW DAMPER ACTUATOR	
				LAB EXH DAMPER		X				NEW DAMPER ACTUATOR	
				LAB EXH BYPASS DAMPER		X				NEW DAMPER ACTUATOR	
				LAB EXH BYPASS DAMPER		X				NEW DAMPER ACTUATOR	
				STACK PLUME VELOCITY	X					NEW AIR FLOW SENSOR	
GENERAL EXH	ROOF	TOILET ROOMS	EF-9E EF-9W	EF-9E S/S				X		NEW VSD	
				EF-9E STATUS			X			NEW CURRENT SENSOR	
				EF-9E SPEED CONTROL		X				NEW VSD SPEED CONTROL	
				EF-9W S/S				X		NEW VSD	
				EF-9W STATUS			X			NEW CURRENT SENSOR	
				EF-9W SPEED CONTROL		X				NEW VSD SPEED CONTROL	
				EF-9E DP		X				NEW DP SENSOR	REMOTE AT 2ND FLOOR MECH ROOM
				EF-9W DP	X					NEW DP SENSOR	REMOTE AT 2ND FLOOR MECH ROOM

CONTROL POINT & FIELD DEVICE SCHEDULE - PENTHOUSE AHU-II-I

SYS TYPE	EQ LOCATION	AREA SERVED	EQUIPMENT	POINT DESCRIPTOR	AI	AO	DI	DO	HW	FIELD DEVICE	NOTES
SINGLE ZONE VAV	PENTHOUSE	PENTHOUSE	AHU-II-I	ECONOMIZER O/A DAMPER				X		NEW DAMPER ACTUATOR	
				ROOM TEMP	X					NEW TEMP SENSOR	
				FILTER DP	X					NEW DP SENSOR	
				COOLING VALVE		X				NEW CONTROL VALVE	
				SUPPLY FAN S/S				X		NEW VSD	
				SUPPLY FAN SPEED		X				NEW VSD	
				SUPPLY FAN STATUS			X			NEW CURRENT SWITCH	
				ECON EXH FAN S/S				X		NEW VSD	
				ECON EXH FAN STATUS			X			NEW CURRENT SWITCH	
				ECON EXH FAN SPEED		X				NEW VSD	

CONTROL POINT & FIELD DEVICE SCHEDULE - HW SYSTEM

SYS TYPE	EQ LOCATION	AREA SERVED	EQUIPMENT	POINT DESCRIPTOR	AI	AO	DI	DO	HW	FIELD DEVICE	NOTES
HEATING HW	BASEMENT MECHANICAL ROOM	BASEMENT	HW	HWP-1 S/S				X		NEW VSD	
				HWP-1 STATUS			X			NEW CURRENT SENSOR	
				HWP-1 SPEED CONTROL		X				NEW VSD SPEED CONTROL	
				HWP-2 S/S				X		NEW VSD	
				HWP-2 STATUS			X			NEW CURRENT SENSOR	
				HWP-2 SPEED CONTROL		X				NEW VSD SPEED CONTROL	
				HX-1 1ST STAGE HWS TEMP	X					NEW TEMP SENSOR	
				HX-2 2ND STAGE HWS TEMP	X					NEW TEMP SENSOR	
				HW BLENDING VALVE		X				NEW CONTROL VALVE	
				BUILDING HWS TEMP	X					NEW TEMP SENSOR	
				BUILDING HWR TEMP	X					NEW TEMP SENSOR	
				BUILDING HW FLOW	X					NEW FLOW SENSOR	
				HW DP	X					NEW DIFFERENTIAL PRESSURE SENSOR	REMOTE

CONTROL POINT & FIELD DEVICE SCHEDULE - AHU-BE & AHU-BW

SYS TYPE	EQ LOCATION	AREA SERVED	EQUIPMENT	POINT DESCRIPTOR	AI	AO	DI	DO	HW	FIELD DEVICE	NOTES
VAV DUAL DUCT	BASEMENT MECHANICAL ROOM	BASEMENT	AHU-BW AHU-BE	PT O/A DAMPER		X				NEW DAMPER ACTUATOR	
				PT O/A AIR FLOW	X					NEW AIR FLOW STATION	
				R/A DAMPER		X				NEW DAMPER ACTUATOR	
				R/A TEMP	X					NEW TEMP SENSOR	
				R/A RELATIVE HUMIDITY	X					NEW HUMIDITY SENSOR	
				R/A CO2	X					NEW CARBON DIOXIDE SENSOR	
				SMOKE DETECTOR					X	NEW SMOKE DETECTOR	2 PER UNIT INTERLOCK TO VSD & FACP
				M/A TEMP	X					NEW TEMP SENSOR	
				PREFILTER DP	X					NEW DP SENSOR	
				FINAL FILTER DP	X					NEW DP SENSOR	
				SUPPLY FAN S/S				X		NEW VSD	
				SUPPLY FAN S/S				X		NEW VSD	
				S/F HIGH STATIC			X		X	NEW DIFFERENTIAL PRESSURE SWITCH	HARDWIRE INTERLOCK WITH VSD
				S/F VSD SPEED CONTROL		X				NEW VSD SPEED CONTROL	
				S/F STATUS			X			NEW CURRENT SENSOR	
				COOLING VALVE		X				NEW CONTROL VALVE	
				COLD S/A TEMP	X					NEW TEMP SENSOR	
				HEATING VALVE		X				NEW CONTROL VALVE	
				HOT S/A TEMP	X					NEW TEMP SENSOR	
				COLD S/A DP	X					NEW DP SENSOR	REMOTE MOUNTED
				HOT S/A DP	X					NEW DP SENSOR	REMOTE MOUNTED

CONTROL POINT & FIELD DEVICE SCHEDULE - DUAL DUCT AHU 2ND FLOOR

SYS TYPE	EQ LOCATION	AREA SERVED	EQUIPMENT	POINT DESCRIPTOR	AI	AO	DI	DO	HW	FIELD DEVICE	NOTES
VAV DUAL DUCT	2ND MECHANICAL ROOM	IST & 2ND FLOOR	AHU-IW AHU-ISW AHU-ISE AHU-1-E AHU-2W AHU-2-W	PT O/A DAMPER		X				NEW DAMPER ACTUATOR	
				OUTSIDE AIR FLOW	X					NEW AIR FLOW STATION	
				R/A TEMP	X					NEW TEMP SENSOR	
				R/A RELATIVE HUMIDITY	X					NEW HUMIDITY SENSOR	
				R/A CO2	X					NEW CARBON DIOXIDE SENSOR	
				SMOKE DETECTOR					X	NEW SMOKE DETECTOR	2 PER UNIT INTERLOCK TO VSD & FACP
				M/A TEMP	X					NEW TEMP SENSOR	
				PREFILTER DP	X					NEW DP SENSOR	
				FINAL FILTER DP	X					NEW DP SENSOR	
				SUPPLY FAN S/S				X		NEW VSD	
				SUPPLY FAN S/S				X		NEW VSD	
				S/F HIGH STATIC			X		X	NEW DIFFERENTIAL PRESSURE SWITCH	HARDWIRE INTERLOCK WITH VSD
				S/F VSD SPEED CONTROL		X				NEW VSD SPEED CONTROL	
				S/F STATUS			X			NEW CURRENT SENSOR	
				COOLING VALVE		X				NEW CONTROL VALVE	
				COLD S/A TEMP	X					NEW TEMP SENSOR	
				HEATING VALVE		X				NEW CONTROL VALVE	
				HOT S/A TEMP	X					NEW TEMP SENSOR	
				COLD S/A DP	X					NEW DP SENSOR	REMOTE MOUNTED
				HOT S/A DP	X					NEW DP SENSOR	REMOTE MOUNTED
				RELIEF AIR DAMPER	X					NEW DAMPER ACTUATOR	REMOTE MOUNTED

CONTROL POINT & FIELD DEVICE SCHEDULE - DUAL DUCT AHU 3 -10 TYPICAL FLOOR

SYS TYPE	EQ LOCATION	AREA SERVED	EQUIPMENT	POINT DESCRIPTOR	AI	AO	DI	DO	HW	FIELD DEVICE	NOTES
DUAL DUCT TERMINAL UNIT WITH ECONOMIZER O/A	MECHANICAL ROOM	3RD - 10TH FLOOR	AHU-3E AHU-3W AHU-4E AHU-4W AHU-5E AHU-5E AHU-6E AHU-6W AHU-7E AHU-7W AHU-8E AHU-8W AHU-9E AHU-9W AHU-10E AHU-10W	PT O/A DAMPER		X				NEW DAMPER ACTUATOR	
				PT O/A FILTER DP	X					NEW DP SENSOR	
				PT O/A AIRFLOW	X					NEW AIR FLOW STATION	
				PT O/A PREHEATING VALVE		X				NEW CONTROL VALVE	
				PT O/A HOT DECK TEMP	X					NEW TEMP SENSOR	
				PT O/A PREHEAT CIRC PUMP				X		NEW HOA MOTOR STARTER	
				PT/O/A FREEZE			X		X	NEW FREEZESTAT	INTERLOCK TO PT O/A DAMPER
				PT O/A COOLING VALVE		X				NEW CONTROL VALVE	
				PT O/A COLD DECK	X					NEW TEMP SENSOR	
				PT O/A SUPPLY TEMP	X					NEW TEMP SENSOR	
				ECON O/A DAMPER		X				NEW DAMPER ACTUATOR	
				ECON O/A FILTER DP	X					NEW DP SENSOR	
				ECON O/A AIRFLOW	X					NEW AIR FLOW STATION	
				R/A TEMP	X					NEW TEMP SENSOR	
				R/A RELATIVE HUMIDITY	X					NEW RH SENSOR	
				R/A CO2	X					NEW CARBON DIOXIDE SENSOR	
				R/A DAMPER		X				NEW DAMPER ACTUATOR	
				SMOKE DETECTOR					X	NEW SMOKE DETECTOR	2 PER UNIT INTERLOCK TO VSD & FACP
				M/A TEMP	X					NEW TEMP SENSOR	
				PREFILTER DP	X					NEW DP SENSOR	
				FINAL FILTER DP	X					NEW DP SENSOR	
				SUPPLY FAN S/S				X		NEW VSD	
				S/F HIGH STATIC			X		X	NEW DIFFERENTIAL PRESSURE SWITCH	HW INTERLOCK WITH VSD
				S/F VFD SPEED CONTROL		X				NEW VFD SPEED CONTROL	
				S/F STATUS	X					NEW CURRENT SENSOR	
				COOLING VALVE		X				NEW CONTROL VALVE	
				COLD S/A TEMP	X					NEW TEMP SENSOR	
				HEATING VALVE		X				NEW CONTROL VALVE	
				HOT S/A TEMP	X					NEW TEMP SENSOR	
				COLD S/A DP	X					NEW DP SENSOR	REMOTE
				HOT S/A DP	X					NEW DP SENSOR	REMOTE
				RELIEF AIR DAMPER		X				NEW DAMPER ACTUATOR	

CONTROL POINT & FIELD DEVICE SCHEDULE - OAHU - 3RD FLOOR LOWER ROOF

SYS TYPE	EQ LOCATION	AREA SERVED	EQUIPMENT	POINT DESCRIPTOR	AI	AO	DI	DO	HW	FIELD DEVICE	NOTES
VARIABLE VOLUME O/A PT	3RD FLOOR-LOW LEVEL ROOF	BASEMENT, 1ST FLOOR, 2ND FLOOR	OAHU-1	O/A TEMP	X					NEW TEMP SENSOR	
				O/A HUMIDITY	X					NEW HUMIDITY SENSOR	
				O/A DAMPER		X				NEW DAMPER ACTUATOR	
				O/A DAMPER OPEN STATUS			X		X	NEW LIMIT SWITCH	INTERLOCK WITH S/S
				FILTER DP	X					NEW DP SENSOR	
				PREHEATING VALVE		X				NEW CONTROL VALVE	
				PREHEAT TEMP	X					NEW TEMP SENSOR	
				PREHEAT CIRC PUMP				X		NEW HOA MOTOR STARTER	
				COIL FREEZE			X		X	NEW FREEZESTAT	INTERLOCK WITH S/S
				COOLING VALVE		X				NEW CONTROL VALVE	
				SMOKE DETECTOR					X	NEW SMOKE DETECTOR	INTERLOCK TO VSD & FACP
				SUPPLY FAN S/S				X		NEW VSD	
				SUPPLY FAN SPEED		X				NEW VSD	
				SUPPLY FAN STATUS				X		NEW CURRENT SWITCH	
				S/A HIGH STATIC				X		NEW DIFFERENTIAL PRESSURE SWITCH	INTERLOCK WITH S/S
				SUPPLY AIR TEMP	X					NEW TEMP SENSOR	
				S/A STATIC PRES	X					NEW STATIC PRESSURE SENSOR	REMOTE MOUNTED

CONTROL POINT & FIELD DEVICE SCHEDULE - AHU BH-I - BASEMENT

SYS TYPE	SYS #	EQ LOCATION	AREA SERVED	EQUIPMENT	POINT DESCRIPTOR	AI	AO	DI	DO	HW	FIELD DEVICE	NOTES
					ECONOMIZER O/A DAMPER		X				NEW DAMPER ACTUATOR	
					R/A TEMP	X					NEW TEMP SENSOR	
					R/A DAMPER		X				NEW DAMPER ACTUATOR	
					R/A CO2	X					NEW CARBON DIOXIDE SENSOR	
					R/A HUMIDITY	X					NEW HUMIDITY SENSOR	
					R/A DAMPER		X				NEW DAMPER ACTUATOR	
					PT O/A AIRFLOW	X					NEW AIR FLOW STATION	
					PT O/A DAMPER		X				NEW DAMPER ACTUATOR	
					M/A TEMP	X					NEW TEMP SENSOR	
					PREFILTER DP	X					NEW DP SENSOR	
					FINAL FILTER DP	X					NEW DP SENSOR	
					COIL FREEZE			X		X	NEW FREEZESTAT	HW INTERLOCK WITH S/S
					COOLING VALVE		X				NEW CONTROL VALVE	
					COLD DECK TEMP	X					NEW TEMP SENSOR	
					SMOKE DETECTOR					X	NEW SMOKE DETECTOR	2 PER UNIT INTERLOCK TO VSD & FACP
					SUPPLY FAN S/S				X		NEW VSD	
					SUPPLY FAN SPEED		X				NEW VSD	
					SUPPLY FAN STATUS			X			NEW CURRENT SWITCH	
					S/A HIGH STATIC			X		X	NEW DIFFERENTIAL PRESSURE SWITCH	HARDWIRE INTERLOCK WITH VSD
					SUPPLY AIR TEMP	X					NEW TEMP SENSOR	
					S/A STATIC PRES	X					NEW STATIC PRESSURE SENSOR	
				VAV-BH-I-1	ZONE DAMPER		X				NEW DAMPER ACTUATOR	
					PRIMARY AIR FLOW	X					NEW AIR FLOW SENSOR	
					FAN S/S				X		NEW MOTOR CONTACTOR	
					HEATING VALVE		X				NEW CONTROL VALVE	
					S/A TEMP	X					NEW TEMP SENSOR	
					SPACE TEMP	X					NEW ROOM TEMP SENSOR	
				VAV-BH-I-2	ZONE DAMPER		X				NEW DAMPER ACTUATOR	
					PRIMARY AIR FLOW	X					NEW AIR FLOW SENSOR	
					FAN S/S				X		NEW MOTOR CONTACTOR	
					HEATING VALVE		X				NEW CONTROL VALVE	
					S/A TEMP	X					NEW TEMP SENSOR	
					SPACE TEMP	X					NEW ROOM TEMP SENSOR	
				VAV-BH-I-3	ZONE DAMPER		X				NEW DAMPER ACTUATOR	
					PRIMARY AIR FLOW	X					NEW AIR FLOW SENSOR	
					FAN S/S				X		NEW MOTOR CONTACTOR	
					HEATING VALVE		X				NEW CONTROL VALVE	
					S/A TEMP	X					NEW TEMP SENSOR	
					SPACE TEMP	X					NEW ROOM TEMP SENSOR	
				VAV-BH-I-4	ZONE DAMPER		X				NEW DAMPER ACTUATOR	
					PRIMARY AIR FLOW	X					NEW AIR FLOW SENSOR	
					FAN S/S				X		NEW MOTOR CONTACTOR	
					HEATING VALVE		X				NEW CONTROL VALVE	
					S/A TEMP	X					NEW TEMP SENSOR	
					SPACE TEMP	X					NEW ROOM TEMP SENSOR	
				VAV-BH-I-5	ZONE DAMPER		X				NEW DAMPER ACTUATOR	
					PRIMARY AIR FLOW	X					NEW AIR FLOW SENSOR	
					FAN S/S				X		NEW MOTOR CONTACTOR	
					HEATING VALVE		X				NEW CONTROL VALVE	
					S/A TEMP	X					NEW TEMP SENSOR	
					SPACE TEMP	X					NEW ROOM TEMP SENSOR	
				VAV-BH-I-6	ZONE DAMPER		X				NEW DAMPER ACTUATOR	
					PRIMARY AIR FLOW	X					NEW AIR FLOW SENSOR	
					FAN S/S				X		NEW MOTOR CONTACTOR	
					HEATING VALVE		X				NEW CONTROL VALVE	
					S/A TEMP	X					NEW TEMP SENSOR	
					SPACE TEMP	X					NEW ROOM TEMP SENSOR	
				VAV-BH-I-7	ZONE DAMPER		X				NEW DAMPER ACTUATOR	
					PRIMARY AIR FLOW	X					NEW AIR FLOW SENSOR	
					FAN S/S				X		NEW MOTOR CONTACTOR	
					HEATING VALVE		X				NEW CONTROL VALVE	
					S/A TEMP	X					NEW TEMP SENSOR	
					SPACE TEMP	X					NEW ROOM TEMP SENSOR	
				VAV-BH-I-8	ZONE DAMPER		X				NEW DAMPER ACTUATOR	
					PRIMARY AIR FLOW	X					NEW AIR FLOW SENSOR	
					FAN S/S				X		NEW MOTOR CONTACTOR	
					HEATING VALVE		X				NEW CONTROL VALVE	
					S/A TEMP	X					NEW TEMP SENSOR	
					SPACE TEMP	X					NEW ROOM TEMP SENSOR	
				VAV-BH-I-9	ZONE DAMPER		X				NEW DAMPER ACTUATOR	
					PRIMARY AIR FLOW	X					NEW AIR FLOW SENSOR	
					FAN S/S				X		NEW MOTOR CONTACTOR	
					HEATING VALVE		X				NEW CONTROL VALVE	
					S/A TEMP	X					NEW TEMP SENSOR	
					SPACE TEMP	X					NEW ROOM TEMP SENSOR	

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INFRASTRUCTURE ASSOCIATES, INC.
6117 RICHMOND AVENUE, SUITE 200
HOUSTON, TEXAS 77057
TBPE REGISTRATION NO. F-4506
(713) 622-0120 PH (713) 622-0557 FAX
WWW.IAHOUSTON.COM

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The University of Texas Health Science Center at Houston
School of Public Health
UT HEALTH SCIENCE SCHOOL OF PUBLIC HEALTH
1200 PRESSLER ST.
HOUSTON, TX 77030

STATE OF TEXAS
MATTA FLUKINGER
110970
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08/16/2017	ADDENDUM 2

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Approved	MAF, SK

Title

CONTROLS POINTS

Sheet

M705

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0 1/2" 1" 2"

CONTROL POINT & FIELD DEVICE SCHEDULE - 8-10 FLOOR ALTERNATE #1

SYS TYPE	EQ LOCATION	AREA SERVED	EQUIPMENT	POINT DESCRIPTOR	AI	AO	DI	DO	HW	FIELD DEVICE	NOTES
DUAL DUCT TERMINAL UNIT WITH DOAS	MECHANICAL ROOM	8TH - 10TH FLOOR	AHU-8E AHU-8W AHU-9E AHU-9W AHU-10E AHU-10W	R/A TEMP	X					NEW TEMP SENSOR	
				R/A RELATIVE HUMIDITY	X					NEW RH SENSOR	
				R/A CO2	X					NEW CARBON DIOXIDE SENSOR	
				R/A DAMPER		X				NEW DAMPER ACTUATOR	
				SMOKE DETECTOR					X	NEW SMOKE DETECTOR	2 PER UNIT INTERLOCK TO VSD & FACP
				M/A TEMP	X					NEW TEMP SENSOR	
				PREFILTER DP	X					NEW DP SENSOR	
				FINAL FILTER DP	X					NEW DP SENSOR	
				SUPPLY FAN S/S				X		NEW VSD	
				S/F HIGH STATIC			X		X	NEW DIFFERENTIAL PRESSURE SWITCH	HW INTERLOCK WITH VSD
				S/F VFD SPEED CONTROL		X				NEW VFD SPEED CONTROL	
				S/F STATUS	X					NEW CURRENT SENSOR	
				COOLING VALVE		X				NEW CONTROL VALVE	
				COLD S/A TEMP	X					NEW TEMP SENSOR	
				HEATING VALVE		X				NEW CONTROL VALVE	
				HOT S/A TEMP	X					NEW TEMP SENSOR	
				COLD S/A DP	X					NEW DP SENSOR	REMOTE
				HOT S/A DP	X					NEW DP SENSOR	REMOTE
				RELIEF AIR DAMPER		X				NEW DAMPER ACTUATOR	
DOAS PT O/A AHU	MECHANICAL ROOM	8TH - 10TH FLOOR	OAHU-8 OAHU-9 OAHU-10	O/A DAMPER		X				NEW DAMPER ACTUATOR	
				PT O/A FILTER DP	X					NEW DP SENSOR	
				PT O/A AIRFLOW	X					NEW AIR FLOW STATION	
				PT O/A PREHEATING VALVE		X				NEW CONTROL VALVE	
				PT O/A HOT DECK TEMP	X					NEW TEMP SENSOR	
				PT O/A PREHEAT CIRC PUMP				X		NEW HOA MOTOR STARTER	
				PT/OA FREEZE			X		X	NEW FREEZESTAT	INTERLOCK TO PT O/A DAMPER
				PT O/A COOLING VALVE		X				NEW CONTROL VALVE	
				PT O/A COLD DECK	X					NEW TEMP SENSOR	
				ECON O/A DAMPER		X				NEW DAMPER ACTUATOR	
				ECON O/A AIRFLOW	X					NEW AIR FLOW STATION	
				SMOKE DETECTOR					X	NEW SMOKE DETECTOR	INTERLOCK TO VSD & FACP
				SUPPLY FAN S/S				X		NEW VSD	
				S/F HIGH STATIC			X		X	NEW DIFFERENTIAL PRESSURE SWITCH	HW INTERLOCK WITH VSD
				S/F VFD SPEED CONTROL		X				NEW VFD SPEED CONTROL	
				S/F STATUS	X					NEW CURRENT SENSOR	

CONTROL POINT & FIELD DEVICE SCHEDULE - TYP FAN COIL UNIT

SYS TYPE	EQ LOCATION	AREA SERVED	EQUIPMENT	POINT DESCRIPTOR	AI	AO	DI	DO	HW	FIELD DEVICE	NOTES
CONSTANT VOLUME	VARIES	VARIES	FCU-XX	SPACE TEMP	X					NEW SPACE TEMP SENSOR	
				COOLING VALVE		X				NEW CONTROL VALVE	
				SUPPLY FAN S/S				X		NEW HOA MOTOR STARTER	
				SUPPLY FAN STATUS			X			NEW CURRENT SWITCH	
				SUPPLY AIR TEMP	X					NEW TEMP SENSOR	

CONTROL POINT & FIELD DEVICE SCHEDULE - MISC VAV TERMINAL UNITS

SYS TYPE	SYS #	EQ LOCATION	AREA SERVED	EQUIPMENT	POINT DESCRIPTOR	AI	AO	DI	DO	HW	FIELD DEVICE	NOTES
VAV COOLING ONLY TERMINALS	AHU-2W	2ND FLOOR MECH ROOM	2ND FLOOR MECH ROOM	VAV-2-1	ZONE DAMPER		X				NEW DAMPER ACTUATOR	
					PRIMARY AIR FLOW	X					NEW AIR FLOW SENSOR	
					SPACE TEMP	X					NEW ROOM TEMP SENSOR	
	AHU-1E	2ND FLOOR MECH ROOM	2ND FLOOR MECH ROOM	VAV-2-2	ZONE DAMPER		X				NEW DAMPER ACTUATOR	
					PRIMARY AIR FLOW	X					NEW AIR FLOW SENSOR	
					SPACE TEMP	X					NEW ROOM TEMP SENSOR	
	AHU-3W	3RD FLOOR MECH ROOM	3RD FLOOR MECH ROOM	VAV-3-1	ZONE DAMPER		X				NEW DAMPER ACTUATOR	
					PRIMARY AIR FLOW	X					NEW AIR FLOW SENSOR	
					SPACE TEMP	X					NEW ROOM TEMP SENSOR	
	AHU-4W	4TH FLOOR MECH ROOM	4TH FLOOR MECH ROOM	VAV-4-1	ZONE DAMPER		X				NEW DAMPER ACTUATOR	
					PRIMARY AIR FLOW	X					NEW AIR FLOW SENSOR	
					SPACE TEMP	X					NEW ROOM TEMP SENSOR	
	AHU-5W	5TH FLOOR MECH ROOM	5TH FLOOR MECH ROOM	VAV-5-1	ZONE DAMPER		X				NEW DAMPER ACTUATOR	
					PRIMARY AIR FLOW	X					NEW AIR FLOW SENSOR	
					SPACE TEMP	X					NEW ROOM TEMP SENSOR	
	AHU-6W	6TH FLOOR MECH ROOM	6TH FLOOR MECH ROOM	VAV-6-1	ZONE DAMPER		X				NEW DAMPER ACTUATOR	
					PRIMARY AIR FLOW	X					NEW AIR FLOW SENSOR	
					SPACE TEMP	X					NEW ROOM TEMP SENSOR	
	AHU-7W	7TH FLOOR MECH ROOM	7TH FLOOR MECH ROOM	VAV-7-1	ZONE DAMPER		X				NEW DAMPER ACTUATOR	
					PRIMARY AIR FLOW	X					NEW AIR FLOW SENSOR	
					SPACE TEMP	X					NEW ROOM TEMP SENSOR	
	AHU-8W	8TH FLOOR MECH ROOM	8TH FLOOR MECH ROOM	VAV-8-1	ZONE DAMPER		X				NEW DAMPER ACTUATOR	
					PRIMARY AIR FLOW	X					NEW AIR FLOW SENSOR	
					SPACE TEMP	X					NEW ROOM TEMP SENSOR	
	AHU-8W	8TH FLOOR FREEZER FARM	8TH FLOOR FREEZER FARM	VAV-8-2	ZONE DAMPER		X				NEW DAMPER ACTUATOR	
					PRIMARY AIR FLOW	X					NEW AIR FLOW SENSOR	
					SPACE TEMP	X					NEW ROOM TEMP SENSOR	
	AHU-8W	8TH FLOOR FREEZER FARM	8TH FLOOR FREEZER FARM	VAV-8-3	ZONE DAMPER		X				NEW DAMPER ACTUATOR	
					PRIMARY AIR FLOW	X					NEW AIR FLOW SENSOR	
					SPACE TEMP	X					NEW ROOM TEMP SENSOR	
	AHU-8W	8TH FLOOR FREEZER FARM	8TH FLOOR FREEZER FARM	VAV-8-4	ZONE DAMPER		X				NEW DAMPER ACTUATOR	
					PRIMARY AIR FLOW	X					NEW AIR FLOW SENSOR	
					SPACE TEMP	X					NEW ROOM TEMP SENSOR	
	AHU-8W	8TH FLOOR FREEZER FARM	8TH FLOOR FREEZER FARM	ROOM RELIEF DAMPERS	ROOM RELIEF DAMPER				X		NEW DAMPER ACTUATOR	
					ROOM RELIEF DAMPER				X		NEW DAMPER ACTUATOR	
					ROOM RELIEF DAMPER				X		NEW DAMPER ACTUATOR	
	AHU-9W	9TH FLOOR MECH ROOM	9TH FLOOR MECH ROOM	VAV-9-1	ZONE DAMPER		X				NEW DAMPER ACTUATOR	
					PRIMARY AIR FLOW	X					NEW AIR FLOW SENSOR	
					SPACE TEMP	X					NEW ROOM TEMP SENSOR	
	AHU-10W	10TH FLOOR MECH ROOM	10TH FLOOR MECH ROOM	VAV-10-2	ZONE DAMPER		X				NEW DAMPER ACTUATOR	
					PRIMARY AIR FLOW	X					NEW AIR FLOW SENSOR	
					SPACE TEMP	X					NEW ROOM TEMP SENSOR	

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INFRASTRUCTURE ASSOCIATES, INC.
6117 RICHMOND AVENUE, SUITE 200
HOUSTON, TEXAS 77057
TBPE REGISTRATION NO. F-4506
(713) 622-0120 PH (713) 622-0557 FAX
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CONTROLS POINTS

Sheet

△1 M706

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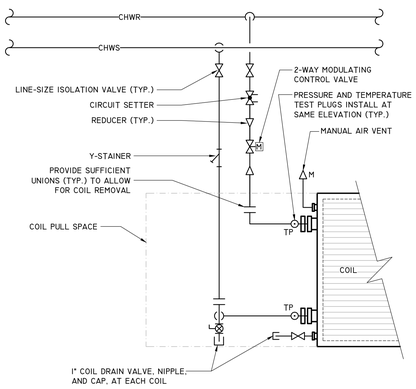
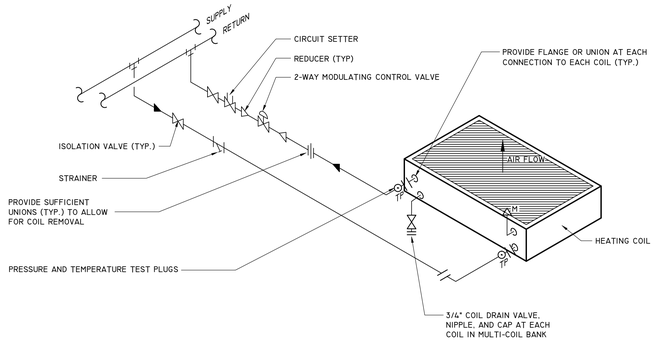
0 1/2" 1" 2"



NOTE:

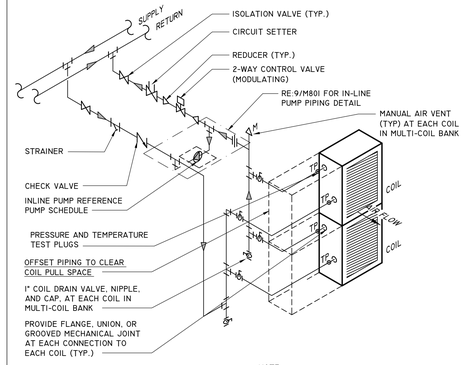
RE: I0/M8.0I FOR STACKED DETAIL.

COOLING COIL PIPING DETAIL — NOT TO SCALE — II



NOTE:

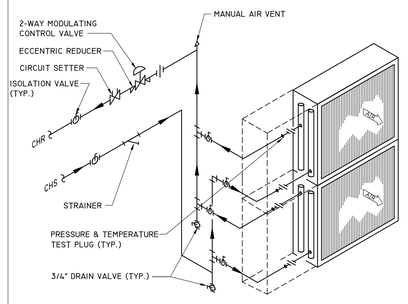
VERTICAL DISCHARGE HEATING COIL PIPING DETAIL — NOT TO SCALE — 6



NOTE:

I. STACK COIL ARRANGEMENT SHOWN. SINGLE COIL PIPING SIMILAR WITH ONE COIL

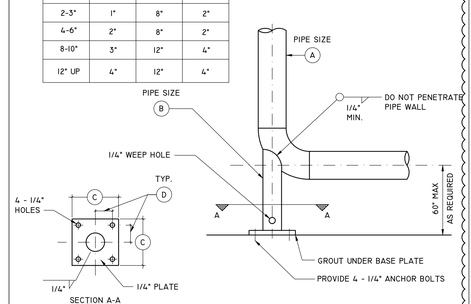
PREHEAT COIL WITH FREEZE PROTECTION PUMP — NTS — 3



NOTES:

I. CONFIGURE PIPING FOR REVERSE RETURN WITH SERVICE ACCESS TO REMOVE COILS.

STACKED COIL PIPING DETAILS — NOT TO SCALE — I0

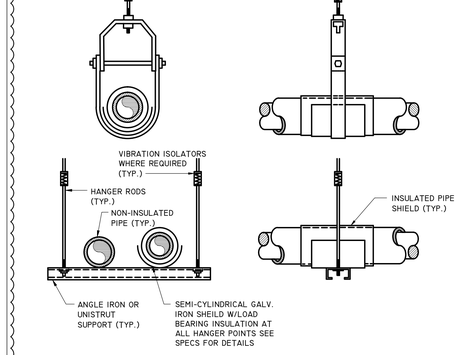


NOTE:

I. INSULATE BASE ELBOW SUPPORTS ON ALL LOW TEMPERATURE SERVICE.

BASE ELBOW SUPPORT DETAIL — NOT TO SCALE — 8

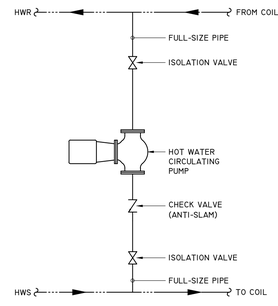
NOT USED — NOT TO SCALE — 5



GENERAL NOTE:

I. ATTACH HANGER RODS TO EXISTING STEEL STRUCTURE W/ SUITABLE BEAM CLAMPS OR PROVIDE CONCRETE ANCHORES FOR CONCRETE STRUCTURES.

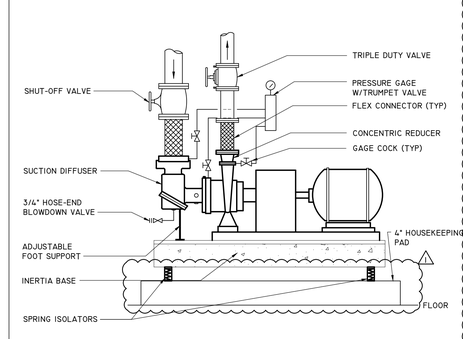
PIPE HANGER DETAIL — NOT TO SCALE — 2



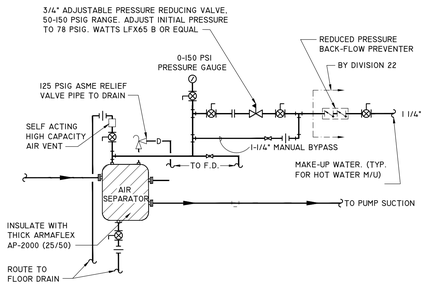
NOTE:

I. SIZE PUMP PIPING SAME AS HWS/HWR TO HEATING COIL
2. SUPPORT PUMP PER MFG INSTALLATION INSTRUCTIONS
3. PROVIDE PUMPS W/HOA STARTERS. COORDINATE WITH ELECTRICAL

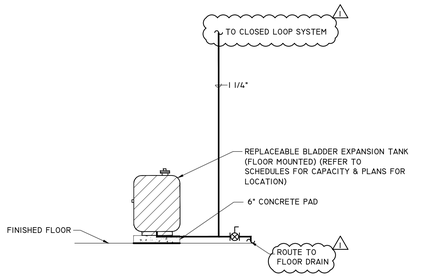
CIRCULATOR PUMP PIPING DETAIL — NOT TO SCALE — 9



END SUCTION PUMP PIPING DETAILS — NOT TO SCALE — 7



HW MAKE UP DETAIL — NOT TO SCALE — 4



EXPANSION TANK DETAIL — NOT TO SCALE — I

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INFRASTRUCTURE ASSOCIATES, INC.
6II7 RICHMOND AVENUE, SUITE 200
HOUSTON, TEXAS 77057
TBPE REGISTRATION NO. F-4506
(7I3) 622-0I20 PH (7I3) 622-0557 FAX
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DETAILS

Sheet

M801

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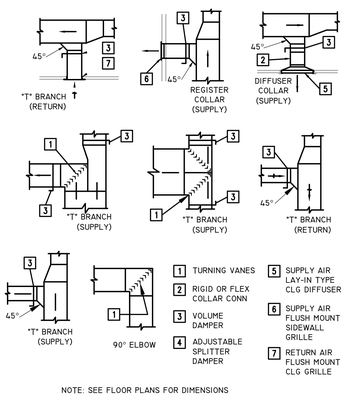
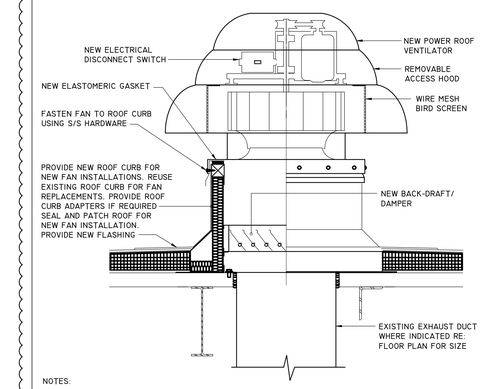


NOTE: SEE FLOOR PLANS FOR DIMENSIONS

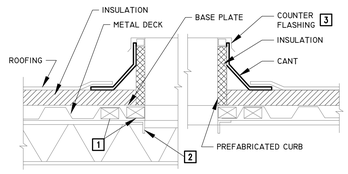
DUCTWORK FITTINGS DETAIL — NOT TO SCALE — 12



NOTES:

1. PROVIDE MOTORIZED DAMPER FOR UNITS WITH 300+CFM AND BACK-DRAFT DAMPER FOR ALL OTHERS. DAMPER TO CLOSE WHEN UNIT IS NOT IN OPERATION.

POWER ROOF VENTILATOR DETAIL — NOT TO SCALE — 9



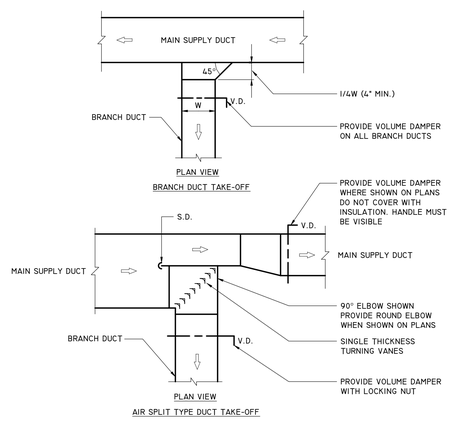
NOTES:

1. REINFORCE METAL DECK WITH TIGHT FITTING WOOD BLOCKING
2. ANGLE IRON FRAME
3. IF THE SUPPORTED EQUIPMENT HAS BUILT-IN COUNTER FLASHING, THEN COUNTER FLASHING SHOWN ABOVE IS NOT REQUIRED

NOTE:

ENSURE ROOF CURB IS PROPERLY SECURED TO DECK ACCORDING TO MIAMI-DADE REQUIREMENTS.

ROOF CURB DETAIL — NOT TO SCALE — 6



BRANCH DUCT DETAIL — NOT TO SCALE — 3

DIM.	DRAW-THRU UNIT	BLOW-THRU UNIT
"A"	FAN T.S.P. + 1"	FAN T.S.P. -1"
"B"	FAN T.S.P. + 2"	2"

KEYED NOTES:

1. SIZE DRAIN PIPING AT LEAST ONE PIPE SIZE LARGER THAN DRAIN PAN CONNECTION. PROVIDE UNION AT UNIT CONNECTION.
2. UPSTREAM CLEANOUT WITH REMOVABLE CAP OR PLUG. EXTEND ABOVE TOP RIM OF DRAIN PAN.
3. DOWNSTREAM PLUGGED CLEANOUT AT HEAD END OF DRAIN.
4. OPEN VENT - DO NOT CAP.
5. ROUTE DISCHARGE TO INDIRECT DRAIN. PITCH DOWN AT 1/8" PER FOOT. PROVIDE CLEANOUTS AT CHANGES OF DIRECTION.

TYPICAL CONDENSATE DRAIN DETAIL — NOT TO SCALE — 11

NOTE:

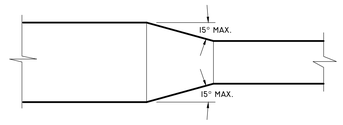
THE FLANGED BELLMOUTH FITTING MUST BE PROVIDED, WHERE HEIGHT OF DUCT SHOWN ON PLANS CAN ACCOMODATE THE FITTING. ONLY WHERE THE DUCT HEIGHT DOES NOT ALLOW THE INSTALLATION OF BELLMOUTH FITTING, PROVIDE STRAIGHT FITTING. FLEX DUCT MAY BE LOCATED IN RISER OR HORIZONTAL RUN.

CEILING DIFFUSER CONNECTION DETAIL — NOT TO SCALE — 8

NOTES:

1. USE THIS DETAIL FOR EXTERNALLY INSULATED DUCTWORK.
2. EXTEND ROUND SHEETMETAL DUCTWORK AND ASSOCIATED DUCT INSULATION FROM MAIN DUCT, SO FLEXIBLE DUCT LENGTH DOES NOT EXCEED 6 FEET.

SPIN FITTING DETAIL — NOT TO SCALE — 5



DUCT TRANSITION DETAIL — NOT TO SCALE — 2

GOOSENECK DETAIL — NOT TO SCALE — 10

DUCT THROUGH ROOF DETAIL — NOT TO SCALE — 7

RECTANGULAR DUCT			ROUND DUCT		
MAX OF DUCT PERIMETER/IN.	STRAP	MAX LOAD EACH HANGAR/LBS	DIAMETER / INCHES	STRAP	MAX LOAD EACH HANGAR/LBS
P/2 < 72	1X20 GA	20	UP TO 20"	1X20 GA	20
P/2 < 72	1X18 GA	30	21" TO 36"	1X18 GA	30

NOTE:

1. NO TRANSVERSE OR LONGITUDINAL BRACING REQUIRED IF DUCT IS SUSPENDED 12 INCHES FROM STRUCTURE.
2. FOR TRANSVERSE AND LONGITUDINAL BRACING FOLLOW "SMACNA".
3. BRACING NOT REQUIRED FOR RECTANGULAR DUCTS WITH CROSS SECTIONAL AREA OF LESS THAN 28 INCHES IN DIAMETER.

DUCT TYPE NOTES — NOT TO SCALE — 4

TERMINAL UNIT PIPING DETAIL — NOT TO SCALE — 1

Infrastructure Associates
INFRASTRUCTURE ASSOCIATES, INC.
6117 RICHMOND AVENUE, SUITE 200
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The University of Texas Health Science Center at Houston
School of Public Health
UT HEALTH SCIENCE SCHOOL OF PUBLIC HEALTH
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STATE OF TEXAS — MATT A. FLUKINGER — 119970 — LICENSED PROFESSIONAL ENGINEER
8-16-2017

REVISIONS

05/31/2017	ISSUED FOR BID
07/28/2017	ADDENDUM 1
08/16/2017	ADDENDUM 2

Sheet Information

Date	31 MARCH 2017
Job Number	-
Drawn	KN, KT, CJT
Checked	IT, SK
Approved	MAF, SK

Title

DETAILS

Sheet

M802

ISSUED FOR BID

0 1/2" 1" 2"

GENERAL NOTE:

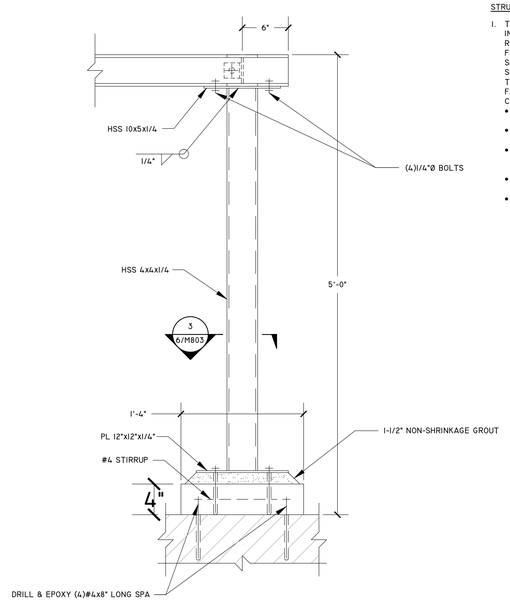
1. CONTRACTOR TO VERIFY ALL THE DIMENSIONS CONSIDERING HEAT EXCHANGER MANUFACTURER'S SHOP DRAWING.
2. CONTRACTOR TO PREPARE SHOP DRAWINGS FOR STRUCTURAL STEEL MEMBERS AND CONNECTIONS AS NECESSARY.

STRUCTURAL CONCEPT, AND LOADS:

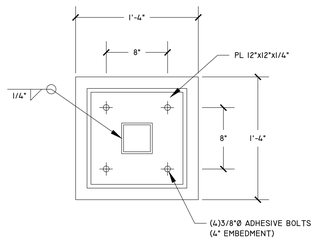
1. THE RENOVATION DESIGN AS SHOWN IS PERFORMED IN ACCORDANCE WITH THE BUILDING CODE REQUIREMENTS AND STANDARDS TO SUPPORT THE FINAL BUILDING SERVICE LOADS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ADDITIONAL SUPPORTS FOR THE STRUCTURE IF NECESSITATED BY THE CONSTRUCTION SEQUENCE OR METHODS OF FABRICATION, HANDLING, ERECTION AND OTHER CONSTRUCTION OPERATIONS.
   - AISC MANUAL OF STEEL CONSTRUCTION, 14TH EDITION, AS NEEDED.
   - INTERNATIONAL BUILDING CODE 2012 EDITION WITH CITY OF HOUSTON AMENDMENTS.
   - AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE): MINIMUM DESIGN LOADS FOR BUILDING AND OTHER STRUCTURES, ASCE 7-10.
   - AISI COLD-FORMED STEEL DESIGN MANUAL, 2013 EDITION.
   - AMERICAN WEDING SOCIETY (AWS).

MATERIALS:

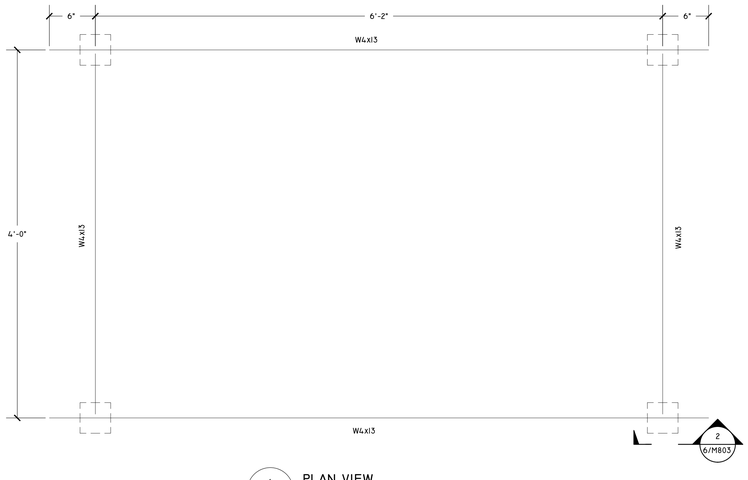
1. ALL STRUCTURAL STEEL FOR THE ANGLES, PLATES AND MISCELLANEOUS STEEL SHALL CONFORM TO ASTM A36, UNLESS OTHERWISE NOTED.
2. ALL STRUCTURAL STEEL FOR HOLLOW STRUCTURAL SECTIONS SHALL CONFORM TO ASTM A500, GRADE B, UNLESS OTHERWISE NOTED.
3. ALL STRUCTURAL STEEL FOR HORIZONTAL FRAMING MEMBERS SHALL CONFORM TO ASTM A992, GRADE 50, UNLESS OTHERWISE NOTED.
4. CONCRETE TO HAVE A MINIMUM COMPRESSIVE STRENGTH OF 3000 PSI AT 28 DAYS.
5. REINFORCING STEEL SHALL BE INTERMEDIATE GRADE DEFORMED BARS IN ACCORDANCE WITH ASTM SPECIFICATION A615, GRADE 60, OR BETTER.
6. ALL STEEL REINFORCEMENT TO HAVE A MINIMUM 2 INCH COVER.
7. ALL EXPOSED STEEL TO BE GALVANIZED.
8. PROVIDE STANDARD BOLTED CONNECTIONS CONFORMING TO AISC BOLTED CONNECTIONS, USING ASTM A325, UNLESS OTHERWISE NOTED.
9. ALL WELDED CONNECTIONS SHALL CONFORM TO AWS UNLESS OTHERWISE NOTED.



2 DETAIL
SCALE: 1-1/2" = 1'-0"

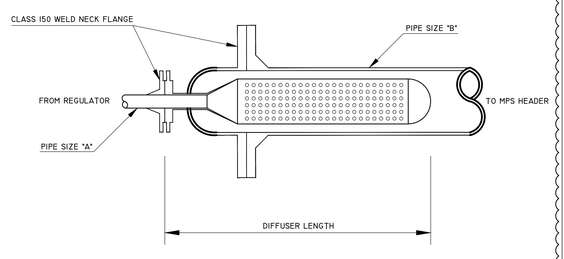


3 BASE PLATE DETAIL
SCALE: 1-1/2" = 1'-0"



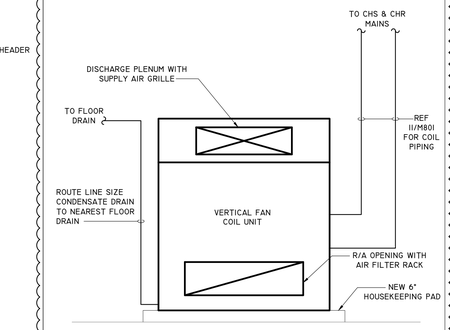
1 PLAN VIEW
SCALE: 1-1/2" = 1'-0"

HEAT EXCHANGER SUPPORT FRAME | NOT TO SCALE | 6



REGULATOR MARK	PIPE SIZE "A"	PIPE SIZE "B"	DIFFUSER LENGTH
SPR-1A	¾	2	13 ½
SPR-1B	2	4	16 ½
SPR-1C	3	8	17
STR-1A	2	6	17
STR-1B	4	10	21
STR-2A	2	6	17
STR-2B	4	10	21

STEAM NOISE DIFFUSER | NOT TO SCALE | 5

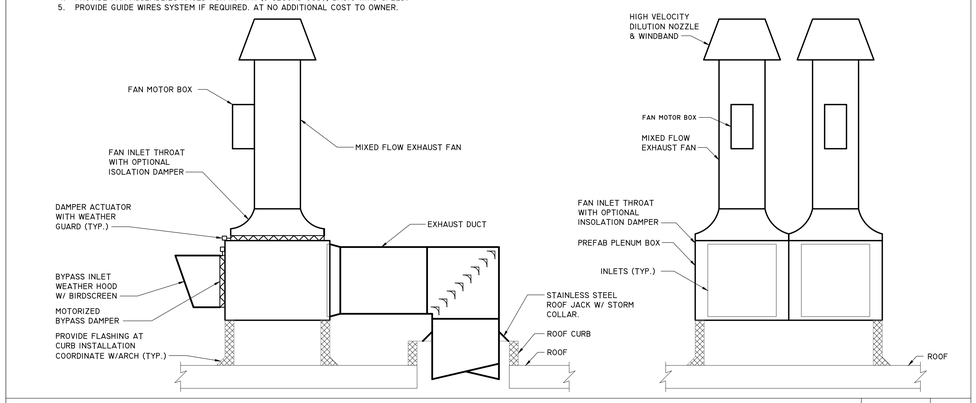


NOTE: PROVIDE FAN COIL UNITS WITH CONDENSATE PUMPS.

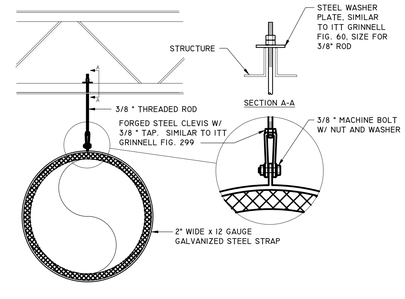
VERTICAL FAN COIL UNIT | NOT TO SCALE | 3

NOTES:

1. MULTIPLE FAN INSTALLATIONS SHOWN. SINGLE INSTALLATION SIMILAR.
2. PROVIDE UNIT MOUNTED ELECTRICAL DISCONNECT SWITCH. COORDINATE WITH ELECTRICAL.
3. COORDINATE ROOF PENETRATIONS AND CURB INSTALLATIONS WITH STRUCTURAL.
4. PROVIDE FAN ASSEMBLIES RATED FOR 110 MPH (3-SECOND GUST) BASIC WIND SPEED.
5. PROVIDE GUIDE WIRES SYSTEM IF REQUIRED. AT NO ADDITIONAL COST TO OWNER.



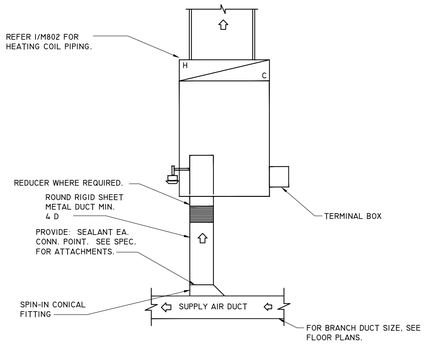
LAB. HOOD EXHAUST FAN DETAIL | NTS | 2



NOTES:

1. SUPPORT DUCTWORK FROM STRUCTURE. DUCT SHALL NOT BE SUPPORTED FROM ROOF DECK.
2. REFER TO SPEC. SECTION 15140 FOR MAXIMUM SPACING BETWEEN SUPPORTS.

ROUND DUCT SUPPORT FROM STRUCTURE DETAIL | NOT TO SCALE | 4



SINGLE DUCT VAV UNIT DETAIL | NOT TO SCALE | 1

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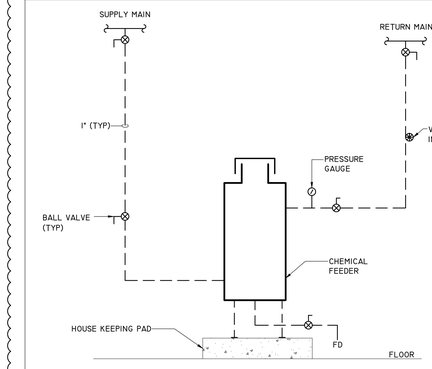
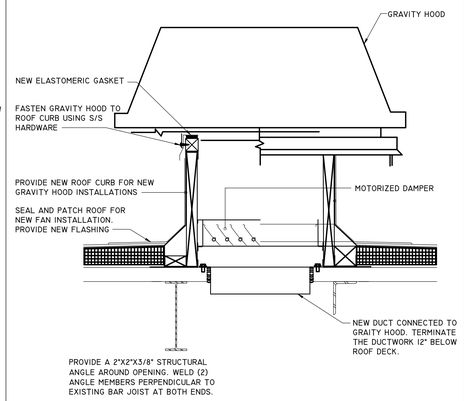
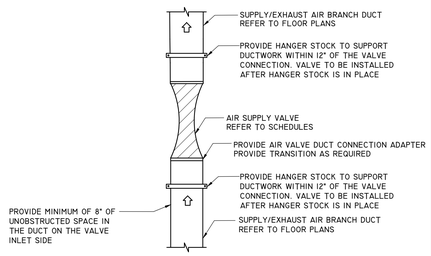


NOTES:
1. INSTALL PRESSURE GAUGE DIRECTLY ON FEEDER BODY OR INSIDE OF ISOLATION VALVES.
2. INSTALL ISOLATION VALVES & FLOW INDICATOR NOT MORE THAN 60" AFF.

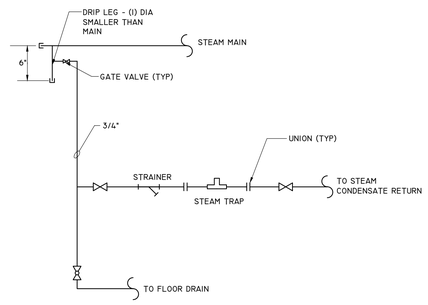
CHEMICAL FEEDER INSTALLATION | NOT TO SCALE | 8



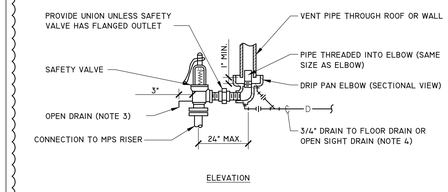
GRAVITY HOOD DETAIL | NOT TO SCALE | 6



AIR VALVE INSTALLATION DETAIL | NOT TO SCALE | 3

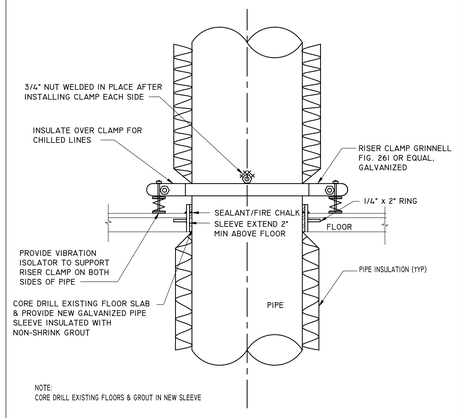


STEAM DRIP TRAP INSTALLATION | NOT TO SCALE | 10

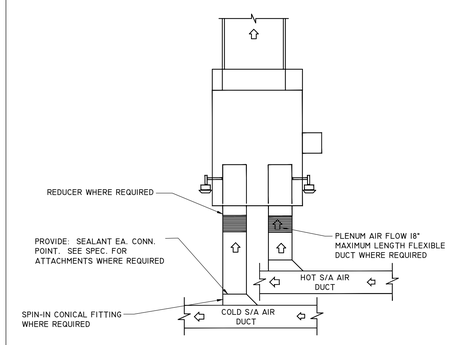


NOTES:
1. UNLESS OTHERWISE SHOWN ON THE DRAWINGS, SIZE THE VENT PIPE SO THAT STEAM IS NOT BLOWN OUT AT THE VENT PIPE ENTRANCE. UTILIZE THE CALCULATION METHOD CONTAINED IN ANSI B31.1. POWER PIPING CODE, APPENDIX II.
2. VENT PIPE SHALL TERMINATE 7' MIN. ABOVE FINISHED ROOF.
3. DISCHARGE OF DRAIN MUST BE DIRECTED AWAY FROM PLATFORMS OR OTHER AREAS WHICH PERSONNEL MAY OCCUPY.
4. DO NOT CONNECT ANY OTHER DRAIN TO THE DRIP PAN ELBOW DRAIN PIPE.
5. SUPPORT VENT PIPE SECURELY FROM ABOVE. VENT PIPE MUST NOT BEAR ON DRIP PAN ELBOW.

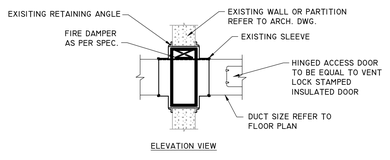
STEAM SAFETY VALVE DETAIL | NOT TO SCALE | 7



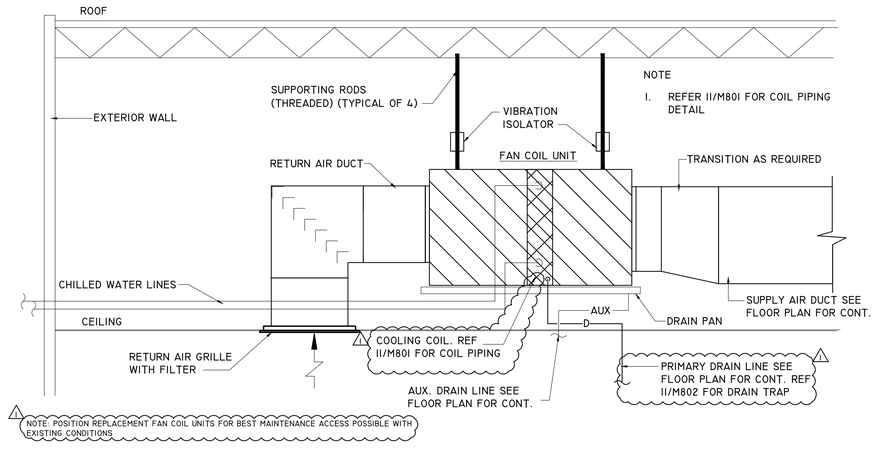
HOT WATER RISER CLAMP PIPE SUPPORT DETAIL | NOT TO SCALE | 5



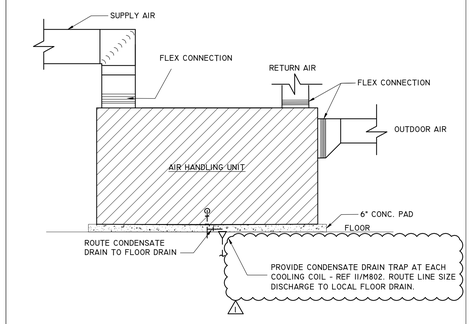
DUAL DUCT TERMINAL UNIT DETAIL | NOT TO SCALE | 2



FIRE DAMPER INSTALLATION | NOT TO SCALE | 9



TYPICAL HORIZONTAL FAN COIL UNIT DETAIL | NOT TO SCALE | 4



NOTE:
1. REF 11/M801 FOR COOLING COIL PIPING.
2. REF 3/M801 FOR PREHEAT COIL PIPING.
3. REF 6/M801 FOR HEATING COIL PIPING.

TYPICAL AIR HANDLING UNIT DETAIL | NOT TO SCALE | 1

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KEY PLAN

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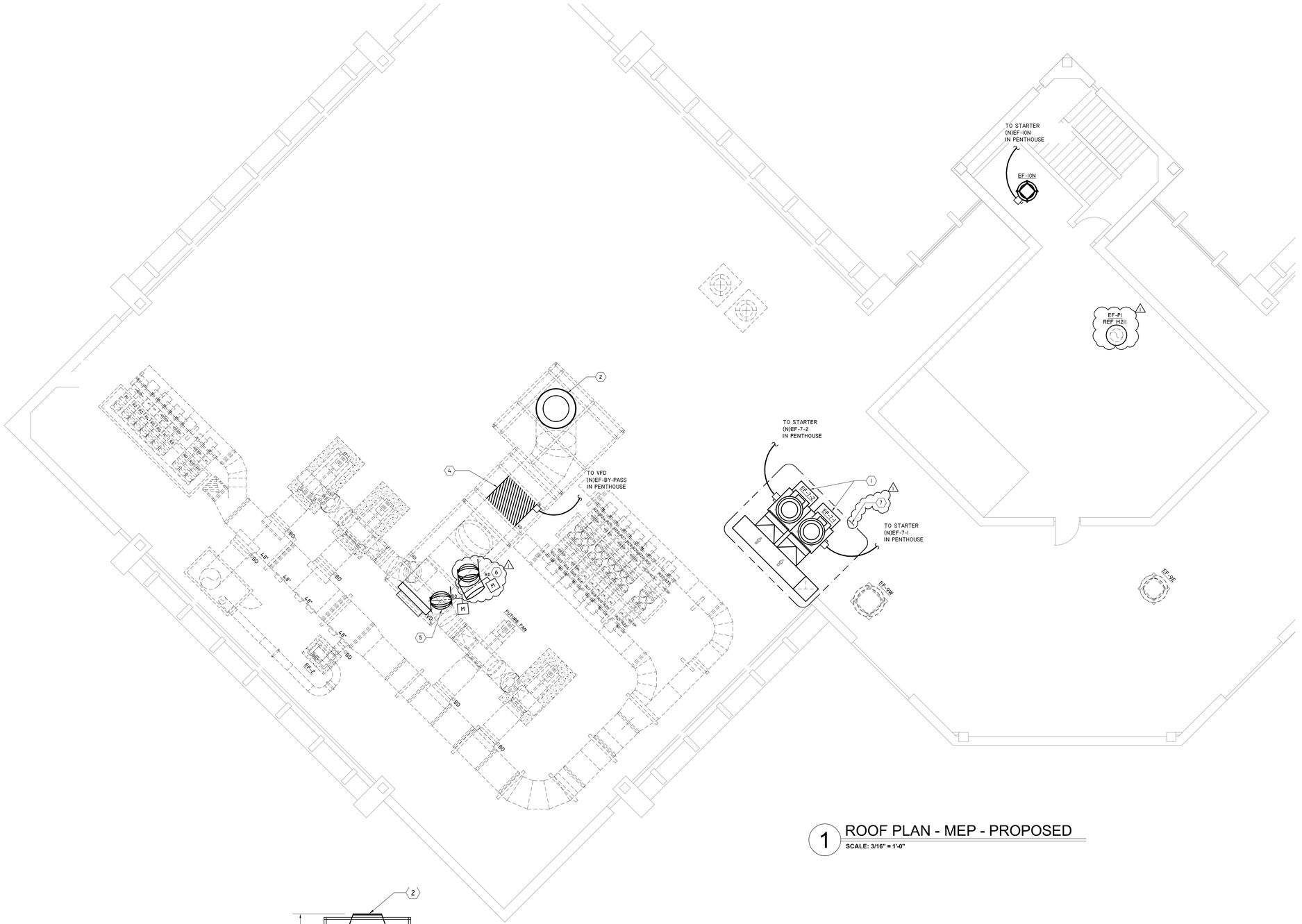
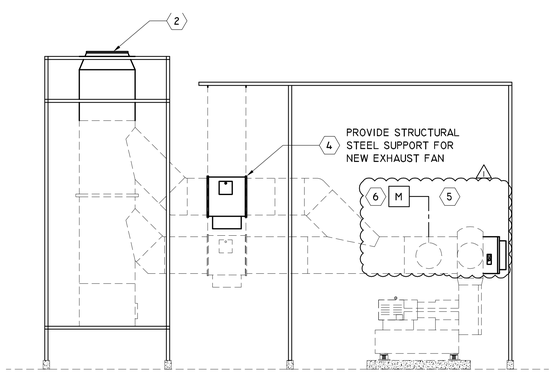


1 ROOF PLAN - MEP - PROPOSED

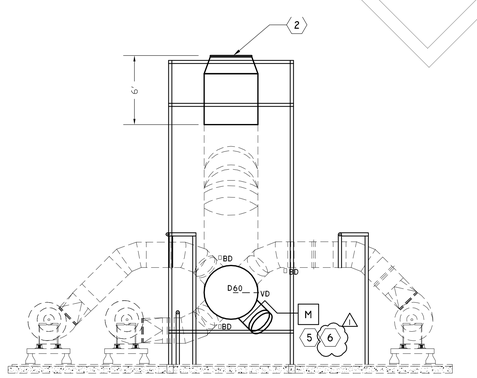
SCALE: 3/16" = 1'-0"



SIDE-VIEW EXISTING EXHAUST FANS WITH SHOWING NEW EXHAUST FAN, NEW DUCT EXTENSION AND NEW MOTORIZED DAMPERS

1 EXHAUST FANS - SIDE VIEW

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



FRONT-VIEW EXISTING EXHAUST FANS WITH SHOWING NEW EXHAUST FAN, NEW DUCT EXTENSION AND NEW MOTORIZED DAMPERS

1 EXHAUST FANS - FRONT VIEW

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

KEYED NOTES:

1. REF 2/M803 FOR LABORATORY EXHAUST FANS INSTALLATION DETAIL.
2. PROVIDE 36" DUCT EXTENSION 6' HEIGHT WITH NOZZLE 60"X48".
3. NOT USED
4. PROVIDE NEW EXHAUST FAN IN BYPASS DUCT
5. PROVIDE NEW 32" MOTORIZED DAMPER.
6. PROVIDE NEW 32" MOTORIZED DAMPER & TAP INTO EXISTING 60" DIA DUCT CAP
7. DEMO EXISTING UTILITY EXHAUST FAN SETS AND ASSOCIATED EXHAUST DUCTWORK

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KEY PLAN

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ROOF PLAN - MEP - DEMO & NEW

Sheet

MEP100

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ELECTRICAL GENERAL DEMOLITION NOTES

1. ELECTRICAL CONTRACTOR SHALL REMOVE ELECTRICAL EQUIPMENT AS INDICATED BY KEY NOTES AND AS REQUIRED BY SCOPE OF DEMOLITION WORK. REFER TO ARCHITECTURAL DRAWINGS FOR ALL WALLS DESIGNATED FOR REMOVAL.
2. BEFORE ANY ELECTRICAL EQUIPMENT OR OUTLET REMOVAL, IDENTIFY AND DISCONNECT THE POWER SUPPLY TO IT. VERIFY WITH OWNER LOADS THAT MUST REMAIN IN SERVICE AND DO NOT DISCONNECT THESE.
3. REMOVE ALL RELATED LINE SIDE AND LOAD SIDE FEEDERS (WIRES AND CONDUITS) IN ENTIRETY FOR EQUIPMENT INDICATED OR REQUIRED TO BE REMOVED.
4. LEAVE OVERCURRENT PROTECTION DEVICE FOR EQUIPMENT INDICATED TO BE REMOVED IN PLACE UNLESS NOTED OTHERWISE.
5. ALL REMOVED EQUIPMENT IS PROPERTY OF OWNER AND SHALL BE STORED AT OWNER DESIGNATED LOCATION FOR INSPECTION. CONTRACTOR IS RESPONSIBLE FOR REMOVAL AND DISPOSAL OF EQUIPMENT OWNER DOES NOT INTEND TO KEEP, STORE, OR REUSE.
6. REMOVE ALL ELECTRICAL, TELEPHONE, AND DATA OUTLETS IN WALLS DESIGNATED FOR DEMOLITION ON ARCHITECTURAL AND/OR ELECTRICAL PLANS. REMOVE RELATED CIRCUITS SERVING THE DEVICES IN THEIR ENTIRETY. VERIFY ALL ABANDONED DATA CABLES ABOVE CEILINGS AND IN OTHER PLENUMS WITH OWNER AND REMOVE THEM AS DIRECTED BY OWNER.
7. WHERE EXISTING OUTLETS AND DEVICES (RECEPTACLES OR LUMINAIRES) TO REMAIN IN SERVICE SHARE SAME BRANCH CIRCUIT AS OUTLETS (RECEPTACLES OR LUMINAIRES) TO BE REMOVED. ELECTRICAL CONTRACTOR SHALL ENSURE CONTINUITY OF THE EXISTING AFTER REMOVAL. THIS CONDITION MAY NOT HAVE BEEN IDENTIFIED ON ELECTRICAL DEMOLITION DRAWINGS. ELECTRICAL CONTRACTOR SHALL FIELD VERIFY SUCH CONDITION.
8. LUMINAIRES SHALL BE REMOVED AS INDICATED ON ARCHITECTURAL REFLECTED CEILING OR ELECTRICAL DEMOLITION PLANS. DISPOSE OF ALL FIXTURES AND LAMPS OWNER DOES NOT INTEND TO KEEP. REMOVE ALL RELATED BRANCH CIRCUITING, WIRING, SWITCHES, OVERCURRENT PROTECTION DEVICES, AND ALL OTHER RELATED ELECTRICAL ITEMS.
9. COORDINATE ARCHITECTURAL REQUIREMENTS FOR EXISTING CEILING GRID SYSTEM. ELECTRICAL CONTRACTOR SHALL PRESERVE AND PROTECT CEILING TILES AND SUPPORTING T'S WHEN REMOVING ELECTRICAL COMPONENTS FROM ABOVE LAY-IN CEILING AS REQUIRED.
10. REMOVE ALL ABANDONED FEEDERS (CONDUITS AND WIRING) IN AREA OF CONSTRUCTION. PROPERLY SUPPORT ALL REMAINING EXISTING CONDUIT AND BOXES AFFECTED. PAINT REUSED AND EXPOSED CONDUIT AND BOXES TO MATCH WALL.
11. WHERE PANELBOARDS ARE INDICATED TO BE REPLACED AND FEEDER AND BRANCH CIRCUITS ARE TO REMAIN IN SERVICE, CONTRACTOR SHALL PROTECT THEM FOR REUSE DURING CONSTRUCTION PHASE OF THE WORK.
12. ELECTRICAL CONTRACTOR SHALL INSPECT EXISTING ELECTRICAL CIRCUITS/BUSWAYS INDICATED TO REMAIN IN SERVICE AND REUSED. CONTRACTOR SHALL PERFORM CONDUCTOR INSULATION TESTING IN ALL MAIN FEEDERS INTENDED TO BE REUSED IN ACCORDANCE WITH SPECIFICATION REQUIREMENTS. ALL CONDUCTORS FAILING TEST SHALL BE REPLACED WITH SAME SIZE AS EXISTING.
13. ELECTRICAL CONTRACTOR SHALL INSPECT ALL EXISTING JUNCTION BOXES AND REPLACE MISSING COVERS AND PLUG ALL UNUSED HOLES.
14. ELECTRICAL PLANS DO NOT SHOW ALL RISER CONDUITS WITHIN WALLS. WHEN FOUND, CONTRACTOR SHALL DETERMINE IF THEY ARE IN SERVICE. IF SO, CONTRACTOR SHALL RELOCATE THEM TO A NEW NEARBY WALL OR OTHER STRUCTURE. SPLICES IN THE WIRING WILL BE PERMITTED IN SUITABLE JUNCTION BOXES IF THE CONDUCTORS ARE IN SOUND CONDITION.

FIRE ALARM GENERAL NOTES

1 (revision mark)

1. DELEGATED FIRE ALARM DESIGN REQUIREMENTS

   THESE FIRE ALARM DOCUMENTS ARE INTENDED TO SHOW MINIMUM REQUIRED DETECTION AND NOTIFICATION DEVICES ONLY. THE AWARDED CONTRACTOR IS RESPONSIBLE FOR A COMPLETE FIRE ALARM SYSTEM DELEGATED-DESIGN. THE CONTRACTOR IS REQUIRED TO PROVIDE NOT ONLY DEVICES SHOWN IN THE DOCUMENTS AS A MINIMUM, BUT ALSO THOSE DEVICES REQUIRED TO MEET CODE, PROJECT SPECIFICATIONS REQUIREMENTS, AND THE AHJ REQUIREMENTS. THE CONTRACTOR IS REQUIRED TO COMPLY WITH PERFORMANCE REQUIREMENTS AND DESIGN CRITERIA, INCLUDING SIGNED AND SEALED CALCULATIONS BY QUALIFIED PROFESSIONAL ENGINEER RESPONSIBLE FOR SHOP DRAWING PREPARATION. THE CONTRACTOR SHALL PRODUCE SHOP DRAWINGS, REQUIRED BATTERY POWER CALCULATIONS, INTERCONNECTION WIRING DIAGRAMS, POWER SUPPLY DESIGN AND REQUIREMENTS, ETC. THESE DOCUMENTS SHALL BE SUBMITTED BY THE CONTRACTOR FOR REVIEW AND/OR APPROVAL BY THE AHJ AND A/E TEAM AS REQUIRED.

2. EXPANSION OF EXISTING SYSTEMS

   PROVIDE NEW DEVICES AND ASSOCIATED WIRING WHERE INDICATED THAT MATCH AND ARE COMPATIBLE WITH THE EXISTING FIRE ALARM SYSTEM IN THE BUILDING, PROVIDE ALL REQUIRED EXPANSION EQUIPMENT REQUIRED TO CONNECT AND OPERATE WITH THE EXISTING SYSTEM AS INTENDED.

3. AIR HANDLING UNITS (QUANTITY 27 EACH)

   PROVIDE TWO (2) DUCT-MOUNTED SMOKE DETECTORS FOR EACH UNIT:
   (1 EACH) IN THE RETURN-AIR DUCTWORK
   (1 EACH) LOCATED SIMILARLY IN THE SUPPLY-AIR DUCTWORK

ELECTRICAL GENERAL NOTES AND SPECIFICATIONS

(BOOKS SPECIFICATIONS SUPERCEDE ANY NOTES BELOW)

1. SCOPE: THIS DIVISION SHALL INCLUDE ALL EQUIPMENT, MATERIALS, AND LABOR REQUIRED FOR COMPLETE INSTALLATION OF THE ELECTRICAL SYSTEM. PROJECT INCLUDES INSTALLATION OF NEW ELECTRICAL DISTRIBUTION SYSTEM, HVAC SYSTEM CONNECTIONS, NEW LIGHTING SYSTEM, NEW RECEPTACLES AND OUTLETS, FIRE ALARM AND NOTIFICATION SYSTEM, AND OTHER ELECTRICAL WORK AS INDICATED ON THE PLANS. CONTRACTOR SHALL PROVIDE CONDUITS, CONDUCTORS FOR POWER, CONTROLS, AND LIGHTING, LIGHTING CONTACTOR AND CONTACT CLOSURES, AND ALL REQUIRED APPARATUS REQUIRED FOR FULL OPERATION OF THE ELECTRICAL SYSTEM.
2. SITE VISIT AND FAMILIARIZATION: CONTRACTORS PROPOSING TO UNDERTAKE WORK UNDER THIS DIVISION SHALL VISIT THE SITE OF THE WORK, AND FULLY INFORM THEMSELVES OF ALL CONDITIONS THAT AFFECT THE WORK, OR COST THEREOF. CONTRACTOR SHALL EXAMINE THE DRAWINGS AND SPECIFICATIONS AS RELATED TO THE SITE CONDITIONS. ANY DISCREPANCY SHALL BE REPORTED TO THE ENGINEER.
3. NOTICE: CONSIDERATION WILL NOT BE GRANTED FOR ANY ALLEGED MISUNDERSTANDING OF THE AMOUNT OF WORK TO BE PERFORMED. TENDER OF A PROPOSAL SHALL CONVEY FULL AGREEMENT TO ALL ITEMS AND CONDITIONS SPECIFIED, INDICATED ON THE DRAWINGS, AND/OR REQUIRED BY NATURE OF THE SITE.
4. DISCREPANCIES: SHOULD CONTRACTOR FIND DISCREPANCIES OR OMISSIONS IN THE CONTRACT DOCUMENTS, OR BE IN DOUBT AS TO THE INTENT THEREOF, HE SHALL IMMEDIATELY OBTAIN CLARIFICATION FROM THE ARCHITECT BEFORE SUBMITTING PROPOSAL FOR WORK IN THIS DIVISION.
5. DEMOLITION: ALL ELECTRICAL COMPONENTS OF THE EXISTING SYSTEM WHICH ARE NOT UTILIZED FOR NEW CONFIGURATION SHALL BE REMOVED AND DISPOSED OF BY CONTRACTOR. REFER TO DEMOLITION NOTES AND DRAWINGS FOR EXTENT OF WORK.
6. TIMELY PLACING OF MATERIALS AND EQUIPMENT: ALL ELECTRICAL APPARATUS SHALL BE INSTALLED AT THE PROPER TIME DURING PROGRESS OF CONSTRUCTION. COORDINATE WORK OPERATIONS WITH OTHER CRAFTS.
7. SPACE REQUIREMENTS: CONTRACTOR FOR WORK UNDER THIS DIVISION SHALL BE FULLY RESPONSIBLE FOR DETERMINING IN ADVANCE OF PURCHASE THAT EQUIPMENT AND MATERIALS PROPOSED FOR INSTALLATION SHALL FIT INTO THE CONFINES INDICATED.
8. MANUFACTURERS' LITERATURE: DELIVER ALL PRINTED TAGS, INSTRUCTIONS, CERTIFIED DRAWINGS, PARTS LISTED, CERTIFICATES, ETC., SUPPLIED WITH EQUIPMENT ITEMS, TO THE OWNER.
9. CODES, PERMITS, AND FEES: WORK UNDER THIS DIVISION SHALL BE CONSTRUCTED IN STRICT CONFORMANCE WITH PERTINENT PROVISIONS OF CITY AND STATE BUILDING CODES.
   A. ALL WORK SHALL COMPLY WITH THE 2014 EDITION OF NATIONAL ELECTRIC CODE (NEC).
   B. OBTAIN ALL REQUIRED PERMITS. PAY ALL LEGAL FEES FOR PERMITS AND INSPECTIONS BY AUTHORITIES HAVING JURISDICTION.
   C. ALL WORK SHALL COMPLY WITH REQUIREMENTS OF CITY OF HOUSTON.
10. CUTTING AND PATCHING:
    A. CONTRACTOR FOR THIS DIVISION SHALL LAYOUT TO DIMENSION AND LOCATIONS, CUT AND PATCH ALL OPENINGS ON SURFACES TO BE FORMED, FRAMED, OR CUT.
    B. SHOULD CONTRACTOR FOR THIS DIVISION FAIL TO ADHERE WITH THIS REQUIREMENT, AS WORK PROGRESSES, ANY OPENINGS SHALL BE CUT AND PATCHED BY GENERAL CONTRACTOR AT THE EXPENSE OF THIS CONTRACTOR FOR THIS DIVISION.
11. PROTECTION OF APPARATUS: TAKE ALL PRECAUTIONS NECESSARY FOR PROPER PROTECTION OF NEW EQUIPMENT, APPARATUS, AND MATERIALS FROM DAMAGE. FAILURE TO DO SO WILL BE CAUSE FOR REJECTION OF ANY ITEM COMING UNDER QUESTION.
12. SHOP DRAWINGS: CONTRACTOR FOR THIS DIVISION SHALL SUBMIT SHOP DRAWINGS AND CATALOGUE DATA ON ALL MAJOR ITEMS OF EQUIPMENT AND SYSTEMS AND OTHER MATERIAL REQUESTED BY ARCHITECT/ENGINEER. SUBMIT PRODUCT DATA FOR SWITCHBOARDS, PANELBOARDS, TRANSFORMERS, WIRES, CABLE, SUPPORTING DEVICES, IDENTIFICATION COMPONENTS, LIGHT FIXTURES, FIRE ALARM SYSTEM AND COMPONENTS, WIRING DEVICES, MULTI-OUTLET RACEWAYS, CABINETS, AND BOXES. SUBMIT SIX COPIES WITHIN THIRTY (30) DAYS AFTER CONTRACT AWARD, AND IN NOT MORE THAN TWO GROUPS OF SUBMITTALS. SUBMITTALS SHALL CONSIST OF LAYOUTS, WORKING DRAWINGS, CUTS, AND OPERATING AND PERFORMANCE DATA. ALLOW FOUR (4) WEEKS FOR REVIEW AND APPROVAL OF THE SHOP DRAWINGS BY ENGINEER.
13. MATERIALS AND WORKMANSHIP: ALL MATERIALS AND EQUIPMENT SHALL BE NEW, OF BEST GRADE OF STANDARD MANUFACTURE. APPROVED BY UL, AND BE SO LABELED. FOR WIRE AND CABLE, MARKED AS REQUIRED BY ART. 310-2, NEC. INSTALLED BY SKILLED ELECTRICIAN, WORKING UNDER THE DIRECT SUPERVISION OF COMPETENT EXPERIENCED FOREMAN AND/OR SUPERINTENDENT. PRODUCTS SHALL BE INSTALLED IN A THOROUGH WORKMANLIKE MANNER, PRESENTING A NEAT, CLEAN-CUT APPEARANCE WHEN COMPLETED. ANY PART OR PARTS NOT MEETING THIS REQUIREMENT SHALL BE REPLACED OR REBUILT WITHOUT EXTRA EXPENSE TO OWNER.
14. PROTECTION OF EXISTING: PLENUM CABLE SHALL BE PROPERLY SECURED ABOVE CEILING PER APPLICABLE CODES.
15. WIRING METHODS: THE DRAWINGS ARE DIAGRAMMATIC AND ARE INTENDED TO SHOW THE LOCATIONS OF EQUIPMENT AND ARRANGEMENT OF CIRCUITS ONLY. EXACT LOCATIONS SHALL BE DETERMINED BY ACTUAL MEASUREMENT AT THE SITE. CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR ALL RISES, DROPS, OFFSETS, ETC. NECESSARY TO AVOID CONFLICT WITH STRUCTURAL MEMBERS, AND SIMILAR ITEMS, WHEN INSTALLING ELECTRICAL CONDUITS. INSTALL EXPOSED CONDUIT AS SHOWN OR NOTED, PARALLEL TO HORIZONTAL AND VERTICAL LINES OF STRUCTURES. MAKE BENDS WITH 90 DEGREE TURN ONLY, OR WITH APPROVED FITTINGS.
16. CONDUIT: FURNISH A COMPLETE RACEWAY SYSTEM FOR BUT NOT LIMITED TO FEEDER, BRANCH CIRCUITS, CONTROL WIRING, AND AUXILIARY SYSTEM WIRING.
    A. USE LIQUID TIGHT FLEXIBLE METAL CONDUIT AND FITTINGS FOR ALL MOTORIZED CONNECTIONS, WHERE EQUIPMENT IS SUBJECT TO MOVEMENT, OR LOCATED OUTDOOR.
    B. WHERE ENTERING PANELS, PULL BOXES, J-BOXES, OR OUTLET BOXES, SECURED IN PLACE WITH WITH LOCK-NUTS INSIDE AND OUTSIDE, AND INSULATED BUSHING INSIDE.
    C. BENDS AND OFFSETS MADE WITH APPROVED TOOLS ONLY. BENDS OR OFFSETS IN WHICH THE PIPE IS CRUSHED OR DEFORMED SHALL NOT BE INSTALLED.
    D. USE EMT FOR INTERIOR DRY LOCATIONS, PVC FOR UNDERGROUND INSTALLATION, AND RIGID GALVANIZED STEEL FOR EXPOSED LOCATIONS SUBJECT TO DAMAGE.
17. OUTLET AND JUNCTION BOXES: FURNISH AND INSTALL ALL JUNCTION BOXES REQUIRED TO FACILITATE INSTALLATION OF THE VARIOUS CONDUIT SYSTEMS. JUNCTION BOXES SHALL BE SUITABLE FOR ENVIRONMENT AND APPLICATION USED FOR.
18. WIRE AND CABLE: ALL WIRE AND CABLE SHALL:
    A. BE NEW AND OF SOFT DRAWN, ANNEALED, COPPER HAVING A CONDUCTIVITY OF NOT LESS THAN 98% OF THAT OF PURE COPPER; EACH WIRE CONTINUOUS WITHOUT WELD, SPLICE OR JOINT THROUGHOUT ITS LENGTH; UNIFORM IN CROSS SECTION AND FREE FROM FLAWS, SCALES, AND OTHER IMPERFECTIONS.
    B. UNLESS OTHERWISE SPECIFIED OR NOTED, WIRES SHALL BE #12 AWG (FOR PHASE, NEUTRAL, AND GROUND CONDUCTORS) TYPE THW, THWN, THHN, AS MANUFACTURED BY TRIANGLE, GENERAL ELECTRIC, OKONITE, OR ANACONDA.
    C. ALL WIRE #8 AND LARGER SHALL BE STRANDED.
    D. NOT BE DRAWN INTO A CONDUIT UNTIL ALL WORK WHICH MAY CAUSE INJURY TO INSULATION IS COMPLETE. WHERE TWO OR MORE CIRCUITS RUN TO A SINGLE OUTLET BOX, TAG EACH CIRCUIT AS A GUIDE.
    E. HAVE ALL STRANDED CONDUCTORS FURNISHED WITH COPPER CONNECTING LUGS, DRILLED, OR REAMED THE FULL DIAMETER OF THE BARE CONDUCTORS. MAINS AND FEEDERS SHALL BE RUN THEIR ENTIRE LENGTH IN CONTINUOUS PIECES WITHOUT JOINTS OR SPLICES.
19. IDENTIFICATION OF CONDUCTORS AND PANELBOARD ELEMENTS:
    A. EACH AND EVERY MAIN AND FEEDER CONDUCTOR SHALL BE IDENTIFIED AT EACH OUTLET POINT WHERE SUCH CONDUCTOR TERMINATES. FEEDER BUNDLES PASSING THROUGH A JUNCTION OR SUPPORT BOX SHALL ALSO BE IDENTIFIED WITHIN SUCH ENCLOSURE, BUT MAY BE IDENTIFIED IN SUCH LOCATIONS AS A GROUP.
    B. IDENTIFY BY USE OF PERMANENT TYPE BANDS, BRADY, OR T AND B. A DEFINITE NUMBER AND/OR LETTER CODE SHALL BE EMPLOYED AND BE UNIFORM THROUGHOUT EACH CONDUCTOR.
    C. IDENTIFY EACH SWITCH, INCLUDING MAIN DISCONNECT AND MOTOR STARTER WITH WHITE-ON-BLACK NAMEPLATE, EACH HAVING 1/4" HIGH LETTERS. NEATLY AND SECURELY ADHERE NAMEPLATES TO THE UNIT.
20. SWITCHES: FURNISH AND INSTALL ALL FUSIBLE AND NON-FUSIBLE SWITCHES AS REQUIRED BY CODES, WHETHER OR NOT SHOWN AND/OR NOTED. SWITCHES SHALL BE:
    A. HEAVY DUTY WITH NEMA-1 OR 3R ENCLOSURE, AS REQUIRED, AND BE PROVIDED WITH PAD-LOCKING FEATURE.
    B. PROVIDED AT EACH MOTOR THAT IS OUT OF SIGHT OF THE SWITCH OR PANEL FROM WHICH FED; AND BE NON-FUSIBLE DISCONNECT FOR SUCH USE.
    C. SWITCH MANUFACTURER SHALL BE GE, WESTINGHOUSE, OR SQUARE D.
    D. DISCONNECT SWITCHES INSTALLED OUTSIDE THE BUILDING SHALL BE IN NEMA-3 ENCLOSURES.
    E. FUSIBLE SWITCH-STARTER UNITS: EACH UNIT SHALL BE TOTALLY ENCLOSED AND EFFECTIVELY BARRIERED, MANUALLY OPERATED QUICK-MAKE, QUICK BREAK, HORSEPOWER RATED STARTER. PROVIDE CLASS R TYPE REJECTION FUSE CLIPS.
    F. IDENTIFY EACH DEVICE WITH NAMEPLATE SHOWING THE LOAD SERVED, MATCHING THE EXISTING NAMEPLATES.
21. WIRING DEVICES: FURNISH AND INSTALL ALL WIRING DEVICES AS INDICATED ON THE DRAWINGS. DEVICES SHALL IN ALL CASES BE SUITABLE FOR THE USE INTENDED AND SHALL HAVE VOLTAGE AND CURRENT RATINGS ADEQUATE FOR THE LOADS TO BE SERVED.
    A. MOUNTING: HEIGHTS OF ALL DEVICES ARE FROM FINISH FLOOR TO CENTERLINE OF DEVICE. DEVICES SHOWN ON THE DRAWINGS IN GROUPS OF TWO OR MORE SHALL BE LOCATED HORIZONTALLY IN SUCH A MANNER AS TO BE CLOSE AS POSSIBLE FROM THE CENTERLINE OF THE FIRST DEVICE TO THE CENTERLINE OF THE NEXT DEVICE UNLESS OTHERWISE NOTES.
    B. WALL SWITCHES: SHALL BE LEVITON DECORA TYPE, WHITE IN COLOR. USE CORRESPONDING DOUBLE POLE, THREE-WAY, FOUR-WAY, KEYED AND DIMMER SWITCHES WHERE NOTES. MOUNT AT 3'-10" A.F.F. AND WITHIN 6" OF ADJACENT DOOR JAMB, UNLESS OTHERWISE NOTED. USE "KEYED" SWITCHES IN LOCATIONS INDICATED.
    C. CONVENIENCE OUTLETS: SHALL BE GROUNDING TYPE, 20 AMP, 125 VOLT, LEVITON, WHITE COLOR. WEATHERPROOF DUPLEX OUTLETS SHALL BE LEVITON 5342 WITH SIERRA NO. WPD-8 PLATE. MOUNT AT 18" A.F.F., UNLESS OTHERWISE NOTED. PROVIDE NEMA 5-20R DEVICES UNLESS OTHERWISE INDICATED. PROVIDE SPECIFICATION (SPEC) GRADE HEAVY DUTY STRAIGHT BLADE DEVICES UNLESS OTHERWISE NOTED. PROVIDE HOSPITAL GRADE DEVICES WHERE INDICATED, OR AS REQUIRED BY CODES.
    D. ACCEPTABLE ALTERNATE MANUFACTURERS: SHALL BE LSI, H.E. WILLIAMS, HUBBELL, P&S AND BRYANT, PROVIDED THEIR DEVICES ARE OF THE SAME TYPE AND QUALITY AND THAT ONLY ONE MANUFACTURER SHALL BE USED THROUGHOUT THE WORK.
    E. PLATES: SHALL BE MATCHING TYPE FOR FINISHED AREAS AND GALVANIZED STEEL FOR AREAS WITH EXPOSED CONDUIT. PROVIDE STAINLESS STEEL PLATES FOR FLUSH MOUNTED DEVICES. PROVIDE CAST ALUMINUM WET LOCATION TYPE COVER PLATES WITH HINGED COVERS FOR DEVICES LOCATED OUTSIDE. GANG OUTLETS GROUPED TOGETHER UNDER A SINGLE WALL PLATE.
    F. INCANDESCENT DIMMERS: 120V SLIDE TO OFF, DECORA STYLE SIMILAR TO SWITCHES, WITH WATTAGE AS REQUIRED PER MANUFACTURER'S RECOMMENDATIONS. POWER FAILURE MEMORY. RFI SUPPRESSION. WHERE SWITCHES ARE SHOWN NEXT TO DIMMERS, PROVIDE MULTI-GANG COVER PLATES. PROVIDE DIMMERS WITH IVORY FINISH, SAME AS SWITCHES UNLESS OTHERWISE DIRECTED.
    G. INSTALL WIRING DEVICES AND ACCESSORIES PLUMB AND LEVEL, IN ACCORDANCE WITH MANUFACTURER'S WRITTEN INSTRUCTIONS, APPLICABLE REQUIREMENTS OF NEC AND IN ACCORDANCE WITH RECOGNIZED INDUSTRY PRACTICES TO FULFILL PROJECT REQUIREMENTS.
    H. TIGHTEN CONNECTORS AND TERMINALS, INCLUDING SCREWS AND BOLTS, IN ACCORDANCE WITH EQUIPMENT MANUFACTURER'S PUBLISHED TORQUE VALUES FOR WIRING DEVICES.
    I. COORDINATE WITH OTHER WORK, INCLUDING PAINTING, ELECTRICAL BOXES AND WIRING INSTALLATIONS, AS NECESSARY TO INTERFACE INSTALLATION OF WIRING DEVICES WITH OTHER WORK.
    J. INSTALL WIRING DEVICES AFTER WIRING WORK IS COMPLETED. INSTALL ONLY IN ELECTRICAL BOXES THAT ARE CLEAN; FREE FROM EXCESS BUILDING MATERIALS, DIRT, AND DEBRIS. INSTALL WALL PLATES AFTER PAINTING WORK IS COMPLETED.
    K. NO RECEPTACLE OR SWITCH OUTLETS SHALL BE MOUNTED BACK TO BACK. A MINIMUM OF ONE (1) STUD MUST BE BETWEEN OUTLETS.
    L. INSTALL RECEPTACLES WITH GROUND PIN UP. INSTALL SWITCHES WITH THE "ON" POSITION UP.
    M. ALL EXTERIOR DEVICES TO BE WEATHER PROOF AND EXTERIOR RECEPTACLES SHALL BE A GFCI TYPE DEVICE.
    N. ALL 120-VOLT RECEPTACLES OUTLETS LOCATED WITHIN SIX FEET OF SINKS SHALL HAVE GROUND FAULT CIRCUIT INTERRUPTION PROTECTION. GROUND FAULT OUTLETS SHALL BE CONNECTED ON DEDICATED NEUTRAL WIRE SERVING ONLY THE INDIVIDUAL OUTLET WITH THE GROUND FAULT PROTECTION.
    O. USE JUMBO SIZE WALL PLATES FOR OUTLETS INSTALLED IN MASONRY WALLS.
    P. DO NOT SHARE NEUTRAL CONDUCTORS ON DIMMERS.
22. PANELBOARD: PANELBOARDS SHALL BE GE TYPE AL, AQ, OR AE OR APPROVED EQUAL. REFER TO CONSTRUCTION DOCUMENTS FOR THE TYPE AND NUMBER OF BRANCH CIRCUIT BREAKERS. ALL PANELBOARD BUSSING SHALL BE COPPER. PANELBOARDS SHALL BE IN OUTDOOR ENCLOSURE WHERE INSTALLED OUTDOOR. MINIMUM INTERRUPTING RATING FOR PANELS SHALL BE AS INDICATED ON DRAWINGS.
23. TRANSFORMERS: DRY TYPE, TWO_WINDING OF THE SIZE AND ELECTRICAL CHARACTERISTICS SHOWN AND SCHEDULED ON DRAWINGS. TRANSFORMERS SHALL BE EQUIPPED WITH 2 2-1/2% TAPS ABOVE AND BELOW RATING. TRANSFORMERS SHALL HAVE A BONDING JUMPER INSTALLED BETWEEN THE SECONDARY NEUTRAL TERMINAL AND METAL CASE, AND SHALL INCLUDE A GROUND TERMINAL OF PROPER SIZE TO RECEIVE GROUND CONDUCTOR. TRANSFORMERS SHALL BE RATED AT FULL LOAD IN A 40°C AMBIENT WITH 30°C ULTIMATE HOT SPOT TEMPERATURE RISE ALLOWANCE, WITH CLASS F INSULATION HAVING A UL 185°C RATING LIMITING SYSTEM TEMPERATURE TO 115°C ON UNITS SMALLER THAN 15 kVA AND CLASS H INSULATION HAVING UL 220°C RATING LIMIT SYSTEM TEMPERATURE TO 150°C ON 15 kVA AND LARGER UNITS. PROVIDE COPPER WINDINGS.
24. FUSES: FUSES IN MAIN, FEEDER, AND BRANCH CIRCUIT SWITCHES, RATED 600 AMPS AND BELOW, FEEDING MOTORS, TRANSFORMERS, AND GENERAL PURPOSE CIRCUITS (UNLESS OTHERWISE SPECIFIED), SHALL BE UL LISTED AND LABELED AS CURRENT LIMITING, TIME-DELAY, 200,000 A.I.C., CLASS RK-5 FUSES SHALL BE BUSSMAN TYPE FRN-R (250V), AND FRS-R (600V).
25. GROUNDING: ALL CONDUIT WORK, MOTOR, STARTERS, AND OTHER ELECTRICAL EQUIPMENT WIRED AND CONNECTED BY THIS CONTRACTOR SHALL BE EFFECTIVELY AND PERMANENTLY GROUNDED IN FULL ACCORDANCE WITH NEC 250.
26. OTHER MATERIALS: FURNISH AND INSTALL ALL OTHER MATERIALS SUCH AS HARDWARE, TAPE, CLAMPS, CONNECTORS, FITTINGS, SUPPORTS, AND ALL OTHER APPURTENANCES REQUIRED TO COMPLETE THE WORK TO THE FULL INTENT OF THE CONTRACT. TERMINAL LUGS SHALL BE FURNISHED BY THE ELECTRICAL CONTRACTOR.
27. ELECTRICAL CONTRACTOR IS RESPONSIBLE FOR ALL TEMPERATURE, CO2, AND HUMIDITY SENSOR STUB-UPS FOR THE MECHANICAL HVAC SYSTEM. REFER TO MECHANICAL PRINTS FOR SENSOR QUANTITY AND LOCATIONS.
28. ELECTRICAL CONTRACTOR WILL CONNECT ALL LOW VOLTAGE PLUMBING CONTRACTOR SUPPLIED TRANSFORMERS (FOR AUTOMATIC FLUSH) TO THE NEAREST 120V CIRCUIT (OR IF INDICATED ON PLANS WITH A CIRCUIT NUMBER). CONTRACTOR TO ASSUME ONE TRANSFORMER PER BATHROOM. THE PLUMBING CONTRACTOR WILL BE RESPONSIBLE FOR LOW VOLTAGE WIRING TO THE FIXTURES.
29. SWITCHGEAR AND DISTRIBUTION PANELS: SHALL BE FIELD MARKED TO WARN QUALIFIED PERSONS OF POTENTIAL ELECTRIC ARC FLASH HAZARDS. THE MARKING SHALL BE LOCATED SO AS TO BE CLEARLY VISIBLE TO QUALIFIED PERSONS BEFORE EXAMINATION, ADJUSTMENT, SERVICING, OR MAINTENANCE OF THE EQUIPMENT, NEC 110.16.
30. ELECTRICAL CONTRACTOR IS RESPONSIBLE FOR COORDINATING THE LOCATIONS OF ALL GTD'S (GENERATOR TRANSFER DEVICES), LIGHTING CONTROL EQUIPMENT, LOW VOLTAGE TRANSFORMERS AND OTHER ELECTRICAL ITEMS WHICH ARE ABOVE CEILINGS. THESE DEVICES SIMILAR TO ELECTRICAL JUNCTION BOXES ARE NOT ALLOWED BY NEC TO BE ABOVE HARD CEILINGS. THE ARCHITECT/OWNER WILL NOT ALLOW THE INSTALLATION OF ACCESS PANELS IN THE CEILINGS. BE AWARE THAT EQUIPMENT IN THOSE AREAS OF HARD CEILINGS WILL HAVE TO BE REMOTELY LOCATED TO THE NEAREST ACOUSTICAL LAY-IN CEILING AREAS.
31. ELECTRICAL MATERIAL AND EQUIPMENT: NO ELECTRICAL MATERIALS, APPARATUS, DEVICES, APPLIANCES, FIXTURES, OR EQUIPMENT SHALL BE SOLD OR INSTALLED IN THE CITY UNLESS THEY ARE IN CONFORMANCE WITH THE PROVISIONS OF THIS CODE, THE LAWS OF THE STATE OF TEXAS AND ANY APPLICABLE RULES AND REGULATIONS ISSUED UNDER THE AUTHORITY OF THE STATE STATUTES. THE MAKER'S NAME, TRADEMARK, OR OTHER IDENTIFICATION SYMBOL SHALL BE PLACED ON ALL ELECTRICAL MATERIALS, APPARATUS, DEVICES, APPLIANCES, FIXTURES, AND EQUIPMENT USED OR INSTALLED UNDER THE PROVISIONS OF THIS CODE. ALL ELECTRICAL MATERIALS AND EQUIPMENT SHALL BE LISTED AND LABELED FOR THE INTENDED USE AND SHALL BE INCLUDED IN A LIST PUBLISHED BY AN APPROVED AGENCY.

ELECTRICAL SYMBOL LEGEND

SYMBOL	DESCRIPTION
HA-1,3,5	HOME RUN TO PANEL HA, CIRCUITS 1, 3, 5 USING 3#12 (H), 3#12 (N), 1#12 (G), 3/4" C (UNLESS OTHERWISE NOTED) EACH CIRCUIT WILL HAVE ITS OWN NEUTRAL
XX	ROUND INCANDESCENT, HID, OR COMPACT FLUORESCENT LUMINAIRE RECESSED OR SUSPENDED FROM ABOVE XX = TYPE ON LUMINAIRE SCHEDULE
XX	ROUND INCANDESCENT, HID, OR COMPACT FLUORESCENT LUMINAIRE SUSPENDED FROM SIDE ARM XX = TYPE ON LUMINAIRE SCHEDULE
XX	LINEAR FLUORESCENT LUMINAIRE RECESSED OR SUSPENDED FROM ABOVE XX = TYPE ON LUMINAIRE SCHEDULE
XX	LINEAR FLUORESCENT WITH EMERGENCY EGRESS OPERATION RECESSED OR SUSPENDED FROM ABOVE XX = TYPE ON LUMINAIRE SCHEDULE
X1 X2	EXIT SIGN WITH DIRECTIONAL ARROWS AS INDICATED, 1 OR 2 FACE PENDANT MOUNTED FROM ABOVE X1 OR X2 = TYPE ON LUMINAIRE SCHEDULE
XX	EMERGENCY EGRESS ONLY LUMINAIRE SURFACE MOUNTED FROM BACK XX = TYPE ON LUMINAIRE SCHEDULE
	NEMA 5-20R DUPLEX RECEPTACLE, MOUNTED 18" AFF (UON) WP = WEATHER PROOF, GFI = GFCI PROTECTED, IG = ISOLATED GROUND PROVIDE WITH STAINLESS STEEL COVERPLATE AND CIRCUIT NUMBER
	NEMA 5-20R QUADRAPLEX RECEPTACLE, MOUNTED 18" AFF (UON) WP = WEATHER PROOF, GFI = GFCI PROTECTED, IG = ISOLATED GROUND PROVIDE WITH STAINLESS STEEL COVERPLATE AND CIRCUIT NUMBER
L6-30R	SIMPLEX RECEPTACLE, MOUNTED 18" AFF (UON) WITH INDICATED CONFIGURATION (E.G. L6-30R = NEMA TWISTLOCK, 250 VAC, 30 A) PROVIDE WITH STAINLESS STEEL COVERPLATE AND CIRCUIT NUMBER
	FLUSH FLOOR BOX WITH WIRING DEVICES AS INDICATED ON PLANS
J	JUNCTION BOX
$XX	LIGHT SWITCH RATED 120/277 VAC, MOUNTED 42" AFF (UON), SINGLE-POLE (UON) 2 = 2-POLE, 3 = 3-WAY, 4 = 4-WAY, D = DIMMER, M = MOTOR-RATED W/ OL, WP = WEATHER PROOF, OS = INTEGRAL OCCUPANCY SENSOR, R = RED COLOR, K = KEYED (MODIFIERS MAY BE COMBINED, E.G. D3 = 3-WAY DIMMER)
OS OS	CEILING OR WALL MOUNTED OCCUPANCY SENSOR LIGHTING CONTROL WITH PASSIVE INFRARED AND ULTRASOUND DUAL TECHNOLOGY, 20 A RATED
TV	TV OUTLET 1-GANG BACKBOX, +42" AFF (UON), SS-302 COVER 1" C WITH MEASURED PULL STRING ROUTED IN CONDUITS BACK TO SERVER ROOM DEVICES AND LOW-VOLTAGE CABLING BY TELECOM CONTRACTOR
W	WALL TELEPHONE OUTLET 1-GANG BACKBOX, +42" AFF (UON), SS-302 COVER 1" C WITH MEASURED PULL STRING ROUTED IN CONDUITS BACK TO SERVER ROOM DEVICES AND LOW-VOLTAGE CABLING BY TELECOM CONTRACTOR
XX	COMBINATION DATA/VOICE (CAT 6E CABLE) OUTLET 2-GANG BACKBOX, SS-302 COVER 1" C WITH MEASURED PULL STRING ROUTED IN CONDUITS BACK TO SERVER ROOM. DEVICES AND LOW-VOLTAGE CABLING BY TELECOM CONTRACTOR. XX - DENOTES NUMBER OF CAT6E CABLES
	MULTIOUTLET ASSEMBLY (PLUG MOLD) AS SPECIFIED ON PLANS, WITH DEVICE TYPES AND QUANTITIES INDICATED ON PLANS
EPO	EMERGENCY POWER OFF, MUSHROOM HEAD, MAINTAINED CONTACT PUSH BUTTON
PC	PHOTOELECTRIC SENSOR AIMED NORTH
TC	TIME CLOCK, ASTRONOMIC/MULTI-POLE CONTACTOR
M	POWER COMPANY POWER METER
HA	LIGHTING CLASS PANEL HA = PANEL NAME CHARACTERISTICS AS INDICATED ON ONE LINE DIAGRAM AND PANEL SCHEDULE
DA	DISTRIBUTION CLASS PANEL DA = PANEL NAME CHARACTERISTICS AS INDICATED ON ONE LINE DIAGRAM
	CONDUIT TURNING UP CONDUIT TURNING DOWN
OH	WEATHER HEAD FOR CONNECTING OVER HEAD CONDUCTORS
	20" Cu CHATWORTH GROUNDING BUSBAR 40153-020 TMGB PATTERN, 4" W x 1/4" H, 20"L, INSULATED STANDOFFS, PRE-DRILLED & TAP AS REQUIRED FOR CONDUCTORS
VFD	VARIABLE FREQUENCY DRIVE WITH INTEGRAL DISCONNECTING MEANS, VFCI
LC CHA 24 COIL 277 VAC 30 AS 12 P NEMA-1	LIGHTING CONTACTOR CHA = CONTACTOR NAME, COIL = COIL CONTROL VOLTAGE, VAC = VOLTAGE RATING, AS = CURRENT RATINGS, P = POLE COUNT, NEMA- = ENCLOSURE TYPE
240 VAC 60 AF 60 AT 3 P NEMA-1 CB	CIRCUIT BREAKER VAC = VOLTAGE RATING, AF = FRAME SIZE, AT = TRIP SETTING, P = POLE COUNT, NEMA- = ENCLOSURE TYPE (WHEN APPLICABLE) MOLDED-CASE, THERMO-MAGNETIC (UON)
240 VAC 60 AS 60 AF 3 P NEMA-1	DISCONNECT SWITCH VAC = VOLTAGE RATING, AS = SWITCH CURRENT RATING, AF = FUSE SIZE/TYPE (E.G. DETD), P = POLE COUNT, NEMA- = ENCLOSURE TYPE (WHEN APPLICABLE)
240 VAC 60 AF 40 AT NEMA-#1 3 P NEMA-1 HOA	COMBINATION CIRCUIT BREAKER, MOTOR CONTROLLER, AND THERMAL OVERLOAD VAC = VOLTAGE RATING, AF = FRAME SIZE, AT = TRIP SETTING, NEMA-# = MOTOR STARTER SIZE/TYPE (E.G. FVNR), HOA = SELECTOR SWITCH TYPE P = POLE COUNT, NEMA- = ENCLOSURE TYPE (WHEN APPLICABLE)
TLA DRY-TYPE 480Δ : 208Y/120 VAC 45 kVA NEMA-2	TRANSFORMER TLA = TRANSFORMER NAME -TYPE = TRANSFORMER TYPE (E.G. DRY-TYPE, HARMONIC-MITIGATING...) VAC = WINDING VOLTAGES (PRIMARY : SECONDARY), kVA = CONTINUOUS CAPACITY, TAPS = QUANTITY/DEVIATION OF TAPS, RISE = TEMP RISE, INSUL = INSULATION CLASS -WOUND = WINDING MATERIAL/CONFIGURATION, NEMA- = ENCLOSURE TYPE
BP	BUS PLUG

ABBREVIATION DEFINITIONS

2SIW	TWO-SPEED, ONE-WINDING MOTOR
2S2W	TWO-SPEED, TWO-WINDING MOTOR
(A)	ABANDONED TO REMOVE
A	PHASE "A" IN THREE-PHASE SYSTEM
A	AMPERES
AF	AMPERE FUSE OR FRAME RATING
AFCI	ARC FAULT CIRCUIT INTERRUPTER
AFF	ABOVE FINISHED FLOOR
AT	AMPERE TRIP SETTING
AFG	ABOVE FINISHED GRADE
B	PHASE "B" IN THREE-PHASE SYSTEM
BF	BALLAST FACTOR
BFC	BELOW FINISHED CEILING
BFF	BELOW FINISHED FLOOR
BFG	BELOW FINISHED GRADE
C	PHASE "C" IN THREE-PHASE SYSTEM
C	CONDUIT
CB	CIRCUIT BREAKER
CH	CONSTANT HORSE POWER (2SIW MOTOR)
CKT	CIRCUIT
CS	COMBINATION STARTER (MOTOR STARTER / DISCONNECT)
CT	CONSTANT TORQUE (2SIW MOTOR)
CT	CURRENT TRANSFORMER
(D)	EXISTING TO BE DEMOLISHED OR REMOVED
DETD	DUAL ELEMENT, TIME DELAY
DS	DISCONNECT SWITCH
(E)	EXISTING TO REMAIN
EMT	ELECTRICAL METALLIC TUBING
EPM	ELECTRONIC POWER METER
FAAP	FIRE ALARM ANNUNCIATOR PANEL
FACP	FIRE ALARM CONTROL PANEL
FVNR	FULL VOLTAGE NON-REVERSING
G	GROUND
GEC	GROUNDING ELECTRODE CONDUCTOR
GFI	GROUND FAULT CIRCUIT INTERRUPTER
HMT	HARMONIC-MITIGATING TRANSFORMER
HOA	HAND / OFF / AUTO SWITCH (FOR FVNR CONTACTOR)
HLOA	HIGH / LOW / OFF / AUTO (FOR 2SIW OR 2S2W CONTACTOR)
IG	ISOLATED GROUND
J/R	JAMMING RATIO
kAIC	KILO AMPERE INTERRUPTING CAPACITY
KCMIL	KILO CIRCULAR MILS
kVA	KILO VOLT AMPERES COMPLEX OR APPARENT POWER
kVAR	KILO VOLT AMPERES REACTIVE POWER
kW	KILO WATT REAL POWER
L1	HOT LEG 1 IN SINGLE-PHASE SYSTEM < 250 VAC
L2	HOT LEG 2 IN SINGLE-PHASE SYSTEM < 250 VAC
LSI+G	LONG TERM, SHORT TERM, INSTANTANEOUS, AND GROUND-FAULT
MCB	MAIN CIRCUIT BREAKER
MCC	MOTOR CONTROL CENTER
MLO	MAIN LUGS ONLY
(N)	NEW
N	NEUTRAL
NEC	NATIONAL ELECTRICAL CODE (NFPA 70)
NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
NF	NON-FUSIBLE
NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
NSL	NON-SWITCHED HOT LEG
OFCI	OWNER FURNISHED, CONTRACTOR INSTALLED
OS	OCCUPANCY SENSOR
P	POLES
PF	POWER FACTOR
PFCC	POWER FACTOR CORRECTION CAPACITOR
PVC	POLY VINYL CHLORIDE
PT	POTENTIAL TRANSFORMER
RAL	RIGID ALUMINUM
RGS	RIGID GALVANIZED STEEL
SEC	SECTION OF LIGHTING-CLASS PANEL
SPD	SURGE PROTECTION DEVICE
SS-xxx	STAINLESS STEEL, "xxx" = AUSTENITIC ALLOY TYPE (E.G. 304)
ST	SHUNT-TRIP FOR CIRCUIT BREAKER
THD	TOTAL HARMONIC DISTORTION
TVSS	TRANSIENT VOLTAGE SURGE SUPPRESSION
TYP	TYPICAL
UON	UNLESS OTHERWISE NOTED
V	VOLTS
VAC	VOLTS, ALTERNATING CURRENT
VDC	VOLTS, DIRECT CURRENT
VFCI	VENDOR FURNISHED, CONTRACTOR INSTALLED
VFD	VARIABLE FREQUENCY DRIVE
VT	VARIABLE TORQUE (2SIW MOTOR)
W	WIRES, NOT INCLUDING GEC
WP	WEATHER PROOF
#	AMERICAN WIRE GAGE
Ø	PHASE
MF	MICRO FARAD
W	OHMS

GENERAL NOTES:

1. SYMBOL LEGEND MAY CONTAIN SYMBOLS THAT ARE NOT USED ON ALL DRAWINGS.
2. ABBREVIATION DEFINITIONS ARE NOT COMPREHENSIVE, AND NOT ALL ABBREVIATIONS MAY APPLY TO ALL DRAWINGS. SUBMIT FORMAL REQUEST FOR INFORMATION WHEN ENCOUNTERING CONFLICTS OR AMBIGUOUS SYMBOLS OR ABBREVIATIONS, AS THESE WILL NOT CONSTITUTE DISMISSAL OF CONTRACTOR RESPONSIBILITY.
3. ALL COVER PLATES FOR RECEPTACLES, SWITCHES, AND DATA SHALL BE SS-302 (UON).
4. PROVIDE DECORA STYLE SWITCHES FOR LIGHT SWITCHES THAT ARE NOT OCCUPANCY SENSOR TYPE.

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6117 RICHMOND AVENUE, SUITE 200
HOUSTON, TEXAS 77057
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(713) 622-0120 PH (713) 622-0557 FAX
WWW.IAHOUSTON.COM

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1200 PRESSLER ST.
HOUSTON, TX 77030

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97498
LICENSED PROFESSIONAL ENGINEER
08/16/2017

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08/16/2017 (1)	ADDENDUM 2

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NOTES, SYMBOLS AND LEGEND

Sheet

E001

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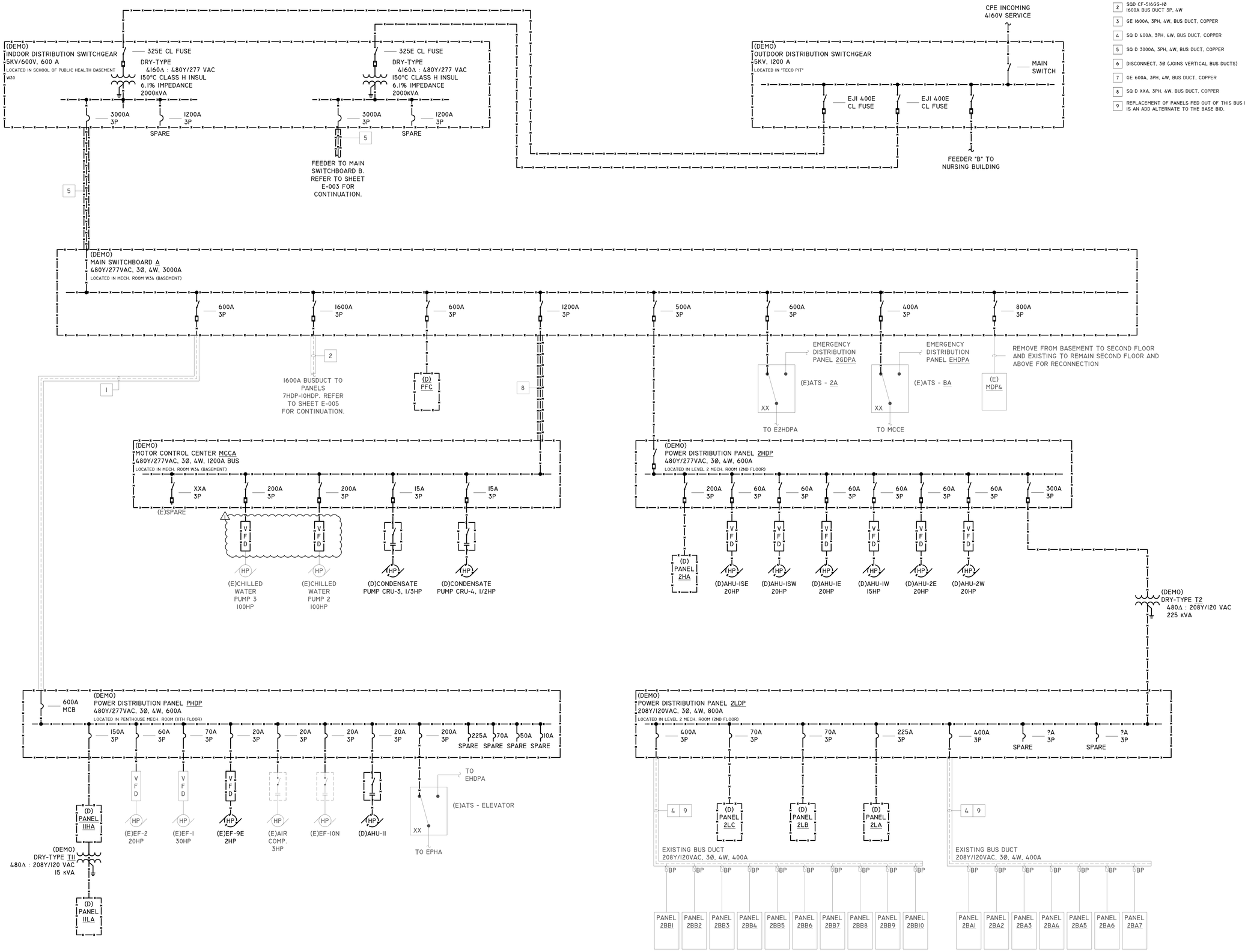

ELECTRICAL KEYED NOTES:

1. SQD CP-506-GG38470FES 600A BUS DUCT 3P, 4W
2. SQD CF-516GG-10 1600A BUS DUCT 3P, 4W
3. GE 1600A, 3PH, 4W, BUS DUCT, COPPER
4. SQ D 400A, 3PH, 4W, BUS DUCT, COPPER
5. SQ D 3000A, 3PH, 4W, BUS DUCT, COPPER
6. DISCONNECT, 3Ø (JOINS VERTICAL BUS DUCTS)
7. GE 600A, 3PH, 4W, BUS DUCT, COPPER
8. SQ D XXA, 3PH, 4W, BUS DUCT, COPPER
9. REPLACEMENT OF PANELS FED OUT OF THIS BUS DUCT IS AN ADD ALTERNATE TO THE BASE BID.

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DEMOLITION ONE LINE DIAGRAM

Sheet

E002

ISSUED FOR BID

0 1/2" 1" 2"

REFER TO SHEET E-002 FOR CONTINUATION.

5

(DEMO)
MAIN SWITCHBOARD B
480Y/277VAC, 3Ø, 4W, 3000A
LOCATED IN MECH. ROOM W34 (BASEMENT)

600A 3P | 1600A 3P | 600A 3P | 1200A 3P | 600A 3P | 600A 3P | 400A 3P | 600A 3P

5 — 1600A BUSDUCT TO PANELS 3HDP-6HDP. REFER TO SHEET E-004 FOR CONTINUATION.

(D) PFC

8

EMERGENCY DISTRIBUTION PANEL 2GDPA
(I EACH EXISTING) ATS - 2B 600 AS 3P, 3W NEMA 1 ENCLOSURE
XX
TO 2EHDPB

EMERGENCY DISTRIBUTION PANEL 2GDPA
(I EACH EXISTING) ATS - 2C X AS XP, XW NEMA 1 ENCLOSURE
XX
TO TRANSFORMER 2TELDPC

(E) MDP5
REMOVE FROM BASEMENT TO SECOND FLOOR AND EXISTING TO REMAIN SECOND FLOOR AND ABOVE FOR RECONNECTION

(DEMO)
MOTOR CONTROL CENTER MCCB
480Y/277VAC, 3Ø, 4W, 1200A BUS
LOCATED IN MECH. ROOM W34 (BASEMENT)

30A 3P | 200A 3P | 15A 3P | 15A 3P | 15A 3P

VFD

HP (D)CONTROL AIR COMPRESSOR 7.5 HP
HP (E)CHILLED WATER PUMP 1 100HP
HP (D)CONDENSATE PUMP CRU-1 CRP 2A
HP (D)CONDENSATE PUMP CRU-2 CRP 2B
HP (D)HWCP

(DEMO)
POWER DISTRIBUTION PANEL IHDP
480Y/277VAC, 3Ø, 4W, 600A
LOCATED IN FIRST FLOOR ELECTRICAL ROOM

225A 3P | 70A 3P | 200A 3P SPARE | 100A 3P SPARE | 30A 3P | 150A 3P

(I EACH EXISTING) DRY-TYPE TIK 480Δ : 208Y/120 VAC 45 kVA
TO EXISTING LOAD

(D) PANEL IHA
(E) PANEL ILK

(I EACH EXISTING) DRY-TYPE 480Δ : 208Y/120 VAC 3 kVA
TO EXISTING LOAD

(DEMO) DRY-TYPE TI 480Δ : 208Y/120 VAC 112.5 kVA

(DEMO)
POWER DISTRIBUTION PANEL BHDP
480Y/277VAC, 3Ø, 4W, 600A
LOCATED IN BASEMENT

125A 3P | 50A 3P | 60A 3P | 60A 3P | 60A 3P | 40A 3P | 50A 3P | 60A 3P | 30A 3P | 30A 3P | 150A 3P

(D) PANEL BHA
(E) FREIGHT ELEVATOR
(D) PANEL BHC
(D) PANEL BHB
VFD
HP (D) AHU-BE
(E) LIBRARY ELEVATOR
(I EACH EXISTING) DRY-TYPE K 480Δ : 208Y/120 VAC 45 kVA
(E) PANEL BLD
HP (D) FAN COIL BHI
(DEMO) DRY-TYPE TB 480Δ : 208Y/120 VAC 112.5 kVA

(DEMO)
POWER DISTRIBUTION PANEL ILDP
208Y/120VAC, 3Ø, 4W, 600A
LOCATED IN FIRST FLOOR ELECTRICAL ROOM

40A 3P | 40A 3P | 125A 3P | 150A 3P | 150A 3P | 225A 3P | 225A 3P | 175A 3P

(D) PANEL ILI02A
(D) PANEL ILI02B
(D) PANEL ILC (AUDITORIUM)
(D) PANEL ILB
(D) PANEL ILA
(D) PANEL BLF
(D) PANEL ILC-4 (MECH ROOM)
(E) PANEL ILC-9 (ADMIN WING)

(DEMO)
POWER DISTRIBUTION PANEL BLDP
208Y/120VAC, 3Ø, 4W, 800A
LOCATED IN BASEMENT

70A 3P SPARE | 250A 3P SPARE | 250A 3P SPARE | 250A 3P | 100A 3P | 150A 3P | 150A 3P

(D) PANEL BLC
(D) PANEL BLB
(D) PANEL BLA
(E) PANEL BLA-1

ELECTRICAL KEYED NOTES:

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2. SQD CF-516GG-1Ø 1600A BUS DUCT 3P, 4W
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4. SQ D 400A, 3PH, 4W, BUS DUCT, COPPER
5. SQ D 3000A, 3PH, 4W, BUS DUCT, COPPER
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DEMOLITION ONE LINE DIAGRAM

Sheet

E003

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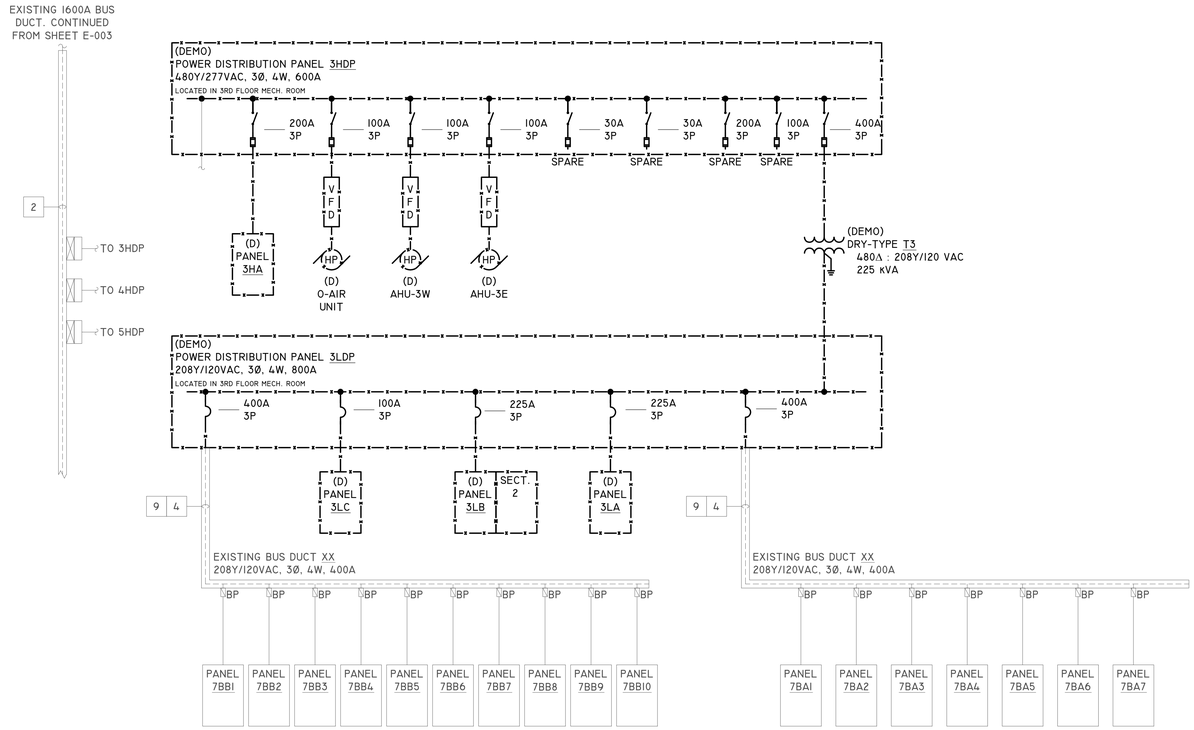

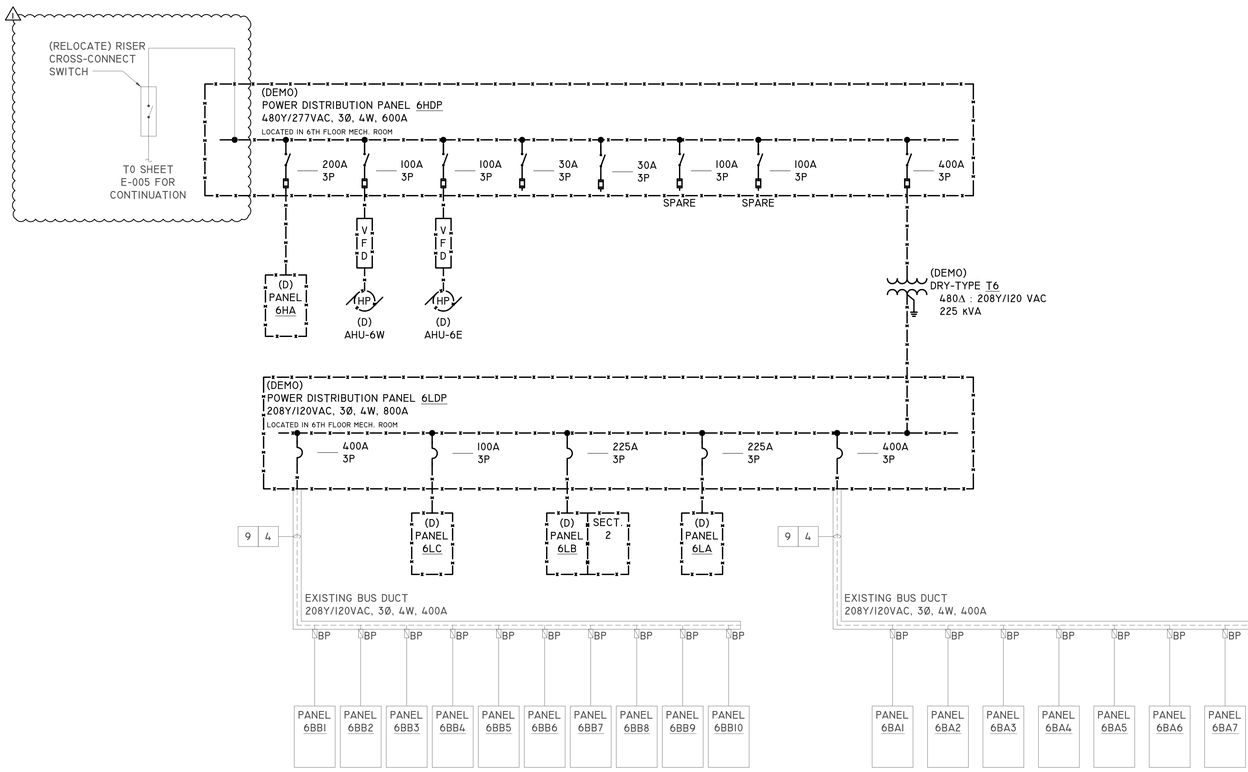

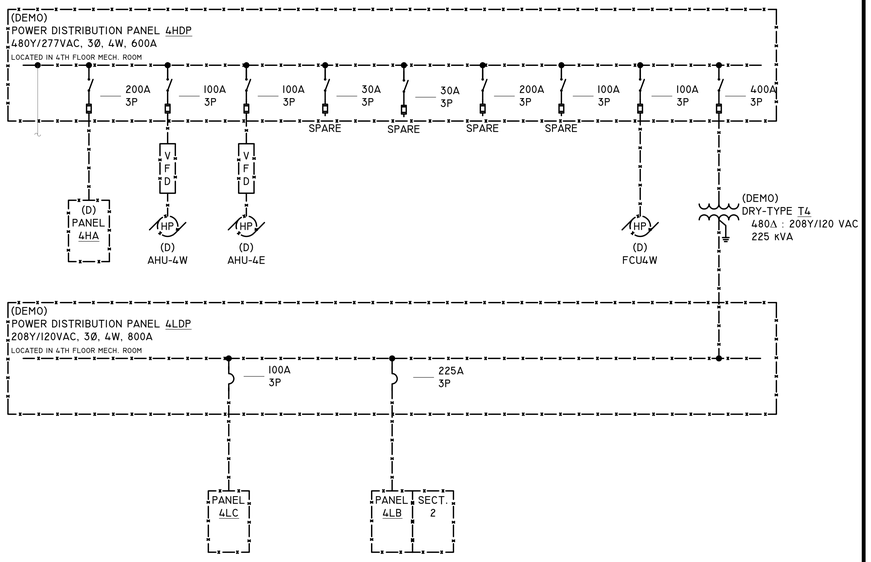

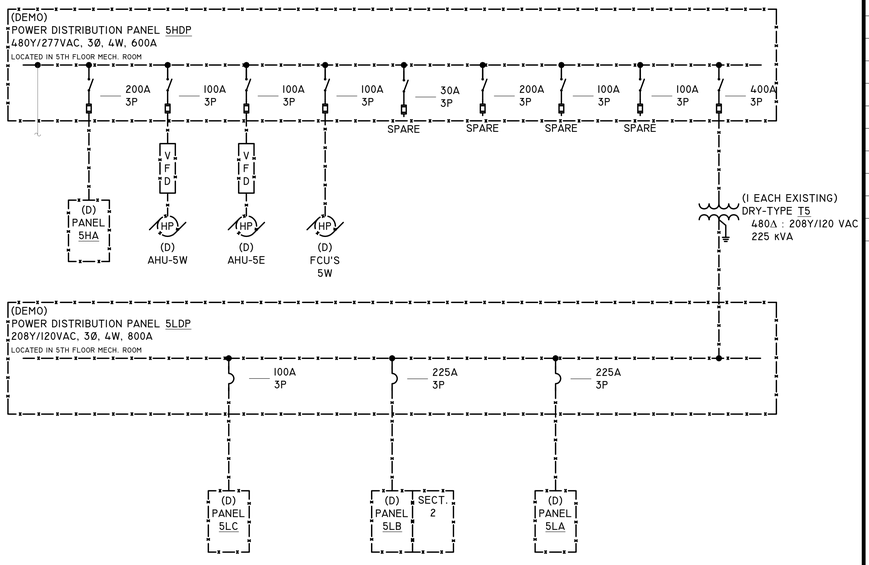

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1. SQD CP-506-GG38470FES 600A BUS DUCT 3P, 4W
2. SQD CF-516GG-10 1600A BUS DUCT 3P, 4W
3. GE 1600A, 3PH, 4W, BUS DUCT, COPPER
4. SQ D 400A, 3PH, 4W, BUS DUCT, COPPER
5. SQ D 3000A, 3PH, 4W, BUS DUCT, COPPER
6. DISCONNECT, 3Ø (JOINS VERTICAL BUS DUCTS)
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DEMOLITION ONE LINE DIAGRAM

Sheet

E004

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0 1/2" 1" 2"

(NEW)
DISTRIBUTION SWITCHGEAR
5KV, 1200 A
LOCATED IN "TECO PIT"

EJI 400E CL FUSE
MAIN EPM
MAIN SWITCH
FEEDER "B" TO NURSING BUILDING
CPE INCOMING 4160V SERVICE

(I SET)
3#500KCMIL CU/EPR/133%/MV-105
I#1/0 (N) CU/EPR/133%/MV-105
5"C RGS
MIN 2" CONCRETE ENCASEMENT
SUSPENDED FROM STRUCTURE ABOVE
(RE: STRUCTURAL DRAWINGS)

(I SET)
3#500KCMIL CU/EPR/133%/MV-105
I#1/0 (N) CU/EPR/133%/MV-105
5"C RGS
MIN 2" CONCRETE ENCASEMENT
SUSPENDED FROM STRUCTURE ABOVE
(RE: STRUCTURAL DRAWINGS)

FEEDER TO NEW SWITCHGEAR REFER TO SHEET E-008 FOR CONTINUATION

(E)PFCC RELOCATED

(I SET)
3#500 (A/B/C) Cu/THHN
I#500 (N) Cu/THHN
I#1/0 (G) Cu
4"C EMT

ELECTRICAL ONE-LINE DIAGRAM NOTES:

1. ALL CIRCUIT BREAKERS INDICATED ON ONE LINE DIAGRAM ARE THERMAL-MAGNETIC UNLESS NOTED OTHERWISE AS "ELECTRONIC" EXCLUDING THE MAIN WHICH WILL BE ELECTRONIC AND INSULATED CASE.
2. CIRCUIT BREAKER FRAME SIZES 250 AF AND LARGER SHALL BE ADJUSTABLE TRIP-UNIT TYPE, AND FRAME SIZES LESS THAN 250 AF MAY BE MOLDED-CASE TYPE.
3. PROVIDE CONDUCTORS WITH INSULATION TYPES INDICATED ON ONE LINE DIAGRAM. SUBSTITUTION OF THWN OR THHN IN LIEU OF INDICATED XHHW-2 IS NOT ACCEPTABLE.
4. LOAD SIDE FEEDERS OF INDIVIDUALLY-MOUNTED DISCONNECT SWITCHES AND ENCLOSED CIRCUIT BREAKERS SHALL MATCH LINE SIDE FEEDERS UNLESS LOAD SIDE FEEDER IS SPECIFICALLY INDICATED OTHERWISE.
5. UNDERGROUND FEEDERS SHALL HAVE SCHEDULE-80 PVC CONDUIT BELOW GRADE WITH LONG-SWEEP, TRANSITIONAL ELBOWS TO RGS CONDUIT AT WHEN STUBBING-UP ABOVE GRADE.
6. A PERMANENTLY AFFIXED LABEL SHALL BE APPLIED WITH THE AVAILABLE FAULT CURRENT AT THE TIME OF INSTALLATION AND CALCULATION. THE LABEL SHALL BE 2"X3" IN SIZE AND SHALL BE BLUE LETTERING ON A CONTRASTING BACKGROUND. THIS LABEL SHALL ALSO INCLUDE THE DATE OF THE CALCULATION.
7. ALL SEPARATELY DERIVED GROUND SOURCES TO HAVE A FULL-SIZE GROUNDING ELECTRODE JUMPER TO MAIN GROUNDING BAR IN MAIN ELECTRICAL ROOM TO CREATE A COMMON GROUNDING ELECTRODE SYSTEM FOR THE BUILDING.

DRY-TYPE
4160Δ : 480Y/277 VAC
150°C RISE
CLASS H (180°C) INSUL
6.1% IMPEDANCE
2000 kVA

EJI 400E CL FUSE

TVSS
240 kA/MODE
60AT
3P
EPM
MCB
GFI
3000 AF
3000 AT
3 P. 100%
LSI+G
KK

(I EACH) SWITCHBOARD A
480Y/277 VAC, 3Ø, 4W, 3000A CU
(SN PLATED) HORIZ BUS, 65 kAIC
NEMA-1 ENCLOSURE
LOCATED IN MAIN ELECTRICAL ROOM

3000 AF
3000 AT

01
600AF
600AT
3P

02
1600AF
1600AT
3P
100% LSI+G

03
600AF
600AT
3P

04
800AF
800AT
3P
100% LSI+G

05
600AF
600AT
3P

06
400AF
400AT
3P

06
400AF
400AT
3P

07
600AF
600AT
3P

GROUND BUS BAR
#3/0 TO WATER PIPE
#3/0 BONDING JUMPER TO GAS PIPE
#3/0 TO BLDG. STEEL
#3/0 TO SLAB & FOOTING REBAR

(2 SETS)
3#350 (A/B/C) Cu/THHN
I#350 (N) Cu/THHN
I#1/0 (G) Cu
3"C EMT

NEW 1600A BUSWAY

ADAPT
TRANSITION NEW TO OLD BUS

EXISTING 1600A BUS DUCT FOR PANELS 7HDP-10HDP. REFER TO SHEET E-010 FOR CONTINUATION.

LTG PANEL HMA 600A

(2 SETS)
3#350 (A/B/C) Cu/THHN
I#350 (N) Cu/THHN
I#1/0 (G) Cu
3"C EMT

(3 SETS)
3#350 (A/B/C) Cu/THHN
I#350 (N) Cu/THHN
I#1/0 (G) Cu
3"C EMT

JUNC BOX
SPLICE POINT ON SECOND FLOOR FOR OLD TO NEW
EXISTING WIRE, INTERCEPT IN SECOND FLOOR JANITOR CLOSET
(E) MDP4

(2 SETS)
3#350 (A/B/C) Cu/THHN
I#350 (N) Cu/THHN
I#1/0 (G) Cu
3"C EMT

EMERGENCY DISTRIBUTION PANEL 2GDPA
XX
ATS - 2A
TO E2HDPA

(2 SETS)
3#3/0 (A/B/C) Cu/THHN
I#3/0 (N) Cu/THHN
I#3 (G) Cu
3"C EMT

EMERGENCY DISTRIBUTION PANEL EHDPA
XX
ATS - BA
TO HME

(2 SETS)
3#350 (A/B/C) Cu/THHN
I#350 (N) Cu/THHN
I#1/0 (G) Cu
3"C EMT

TAP BOX
CABLE TO BUS TAP BOX, BUS ARRANGEMENT TO MATCH EXISTING BUSWAY, PROVIDE COMPRESSION LUGS MATCHING WIRE SIZE
NEW 600A BUSWAY
ADAPT
TRANSITION NEW TO OLD BUS
EXISTING 600A BUSWAY

LTG PANEL 2HDP 600A

(I SET)
3#1/0 (A/B/C) Cu/THHN
I#1/0 (N) Cu/THHN
I#6 (G) Cu
2"C EMT

LTG PANEL 2HA 150A

(I SET)
3#1 (A/B/C) Cu/THHN
I#6 (G) Cu
1-1/4"C EMT

(I SET)
3#1 (A/B/C) Cu/THHN
I#6 (G) Cu
1-1/4"C EMT

(I EACH)
T2P2
480Δ : 208Y/120 VAC
75 kVA, Cu-WOUND, 0° SHIFT
(6) 2.5% TAPS (2+/4-)
130°C RISE
220°C CLASS R INSUL
NEMA-2 ENCLOSURE
#1/0

(I EACH)
T2PI
480Δ : 208Y/120 VAC
75 kVA, Cu-WOUND, 30° SHIFT
(6) 2.5% TAPS (2+/4-)
130°C RISE
220°C CLASS R INSUL
NEMA-2 ENCLOSURE
#1/0

(I SET)
3#4/0 (A/B/C) Cu/THHN
2#4/0 (N) Cu/THHN
I#2 (G) Cu
3"C RGS

225A ENCLOSED CB

(I SET)
3#4/0 (A/B/C) Cu/THHN
2#4/0 (N) Cu/THHN
I#2 (G) Cu
3"C RGS

LTG PANEL 2LA 225A

(I SET)
3#2 (A/B/C) Cu/THHN
I#2 (N) Cu/THHN
I#8 (G) Cu
1-1/2"C RGS

LTG PANEL 2LC 100A

(I SET)
3#4/0 (A/B/C) Cu/THHN
2#4/0 (N) Cu/THHN
I#2 (G) Cu
3"C RGS

225A ENCLOSED CB

(I SET)
3#4/0 (A/B/C) Cu/THHN
2#4/0 (N) Cu/THHN
I#2 (G) Cu
3"C RGS

LTG PANEL 2LB 225A
SEC. 2

(I SET)
3#2/0 (A/B/C) Cu/THHN
I#4 (G) Cu
2"C

(I EACH)
T2B2
480Δ : 208Y/120 VAC
112.5 kVA, Cu-WOUND, 0° SHIFT
(6) 2.5% TAPS (2+/4-)
130°C RISE
220°C CLASS R INSUL
NEMA-2 ENCLOSURE
#2/0

(I SET)
3#600 (A/B/C) Cu/THHN
2#600 (N) Cu/THHN
I#2/0 (G) Cu
4"C

400 AT BUS-PLUG CIRCUIT BREAKER

EXISTING BUS DUCT
208Y/120VAC, 3Ø, 4W, 400A
BP
EXISTING
PANEL 2BA1 100A
PANEL 2BA2 100A
PANEL 2BA3 100A
PANEL 2BA4 100A
PANEL 2BA5 100A
PANEL 2BA6 100A
PANEL 2BA7 100A

(I SET)
3#2/0 (A/B/C) Cu/THHN
I#4 (G) Cu
2"C

(I EACH)
T2BI
480Δ : 208Y/120 VAC
112.5 kVA, Cu-WOUND, 30° SHIFT
(6) 2.5% TAPS (2+/4-)
130°C RISE
220°C CLASS R INSUL
NEMA-2 ENCLOSURE
#2/0

(I SET)
3#600 (A/B/C) Cu/THHN
2#600 (N) Cu/THHN
I#2/0 (G) Cu
4"C

400 AT BUS-PLUG CIRCUIT BREAKER

400 AT BUS-PLUG CIRCUIT BREAKER

EXISTING BUS DUCT
208Y/120VAC, 3Ø, 4W, 400A
BP
EXISTING
PANEL 2BB1 100A
PANEL 2BB2 100A
PANEL 2BB3 100A
PANEL 2BB4 100A
PANEL 2BB5 100A
PANEL 2BB6 100A
PANEL 2BB7 100A
PANEL 2BB8 100A
PANEL 2BB9 100A
PANEL 2BBI0 100A

LTG PANEL PHDP 600A

(I SET)
3#4/0 (A/B/C) Cu/THHN
I#4/0 (N) Cu/THHN
I#4 (G) Cu
2-1/2"C EMT

EXISTING
TO EHDPA
ATS - ELEVATOR
XX
TO EPHA

LTG PANEL IIHA 225A

(I SET)
3#10 (A/B/C) Cu/THHN
I#10 (G) Cu
3/4"C EMT

(I EACH)
TII
480Δ : 208Y/120 VAC
15 kVA, Cu-WOUND, 0° SHIFT
(6) 2.5% TAPS (2+/4-)
130°C RISE
220°C CLASS R INSUL
NEMA-2 ENCLOSURE
#10

(I SET)
3#6 (A/B/C) Cu/THHN
I#6 (N) Cu/THHN
I#10 (G) Cu
1"C EMT

LTG PANEL IILA 60A

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Approved	MAF, SK

Title

PROPOSED ONE LINE DIAGRAM

Sheet

E007

ISSUED FOR BID

0 1/2" 1" 2"

(NEW)
DISTRIBUTION SWITCHGEAR
5KV, 1200 A
LOCATED IN "TECO PIT"

EJI 400E CL FUSE
MAIN EPM
MAIN SWITCH
FEEDER "B" TO NURSING BUILDING
CPE INCOMING 4160V SERVICE

(I SET)
3#500KCMIL CU/EPR/133%/MV-105
I#I/0 (N) CU/EPR/133%/MV-105
5"C RGS
MIN 2" CONCRETE ENCASEMENT
SUSPENDED FROM STRUCTURE ABOVE
(RE: STRUCTURAL DRAWINGS)

FEEDER TO NEW SWITCHGEAR REFER TO SHEET E-008 FOR CONTINUATION

ADD ALTERNATE #3 ON THIS SHEET:

C BASE BID: (8 EACH) 600 AT AND (1 EACH) 800 AT BRANCHES IN MAIN SWITCHBOARD GROUP-MOUNTED WITH CABLE FEEDERS TO LOADS AS SHOWN ON E007 AND E008.

ADD ALTERNATE #3: (8 EACH) 600 AT AND (1 EACH) 800 AT BRANCHES STACK- OR INDIVIDUALLY-MOUNTED WITH BUS CONNECTION TO CABLE-TAP BOXES LOCATED ADJACENT TO EACH LOAD AS SHOWN ON E007A AND E008A.

ELECTRICAL ONE-LINE DIAGRAM NOTES:

1. ALL CIRCUIT BREAKERS INDICATED ON ONE LINE DIAGRAM ARE THERMAL-MAGNETIC UNLESS NOTED OTHERWISE AS "ELECTRONIC" EXCLUDING THE MAIN WHICH WILL BE ELECTRONIC AND INSULATED CASE.
2. CIRCUIT BREAKER FRAME SIZES 250 AF AND LARGER SHALL BE ADJUSTABLE TRIP-UNIT TYPE, AND FRAME SIZES LESS THAN 250 AF MAY BE MOLDED-CASE TYPE.
3. PROVIDE CONDUCTORS WITH INSULATION TYPES INDICATED ON ONE LINE DIAGRAM. SUBSTITUTION OF THWN OR THHN IN LIEU OF INDICATED XHHW-2 IS NOT ACCEPTABLE.
4. LOAD SIDE FEEDERS OF INDIVIDUALLY-MOUNTED DISCONNECT SWITCHES AND ENCLOSED CIRCUIT BREAKERS SHALL MATCH LINE SIDE FEEDERS UNLESS LOAD SIDE FEEDER IS SPECIFICALLY INDICATED OTHERWISE.
5. UNDERGROUND FEEDERS SHALL HAVE SCHEDULE-80 PVC CONDUIT BELOW GRADE WITH LONG-SWEEP, TRANSITIONAL ELBOWS TO RGS CONDUIT AT WHEN STUBBING-UP ABOVE GRADE.
6. A PERMANENTLY AFFIXED LABEL SHALL BE APPLIED WITH THE AVAILABLE FAULT CURRENT AT THE TIME OF INSTALLATION AND CALCULATION. THE LABEL SHALL BE 2"X3" IN SIZE AND SHALL BE BLUE LETTERING ON A CONTRASTING BACKGROUND. THIS LABEL SHALL ALSO INCLUDE THE DATE OF THE CALCULATION.
7. ALL SEPARATELY DERIVED GROUND SOURCES TO HAVE A FULL-SIZE GROUNDING ELECTRODE JUMPER TO MAIN GROUNDING BAR IN MAIN ELECTRICAL ROOM TO CREATE A COMMON GROUNDING ELECTRODE SYSTEM FOR THE BUILDING.

(E)PFCC RELOCATED
(I SET)
3#500 (A/B/C) Cu/THHN
I#500 (N) Cu/THHN
I#I/0 (G) Cu
4"C EMT

DRY-TYPE
4160Δ : 480Y/277 VAC
150°C RISE
CLASS H (180°C) INSUL
6.1% IMPEDANCE
2000 kVA

EJI 400E CL FUSE
TVSS 240 kA/MODE 60AT 3P
EPM
MCB
GFI
3000 AF 3000 AT 3 P. 100% LSI+G
KK

(I EACH) SWITCHBOARD A
480Y/277 VAC, 3Ø, 4W, 3000A CU
(SN PLATED) HORIZ BUS, 65 kAIC
NEMA-I ENCLOSURE
LOCATED IN MAIN ELECTRICAL ROOM

3000 AF 3000 AT

01 600AF 600AT 3P
(2 SETS)
3#350 (A/B/C) Cu/THHN
I#350 (N) Cu/THHN
I#I/0 (G) Cu
3"C EMT

02 1600AF 1600AT 3P 100% LSI+G
1600 A FEEDER BUS
ADAPT
EXISTING 1600A BUS DUCT FOR PANELS 7HDP-10HDP. REFER TO SHEET E-010 FOR CONTINUATION.

04 800AF 800AT 3P 100% LSI+G
(2 SETS)
3#600 (A/B/C) Cu/THHN
I#600 (N) Cu/THHN
I#2/0 (G) Cu
4"C EMT
JUNC BOX
SPLICE POINT ON SECOND FLOOR FOR OLD TO NEW
EXISTING WIRE, INTERCEPT IN SECOND FLOOR JANITOR CLOSET
(E) MDP4

05 600AF 600AT 3P
600 A FEEDER BUS
TAP BOX
TRANSITION BUS TO CABLE
(2 SETS)
4#350 Cu/THHN
I#I/0 (G) Cu
3"C EMT
EMERGENCY DISTRIBUTION PANEL 2GDPA
XX
ATS - 2A
TO E2HDPA

06 400AF 400AT 3P
600 A FEEDER BUS
ADAPT
TRANSITION NEW TO OLD BUS
EXISTING 600A BUSDUCT
TAP BOX
TRANSITION TO CABLE IN BASEMENT
(I SET)
4#600 (A/B/C/N) Cu/THHN
I#2/0 (G) Cu
4"C EMT
EMERGENCY DISTRIBUTION PANEL EHDPA
XX
ATS - BA
TO HME

07 600AF 600AT 3P
600 A FEEDER BUS
ADAPT
TRANSITION NEW TO OLD BUS
EXISTING 600A BUSDUCT

GROUND BUS BAR
#3/0 TO WATER PIPE
#3/0 BONDING JUMPER TO GAS PIPE
#3/0 TO BLDG. STEEL
#3/0 TO SLAB & FOOTING REBAR

LTG PANEL 2HDP 600A
(I SET)
3#I/0 (A/B/C) Cu/THHN
I#I/0 (N) Cu/THHN
I#6 (G) Cu
2"C EMT
LTG PANEL 2HA I50A

(I SET)
3#I (A/B/C) Cu/THHN
I#6 (G) Cu
I-I/4"C EMT
(I EACH)
T2P2
480Δ : 208Y/I20 VAC
75 kVA, Cu-WOUND, 0° SHIFT
(6) 2.5% TAPS (2+/4-)
I30°C RISE
220°C CLASS R INSUL
NEMA-2 ENCLOSURE
#I/0
(I SET)
3#4/0 (A/B/C) Cu/THHN
2#4/0 (N) Cu/THHN
I#2 (G) Cu
3"C RGS
225A ENCLOSED CB
(I SET)
3#4/0 (A/B/C) Cu/THHN
2#4/0 (N) Cu/THHN
I#2 (G) Cu
3"C RGS
LTG PANEL 2LA 225A
(I SET)
3#2 (A/B/C) Cu/THHN
I#2 (N) Cu/THHN
I#8 (G) Cu
I-I/2"C RGS
LTG PANEL 2LC I00A

(I SET)
3#I (A/B/C) Cu/THHN
I#6 (G) Cu
I-I/4"C EMT
(I EACH)
T2P1
480Δ : 208Y/I20 VAC
75 kVA, Cu-WOUND, 30° SHIFT
(6) 2.5% TAPS (2+/4-)
I30°C RISE
220°C CLASS R INSUL
NEMA-2 ENCLOSURE
#I/0
(I SET)
3#4/0 (A/B/C) Cu/THHN
2#4/0 (N) Cu/THHN
I#2 (G) Cu
3"C RGS
225A ENCLOSED CB
(I SET)
3#4/0 (A/B/C) Cu/THHN
2#4/0 (N) Cu/THHN
I#2 (G) Cu
3"C RGS
LTG PANEL 2LB 225A
SEC. 2

EXISTING
(I SET)
3#2/0 (A/B/C) Cu/THHN
I#4 (G) Cu
2"C
(I EACH)
T2B2
480Δ : 208Y/I20 VAC
II2.5 kVA, Cu-WOUND, 0° SHIFT
(6) 2.5% TAPS (2+/4-)
I30°C RISE
220°C CLASS R INSUL
NEMA-2 ENCLOSURE
#2/0
(I SET)
3#600 (A/B/C) Cu/THHN
2#600 (N) Cu/THHN
I#2/0 (G) Cu
4"C
400 AT BUS-PLUG CIRCUIT BREAKER
EXISTING BUS DUCT 208Y/I20VAC, 3Ø, 4W, 400A
BP
EXISTING
PANEL 2BA1 I00A
PANEL 2BA2 I00A
PANEL 2BA3 I00A
PANEL 2BA4 I00A
PANEL 2BA5 I00A
PANEL 2BA6 I00A
PANEL 2BA7 I00A

EXISTING
(I SET)
3#2/0 (A/B/C) Cu/THHN
I#4 (G) Cu
2"C
(I EACH)
T2BI
480Δ : 208Y/I20 VAC
II2.5 kVA, Cu-WOUND, 30° SHIFT
(6) 2.5% TAPS (2+/4-)
I30°C RISE
220°C CLASS R INSUL
NEMA-2 ENCLOSURE
#2/0
(I SET)
3#600 (A/B/C) Cu/THHN
2#600 (N) Cu/THHN
I#2/0 (G) Cu
4"C
400 AT BUS-PLUG CIRCUIT BREAKER
EXISTING BUS DUCT 208Y/I20VAC, 3Ø, 4W, 400A
BP
EXISTING
PANEL 2BBI I00A
PANEL 2BB2 I00A
PANEL 2BB3 I00A
PANEL 2BB4 I00A
PANEL 2BB5 I00A
PANEL 2BB6 I00A
PANEL 2BB7 I00A
PANEL 2BB8 I00A
PANEL 2BB9 I00A
PANEL 2BBI0 I00A

VFD HP AHU-ISE
VFD HP AHU-ISW
VFD HP AHU-IE
VFD HP AHU-IW
VFD HP AHU-2E
VFD HP AHU-2W

LTG PANEL PHDP 600A
EXISTING
TO EHDPA
ATS - ELEVATOR
XX
TO EPHA
(I SET)
3#4/0 (A/B/C) Cu/THHN
I#4/0 (N) Cu/THHN
I#4 (G) Cu
2-I/2"C EMT
LTG PANEL IIHA 225A
(I SET)
3#I0 (A/B/C) Cu/THHN
I#I0 (G) Cu
3/4"C EMT
(I EACH)
TII
480Δ : 208Y/I20 VAC
I5 kVA, Cu-WOUND, 0° SHIFT
(6) 2.5% TAPS (2+/4-)
I30°C RISE
220°C CLASS R INSUL
NEMA-2 ENCLOSURE
#I0
(I SET)
3#6 (A/B/C) Cu/THHN
I#6 (N) Cu/THHN
I#I0 (G) Cu
I"C EMT
LTG PANEL IILA 60A

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STATE OF TEXAS
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97498
LICENSED PROFESSIONAL ENGINEER
08/16/2017

REVISIONS

05/31/2017	ISSUED FOR BID
07/28/2017	ADDENDUM 1
08/16/2017	ADDENDUM 2

Sheet Information

Date	31 MARCH 2017
Job Number	-
Drawn	KN, KT, CJT
Checked	IT, SK
Approved	MAF, SK

Title

PROPOSED ONE LINE DIAGRAM ALTERNATE

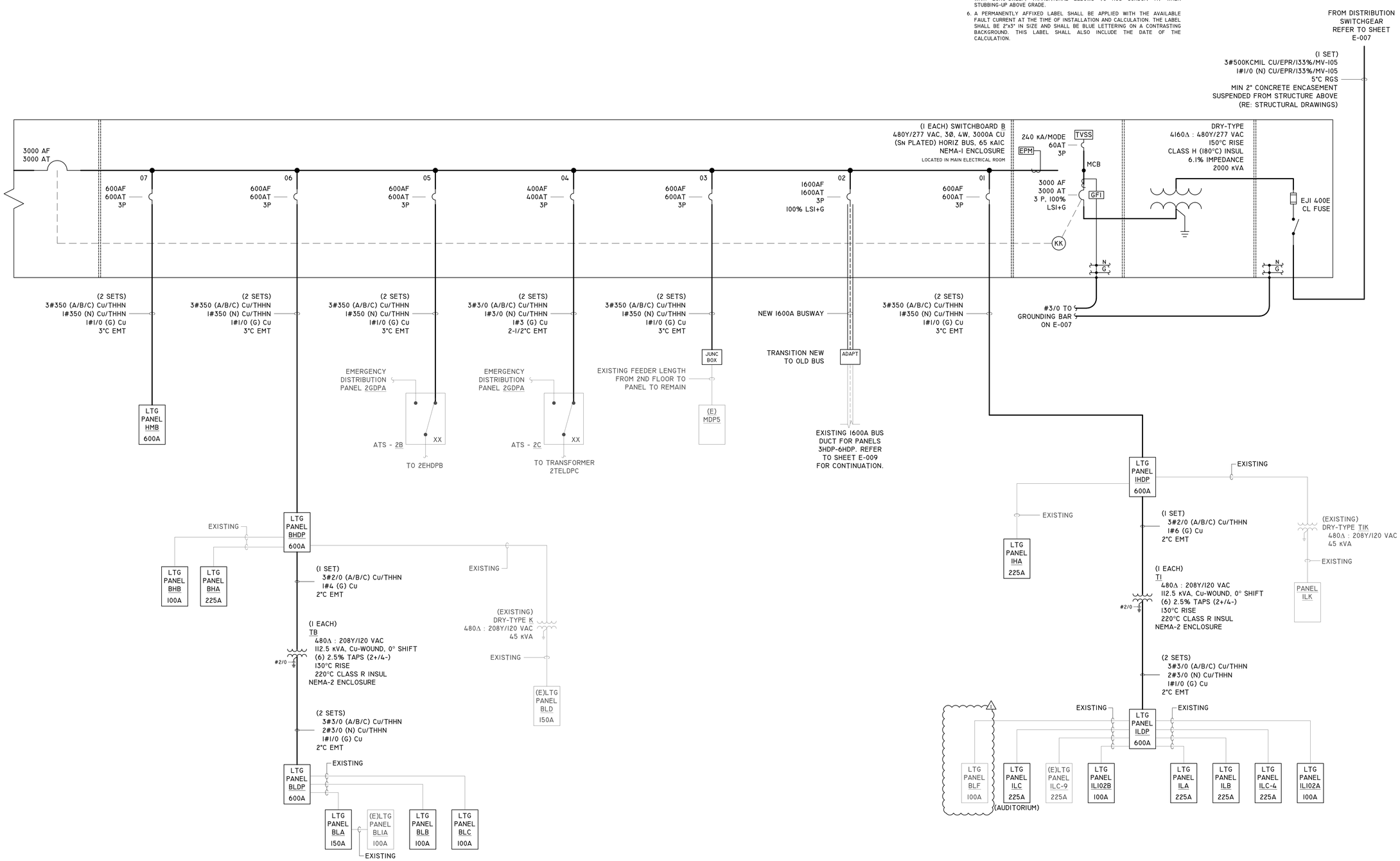
Sheet

E007A
ISSUED FOR BID

0 1/2" 1" 2"

ELECTRICAL ONE-LINE DIAGRAM NOTES:

1. ALL CIRCUIT BREAKERS INDICATED ON ONE LINE DIAGRAM ARE THERMAL-MAGNETIC UNLESS NOTED OTHERWISE AS "ELECTRONIC" EXCLUDING THE MAIN WHICH WILL BE ELECTRONIC AND INSULATED CASE.
2. CIRCUIT BREAKER FRAME SIZES 250 AF AND LARGER SHALL BE ADJUSTABLE TRIP-UNIT TYPE, AND FRAME SIZES LESS THAN 250 AF MAY BE MOLDED-CASE TYPE.
3. PROVIDE CONDUCTORS WITH INSULATION TYPES INDICATED ON ONE LINE DIAGRAM. SUBSTITUTION OF THWN OR THHN IN LIEU OF INDICATED XHHW-2 IS NOT ACCEPTABLE.
4. LOAD SIDE FEEDERS OF INDIVIDUALLY-MOUNTED DISCONNECT SWITCHES AND ENCLOSED CIRCUIT BREAKERS SHALL MATCH LINE SIDE FEEDERS UNLESS LOAD SIDE FEEDER IS SPECIFICALLY INDICATED OTHERWISE.
5. UNDERGROUND FEEDERS SHALL HAVE SCHEDULE-80 PVC CONDUIT BELOW GRADE WITH LONG-SWEEP, TRANSITIONAL ELBOWS TO RGS CONDUIT AT WHEN STUBBING-UP ABOVE GRADE.
6. A PERMANENTLY AFFIXED LABEL SHALL BE APPLIED WITH THE AVAILABLE FAULT CURRENT AT THE TIME OF INSTALLATION AND CALCULATION. THE LABEL SHALL BE 2"x3" IN SIZE AND SHALL BE BLUE LETTERING ON A CONTRASTING BACKGROUND. THIS LABEL SHALL ALSO INCLUDE THE DATE OF THE CALCULATION.



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PROPOSED ONE LINE DIAGRAM

Sheet

E008

ISSUED FOR BID

0 1/2" 1" 2"

ELECTRICAL ONE-LINE DIAGRAM NOTES:

1. ALL CIRCUIT BREAKERS INDICATED ON ONE LINE DIAGRAM ARE THERMAL-MAGNETIC UNLESS NOTED OTHERWISE AS "ELECTRONIC" EXCLUDING THE MAIN WHICH WILL BE ELECTRONIC AND INSULATED CASE.
2. CIRCUIT BREAKER FRAME SIZES 250 AF AND LARGER SHALL BE ADJUSTABLE TRIP-UNIT TYPE, AND FRAME SIZES LESS THAN 250 AF MAY BE MOLDED-CASE TYPE.
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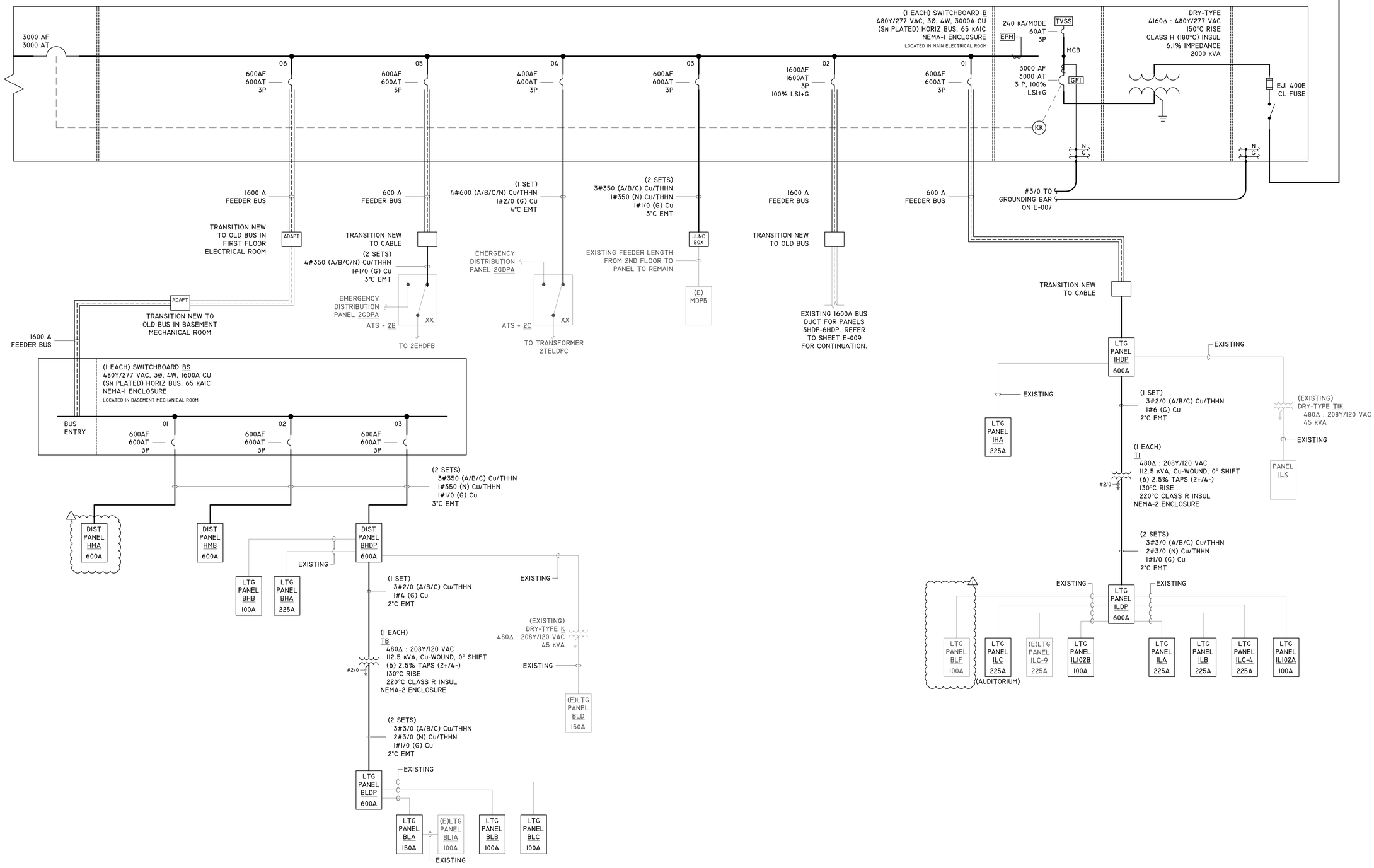
ADD ALTERNATE #3 ON THIS SHEET:

C BASE BID: (8 EACH) 600 AT AND (1 EACH) 800 AT BRANCHES IN MAIN SWITCHBOARD GROUP-MOUNTED WITH CABLE FEEDERS TO LOADS AS SHOWN ON E007 AND E008.

ADD ALTERNATE #3: (8 EACH) 600 AT AND (1 EACH) 800 AT BRANCHES STACK- OR INDIVIDUALLY-MOUNTED WITH BUS CONNECTION TO CABLE-TAP BOXES LOCATED ADJACENT TO EACH LOAD AS SHOWN ON E007A AND E008A.



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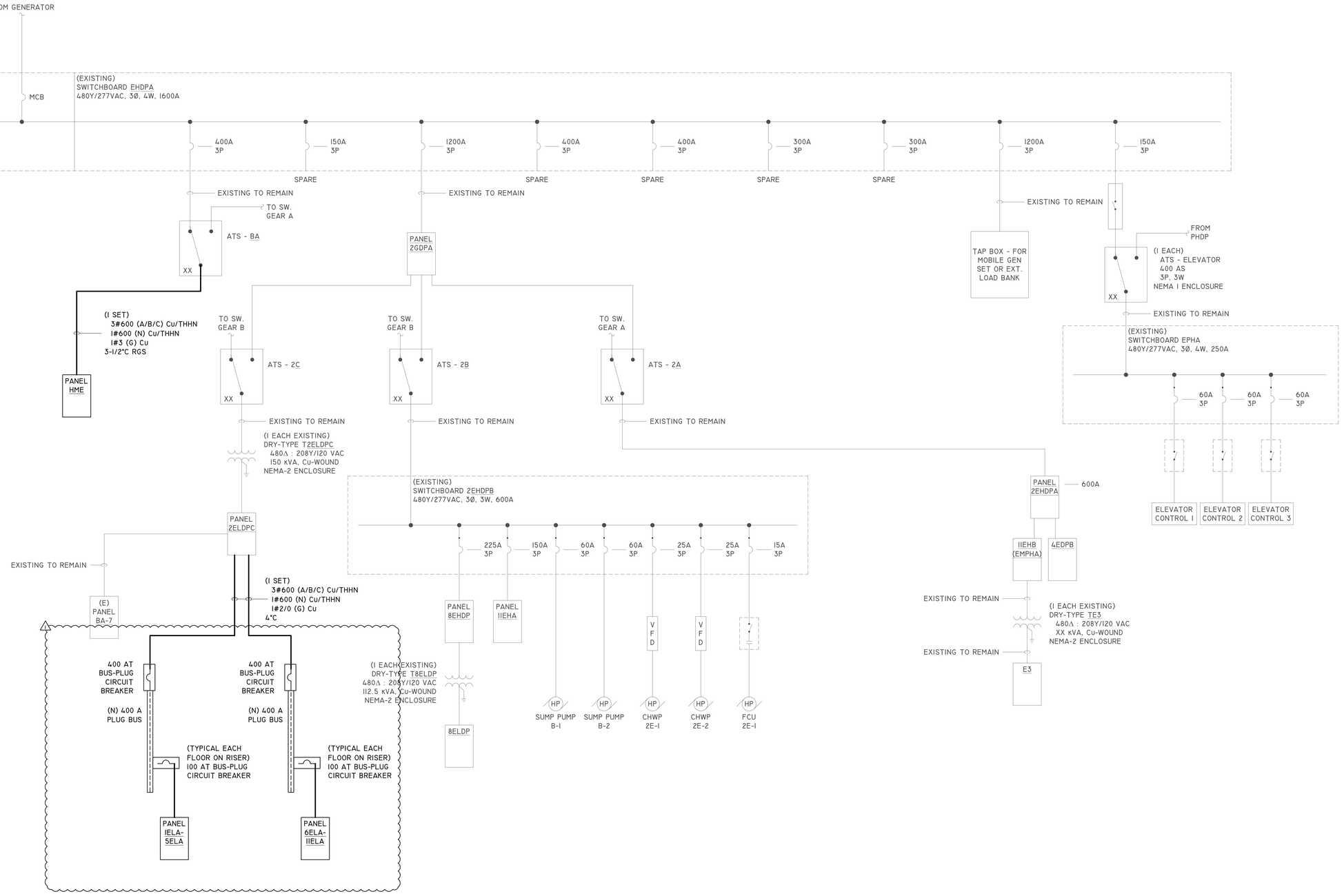
PROPOSED ONE LINE DIAGRAM ALTERNATE

Sheet

E008A

ISSUED FOR BID



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PROPOSED EMERGENCY ONE LINE DIAGRAM

Sheet

E011

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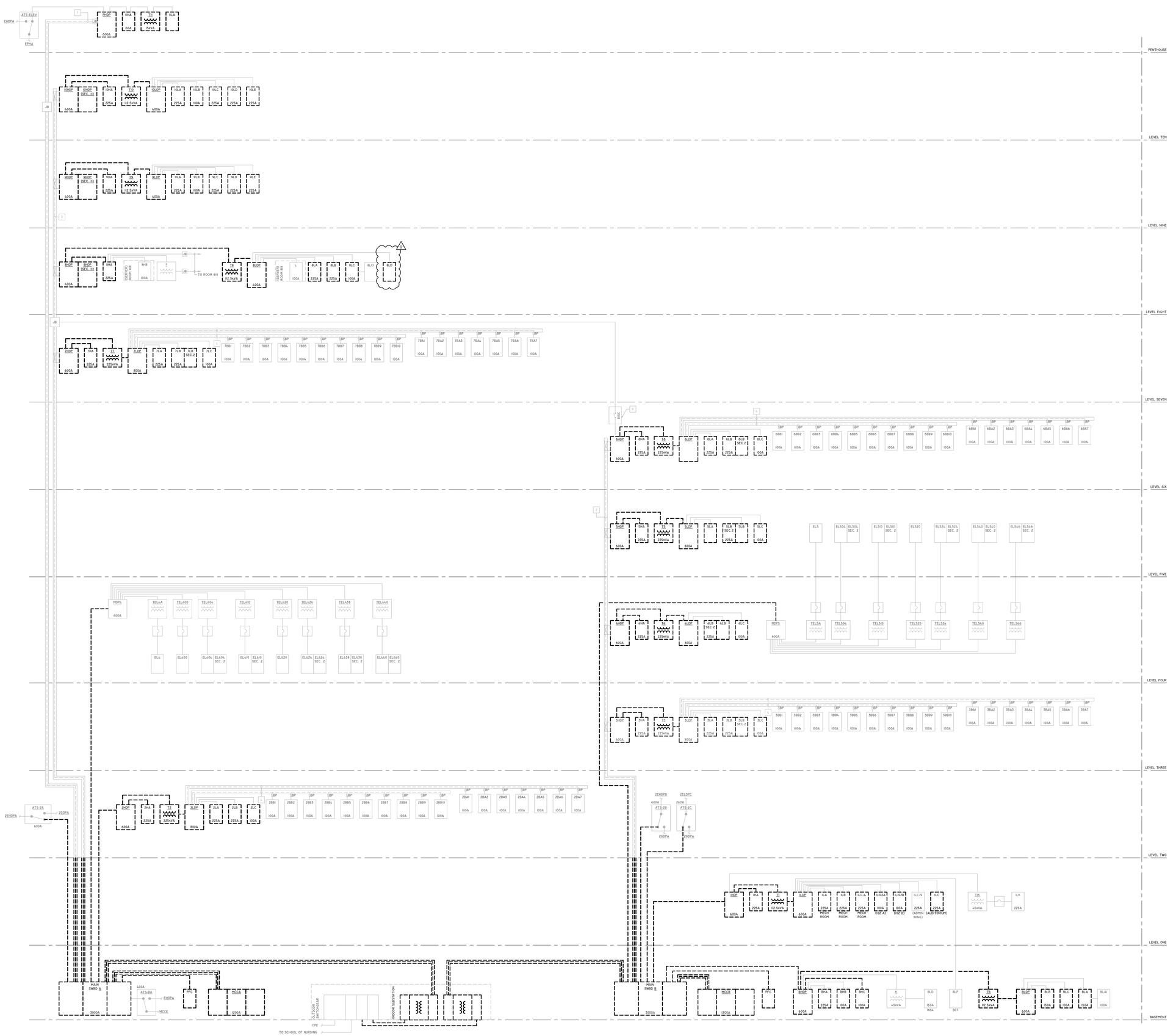

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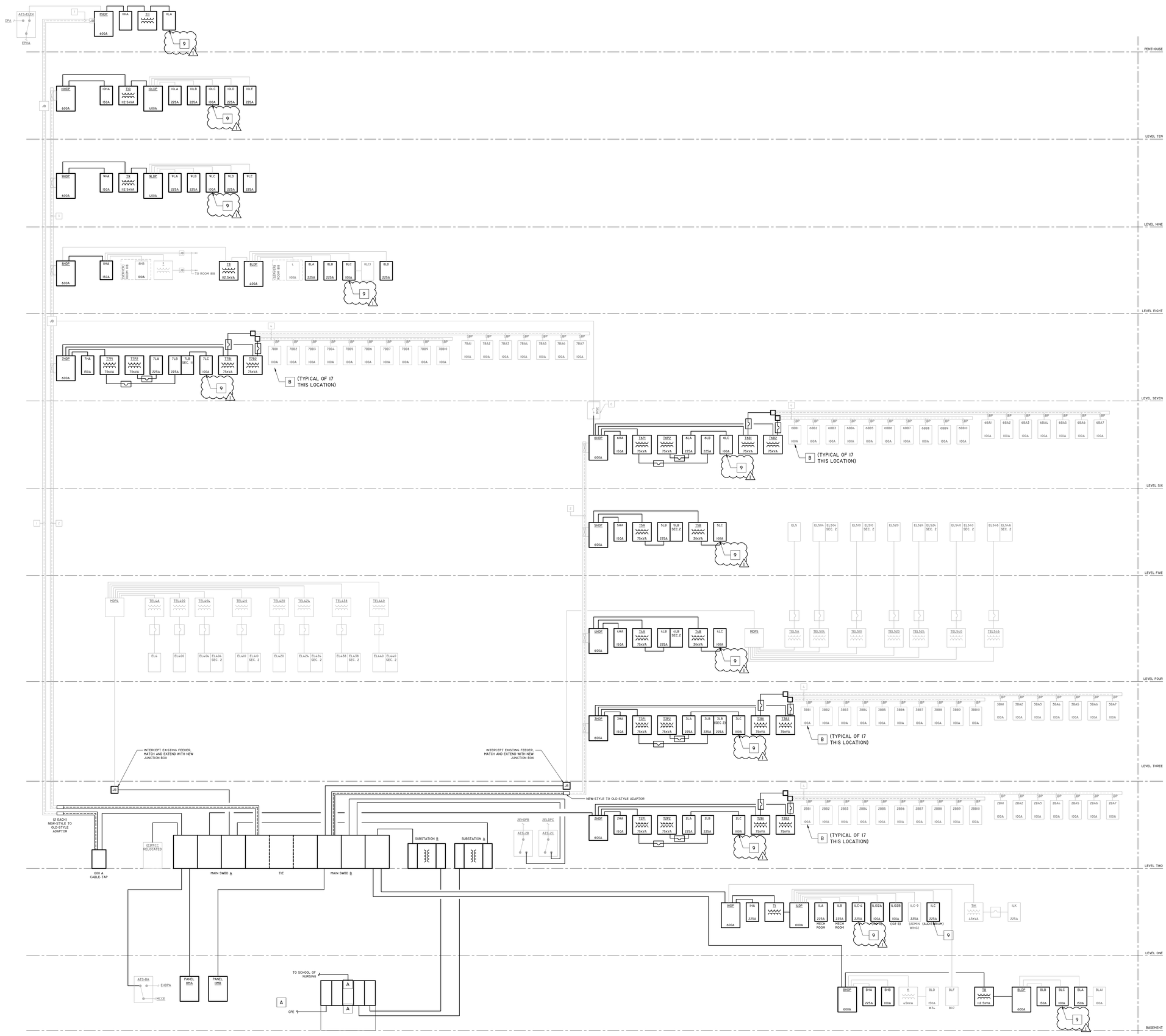
DEMOLITION ELECTRICAL RISER DIAGRAM

Sheet

E012

ISSUED FOR BID



1 **PROPOSED - ELECTRICAL RISER DIAGRAM**
NTS

ELECTRICAL KEYED NOTES:

1. SQD CP-506-GG38470FES 600A BUS DUCT 3P, 4W
2. SQD CF-516GG-I0 1600A BUS DUCT 3P, 4W
3. GE 1600A, 3PH, 4W, BUS DUCT, COPPER
4. SQ D 400A, 3PH, 4W, BUS DUCT, COPPER
5. SQ D 3000A, 3PH, 4W, BUS DUCT, COPPER
6. DISCONNECT, 3Ø (JOINS VERTICAL BUS DUCTS)
7. GE 600A, 3PH, 4W, BUS DUCT, COPPER
8. SQD 600A, 3PH, 4W, BUS DUCT, COPPER
9. ALLOW (2 EACH) 20AT/1P BRANCH CIRCUITS WITH 3#12 IN 3/4"C AT 150'-0" LENGTH FOR USE BY CONTROLS AND FIRE ALARM VENDORS. FIELD COORDINATE EXACT LOAD LOCATIONS AND CLOSEST SOURCE PANEL WITH VENDORS.

SCOPE KEYED NOTES:

A. BASE BID: REPLACE EQUIPMENT WITH LIKE AND PROVIDE NEW CONCRETE PAD AND PLATFORM TO RAISE ELEVATION PER STRUCTURAL DRAWINGS.

DEDUCTIVE ALTERNATE #1: REFURBISHING EQUIPMENT IN LIEU OF REPLACEMENT AND OMIT NEW CONCRETE PAD AND PLATFORM.

B. BASE BID: NO REPLACEMENT OF EXISTING LABORATORY PANELS.

ADD ALTERNATE #2: REPLACE ALL LABORATORY PANELS WITH LIKE (TOTAL 68 SUCH)

C. BASE BID: (8 EACH) 600 AT AND (1 EACH) 800 AT BRANCHES IN MAIN SWITCHBOARD GROUP-MOUNTED WITH CABLE FEEDERS TO LOADS AS SHOWN ON E007 AND E008.

ADD ALTERNATE #3: (8 EACH) 600 AT AND (1 EACH) 800 AT BRANCHES STACK- OR INDIVIDUALLY-MOUNTED WITH BUS CONNECTION TO CABLE-TAP BOXES LOCATED ADJACENT TO EACH LOAD AS SHOWN ON E007A AND E008A.

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07/28/2017	ADDENDUM 1
08/16/2017 1	ADDENDUM 2

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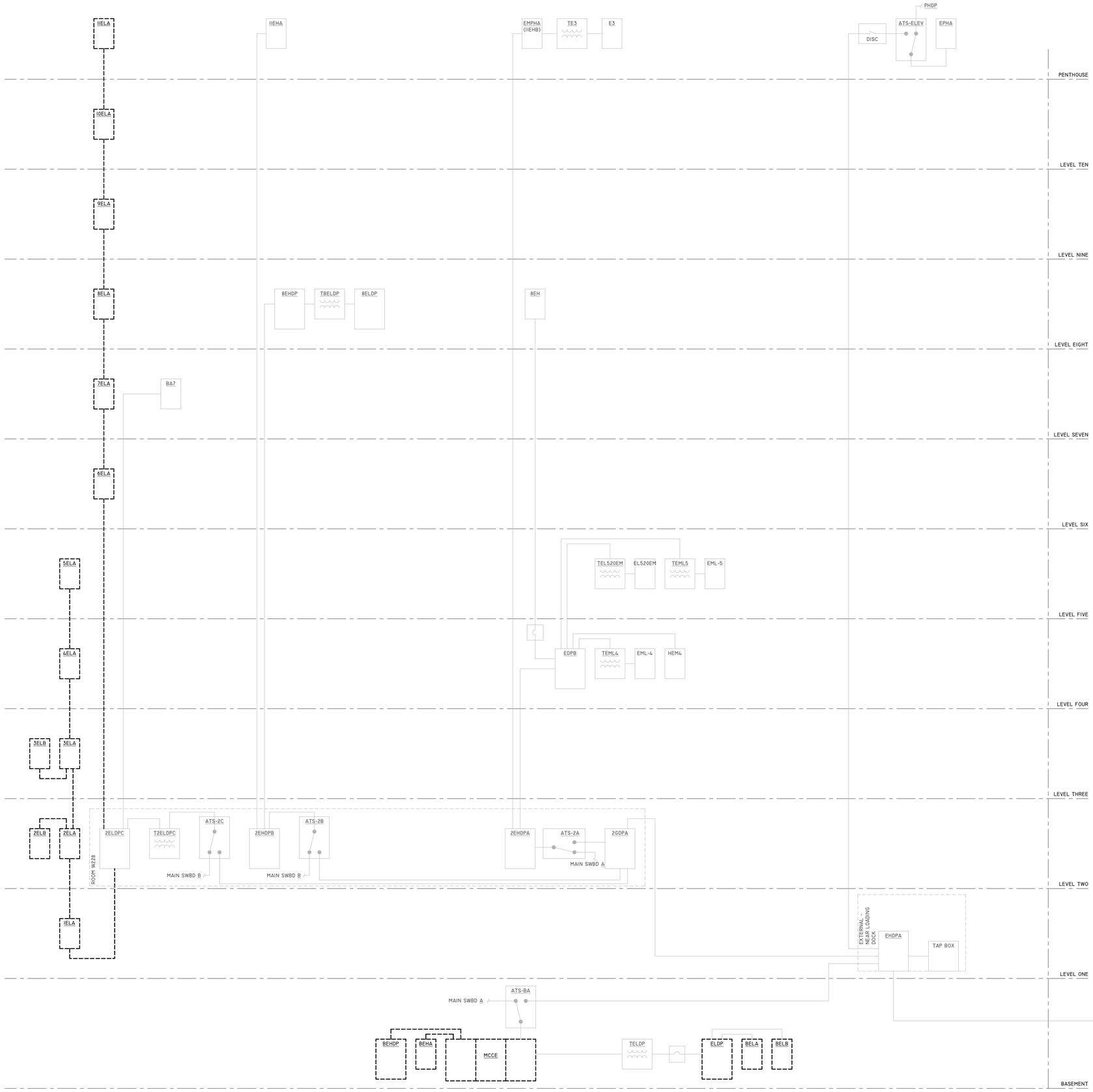
PROPOSED ELECTRICAL RISER DIAGRAM

Sheet

E013

ISSUED FOR BID



1 EXISTING - ELECTRICAL RISER DIAGRAM - EMERGENCY POWER DISTRIBUTION
NTS

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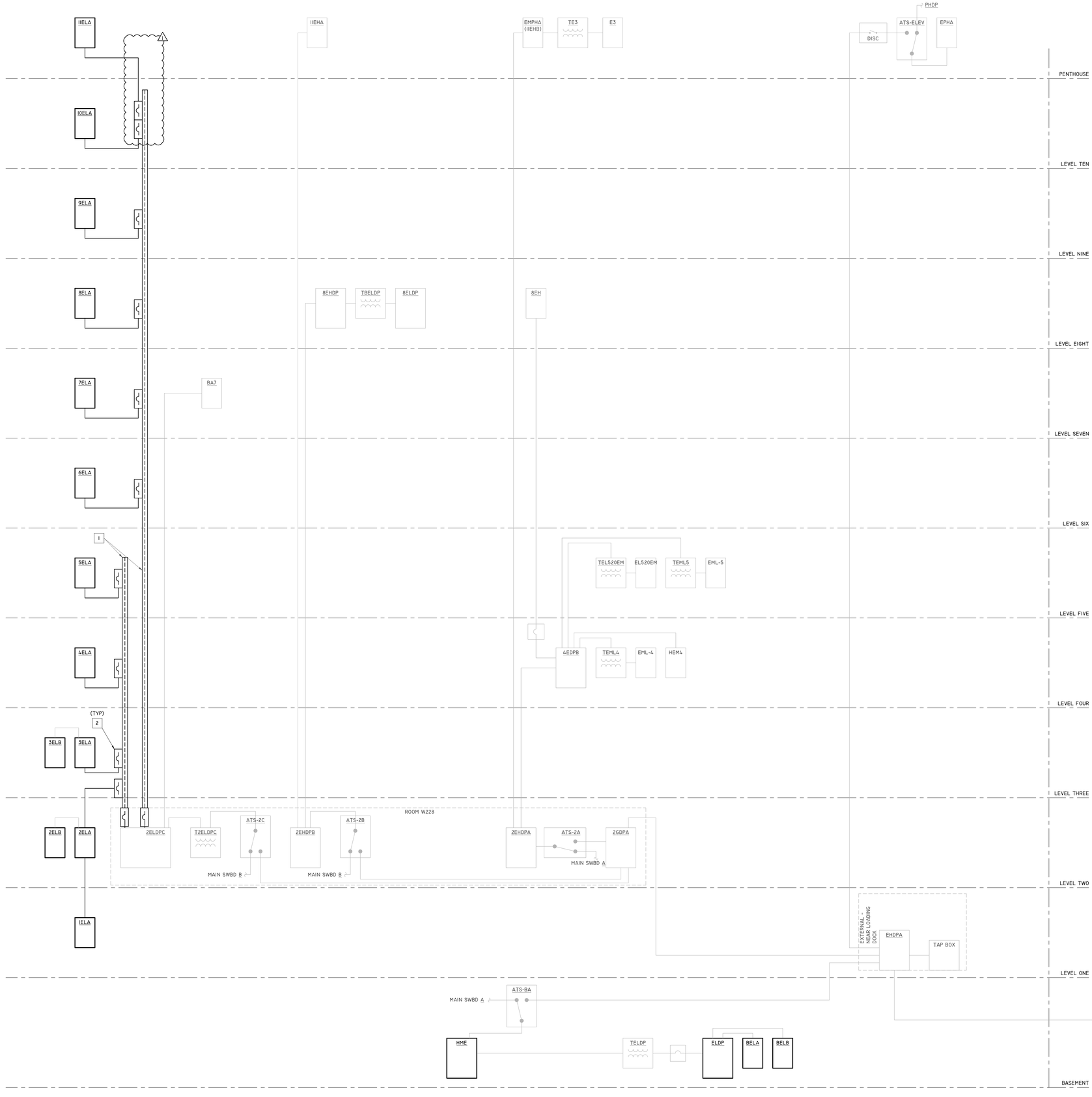
DEMOLITION EMERGENCY ELECTRICAL RISER DIAGRAM

Sheet

E014

ISSUED FOR BID



1 EXISTING - ELECTRICAL RISER DIAGRAM - EMERGENCY POWER DISTRIBUTION
NTS

ELECTRICAL KEYED NOTES:

1. SQD CP-504-GG38470FES 400A PLUG-BUSWAY 3P, 4W
2. 100 AT / 3P CIRCUIT-BREAKER PLUG-UNIT TO MATCH EMERGENCY PLUG-BUS.

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HOUSTON, TEXAS 77057
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(713) 622-0120 PH (713) 622-0557 FAX
WWW.IAHOUSTON.COM

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UT HEALTH SCIENCE SCHOOL OF PUBLIC HEALTH

1200 PRESSLER ST.
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STATE OF TEXAS
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LICENSED PROFESSIONAL ENGINEER

08/16/2017

REVISIONS

05/31/2017	ISSUED FOR BID
07/28/2017	ADDENDUM 1
08/16/2017 △1	ADDENDUM 2

Sheet Information

Date	31 MARCH 2017
Job Number	-
Drawn	KN, KT, CJT
Checked	IT, SK
Approved	MAF, SK

Title

PROPOSED EMERGENCY ELECTRICAL RISER DIAGRAM

Sheet

E015

ISSUED FOR BID

EXISTING PANELBOARD TO BE REMOVED (DEMO THIS PANEL)

REMOVE THIS PANEL IDENTIFY ANY EXISTING LOADS TO REMAIN AND RECONNECT TO SPARES

PANEL: BEHA — LOCATION: W34 — MTG: [X] SURFACE [ ] FLUSH — BUS: [X] NEUTRAL [X] SYS GND [ ] ISO GND — OPT: [ ] INT TVSS [ ] FEED THRU — NEMA-1 ENC — CU MAT — 100 AMP MLO — - AMP MCB — 3 Ø 4 WIRE — 35 KAIC — 480Y/277 VOLT

WIRE SIZE	LOAD DESCRIPTION	LOAD KVA	BRKR SIZE	CKT NO	CKT NO	BRKR SIZE	LOAD KVA	LOAD DESCRIPTION	WIRE SIZE
-	EFBVI	6.6	20	1	2	20	-	SPARE	-
-				3	4		-		-
-			3	5	6	3	-		-
-	SPARE	-	20	7	8	40	13.2	AIR COMP#2	-
-		-		9	10		-		-
-		-	3	11	12	3	-		-
-	SPARE	-	20/1	13	14	30	-	SPARE	-
-	SPARE	-	20/1	15	16		-		-
-	SPARE	-	20/1	17	18	3	-		-
-	SPARE	-	20/1	19	20	20/1	-	LIGHTING - W34	-
-	SPARE	-	20/1	21	22	20/1	-	SPARE	-
-	SPARE	-	20/1	23	24	20/1	-	SPARE	-
	SPACE			25	26			SPACE	
	SPACE			27	28			SPACE	
	SPACE			29	30			SPACE	

CONN LTG - xl.25= - KVA; XFER LOAD - xl.0= - KVA; CONN EQUIP 19.8 xl.0= 19.8 KVA; CONN RCPT - xNEC= - KVA; CONN HVAC - xl.0= - KVA; TOTAL LOAD 19.8 KVA 23.8 AMPS. ALL WIRING FOR 20A/1P CKT. SHALL CONSIST OF 2#12, 1#12G IN 3/4"C UNLESS OTHERWISE NOTED.

*REGARDLESS OF DEMO'ED CIRCUITING SHOWN ABOVE REAL WORLD CONDITIONS MAY VARY FROM AS BUILT DOCUMENTATION. THE CONTRACTOR SHALL FIELD VERIFY AND NOT DISCONNECT ALL EXISTING LOADS THAT ARE TO REMAIN IN OPERATION, INCLUDING BUT NOT LIMITED TO RECEPTACLE, LIGHTING, HVAC, AND EQUIPMENT CIRCUITS. IF THERE IS A CONFLICT NEW LOADS SHALL BE CONNECTED TO NEXT AVAILABLE SPARE IN OTHER SUITABLE PANEL. RE-TYPE PANEL SCHEDULE.

EXISTING PANELBOARD TO BE REMOVED (DEMO THIS PANEL)

REMOVE THIS PANEL IDENTIFY ANY EXISTING LOADS TO REMAIN AND RECONNECT TO SPARES

PANEL: BEHDP — LOCATION: B02 — MTG: [X] SURFACE [ ] FLUSH — BUS: [X] NEUTRAL [X] SYS GND [ ] ISO GND — OPT: [ ] INT TVSS [ ] FEED THRU — NEMA-1 ENC — CU MAT — - AMP MLO — 200 AMP MCB — 3 Ø 4 WIRE — 35 KAIC — 480Y/277 VOLT

WIRE SIZE	LOAD DESCRIPTION	LOAD KVA	BRKR SIZE	CKT NO	CKT NO	BRKR SIZE	LOAD KVA	LOAD DESCRIPTION	WIRE SIZE
-	TRANSDUCER	6.6	20	1	2	40	-	AHU-BW-1 [15 HP]	3#10
-				3	4				1#10G
-			3	5	6	3			3/4"C
-	SPARE	-	20	7	8	20	-	SPARE	-
-		-		9	10		-		-
-		-	3	11	12	3	-		-
-	SPARE	-	20	13	14	20	-	SPARE	-
-		-		15	16		-		-
-		-	3	17	18	3	-		-
-	SPARE	-	20	19	20	20	-	SPARE	-
-		-		21	22		-		-
-		-	3	23	24	3	-		-
-	SPARE	-	20	25	26	20	-	SPARE	-
-		-		27	28		-		-
-		-	3	29	30	3	-		-
-	SPARE	-	20	31	32	20/1	-	SPARE	-
-		-		33	34	20/1	-	SPARE	-
-		-	3	35	36	20/1	-	SPARE	-
-	EXISTING	-	20	37	38	20	-	SPARE	-
-		-		39	40		-		-
-		-	3	41	42	3	-		-

CONN LTG - xl.25= - KVA; XFER LOAD - xl.0= - KVA; CONN EQUIP 24.1 xl.0= 24.1 KVA; CONN RCPT - xNEC= - KVA; CONN HVAC - xl.0= - KVA; TOTAL LOAD 24.1 KVA 29.0 AMPS. ALL WIRING FOR 20A/1P CKT. SHALL CONSIST OF 2#12, 1#12G IN 3/4"C UNLESS OTHERWISE NOTED.

*REGARDLESS OF DEMO'ED CIRCUITING SHOWN ABOVE REAL WORLD CONDITIONS MAY VARY FROM AS BUILT DOCUMENTATION. THE CONTRACTOR SHALL FIELD VERIFY AND NOT DISCONNECT ALL EXISTING LOADS THAT ARE TO REMAIN IN OPERATION, INCLUDING BUT NOT LIMITED TO RECEPTACLE, LIGHTING, HVAC, AND EQUIPMENT CIRCUITS. IF THERE IS A CONFLICT NEW LOADS SHALL BE CONNECTED TO NEXT AVAILABLE SPARE IN OTHER SUITABLE PANEL. RE-TYPE PANEL SCHEDULE.

EXISTING PANELBOARD TO BE REPLACED IN KIND WITH NEW 42 POLE PANELBOARD

PANEL: BELA — LOCATION: W34 — MTG: [X] SURFACE [ ] FLUSH — BUS: [X] NEUTRAL [X] SYS GND [ ] ISO GND — OPT: [ ] INT TVSS [ ] FEED THRU — NEMA-1 ENC — CU MAT — 225 AMP MLO — - AMP MCB — 3 Ø 4 WIRE — 22 KAIC — 208Y/120 VOLT

WIRE SIZE	LOAD DESCRIPTION	LOAD KVA	BRKR SIZE	CKT NO	CKT NO	BRKR SIZE	LOAD KVA	LOAD DESCRIPTION	WIRE SIZE
-	RECEPT FOR FIRE ALARM B6	1.0	20/1	1	2	20/1	1.0	EM RECEPT W16 GEN AREA	-
-	RECPT FREIGHT ELEV+ POLE LIGHTS	1.0	20/1	3	4	20/1	1.0	RECEPT FIRST AID ROOM B4	-
-	NIGHT LIGHTS CORR. 13 + EM LITE B6	1.0	20/1	5	6	20/1	1.0	NIGHT LGTS. W16, 17, 19, 20 +EM TELE	-
-	TELEPHONE RM RECPT	1.0	20/1	7	8	20/1	1.0	FUTURE ELEV. LGT.	-
-	ELEV. LIGHTS	1.0	20/1	9	10	20/1	1.0	FUTURE ELEV. LGT.	-
-	ELEV. LIGHTS	1.0	20/1	11	12	20/1	1.0	AIR COMP CONTROL CRT	-
-	NIGHT, LGTS, EXIT STR. #2 EAST A	1.0	20/1	13	14	20/1	1.0	CONTROL FOR SURGE TANK	-
-	BLD CLOCK	1.0	20/1	15	16	20/1	1.0	RECPT. ELEV #3	-
-	LGTS. CORR W27	1.0	20/1	17	18	20/1	1.0	RECPT. ELEV #1	-
-	CORR. RECPT. W27	1.0	20/1	19	20	20/1	1.0	WASHING MACHINE B	-
-	RECPT. ELEV. #6 RAIN BIRD EAST SIDE	1.0	20/1	21	22	20/1	1.0	A.K COMPRESSOR	-
-	COLDROOM	5.8	40	23	24	20/1	1.0	COMPRESSORS/ HVAC PANEL	-
-	B-4 WIREMOLD			25	26	20/1	1.0	POLE LIGHTS	-
-	HOOD POWER		3	27	28	20/1	1.0	POLE LIGHTS	-
-	EXISTING	1.0	30/1	29	30	20/1	1.0	MEZASYS UNT 120V OA	-
-	W04A BIO-HOOD	1.0	20/1	31	32	20/1	1.0	EXISTING	-
-	METASYS BW19 BHI	1.0	20/1	33	34	20/1	1.0	EXISTING	-
-	METASYS COM BE-1	1.0	20/1	35	36	20/1	1.0	EXISTING	-
-	METASYS CON. BW2	1.0	20/1	37	38	20/1	1.0	3 PHASE MOTOR FOR CW ON RE	-
-	EXISTING	1.0	20/1	39	40	20/1	1.0	W38	-
-	EXISTING	1.0	20/1	41	42	20/1	1.0	W38	-

CONN LTG - xl.25= - KVA; XFER LOAD - xl.0= - KVA; CONN EQUIP 44.8 xl.0= 44.8 KVA; CONN RCPT - xNEC= - KVA; CONN HVAC - xl.0= - KVA; TOTAL LOAD 44.8 KVA 124.0 AMPS. ALL WIRING FOR 20A/1P CKT. SHALL CONSIST OF 2#12, 1#12G IN 3/4"C UNLESS OTHERWISE NOTED.

EXISTING PANELBOARD TO BE REPLACED IN KIND WITH NEW 42 POLE PANELBOARD △1

PANEL: BELB — LOCATION: B09 — MTG: [X] SURFACE [ ] FLUSH — BUS: [X] NEUTRAL [X] SYS GND [ ] ISO GND — OPT: [ ] INT TVSS [ ] FEED THRU — NEMA-1 ENC — CU MAT — AMP MLO — 200 AMP MCB — 3 Ø 4 WIRE — 22 KAIC — 208Y/120 VOLT

WIRE SIZE	LOAD DESCRIPTION	LOAD KVA	BRKR SIZE	CKT NO	CKT NO	BRKR SIZE	LOAD KVA	LOAD DESCRIPTION	WIRE SIZE
-	SPARE	-	70	1	2	20/1	1.0	LIGHTS	-
-		-	2	3	4	20/1	1.0	RECEPT WEST WALL	-
-	SPARE	-	70	5	6	20/1	1.0	RECEPT WEST WALL	-
-		-	2	7	8	20/1	1.0	RECEPT WEST WALL	-
-	EXISTING	1.4	30/1	9	10	30/1	1.0	AC DAMPER	-
-	EXISTING	1.0	20/1	11	12	20/1	1.0	B7 REFRIGER	-
-	EXISTING	1.0	20/1	13	14	20/1	1.0	B7 OVEN	-
-	WBKAL UNIT COMPRESSOR	1.0	20/1	15	16	20/1	1.0	B7 PLUG	-
-	LIGHTS OF WAKING UNIT	1.0	20/1	17	18	30/1	1.4	SPARE	-
-	UPS PHONE SYSTEM B.10	1.7	20	19	20	20	1.7	?	-
-			2	21	22	2			-
-	UPS PHONE SYSTEM B.10	1.7	20	23	24	20/1	1.0	B.9 SPARE 1996	-
-			2	25	26	20/1	1.0	B.9 SPARE 1996	-
-	GATE CAMERA CONTROLS	1.0	20/1	27	28	40	3.4	COUPS?	-
-	EXISTING	1.0	20/1	29	30	2			-
	SPACE			31	32			SPACE	
	SPACE			33	34			SPACE	
	SPACE			35	36			SPACE	
	SPACE			37	38			SPACE	
	SPACE			39	40			SPACE	
	SPACE			41	42			SPACE	

CONN LTG 2.0 xl.25= 2.5 KVA; XFER LOAD - xl.0= - KVA; CONN EQUIP 21.8 xl.0= 21.8 KVA; CONN RCPT 3.0 xNEC= 3.0 KVA; CONN HVAC - xl.0= - KVA; TOTAL LOAD 27.8 KVA 77.0 AMPS. ALL WIRING FOR 20A/1P CKT. SHALL CONSIST OF 2#12, 1#12G IN 3/4"C UNLESS OTHERWISE NOTED.

EXISTING PANELBOARD TO BE REPLACED IN KIND WITH NEW 42 POLE PANELBOARD

PANEL: BHA — LOCATION: W34 — MTG: [X] SURFACE [ ] FLUSH — BUS: [X] NEUTRAL [X] SYS GND [ ] ISO GND — OPT: [ ] INT TVSS [ ] FEED THRU — NEMA-1 ENC — CU MAT — 225 AMP MLO — - AMP MCB — 3 Ø 4 WIRE — 35 KAIC — 480Y/277 VOLT

WIRE SIZE	LOAD DESCRIPTION	LOAD KVA	BRKR SIZE	CKT NO	CKT NO	BRKR SIZE	LOAD KVA	LOAD DESCRIPTION	WIRE SIZE
-	SPARE	-	20	1	2	20/1	2.2	WEST HALLWAY	-
-		-		3	4	20/1	2.2	LIGHTS RM122	-
-		-	3	5	6	20/1	-	SPARE	-
-	LIGHTS E24	2.2	20/1	7	8	20/1	2.2	LIGHTS CORR. W20	-
-	LIGHTS E22	2.2	20/1	9	10	20/1	2.2	LGTS. EM. GEN W19, W17	-
-	LIGHTS E21	2.2	20/1	11	12	20/1	2.2	LGTS. MECH RM. W16	-
-	LGTS. E1, E2, E3	2.2	20/1	13	14	20/1	2.2	LGTS. E123	-
-	LGHTS E4, E5, E6	2.2	20/1	15	16	20/1	2.2	LGTS. E25	-
-	LGTS. ELEV. EQU. E49-63	2.2	20/1	17	18	20/1	2.2	LGTS. MECH. RM 14,16	-
-	ELEV. LOBBY LGTS 01	2.2	20/1	19	20	20/1	2.2	COVE LIGHTS LOBBY	-
-	LIGHTS 03,04 CORR.13	2.2	20/1	21	22	20/1	2.2	EXISTING	-
-	SPARE	-	20/1	23	24	20/1	-	SPARE	-
-	SPARE	-	20/1	25	26	20/1	-	SPARE	-
-	EXISTING	2.2	20/1	27	28	20/1	2.2	EXISTING	-
-	EXISTING	2.2	20/1	29	30	20/1	2.2	EXISTING	-
-	EXISTING	2.2	20/1	31	32	20	-	SPARE	-
-	EXISTING	2.2	20/1	33	34		-		-
-	EXISTING	2.2	20/1	35	36	3	-		-
-	EXISTING	2.2	20/1	37	38			SPACE	
-	EXISTING	2.2	20/1	39	40			SPACE	
-	EXISTING	2.2	20/1	41	42			SPACE	

CONN LTG 37.4 xl.25= 46.8 KVA; XFER LOAD - xl.0= - KVA; CONN EQUIP 23.2 xl.0= 23.2 KVA; CONN RCPT - xNEC= - KVA; CONN HVAC - xl.0= - KVA; TOTAL LOAD 70.0 KVA 84.2 AMPS. ALL WIRING FOR 20A/1P CKT. SHALL CONSIST OF 2#12, 1#12G IN 3/4"C UNLESS OTHERWISE NOTED.

EXISTING PANELBOARD TO BE REPLACED IN KIND WITH NEW 30 POLE PANELBOARD

PANEL: BHB — LOCATION: W34 — MTG: [X] SURFACE [ ] FLUSH — BUS: [X] NEUTRAL [X] SYS GND [ ] ISO GND — OPT: [ ] INT TVSS [ ] FEED THRU — NEMA-1 ENC — CU MAT — 100 AMP MLO — - AMP MCB — 3 Ø 4 WIRE — 35 KAIC — 480Y/277 VOLT

WIRE SIZE	LOAD DESCRIPTION	LOAD KVA	BRKR SIZE	CKT NO	CKT NO	BRKR SIZE	LOAD KVA	LOAD DESCRIPTION	WIRE SIZE
-	SPARE	-	20/1	1	2	20/1	2.2	W34 LTS	-
-	SPARE	-	20/1	3	4	20/1	2.2	W30 & 30B LTS	-
-	SPARE	-	20/1	5	6	20/1	-	SPARE	-
-	SHOP-6E DISCONNECT	6.6	20	7	8	20/1	-	SPARE	-
-		-		9	10	20/1	-	SPARE	-
-		-	3	11	12	20/1	-	SPARE	-
-	SPARE	-	20	13	14	20	-	SPARE	-
-		-		15	16		-		-
-		-	3	17	18	3	-		-

CONN LTG - xl.25= - KVA; XFER LOAD - xl.0= - KVA; CONN EQUIP 11.0 xl.0= 11.0 KVA; CONN RCPT - xNEC= - KVA; CONN HVAC - xl.0= - KVA; TOTAL LOAD 11.0 KVA 13.2 AMPS. ALL WIRING FOR 20A/1P CKT. SHALL CONSIST OF 2#12, 1#12G IN 3/4"C UNLESS OTHERWISE NOTED.

EXISTING PANELBOARD TO BE REMOVED (DEMO THIS PANEL)

REMOVE THIS PANEL IDENTIFY ANY EXISTING LOADS TO REMAIN AND RECONNECT TO SPARES

PANEL: BHC — LOCATION: W34 — MTG: [X] SURFACE [ ] FLUSH — BUS: [X] NEUTRAL [X] SYS GND [ ] ISO GND — OPT: [ ] INT TVSS [ ] FEED THRU — NEMA-1 ENC — CU MAT — 100 AMP MLO — - AMP MCB — 3 Ø 4 WIRE — 35 KAIC — 480Y/277 VOLT

WIRE SIZE	LOAD DESCRIPTION	LOAD KVA	BRKR SIZE	CKT NO	CKT NO	BRKR SIZE	LOAD KVA	LOAD DESCRIPTION	WIRE SIZE
-	SPARE	-	20/1	1	2	20/1	-	SPARE	-
-	SPARE	-	20/1	3	4	20/1	-	SPARE	-
-	SPARE	-	20/1	5	6	20/1	-	SPARE	-
-	SPARE	-	20/1	7	8	20/1	-	SPARE	-
-	SPARE	-	20/1	9	10	20/1	-	SPARE	-
-	SPARE	-	20/1	11	12	20/1	-	SPARE	-
-	SPARE	-	20/1	13	14	20/1	-	SPARE	-
-	SPARE	-	20/1	15	16	20/1	-	SPARE	-
-	SPARE	-	20/1	17	18	20/1	-	SPARE	-
-	SPARE	-	20/1	19	20	20/1	-	SPARE	-
-	SPARE	-	20/1	21	22			SPACE	
-	SPARE	-	20/1	23	24			SPACE	
	SPACE			25	26			SPACE	
	SPACE			27	28			SPACE	
	SPACE			29	30			SPACE	

CONN LTG - xl.25= - KVA; XFER LOAD - xl.0= - KVA; CONN EQUIP - xl.0= - KVA; CONN RCPT - xNEC= - KVA; CONN HVAC - xl.0= - KVA; TOTAL LOAD - KVA - AMPS. ALL WIRING FOR 20A/1P CKT. SHALL CONSIST OF 2#12, 1#12G IN 3/4"C UNLESS OTHERWISE NOTED.

*REGARDLESS OF DEMO'ED CIRCUITING SHOWN ABOVE REAL WORLD CONDITIONS MAY VARY FROM AS BUILT DOCUMENTATION. THE CONTRACTOR SHALL FIELD VERIFY AND NOT DISCONNECT ALL EXISTING LOADS THAT ARE TO REMAIN IN OPERATION, INCLUDING BUT NOT LIMITED TO RECEPTACLE, LIGHTING, HVAC, AND EQUIPMENT CIRCUITS. IF THERE IS A CONFLICT NEW LOADS SHALL BE CONNECTED TO NEXT AVAILABLE SPARE IN OTHER SUITABLE PANEL. RE-TYPE PANEL SCHEDULE.

EXISTING PANELBOARD TO BE REPLACED IN KIND WITH NEW 42 POLE PANELBOARD

PANEL: BLA — LOCATION: BASEMENT HALLWAY — MTG: [ ] SURFACE [X] FLUSH — BUS: [X] NEUTRAL [X] SYS GND [ ] ISO GND — OPT: [ ] INT TVSS [ ] FEED THRU — NEMA-1 ENC — CU MAT — - AMP MLO — 150 AMP MCB — 3 Ø 4 WIRE — 22 KAIC — 208Y/120 VOLT

WIRE SIZE	LOAD DESCRIPTION	LOAD KVA	BRKR SIZE	CKT NO	CKT NO	BRKR SIZE	LOAD KVA	LOAD DESCRIPTION	WIRE SIZE
-	BLANK	-	20/1	1	2	100	14.4	FEED BLA1 PANEL	-
-	LRR 120V PLUG	1.0	20/1	3	4				-
-	BLANK	1.0	20/1	5	6	3			-
-	WEAT OFFICE PLUGS	1.0	20/1	7	8	20/1	-	SPARE	-
-	S. OFFICE PLUG E21, 25	1.0	20/1	9	10	20/1	-	SPARE	-
-	WORK RM. PLUGS	1.0	20/1	11	12	20/1	-	SPARE	-
-	SPARE	-	20/1	13	14	20/1	-	SPARE	-
-	SPARE	-	20/1	15	16	20/1	-	SPARE	-
-	INTERA. & CONF. RM PLUG	1.0	20/1	17	18	20/1	-	SPARE	-
-	MEDIA PLUGS	1.0	20/1	19	20	20/1	1.0	LIBRARY, STUDY IST. FL	-
-	EXISTING	1.0	20/1	21	22	20/1	1.0	DOOR OPENER WEST	-
-	EXISTING	1.0	20/1	23	24	30/1	1.0	LIBRARY STUDY CARRSE	-
-	EDF	1.0	20/1	25	26	20/1	1.0	CAN LGTS. COMPUTER LA	-
-	PLUGS E41	1.0	20/1	27	28	20/1	1.0	ENTRY DOOR EAST OPEN	-
-	FEED PANEL L-E21	1.0	20/1	29	30	20/1	1.0	DOOR OPENER	-
-	FEED PANEL L-E21	1.0	20/1	31	32	20	1.7	COPIER PLUG	-
-	DECK PLUGS	1.0	20/1	33	34	2			-
-	KITCHENETTE, STOV. REF	2.5	30	35	36	20	1.7	208V-B05 SHII	-
-	PLUGS MEDIA SERVICES		2	37	38	2			-
-	RM B09- AIR PUMPS	1.0	20/1	39	40	20/1	1.0	TELE. PLUG/ PROJECTO	-
-	W. DECK & RAIN BIRD	1.0	20/1	41	42	20/1	1.0	HOOD & RECEPTALE	-

CONN LTG - xl.25= - KVA; XFER LOAD 14.4 xl.0= 14.4 KVA; CONN EQUIP 29.9 xl.0= 29.9 KVA; CONN RCPT - xNEC= - KVA; CONN HVAC - xl.0= - KVA; TOTAL LOAD 44.3 KVA 122.7 AMPS. ALL WIRING FOR 20A/1P CKT. SHALL CONSIST OF 2#12, 1#12G IN 3/4"C UNLESS OTHERWISE NOTED.

EXISTING PANELBOARD TO REMAIN

PANEL: BLIA — LOCATION: BASEMENT HALLWAY — MTG: [ ] SURFACE [X] FLUSH — BUS: [X] NEUTRAL [X] SYS GND [ ] ISO GND — OPT: [ ] INT TVSS [ ] FEED THRU — NEMA-1 ENC — CU MAT — 100 AMP MLO — - AMP MCB — 3 Ø 4 WIRE — 22 KAIC — 208Y/120 VOLT

WIRE SIZE	LOAD DESCRIPTION	LOAD KVA	BRKR SIZE	CKT NO	CKT NO	BRKR SIZE	LOAD KVA	LOAD DESCRIPTION	WIRE SIZE
-	PLUG COMP. DESK 120	1.0	20/1	43	44	20/1	1.0	PLUG OFFICE 111-114	-
-	PLUG COMP. DESK 120	1.0	20/1	45	46	20/1	1.0	PLUG OFFICE 111-114	-
-	PLUG COMP. DESK 120	1.0	20/1	47	48	20/1	1.0	PLUG OFFICE 111-114	-
-	PLUG COMP. DESK 120	1.0	20/1	49	50	20/1	1.0	LECTERN POWER	-
-	PLUG COMP. DESK 120	1.0	20/1	51	52	20/1	1.0	LECTERN POWER	-
-	PLUG COMP. DESK 120	1.0	20/1	53	54	20/1	1.0	PROJECTOR PLUGS	-
-	PLUG COMP. DESK 120	1.0	20/1	55	56	20/1	1.0	PLUG FOR LED DISPLAY	-
-	PLUG COMP. DESK 120	1.0	20/1	57	58	20/1	1.0	POWER FOR FRONT LED	-
-	PLUG COMP. DESK 120	1.0	20/1	59	60	20/1	1.0	PROJECTOR SCREEN POW	-
-	PLUG COMP. DESK 120	1.0	20/1	61	62	20/1	1.0	PLUGS OFFICE 116-118	-
-	WATTSTOPPER PANEL	1.0	20/1	63	64	20/1	1.0	PLUGS OFFICE 116-118	-
-	EXISTING	1.0	20/1	65	66	20/1	1.0	HALLWAY	-
-	EXISTING	1.0	20/1	67	68	20/1	1.0	EXISTING	-
	SPACE			69	70			SPACE	
	SPACE			71	72			SPACE	
-	EXISTING	1.0	20/1	73	74	20/1	1.0	EXISTING	-
-	EXISTING	1.0	20/1	75	76	20/1	1.0	EXISTING	-
-	EXISTING	1.0	20/1	77	78	20/1	1.0	EXISTING	-
-	EXISTING	1.0	20/1	79	80	20/1	1.0	EXISTING	-
-	EXISTING	1.0	20/1	81	82	20/1	1.0	EXISTING	-
-	EXISTING	1.0	20/1	83	84	20/1	1.0	EXISTING	-

CONN LTG - xl.25= - KVA; XFER LOAD - xl.0= - KVA; CONN EQUIP 38.0 xl.0= 38.0 KVA; CONN RCPT - xNEC= - KVA; CONN HVAC - xl.0= - KVA; TOTAL LOAD 38.0 KVA 105.2 AMPS. ALL WIRING FOR 20A/1P CKT. SHALL CONSIST OF 2#12, 1#12G IN 3/4"C UNLESS OTHERWISE NOTED.

EXISTING PANELBOARD TO BE REPLACED IN KIND WITH NEW 42 POLE PANELBOARD

PANEL: BLB — LOCATION: BASEMENT HALLWAY — MTG: [ ] SURFACE [X] FLUSH — BUS: [X] NEUTRAL [X] SYS GND [ ] ISO GND — OPT: [ ] INT TVSS [ ] FEED THRU — NEMA-1 ENC — CU MAT — - AMP MLO — 150 AMP MCB — 3 Ø 4 WIRE — 35 KAIC — 208Y/120 VOLT

WIRE SIZE	LOAD DESCRIPTION	LOAD KVA	BRKR SIZE	CKT NO	CKT NO	BRKR SIZE	LOAD KVA	LOAD DESCRIPTION	WIRE SIZE
-	W EXST HALL PLUG	1.0	20/1	1	2	20/1	1.0	RM 123 FT. TV	-
-	PLUGS ELEVATOR LOBBY	1.0	20/1	3	4	20/1	1.0	123 BACK TV	-
-	EXISTING	1.0	20/1	5	6	20/1	1.0	RM 122 FT. TV	-
-	EXISTING	1.7	20	7	8	20/1	1.0	PLUGS W20 & W22	-
-			2	9	10	20/1	1.0	PLUG W16	-
-	EVAPORATOR FAN	1.0	20/1	11	12	20/1	1.0	FUC WEST SIDE	-
-	BEER BOX COMPRESSOR	1.0	20/1	13	14	20/1	1.0	RM 123 PROJECTOR	-
-	RECPT W12-W24	1.0	20/1	15	16	20/1	1.0	RM 123 PROJECT SCREE	-
-	EXISTING	1.0	20/1	17	18	20/1	1.0	LECTERN POWER	-
-	EXISTING	1.0	20/1	19	20	20/1	1.0	RM 122 PROJECTOR	-
-	EXISTING	1.0	20/1	21	22	20/1	1.0	RM 122 SCREEN	-
-	EXISTING	1.0	20/1	23	24	20/1	1.0	RM 122 LECTERN POWER	-
-	RANGE TOP RM 06	10.1	70	25	26	20/1	1.0	EXISTING	-
-			2	27	28	20/1	1.0	FREEZER 07	-
-	RECEPT RM 123	1.0	20/1	29	30	20/1	1.0	RECEPT RM 12	-
-	NEW HALL PLUGS & B02	1.0	20/1	31	32	20/1	1.0	PLUGS RM 05, 06, 07	-
-	RECEPT RM 122	1.0	20/1	33	34	20/1	1.0	RECEPT RM 06	-
-	220 V RECEPT RM 06	1.7	20	35	36	20/1	1.0	RECEPT RM 08, 03	-
-			2	37	38	20/1	1.0	EXISTING	-
-	EXISTING	1.7	20	39	40	20/1	1.0	RECEPT RM 06	-
-			2	41	42	20/1	1.0	EXISTING	-

CONN LTG - xl.25= - KVA; XFER LOAD - xl.0= - KVA; CONN EQUIP 44.4 xl.0= 44.4 KVA; CONN RCPT 6.0 xNEC= 6.0 KVA; CONN HVAC - xl.0= - KVA; TOTAL LOAD 50.4 KVA 139.5 AMPS. ALL WIRING FOR 20A/1P CKT. SHALL CONSIST OF 2#12, 1#12G IN 3/4"C UNLESS OTHERWISE NOTED.

EXISTING PANELBOARD TO BE REPLACED IN KIND WITH NEW 42 POLE PANELBOARD

PANEL: BLC — LOCATION: W34 — MTG: [X] SURFACE [ ] FLUSH — BUS: [X] NEUTRAL [X] SYS GND [ ] ISO GND — OPT: [ ] INT TVSS [ ] FEED THRU — NEMA-1 ENC — CU MAT — 100 AMP MLO — - AMP MCB — 3 Ø 4 WIRE — 22 KAIC — 208Y/120 VOLT

WIRE SIZE	LOAD DESCRIPTION	LOAD KVA	BRKR SIZE	CKT NO	CKT NO	BRKR SIZE	LOAD KVA	LOAD DESCRIPTION	WIRE SIZE
-	SPARE	-	100	1	2	20/1	1.0	CONDENSATE PUMP RM-B2	-
-				3	4	20/1	1.0	CONDENSATE PUMP B2	-
-			3	5	6	20/1	1.0	CONDENSATE PUMP B2	-
-	SPARE	-	20/1	7	8	20/1	1.0	CONDENSATE PUMP B2	-
-	EXISTING	1.0	20/1	9	10	20/1	1.0	CONDENSATE PUMP B2	-
-	EXISTING	1.0	20/1	11	12	20/1	1.0	AIR DRYER #3 GEN. RM	-
-	RECEPT B6	1.0	20/1	13	14	20/1	1.0	B9- SPARE IN HALL	-
-	RECEPT B6	1.0	20/1	15	16	20/1	1.0	B9- SPARE IN HALL	-
-	RECEPT B6	1.0	20/1	17	18	20/1	1.0	B9- SPARE IN HALL	-
-	TECO HEATER	1.0	20/1	19	20	20/1	1.0	B6-SPARE	-
-	RECEPT B7 FREEZER	1.0	20/1	21	22	20/1	1.0	EXISTING	-
-	EXISTING	1.0	20/1	23	24	20/1	1.0	EXISTING	-
-	B2 STEAM WASHER	1.0	20/1	25	26	20/1	1.0	EXISTING	-
-	B2 STEAM WASHER	1.0	20/1	27	28	20/1	1.0	EXISTING	-
-	EXISTING	1.0	20/1	29	30	20/1	1.0	TEGO PIT	-
-	EXISTING	1.0	30/1	31	32	20/1	1.0	TEGO PIT	-
-	EXISTING	1.0	20/1	33	34	20/1	1.0	EXISTING	-
-	EXISTING	1.0	20/1	35	36	30/1	1.0	EXISTING	-
-	EXISTING	1.0	20/1	37	38	30/1	1.0	EXISTING	-
	SPACE			39	40			SPACE	
	SPACE			41	42			SPACE	

CONN LTG - xl.25= - KVA; XFER LOAD - xl.0= - KVA; CONN EQUIP 34.0 xl.0= 34.0 KVA; CONN RCPT - xNEC= - KVA; CONN HVAC - xl.0= - KVA; TOTAL LOAD 34.0 KVA 94.2 AMPS. ALL WIRING FOR 20A/1P CKT. SHALL CONSIST OF 2#12, 1#12G IN 3/4"C UNLESS OTHERWISE NOTED.

EXISTING PANELBOARD TO REMAIN

PANEL: BLD — LOCATION: B10A — MTG: [X] SURFACE [ ] FLUSH — BUS: [X] NEUTRAL [X] SYS GND [ ] ISO GND — OPT: [ ] INT TVSS [ ] FEED THRU — NEMA-1 ENC — CU MAT — - AMP MLO — 150 AMP MCB — 3 Ø 4 WIRE — 22 KAIC — 208Y/120 VOLT

WIRE SIZE	LOAD DESCRIPTION	LOAD KVA	BRKR SIZE	CKT NO	CKT NO	BRKR SIZE	LOAD KVA	LOAD DESCRIPTION	WIRE SIZE
-	RECEPTACLE ROOM B3	2.5	30	1	2	30/1	1.4	AUDITORIUM ROC	-
-			2	3	4	20/1	1.0	RECEPTACLE ROOM B3	-
-	E23	1.0	20/1	5	6	20/1	1.0	RECEPTACLE ROOM B3	-
-	E23	1.0	20/1	7	8	20/1	1.0	RECEPTACLE ROOM B3	-
-	E23	1.0	20/1	9	10	30	-	SPARE	-
-	RECEPTACLE ROOM B3	1.7	20	11	12	2			-
-	WITH 11		2	13	14	20/1	1.0	EXISTING	-
-	WITH 17	2.9	20	15	16	20/1	1.0	EXISTING	-
-	PAPER CUTTER 3Ø 208V RECEP			17	18	30	2.5	DISTILLER	-
-	WITH 15		3	19	20	2			-
-	AUTO CLOSURE STERILIZER IN JBOX	1.0	20/1	21	22	30	2.5	EXISTING	-
-	EXISTING	1.0	20/1	23	24	2			-
-	EXISTING	1.0	20/1	25	26	20/1	1.0	EXISTING	-
-	EXISTING	1.0	20/1	27	28	20/1	1.0	EXISTING	-
-	SPARE	-	50	29	30	20/1	1.0	EXISTING	-
-				31	32	20/1	1.0	EXISTING	-
-			3	33	34	20/1	1.0	EXISTING	-
-	EXISTING	1.0	20/1	35	36	20/1	1.0	EXISTING	-
-	EXISTING	2.5	30	37	38	50	4.2	EXISTING	-
-			2	39	40	2			-
	SPACE			41	42			SPACE	

CONN LTG - xl.25= - KVA; XFER LOAD - xl.0= - KVA; CONN EQUIP 40.2 xl.0= 40.2 KVA; CONN RCPT 7.2 xNEC= 7.2 KVA; CONN HVAC - xl.0= - KVA; TOTAL LOAD 47.4 KVA 131.3 AMPS. ALL WIRING FOR 20A/1P CKT. SHALL CONSIST OF 2#12, 1#12G IN 3/4"C UNLESS OTHERWISE NOTED.

EXISTING PANELBOARD TO BE REPLACED IN KIND

PANEL: BLDP — LOCATION: W34 — MTG: [X] SURFACE [ ] FLUSH — BUS: [X] NEUTRAL [X] SYS GND [ ] ISO GND — OPT: [ ] INT TVSS [ ] FEED THRU — NEMA-1 ENC — CU MAT — - AMP MLO — 600 AMP MCB — 3 Ø 4 WIRE — 22 KAIC — 208Y/120 VOLT

WIRE SIZE	LOAD DESCRIPTION	LOAD KVA	BRKR SIZE	CKT NO	CKT NO	BRKR SIZE	LOAD KVA	LOAD DESCRIPTION	WIRE SIZE
-	BLA	44.3	150	1	2	325	-	MAIN BREAKER	-
-									-
-			3			3			-
-	BLB	50.4	150	3	4	250	-	SPARE	-
-									-
-			3			3			-
-	BLC	34.0	100	5	6	250	-	SPARE	-
-									-
-			3			3			-
-	SPARE	-	70	7	8	250	-	SPARE	-
-									-
-			3			3			-
	SPACE			9	10			SPACE	
	SPACE			11	12			SPACE	
	SPACE			13	14			SPACE	

CONN LTG - xl.25= - KVA; XFER LOAD 128.7 xl.0= 128.7 KVA; CONN EQUIP - xl.0= - KVA; CONN RCPT - xNEC= - KVA; CONN HVAC - xl.0= - KVA; TOTAL LOAD 128.7 KVA 356.5 AMPS. ALL WIRING FOR 20A/1P CKT. SHALL CONSIST OF 2#12, 1#12G IN 3/4"C UNLESS OTHERWISE NOTED.

*REGARDLESS OF DEMO'ED CIRCUITING SHOWN ABOVE REAL WORLD CONDITIONS MAY VARY FROM AS BUILT DOCUMENTATION. THE CONTRACTOR SHALL FIELD VERIFY AND NOT DISCONNECT ALL EXISTING LOADS THAT ARE TO REMAIN IN OPERATION, INCLUDING BUT NOT LIMITED TO RECEPTACLE, LIGHTING, HVAC, AND EQUIPMENT CIRCUITS. IF THERE IS A CONFLICT NEW LOADS SHALL BE CONNECTED TO NEXT AVAILIBLE SPARE IN THE PANEL. RE-TYPE PANEL SCHEDULE.

EXISTING PANELBOARD TO REMAIN

PANEL: BLF — LOCATION: B07 — MTG: [X] SURFACE [ ] FLUSH — BUS: [X] NEUTRAL [X] SYS GND [ ] ISO GND — OPT: [ ] INT TVSS [ ] FEED THRU — NEMA-1 ENC — CU MAT — 100 AMP MLO — - AMP MCB — 3 Ø 4 WIRE — 35 KAIC — 480Y/277 VOLT

WIRE SIZE	LOAD DESCRIPTION	LOAD KVA	BRKR SIZE	CKT NO	CKT NO	BRKR SIZE	LOAD KVA	LOAD DESCRIPTION	WIRE SIZE
-	RECEPTACLES - MAINTENANCE RM.	1.0	20/1	1	2	20/1	1.0	RECEPTACLES - MAINTENANCE RM.	-
-	RECEPTACLES - MAINTENANCE RM.	1.0	20/1	3	4	20/1	1.0	RECEPTACLES - MAINTENANCE RM.	-
-	RECEPTACLES - MAINTENANCE RM.	1.0	20/1	5	6	20/1	1.0	RECEPTACLES - MAINTENANCE RM.	-
-	EXISTING	-	20/1	7	8	20/1	-	EXISTING	-
-	EXISTING	-	20/1	9	10	20/1	-	EXISTING	-
-	EXISTING	-	20/1	11	12	20/1	-	EXISTING	-
-	EXISTING	-	20/1	13	14	20/1	-	EXISTING	-
-	EXISTING	-	20/1	15	16	20/1	-	EXISTING	-
-	EXISTING	-	20	17	18	20/1	-	EXISTING	-
-	EXISTING	-	2	19	20	20/1	-	EXISTING	-
-	EXISTING	-	20/1	21	22	20/1	-	EXISTING	-
-	EXISTING	-	20/1	23	24	20/1	-	EXISTING	-
-	EXISTING	-	20/1	25	26	20/1	-	EXISTING	-
-	EXISTING	-	20/1	27	28	20/1	-	EXISTING	-
-	EXISTING	-	20/1	29	30	20/1	-	EXISTING	-

CONN LTG - xl.25= - KVA; XFER LOAD - xl.0= - KVA; CONN EQUIP - xl.0= - KVA; CONN RCPT 6.0 xNEC= 6.0 KVA; CONN HVAC - xl.0= - KVA; TOTAL LOAD 6.0 KVA 16.6 AMPS. ALL WIRING FOR 20A/1P CKT. SHALL CONSIST OF 2#12, 1#12G IN 3/4"C UNLESS OTHERWISE NOTED.

EXISTING PANELBOARD TO BE REPLACED IN KIND

PANEL: ELDP — LOCATION: W34 — MTG: [X] SURFACE [ ] FLUSH — BUS: [X] NEUTRAL [X] SYS GND [ ] ISO GND — OPT: [ ] INT TVSS [ ] FEED THRU — NEMA-1 ENC — CU MAT — - AMP MLO — 800 AMP MCB — 3 Ø 4 WIRE — 22 KAIC — 208Y/120 VOLT

WIRE SIZE	LOAD DESCRIPTION	LOAD KVA	BRKR SIZE	CKT NO	CKT NO	BRKR SIZE	LOAD KVA	LOAD DESCRIPTION	WIRE SIZE
-	SPARE	-	20/1	1	2	100	-	SPARE	-
-	SPARE	-	20/1	3	4				-
-	SPARE	-	20/1	5	6	3			-
-	FAN CHRGER	1.0	20/1	7	8	175	27.8	PANEL BELB	-
-	SPARE	-	300	9	10				-
-				11	12	3			-
-			3	13	14	225	44.8	BELA	-
-	-	-	-	15	16				-
-	SPARE	-	300	17	18	3			-
-				19	20			SPACE	
-			3	21	22			SPACE	
-	-	-	-	23	24			SPACE	
-	SPARE	-	300	25	26			SPACE	
-				27	28			SPACE	
-			3	29	30			SPACE	
	SPACE			31	32			SPACE	
	SPACE			33	34			SPACE	
	SPACE			35	36			SPACE	
	SPACE			37	38			SPACE	
	SPACE			39	40			SPACE	
	SPACE			41	42			SPACE	

CONN LTG - xl.25= - KVA; XFER LOAD 72.6 xl.0= 72.6 KVA; CONN EQUIP 1.0 xl.0= 1.0 KVA; CONN RCPT - xNEC= - KVA; CONN HVAC - xl.0= - KVA; TOTAL LOAD 73.6 KVA 203.8 AMPS. ALL WIRING FOR 20A/1P CKT. SHALL CONSIST OF 2#12, 1#12G IN 3/4"C UNLESS OTHERWISE NOTED.

GENERAL PANELBOARD NOTES

1. ALL PANELBOARDS AND DISTRIBUTION PANELBOARDS SHALL HAVE A STABILITY HINGED FRONT COVER. THE PANEL BOX SHALL HAVE ENOUGH LIP TO HOLD THE WEIGHT OF THE FRONT HINGED COVER. BOLTED FRONT COVER IS NOT ALLOWED.
2. ALL WIRING SHALL BE INSTALLED NEAT, ORDERLY AND TIE-WRAP, LABEL THE PHASES AND NEUTRALS CIRCUITS, TYPE WRITTEN HARD PAPER DIRECTORY.
3. ALL GROUNDING WIRING SHALL BE INSTALLED ON A SINGLE GROUND BAR. NO DOUBLE LUGGING.
4. NEUTRALS SHALL BE INSTALLED ON SEPARATE NEUTRAL BAR AND NO OTHER WIRING INSTALL. REMOVE THE MANUFACTURED GROUNDING SCREWS TO ISOLATE BOTH THE GROUNDING BAR AND NEUTRAL BAR.
5. PROVIDE A BAKELITE LABEL INDICATING THE PANEL INDICATION, RIVETED IN FRONT OF THE PANEL.
6. EACH PANELBOARD SHALL HAVE A HARD STOCK DIRECTORY CARD. A TYPE WRITTEN DIRECTORY CARD IDENTIFYING THE LOAD SERVED BY EACH BRANCH CIRCUIT IN THE FRAME ON THE PANEL DOOR UNDER A CLEAR PLASTIC COVER. SPARES AND SPACES SHALL BE WRITTEN WITH ERASABLE PENCIL FOR FUTURE USE.
7. LABEL ALL CONDUITS, DEAD FRONT COVER, CONDUCTORS IN THE PANEL (PHASE AND NEUTRAL) WITH THE CIRCUIT NUMBERS OF THE LOAD SERVED.
8. ALL NEUTRAL AND GROUNDING CONDUCTORS MUST BE INSTALLED ON SEPARATE GROUND BARS.
9. ALL BRANCH CIRCUIT CONDUCTORS IN THE PANEL, NEUTRAL CONDUCTORS MUST IDENTIFY OR BE LABELED WITH THE CIRCUIT NUMBER OF THE LOAD SERVED.
10. INSTALL SURFACE-MOUNTED CABINETS AND PANELBOARDS WITH A MINIMUM OF FOUR ANCHORS AND MUST MAINTAIN A 1/4" CLEARANCE FROM THE WALL. USE A UNISTRUT AS MOUNTING STRUCTURE.
11. USE COPPER BUS BARS IN ALL PANELBOARDS.

GENERAL WIRING/LABEL NOTES

GENERAL ELECTRICAL NOTES:

1. PIGTAILING
   - 1.1. CIRCUITING TO ALL NON DEDICATED ELECTRICAL RECEPTACLES AND SWITCHES ARE REQUIRED TO UTILIZE PARALLEL CIRCUITING BY THE USE OF "PIG TAILS" TO EACH DEVICE SO THAT IF AN OUTLET IS REMOVED OR FAILS ELECTRICAL CONTINUITY THE CIRCUIT WILL NOT BE COMPROMISED.
   - 1.2. ALL ELECTRICAL WIRING MUST BE PROPERLY SPLICED BY TWISTING THE WIRES TOGETHER AND USE OF APPROVED AND LISTED COMPRESSION WIRE NUTS FOR ANY WIRING.
   - 1.3. DO NOT USE END TO END BUTT-SPLICING CONNECTORS FOR ANY WIRING.
2. CIRCUIT LABELING
   - 2.1. ALL RECEPTACLE PLATES, LIGHT SWITCH PLACES AND OUTLET BOXES SHALL BE PERMANENTLY LABELED WITH PANEL AND CIRCUIT NUMBER ON OUTSIDE (OR INSIDE) OF COVER PLATE AND INSIDE OF OUTLET BOX.
   - 2.2. RECEPTACLES/SWITCHES: IDENTIFY PANEL BOARD AND CIRCUIT NUMBER FROM WHICH SERVED. USE HOT, STAMPED OR ENGRAVED MACHINE PRINTING WITH BLACK-FILLED LETTERING ON FACE OF PLATE, AND DURABLE WIRE MARKERS OF TAGS INSIDE OUTLET BOXES.
   - 2.3. CIRCUIT WIRING AND NUETRALS INSIDE OF ALL PANELBOARDS ARE REQUIRED TO BE LABELED WITH WIRE TAGS SHOWING CIRUCIT NUMBERS.

PANELBOARDS:
'BEHA' 'BEHDP' 'BELA' 'BELB'
'BHA' 'BHB' 'BHC' 'BLA'
'BLB' 'BLC' 'BLD' 'BLDP'
'BLF' 'ELDP'

Infrastructure Associates
INFRASTRUCTURE ASSOCIATES, INC.
6117 RICHMOND AVENUE, SUITE 200
HOUSTON, TEXAS 77057
TBPE REGISTRATION NO. F-4506
(713) 622-0120 PH (713) 622-0557 FAX
WWW.IAHOUSTON.COM

UTHealth
The University of Texas
Health Science Center at Houston
School of Public Health

UT HEALTH SCIENCE SCHOOL OF PUBLIC HEALTH

1200 PRESSLER ST.
HOUSTON, TX 77030

STATE OF TEXAS — SEVAK KALANTARIANS — 97498 — LICENSED PROFESSIONAL ENGINEER
08/16/2017

REVISIONS

Date	Description
05/31/2017	ISSUED FOR BID
07/28/2017	ADDENDUM 1
08/16/2017 △1	ADDENDUM 2

Sheet Information

Date	31 MARCH 2017
Job Number	-
Drawn	KN, KT, CJT
Checked	IT, SK
Approved	MAF, SK

Title

EXISTING BASEMENT PANEL SCHEDULES

Sheet

E020

ISSUED FOR BID

0 1/2" 1" 2"

PANEL: BHDP
LOCATION: -

MTG: ☒ SURFACE ☐ FLUSH | BUS: ☒ NEUTRAL ☒ SYS GND ☐ ISO GND | OPT: ☐ INT TVSS ☐ FEED THRU | NEMA-1 ENC | CU MAT | - AMP MLO | 600 AMP MCB | 3 Ø 4 WIRE | 35 KAIC | 480Y/277 VOLT

WIRE SIZE	LOAD DESCRIPTION	LOAD KVA	BRKR SIZE	CKT NO	CKT NO	BRKR SIZE	LOAD KVA	LOAD DESCRIPTION	WIRE SIZE
EXIST	(E)PANEL BHA	70.0	225	1	2	100	11.0	(E)PANEL BHB	EXIST
EXIST				3	4				EXIST
EXIST			3	5	6	3			EXIST
3#8	(N) AHU-BE [25 HP]	28	70	7	8	40	18	(N) AHU-BH [15 HP]	3#10
#10G	VIA ACTIVE FRONT END VFD			9	10			VIA ACTIVE FRONT END VFD	#10G
1"C			3	11	12	3			1"C
EXIST	(E) LIBRARY ELEVATOR	50	50	13	14	70	47.4	(E) TRANSFORMER "K"	EXIST
EXIST				15	16				EXIST
EXIST			3	17	18	3			EXIST
EXIST	(E) FREIGHT ELEVATOR	50	50	19	20	80	35	(N) AHU-BW [30 HP]	3#8
EXIST				21	22			VIA ACTIVE FRONT END VFD	#10G
EXIST			3	23	24	3			1"C
-	SPACE	-	-	25	26	100	-	SPARE	-
-	SPACE	-	-	27	28				-
-	SPACE	-	-	29	30	3			-
-	SPACE	-	-	31	32	-	-	SPACE	-
-	SPACE	-	-	33	34	-	-	SPACE	-
-	SPACE	-	-	35	36	-	-	SPACE	-
1-LINE	(N)TRANSFORMER "TB"	90	175	37	38				
	[112.5kVA]			39	40				
			3	41	42				

CONN LTG - x1.25= - KVA | XFER LOAD 218 x1.0= 218 KVA | CONN EQUIP 100 x1.0= 100 KVA | CONN RCPT - xNEC= - KVA | CONN HVAC 81 x1.0= 81 KVA | TOTAL LOAD 399 KVA 480 AMPS | ALL WIRING FOR 20A/1P CKT. SHALL CONSIST OF 2#12, 1#12G IN 3/4"C UNLESS OTHERWISE NOTED.

PANEL: 1HDP
LOCATION: -

MTG: ☒ SURFACE ☐ FLUSH | BUS: ☒ NEUTRAL ☒ SYS GND ☐ ISO GND | OPT: ☐ INT TVSS ☐ FEED THRU | NEMA-1 ENC | CU MAT | - AMP MLO | 600 AMP MCB | 3 Ø 4 WIRE | 35 KAIC | 480Y/277 VOLT

WIRE SIZE	LOAD DESCRIPTION	LOAD KVA	BRKR SIZE	CKT NO	CKT NO	BRKR SIZE	LOAD KVA	LOAD DESCRIPTION	WIRE SIZE
1-LINE	(E)PANEL 1HA	66.0	225	1	2	50	35.0	(E) TRANSFORMER "T1K"	EXIST
				3	4				EXIST
			3	5	6	3			EXIST
-	SPARE		100	7	8	100	-	SPARE	1-LINE
				9	10				
			3	11	12	3			
	SPACE			13	14			SPACE	
	SPACE			15	16			SPACE	
	SPACE			17	18			SPACE	
	SPACE			19	20			SPACE	
	SPACE			21	22			SPACE	
	SPACE			23	24			SPACE	
1-LINE	TRANSFORMER "T1"	90	175	25	26			SPACE	
	[112.5kVA]			27	28			SPACE	
			3	29	30			SPACE	

CONN LTG - x1.25= - KVA | XFER LOAD 191 x1.0= 191 KVA | CONN EQUIP - x1.0= - KVA | CONN RCPT - xNEC= - KVA | CONN HVAC - x1.0= - KVA | TOTAL LOAD 191 KVA 230 AMPS | ALL WIRING FOR 20A/1P CKT. SHALL CONSIST OF 2#12, 1#12G IN 3/4"C UNLESS OTHERWISE NOTED.

PANEL: 2HDP
LOCATION: -

MTG: ☒ SURFACE ☐ FLUSH | BUS: ☒ NEUTRAL ☒ SYS GND ☐ ISO GND | OPT: ☐ INT TVSS ☐ FEED THRU | NEMA-1 ENC | CU MAT | - AMP MLO | 600 AMP MCB | 3 Ø 4 WIRE | 35 KAIC | 480Y/277 VOLT

WIRE SIZE	LOAD DESCRIPTION	LOAD KVA	BRKR SIZE	CKT NO	CKT NO	BRKR SIZE	LOAD KVA	LOAD DESCRIPTION	WIRE SIZE
3#8	AHU-1SW [25 HP]	28	70	1	2	70	28	AHU-1SE [25 HP]	3#8
#10G	VIA ACTIVE FRONT END VFD			3	4			VIA ACTIVE FRONT END VFD	#10G
1"C			3	5	6	3			1"C
3#8	AHU-1W [20 HP]	23	50	7	8	50	23	AHU-1E [20 HP]	3#8
#10G	VIA ACTIVE FRONT END VFD			9	10			VIA ACTIVE FRONT END VFD	#10G
1"C			3	11	12	3			1"C
3#8	AHU-2W [20 HP]	23	50	13	14	50	23	AHU-2E [20 HP]	3#8
#10G	VIA ACTIVE FRONT END VFD			15	16			VIA ACTIVE FRONT END VFD	#10G
1"C			3	17	18	3			1"C
1-LINE	PANEL 2HA	60	225	19	20	100	-	SPARE	-
				21	22				-
			3	23	24	3			-
3#12	FCU-2-1A AND 1B	5	20	25	26	-	-	-	-
#12G	VIA LOCAL COMBO STARTER			27	28	-	-	-	-
3/4"C	600VAC/30AF/10AT/3P/#0/NEMA-1		3	29	30	-	-	-	-
1-LINE	TRANSFORMER "T2P1"	45	125	31	32	175	70	TRANSFORMER "T2B1"	1-LINE
	[75kVA]			33	34			[112.5kVA]	
			3	35	36	3			
1-LINE	TRANSFORMER "T2P2"	45	125	37	38	175	70	TRANSFORMER "T2B2"	1-LINE
	[75kVA]			39	40			[112.5kVA]	
			3	41	42	3			

CONN LTG - x1.25= - KVA | XFER LOAD 290 x1.0= 290 KVA | CONN EQUIP - x1.0= - KVA | CONN RCPT - xNEC= - KVA | CONN HVAC 148 x1.0= 148 KVA | TOTAL LOAD 438 KVA 527 AMPS | ALL WIRING FOR 20A/1P CKT. SHALL CONSIST OF 2#12, 1#12G IN 3/4"C UNLESS OTHERWISE NOTED.

PANEL: 3HDP
LOCATION: -

MTG: ☒ SURFACE ☐ FLUSH | BUS: ☒ NEUTRAL ☒ SYS GND ☐ ISO GND | OPT: ☐ INT TVSS ☐ FEED THRU | NEMA-1 ENC | CU MAT | - AMP MLO | 600 AMP MCB | 3 Ø 4 WIRE | 35 KAIC | 480Y/277 VOLT

WIRE SIZE	LOAD DESCRIPTION	LOAD KVA	BRKR SIZE	CKT NO	CKT NO	BRKR SIZE	LOAD KVA	LOAD DESCRIPTION	WIRE SIZE
3#6	AHU-3W [40 HP]	43	100	1	2	100	43	AHU-3E [40 HP]	3#6
#10G	VIA ACTIVE FRONT END VFD			3	4			VIA ACTIVE FRONT END VFD	#10G
1"C			3	5	6	3			1"C
3#6	OAHU-1 [40 HP]	43	100	7	8	150	40	PANEL 3HA	1-LINE
#10G	VIA ACTIVE FRONT END VFD			9	10				
1"C			3	11	12	3			
				13	14	100	-	SPARE	
				15	16				
				17	18	3			
1-LINE	TRANSFORMER "T3P1"	45	125	19	20	175	70	TRANSFORMER "T3B1"	1-LINE
	[75kVA]			21	22			[112.5kVA]	
			3	23	24	3			
1-LINE	TRANSFORMER "T3P2"	45	125	25	26	175	70	TRANSFORMER "T3B2"	1-LINE
	[75kVA]			27	28			[112.5kVA]	
			3	29	30	3			

CONN LTG - x1.25= - KVA | XFER LOAD 270 x1.0= 270 KVA | CONN EQUIP - x1.0= - KVA | CONN RCPT - xNEC= - KVA | CONN HVAC 129 x1.0= 129 KVA | TOTAL LOAD 399 KVA 480 AMPS | ALL WIRING FOR 20A/1P CKT. SHALL CONSIST OF 2#12, 1#12G IN 3/4"C UNLESS OTHERWISE NOTED.

PANEL: 4HDP
LOCATION: -

MTG: ☒ SURFACE ☐ FLUSH | BUS: ☒ NEUTRAL ☒ SYS GND ☐ ISO GND | OPT: ☐ INT TVSS ☐ FEED THRU | NEMA-1 ENC | CU MAT | - AMP MLO | 600 AMP MCB | 3 Ø 4 WIRE | 35 KAIC | 480Y/277 VOLT

WIRE SIZE	LOAD DESCRIPTION	LOAD KVA	BRKR SIZE	CKT NO	CKT NO	BRKR SIZE	LOAD KVA	LOAD DESCRIPTION	WIRE SIZE
3#6	AHU-4W [40 HP]	43	100	1	2	100	43	AHU-4E [40 HP]	3#6
#10G	VIA ACTIVE FRONT END VFD			3	4			VIA ACTIVE FRONT END VFD	#10G
1"C			3	5	6	3			1"C
3#12	(4 EACH NEW) FCU-4W [1 HP]	6.8	20	7	8	150	22	PANEL 4HA	1-LINE
#12G	600V/30AS/4AF-CC/#0-FVNR/3P/N1			9	10				
3/4"C	VIA LOCAL COMBINATION STARTER		3	11	12	3			
	SPARE	-	100	13	14				
				15	16				
			3	17	18				
				19	20				
				21	22				
				23	24				
1-LINE	TRANSFORMER "T4A"	41	125	25	26	50	20	TRANSFORMER "T4B"	1-LINE
	[75kVA]			27	28			[30kVA]	
			3	29	30	3			

CONN LTG - x1.25= - KVA | XFER LOAD 83 x1.0= 83 KVA | CONN EQUIP - x1.0= - KVA | CONN RCPT - xNEC= - KVA | CONN HVAC 93 x1.0= 93 KVA | TOTAL LOAD 176 KVA 212 AMPS | ALL WIRING FOR 20A/1P CKT. SHALL CONSIST OF 2#12, 1#12G IN 3/4"C UNLESS OTHERWISE NOTED.

PANEL: 5HDP
LOCATION: -

MTG: ☒ SURFACE ☐ FLUSH | BUS: ☒ NEUTRAL ☒ SYS GND ☐ ISO GND | OPT: ☐ INT TVSS ☐ FEED THRU | NEMA-1 ENC | CU MAT | - AMP MLO | 600 AMP MCB | 3 Ø 4 WIRE | 35 KAIC | 480Y/277 VOLT

WIRE SIZE	LOAD DESCRIPTION	LOAD KVA	BRKR SIZE	CKT NO	CKT NO	BRKR SIZE	LOAD KVA	LOAD DESCRIPTION	WIRE SIZE
3#6	AHU-5W [40 HP]	43	100	1	2	100	43	AHU-5E [40 HP]	3#6
#10G	VIA ACTIVE FRONT END VFD			3	4			VIA ACTIVE FRONT END VFD	#10G
1"C			3	5	6	3			1"C
3#12	(4 EACH NEW) FCU-5W [1 HP]	6.8	20	7	8	150	45	PANEL 5HA	1-LINE
#12G	600V/30AS/4AF-CC/#0-FVNR/3P/N1			9	10				
3/4"C	VIA LOCAL COMBINATION STARTER		3	11	12	3			
	SPARE	-	100	13	14				
				15	16				
			3	17	18				
				19	20				
				21	22				
				23	24				
1-LINE	TRANSFORMER "T5A"	41	125	25	26	50	20	TRANSFORMER "T5B"	1-LINE
	[75kVA]			27	28			[30kVA]	
			3	29	30	3			

CONN LTG - x1.25= - KVA | XFER LOAD 106 x1.0= 106 KVA | CONN EQUIP - x1.0= - KVA | CONN RCPT - xNEC= - KVA | CONN HVAC 93 x1.0= 93 KVA | TOTAL LOAD 199 KVA 240 AMPS | ALL WIRING FOR 20A/1P CKT. SHALL CONSIST OF 2#12, 1#12G IN 3/4"C UNLESS OTHERWISE NOTED.

PANEL: 6HDP
LOCATION: -

MTG: ☒ SURFACE ☐ FLUSH | BUS: ☒ NEUTRAL ☒ SYS GND ☐ ISO GND | OPT: ☐ INT TVSS ☐ FEED THRU | NEMA-1 ENC | CU MAT | - AMP MLO | 600 AMP MCB | 3 Ø 4 WIRE | 35 KAIC | 480Y/277 VOLT

WIRE SIZE	LOAD DESCRIPTION	LOAD KVA	BRKR SIZE	CKT NO	CKT NO	BRKR SIZE	LOAD KVA	LOAD DESCRIPTION	WIRE SIZE
3#6	AHU-6W [40 HP]	43	100	1	2	100	43	AHU-6E [40 HP]	3#6
#10G	VIA ACTIVE FRONT END VFD			3	4			VIA ACTIVE FRONT END VFD	#10G
1"C			3	5	6	3			1"C
	SPARE	-	100	7	8	150	60	PANEL 6HA	1-LINE
				9	10				
			3	11	12	3			
				13	14				
				15	16				
				17	18				
1-LINE	TRANSFORMER "T6P1"	45	125	19	20	175	70	TRANSFORMER "T6B1"	1-LINE
	[75kVA]			21	22			[112.5kVA]	
			3	23	24	3			
1-LINE	TRANSFORMER "T6P2"	45	125	25	26	175	70	TRANSFORMER "T6B2"	1-LINE
	[75kVA]			27	28			[112.5kVA]	
			3	29	30	3			

CONN LTG - x1.25= - KVA | XFER LOAD 290 x1.0= 290 KVA | CONN EQUIP - x1.0= - KVA | CONN RCPT - xNEC= - KVA | CONN HVAC 86 x1.0= 86 KVA | TOTAL LOAD 376 KVA 453 AMPS | ALL WIRING FOR 20A/1P CKT. SHALL CONSIST OF 2#12, 1#12G IN 3/4"C UNLESS OTHERWISE NOTED.

PANEL: 7HDP
LOCATION: -

MTG: ☒ SURFACE ☐ FLUSH | BUS: ☒ NEUTRAL ☒ SYS GND ☐ ISO GND | OPT: ☐ INT TVSS ☐ FEED THRU | NEMA-1 ENC | CU MAT | - AMP MLO | 600 AMP MCB | 3 Ø 4 WIRE | 35 KAIC | 480Y/277 VOLT

WIRE SIZE	LOAD DESCRIPTION	LOAD KVA	BRKR SIZE	CKT NO	CKT NO	BRKR SIZE	LOAD KVA	LOAD DESCRIPTION	WIRE SIZE
3#6	(E) AHU-7W [40 HP]	43	100	1	2	100	43	(E) AHU-7E [40 HP]	3#6
#10G	VIA ACTIVE FRONT END VFD			3	4			VIA ACTIVE FRONT END VFD	#10G
1"C			3	5	6	3			1"C
	SPARE	-	100	7	8	150	80	PANEL 7HA	1-LINE
				9	10				
			3	11	12	3			
				13	14				
				15	16				
				17	18				
1-LINE	TRANSFORMER "T7P1"	45	125	19	20	175	70	TRANSFORMER "T7B1"	1-LINE
	[75kVA]			21	22			[112.5kVA]	
			3	23	24	3			
1-LINE	TRANSFORMER "T7P2"	45	125	25	26	175	70	TRANSFORMER "T7B2"	1-LINE
	[75kVA]			27	28			[112.5kVA]	
			3	29	30	3			

CONN LTG - x1.25= - KVA | XFER LOAD 310 x1.0= 310 KVA | CONN EQUIP - x1.0= - KVA | CONN RCPT - xNEC= - KVA | CONN HVAC 86 x1.0= 86 KVA | TOTAL LOAD 396 KVA 477 AMPS | ALL WIRING FOR 20A/1P CKT. SHALL CONSIST OF 2#12, 1#12G IN 3/4"C UNLESS OTHERWISE NOTED.

PANEL: 8HDP
LOCATION: -

MTG: ☒ SURFACE ☐ FLUSH | BUS: ☒ NEUTRAL ☒ SYS GND ☐ ISO GND | OPT: ☐ INT TVSS ☐ FEED THRU | NEMA-1 ENC | CU MAT | - AMP MLO | 600 AMP MCB | 3 Ø 4 WIRE | 35 KAIC | 480Y/277 VOLT

WIRE SIZE	LOAD DESCRIPTION	LOAD KVA	BRKR SIZE	CKT NO	CKT NO	BRKR SIZE	LOAD KVA	LOAD DESCRIPTION	WIRE SIZE
3#6	AHU-8E [30 HP]	33	80	1	2	80	33	AHU-8W [30 HP]	3#6
#10G	VIA ACTIVE FRONT END VFD			3	4			VIA ACTIVE FRONT END VFD	#10G
1"C			3	5	6	3			1"C
3#12	OAHU-8 [5 HP]	7	20	7	8	150	90	PANEL 8HA	1-LINE
#12G	VIA ACTIVE FRONT END VFD			9	10				
3/4"C			3	11	12	3			
3#12	RF-8-1 [1-1/2 HP]	2	10	13	14	10	2	RF-8-2 [1-1/2 HP]	3#12
#12G	VIA VFD			15	16			VIA VFD	#12G
3/4"C			3	17	18	3			3/4"C
				19	20				
				21	22				
				23	24				
1-LINE	TRANSFORMER "T8"	70	175	25	26				
	[112.5kVA]			27	28				
			3	29	30				

CONN LTG - x1.25= - KVA | XFER LOAD 160 x1.0= 160 KVA | CONN EQUIP - x1.0= - KVA | CONN RCPT - xNEC= - KVA | CONN HVAC 77 x1.0= 77 KVA | TOTAL LOAD 237 KVA 285 AMPS | ALL WIRING FOR 20A/1P CKT. SHALL CONSIST OF 2#12, 1#12G IN 3/4"C UNLESS OTHERWISE NOTED.

PANEL: 9HDP
LOCATION: -

MTG: ☒ SURFACE ☐ FLUSH | BUS: ☒ NEUTRAL ☒ SYS GND ☐ ISO GND | OPT: ☐ INT TVSS ☐ FEED THRU | NEMA-1 ENC | CU MAT | - AMP MLO | 600 AMP MCB | 3 Ø 4 WIRE | 35 KAIC | 480Y/277 VOLT

WIRE SIZE	LOAD DESCRIPTION	LOAD KVA	BRKR SIZE	CKT NO	CKT NO	BRKR SIZE	LOAD KVA	LOAD DESCRIPTION	WIRE SIZE
3#6	AHU-9E [30 HP]	33	80	1	2	80	33	AHU-9W [30 HP]	3#6
#10G	VIA ACTIVE FRONT END VFD			3	4			VIA ACTIVE FRONT END VFD	#10G
1"C			3	5	6	3			1"C
3#12	OAHU-9 [5 HP]	7	20	7	8	150	62	PANEL 9HA	1-LINE
#12G	VIA ACTIVE FRONT END VFD			9	10				
3/4"C			3	11	12	3			
3#12	RF-9-1 [1-1/2 HP]	2	10	13	14	10	2	RF-9-2 [1-1/2 HP]	3#12
#12G	VIA VFD			15	16			VIA VFD	#12G
3/4"C			3	17	18	3			3/4"C
				19	20				
				21	22				
				23	24				
1-LINE	TRANSFORMER "T9"	70	175	25	26				
	[112.5kVA]			27	28				
			3	29	30				

CONN LTG - x1.25= - KVA | XFER LOAD 132 x1.0= 132 KVA | CONN EQUIP - x1.0= - KVA | CONN RCPT - xNEC= - KVA | CONN HVAC 77 x1.0= 77 KVA | TOTAL LOAD 209 KVA 252 AMPS | ALL WIRING FOR 20A/1P CKT. SHALL CONSIST OF 2#12, 1#12G IN 3/4"C UNLESS OTHERWISE NOTED.

PANEL: 10HDP
LOCATION: -

MTG: ☒ SURFACE ☐ FLUSH | BUS: ☒ NEUTRAL ☒ SYS GND ☐ ISO GND | OPT: ☐ INT TVSS ☐ FEED THRU | NEMA-1 ENC | CU MAT | - AMP MLO | 600 AMP MCB | 3 Ø 4 WIRE | 35 KAIC | 480Y/277 VOLT

WIRE SIZE	LOAD DESCRIPTION	LOAD KVA	BRKR SIZE	CKT NO	CKT NO	BRKR SIZE	LOAD KVA	LOAD DESCRIPTION	WIRE SIZE
3#6	AHU-10E [40 HP]	43	100	1	2	100	43	AHU-10W [40 HP]	3#6
#10G	VIA ACTIVE FRONT END VFD			3	4			VIA ACTIVE FRONT END VFD	#10G
1"C			3	5	6	3			1"C
3#12	OAHU-10 [5 HP]	7	20	7	8	150	57	PANEL 10HA	1-LINE
#12G	VIA ACTIVE FRONT END VFD			9	10				
3/4"C			3	11	12	3			
3#12	RF-10-1 [1-1/2 HP]	2	10	13	14	10	2	RF-10-2 [1-1/2 HP]	3#12
#12G	VIA VFD			15	16			VIA VFD	#12G
3/4"C			3	17	18	3			3/4"C
				19	20				
				21	22				
				23	24				
1-LINE	TRANSFORMER "T10"	70	175	25	26				
	[112.5kVA]			27	28				
			3	29	30				

CONN LTG - x1.25= - KVA | XFER LOAD 127 x1.0= 127 KVA | CONN EQUIP - x1.0= - KVA | CONN RCPT - xNEC= - KVA | CONN HVAC 97 x1.0= 97 KVA | TOTAL LOAD 224 KVA 270 AMPS | ALL WIRING FOR 20A/1P CKT. SHALL CONSIST OF 2#12, 1#12G IN 3/4"C UNLESS OTHERWISE NOTED.

PANEL: PHDP
LOCATION: -

MTG: ☒ SURFACE ☐ FLUSH | BUS: ☒ NEUTRAL ☒ SYS GND ☐ ISO GND | OPT: ☐ INT TVSS ☐ FEED THRU | NEMA-1 ENC | CU MAT | - AMP MLO | 600 AMP MCB | 3 Ø 4 WIRE | 35 KAIC | 480Y/277 VOLT

WIRE SIZE	LOAD DESCRIPTION	LOAD KVA	BRKR SIZE	CKT NO	CKT NO	BRKR SIZE	LOAD KVA	LOAD DESCRIPTION	WIRE SIZE
3#12	(N) AHU-11 [5 HP]	7	20	1	2	150	20	PANEL 11HA	1-LINE
#12G	VIA ACTIVE FRONT END VFD			3	4				
3/4"C			3	5	6	3			
EXIST	(E) EF-2 [20 HP]	23	60	7	8	20	4	(E) AIR COMP. [3 HP]	EXIST
EXIST	VIA ACTIVE FRONT END VFD			9	10			VIA LOCAL COMBINATION STARTER	EXIST
EXIST			3	11	12	3			EXIST
EXIST	(E) EF-1 [30 HP]	33	70	13	14	20	3	(N) EF-10N	3#12
EXIST	VIA ACTIVE FRONT END VFD			15	16			VIA 480V/10AT/#1/3P/NEMA-3R	#12G
EXIST			3	17	18	3			3/4"C
EXIST	(N) EF-9E [3 HP]	5	15	19	20	200	80	(N) EF-BY-PASS	3#1/0
EXIST	VIA ACTIVE FRONT END VFD			21	22			VIA ACTIVE FRONT END VFD	#6G
EXIST			3	23	24	3			1-1/2"C
	SPARE	-	100	25	26	15	6	(N) EF-7-1	3#12
				27	28			VIA 480V/15AT/#1/3P/NEMA-3R	#12G
			3	29	30	3			3/4"C
				31	32	15	6	(N) EF-7-2	3#12
				33	34			VIA 480V/15AT/#1/3P/NEMA-3R	#12G
				35	36	3			3/4"C
3#12	(N) EF-P1	6	15	37	38				
#12G	VIA 480V/15AT/#1/3P/NEMA-3R			39	40				
3/4"C			3	41	42				

CONN LTG - x1.25= - KVA | XFER LOAD 20 x1.0= 20 KVA | CONN EQUIP - x1.0= - KVA | CONN RCPT - xNEC= - KVA | CONN HVAC 168 x1.0= 168 KVA | TOTAL LOAD 188 KVA 226 AMPS | ALL WIRING FOR 20A/1P CKT. SHALL CONSIST OF 2#12, 1#12G IN 3/4"C UNLESS OTHERWISE NOTED.

PANEL: HMA
LOCATION: -

MTG: ☒ SURFACE ☐ FLUSH | BUS: ☐ NEUTRAL ☒ SYS GND ☐ ISO GND | OPT: ☐ INT TVSS ☐ FEED THRU | NEMA-1 ENC | CU MAT | 600 AMP MLO | - AMP MCB | 3 Ø 3 WIRE | 35 KAIC | 480Δ VOLT

WIRE SIZE	LOAD DESCRIPTION	LOAD KVA	BRKR SIZE	CKT NO	CKT NO	BRKR SIZE	LOAD KVA	LOAD DESCRIPTION	WIRE SIZE
3#12	CONTROL AIR COMPRESSOR [7.5 HP]	9.3	30	1	2	250	103	(E) CHILLED WATER PUMP 1 [100 HP]	3#2/0
1#12G				3	4			VIA ACTIVE FRONT END VFD	1#2/0G
3/4"C			3	5	6	3			2"C
	SPACE			7	8	250	103	(E) CHILLED WATER PUMP 2 [100 HP]	3#2/0
	SPACE			9	10			VIA ACTIVE FRONT END VFD	1#2/0G
	SPACE			11	12	3			2"C
3#12	(N) HOT WATER CIRC. PUMP [1-1/2 HP]	2.5	20	13	14	250	103	(E) CHILLED WATER PUMP 3 [100 HP]	3#2/0
1#12G	600V/30AS/NF/#0-FVNR/3P/N1			15	16			VIA ACTIVE FRONT END VFD	1#2/0G
3/4"C	VIA LOCAL COMBINATION STARTER		3	17	18	3			2"C
	SPACE			19	20			SPACE	
	SPACE			21	22			SPACE	
	SPACE			23	24			SPACE	
	SPACE			25	26			SPACE	
	SPACE			27	28			SPACE	
	SPACE			29	30			SPACE	

CONN LTG - x1.25= - KVA | LARG MTR 103 x0.25= 26 KVA | CONN MOTOR 321 x1.0= 321 KVA | CONN RCPT - xNEC= - KVA | CONN HVAC - x1.0= - KVA | TOTAL LOAD 347 KVA 418 AMPS | ALL WIRING FOR 20A/1P CKT. SHALL CONSIST OF 2#12, 1#12G IN 3/4"C UNLESS OTHERWISE NOTED.

PANEL: HMB
LOCATION: -

MTG: ☒ SURFACE ☐ FLUSH | BUS: ☐ NEUTRAL ☒ SYS GND ☐ ISO GND | OPT: ☐ INT TVSS ☐ FEED THRU | NEMA-1 ENC | CU MAT | 600 AMP MLO | - AMP MCB | 3 Ø 3 WIRE | 35 KAIC | 480Δ VOLT

WIRE SIZE	LOAD DESCRIPTION	LOAD KVA	BRKR SIZE	CKT NO	CKT NO	BRKR SIZE	LOAD KVA	LOAD DESCRIPTION	WIRE SIZE
3#12	FCU-B-1 [1 HP]	1.7	10	1	2	225	54	HWP-1 [50 HP]	3#3
1#12G	600V/10AT/#00-FVNR/3P/N1			3	4			VIA ACTIVE FRONT END VFD	1#8G
3/4"C	VIA LOCAL COMBINATION STARTER		3	5	6	3			1-1/4"C
3#12	FCU-B-2 [1 HP]	1.7	10	7	8	225	54	HWP-2 [50 HP]	3#3
1#12G	600V/10AT/#00-FVNR/3P/N1			9	10			VIA ACTIVE FRONT END VFD	1#8G
3/4"C	VIA LOCAL COMBINATION STARTER		3	11	12	3			1-1/4"C
3#12	FCU-B-3 [1 HP]	1.7	10	13	14	30	10	CRU-1 [DUPLEX 5 HP]	3#10
1#12G	600V/10AT/#00-FVNR/3P/N1			15	16			VIA VFCI VFD	1#10G
3/4"C	VIA LOCAL COMBINATION STARTER		3	17	18	3			3/4"C
				19	20	30	10	CRU-2 [DUPLEX 5 HP]	3#10
				21	22			VIA VFCI VFD	1#10G
				23	24	3			3/4"C
				25	26			SPACE	
				27	28			SPACE	
				29	30			SPACE	

CONN LTG - x1.25= - KVA | LARG MTR 54 x0.25= 13.5 KVA | CONN MOTOR 133.1 x1.0= 133.1 KVA | CONN RCPT - xNEC= - KVA | CONN HVAC - x1.0= - KVA | TOTAL LOAD 146.6 KVA 176 AMPS | ALL WIRING FOR 20A/1P CKT. SHALL CONSIST OF 2#12, 1#12G IN 3/4"C UNLESS OTHERWISE NOTED.

PANEL: HME
LOCATION: -

MTG: ☒ SURFACE ☐ FLUSH | BUS: ☒ NEUTRAL ☒ SYS GND ☐ ISO GND | OPT: ☐ INT TVSS ☐ FEED THRU | NEMA-1 ENC | CU MAT | - AMP MLO | 400 AMP MCB | 3 Ø 4 WIRE | 35 KAIC | 480Y/277 VOLT

WIRE SIZE	LOAD DESCRIPTION	LOAD KVA	BRKR SIZE	CKT NO	CKT NO	BRKR SIZE	LOAD KVA	LOAD DESCRIPTION	WIRE SIZE
3#10	SEWAGE EJECTOR P-1	10	30	1	2	20	6	SUMP PUMP P-2	3#12
1#10G	VIA LOCAL COMBINATION STARTER			3	4			VIA LOCAL COMBINATION STARTER	1#12G
3/4"C			3	5	6	3			3/4"C
3#12	SEWAGE EJECTOR P-3	2	15	7	8			SPACE	
1#12G	VIA LOCAL COMBINATION STARTER			9	10			SPACE	
3/4"C			3	11	12			SPACE	
	SPACE			13	14	50	20	(E) DWP-1,2 BOOST PUMPS [DUPLEX 10HP]	3#8
	SPACE			15	16			VIA VFD	1#10G
	SPACE			17	18	3			1"C
	SPACE			19	20	100	20	TRANSFORMER "TELDP"	3#2
	SPACE			21	22				1#2
	SPACE			23	24	3			1-1/2"C
				25	26	20	5	EF-BV1	EXIST
				27	28			PATCH AND EXTEND EXISTING WIRES	EXIST
				29	30	3			EXIST
				31	32				
				33	34				
				35	36				
				37	38				
				39	40				
				41	42				

CONN LTG - x1.25= - KVA | XFER LOAD 20 x1.0= 20 KVA | CONN EQUIP 33 x1.0= 33 KVA | CONN RCPT - xNEC= - KVA | CONN HVAC - x1.0= - KVA | TOTAL LOAD 53 KVA 64 AMPS | ALL WIRING FOR 20A/1P CKT. SHALL CONSIST OF 2#12, 1#12G IN 3/4"C UNLESS OTHERWISE NOTED.

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08/16/2017

REVISIONS

Date	Revision
05/31/2017	ISSUED FOR BID
07/28/2017	ADDENDUM 1
08/16/2017 △1	ADDENDUM 2

Sheet Information

Date	31 MARCH 2017
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Title

PROPOSED PANEL SCHEDULES

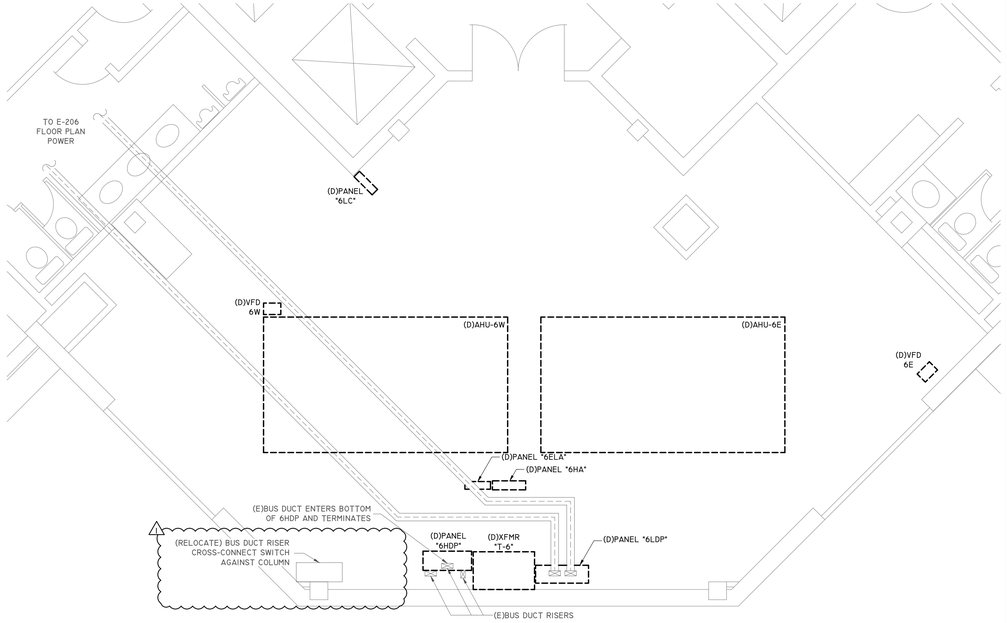
Sheet

E035

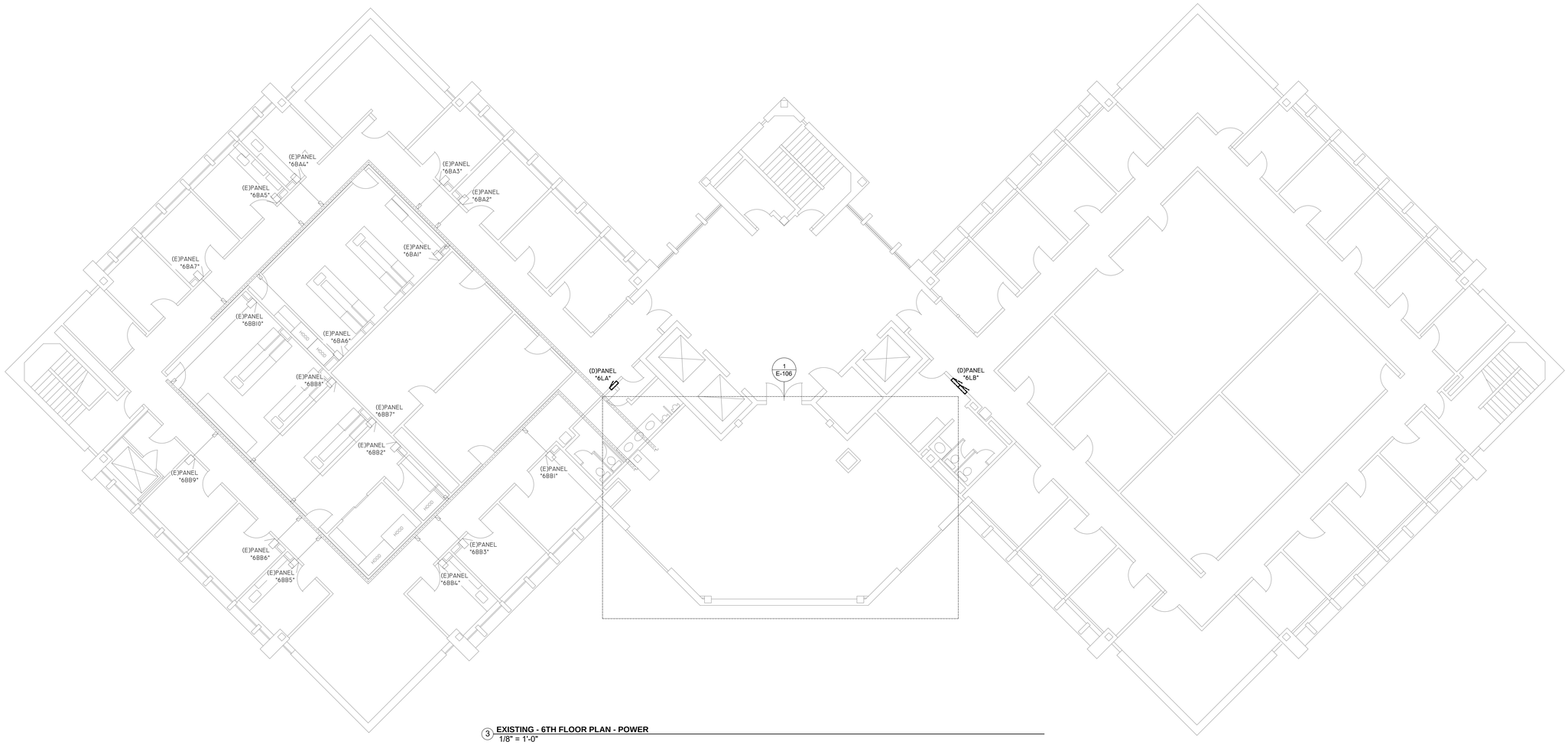
ISSUED FOR BID

0 1/2" 1" 2"

2 EXISTING - 6TH FLOOR ELECTRICAL DISTRIBUTION LINEUP
NTS



1 EXISTING - 6TH FLOOR MECHANICAL ROOM - POWER
1/4" = 1'-0"



3 EXISTING - 6TH FLOOR PLAN - POWER
1/8" = 1'-0"

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Title

EXISTING SIXTH FLOOR PLAN POWER

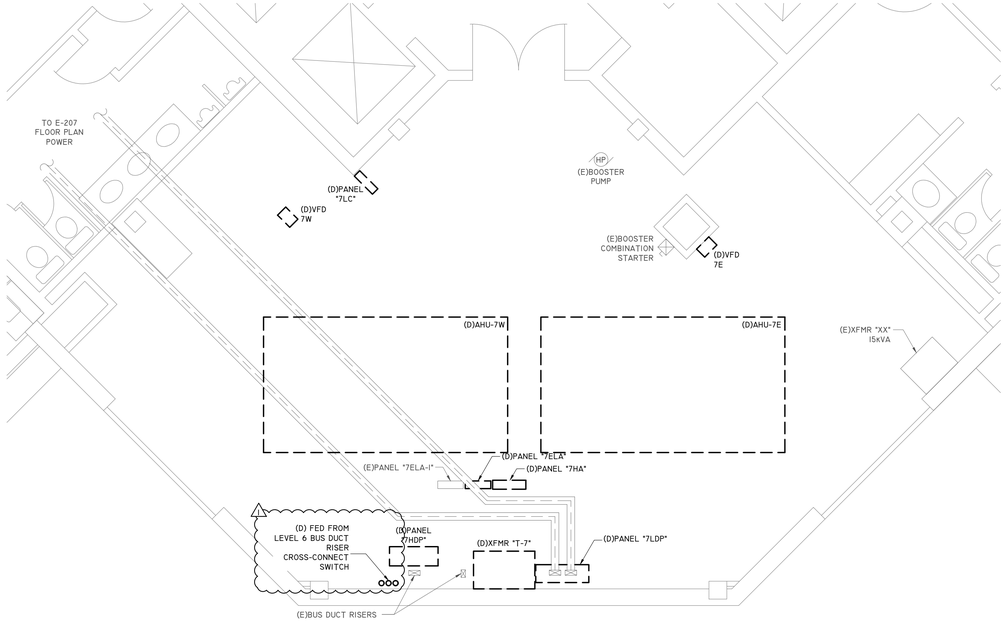
Sheet

E106

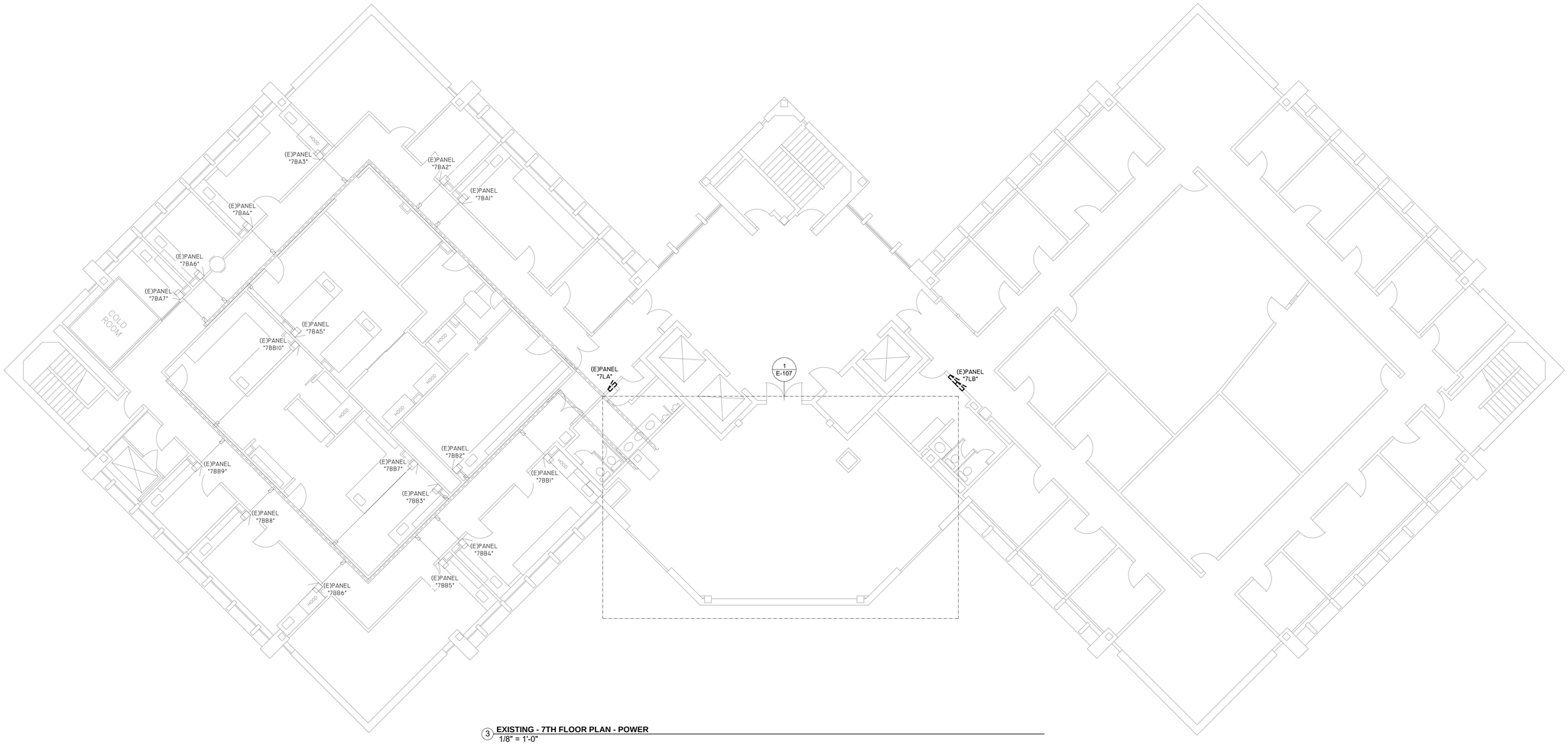
ISSUED FOR BID

0 1/2" 1" 2"

2 EXISTING - 7TH FLOOR ELECTRICAL DISTRIBUTION LINEUP
NTS



1 EXISTING - 7TH FLOOR MECHANICAL ROOM - POWER
1/4" = 1'-0"



3 EXISTING - 7TH FLOOR PLAN - POWER
1/8" = 1'-0"

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Title

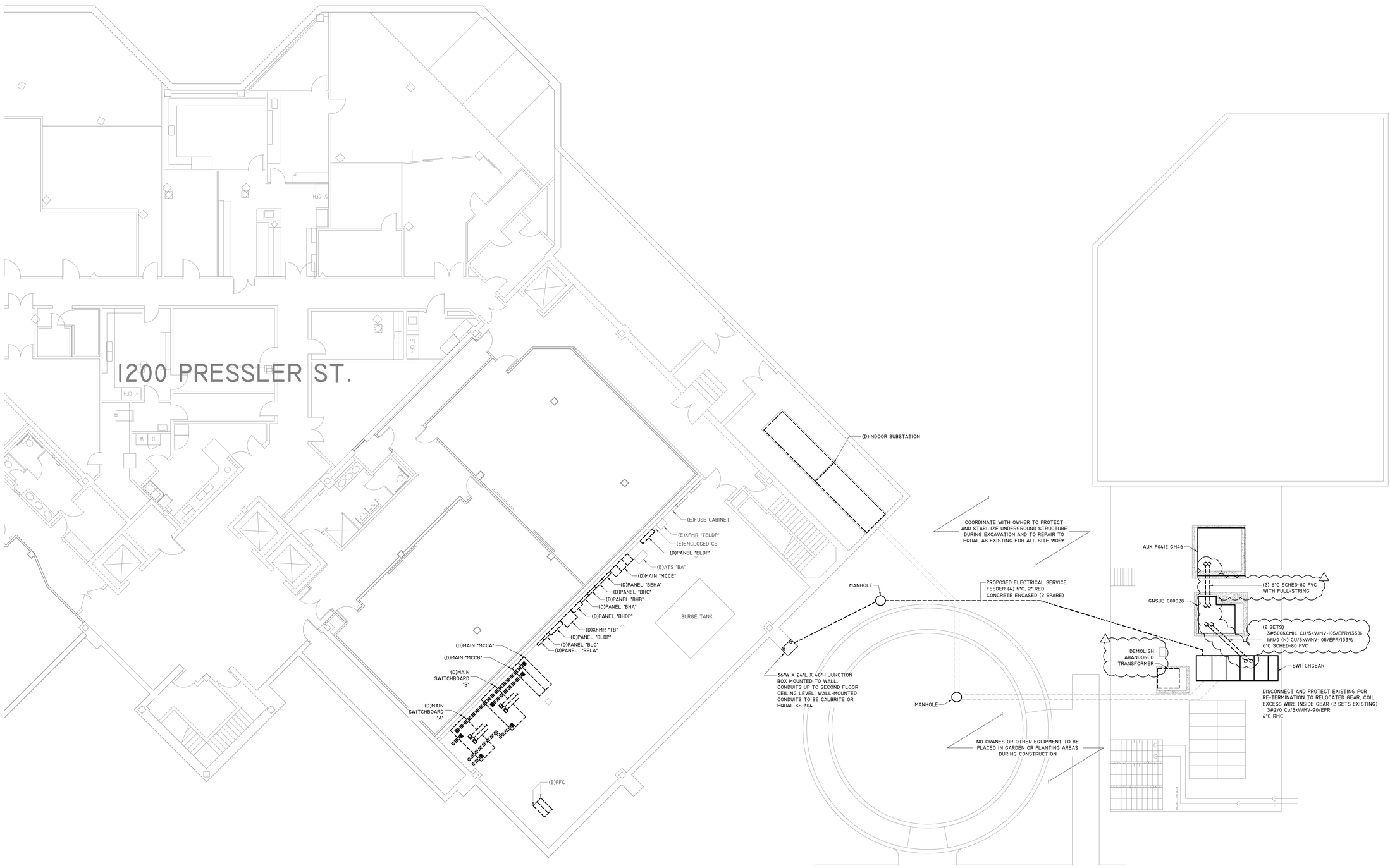
EXISTING SEVENTH FLOOR PLAN POWER

Sheet

E107

ISSUED FOR BID

0 1/2" 1" 2"



1 **SITE PLAN - POWER**
1/8" = 1'-0"

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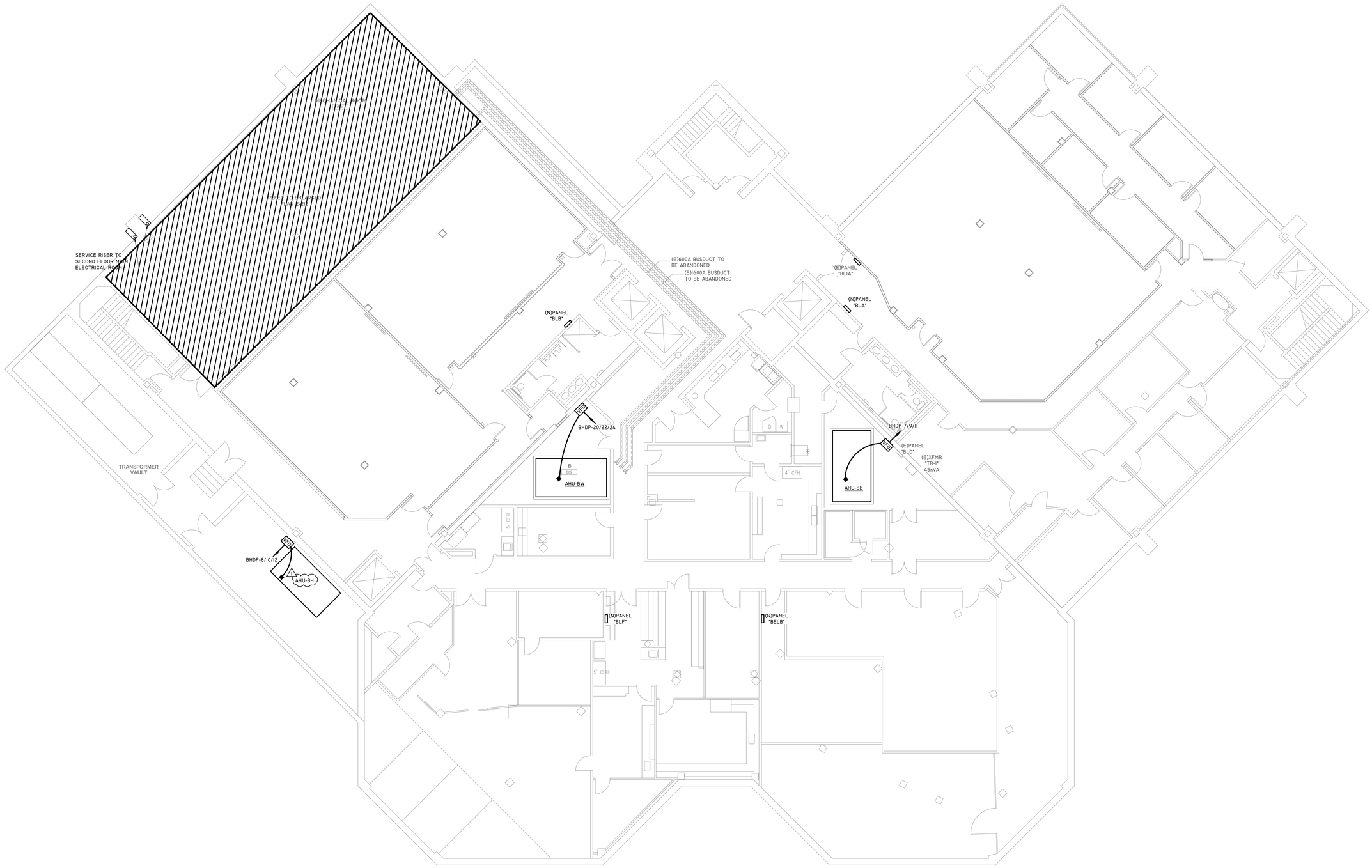
Title

EXISTING SITE PLAN POWER

Sheet

E114
ISSUED FOR BID



1 **PROPOSED - BASEMENT FLOOR PLAN - POWER**
1/8" = 1'-0"

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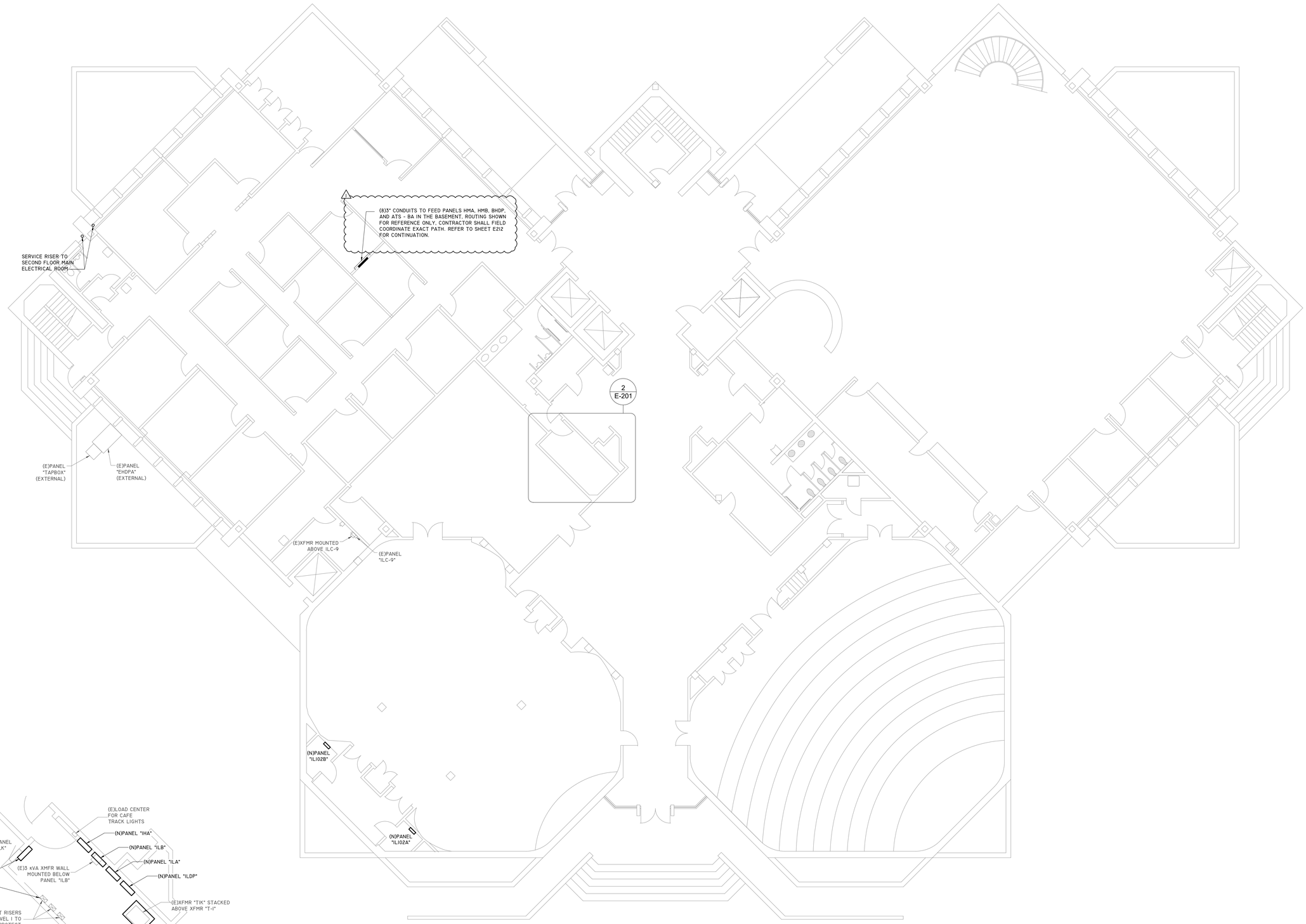
PROPOSED BASEMENT FLOOR PLAN POWER

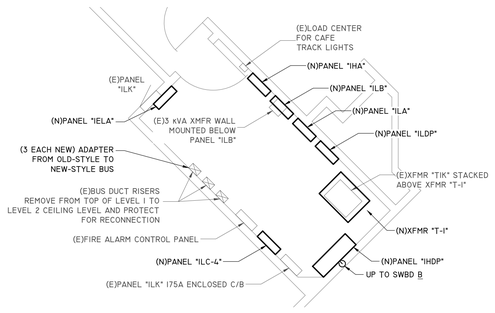
Sheet

E200

ISSUED FOR BID



1 **PROPOSED - 1ST FLOOR PLAN - POWER**
1/8" = 1'-0"



2 **PROPOSED - 1ST FLOOR ELECTRICAL ROOM - POWER**
1/4" = 1'-0"

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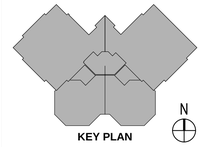

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08/16/2017	ADDENDUM 2
1	

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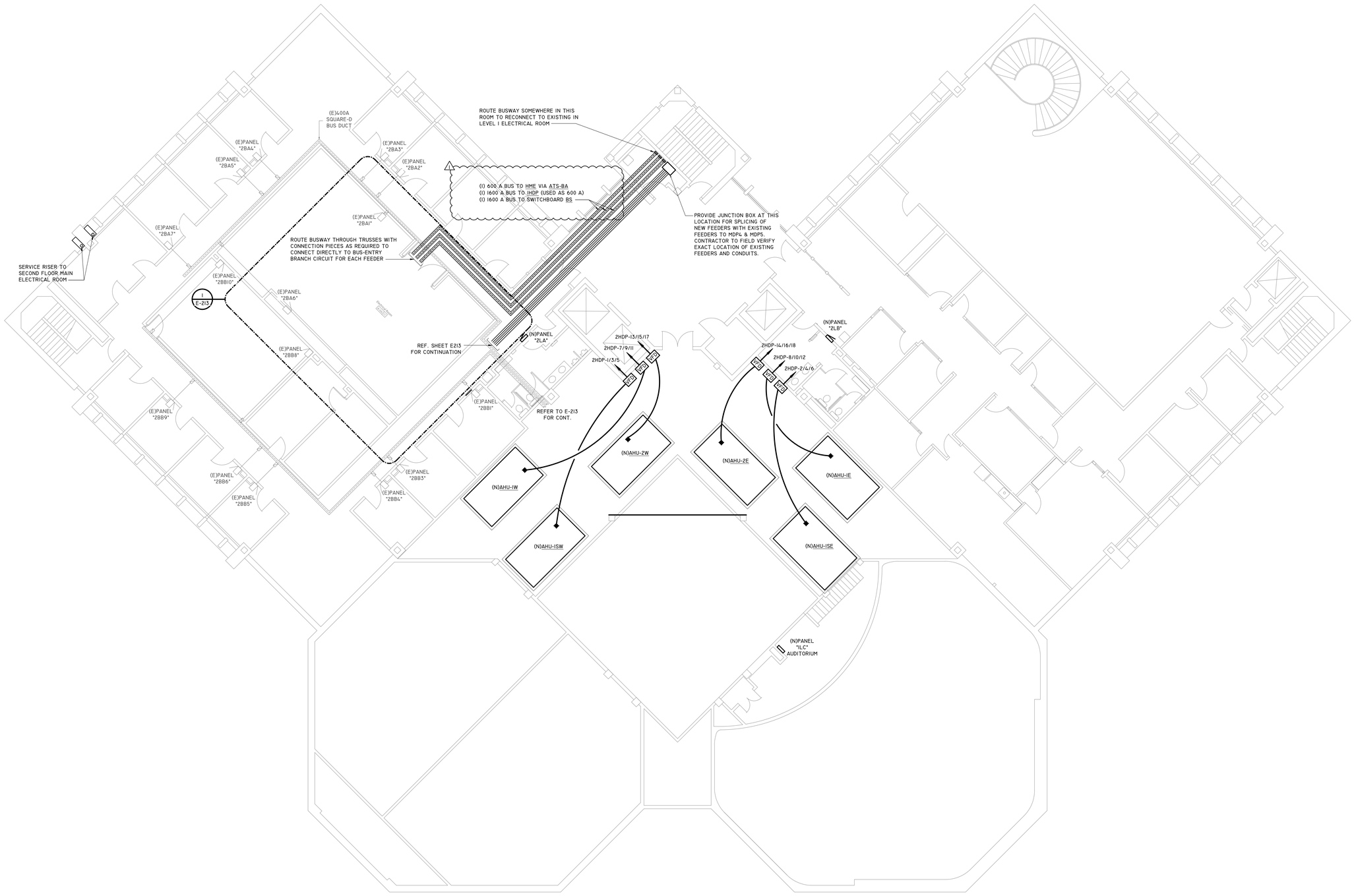
PROPOSED FIRST FLOOR PLAN POWER

Sheet

E201
ISSUED FOR BID



1 **PROPOSED - 2ND FLOOR PLAN - POWER**
1/8" = 1'-0"

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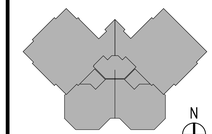

KEY PLAN

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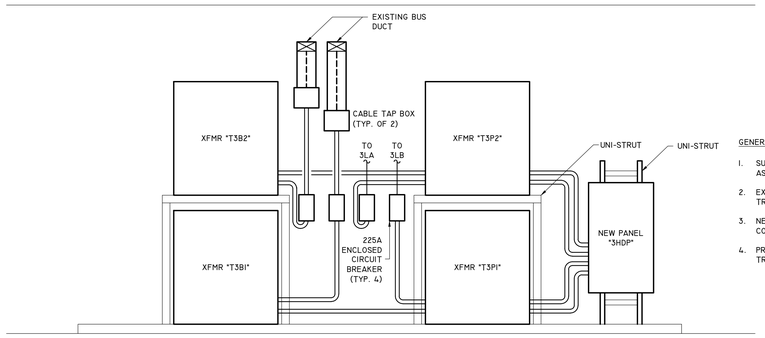
PROPOSED SECOND FLOOR PLAN POWER ALTERNATE

Sheet

E202A
ISSUED FOR BID

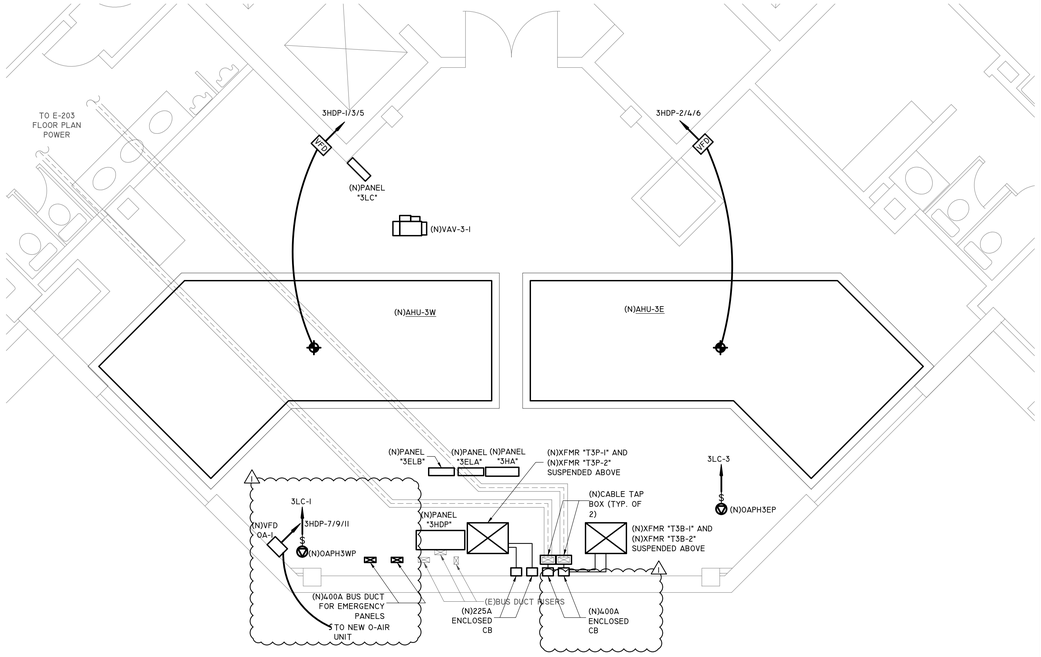
0 1/2" 1" 2"



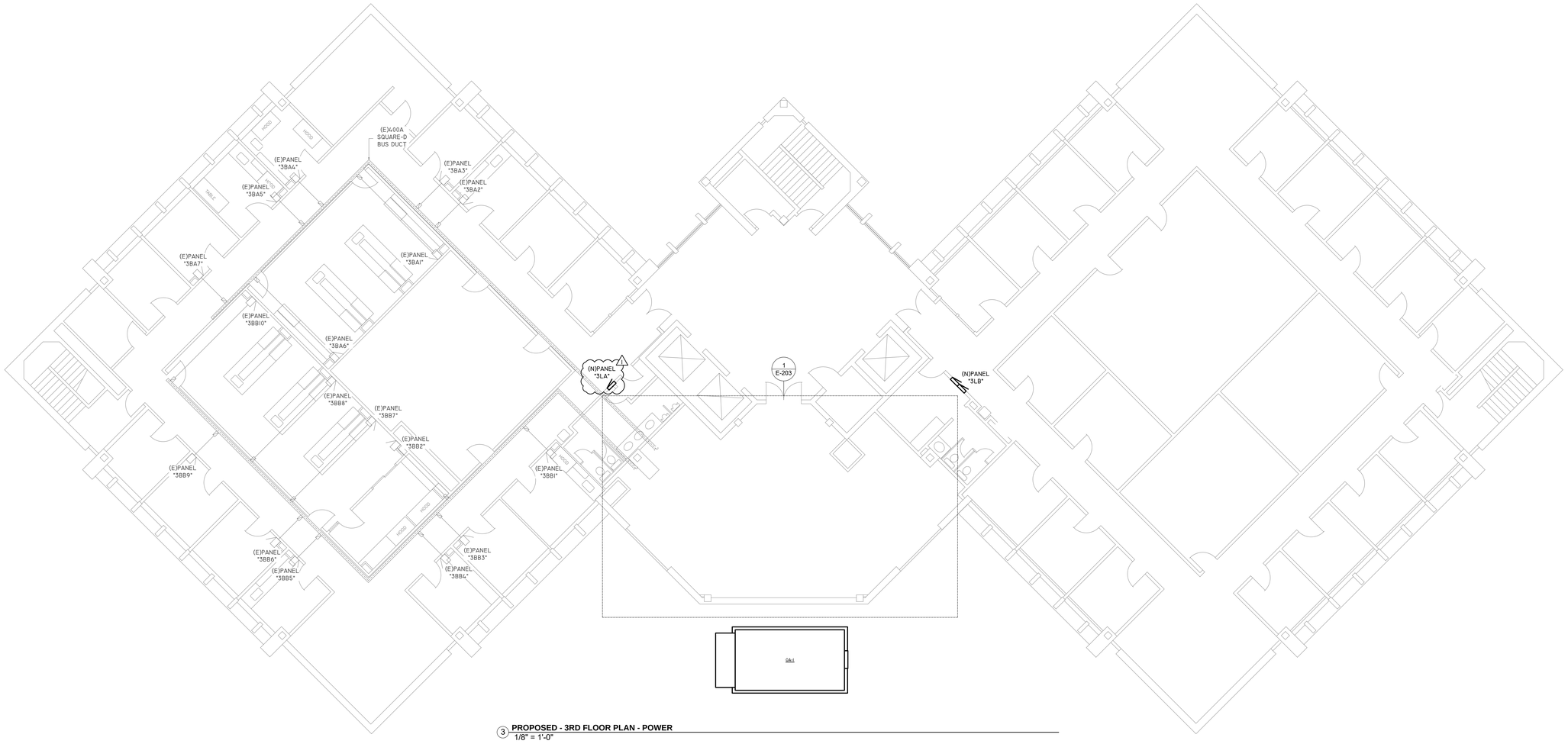
GENERAL NOTES

1. SUPPORT NEW PANEL "HDP" FROM WALL. INSTALL NEW UNI-STRUT AS REQUIRED.
2. EXTEND EXISTING CONCRETE BASE TO ACCOMMODATE NEW TRANSFORMERS.
3. NEW CABLE TAP BOX LOCATION AND ELEVATION SHOULD BE COORDINATED WITH EXISTING EQUIPMENT.
4. PROVIDE AT LEAST 18" OF SPACE BETWEEN STACKED TRANSFORMERS FOR VENTILATION.

2 **PROPOSED - 3RD FLOOR ELEVATION OF NEW INSTALLATION**
NTS



1 **PROPOSED - 3RD FLOOR MECHANICAL ROOM - POWER**
1/4" = 1'-0"



3 **PROPOSED - 3RD FLOOR PLAN - POWER**
1/8" = 1'-0"

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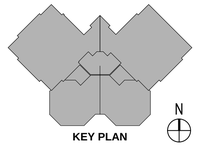

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PROPOSED THIRD FLOOR PLAN POWER

Sheet

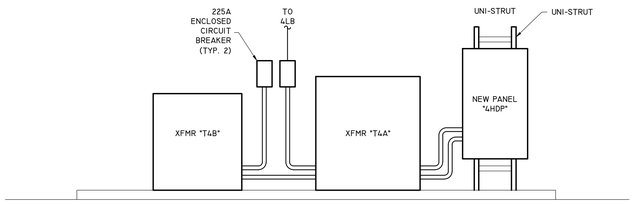
E203

ISSUED FOR BID

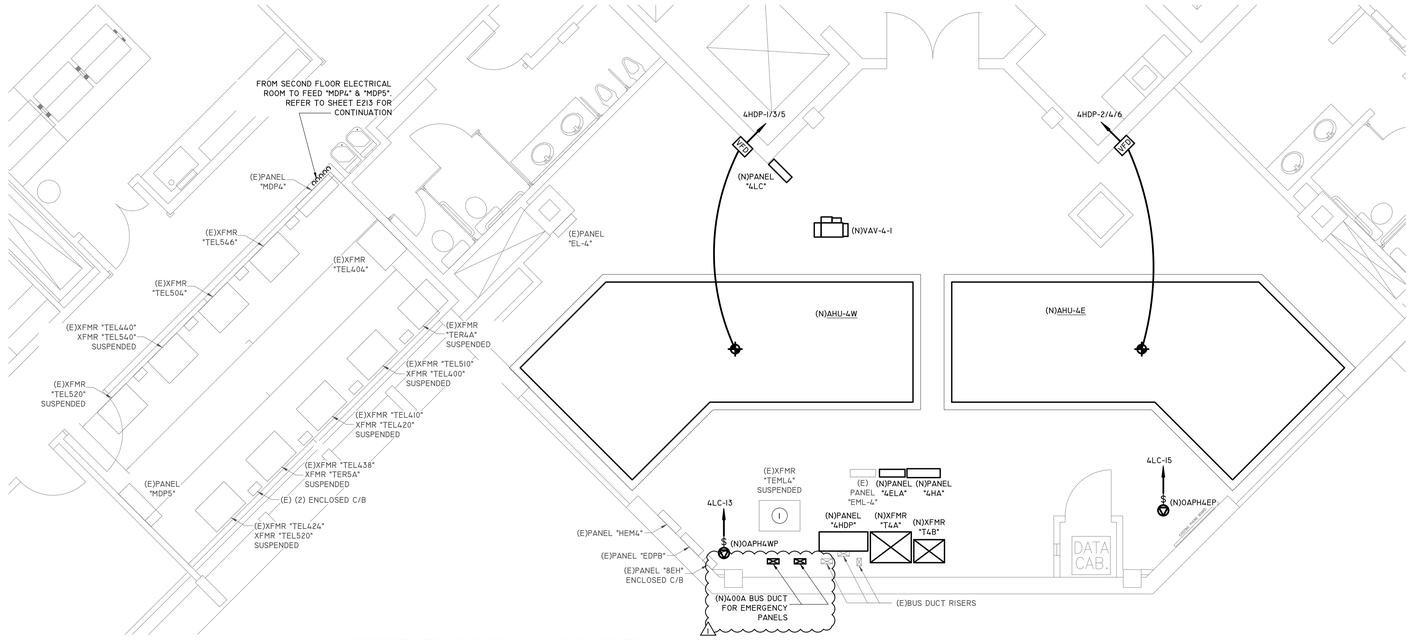
0 1/2" 1" 2"

GENERAL NOTES

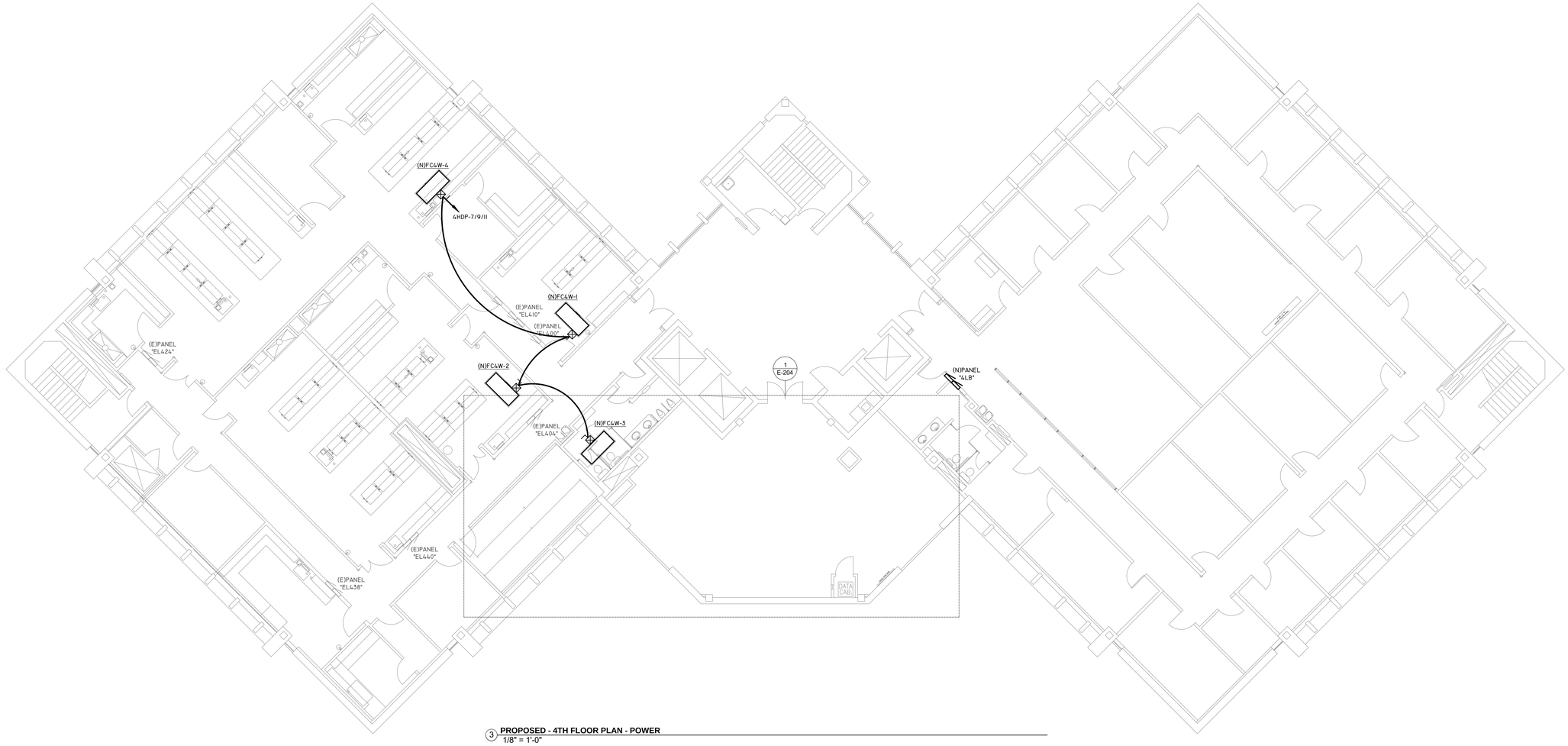
1. SUPPORT NEW PANEL "HDP" FROM WALL. INSTALL NEW UNI-STRUT AS REQUIRED.
2. EXTEND EXISTING CONCRETE BASE TO ACCOMMODATE NEW TRANSFORMERS.
3. NEW CABLE TAP BOX LOCATION AND ELEVATION SHOULD BE COORDINATED WITH EXISTING EQUIPMENT.
4. PROVIDE AT LEAST 18" OF SPACE BETWEEN STACKED TRANSFORMERS FOR VENTILATION.



2 **PROPOSED - 4TH FLOOR ELEVATION OF NEW INSTALLATION**
NTS



1 **PROPOSED - 4TH FLOOR MECHANICAL ROOM - POWER**
1/4" = 1'-0"



3 **PROPOSED - 4TH FLOOR PLAN - POWER**
1/8" = 1'-0"

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PROPOSED FOURTH FLOOR PLAN POWER

Sheet

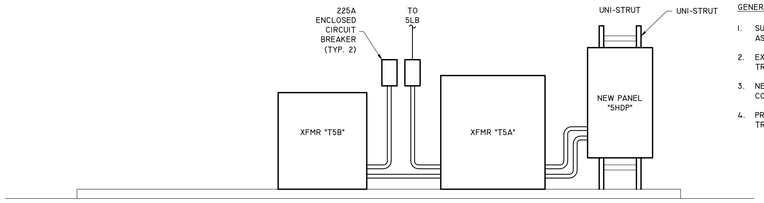
E204

ISSUED FOR BID

0 1/2" 1" 2"

ELECTRICAL KEYED NOTES:

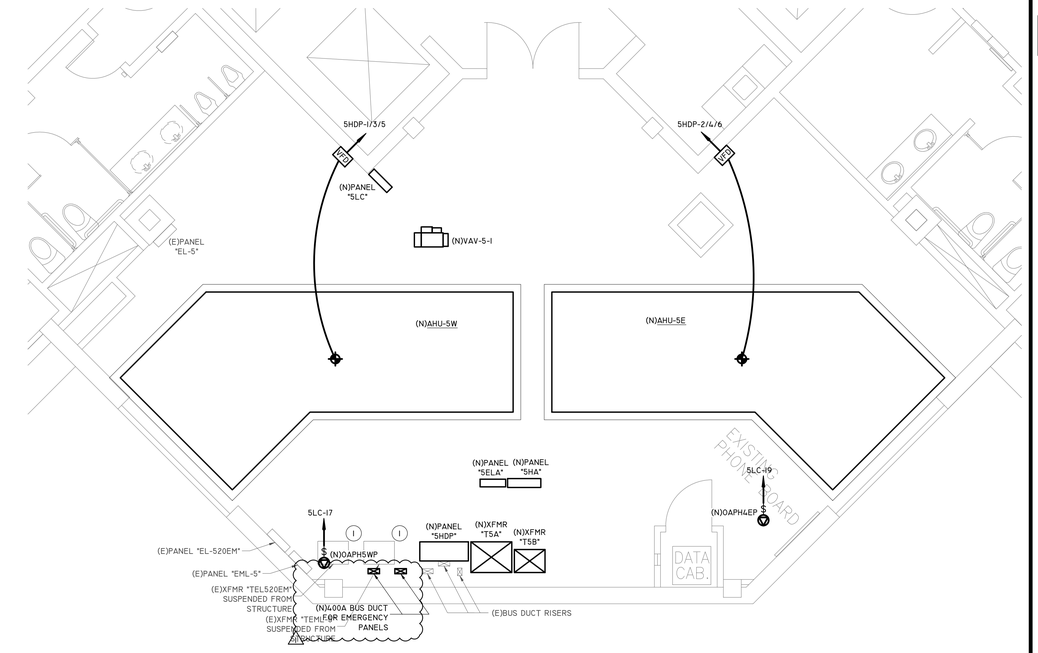
(1) RELOCATE EXISTING TRANSFORMER AWAY FROM BUS WAY CLEARANCES. ALLOW 6 FEET DEVIATION FROM EXISTING LOCATION.



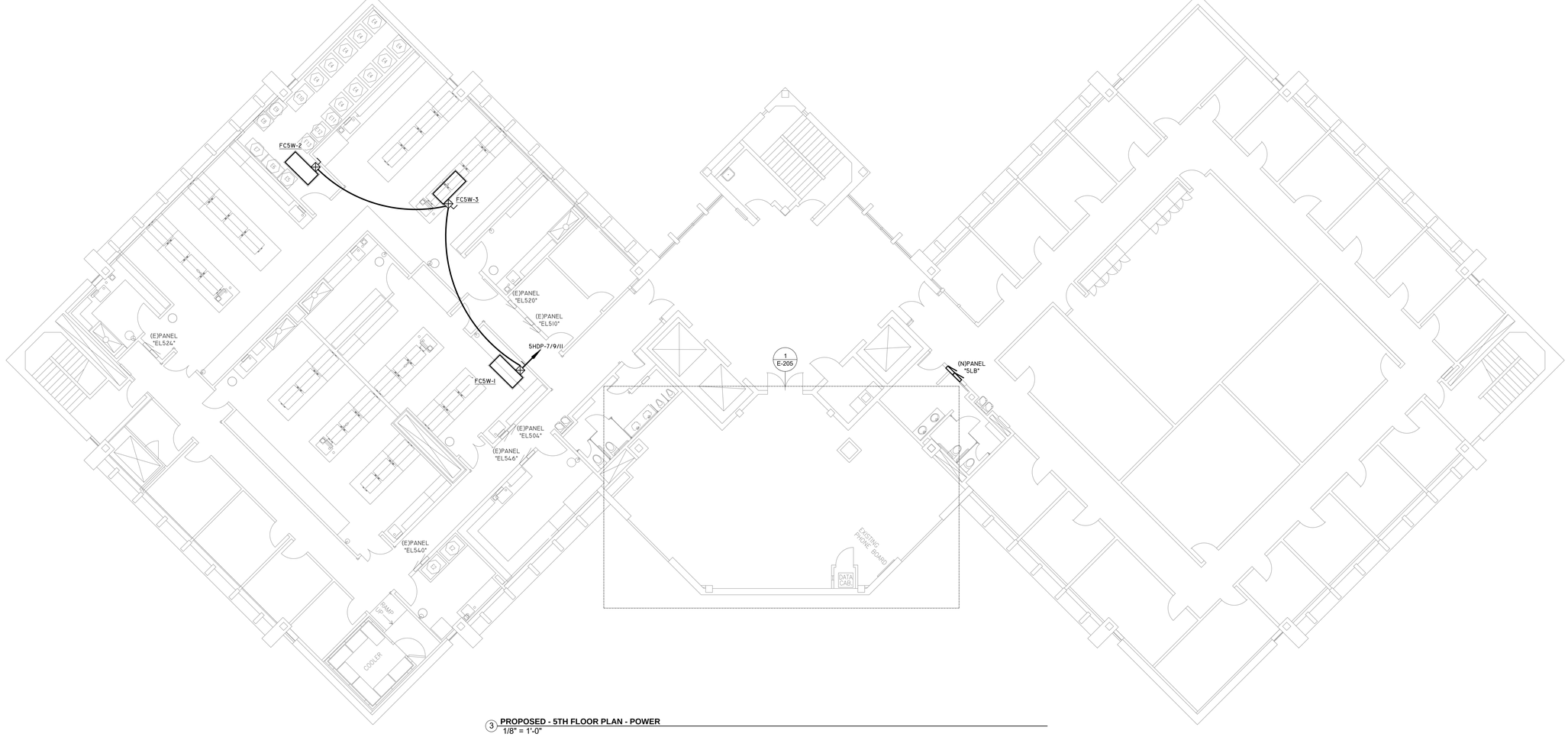
GENERAL NOTES

1. SUPPORT NEW PANEL "HDP" FROM WALL. INSTALL NEW UNI-STRUT AS REQUIRED.
2. EXTEND EXISTING CONCRETE BASE TO ACCOMMODATE NEW TRANSFORMERS.
3. NEW CABLE TAP BOX LOCATION AND ELEVATION SHOULD BE COORDINATED WITH EXISTING EQUIPMENT.
4. PROVIDE AT LEAST 18" OF SPACE BETWEEN STACKED TRANSFORMERS FOR VENTILATION.

(2) **PROPOSED - 5TH FLOOR ELEVATION OF NEW INSTALLATION**
NTS



(1) **PROPOSED - 5TH FLOOR MECHANICAL ROOM - POWER**
1/4" = 1'-0"



(3) **PROPOSED - 5TH FLOOR PLAN - POWER**
1/8" = 1'-0"

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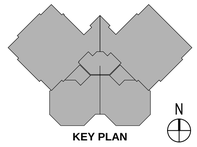

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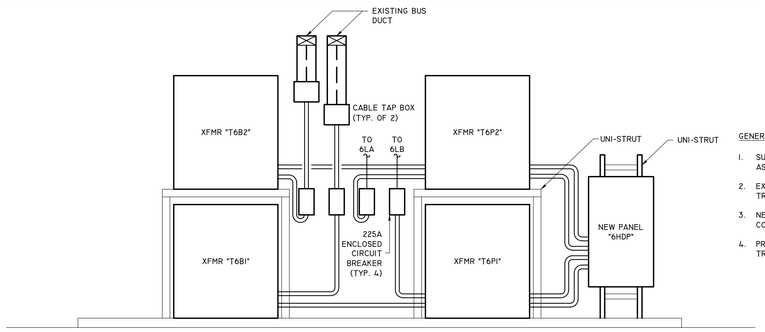
PROPOSED FIFTH FLOOR PLAN POWER

Sheet

E205

ISSUED FOR BID

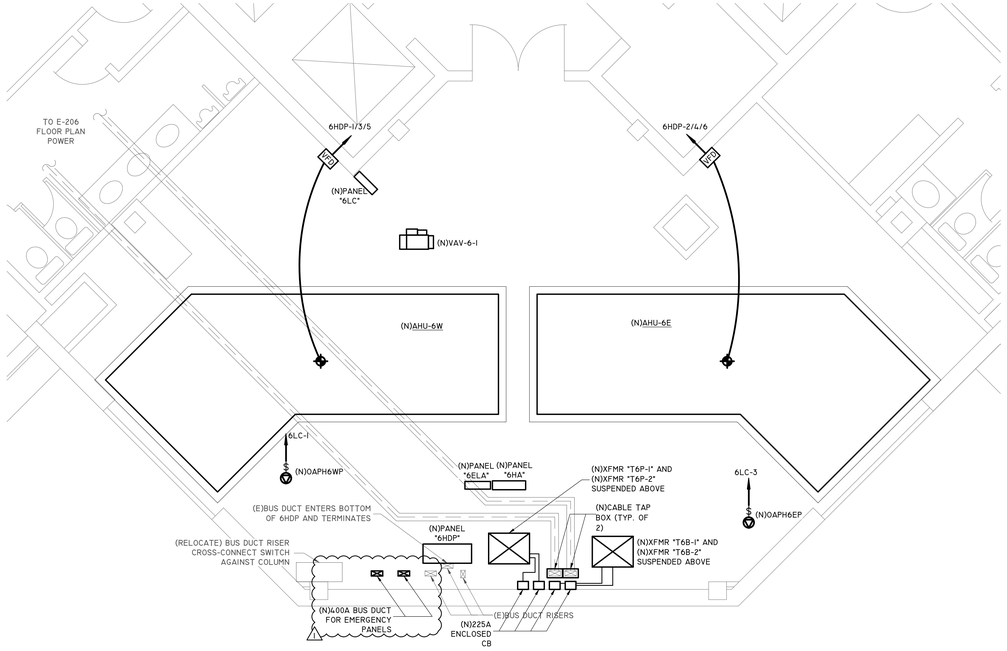
0 1/2" 1" 2"



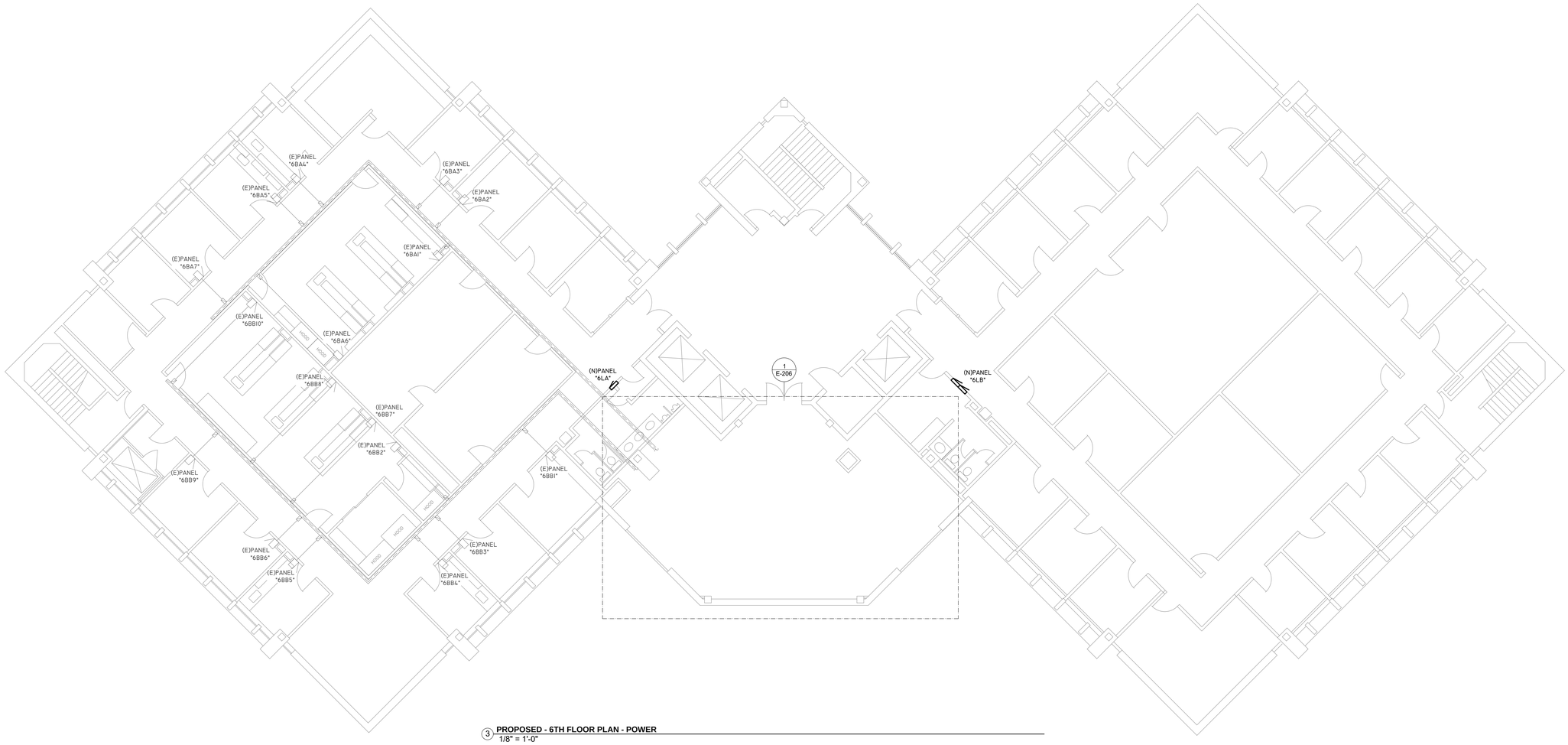
GENERAL NOTES

1. SUPPORT NEW PANEL "HDP" FROM WALL. INSTALL NEW UNI-STRUT AS REQUIRED.
2. EXTEND EXISTING CONCRETE BASE TO ACCOMMODATE NEW TRANSFORMERS.
3. NEW CABLE TAP BOX LOCATION AND ELEVATION SHOULD BE COORDINATED WITH EXISTING EQUIPMENT.
4. PROVIDE AT LEAST 18" OF SPACE BETWEEN STACKED TRANSFORMERS FOR VENTILATION.

2 **PROPOSED - 6TH FLOOR ELEVATION OF NEW INSTALLATION**
NTS



1 **PROPOSED - 6TH FLOOR MECHANICAL ROOM - POWER**
1/4" = 1'-0"



3 **PROPOSED - 6TH FLOOR PLAN - POWER**
1/8" = 1'-0"

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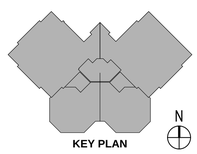
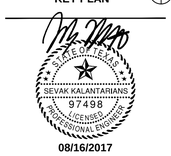


KEY PLAN



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PROPOSED SIXTH FLOOR PLAN POWER

Sheet

E206

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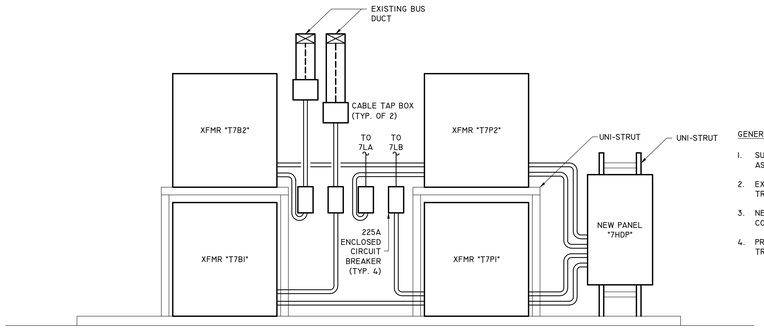
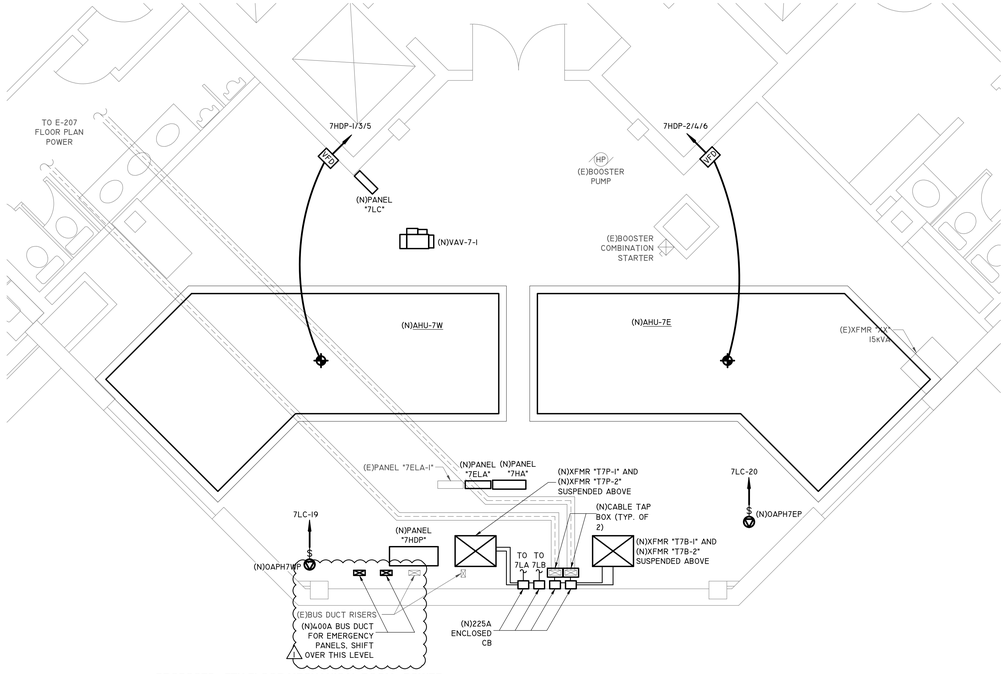
0 1/2" 1" 2"



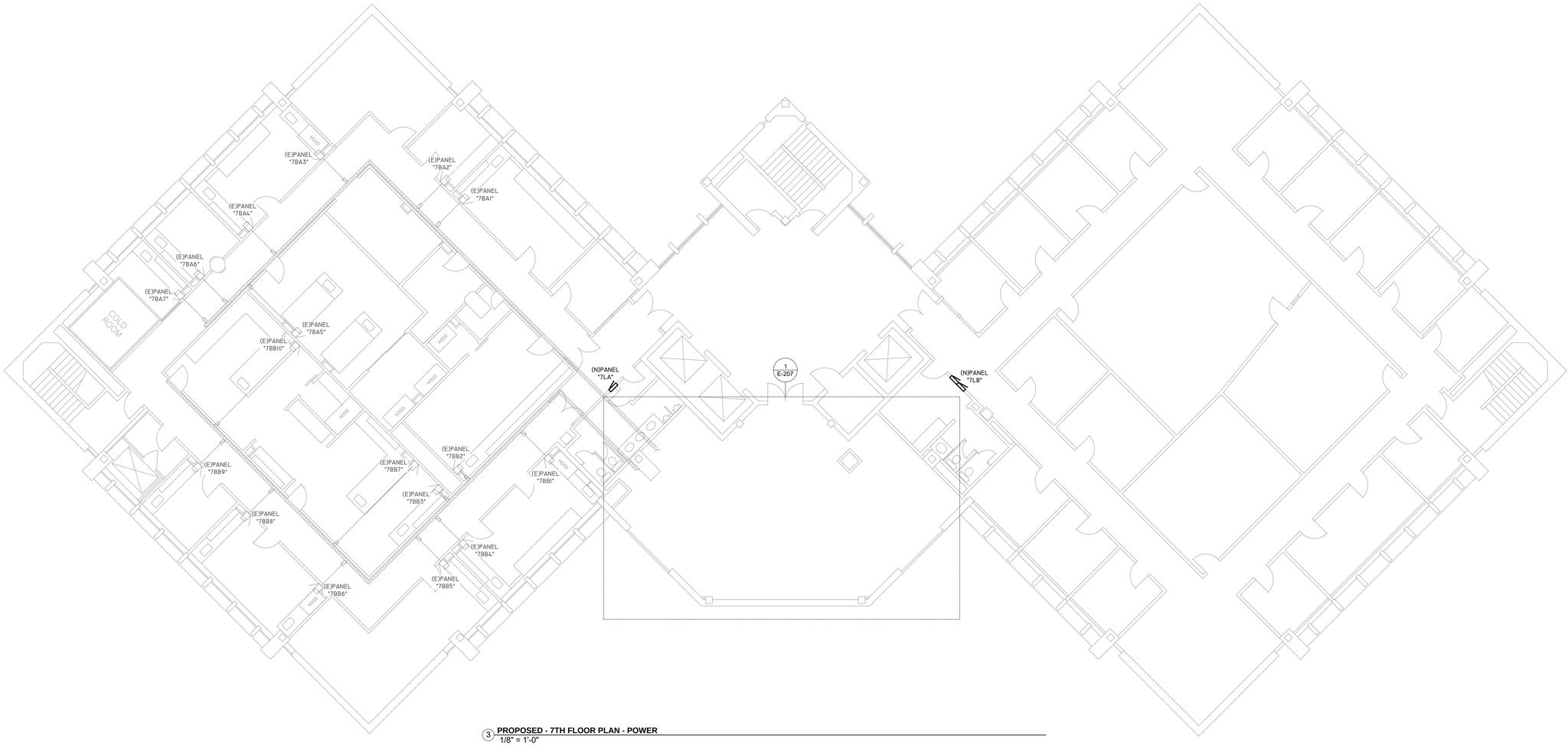
GENERAL NOTES

1. SUPPORT NEW PANEL "HDP" FROM WALL. INSTALL NEW UNI-STRUT AS REQUIRED.
2. EXTEND EXISTING CONCRETE BASE TO ACCOMMODATE NEW TRANSFORMERS.
3. NEW CABLE TAP BOX LOCATION AND ELEVATION SHOULD BE COORDINATED WITH EXISTING EQUIPMENT.
4. PROVIDE AT LEAST 18" OF SPACE BETWEEN STACKED TRANSFORMERS FOR VENTILATION.

2 **PROPOSED - 7TH FLOOR ELEVATION OF NEW INSTALLATION**
NTS



1 **PROPOSED - 7TH FLOOR MECHANICAL ROOM - POWER**
1/4" = 1'-0"



3 **PROPOSED - 7TH FLOOR PLAN - POWER**
1/8" = 1'-0"

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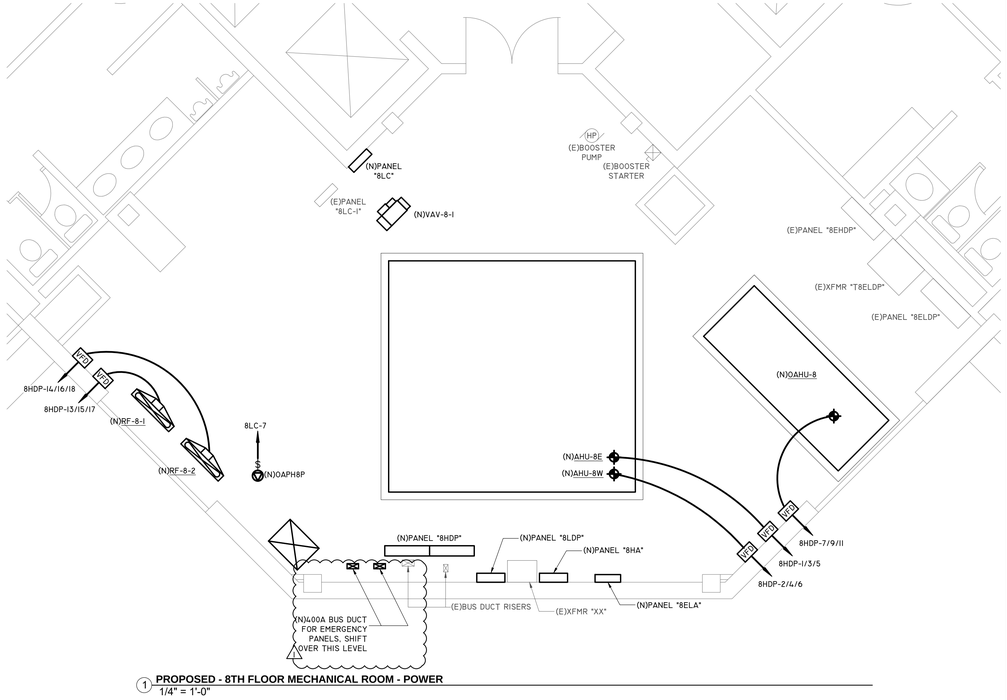
PROPOSED SEVENTH FLOOR PLAN POWER

Sheet

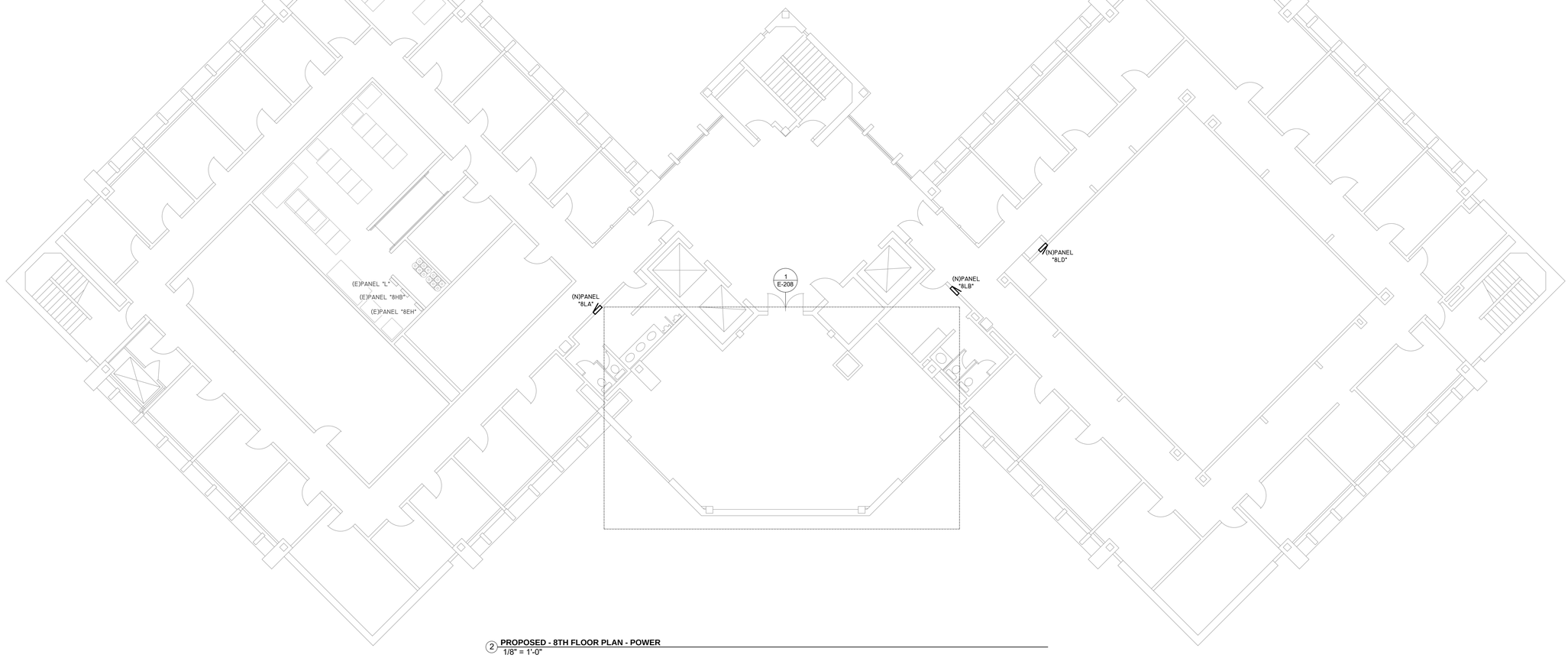
E207

ISSUED FOR BID

0 1/2" 1" 2"



1 **PROPOSED - 8TH FLOOR MECHANICAL ROOM - POWER**
1/4" = 1'-0"



2 **PROPOSED - 8TH FLOOR PLAN - POWER**
1/8" = 1'-0"

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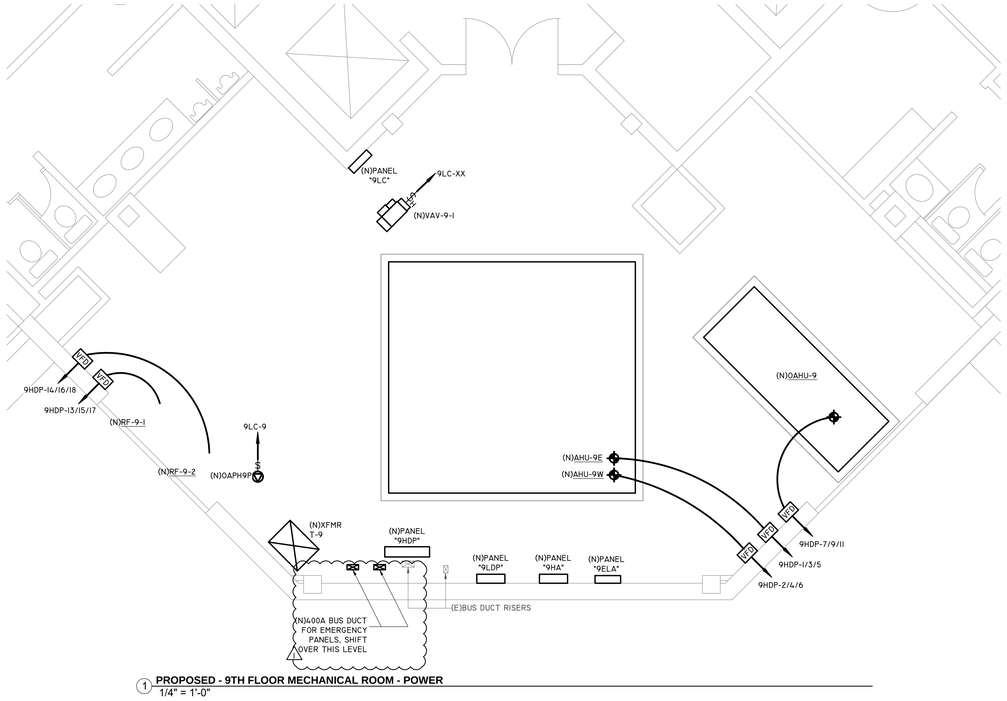
PROPOSED EIGHTH FLOOR PLAN POWER

Sheet

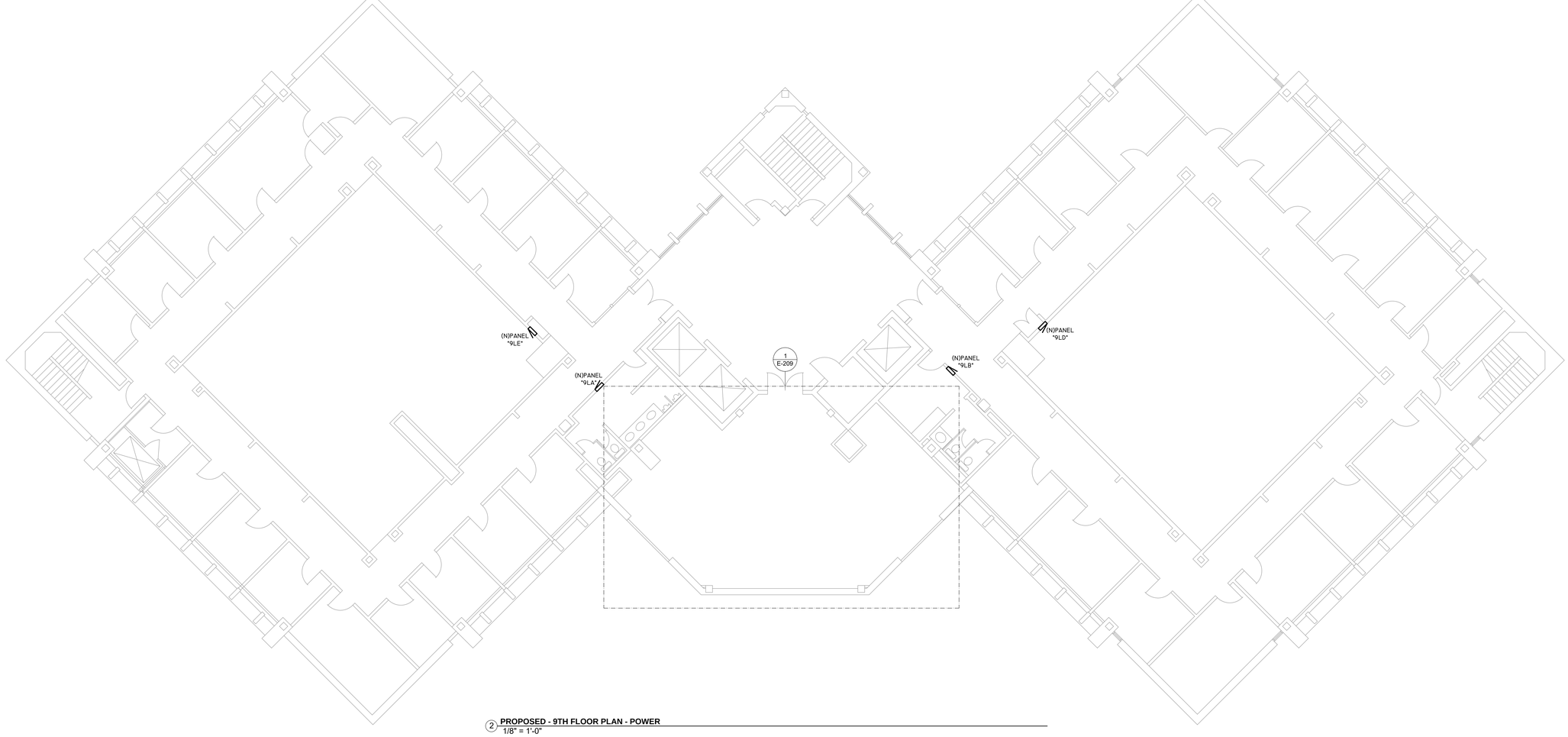
E208

ISSUED FOR BID

0 1/2" 1" 2"



1 **PROPOSED - 9TH FLOOR MECHANICAL ROOM - POWER**
1/4" = 1'-0"



2 **PROPOSED - 9TH FLOOR PLAN - POWER**
1/8" = 1'-0"

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PROPOSED NINTH FLOOR PLAN POWER

Sheet

E209

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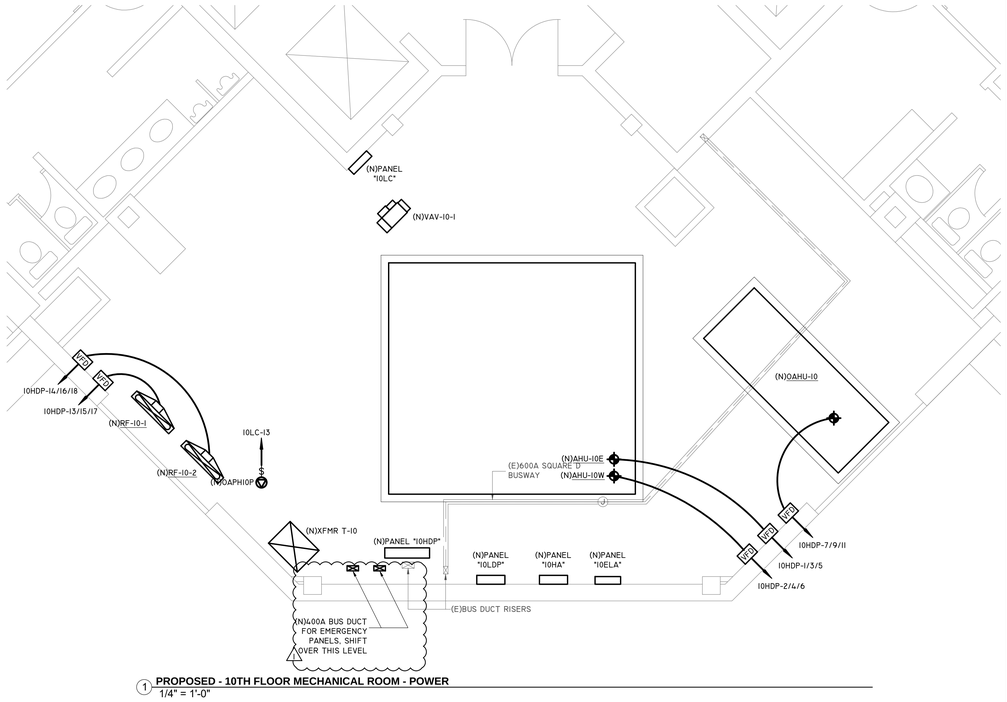
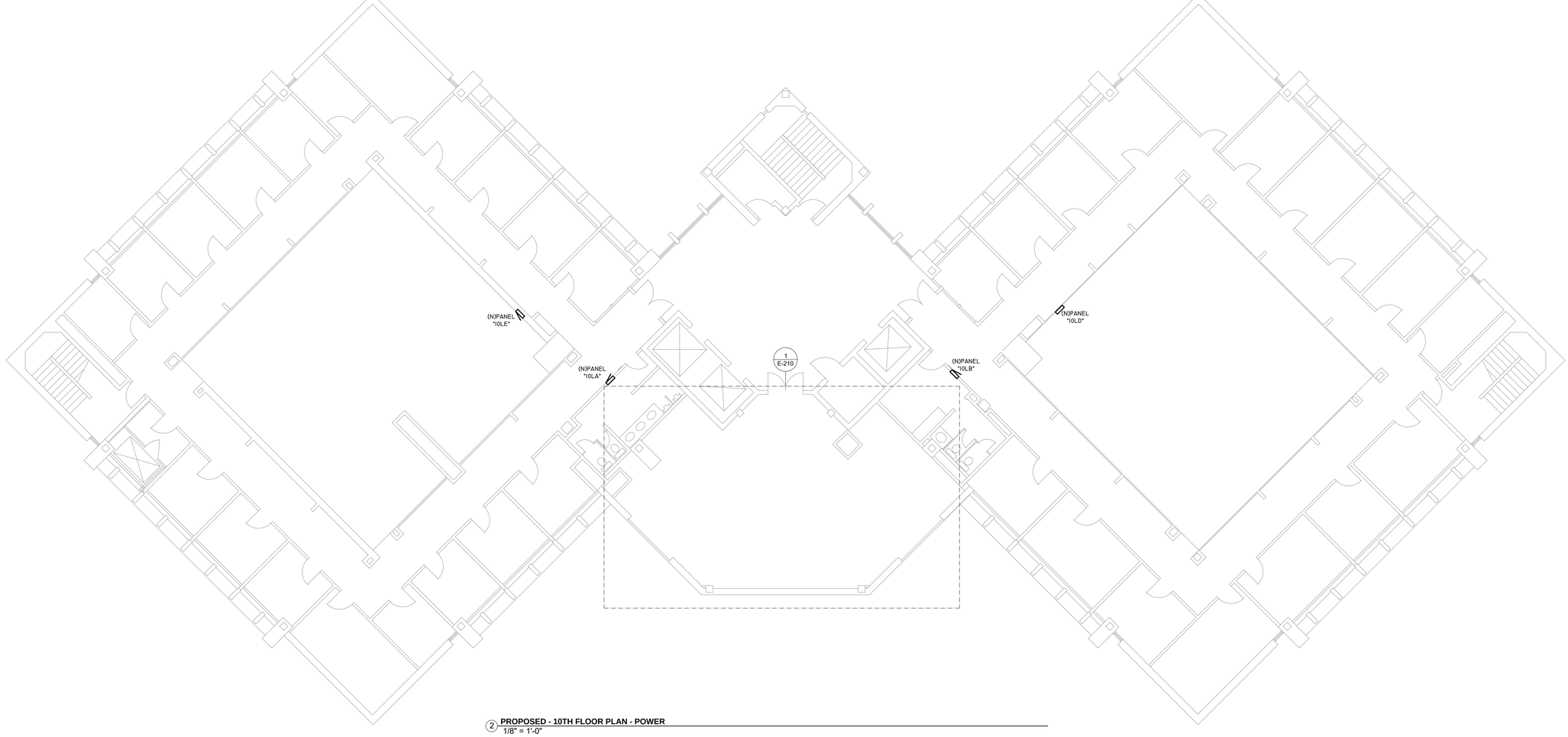
0 1/2" 1" 2"



1 **PROPOSED - 10TH FLOOR MECHANICAL ROOM - POWER**
1/4" = 1'-0"



2 **PROPOSED - 10TH FLOOR PLAN - POWER**
1/8" = 1'-0"

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PROPOSED TENTH FLOOR PLAN POWER

Sheet

E210

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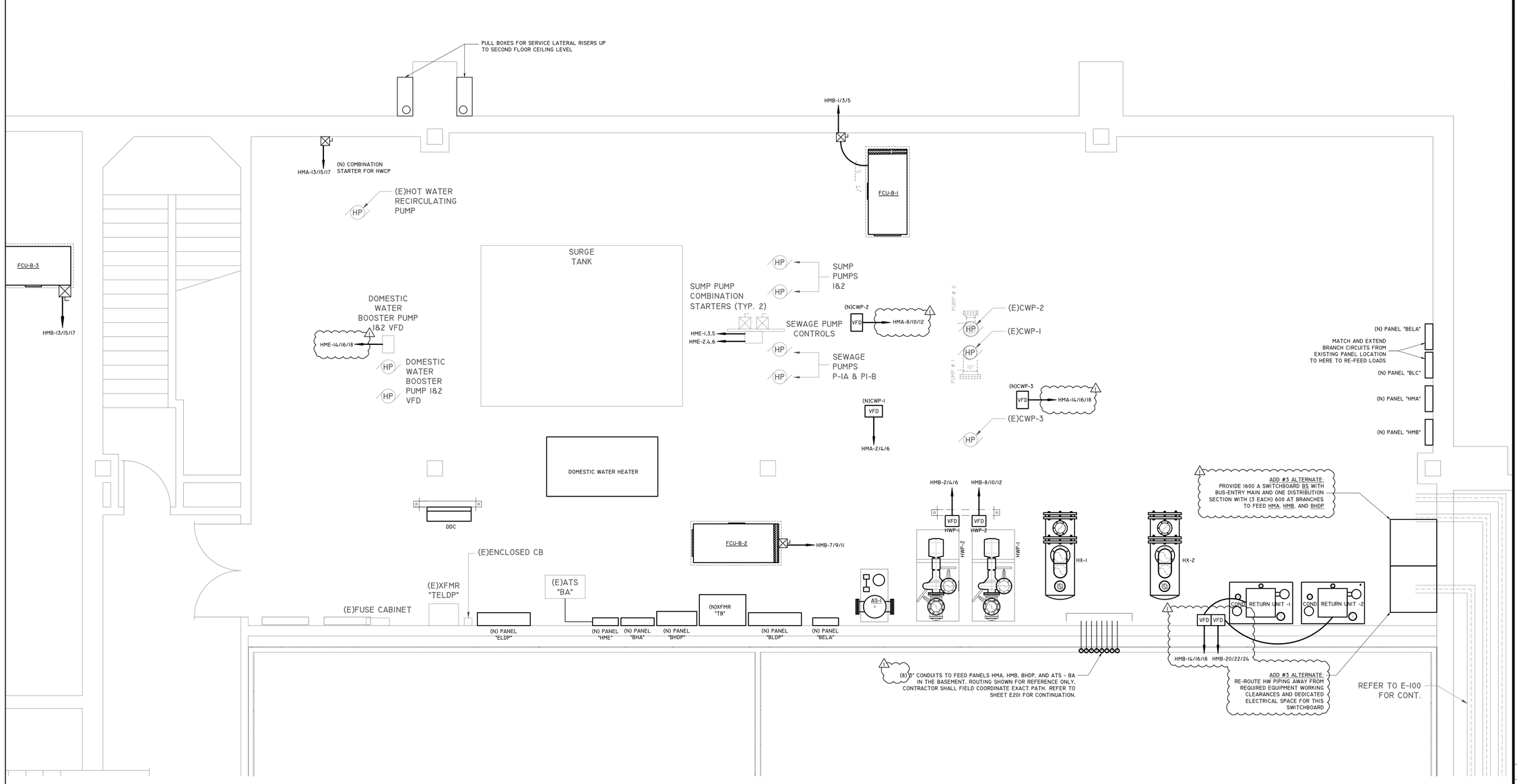

1 ENLARGED CENTRAL PLANT - BASEMENT FLOOR PLAN - POWER

SCALE: 3/8" = 1'-0"

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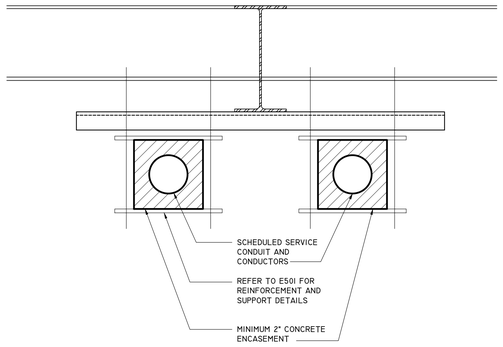
PROPOSED ENLARGED BASEMENT FLOOR PLANS POWER

Sheet

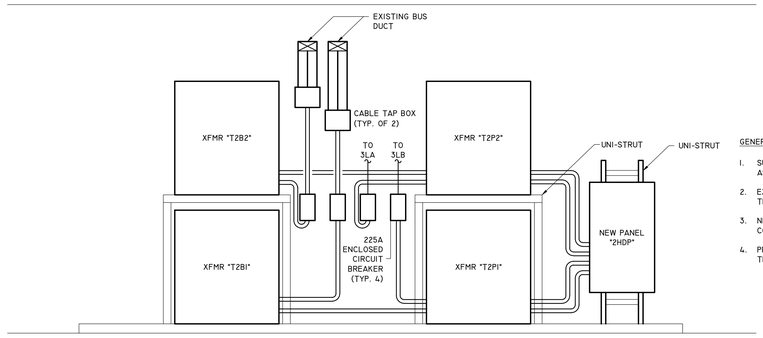
E212

ISSUED FOR BID

0 1/2" 1" 2"



4 **DETAIL AT SUSPENDED SERVICE LATERAL**
1-1/2" = 1'-0"



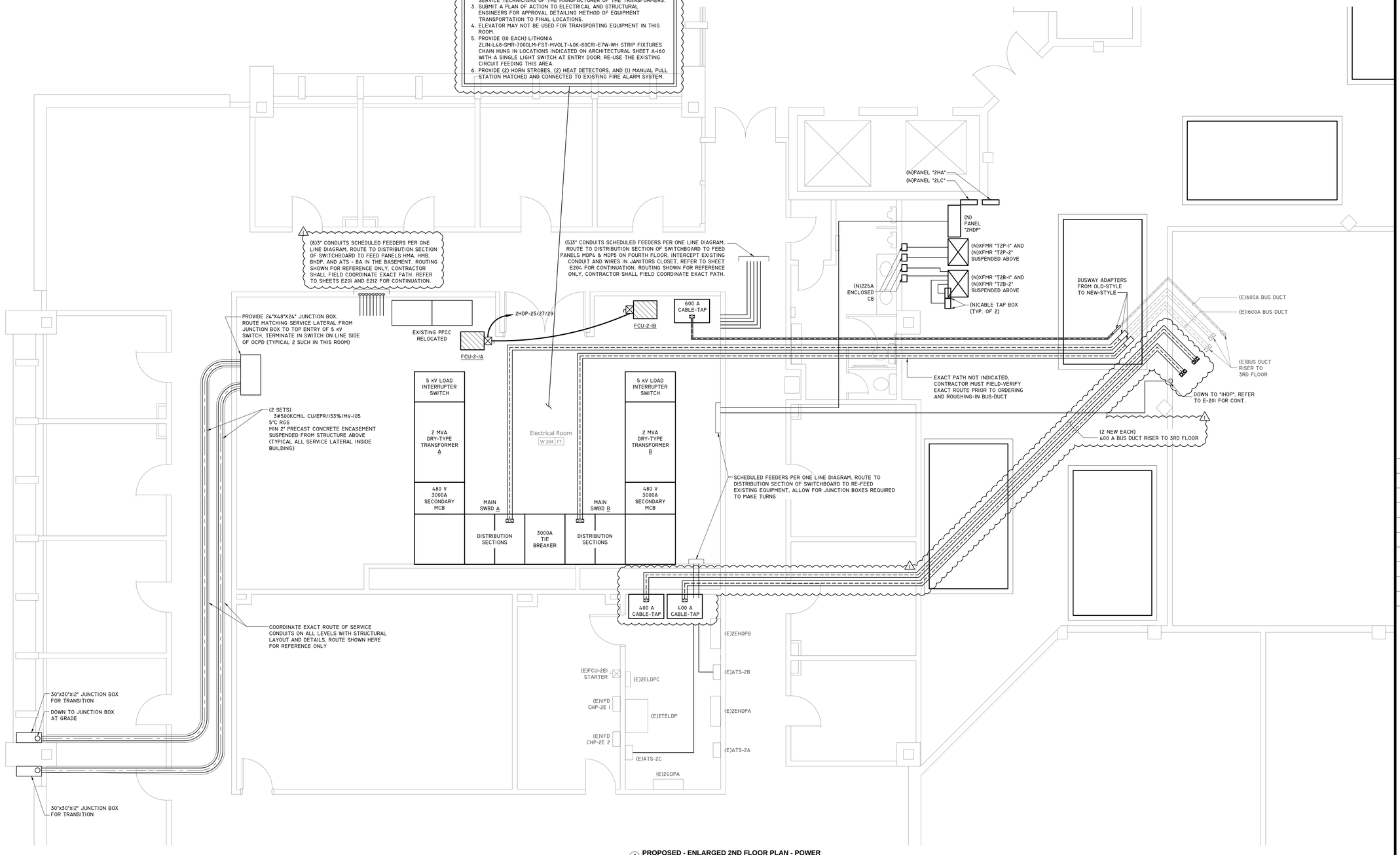
3 **PROPOSED - 2ND FLOOR ELEVATION OF NEW INSTALLATION**
NTS

GENERAL NOTES

1. SUPPORT NEW PANEL "HDP" FROM WALL. INSTALL NEW UNI-STRUT AS REQUIRED.
2. EXTEND EXISTING CONCRETE BASE TO ACCOMMODATE NEW TRANSFORMERS.
3. NEW CABLE TAP BOX LOCATION AND ELEVATION SHOULD BE COORDINATED WITH EXISTING EQUIPMENT.
4. PROVIDE AT LEAST 18" OF SPACE BETWEEN STACKED TRANSFORMERS FOR VENTILATION.

MAIN ELECTRICAL ROOM NOTES:

1. CONTRACTOR TO ORDER TRANSFORMERS AS "TRIPLEX" TO BE DELIVERED IN MAXIMUM COMPONENT SIZE: 45"W X 67"H X 28"D @ 3600 LBS.
2. RE-ASSEMBLY FIELD WORK TO BE PERFORMED BY QUALIFIED FIELD SERVICE TECHNICIANS OF THE MANUFACTURER OF THE TRANSFORMERS.
3. SUBMIT A PLAN OF ACTION TO ELECTRICAL AND STRUCTURAL ENGINEERS FOR APPROVAL DETAILING METHOD OF EQUIPMENT TRANSPORTATION TO FINAL LOCATIONS.
4. ELEVATOR MAY NOT BE USED FOR TRANSPORTING EQUIPMENT IN THIS ROOM.
5. PROVIDE (10 EACH) LITHONIA ZLIN-L48-SMR-7000LM-FST-MVOLT-40K-80CRI-E7W-WH STRIP FIXTURES CHAIN HUNG IN LOCATIONS INDICATED ON ARCHITECTURAL SHEET A-160 WITH A SINGLE LIGHT SWITCH AT ENTRY DOOR. RE-USE THE EXISTING CIRCUIT FEEDING THIS AREA.
6. PROVIDE (2) HORN STROBES, (2) HEAT DETECTORS, AND (1) MANUAL PULL STATION MATCHED AND CONNECTED TO EXISTING FIRE ALARM SYSTEM.



1 **PROPOSED - ENLARGED 2ND FLOOR PLAN - POWER**
1/4" = 1'-0"

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PROPOSED ENLARGED SECOND FLOOR PLAN POWER

Sheet

E213

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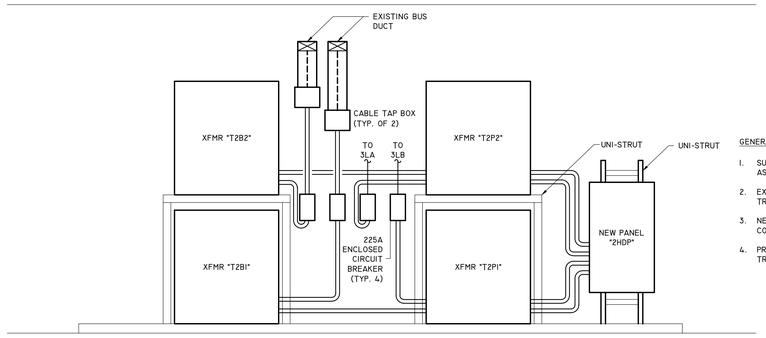

3 **PROPOSED - 2ND FLOOR ELEVATION OF NEW INSTALLATION**
NTS

GENERAL NOTES

1. SUPPORT NEW PANEL "HDP" FROM WALL. INSTALL NEW UNI-STRUT AS REQUIRED.
2. EXTEND EXISTING CONCRETE BASE TO ACCOMMODATE NEW TRANSFORMERS.
3. NEW CABLE TAP BOX LOCATION AND ELEVATION SHOULD BE COORDINATED WITH EXISTING EQUIPMENT.
4. PROVIDE AT LEAST 18" OF SPACE BETWEEN STACKED TRANSFORMERS FOR VENTILATION.

MAIN ELECTRICAL ROOM NOTES:

1. CONTRACTOR TO ORDER TRANSFORMERS AS "TRIPLEX" TO BE DELIVERED IN MAXIMUM COMPONENT SIZE: 45"W X 67"H X 28"D @ 3600 LBS.
2. RE-ASSEMBLY FIELD WORK TO BE PERFORMED BY QUALIFIED FIELD SERVICE TECHNICIANS OF THE MANUFACTURER OF THE TRANSFORMERS.
3. SUBMIT A PLAN OF ACTION TO ELECTRICAL AND STRUCTURAL ENGINEERS FOR APPROVAL DETAILING METHOD OF EQUIPMENT TRANSPORTATION TO FINAL LOCATIONS.
4. ELEVATOR MAY NOT BE USED FOR TRANSPORTING EQUIPMENT IN THIS ROOM.
5. PROVIDE (10 EACH) LITHONIA ZLIN-L48-SMR-7000LM-FST-MVOLT-40K-80CRI-E7W-WH STRIP FIXTURES CHAIN HUNG IN LOCATIONS INDICATED ON ARCHITECTURAL SHEET A-160 WITH A SINGLE LIGHT SWITCH AT ENTRY DOOR. RE-USE THE EXISTING CIRCUIT FEEDING THIS AREA.
6. PROVIDE (2) HORN STROBES, (2) HEAT DETECTORS, AND (1) MANUAL PULL STATION MATCHED AND CONNECTED TO EXISTING FIRE ALARM SYSTEM.

ROUTE BUSWAY SOMEWHERE IN THIS ROOM TO RECONNECT TO EXISTING IN LEVEL 1 ELECTRICAL ROOM

PROVIDE JUNCTION BOX AT THIS LOCATION FOR SPLICING OF NEW FEEDERS WITH EXISTING FEEDERS TO MDP4 & MDP5. CONTRACTOR TO FIELD VERIFY EXACT LOCATION OF EXISTING FEEDERS AND CONDUITS.

(1) 600 A BUS TO HME VIA ATS-BA
(1) 1600 A BUS TO BEHDP (USED AS 600 A)
(1) 1600 A BUS TO SWITCHBOARD BS

(5)3" CONDUITS SCHEDULED FEEDERS PER ONE LINE DIAGRAM. ROUTE TO DISTRIBUTION SECTION OF SWITCHBOARD TO FEED PANELS MDP4 & MDP5 ON FOURTH FLOOR. INTERCEPT EXISTING CONDUIT AND WIRES IN JANITORS CLOSET. REFER TO SHEET E204 FOR CONTINUATION. ROUTING SHOWN FOR REFERENCE ONLY, CONTRACTOR SHALL FIELD COORDINATE EXACT PATH.

(N)PANEL "2HA"
(N)PANEL "2LC"
(N) PANEL "2HDP"
(N)XFMR "T2P-1" AND (N)XFMR "T2P-2" SUSPENDED ABOVE
(N)XFMR "T2B-1" AND (N)XFMR "T2B-2" SUSPENDED ABOVE
(N)225A ENCLOSED CB
(N)CABLE TAP BOX (TYP. OF 2)
BUSWAY ADAPTERS FROM OLD-STYLE TO NEW-STYLE
(E)600A BUS DUCT
(E)600A BUS DUCT
(E)BUS DUCT RISER TO 3RD FLOOR
DOWN TO "HDP". REFER TO E-201 FOR CONT.
(2 NEW EACH) 400 A BUS DUCT RISER TO 3RD FLOOR
EXACT PATH NOT INDICATED. CONTRACTOR MUST FIELD VERIFY EXACT ROUTE PRIOR TO MODELING AND ROUGHING-IN BUSDUCT

ROUTE BUSWAY THROUGH TRUSSES WITH CONNECTION PIECES AS REQUIRED TO CONNECT DIRECTLY TO BUS-ENTRY BRANCH CIRCUIT FOR EACH FEEDER

EXISTING PFCC RELOCATED

Electrical Room
W 204 F7

5 kV LOAD INTERRUPTER SWITCH
2 MVA DRY-TYPE TRANSFORMER A
480 V 3000A SECONDARY MCB
MAIN SWBD A
DISTRIBUTION SECTIONS
3000A TIE BREAKER
MAIN SWBD B
DISTRIBUTION SECTIONS
5 kV LOAD INTERRUPTER SWITCH
2 MVA DRY-TYPE TRANSFORMER B
480 V 3000A SECONDARY MCB

SCHEDULED FEEDERS PER ONE LINE DIAGRAM. ROUTE TO DISTRIBUTION SECTION OF SWITCHBOARD TO RE-FEED EXISTING EQUIPMENT. ALLOW FOR JUNCTION BOXES REQUIRED TO MAKE TURNS

400 A CABLE-TAP
400 A CABLE-TAP
(E)2EHDPB
(E)ATS-2B
(E)2EHDPA
(E)ATS-2A
(E)FCU-2E1 STARTER
(E)2ELDPC
(E)VFD CHP-2E 1
(E)2TELDP
(E)VFD CHP-2E 2
(E)ATS-2C
(E)2GDPA

1 **PROPOSED - ENLARGED 2ND FLOOR PLAN - POWER**
1/4" = 1'-0"

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PROPOSED ENLARGED SECOND FLOOR PLAN POWER ALTERNATE

Sheet

E213A

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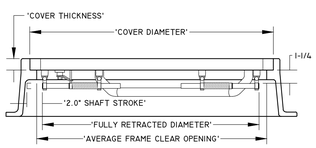
0 1/2" 1" 2"

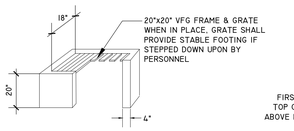
NOTES:

1. MANHOLE TO BE DESIGNED FOR H-20 LOADING.
2. SUBBASE FOR PLACEMENT OF MANHOLE TO BE STABILIZED WITH 6" OF CEMENT STABALIZED SAND TO PROVIDE LEVEL SOLID BEARING SURFACE BEFORE INSTALLATION OF MANHOLE.
3. ALL WINDOWS TO BE FURNISHED WITH SMOOTH OUTSIDE WALLS PROVIDING ADDITIONAL STRENGTH TO RESIST BREAKOUT DURING INSTALLATION.
4. MANHOLE COVER TO BE MARKED "ELECTRIC".
5. MANHOLE TO BE INSTALLED SO AS TO PROMOTE NATURAL FLOW TO MANHOLE SUMP. GROUT MAY BE USED TO CORRECT IRREGULARITIES IN FLOOR, IF GROUT IS REQUIRED A RICH GROUT (9 SACKS SHALL BE USED)
6. FIRST LADDER RING TO BE WITHIN 12" OF TOP OF NECK LADDER RAIL TO EXTEND 6" ABOVE FIRST RUNG
7. FINISHED GRADE TO BE SLOPED GENTLY AWAY FROM MANHOLE OPENING TO PREVENT RUNOFF FROM ENTERING MANHOLE
8. ALL CABLES ROUTED AROUND MAN HOLE SHALL BE LOCATED ON RACKS MOUNTED IN THE TOP 2'-0" OF MAN HOLE. FILL RACKS FROM TOP FIRST.
9. ALL CABLES TO BE SUPPORTED EVERY 3'-0" HORIZONTALLY MINIMUM OF 50 FEET OF SLACK IN CABLE SHALL BE PROVIDED IN EACH MANHOLE AND SHALL BE WRAPPED AND SUPPORTED BY CABLE RACKS INSIDE MANHOLE.
10. CIRCUITS SHALL BE SECURED TO INDIVIDUAL CABLE RACK INSULATORS WITH ADEQUATELY SIZED CABLE TIES DURING INSTALLATION OF NEW CABLES, OR RE-INSTALLATION OF EXISTING CIRCUITS.

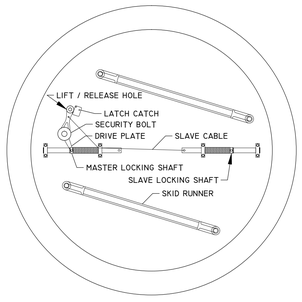
COVER DIAMETER	COVER THICKNESS	AVERAGE FRAME CLEAR OPENING	FULLY RETRACTED DIAMETER
38"	1 1/2"	36"	35"



SECTION

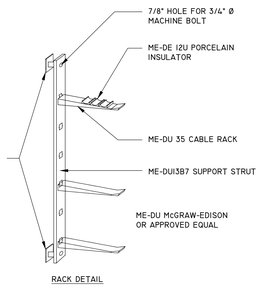


SUMP DETAIL

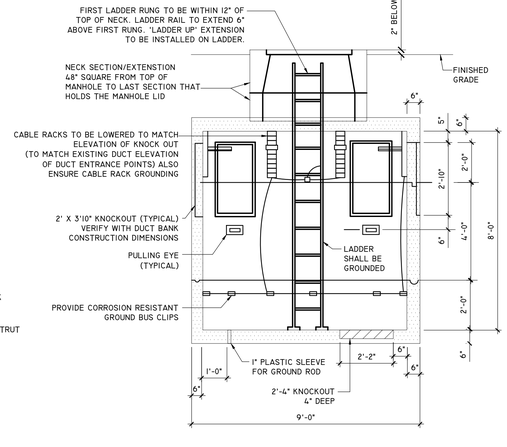


TOP PLAN

FIBERSHIELD MANHOLE COVER WITH LOCKING SYSTEM



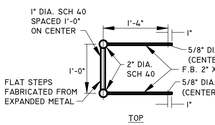
RACK DETAIL



SECTION A-A

ELECTRIC MANHOLE DETAILS

EI8-3



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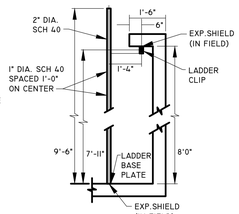
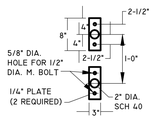
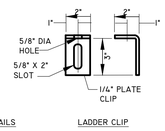


SIDE

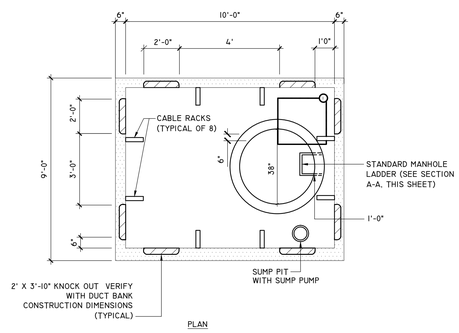


BOTTOM

MANHOLE LADDER DETAILS

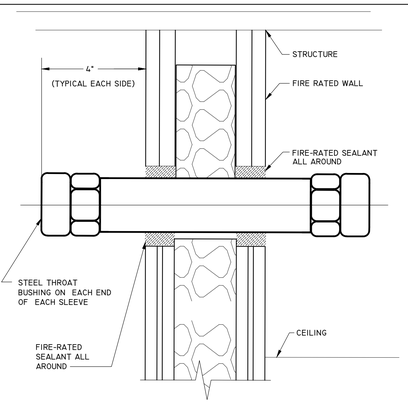


LADDER CLIP

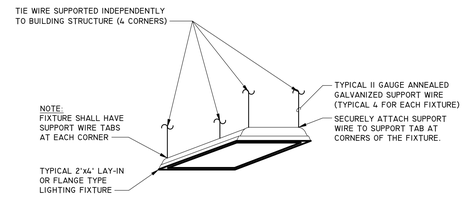


PLAN

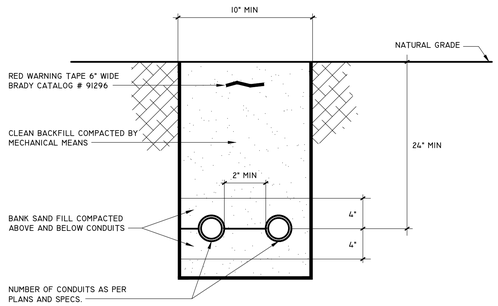
PRECAST CONCRETE ELECTRICAL MANHOLE DETAILS | NOT TO SCALE | 8



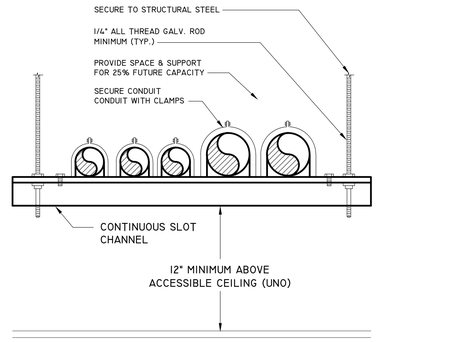
DETAIL - WALL SLEEVE | NOT TO SCALE | 14



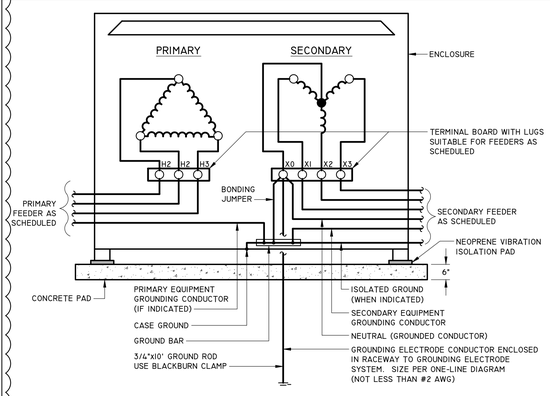
DETAIL - FIXTURE SUPPORT | NOT TO SCALE | 4



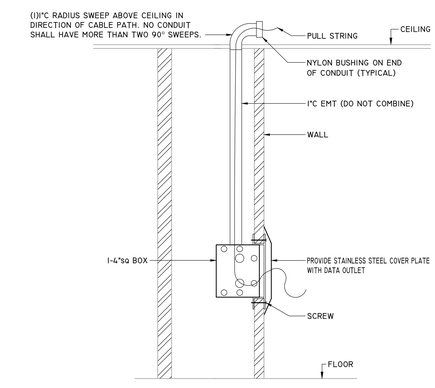
DETAIL - TRENCH (OTHER THAN SERVICE FEEDERS) | NOT TO SCALE | 6



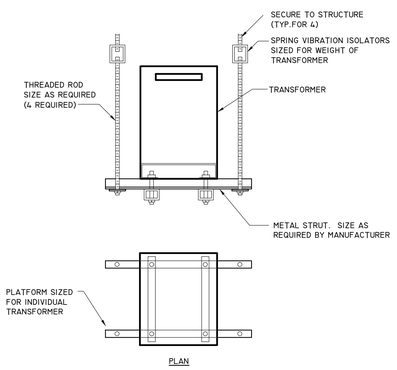
DETAIL - CONDUIT RACK | NOT TO SCALE | 3



NOT TO SCALE | 6

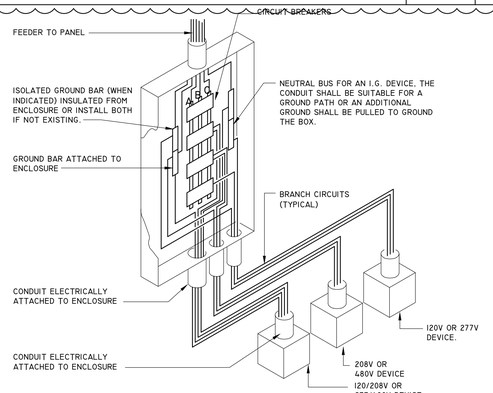


DETAIL - DATA OUTLETS | NOT TO SCALE | 2

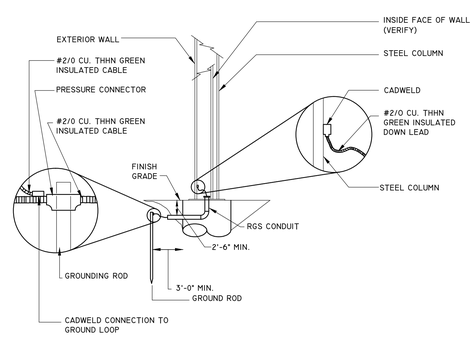


PLAN

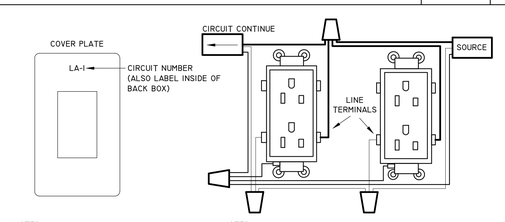
DETAIL - TRANSFORMER INSTALLATION (SUSPENDED) | NOT TO SCALE | 10



DETAIL - | NOT TO SCALE | 7



DETAIL - | NOT TO SCALE | 5



NOTES:
1. LABEL ALL JUNCTION BOXES, CONDUITS, CONDUITS ABOVE AND BELOW PANELBOARD, PULL BOXES, DEVICE BOXES, AND COVER PLATES.

NOTES:
1. CIRCUITING TO ALL NON DEDICATED ELECTRICAL RECEPTACLES AND SWITCHES ARE REQUIRED TO UTILIZE PARALLEL CIRCUITING BY THE USE OF "PIG TAILS" TO EACH DEVICE SO THAT IF AN OUTLET IS REMOVED OR FAILS ELECTRICAL CONTINUITY OF THE CIRCUIT WILL NOT BE COMPROMISED.
2. ALL ELECTRICAL WIRING MUST BE PROPERLY SPLICED BY TWISTING THE WIRES TOGETHER AND USE OF APPROVED AND LISTED COMPRESSION WIRE NUTS FOR ANY WIRING.
3. DO NOT USE END TO END BUTT-SPLICING CONNECTORS FOR ANY WIRING.
4. WRAP AROUND THE TERMINALS WITH ELECTRICAL TAPE.

DETAIL - PIGTAIL | NOT TO SCALE | 1

Infrastructure Associates
INFRASTRUCTURE ASSOCIATES, INC.
6117 RICHMOND AVENUE, SUITE 200
HOUSTON, TEXAS 77057
TBPE REGISTRATION NO. F-4506
(713) 622-0120 PH (713) 622-0557 FAX
WWW.IAHOUSTON.COM

UTHealth™
The University of Texas Health Science Center at Houston
School of Public Health
UT HEALTH SCIENCE SCHOOL OF PUBLIC HEALTH
1200 PRESSLER ST.
HOUSTON, TX 77030

STATE OF TEXAS
SEVAK KALANTARIANS
97498
LICENSED PROFESSIONAL ENGINEER

08/16/2017

REVISIONS

05/31/2017	ISSUED FOR BID
07/28/2017	ADDENDUM 1
08/16/2017	ADDENDUM 2
1	

Sheet Information

Date	31 MARCH 2017
Job Number	-
Drawn	KN, KT, CJT
Checked	IT, SK
Approved	MAF, SK

Title

DETAILS

Sheet

E500

ISSUED FOR BID

GENERAL NOTES

BOOK SPECIFICATION SUPERCEDE ANY NOTES BELOW

1. THESE DRAWINGS ARE SCHEMATIC IN NATURE AND ARE NOT INTENDED TO SHOW ALL OFFSETS. INSTALL PIPING AS CLOSE AS POSSIBLE TO LOCATIONS SHOWN. WHERE INTERFERENCE'S WITH COMPONENTS OF OTHER TRADE'S WORK (STRUCTURAL FOUNDATIONS OR OTHER BUILDING ELEMENTS) REQUIRE ROUTINGS AND LOCATIONS THAT VARY FROM THOSE SHOWN, THE CONTRACTOR SHALL OBTAIN PROJECT ENGINEER'S APPROVAL PRIOR TO INSTALLATION. NO ADDITIONAL COST SHALL BE GRANTED FOR THESE CHANGES.
2. BEFORE BEGINNING EXCAVATIONS OR DEMOLITION OF ANY NATURE WHATSOEVER, CONTRACTOR SHALL LOCATE ALL SERVICES AND UTILITIES OCCURRING WITHIN THE BOUNDS OF THE PROJECT. THE CONTRACTOR SHALL THEN PROCEED WITH CAUTION IN HIS WORK SO THAT NO UTILITY OR LINE SERVING AREAS THAT ARE TO REMAIN BE DAMAGED WITH A RESULTANT LOSS OF SERVICE. VERIFY THE SOURCE AND SERVICE OF EACH AND EVERY LINE ENCOUNTERED AND RECORD SERVICE, SIZE AND LOCATION ON RECORD DRAWINGS.
3. ROUGH-IN PLUMBING PIPING USING DIMENSIONS SHOWN ON ARCHITECTURAL DRAWINGS. LOCATION OF ALL PIPING SHALL ALLOW INSTALLATION OF FIXTURES WITHOUT THE NEED TO FURR-OUT WALLS.
4. PROVIDE CLEANOUTS IN EXCESS OF THOSE SHOWN WHICH ARE REQUIRED BY THE PLUMBING CODE.
5. INDIVIDUAL FIXTURE SUPPLY AND DRAIN SERVICES ARE NOT SHOWN DUE TO DRAWING SPACE LIMITATIONS. THIS CONTRACTOR SHALL PROVIDE ALL SERVICES FOR A COMPLETE FIRST CLASS INSTALLATION.
6. FURNISH AND INSTALL ALL NECESSARY VALVES, TRAPS, GAUGES, STRAINERS, UNIONS, ETC. FOR EACH PIECE OF EQUIPMENT HAVING PLUMBING CONNECTIONS TO FACILITATE PROPER FUNCTIONING AND SERVICING.
7. SEAL ALL PENETRATIONS THROUGH RATED WALLS, FLOORS AND CEILINGS WITH A UL LISTED ASSEMBLY TO PROVIDE A RATING EQUAL TO OR GREATER THAN THE RATING OF THE WALL, FLOOR OR CEILING.
8. EACH CONTRACTOR SHALL VISIT THE SITE AND ASCERTAIN FOR HIMSELF THE CONDITIONS TO BE MET THERE IN IMPLEMENTING HIS WORK AND MAKE DUE PROVISIONS FOR THE SAME. IT IS ASSUMED THAT THE CONTRACTOR HAS VISITED THE PREMISES AND THAT HIS COST ESTIMATE COVERS ALL NECESSARY LABOR AND MATERIALS TO PROPERLY ACCOMPLISH HIS WORK. FAILURE ON THE PART OF THE CONTRACTOR TO COMPLY WITH THIS REQUIREMENT SHALL NOT BE CONSIDERED JUSTIFICATION FOR OMISSIONS OR FAULTY WORK OR FOR THE PAYMENT OF ADDITIONAL COMPENSATION.
9. FIELD VERIFY EXISTING AND FUTURE GRADES WITHIN AREAS WHERE WORK IS BEING DONE.
10. VERIFY EXACT LOCATION OF EQUIPMENT PRIOR TO INSTALLATION OF FLOOR DRAINS. RELOCATION DUE TO MISPLACEMENT SHALL BE AT CONTRACTORS EXPENSE.
11. PROVIDE ACCESS PANELS FOR ALL BALL VALVES, WATER HAMMER ARRESTORS AND ETC THAT REQUIRE MAINTENANCE ACCESS.

WATER SOFTENER SCHDULE

TAG	TYPE	FLOW CAPACITIES				RESIN CAPACITIES		RESIN TANK			BRINE TANK		NOTES
		NOMINAL	PRES DROP	PEAK	BACKWASH	EXCHANGE	VOLUME	CONNECTION	ASME M.W.P.	VOLUME	VOLUME	SALT	
		(GPM)	(PSID)	(GPM)	(GPM)	(GRAINS)	(FT^3)	(NPS)	(PSIG)	(GAL)	(GAL)	(LBS)	
WS-1	DUPLEX	300	15	450	55	1,000,000	40	4" FLANGED	100	550	600	2,000	ALL

NOTES:
1. PROVIDE SOFTENER WITH MANUFACTURER'S DIGITAL PROGRAMMABLE CONTROLLER AND BACKLIT LCD DISPLAY IN NEMA 12 ENCLOSURE.
2. PROVIDE FULLY FUNCTIONAL SKID MOUNTED UNITS COMPLETE WITH MANUFACTURER INSTALLED PIPING, VALVES, WIRING, AND ACCESSORIES.
3. PROVIDE MANUFACTURER PRE-WIRED UNITS WITH SINGLE POINT 120 VAC ELECTRICAL CONNECTION.
4. PROVIDE RESIN TANKS FABRICATION, TESTED, AND LABELED IN COMPLIANCE WITH ASME STANDARDS.
5. PROVIDE RESIN TANKS AND ALL POTABLE WATER EXPOSED INTERNALS WITH NSF APPROVED MATERIALS OR LININGS.

1

STEAM FIRED WATER HEATER

PLAN MARK	MFR.	MODEL	TYPE	SERVICE	STEAM PSIG	STEAM TEMP.	STEAM PPH	STEAM MIN. ASME CLASS	MAX WPD (FT)	COLD IN	HOT WTR	RECOVERY GPM
WH-1	THERMAFLO	TH750H-1448-DWEN	SEMI-INST	DOMESTIC HEATING WTR	60	400	4,200	250	5.0	40	140	85
WH-2	THERMAFLO	TH750H-1448-DWEN	SEMI-INST	DOMESTIC HEATING WTR	60	400	4,200	250	5.0	40	140	85

NOTES:
1. HEATER SHALL BE SEMI-INST TYPE WITH STAINLESS STEEL SHELL.
2. PROVIDE UNITS COMPLETE WITH FACTORY AUTOMATED TEMPERATURE CONTROL SYSTEM AND SINGLE POINT ELECTRICAL CONNECTIONS.
3. UNIT SHALL BE SKIDMOUNTED

HOT WATER CIRCULATING PUMP SCHEDULE

MARK	MFR.	MODEL NO.	TYPE	G.P.M.	HEAD	H.P.	VOLTAGE	MOTOR R.P.M.	LOCATION
HWCP-1	BELL & GOSSETT	-	IN LINE BRONZE	40	60	1-1/2	480/3/60	1725	MECH. ROOM

NOTES:
1. HOT WATER CIRCULATION PUMP SHALL BE PROVIDED WITH TIMER TO DE-ENERGIZE THE PUMP UNDER DURING UNOCCUPIED PERIODS PER LATEST IEC.

SUMP PUMP SCHEDULE

MARK	MANUFACTURER	QTY	HP	HEAD	VOLTS	PHASE	HZ	GPM	LOCAITON
P-1	BELL & GOSSETT	2	3	30	480	3	60	125	EJECTOR / PUMP
P-2	BELL & GOSSETT	2	5	32	480	3	60	200	SUMP PUM
P-3	BELL & GOSSETT	2	1	34	480	3	60	60	EJECTOR / PUMP

NOTES:
1. PROVIDE NEW RAIL SYSTEM FOR EACH PIT FOR EASY REMOVAL OF PUMPS.
2. PROVIDE NEW FLOAT SWITCH SYSTEMS HIGH, LOW , ON OFF.
3. PROVIDE NEW CONTROLS AND TIE SYSTEM CONTROLS TO BAS SYSTEM.

GRADE OF HORIZONTAL DRAINAGE PIPING

1. HORIZONTAL DRAINAGE PIPING SHALL RUN IN PRACTICAL ALIGNMENT AND UNIFORM SLOPE OF NOT LESS THAN ONE-FOURTH (1/4) OF AN INCH PER FOOT OR TWO PERCENT (2) TOWARD POINT OF DISPOSAL PROVIDED THAT, WHERE IT IS IMPRACTICAL DUE TO THE DEPTH OF THE STREET SEWER OR TO THE STRUCTURAL FEATURES OR TO THE ARRANGEMENT OF ANY BUILDING OR STRUCTURE TO OBTAIN A SLOPE OF ONE-FOURTH (1/4) OF AN INCH PER FOOT OR TWO PERCENT, ANY SUCH PIPE OR PIPING FOUR (4) INCHES OR LARGER IN DIAMETER MAY HAVE A SLOPE OF NOT LESS THAN ONE EIGHTH (1/8) OF AN INCH OR ONE (1) PERCENT, WHEN FIRST APPROVED BY THE ADMINISTRATIVE AUTHORITY.

PIPING MATERIALS

1. SANITARY WASTE: (ABOVE SLAB ONLY)
   PIPE: CAST IRON ASTM A 74, HUBLESS, SERVICE WEIGHT. ALL 90'S MUST HAVE CLEANOUTS.

   JOINTS: NO HUB, ASTM C 564 NEOPRENE GASKETS AND STANDARD. ALL CLAMPS SHALL BE WIDE BODY HUSKY CLAMPS. CLAMP ASSEMBLIES SHALL CONFORM TO FM 1680 WHERE REQUIRED BY THE ADMINISTRATIVE AUTHORITY.

   FITTINGS: CAST IRON, ASTM A 888 DRAINAGE PATTERN.
2. VENT STACKS:
   FOR PIPING 1-1/2" AND SMALLER: PROVIDE DWV COPPER OR SCHEDULE 40 GALVANIZED PIPE AND FITTINGS. FOR PIPING 2" AND LARGER, USE CAST IRON SOIL PIPE AND FITTINGS, SAME AS ABOVE SLAB PIPING INDICATED ABOVE. PIPE MUST CONFORM TO ASTM A-74.
3. DOMESTIC WATER:
   TYPE "L" COPPER TUBING WITH WROUGHT COPPER FITTINGS AND 95/5 (TIN/ANTIMONY) SOLDER JOINTS.

PLUMBING LEGEND

DISREGARD LEGEND ITEMS NOT INDICATED ON DRAWINGS

SYMBOL	DESCRIPTION
	NEW PLUMBING FIXTURE
SAN / S	SANITARY WASTE
C.D.	CONDENSATE DRAIN LINE
V	VENT
DCW	DOMESTIC COLD WATER PIPING
DHW	DOMESTIC HOT WATER PIPING
DHWR	DOMESTIC HOT WATER RETURN PIPING
NG	NATURAL GAS
FCO	FLOOR CLEAN OUT
ECO	EXTERIOR CLEANOUT
WCO	WALL CLEANOUT
FD	FLOOR DRAIN
FS	FLOOR SINK
# #	RISER IDENTIFICATION
	ELBOW UP
	ELBOW DOWN
	BALL VALVE
B.V.	BALANCING VALVE
	GAS VALVE
	GATE VALVE
	GLOBE VALVE
	CHECK VALVE
	CAP AND SEAL
VTR	VENT THROUGH ROOF
(E)	EXISTING

PLUMBING FIXTURE SCHEDULE

MARK	DESCRIPTION	TRAP	SS	SV	CW	HW	REMARKS
EW-1	EYE WASH	-	-	-	1/2"	1/2"	HAWS NO. 8902_VB HAND HELD, DECK MOUNTED, LABORATORY EMERGENCY EYE AND FACE SPRAY UNIT WITH 1/2_INCH SUPPLY CONNECTION, EIGHT FOOT STAINLESS STEEL SAFETY HOSE, SOFT FLOW POLISHED CHROME PLATED SPRAY UNIT WITH QUICK OPENING LEVER VALVE, AUTOMATIC FLOW COMPENSATION DEVICE, POLISHED CHROME PLATED HAND GRIP WITH LARGE INTEGRAL BASE, BASE FLANGE, POSITIONING DECK FLANGE, METAL HOSE BRACKET, VACUUM BREAKER AND "EMERGENCY EYEWASH" IDENTIFICATION SIGN. LOCATE WHERE DIRECTED BY OWNER. ALL EXPOSED SURFACES
ESH-1	EYE WASH / SHOWER (SAFETY FIXTURE)	-	2"	2"	1 1/4"	-	EMERGENCY SHOWER SHALL BE HAWS 8169, OR SPEAKMAN SE_235 CONCEALED WALL-MOUNTED SHOWER. FURNISH COMPLETE WITH FLANGED DELUGE SHOWER HEAD, STAY_OPEN VALVE WITH PULL BAR, FLANGED THROUGH CEILING, INTERCONNECTING FITTINGS. ALL EXPOSED PARTS SHALL BE POLISHED CHROME_PLATED.
TMV-1	EMERGENCY WATER MIXING VALVE	-	-	-	1 1/2"	1 1/2"	TM-5125-STSTL-EXP LEONARD, DURA-TROL® SOLID BIMETAL THERMOSTAT DIRECTLY LINKED TO VALVE PORTING TO CONTROL THE INTAKE OF HOT AND COLD WATER AND COMPENSATE FOR SUPPLY TEMPERATURE AND PRESSURE FLUCTUATIONS. DURA-TROL® IS HIGHLY RESPONSIVE AND CANNOT BE DAMAGED BY EXTREMES IN TEMPERATURE. PRIMARY MIXING VALVE CAN BE SET TO THE CORRECT TEMPERATURE FOR THE APPLICATION. LOCKING TEMPERATURE REGULATOR TO PREVENT ACCIDENTAL MOVEMENT SET FOR 85°F , RECOMMENDED HOT INLET TEMPERATURE 140ºF, PRIMARY VALVE WILL CLOSE DOWN ON FAILURE OF COLD WATER SUPPLY. PRIMARY VALVE WITH SPECIAL BUILT IN COLD WATER BYPASS CAPABLE OF 40 GPM (151 L/MIN) @ 30 PSI (2.1 BAR) UPON FAILURE OF HOT WATER SUPPLY. ADJUSTABLE HIGH TEMPERATURE LIMIT STOP SET FOR 90°F (32°C). FULL 1 ¼ TOP INLETS AND 1 ½ TOP OUTLET. INTEGRAL WALL SUPPORT. DIAL THERMOMETER (0 TO 140°F, -10 TO 60°C). ROUGH BRONZE FINISH. EXPOSED STAINLESS STEEL CABINET WITH HINGED DOOR AND CYLINDER LOCK. UNION ANGLE CHECKSTOPS ON INLETS. COMPLIANCE□ □ □ □ ANSI Z 358.1 2004. OUTLET TEMPURATURE SHALL BE 85ºF. CAUTION! ALL THERMOSTATIC WATER MIXING VALVES HAVE LIMITATIONS. THEY WILL NOT PROVIDE THE DESIRED ACCURACY OUTSIDE OF THEIR FLOW CAPACITY RANGE. CONSULT THE FLOW CAPACITY CHART AND DO NOT OVERSIZE. MINIMUM FLOW MUST BE NO LESS THAN AS INDICATED.
WHA-1	WATER HAMMER ARRESTOR	-	-	-	-	-	5000 J.R. SMITH, "HYDROTROL" ALL STAINLESS STEEL SHOCK ABSORBERS SHALL BE INSTALLED AT ALL SOLENOID, REMOTE OPERATED OR QUICK CLOSING VALVES AND AT EACH PLUMBING FIXTURE OR BATTERY OF PLUMBING FIXTURES. INSTALL ON BOTH HOT AND COLD WATER BRANCH LINES IN AN UPRIGHT POSITION AS CLOSE AS POSSIBLE TO THE VALVE OR VALVES BEING SERVED. SIZES AND LOCATIONS AS INDICATED ON DRAWINGS.
RPZ-1	DOUBLE CHECK VALVE ASSEMBLIES	-	-	-	AS SHOWN	-	LF009 WATTS, LEAD FREE* REDUCED PRESSURE ZONE ASSEMBLIES PREVENT THE REVERSE FLOW OF POLLUTED WATER FROM ENTERING INTO THE POTABLE WATER SUPPLY DUE TO BACKSIPHONAGE AND OR BACKPRESSURE. IT CONSISTS OF LEAD FREE* BRONZE BODY CONSTRUCTION (1/4 TO 2 IN.) OR LEAD FREE* FDA APPROVED EPOXY COATED CAST IRON (2 1/2 TO 3 IN.), TWO, IN-LINE INDEPENDENT CHECK VALVES, REPLACEABLE CHECK SEATS WITH AN INTERMEDIATE RELIEF VALVE, AND BALL VALVE TEST COCKS. SERIES LF009 IS IDEAL FOR PROTECTION OF HEALTH HAZARD CROSS-CONNECTIONS OR FOR CONTAINMENT AT THE SERVICE LINE ENTRANCE. CHECK WITH LOCAL WATER AUTHORITIES FOR INSTALLATION REQUIREMENTS. MAXIMUM WORKING PRESSURE: 175PSI (12.06 BAR).

(SIZE OF CONNECTION: TRAP, SS, SV, CW, HW)

Infrastructure Associates

INFRASTRUCTURE ASSOCIATES, INC.
6117 RICHMOND AVENUE, SUITE 200
HOUSTON, TEXAS 77057
TBPE REGISTRATION NO. F-4506
(713) 622-0120 PH (713) 622-0557 FAX
WWW.IAHOUSTON.COM

UTHealth
The University of Texas
Health Science Center at Houston
School of Public Health

UT HEALTH SCIENCE SCHOOL OF PUBLIC HEALTH

1200 PRESSLER ST.
HOUSTON, TX 77030

STATE OF TEXAS
MATT A FLUKINGER
119970
LICENSED
PROFESSIONAL ENGINEER
8-16-2017

REVISIONS

DATE	DESCRIPTION
05/31/2017	ISSUED FOR BID
07/28/2017	ADDENDUM 1
08/16/2017 (1)	ADDENDUM 2

Sheet Information

Date	31 MARCH 2017
Job Number	-
Drawn	KN, KT, CJT
Checked	IT, SK
Approved	MAF, SK

Title

SCHEDULES, NOTES AND LEGEND

Sheet

P001

ISSUED FOR BID

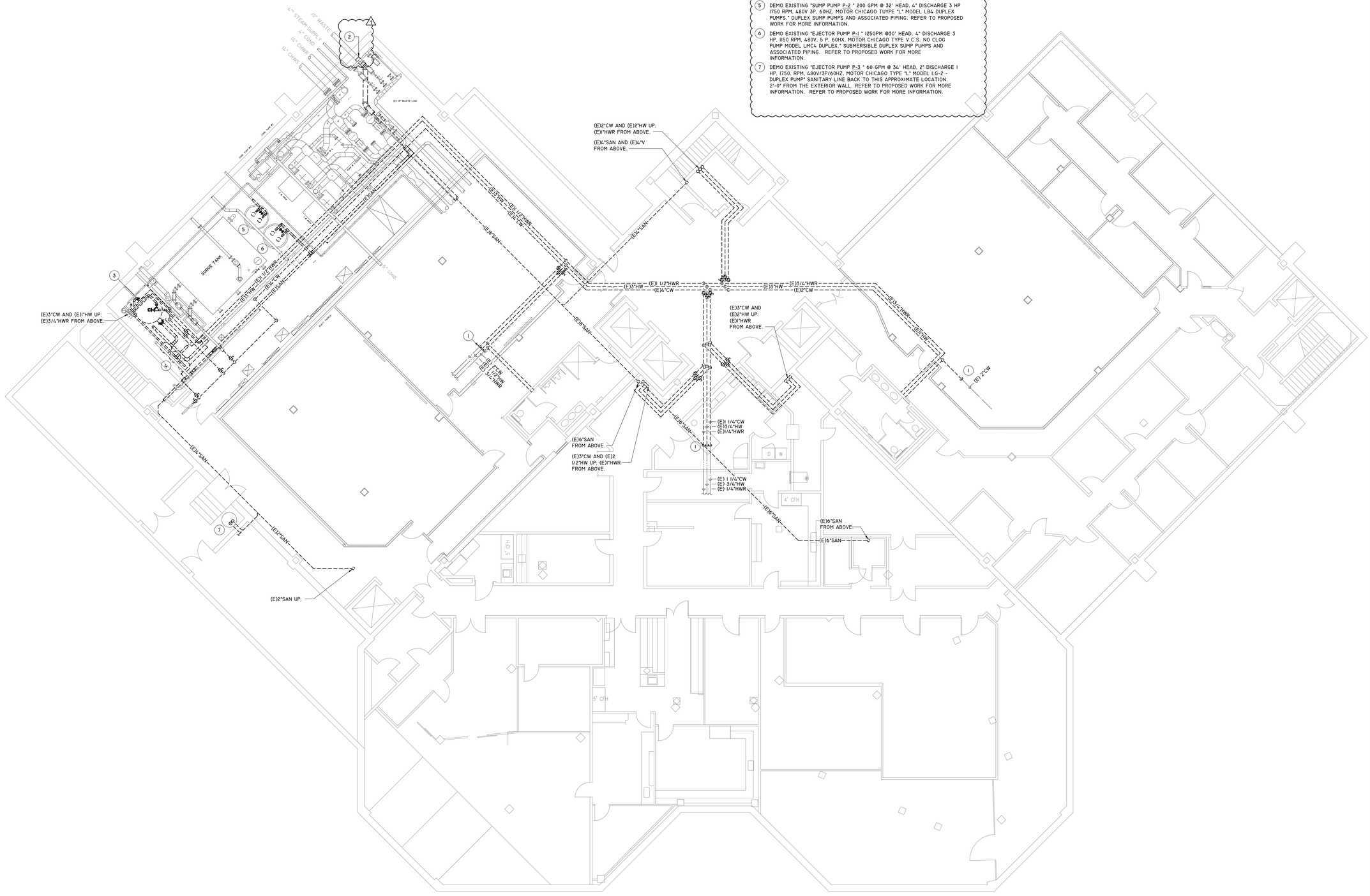
0 1/2" 1" 2"

KEYED NOTE:

1. ALL EXISTING PIPING SHALL REMAIN UNTIL THE END OF THE "ADA RESTROOM PROJECT BY OTHER". THE CONTRACTOR SHALL DEMO THE EXISTING PIPING UP TO THIS POINT AT THE END OF THE "ADA RESTROOM PROJECT" CONTRACTOR SHALL COORDINATE WITH OWNER PHASING SCHEDULE. REFER TO PROPOSED WORK FOR MORE INFORMATION.
2. DEMO EXISTING MANUAL CHECK VALVE. REFER TO PROPOSED FOR MORE INFORMATION.
3. DEMO EXISTING DOMESTIC HOT WATER SYSTEM, PIPING AND ASSOCIATED APPARATUS. HOT WATER RE-CIRCULATING SYSTEM SHALL BE REPLACED WITH SAME SIZE AS EXISTING REFER TO PROPOSED DRAWINGS FOR NEW LOCATION. CONTRACTOR SHALL COORDINATE WITH OWNER PHASING SCHEDULE TO DETERMINE MINIMAL DOWN TIME IN THE HOT WATER SYSTEM.
4. DEMO EXISTING WATER SOFTENER SYSTEM AND ASSOCIATED APPARATUS BACK TO ACTIVE MAIN. REFER TO SCHEDULE SHEETS AND PROPOSED WORK FOR MORE INFORMATION.
5. DEMO EXISTING "SUMP PUMP P-2 " 200 GPM @ 32' HEAD, 4" DISCHARGE 3 HP 1750 RPM, 480V 3P, 60HZ, MOTOR CHICAGO TUYPE "L" MODEL LB4 DUPLEX PUMPS." DUPLEX SUMP PUMPS AND ASSOCIATED PIPING. REFER TO PROPOSED WORK FOR MORE INFORMATION.
6. DEMO EXISTING "EJECTOR PUMP P-1 " 125GPM @30' HEAD. 4" DISCHARGE 3 HP, 1150 RPM, 480V, 5 P, 60HX, MOTOR CHICAGO TYPE V.C.S. NO CLOG PUMP MODEL LMC4 DUPLEX." SUBMERSIBLE DUPLEX SUMP PUMPS AND ASSOCIATED PIPING. REFER TO PROPOSED WORK FOR MORE INFORMATION.
7. DEMO EXISTING "EJECTOR PUMP P-3 " 60 GPM @ 34' HEAD, 2" DISCHARGE 1 HP, 1750, RPM, 480V/3P/60HZ, MOTOR CHICAGO TYPE "L" MODEL LG-2 - DUPLEX PUMP" SANITARY LINE BACK TO THIS APPROXIMATE LOCATION. 2'-0" FROM THE EXTERIOR WALL. REFER TO PROPOSED WORK FOR MORE INFORMATION. REFER TO PROPOSED WORK FOR MORE INFORMATION.

GENERAL NOTE:

I. EXISTING COLD WATER, HOT WATER, HOT WATER RETURN HWR, SANITARY AND VENT PIPING SHALL REMAIN EXISTING AND IN OPERATION UNTIL THE END OF THE "ADA PROJECT" THEN PIPING SHALL BE DEMOED UNDER THIS PACKAGE.



1 BASEMENT FLOOR PLAN - PLUMBING EXISTING PIPING

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

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119970
LICENSED
PROFESSIONAL ENGINEER
8-16-2017

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07/28/2017	ADDENDUM 1
08/16/2017 △	ADDENDUM 2

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DEMO BASEMENT FLOOR PLAN - PLUMBING

Sheet

P101

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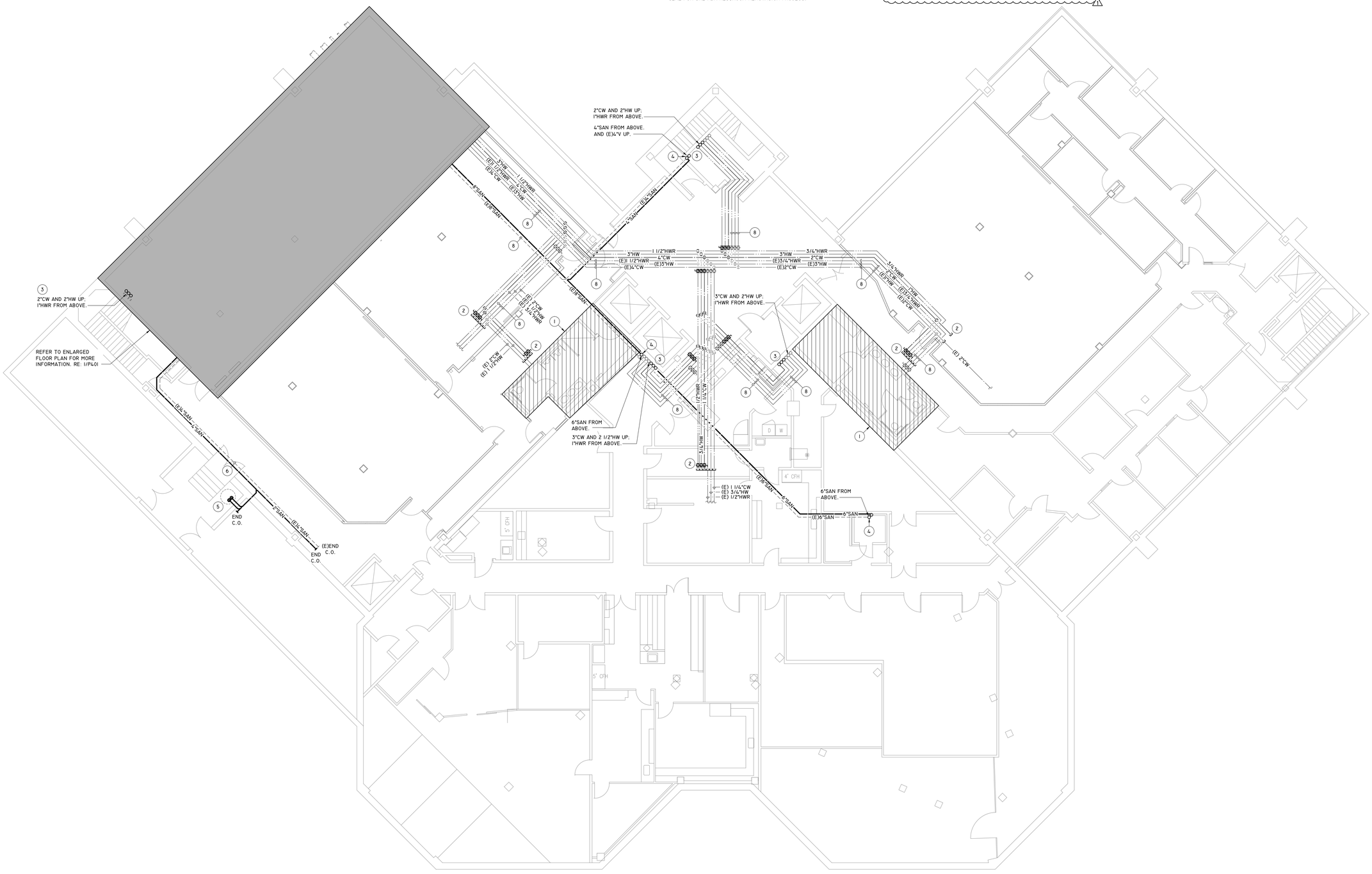
0 1/2" 1" 2"

KEYED NOTE:

1. THE BUILD OUT FOR THIS RESTROOM SHALL BE RENOVATED IN THE "ADA PROJECT BY OTHER".
2. ALL EXISTING CW, HW, HWR, SAN, AND VENT TO REMAIN IN SERVICE UNTIL THE END OF THE "ADA PROJECT". ROUTE PROPOSED CW, HW, HWR, SAN AND VENT LINES PARALLEL TO THE EXISTING PIPING WITH THE SAME SIZE PIPING. ROUTE MAIN WATER LINES AND RISERS AND PROVIDE NEW PENETRATIONS THRU EACH FLOOR. SEAL ALL PENETRATIONS WITH FIRE RATED SEALANT. PROVIDE A TAP WITH A SHUT OFF VALVE, CAP AND SEAL ON EACH LEVEL FOR EACH RISER. THE "ADA RESTROOM RENOVATION PROJECT (BY OTHER)" SHALL CONNECT TO THE PROPOSED RISERS. UNDER THIS PROJECT THE CONTRACTOR SHALL DEMO ALL OLD HORIZONTAL AND VERTICAL RUNS THAT ARE NO LONGER IN USE. CONTRACTOR SHALL REPAIR WALLS, FLOORS, SLABS, CEILINGS TO MATCH EXISTING UNLESS OTHERWISE NOTED ON THE ARCHITECTURAL DRAWINGS.
3. INSTALL NEW CW, HW, AND HWR RISERS NEXT TO THE EXISTING PIPE RISER WITH LINE SIZE BALL VALVES, CAP AND SEAL FOR THE NEXT PROJECT. ALL VALVES SHALL BE NIBCO "HydraPure" BALL VALVE ONLY. CERTIFIED "LEAD FREE".
4. INSTALL PROPOSED SANITARY, VENT LINES AND RISERS NEXT TO THE EXISTING PIPING CAP AND SEAL 4"SAN AND 4" V LINES AT EACH FLOOR THEN CAP AND SEAL FOR THE ADA RESTROOM RENOVATION PROJECT.
5. REPLACE EXISTING "EJECTOR PUMP P-3 " 60 GPM @ 34' HEAD, 2" DISCHARGE 1 HP, 1750, RPM, 480V/3P/60HZ, MOTOR CHICAGO TYPE "L" MODEL LG-2 - DUPLEX PUMP" SANITARY LINE BACK TO THIS APPROXIMATE LOCATION. 2'-0" FROM THE EXTERIOR WALL. REFER TO PROPOSED WORK FOR MORE INFORMATION. COORDINATE WITH PROJECT PHASING SCHEDULE TO MINIMIZE OUTAGE TIME.
6. EXISTING PLUMBING LINES TO REMAIN UNTIL THE END OF THE ADA RESTROOM RENOVATION PROJECT BY OTHER. UNDER THIS BASE BID CONTRACTOR SHALL DEMO AND REMOVE ALL UNUSED LINES. CONTRACTOR SHALL REPAIR WALLS, FLOORS, SLABS, CEILINGS TO MATCH EXISTING UNLESS OTHERWISE NOTED ON THE ARCHITECTURAL DRAWINGS.

GENERAL NOTE:

1. ALL EXISTING HAND HELD EYE WASH STATIONS IN CORRIDORS SHALL BE REPLACED WITH EW-1 THROUGH THE ENTIRE BUILDING. ALL EYE/FACE DRENCH SHOWERS SHALL BE REPLACED WITH ESH-1 IF THEY ARE NOT IN PRISTINE CONDITION. ALL EMERGENCY SHOWERS SHALL BE PROVIDED WITH TEMPERED WATER WITH LOCAL MIXING VALVES @ 85°F.
2. CONTRACTOR IS RESPONSIBLE FOR RECONNECTING ANY EXISTING LINES THAT ARE NOT SHOWN ON THESE PLANS AFTER THE ADA RESTROOM RENOVATION. CONTRACTOR SHALL COORDINATE WITH OWNER PHASING TO AVOID DOWN TIME.
3. ALL COLD WATER PIPING AND PIPING SHALL BE INSULATED WITH 1" FIBERGLASS INSULATION, ALL HOT AND HOT WATER RETURN PIPING SHALL BE INSULATED AS FOLLOWED (1 1/4" AND BELOW 1" FIBERGLASS INSULATION SHALL BE USED) AND (1 1/2" AND ABOVE 2" FIBERGLASS INSULATION SHALL BE USED)



1 BASEMENT FLOOR PLAN - PLUMBING - PROPOSED NEW PIPING

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

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119970
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PROFESSIONAL ENGINEER
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BASEMENT FLOOR PLAN - PLUMBING

Sheet

P201

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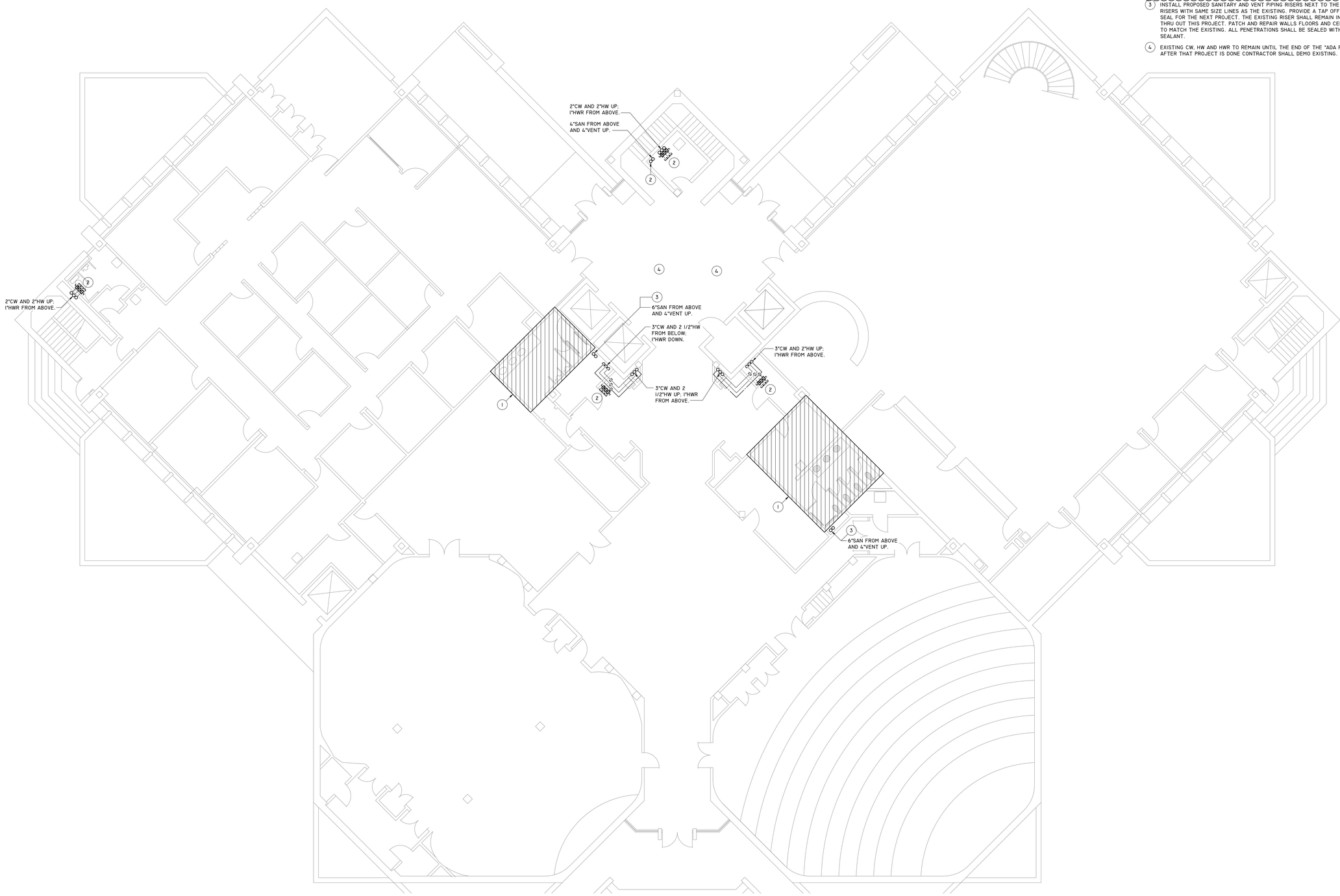
0 1/2" 1" 2"

GENERAL NOTE:

1. EXISTING PLUMBING FIXTURE TO REMAIN. UNLESS OTHERWISE NOTED BY ARCHITECT.
2. ALL EXISTING CW, HW, HWR, SAN, AND VENT TO REMAIN IN SERVICE UNTIL THE END OF THE "ADA RESTROOM PROJECT BY OTHER". ROUTE PROPOSED CW, HW, HWR, SAN AND VENT LINES PARALLEL TO THE EXISTING PIPING WITH THE SAME SIZE PIPING. ROUTE MAIN WATER LINES AND RISERS AND PROVIDE NEW PENETRATIONS THRU EACH FLOOR. SEAL ALL PENETRATIONS WITH FIRE RATED SEALANT. PROVIDE A TAP WITH A SHUT OFF VALVE, CAP AND SEAL ON EACH LEVEL FOR EACH RISER. THE "ADA PROJECT" SHALL CONNECT TO THE PROPOSED RISERS. UNDER THIS PROJECT THE CONTRACTOR SHALL DEMO ALL OLD HORIZONTAL AND VERTICAL RUNS THAT ARE NO LONGER IN USE. CONTRACTOR SHALL REPAIR WALLS, FLOORS, SLABS, CEILINGS TO MATCH EXISTING UNLESS OTHERWISE NOTED ON THE ARCHITECTURAL DRAWINGS.

KEYED NOTE:

1. REFER TO OTHER PROJECT FOR WORK IN THIS AREA.
2. INSTALL PROPOSED RISERS NEXT TO THE EXISTING RISERS WITH SAME SIZE LINES AS THE EXISTING (ASSUME 3"CW, 2 1/2"HW, 1"HWR FIELD VERIFY EXACT SIZES). PROVIDE A CAPPED AND SEALED TAP FOR EACH WATER LINE SERVING THIS LEVEL. PROVIDE LINE SIZE BALL VALVES FOR EACH PIPE (ASSUME 2 1/2"CW, 1"HW, 3/4"HWR FIELD VERIFY EXACT SIZES). THE EXISTING RISER SHALL REMAIN IN USE THRU OUT THIS PROJECT. PATCH AND REPAIR WALLS FLOORS AND CEILINGS TO MATCH THE EXISTING. ALL PENETRATIONS SHALL BE SEALED WITH FIRE SEALANT.
3. INSTALL PROPOSED SANITARY AND VENT PIPING RISERS NEXT TO THE EXISTING RISERS WITH SAME SIZE LINES AS THE EXISTING. PROVIDE A TAP OFF CAP AND SEAL FOR THE NEXT PROJECT. THE EXISTING RISER SHALL REMAIN IN USE THRU OUT THIS PROJECT. PATCH AND REPAIR WALLS FLOORS AND CEILINGS TO MATCH THE EXISTING. ALL PENETRATIONS SHALL BE SEALED WITH FIRE SEALANT.
4. EXISTING CW, HW AND HWR TO REMAIN UNTIL THE END OF THE "ADA PROJECT" AFTER THAT PROJECT IS DONE CONTRACTOR SHALL DEMO EXISTING.



1 FIRST FLOOR PLAN - PLUMBING

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

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119970
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FIRST FLOOR PLAN - PLUMBING

Sheet

P202

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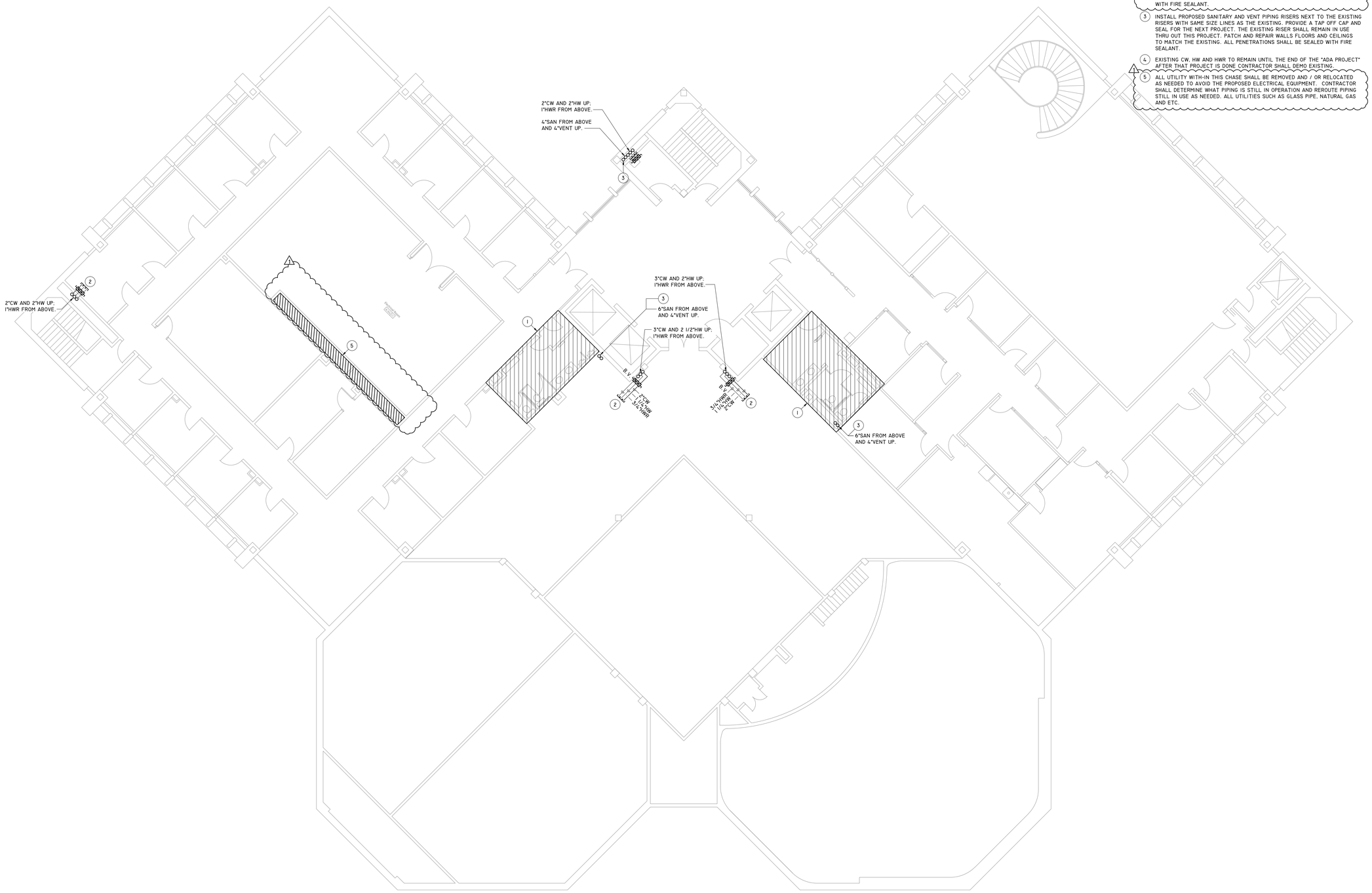
0 1/2" 1" 2"

GENERAL NOTE:

1. EXISTING PLUMBING FIXTURE TO REMAIN. UNLESS OTHERWISE NOTED BY ARCHITECT.
2. ALL EXISTING CW, HW, HWR, SAN, AND VENT TO REMAIN IN SERVICE UNTIL THE END OF THE "ADA PROJECT". ROUTE PROPOSED CW, HW, HWR, SAN AND VENT LINES PARALLEL TO THE EXISTING PIPING WITH THE SAME SIZE PIPING. ROUTE MAIN WATER LINES AND RISERS AND PROVIDE NEW PENETRATIONS THRU EACH FLOOR. SEAL ALL PENETRATIONS WITH FIRE RATED SEALANT. PROVIDE A TAP WITH A SHUT OFF VALVE, CAP AND SEAL ON EACH LEVEL FOR EACH RISER. THE "ADA PROJECT" SHALL CONNECT TO THE PROPOSED RISERS. UNDER THIS PROJECT THE CONTRACTOR SHALL DEMO ALL OLD HORIZONTAL AND VERTICAL RUNS THAT ARE NO LONGER IN USE. CONTRACTOR SHALL REPAIR WALLS, FLOORS, SLABS, CEILINGS TO MATCH EXISTING UNLESS OTHERWISE NOTED ON THE ARCHITECTURAL DRAWINGS.

KEYED NOTE:

1. REFER TO OTHER PROJECT FOR WORK IN THIS AREA.
2. INSTALL PROPOSED RISERS NEXT TO THE EXISTING RISERS WITH SAME SIZE LINES AS THE EXISTING (ASSUME 3"CW, 2 1/2"HW, 1"HWR FIELD VERIFY EXACT SIZES). PROVIDE A CAPPED AND SEALED TAP FOR EACH WATER LINE SERVING THIS LEVEL. PROVIDE LINE SIZE BALL VALVES FOR EACH PIPE (ASSUME 2 1/2"CW, 1"HW, 3/4"HWR FIELD VERIFY EXACT SIZES). THE EXISTING RISER SHALL REMAIN IN USE THRU OUT THIS PROJECT. PATCH AND REPAIR WALLS FLOORS AND CEILINGS TO MATCH THE EXISTING. ALL PENETRATIONS SHALL BE SEALED WITH FIRE SEALANT.
3. INSTALL PROPOSED SANITARY AND VENT PIPING RISERS NEXT TO THE EXISTING RISERS WITH SAME SIZE LINES AS THE EXISTING. PROVIDE A TAP OFF CAP AND SEAL FOR THE NEXT PROJECT. THE EXISTING RISER SHALL REMAIN IN USE THRU OUT THIS PROJECT. PATCH AND REPAIR WALLS FLOORS AND CEILINGS TO MATCH THE EXISTING. ALL PENETRATIONS SHALL BE SEALED WITH FIRE SEALANT.
4. EXISTING CW, HW AND HWR TO REMAIN UNTIL THE END OF THE "ADA PROJECT" AFTER THAT PROJECT IS DONE CONTRACTOR SHALL DEMO EXISTING.
5. ALL UTILITY WITH-IN THIS CHASE SHALL BE REMOVED AND / OR RELOCATED AS NEEDED TO AVOID THE PROPOSED ELECTRICAL EQUIPMENT. CONTRACTOR SHALL DETERMINE WHAT PIPING IS STILL IN OPERATION AND REROUTE PIPING STILL IN USE AS NEEDED. ALL UTILITIES SUCH AS GLASS PIPE, NATURAL GAS AND ETC.



1 SECOND FLOOR PLAN - PLUMBING

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

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SECOND FLOOR PLAN - PLUMBING

Sheet

P203

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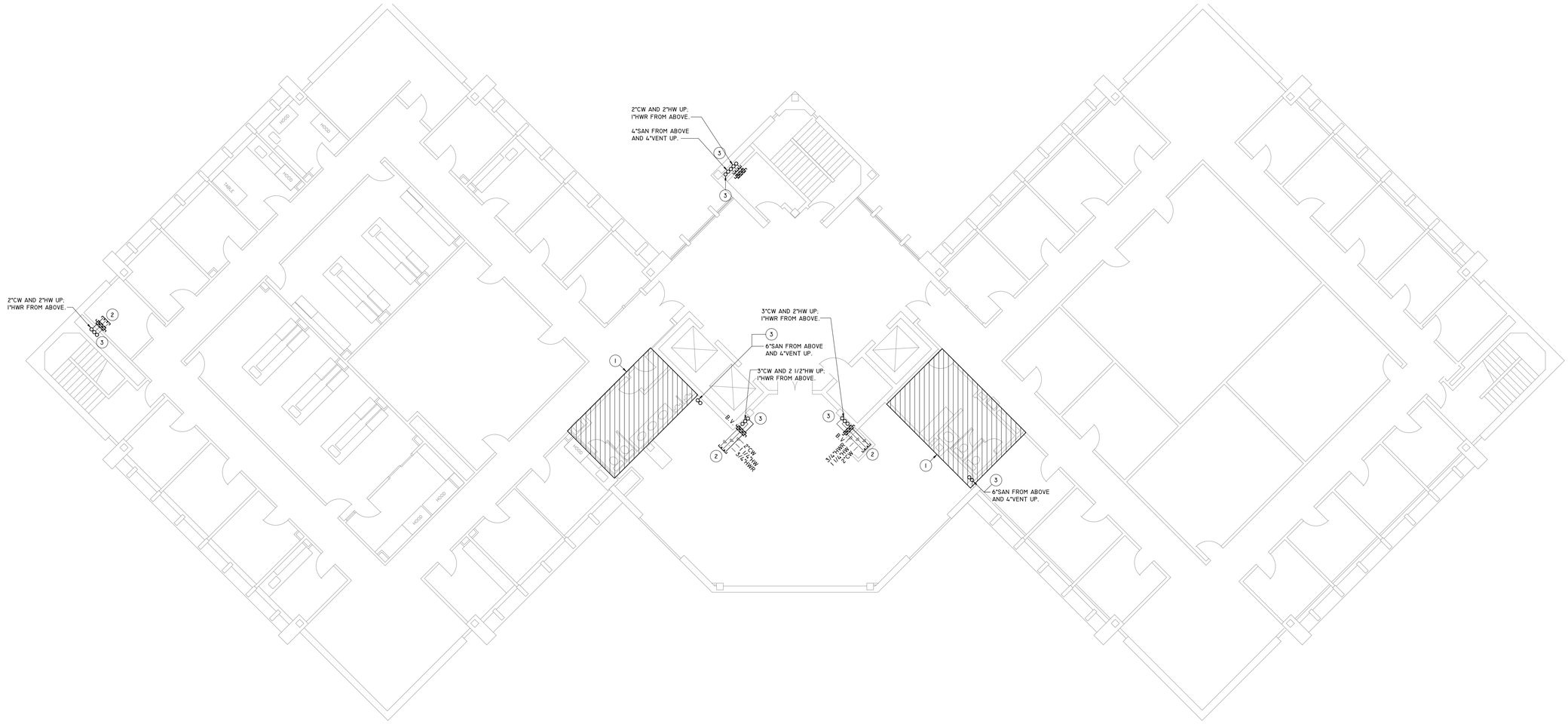
0 1/2" 1" 2"

GENERAL NOTE:

1. EXISTING PLUMBING FIXTURE TO REMAIN. UNLESS OTHERWISE NOTED BY ARCHITECT.
2. ALL EXISTING CW, HW, HWR, SAN, AND VENT TO REMAIN IN SERVICE UNTIL THE END OF THE "ADA RESTROOM PROJECT BY OTHER". ROUTE PROPOSED CW, HW, HWR, SAN AND VENT LINES PARALLEL TO THE EXISTING PIPING WITH THE SAME SIZE PIPING. ROUTE MAIN WATER LINES AND RISERS AND PROVIDE NEW PENETRATIONS THRU EACH FLOOR. SEAL ALL PENETRATIONS WITH FIRE RATED SEALANT. PROVIDE A TAP WITH A SHUT OFF VALVE, CAP AND SEAL ON EACH LEVEL FOR EACH RISER. THE "ADA PROJECT" SHALL CONNECT TO THE PROPOSED RISERS. UNDER THIS PROJECT THE CONTRACTOR SHALL DEMO ALL OLD HORIZONTAL AND VERTICAL RUNS THAT ARE NO LONGER IN USE. CONTRACTOR SHALL REPAIR WALLS, FLOORS, SLABS, CEILINGS TO MATCH EXISTING UNLESS OTHERWISE NOTED ON THE ARCHITECTURAL DRAWINGS.

KEYED NOTE:

1. REFER TO OTHER PROJECT FOR WORK IN THIS AREA.
2. INSTALL PROPOSED RISERS NEXT TO THE EXISTING RISERS WITH SAME SIZE LINES AS THE EXISTING (ASSUME 3"CW, 2 1/2"HW, 1"HWR FIELD VERIFY EXACT SIZES). PROVIDE A CAPPED AND SEALED TAP FOR EACH WATER LINE SERVING THIS LEVEL. PROVIDE LINE SIZE BALL VALVES FOR EACH PIPE (ASSUME 2 1/2"CW, 1"HW, 3/4"HWR FIELD VERIFY EXACT SIZES). THE EXISTING RISER SHALL REMAIN IN USE THRU OUT THIS PROJECT. PATCH AND REPAIR WALLS FLOORS AND CEILINGS TO MATCH THE EXISTING. ALL PENETRATIONS SHALL BE SEALED WITH FIRE SEALANT.
3. INSTALL PROPOSED SANITARY AND VENT PIPING RISERS NEXT TO THE EXISTING RISERS WITH SAME SIZE LINES AS THE EXISTING. PROVIDE A TAP OFF CAP AND SEAL FOR THE NEXT PROJECT. THE EXISTING RISER SHALL REMAIN IN USE THRU OUT THIS PROJECT. PATCH AND REPAIR WALLS FLOORS AND CEILINGS TO MATCH THE EXISTING. ALL PENETRATIONS SHALL BE SEALED WITH FIRE SEALANT.
4. EXISTING CW, HW AND HWR TO REMAIN UNTIL THE END OF THE "ADA PROJECT" AFTER THAT PROJECT IS DONE CONTRACTOR SHALL DEMO EXISTING.



1 THIRD FLOOR PLAN - PLUMBING

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

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THIRD FLOOR PLAN - PLUMBING

Sheet

P204

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0 1/2" 1" 2"

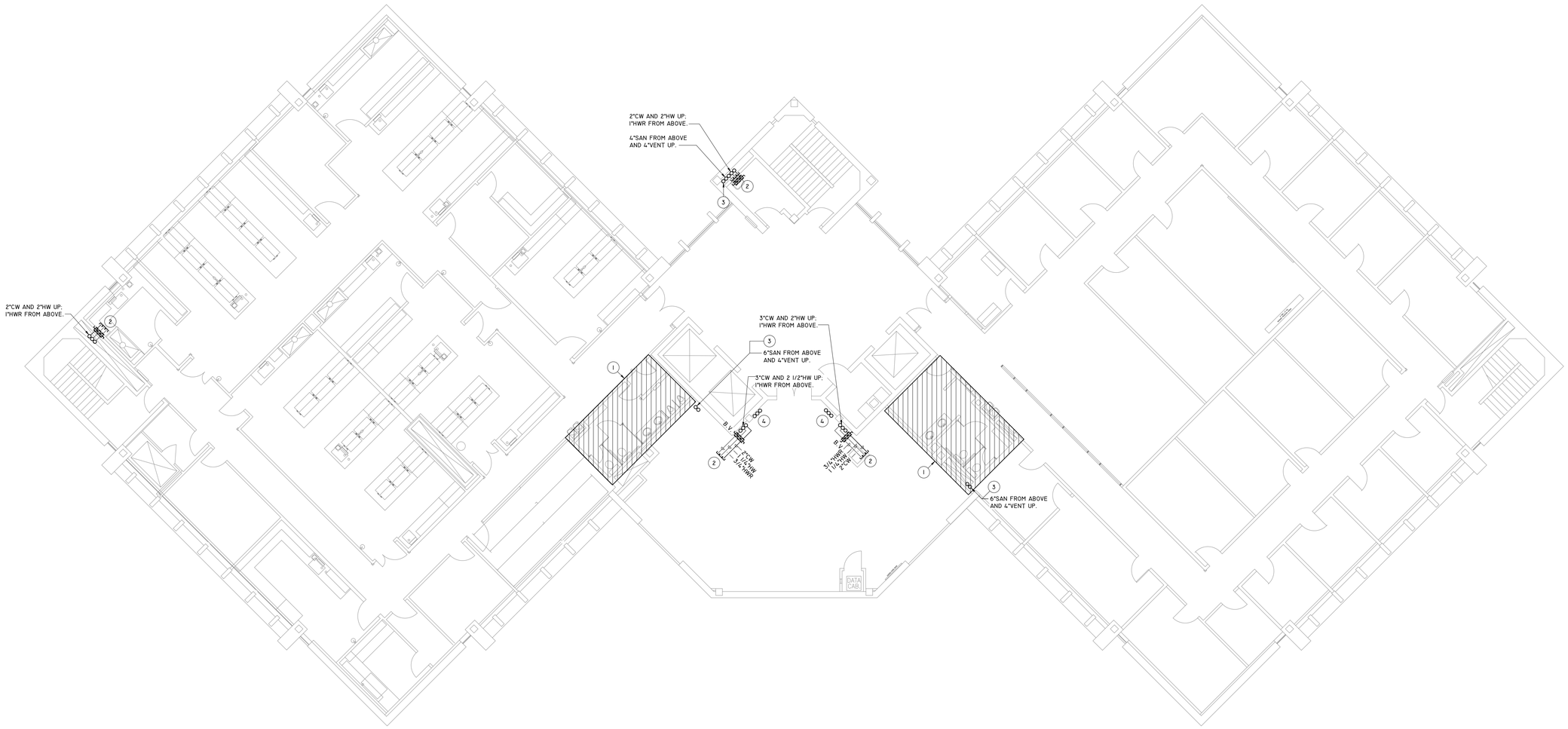
GENERAL NOTE:

1. EXISTING PLUMBING FIXTURE TO REMAIN. UNLESS OTHERWISE NOTED BY ARCHITECT.

2. ALL EXISTING CW, HW, HWR, SAN, AND VENT TO REMAIN IN SERVICE UNTIL THE END OF THE "ADA RESTROOM PROJECT BY OTHER". ROUTE PROPOSED CW, HW, HWR, SAN AND VENT LINES PARALLEL TO THE EXISTING PIPING WITH THE SAME SIZE PIPING. ROUTE MAIN WATER LINES AND RISERS AND PROVIDE NEW PENETRATIONS THRU EACH FLOOR. SEAL ALL PENETRATIONS WITH FIRE RATED SEALANT. PROVIDE A TAP WITH A SHUT OFF VALVE, CAP AND SEAL ON EACH LEVEL FOR EACH RISER. THE "ADA PROJECT" SHALL CONNECT TO THE PROPOSED RISERS. UNDER THIS PROJECT THE CONTRACTOR SHALL DEMO ALL OLD HORIZONTAL AND VERTICAL RUNS THAT ARE NO LONGER IN USE. CONTRACTOR SHALL REPAIR WALLS, FLOORS, SLABS, CEILINGS TO MATCH EXISTING UNLESS OTHERWISE NOTED ON THE ARCHITECTURAL DRAWINGS.

KEYED NOTE:

1. REFER TO OTHER PROJECT FOR WORK IN THIS AREA.
2. INSTALL PROPOSED RISERS NEXT TO THE EXISTING RISERS WITH SAME SIZE LINES AS THE EXISTING (ASSUME 3"CW, 2 1/2"HW, 1"HWR FIELD VERIFY EXACT SIZES). PROVIDE A CAPPED AND SEALED TAP FOR EACH WATER LINE SERVING THIS LEVEL. PROVIDE LINE SIZE BALL VALVES FOR EACH PIPE (ASSUME 2 1/2"CW, 1"HW, 3/4"HWR FIELD VERIFY EXACT SIZES). THE EXISTING RISER SHALL REMAIN IN USE THRU OUT THIS PROJECT. PATCH AND REPAIR WALLS FLOORS AND CEILINGS TO MATCH THE EXISTING. ALL PENETRATIONS SHALL BE SEALED WITH FIRE SEALANT.
3. INSTALL PROPOSED SANITARY AND VENT PIPING RISERS NEXT TO THE EXISTING RISERS WITH SAME SIZE LINES AS THE EXISTING. PROVIDE A TAP OFF CAP AND SEAL FOR THE NEXT PROJECT. THE EXISTING RISER SHALL REMAIN IN USE THRU OUT THIS PROJECT. PATCH AND REPAIR WALLS FLOORS AND CEILINGS TO MATCH THE EXISTING. ALL PENETRATIONS SHALL BE SEALED WITH FIRE SEALANT.
4. EXISTING CW, HW AND HWR TO REMAIN UNTIL THE END OF THE "ADA PROJECT" AFTER THAT PROJECT IS DONE CONTRACTOR SHALL DEMO EXISTING.



1 FOURTH FLOOR PLAN - PLUMBING

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

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FOURTH FLOOR PLAN - PLUMBING

Sheet

P205

ISSUED FOR BID

0 1/2" 1" 2"

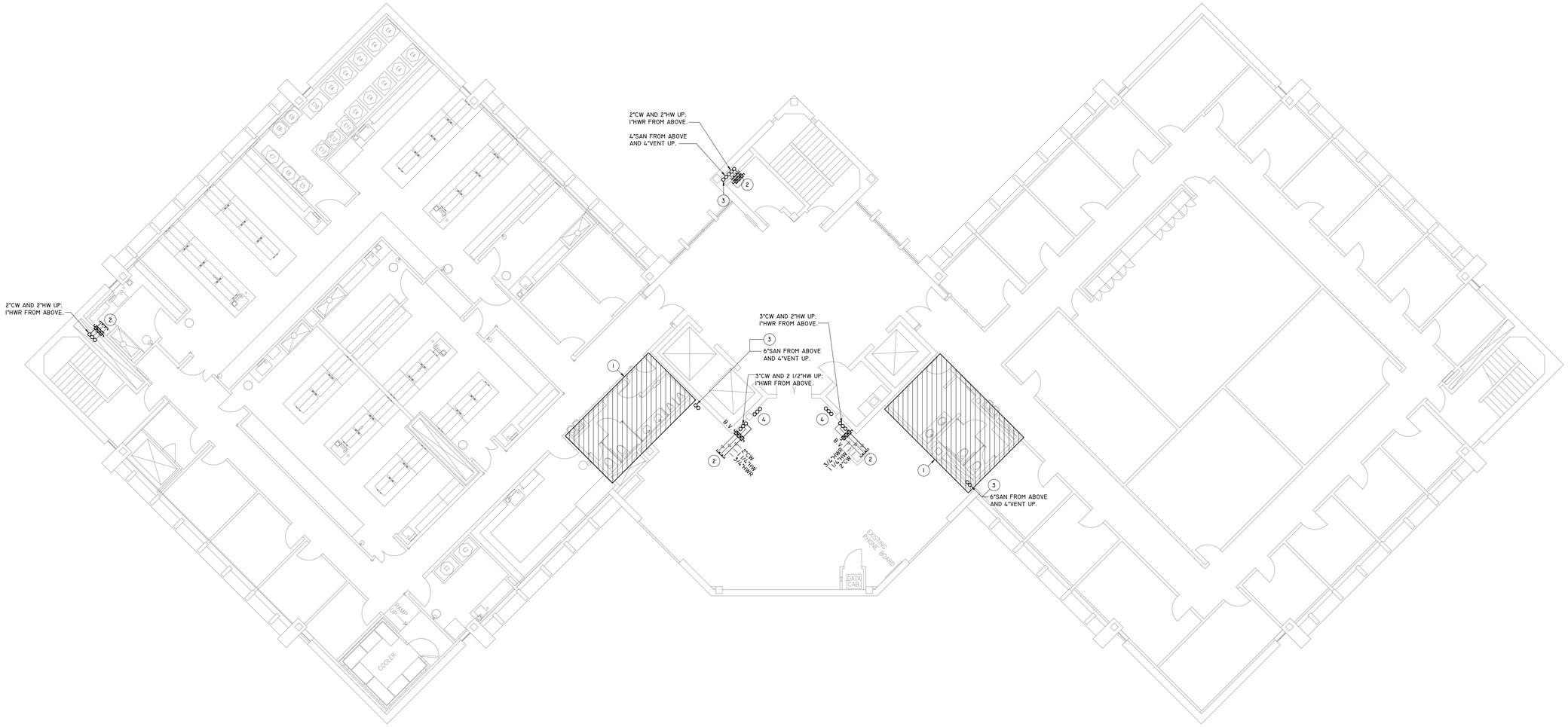
GENERAL NOTE:

1. EXISTING PLUMBING FIXTURE TO REMAIN. UNLESS OTHERWISE NOTED BY ARCHITECT.

2. ALL EXISTING CW, HW, HWR, SAN, AND VENT TO REMAIN IN SERVICE UNTIL THE END OF THE "ADA RESTROOM PROJECT BY OTHER". ROUTE PROPOSED CW, HW, HWR, SAN AND VENT LINES PARALLEL TO THE EXISTING PIPING WITH THE SAME SIZE PIPING. ROUTE MAIN WATER LINES AND RISERS AND PROVIDE NEW PENETRATIONS THRU EACH FLOOR. SEAL ALL PENETRATIONS WITH FIRE RATED SEALANT. PROVIDE A TAP WITH A SHUT OFF VALVE, CAP AND SEAL ON EACH LEVEL FOR EACH RISER. THE "ADA PROJECT" SHALL CONNECT TO THE PROPOSED RISERS. UNDER THIS PROJECT THE CONTRACTOR SHALL DEMO ALL OLD HORIZONTAL AND VERTICAL RUNS THAT ARE NO LONGER IN USE. CONTRACTOR SHALL REPAIR WALLS, FLOORS, SLABS, CEILINGS TO MATCH EXISTING UNLESS OTHERWISE NOTED ON THE ARCHITECTURAL DRAWINGS.

KEYED NOTE:

1. REFER TO OTHER PROJECT FOR WORK IN THIS AREA.
2. INSTALL PROPOSED RISERS NEXT TO THE EXISTING RISERS WITH SAME SIZE LINES AS THE EXISTING (ASSUME 3"CW, 2 1/2"HW, 1"HWR FIELD VERIFY EXACT SIZES). PROVIDE A CAPPED AND SEALED TAP FOR EACH WATER LINE SERVING THIS LEVEL. PROVIDE LINE SIZE BALL VALVES FOR EACH PIPE (ASSUME 2 1/2"CW, 1"HW, 3/4"HWR FIELD VERIFY EXACT SIZES). THE EXISTING RISER SHALL REMAIN IN USE THRU OUT THIS PROJECT. PATCH AND REPAIR WALLS FLOORS AND CEILINGS TO MATCH THE EXISTING. ALL PENETRATIONS SHALL BE SEALED WITH FIRE SEALANT.
3. INSTALL PROPOSED SANITARY AND VENT PIPING RISERS NEXT TO THE EXISTING RISERS WITH SAME SIZE LINES AS THE EXISTING. PROVIDE A TAP OFF CAP AND SEAL FOR THE NEXT PROJECT. THE EXISTING RISER SHALL REMAIN IN USE THRU OUT THIS PROJECT. PATCH AND REPAIR WALLS FLOORS AND CEILINGS TO MATCH THE EXISTING. ALL PENETRATIONS SHALL BE SEALED WITH FIRE SEALANT.
4. EXISTING CW, HW AND HWR TO REMAIN UNTIL THE END OF THE "ADA PROJECT" AFTER THAT PROJECT IS DONE CONTRACTOR SHALL DEMO EXISTING.



1 FIFTH FLOOR PLAN - PLUMBING

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

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KEY PLAN

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STATE OF TEXAS
MATT A FLUKINGER
119970
LICENSED
PROFESSIONAL ENGINEER
8-16-2017

REVISIONS

05/31/2017	ISSUED FOR BID
07/28/2017	ADDENDUM 1
08/16/2017	ADDENDUM 2
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FIFTH FLOOR PLAN - PLUMBING

Sheet

P206

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0 1/2" 1" 2"

GENERAL NOTE:

1. EXISTING PLUMBING FIXTURE TO REMAIN. UNLESS OTHERWISE NOTED BY ARCHITECT.
2. ALL EXISTING CW, HW, HWR, SAN, AND VENT TO REMAIN IN SERVICE UNTIL THE END OF THE "ADA RESTROOM PROJECT BY OTHER". ROUTE PROPOSED CW, HW, HWR, SAN AND VENT LINES PARALLEL TO THE EXISTING PIPING WITH THE SAME SIZE PIPING. ROUTE MAIN WATER LINES AND RISERS AND PROVIDE NEW PENETRATIONS THRU EACH FLOOR. SEAL ALL PENETRATIONS WITH FIRE RATED SEALANT. PROVIDE A TAP WITH A SHUT OFF VALVE, CAP AND SEAL ON EACH LEVEL FOR EACH RISER. THE "ADA PROJECT" SHALL CONNECT TO THE PROPOSED RISERS. UNDER THIS PROJECT THE CONTRACTOR SHALL DEMO ALL OLD HORIZONTAL AND VERTICAL RUNS THAT ARE NO LONGER IN USE. CONTRACTOR SHALL REPAIR WALLS, FLOORS, SLABS, CEILINGS TO MATCH EXISTING UNLESS OTHERWISE NOTED ON THE ARCHITECTURAL DRAWINGS.

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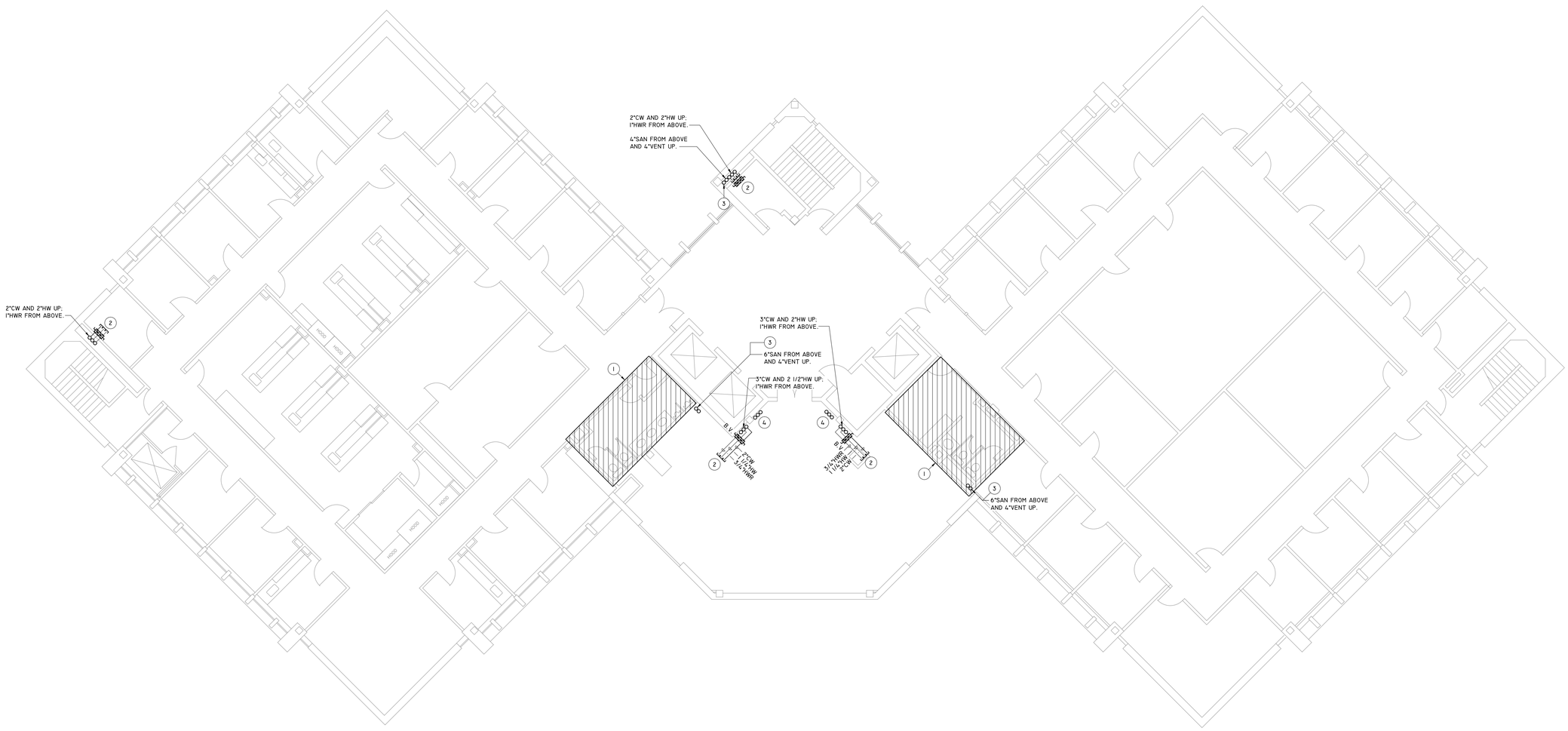

1 SIXTH FLOOR PLAN - PLUMBING

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

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SIXTH FLOOR PLAN - PLUMBING

Sheet

P207

ISSUED FOR BID

0 1/2" 1" 2"

GENERAL NOTE:

1. EXISTING PLUMBING FIXTURE TO REMAIN. UNLESS OTHERWISE NOTED BY ARCHITECT.
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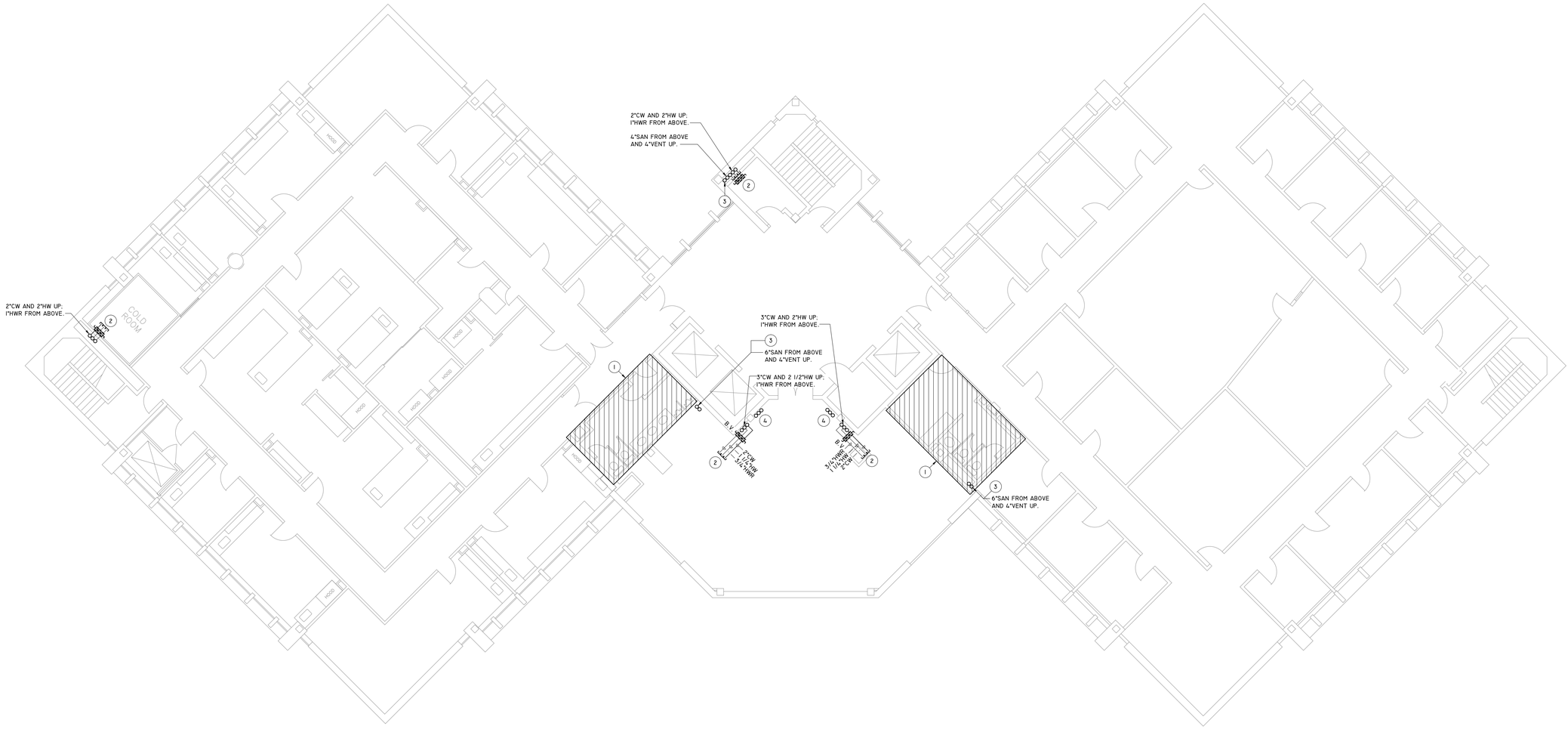

1 SEVENTH FLOOR PLAN - PLUMBING

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

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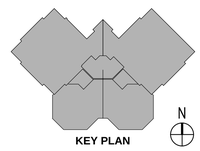

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SEVENTH FLOOR PLAN - PLUMBING

Sheet

P208

ISSUED FOR BID

0 1/2" 1" 2"

GENERAL NOTE:

1. EXISTING PLUMBING FIXTURE TO REMAIN. UNLESS OTHERWISE NOTED BY ARCHITECT.
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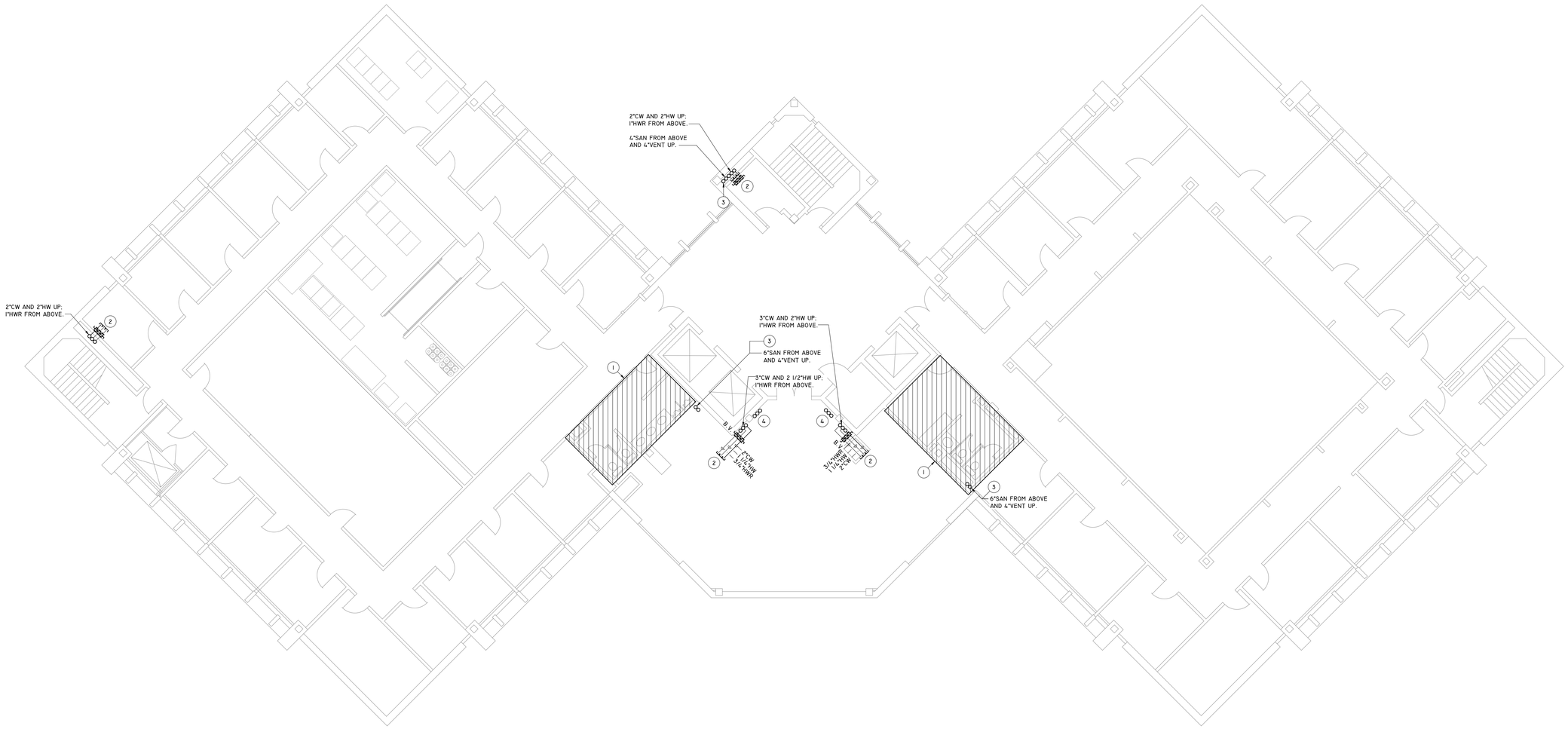

1 EIGHTH FLOOR PLAN - PLUMBING

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

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EIGHTH FLOOR PLAN - PLUMBING

Sheet

P209

ISSUED FOR BID

0 1/2" 1" 2"

GENERAL NOTE:

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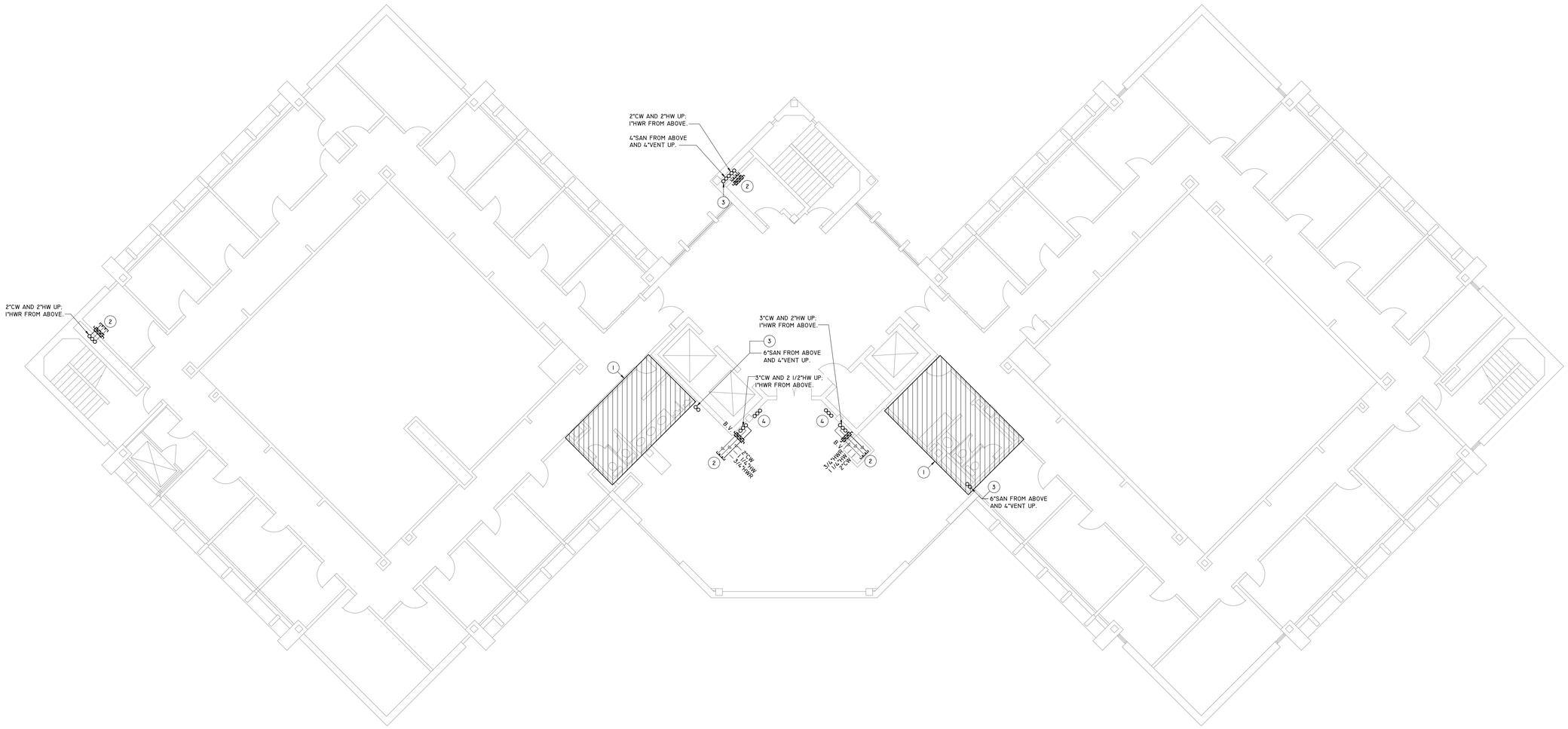

1 NINTH FLOOR PLAN - PLUMBING

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

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NINTH FLOOR PLAN - PLUMBING

Sheet

P210

ISSUED FOR BID

0 1/2" 1" 2"

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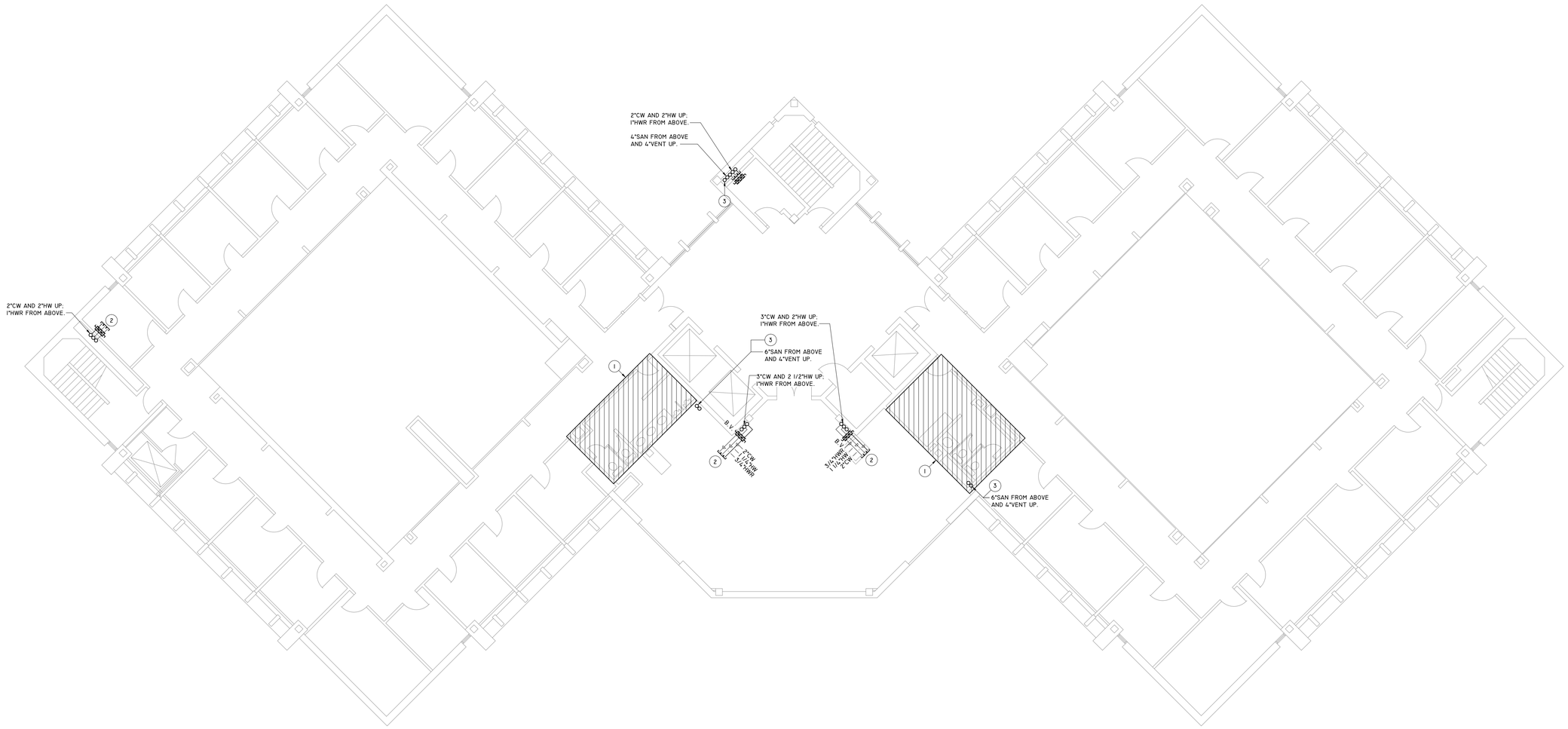

1 TENTH FLOOR PLAN - PLUMBING

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

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TENTH FLOOR PLAN - PLUMBING

Sheet

P211

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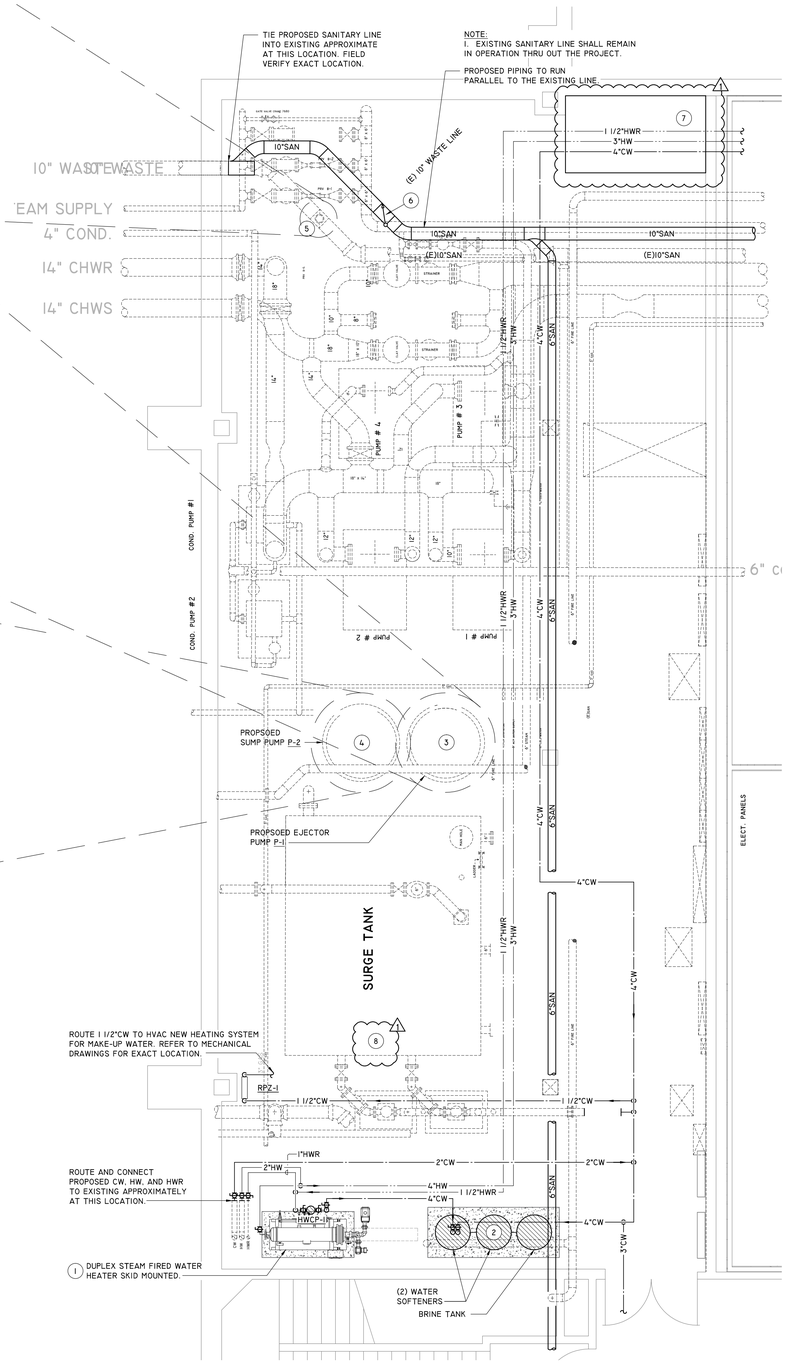
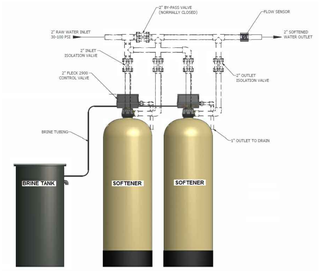


1 ENLARGED BASEMENT FLOOR PLAN - PLUMBING

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

KEYED NOTE:

1. PROPOSED HORIZONTAL DUAL SKID MOUNTED DOMESTIC HOT WATER SYSTEM, PIPING AND ASSOCIATED APPARATUS. HOT WATER RE-CIRCULATING SYSTEM SHALL BE REPLACED WITH SAME SIZE AS EXISTING REFER TO PROPOSED DRAWINGS FOR NEW LOCATION. CONTRACTOR SHALL COORDINATE WITH OWNER PHASING SCHEDULE TO DETERMINE MINIMAL DOWN TIME IN THE HOT WATER SYSTEM.
2. REPLACE WATER SOFTENER TANK REFER TO SCHEDULE FOR MORE INFORMATION. 1
3. REPLACE EXISTING "EJECTOR PUMP P-1 " 125GPM @30' HEAD. 4" DISCHARGE 5 HP, 1150 RPM, 480V, 3 P, 60HX, MOTOR CHICAGO TYPE V.C.S. NO CLOG PUMP MODEL LMC4 DUPLEX." SUBMERSIBLE DUPLEX SUMP PUMPS AND ASSOCIATED PIPING. COORDINATE WITH PROJECT PHASING SCHEDULE TO MINIMIZE OUTAGE TIME.
4. REPLACE EXISTING "SUMP PUMP P-2 " 200 GPM @ 32' HEAD, 4" DISCHARGE 3 HP 1750 RPM, 480V 3P, 60HZ, MOTOR CHICAGO TUYPE "L" MODEL LB4 DUPLEX PUMPS." DUPLEX SUMP PUMPS AND ASSOCIATED PIPING. COORDINATE WITH PROJECT PHASING SCHEDULE TO MINIMIZE OUTAGE TIME.
5. EXISTING 10" MANUAL VALVE TO REMAIN ALONG WITH THE EXISTING SANITARY LINE.
6. PROVIDE NEW INLINE 10" SANITARY BACK WATER VALVE BY MIFAB MODEL BV1000 ON THE PROPOSED SANITARY LINE. PROVIDE SUPPORTS ON BOTH SIDES OF THE PROPOSED VALVE.
7. ADD ALTERNATE #3 - RE-ROUTE WATER PIPING AWAY FROM REQUIRED EQUIPMENT WORKING CLEARANCES AND DEDICATED ELECTRICAL SPACE FOR THIS SWITCHBOARD 1
8. REMOVE ALL RUST FROM EXISTING BREAK TANK. PROVIDE 1 COAT OF PRIMER AND 2 COATS OF MARINE GRADE PAINT COLOR TO MATCH EXISTING.



2 WATER SOFTENER PIPING DETAIL

SCALE: N.T.S.

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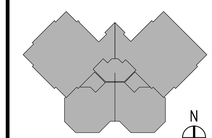

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ENLARGED FLOOR PLAN AND DETAILS - PLUMBING

Sheet

P401

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