

MECHANICAL LEGEND		MECHANICAL LEGEND	
SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
<b>PLAN-VIEW LINE TYPES</b>			
	WORK SHOWN FADED INDICATES EXISTING WORK TO REMAIN OR NEW WORK BY OTHERS AS APPLICABLE		DIGITAL INPUT
	WORK SHOWN BOLD-DASHED INDICATES SELECTIVE DEMOLITION WORK		DIGITAL OUTPUT
	WORK SHOWN BOLD-CONTINUOUS INDICATES NEW WORK		ANALOG INPUT
<b>PIPING LINE TYPES</b>			
	HOT WATER SUPPLY		ANALOG OUTPUT
	HOT WATER RETURN		HARD WIRE INTERLOCK
	CHILLED WATER SUPPLY		ANSUL PULL STATION
	CHILLED WATER RETURN		ENVIRONMENTAL CONTROL PANEL
	REFRIGERANT LIQUID		CONNECT TO EXISTING (FIELD VERIFY EXISTING UTILITY SERVICE TYPE, PRIOR TO MAKING CONNECTION)
	REFRIGERANT SUCTON		1" DOOR UNDERCUT
	CONDENSATE DRAIN	<b>MECHANICAL STATS &amp; SENSORS</b>	
	SUPPLY MAIN OR BRANCH		FLOW SENSOR
	RETURN MAIN OR BRANCH		CURRENT SENSOR
<b>MECHANICAL PIPING ACCESSORIES</b>			
	MANUAL ISOLATION VALVE		END SWITCH
	CHECK VALVE (DIRECTION OF FLOW INDICATED)		TEMPERATURE SENSOR
	PRESSURE RELIEF VALVE		LOW VOLTAGE THERMOSTAT
	PRESSURE REGULATING VALVE		LOW VOLTAGE THERMOSTAT WITH LOCKABLE GUARD
	AUTOMATIC BALANCING VALVE		REVERSE ACTING THERMOSTAT
	MANUAL BALANCING VALVE		HUMIDISTAT
	HEAT TRACING		PRESSURE STAT
	UNION		PRESSURE SENSOR
	TEMPERATURE & PRESSURE TEST PORT		LINE VOLTAGE THERMOSTAT
	FLOW DIRECTION		HUMIDITY SENSOR
	FLEX PIPING CONNECTOR		FLUID SENSOR
	THERMOMETER		VIBRATION SENSOR
	PRESSURE GAUGE		CARBON MONOXIDE SENSOR
	SOLENOID VALVE		CARBON DIOXIDE SENSOR
	WATER METER		VOC SENSOR
	Y-STRAINER		REFRIGERANT MONITOR
	STRAINER WITH BLOW OFF		COMBINATION CARBON MONOXIDE AND NITROGEN DIOXIDE SENSOR
	3 WAY CONTROL VALVE (MODULATION)		NITROGEN DIOXIDE SENSOR
	3 WAY CONTROL VALVE (2 POSITION)	<b>MECHANICAL DUCTWORK ACCESSORIES</b>	
	2 WAY CONTROL VALVE (MODULATING)		ROUND ELBOW WITH TURNING VANES
	2 WAY CONTROL VALVE (2 POSITION)		DUCT WITH MANUAL VOLUME DAMPER
			ELBOW WITH TURNING VANES
			MOTOR OPERATED DAMPER - LINE VOLTAGE
			MOTOR OPERATED DAMPER - LOW VOLTAGE
			BAROMETRIC DAMPER
			DUCT MOUNTED SMOKE DETECTOR (HARD WIRE INTERLOCK TO FAN MOTOR BY E.C.) FURNISHED BY E.C., INSTALLED BY M.C.
			FIRE DAMPER - 1.5 HR
			FIRE DAMPER - 3.0 HR
			FIRE DAMPER - 3 HR
			SMOKE DAMPER
			SMOKE CONTROL DAMPER
			COMBINATION FIRE/SMOKE DAMPER
			COMBINATION FIRE/SMOKE DAMPER
			AIR FILTER HOUSING
<b>MECHANICAL AIR DEVICES</b>			
	SUPPLY REGISTER		
	RETURN REGISTER		
	EXHAUST REGISTER		
	SUPPLY GRILLE		
	RETURN GRILLE		
	CEILING DIFFUSER		
	2'x2' SQUARE CEILING DIFFUSER WITH 10" NECK		
	ROUND CEILING DIFFUSER		
	LINEAR SLOT DIFFUSER		
<b>MECHANICAL DUCTWORK</b>			
	SUPPLY DUCT WITH ELBOW TURNED UP		
	SUPPLY DUCT WITH ELBOW TURNED DOWN		
	RETURN DUCT WITH ELBOW TURNED UP		
	RETURN DUCT WITH ELBOW TURNED DOWN		
	EXHAUST DUCT WITH ELBOW TURNED UP		
	EXHAUST DUCT WITH ELBOW TURNED DOWN		
	SUPPLY DUCT		
	RETURN DUCT		
	EXHAUST DUCT		
	OUTSIDE AIR DUCT		
	1" LINED DUCTWORK		
	FLEXIBLE DUCTWORK CONNECTION		
	BRANCH TAKEOFF		
	OVAL DUCT		
	REDUCER, CONCENTRIC		
	REDUCER, NONCONCENTRIC		
	DUCT FLEX CONNECTOR		

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**SHARONVILLE CONVENTION CENTER EXPANSION**  
 CITY OF SHARONVILLE  
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**MECHANICAL COVER SHEET**

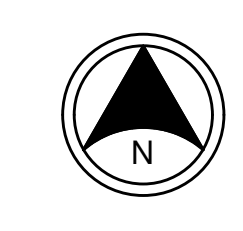
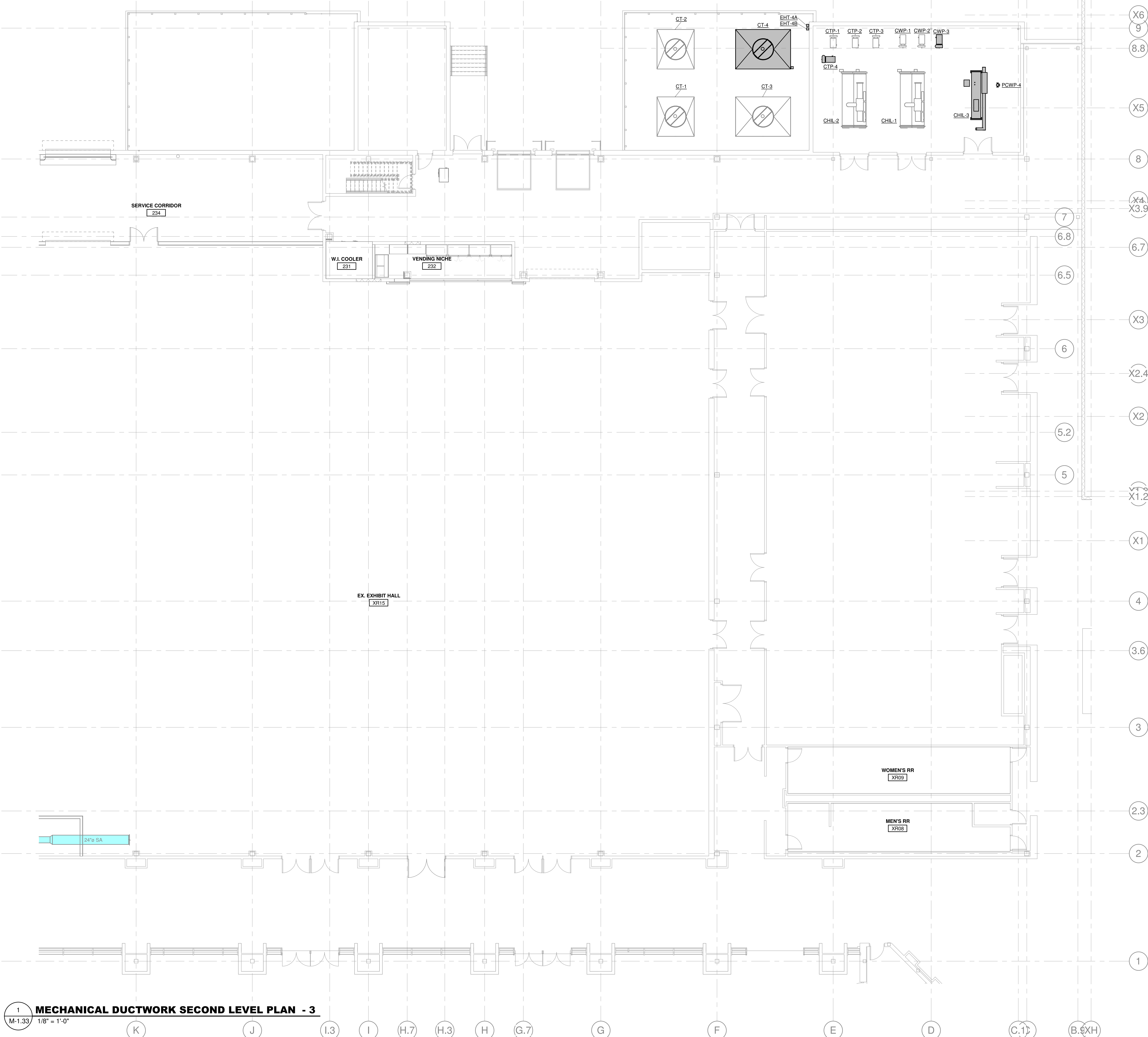
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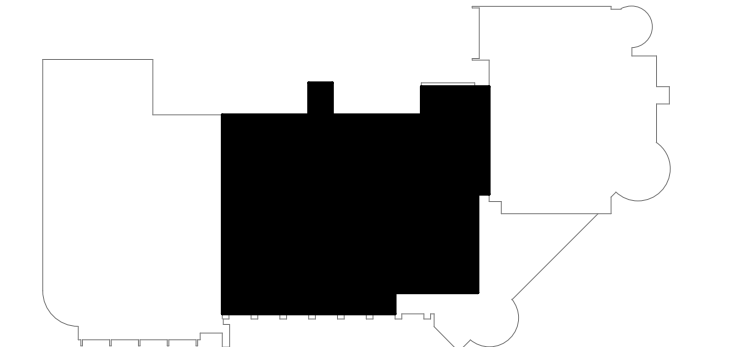
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1 MECHANICAL DUCTWORK SECOND LEVEL PLAN - 3  
M-1.33 1/8" = 1'-0"



KEYPLAN



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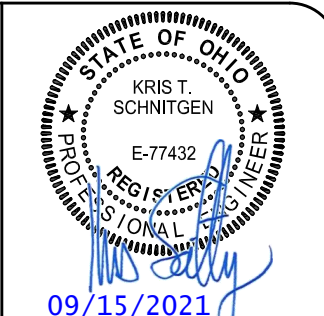
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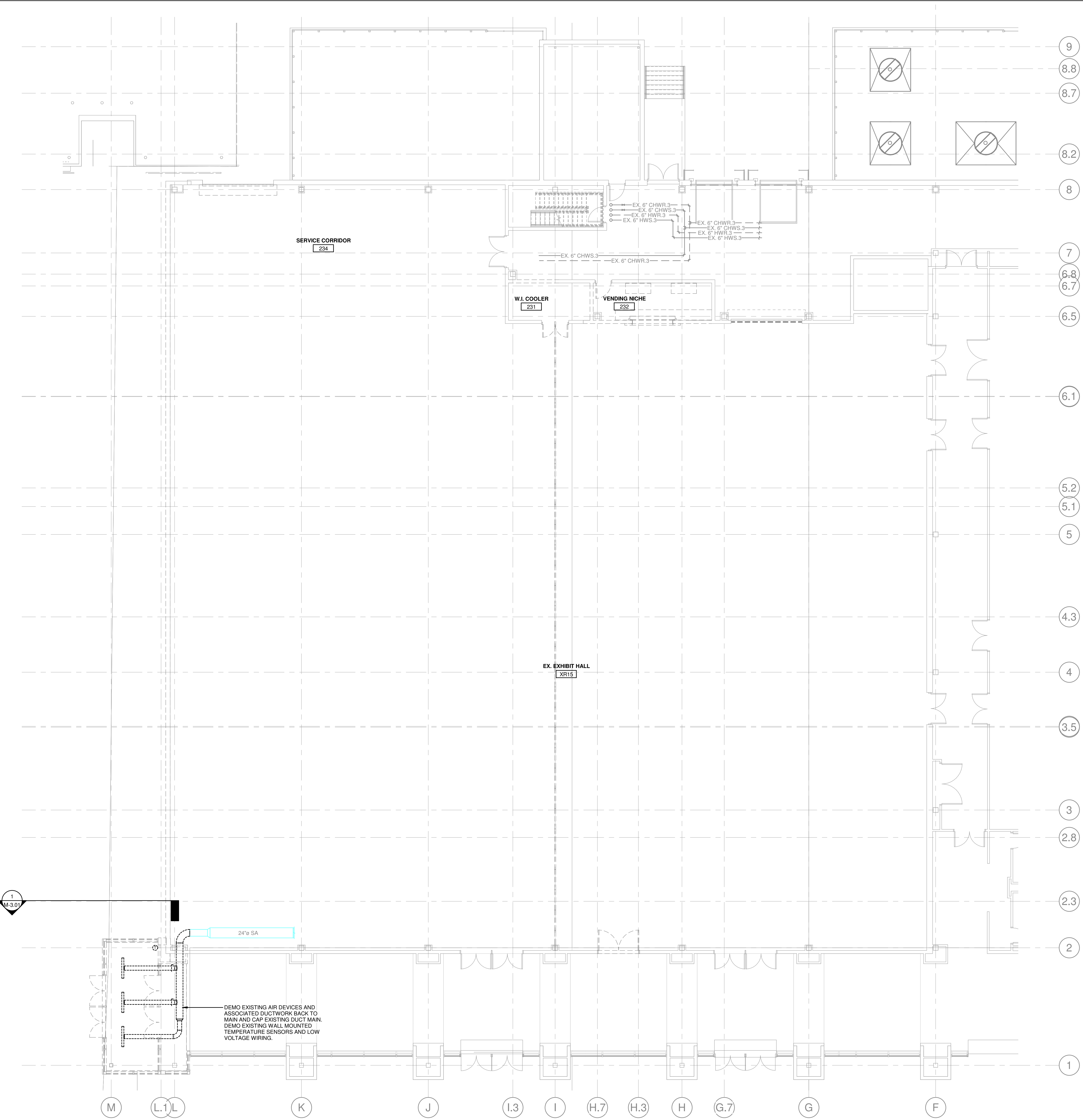
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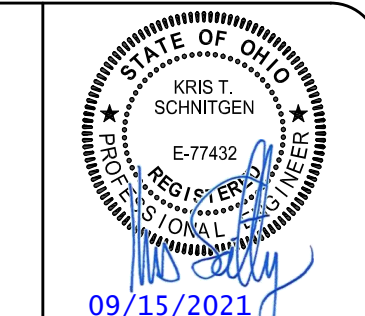
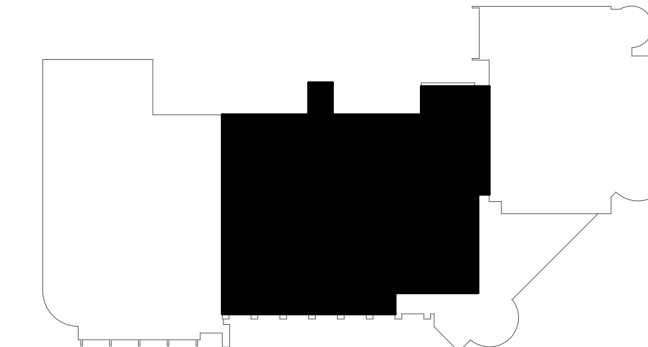
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1/8" = 1'-0"

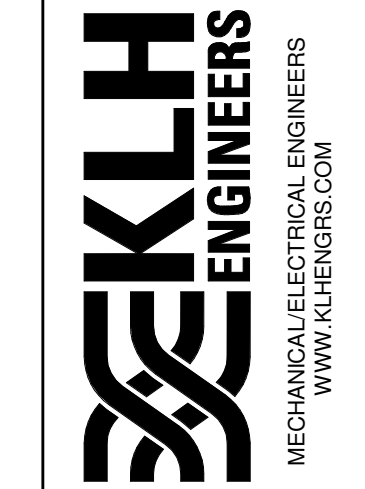
**MECHANICAL DEMOLITION SECOND LEVEL PLAN - 3**



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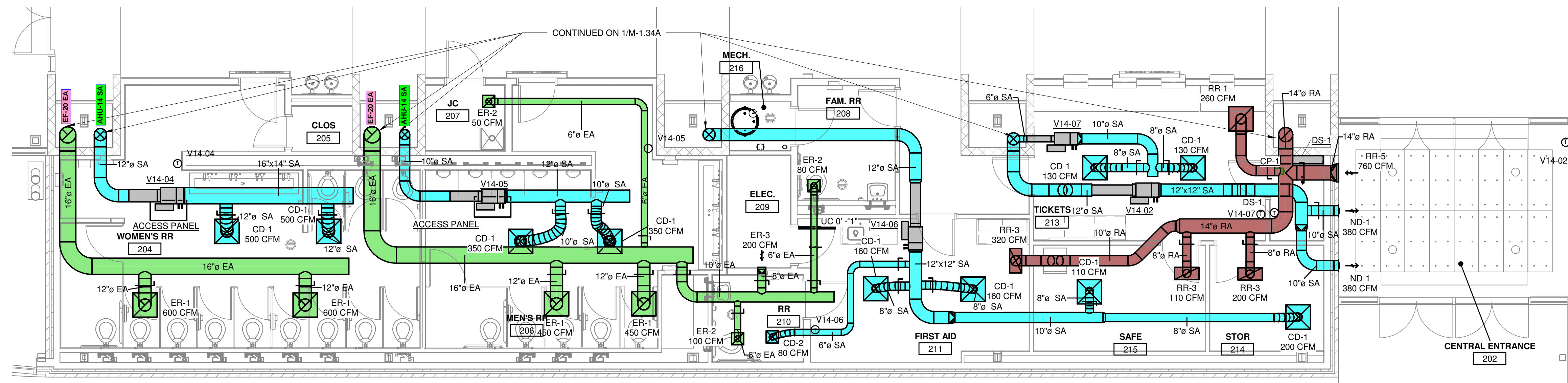
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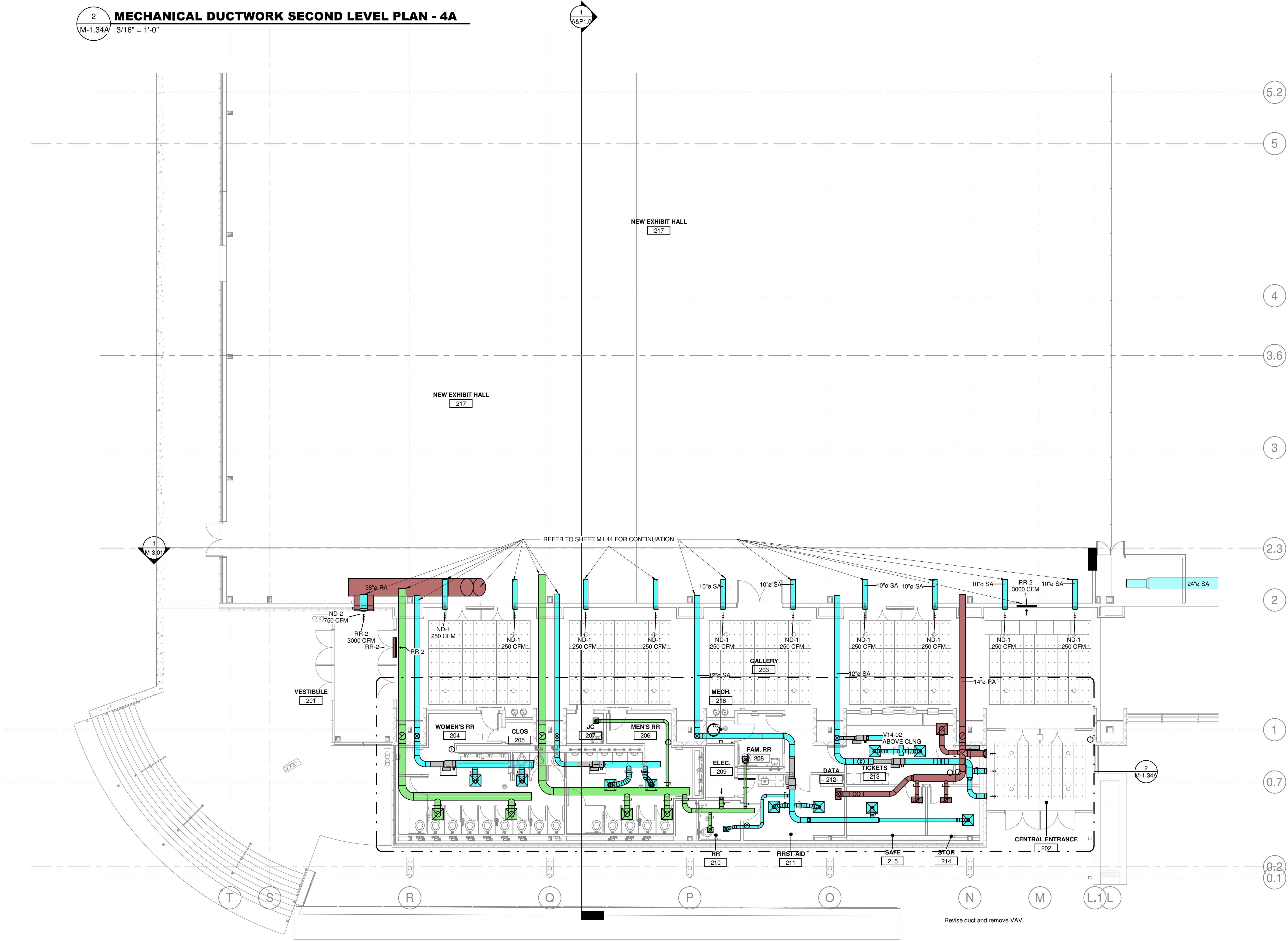
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MECHANICAL DEMOLITION SECOND LEVEL PLAN

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<b>MD1.33</b>

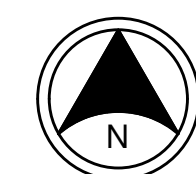
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2 MECHANICAL DUCTWORK SECOND LEVEL PLAN - 4A  
 M-1.34A 3/16" = 1'-0"



1 MECHANICAL DUCTWORK SECOND LEVEL PLAN - 4A  
 M-1.34A 1/8" = 1'-0"



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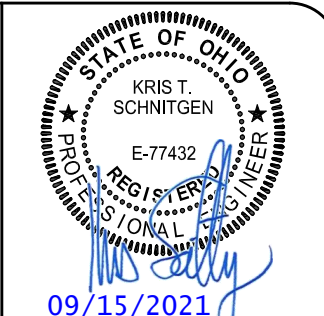
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 MECHANICAL DUCTWORK SECOND LEVEL PLAN - 4A

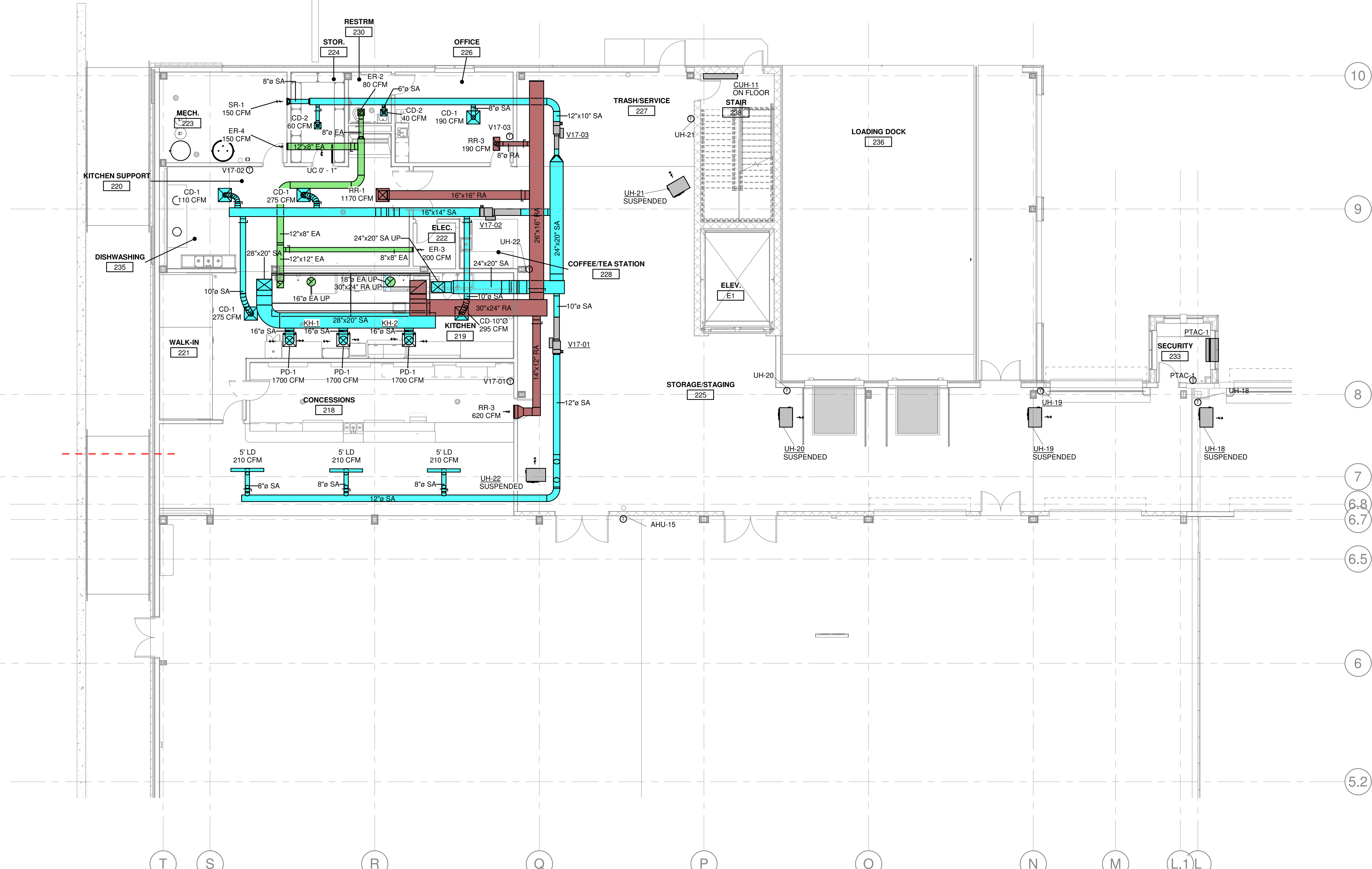
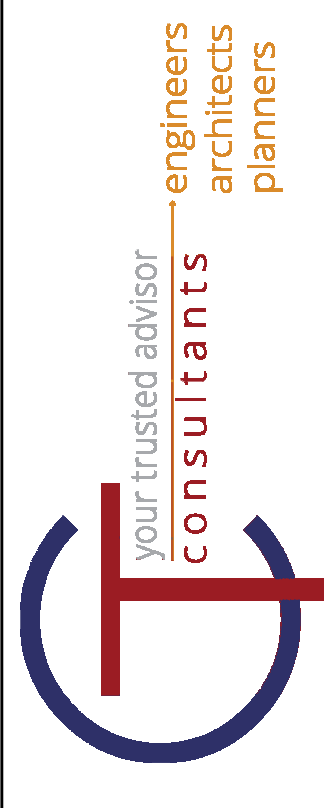
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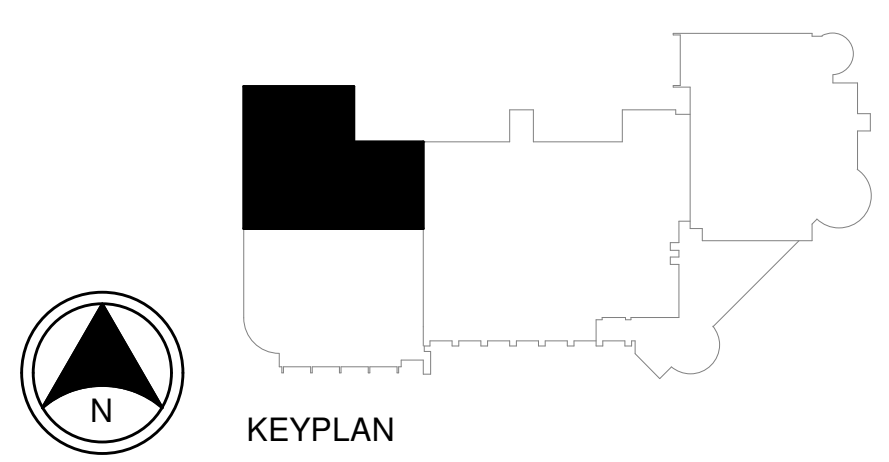


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 M-1.34B 1/8" = 1'-0"

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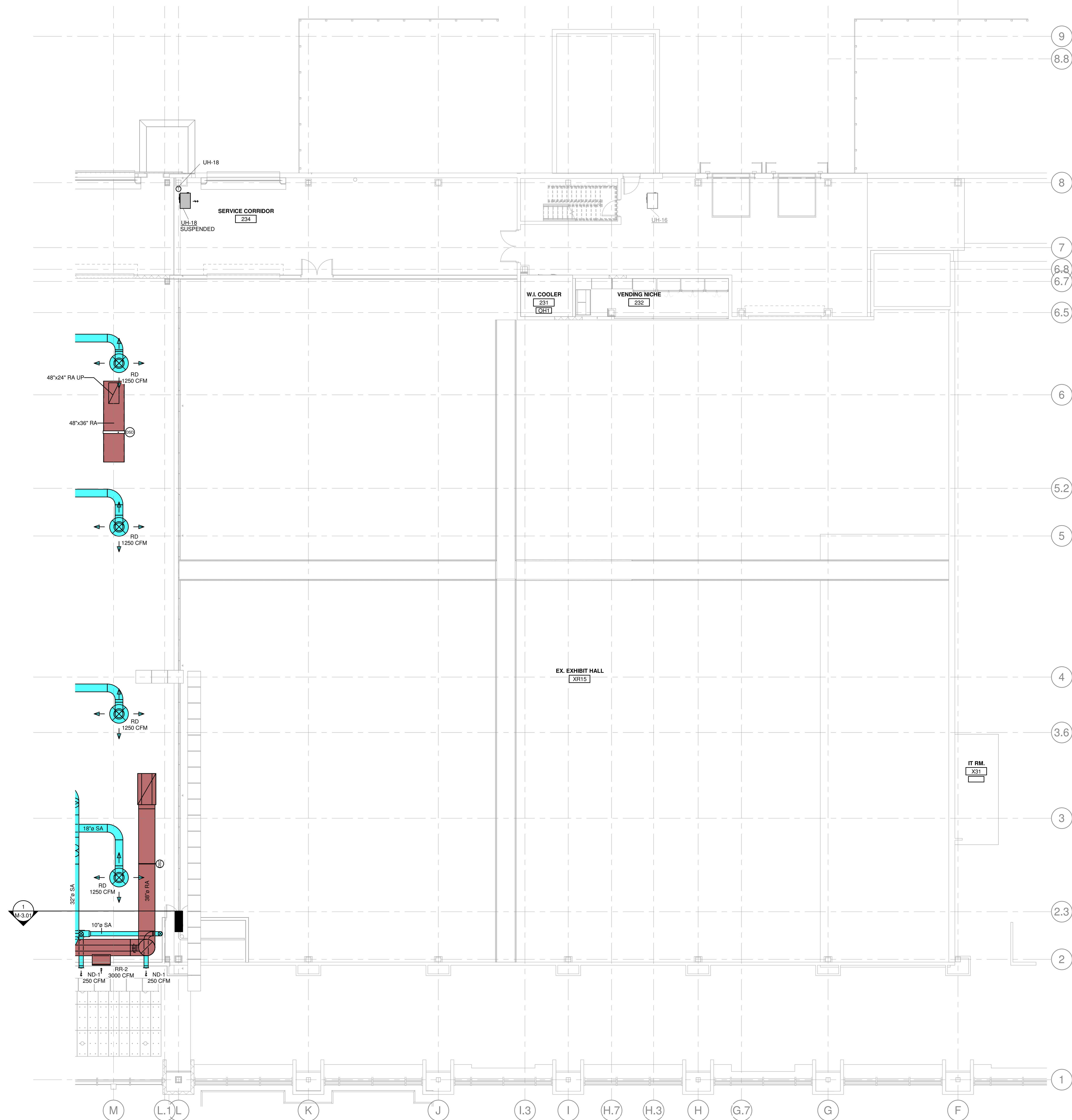
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 MECHANICAL DUCTWORK SECOND LEVEL PLAN - 4B

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M-1.34B



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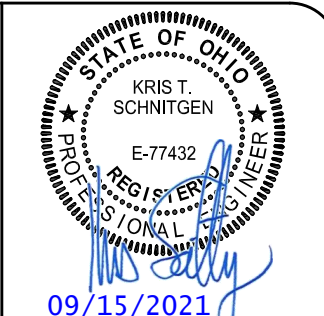
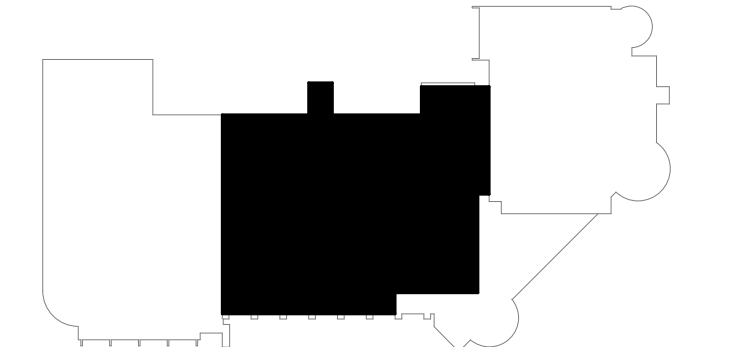
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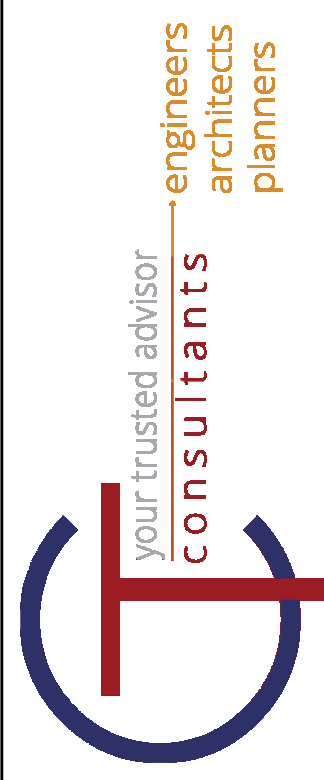
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**MECHANICAL DUCTWORK THIRD LEVEL PLAN - 3**  
1/8" = 1'-0"



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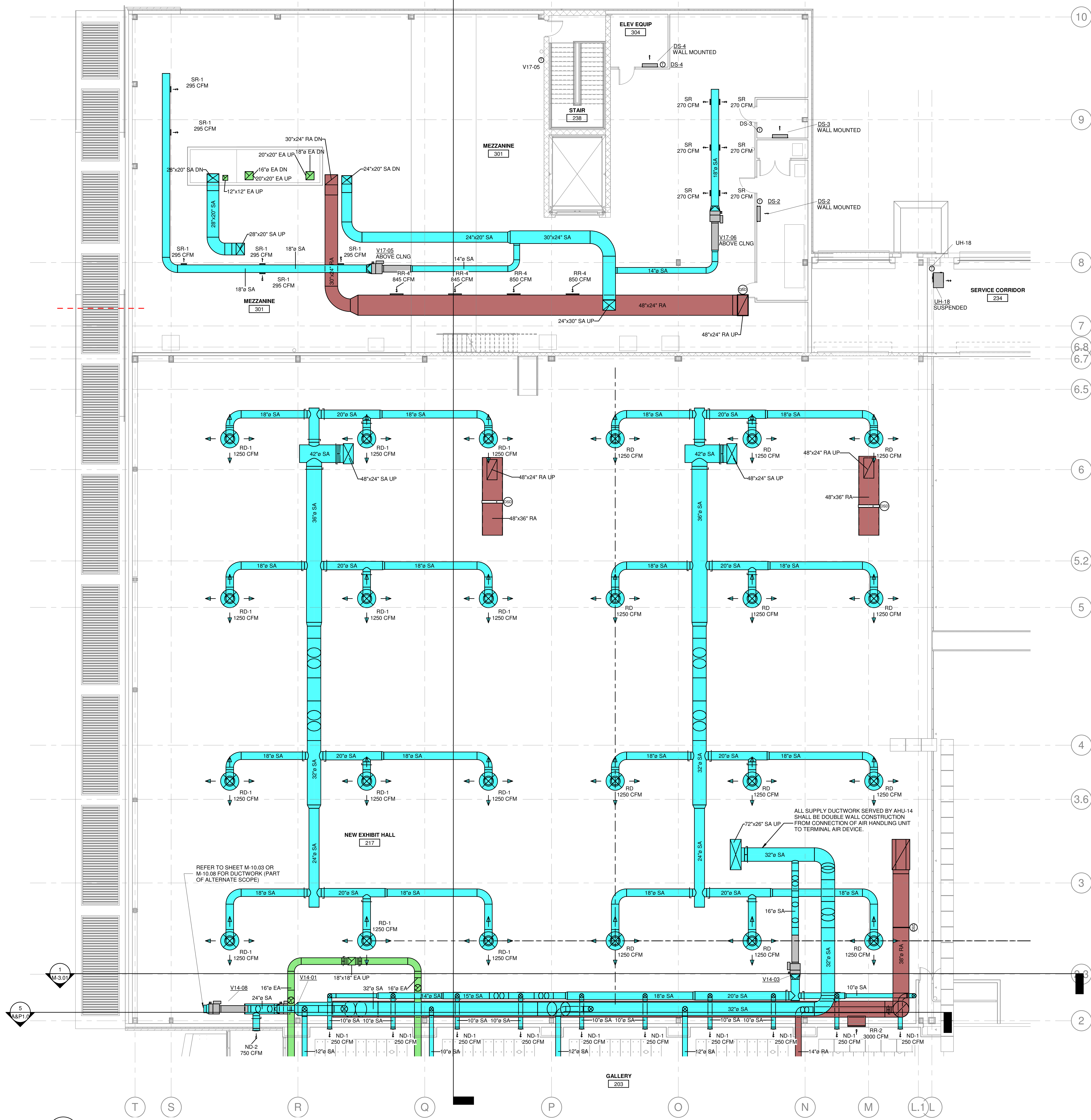
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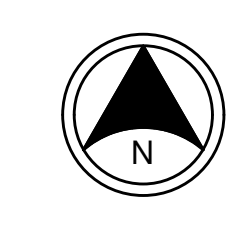
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<b>SHARONVILLE CONVENTION CENTER EXPANSION</b> CITY OF SHARONVILLE 11355 CHESTER RD., CINCINNATI OH 45246 <b>MECHANICAL DUCTWORK THIRD LEVEL PLAN - 3</b>			
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1  
M-1.44  
MECHANICAL DUCTWORK THIRD LEVEL PLAN - 4  
1/8" = 1'-0"



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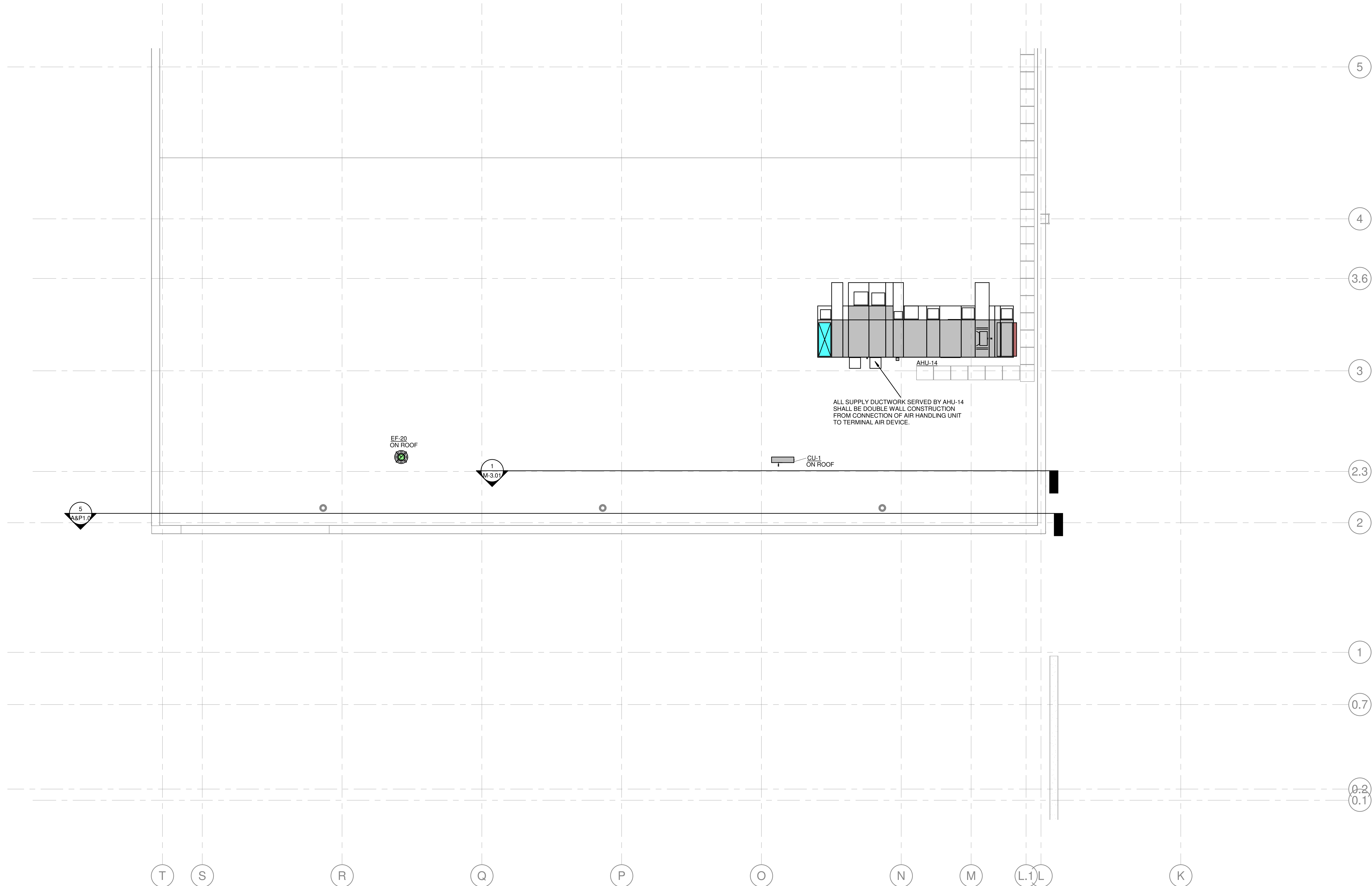
  

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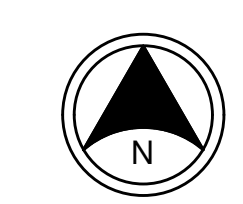
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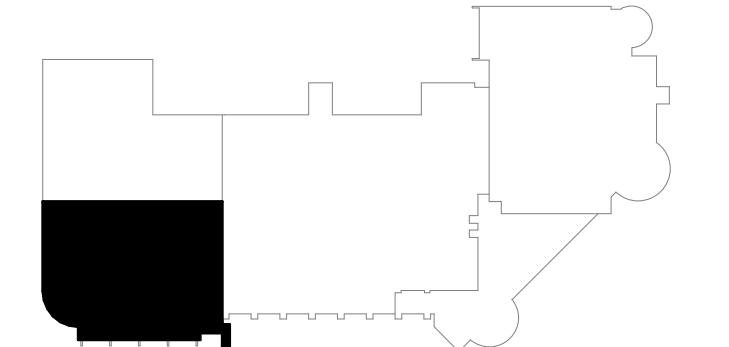
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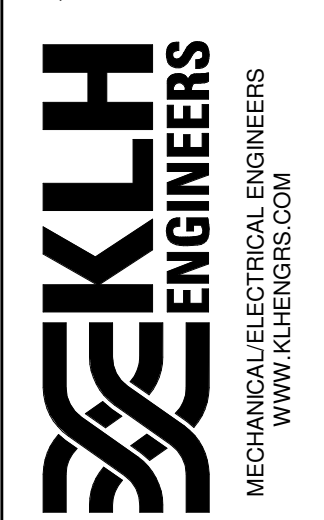


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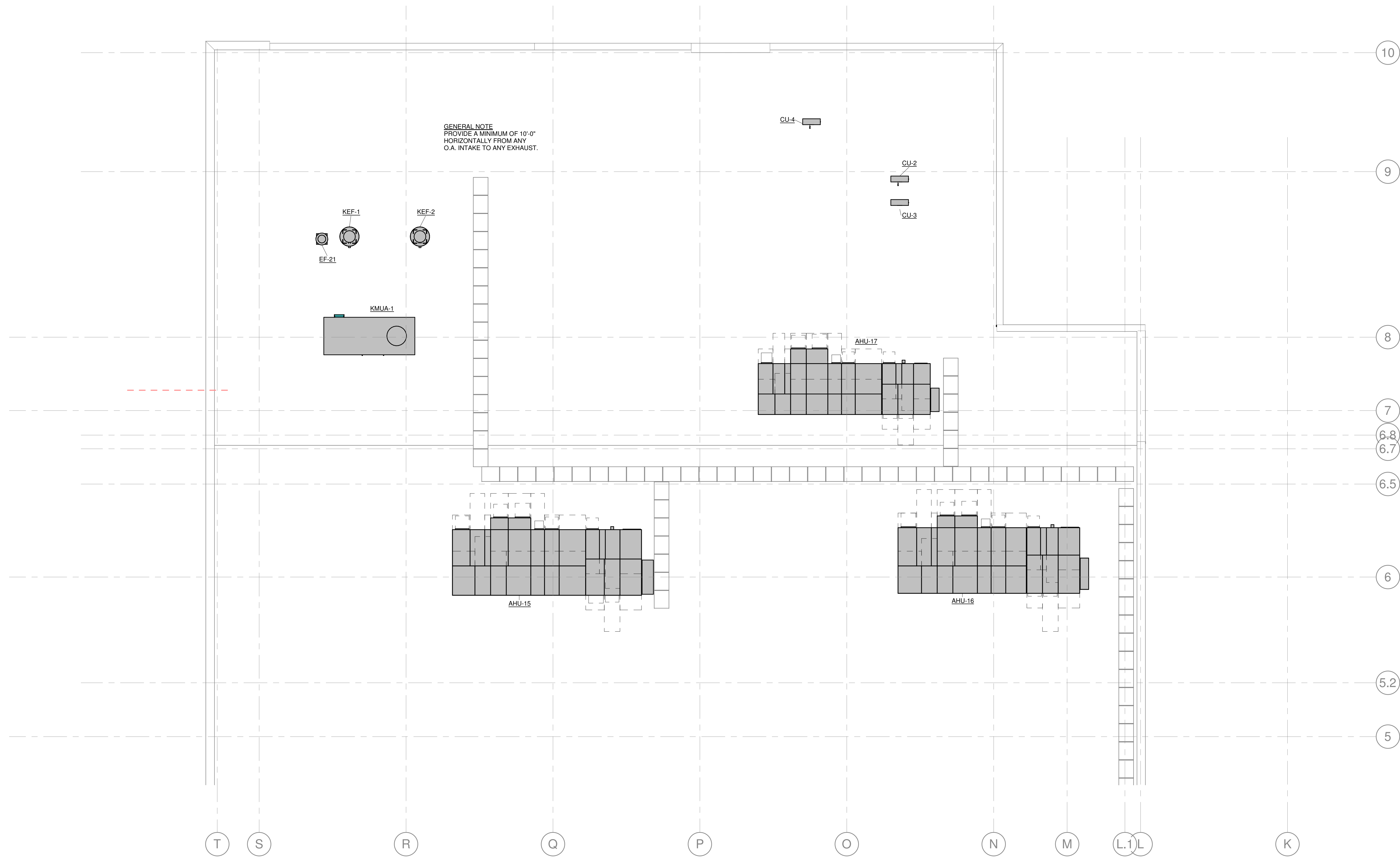
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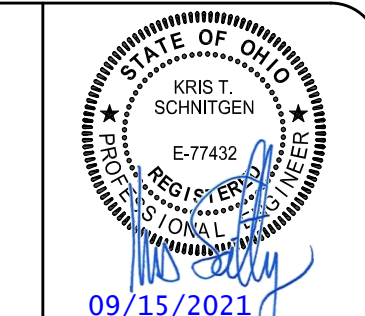
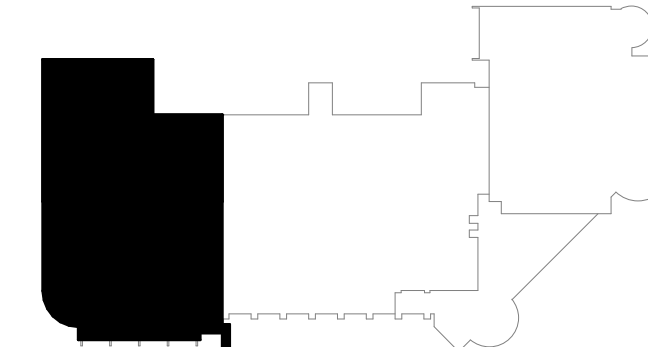
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 MECHANICAL DUCTWORK ROOF PLAN - 4A

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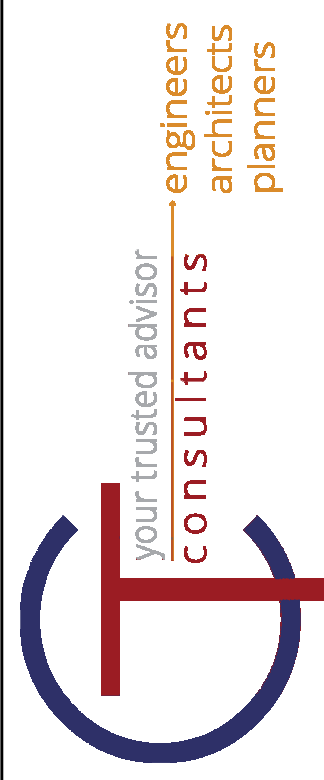
1 MECHANICAL DUCTWORK ROOF PLAN - 4B  
M-1.54B 1/8" = 1'-0"



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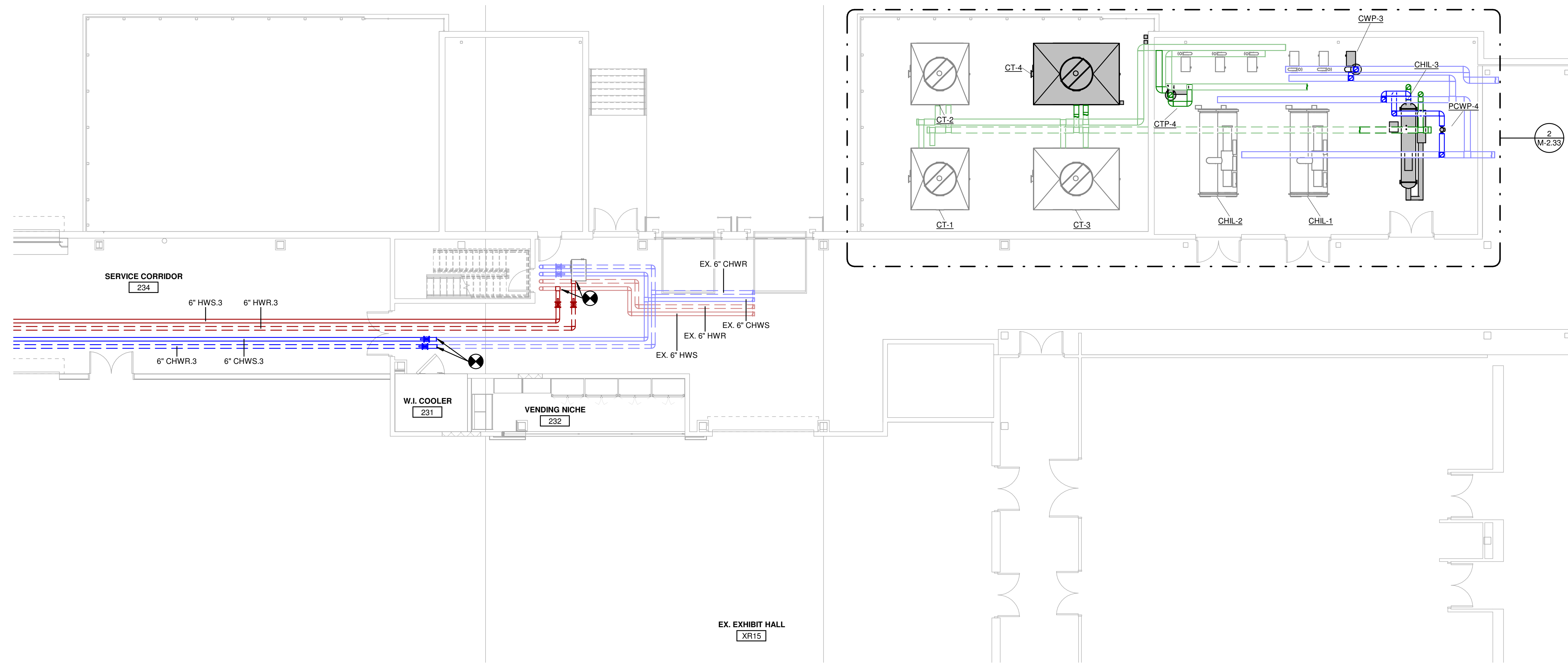
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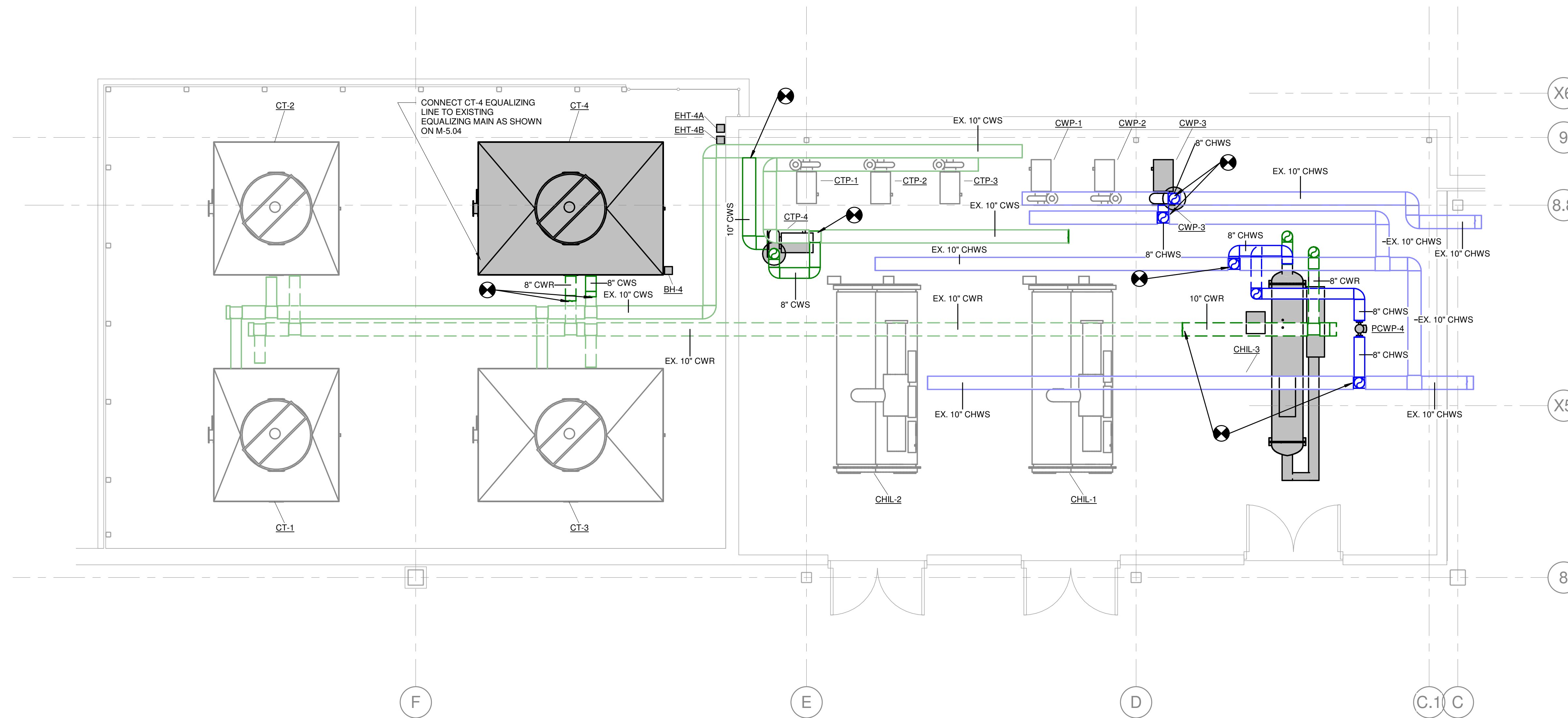
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SHEET
M-1.54B

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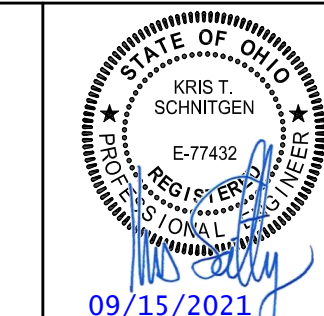
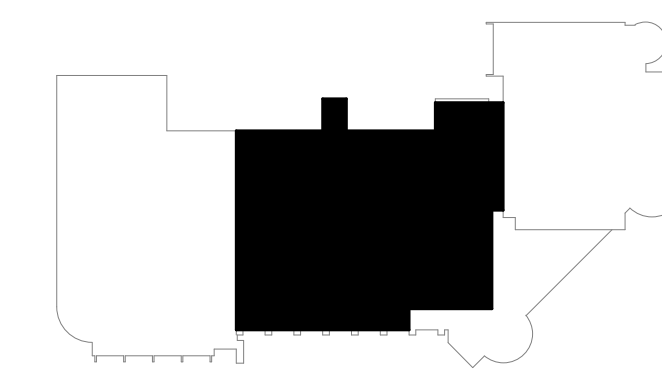
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2  
M-2.33 1/4" = 1'-0"

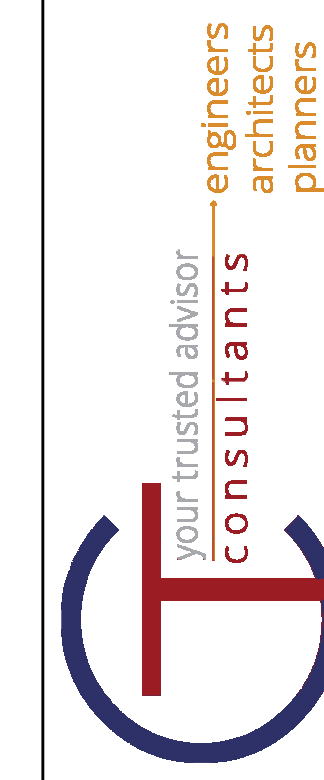
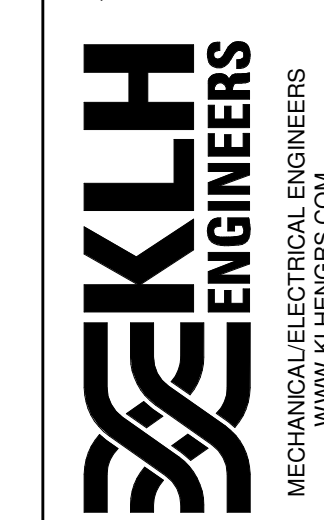


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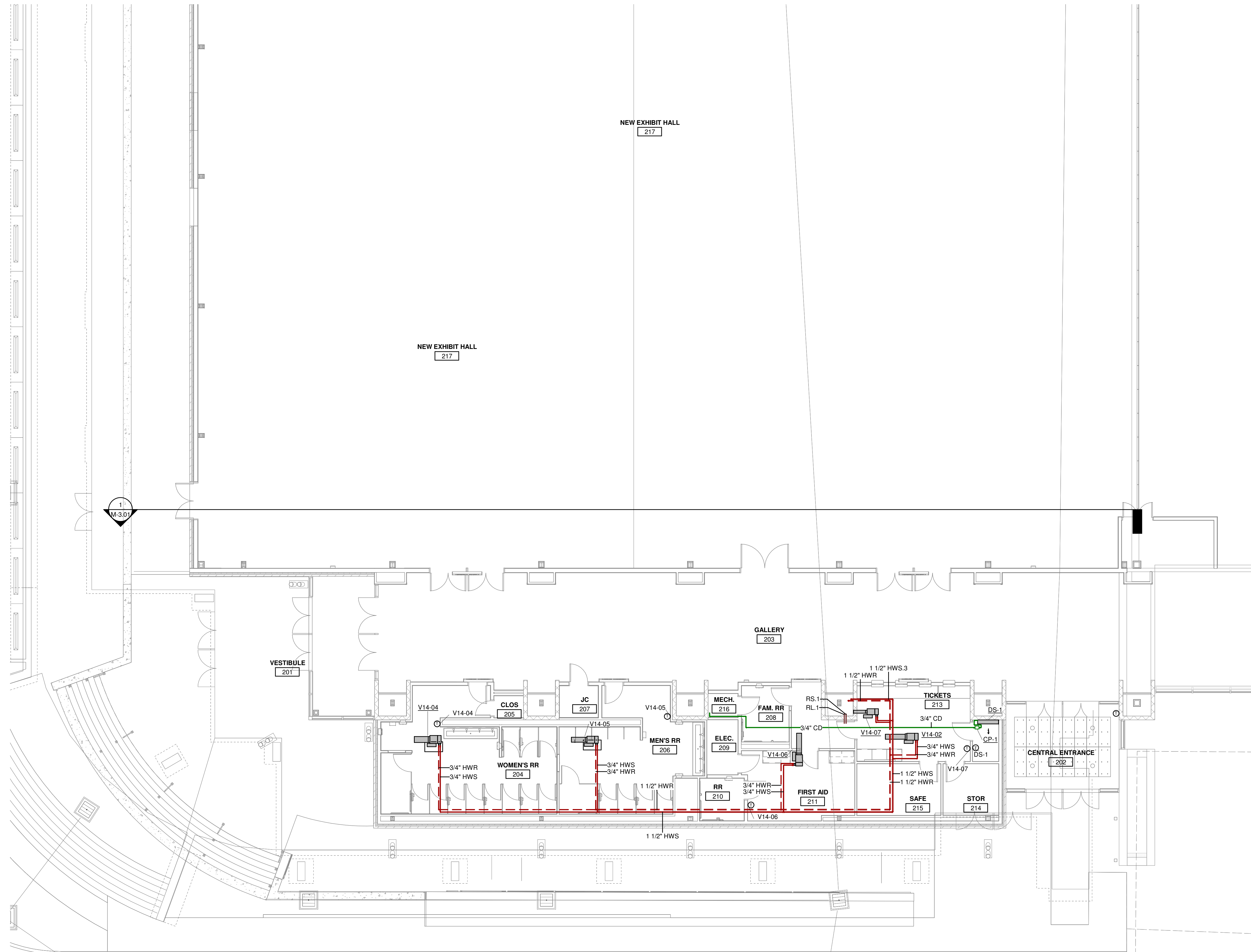
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CONTRACT NO: 180634

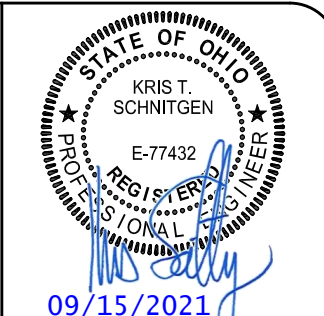
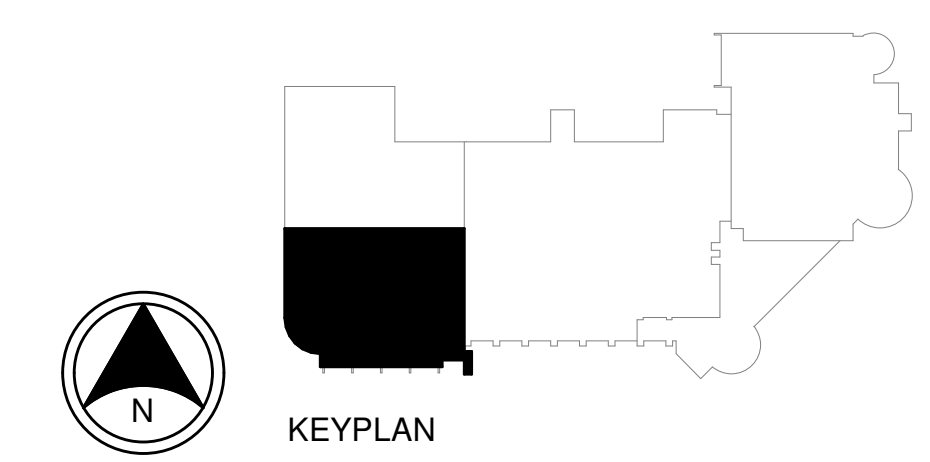
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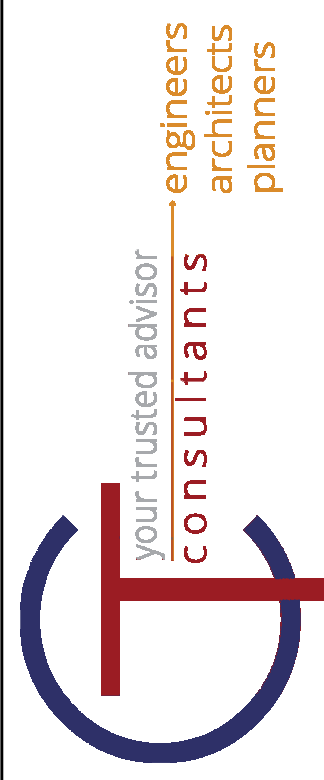
KLH JOB #: 21108.00



1 **MECHANICAL PIPING SECOND LEVEL PLAN - 4A**  
 M-2.34A 1/8" = 1'-0"



100 N. SANDY RUN BLVD  
 4195 800-854-8783  
 111 FT. THOMAS, KENTUCKY  
 LEONIDON, KENTUCKY  
 NEW YORK, NEW YORK  
 LOUISVILLE, KENTUCKY



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1	04-24-2021	CAM	ISSUED FOR BIDDING AND PERMIT
2	09-13-2021	CAM	ISSUED FOR BIDDING AND PERMIT

SHARONVILLE CONVENTION CENTER EXPANSION  
 CITY OF SHARONVILLE  
 11355 CHESTER RD., CINCINNATI OH 45246  
 MECHANICAL PIPING SECOND LEVEL PLAN - 4A

SCALE: AS NOTED  
 HORIZ: \_\_\_\_\_  
 VERT: \_\_\_\_\_

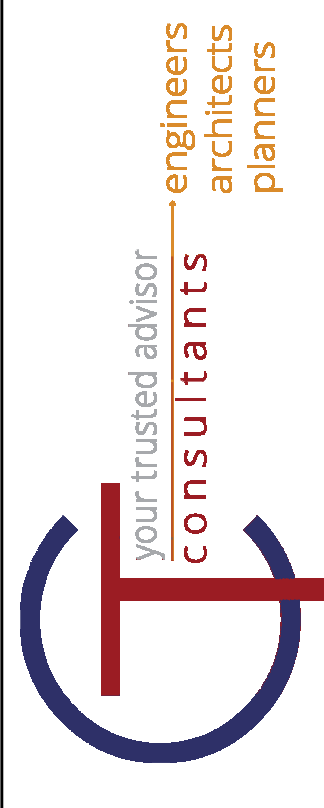
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 180634  
 SHEET  
 M-2.34A

KLH JOB #: 211088.00

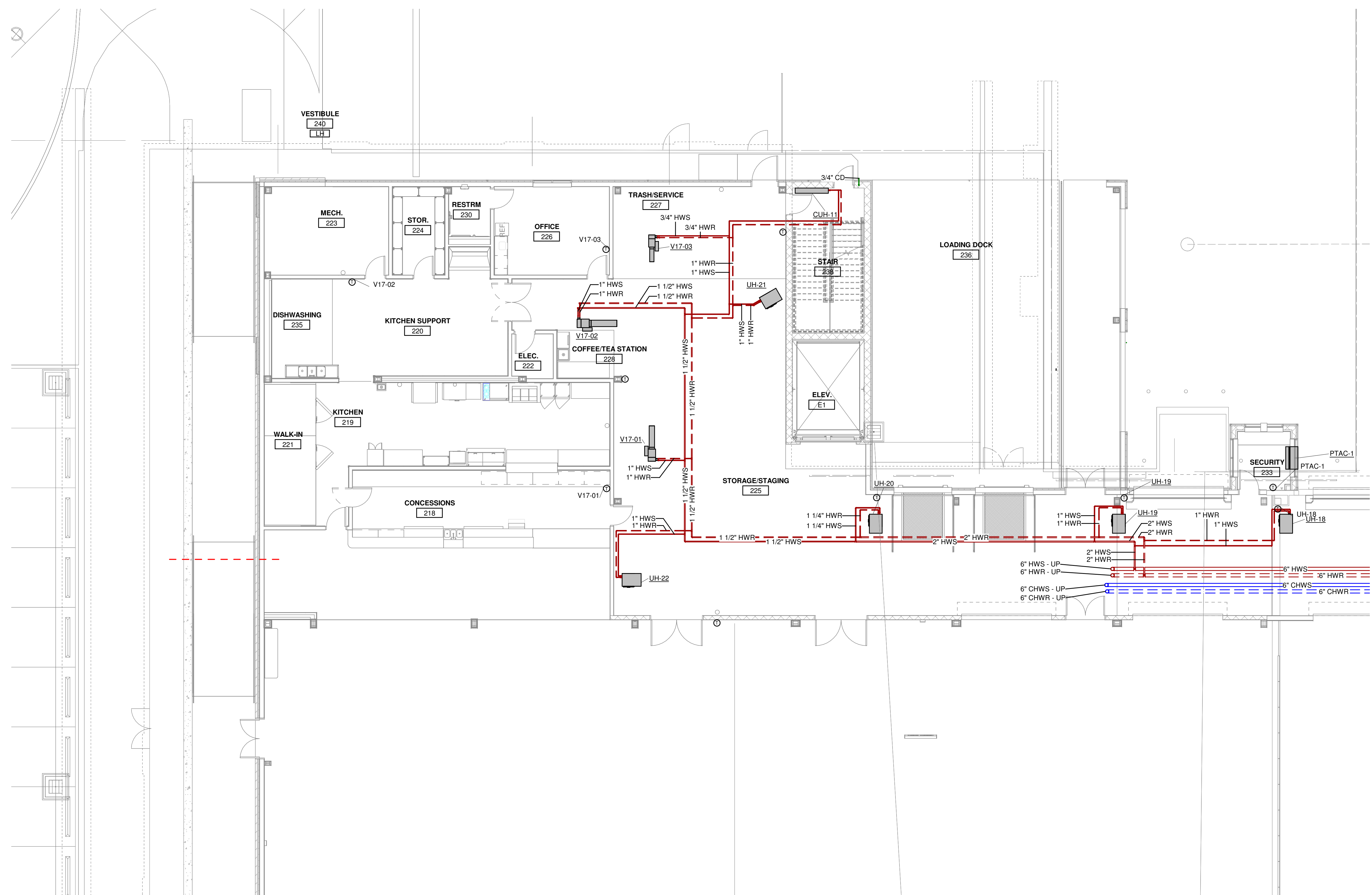
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100 N. UNIVERSITY AVE. SUITE 1100  
 41975 800-584-8783  
 111 FT. THOMAS, KENTUCKY  
 859-442-8688 FAX  
 LEONIDON, KENTUCKY  
 NEW YORK, NEW YORK  
 LOUISVILLE, KENTUCKY



Plumbing Pipe Type Legend			
Mark	Color	System Name	Pipe Material
CD.1	Green	CD - (HVAC) Condensate	1 - Copper - Type L - ASTM B88
CHWS.3	Blue	CHWS - (HVAC) Chilled Water Supply	3 - Black Steel - Schedule 40 - ASTM A-53
CHWR.3	Blue	CHWR - (HVAC) Chilled Water Return	3 - Black Steel - Schedule 40 - ASTM A-53
HWS.3	Red	HWS - (HVAC) Hot Water Supply	3 - Black Steel - Schedule 40 - ASTM A-53
HWR.3	Red	HWR - (HVAC) Hot Water Return	3 - Black Steel - Schedule 40 - ASTM A-53

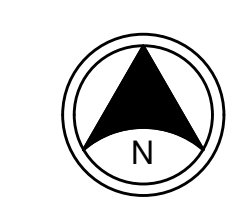


1  
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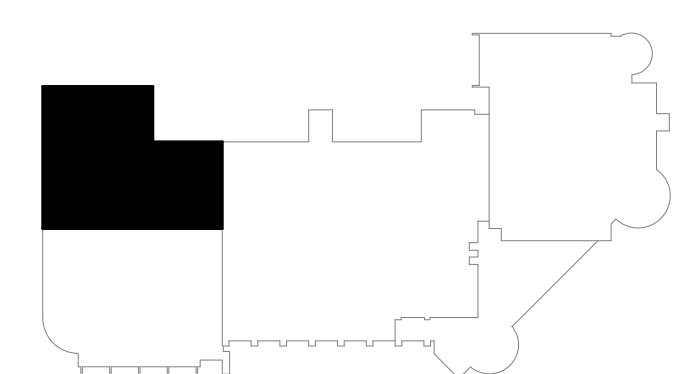
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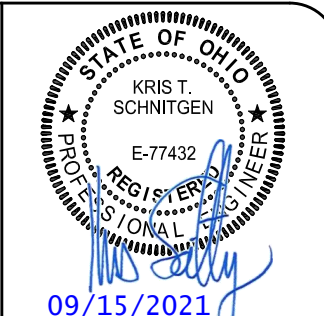
SHARONVILLE CONVENTION CENTER EXPANSION  
 CITY OF SHARONVILLE  
 11355 CHESTER RD, CINCINNATI OH 45246  
 MECHANICAL PIPING SECOND LEVEL PLAN - 4B

SCALE: AS NOTED
HORIZ:
VERT:
CONTRACT NO:
180634
SHEET
M-2.34B



KEYPLAN





1000 SHARONVILLE PARK BLVD  
 111 FT. THOMAS, KENTUCKY  
 41075-8000-854-8783  
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 NEW YORK, NEW YORK  
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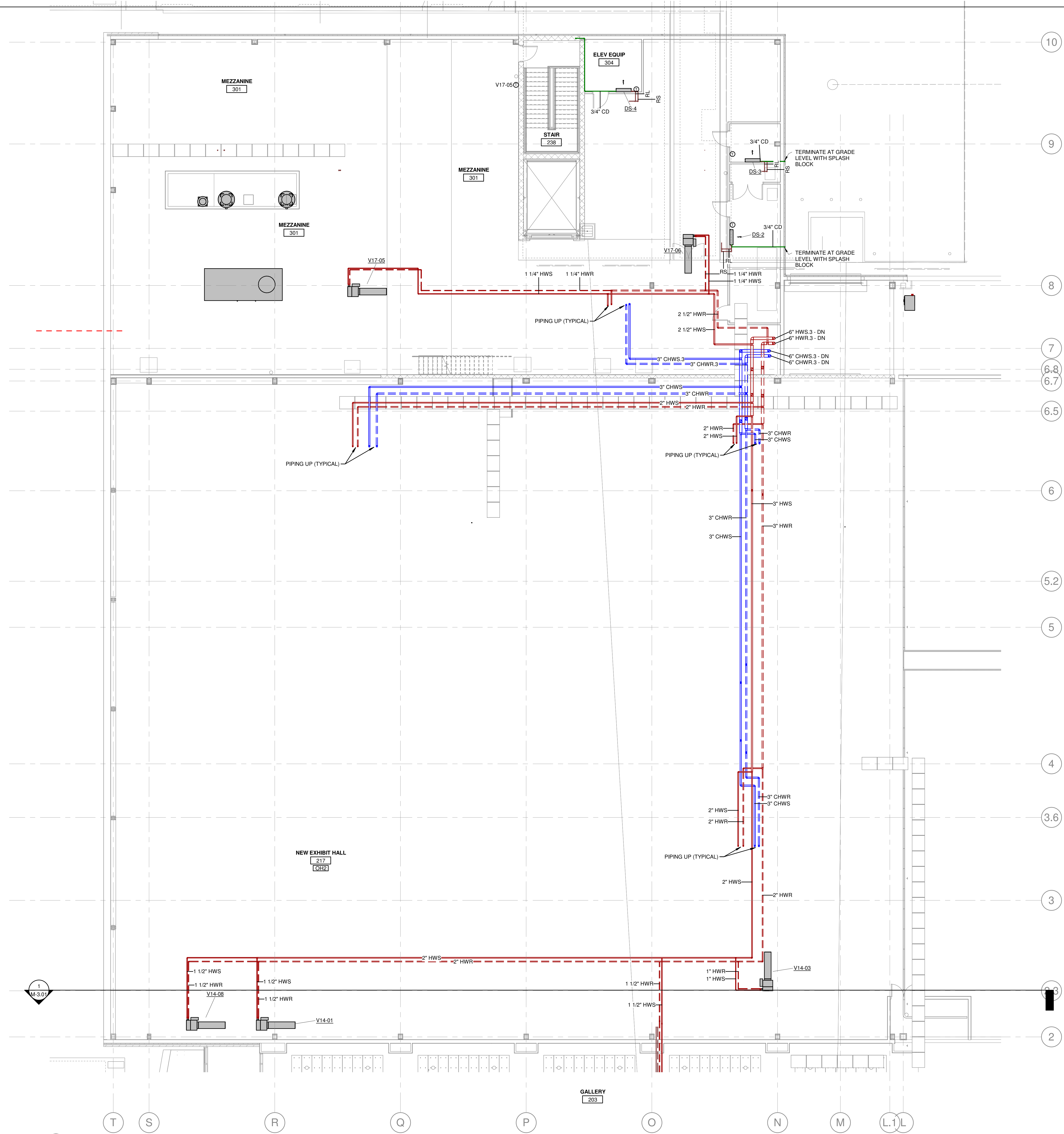
BY: CAM  
 DATE: 04-24-2021  
 09-13-2021

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2	04-24-2021	ISSUED FOR BIDDING AND PERMIT

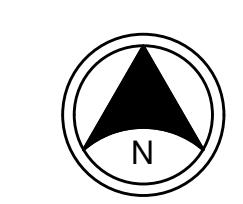
DATE: 09/15/2021  
 DRAWN BY: DSJ  
 CHECKED BY: KTS  
 APPROVED BY: [Signature]  
 P.E. [Signature]  
 P.C. [Signature]

**SHARONVILLE CONVENTION CENTER EXPANSION**  
 CITY OF SHARONVILLE  
 11355 CHESTER RD, CINCINNATI OH 45246  
**MECHANICAL PIPING THIRD LEVEL PLAN - 4**

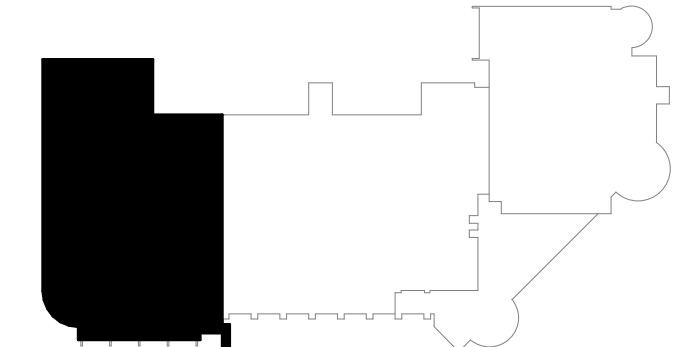
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 VERT: [Symbol]  
 CONTRACT NO: 180634  
 SHEET: M-2.44  
 KLH JOB #: 21108.00



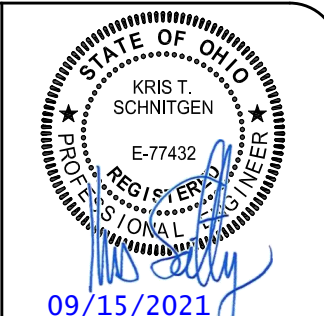
**MECHANICAL PIPING THIRD LEVEL PLAN - 4**  
 M-2.44 1/8" = 1'-0"



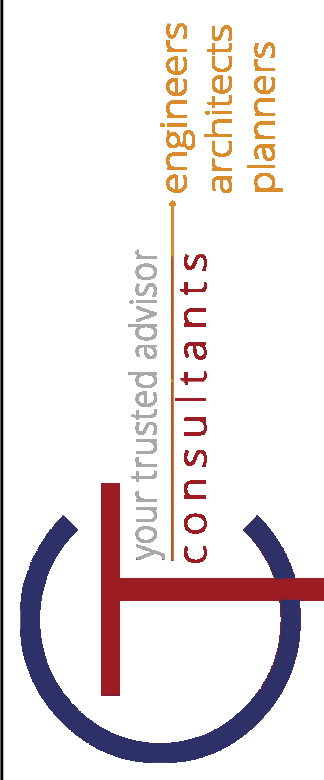
KEYPLAN



9/15/2021 1:25:17 PM



100 N. CHURCH PK. SUITE 410  
117 FT. THOMAS, KENTUCKY 40375  
LEWISTON, KENTUCKY 40328  
NEW YORK, NEW YORK  
LOUISVILLE, KENTUCKY



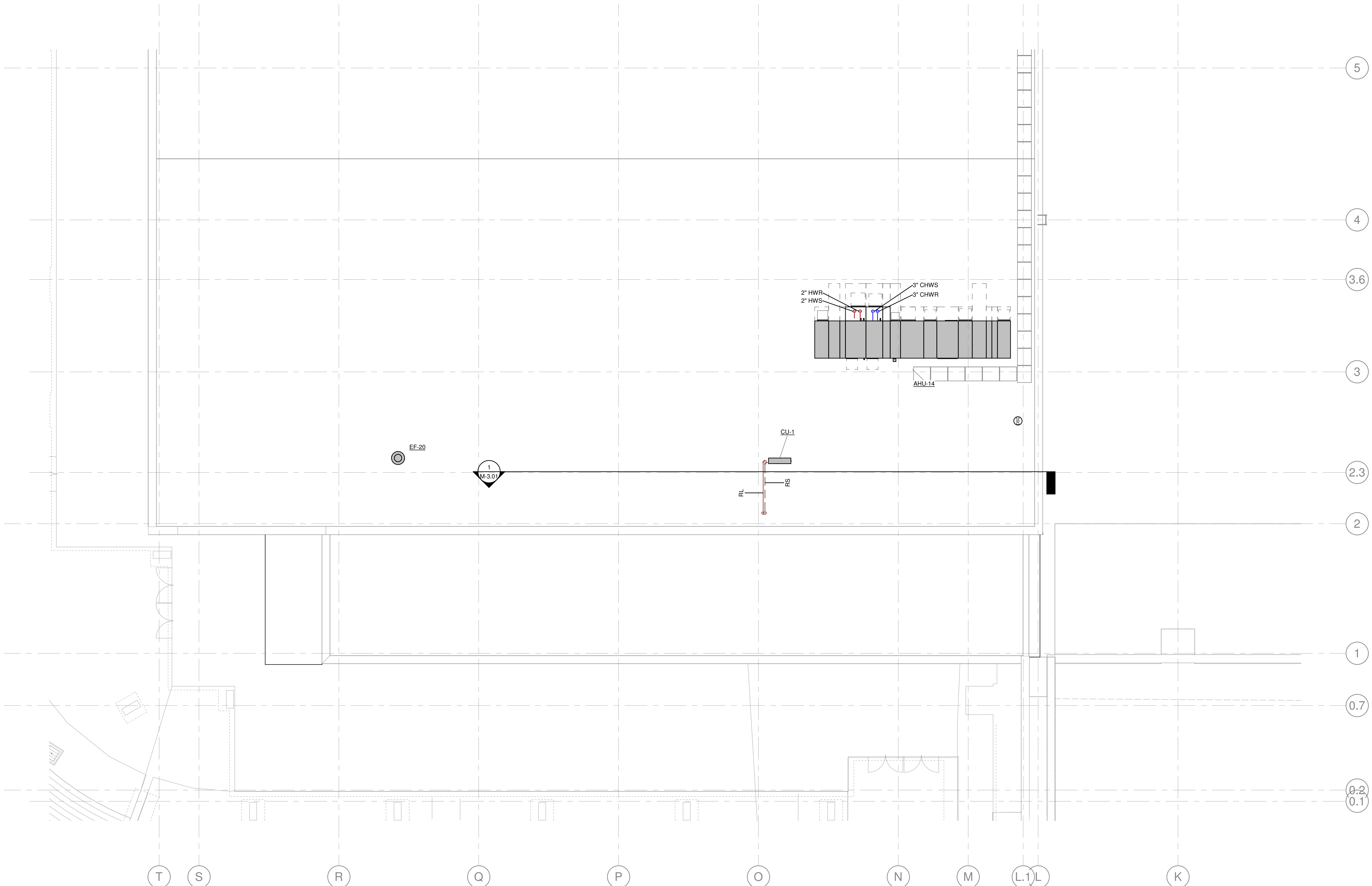
REV	DATE	BY	REVISIONS
1	04-24-2021	CAM	ISSUED FOR BIDDING AND PERMIT
0	09-13-2021	CAM	

DATE: 09/13/2021  
 DRAWN BY: [ ]  
 CHECKED BY: KTS  
 APPROVED BY: [ ]  
 P.E. [ ]  
 P.L. [ ]

**SHARONVILLE CONVENTION CENTER EXPANSION**  
 CITY OF SHARONVILLE  
 11355 CHESTER RD., CINCINNATI OH 45246  
**MECHANICAL PIPING ROOF PLAN - 4A**

SCALE: AS NOTED
HORIZ: [ ]
VERT: [ ]
CONTRACT NO: [ ]
<b>180634</b>
SHEET
<b>M-2.54A</b>

KLH JOB #: 211088.00



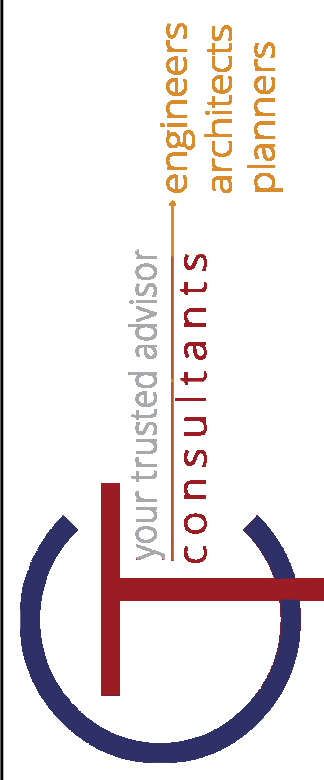
**1 MECHANICAL PIPING ROOF PLAN - 4A**  
 M-2.54A 1/8" = 1'-0"

9/15/2021 1:25:18 PM





1000 S. EVANS BLVD. SUITE 100  
 41075 600-854-9783  
 111 FT. THOMAS, KENTUCKY  
 800-442-8688 FAX  
 LEVINGTON, KENTUCKY  
 NEW YORK, NEW YORK  
 LOUISVILLE, KENTUCKY

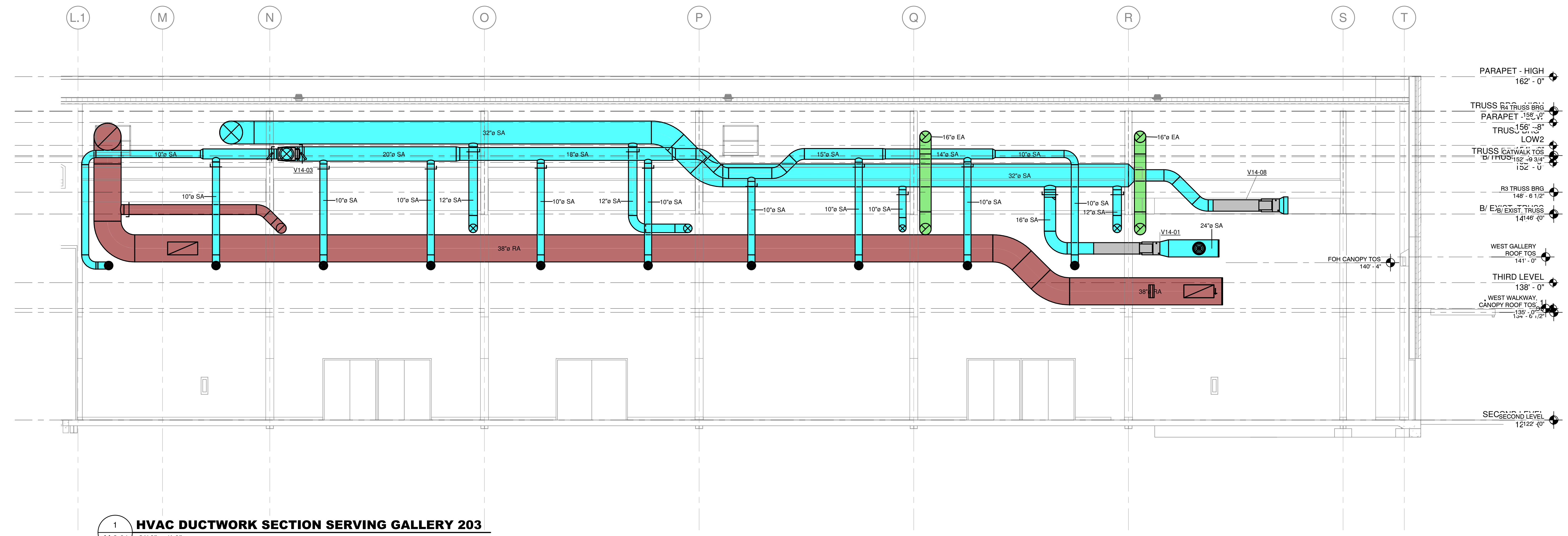


BY: CAM  
 DATE: 04-24-2021  
 09-13-2021

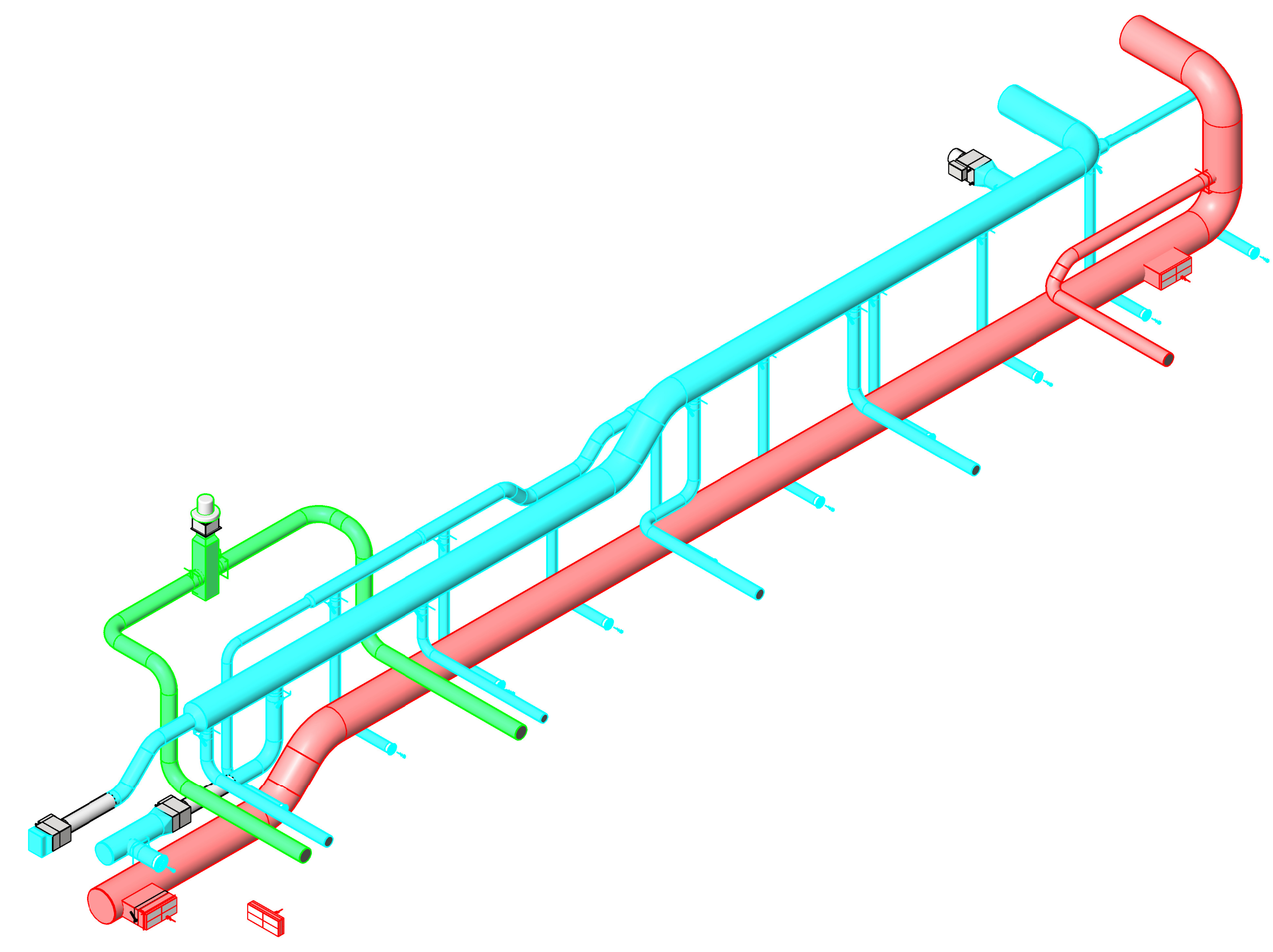
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SHARONVILLE CONVENTION CENTER EXPANSION  
 CITY OF SHARONVILLE  
 11355 CHESTER RD., CINCINNATI OH 45246  
 MECHANICAL DUCTWORK SECOND LEVEL PLAN - SECTION

SCALE: AS NOTED  
 HORIZ:  
 VERT:  
 CONTRACT NO:  
 180634  
 SHEET  
 M-3.01  
 KLH JOB #: 21108.00

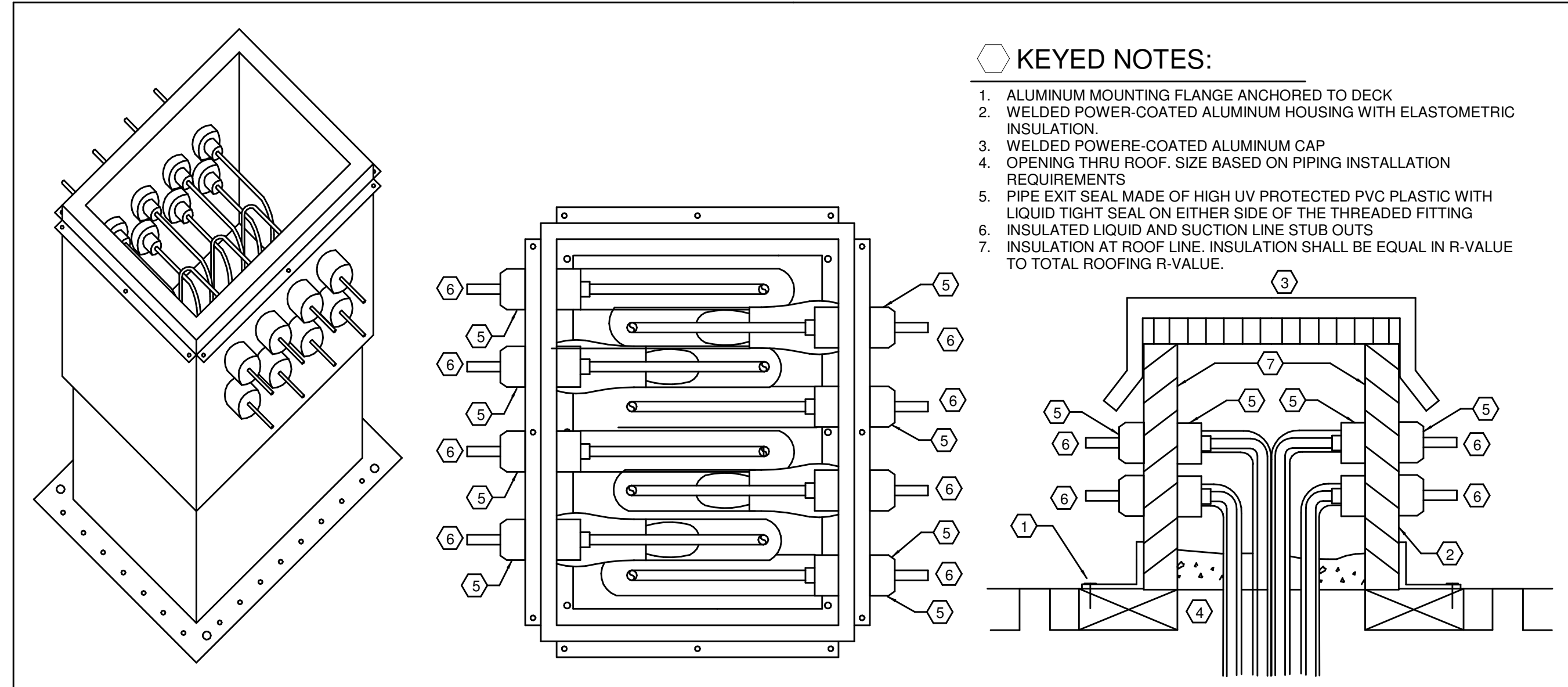


1 HVAC DUCTWORK SECTION SERVING GALLERY 203  
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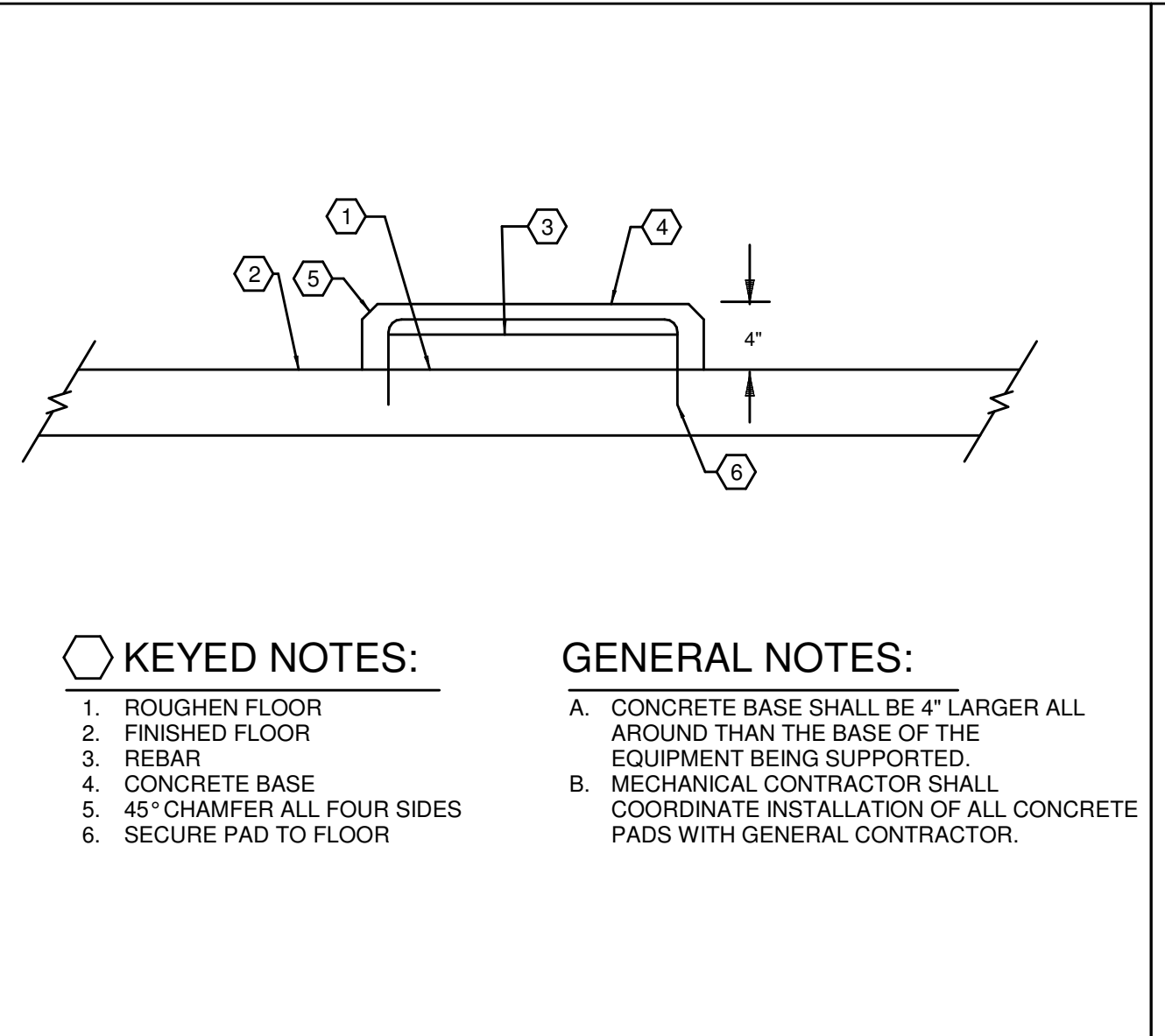


2 COORDINATION - DUCTWORK ISOMETRIC  
 M-3.01

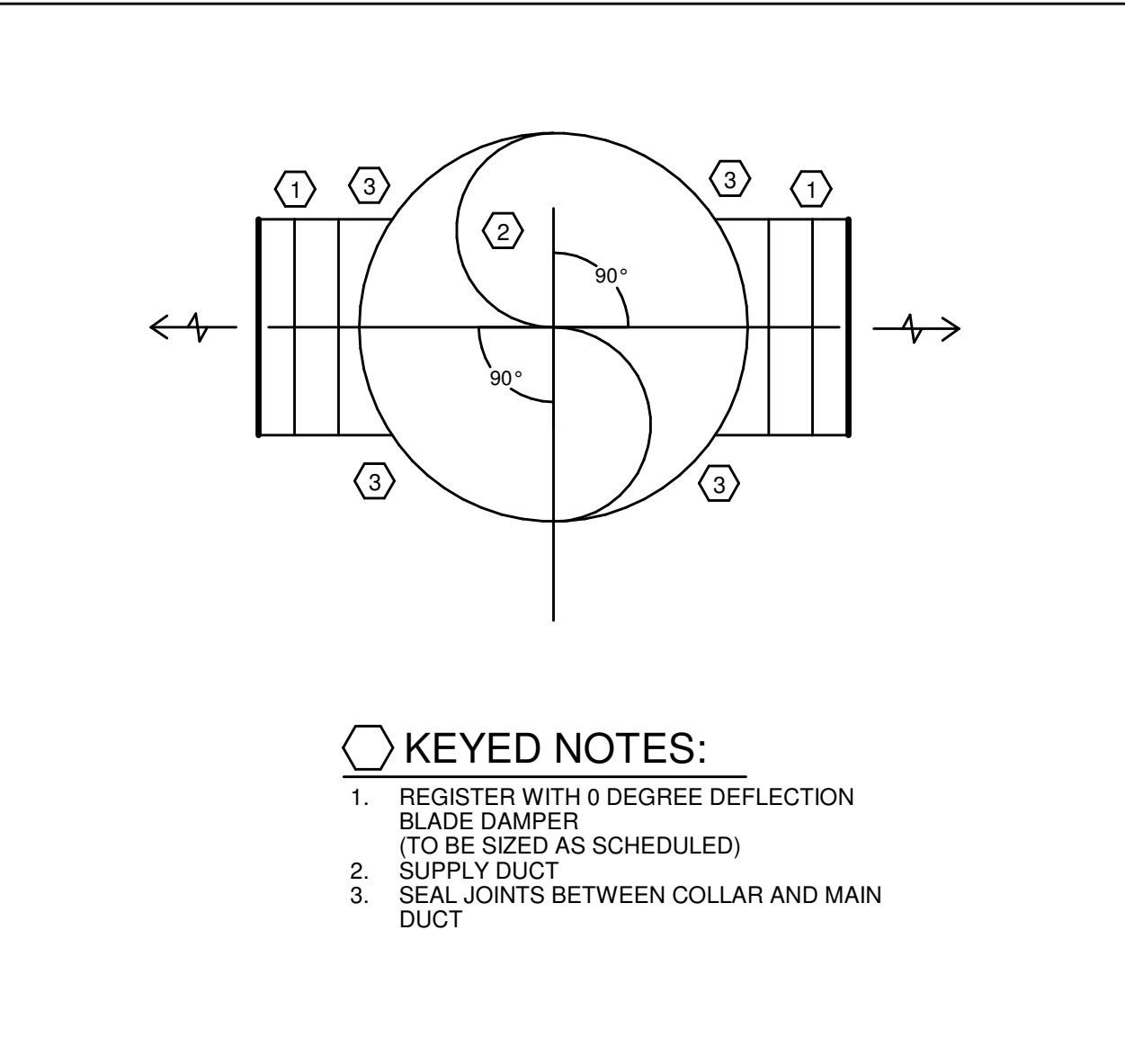




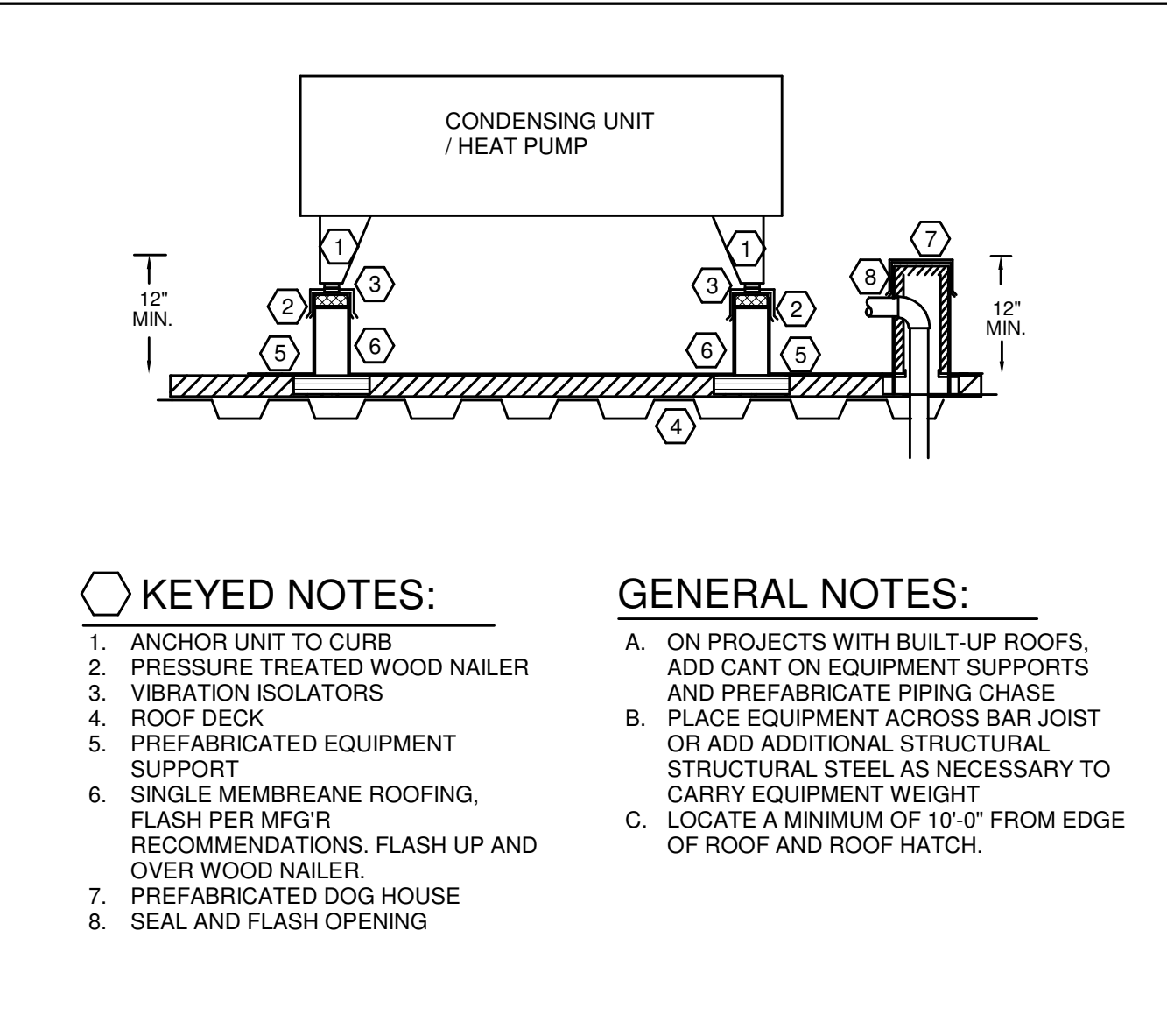
232313.00-01 - PRE-FABRICATED DOG HOUSE FOR REFRIGERANT PIPING  
SCALE: NONE



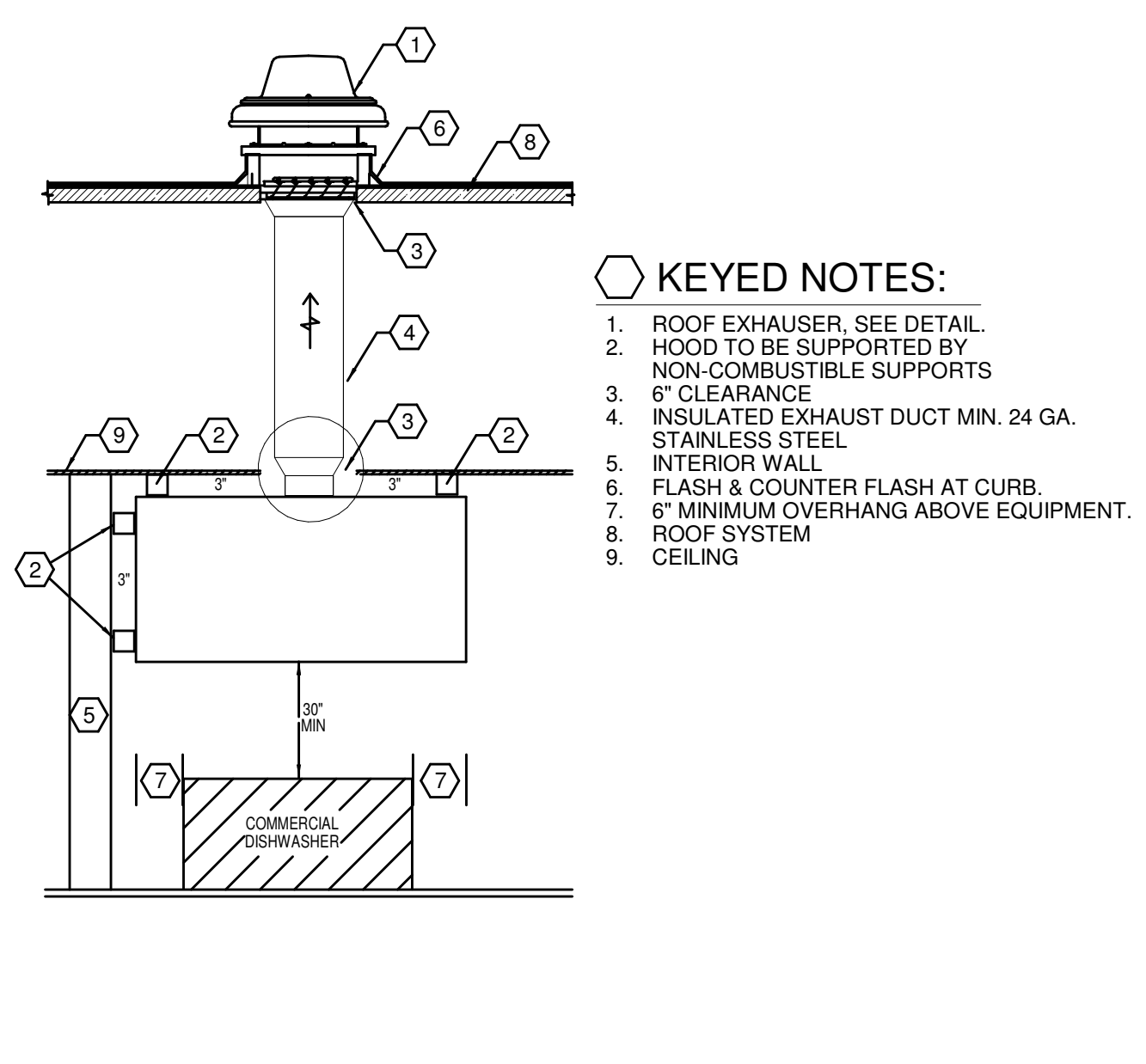
233113.00-01 - 4 INCH CONCRETE BASE  
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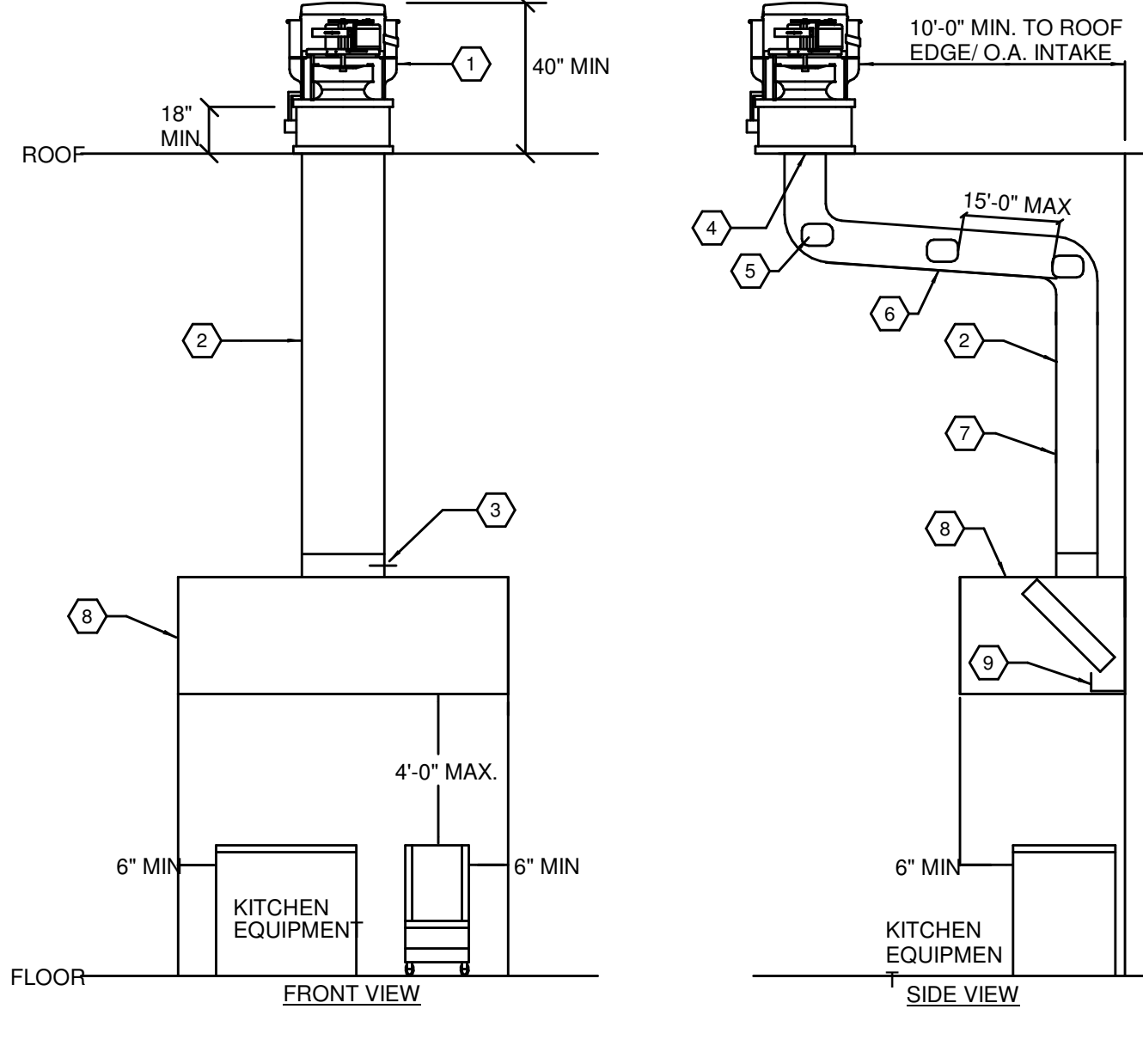
233713.00-01 - ANGLED REGISTER INSTALLATION 0 DEGREES  
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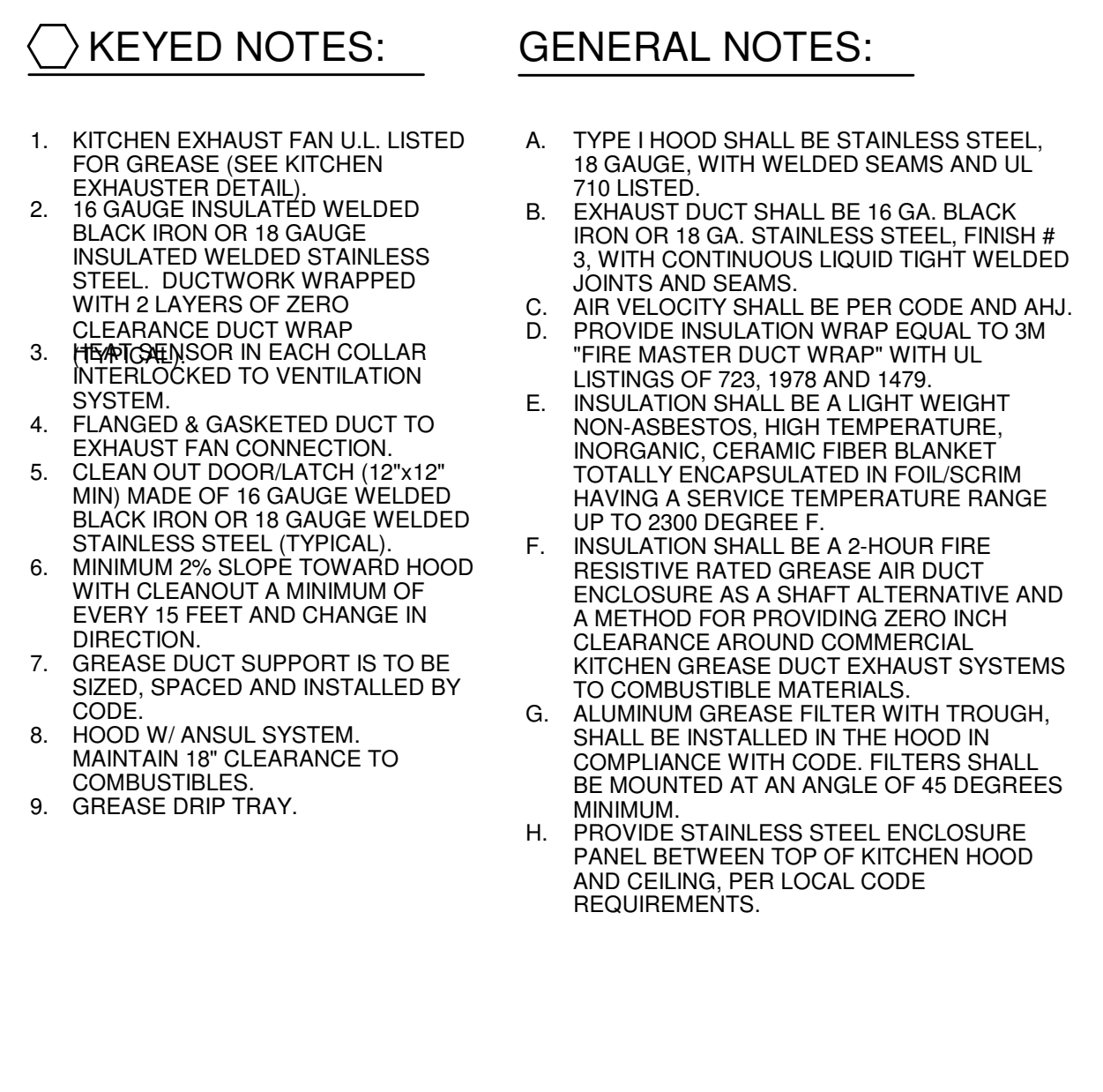
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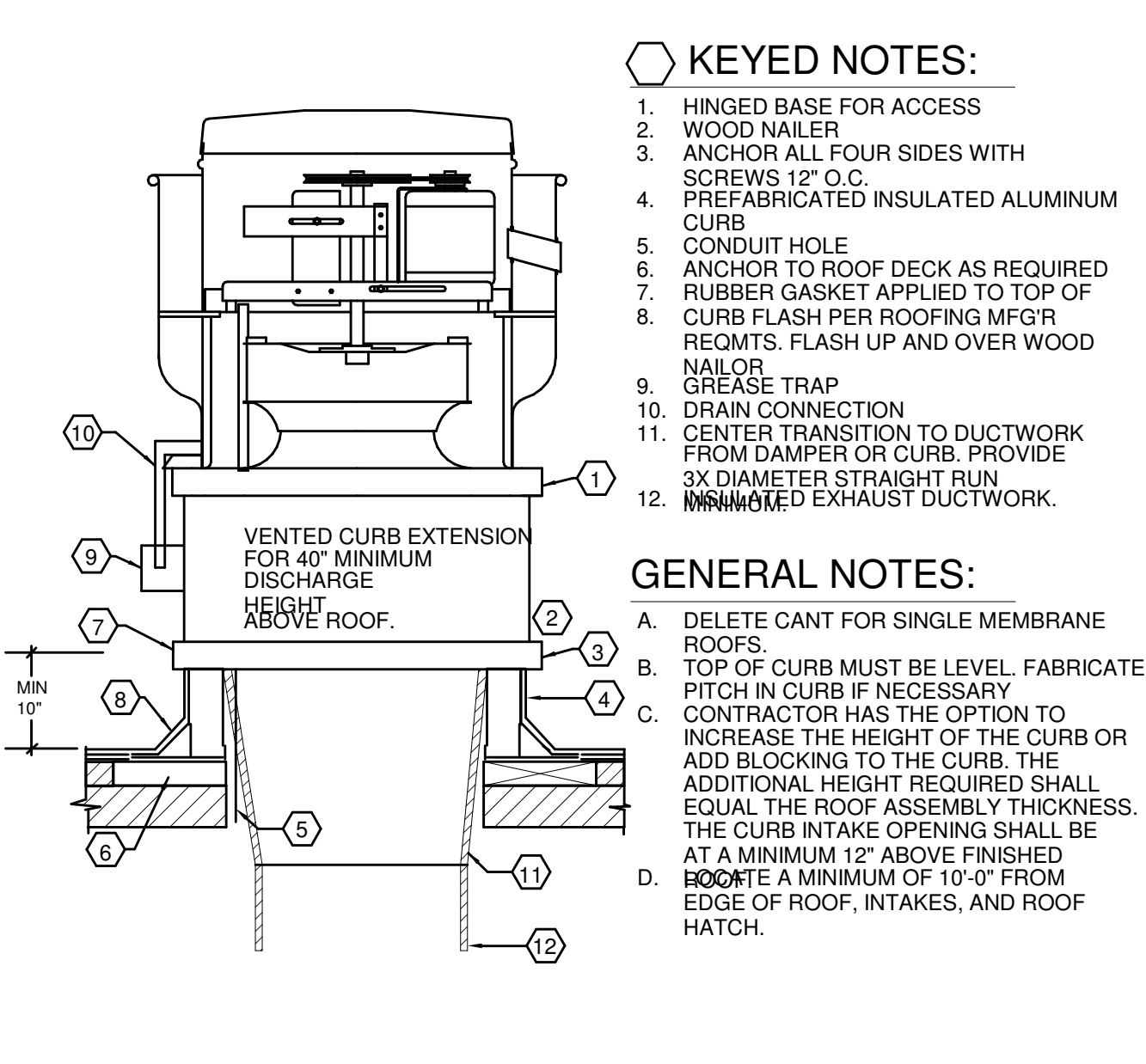
233813.00-01 - DISHWASHER HOOD TYPE 2  
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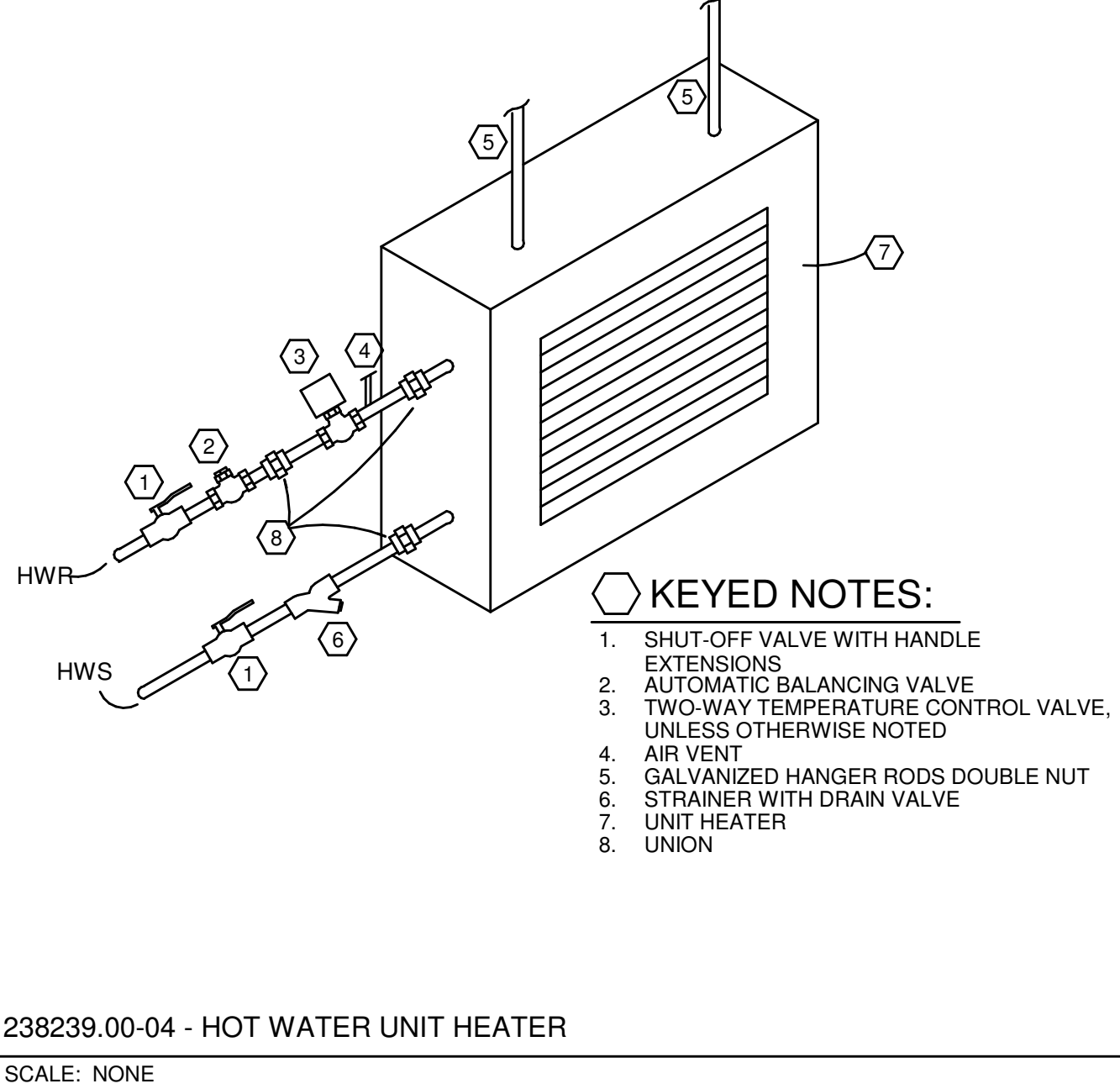
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SCALE: NONE



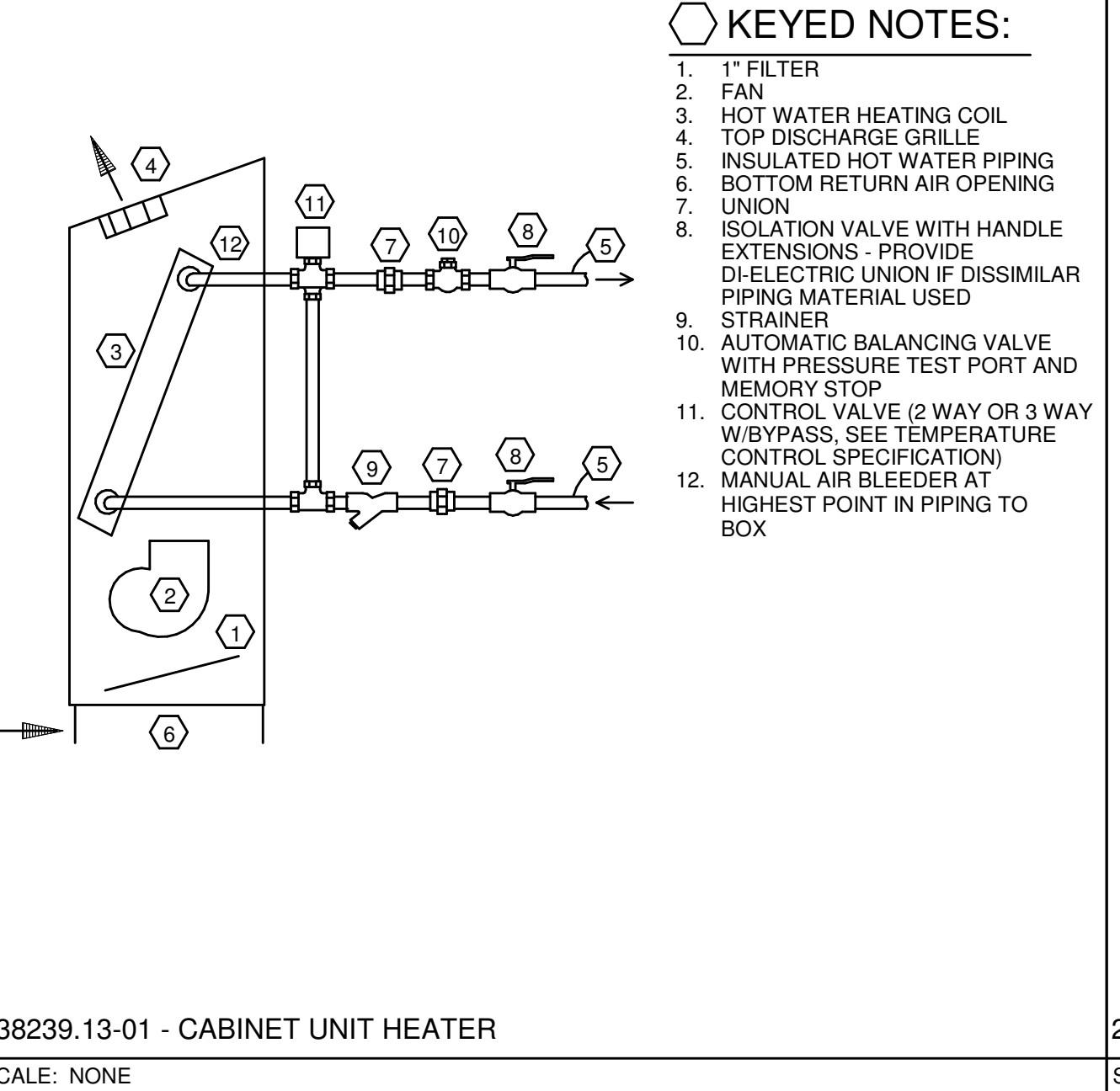
233813.00-02 - KITCHEN EXHAUSTER  
SCALE: NONE



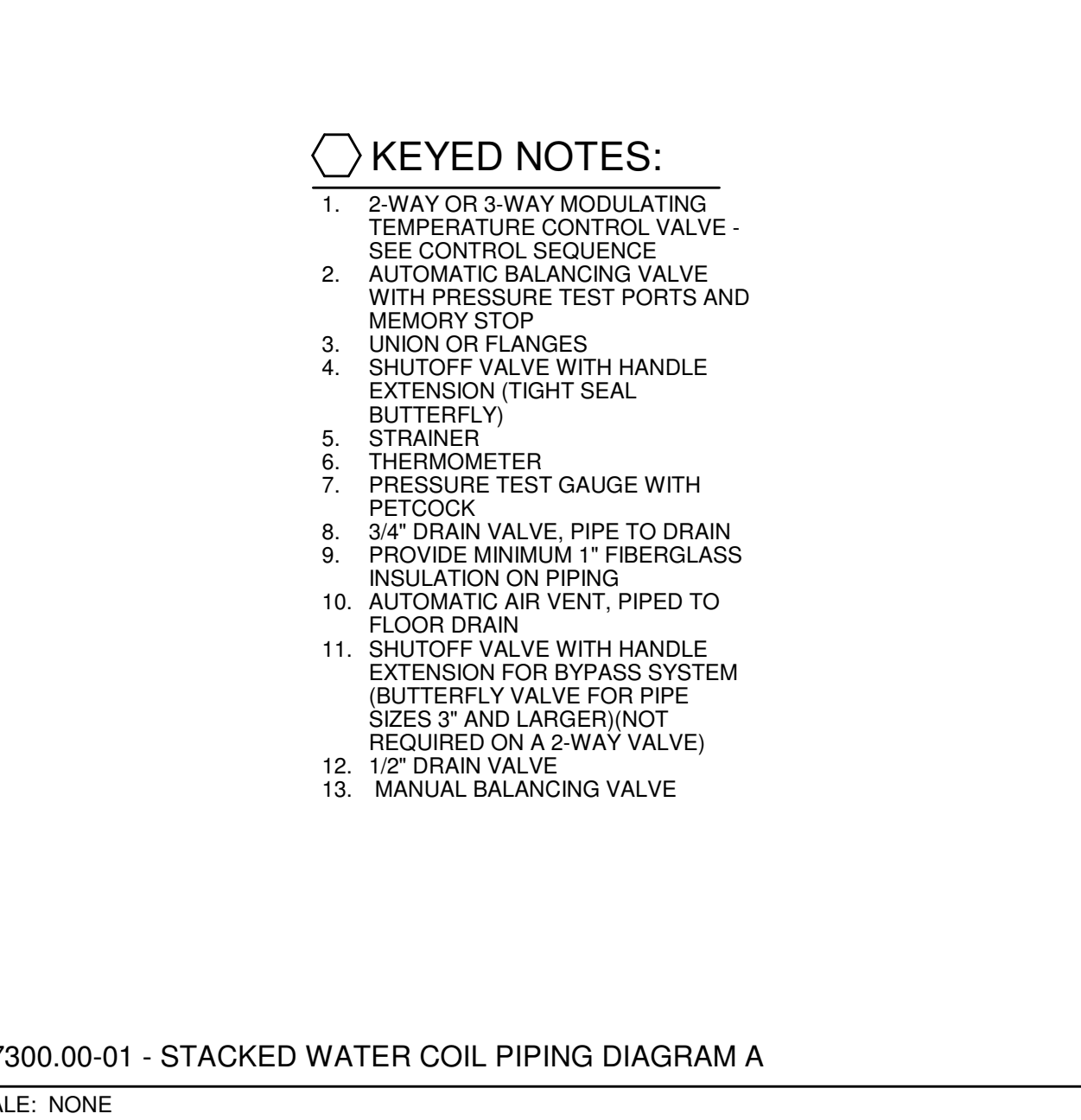
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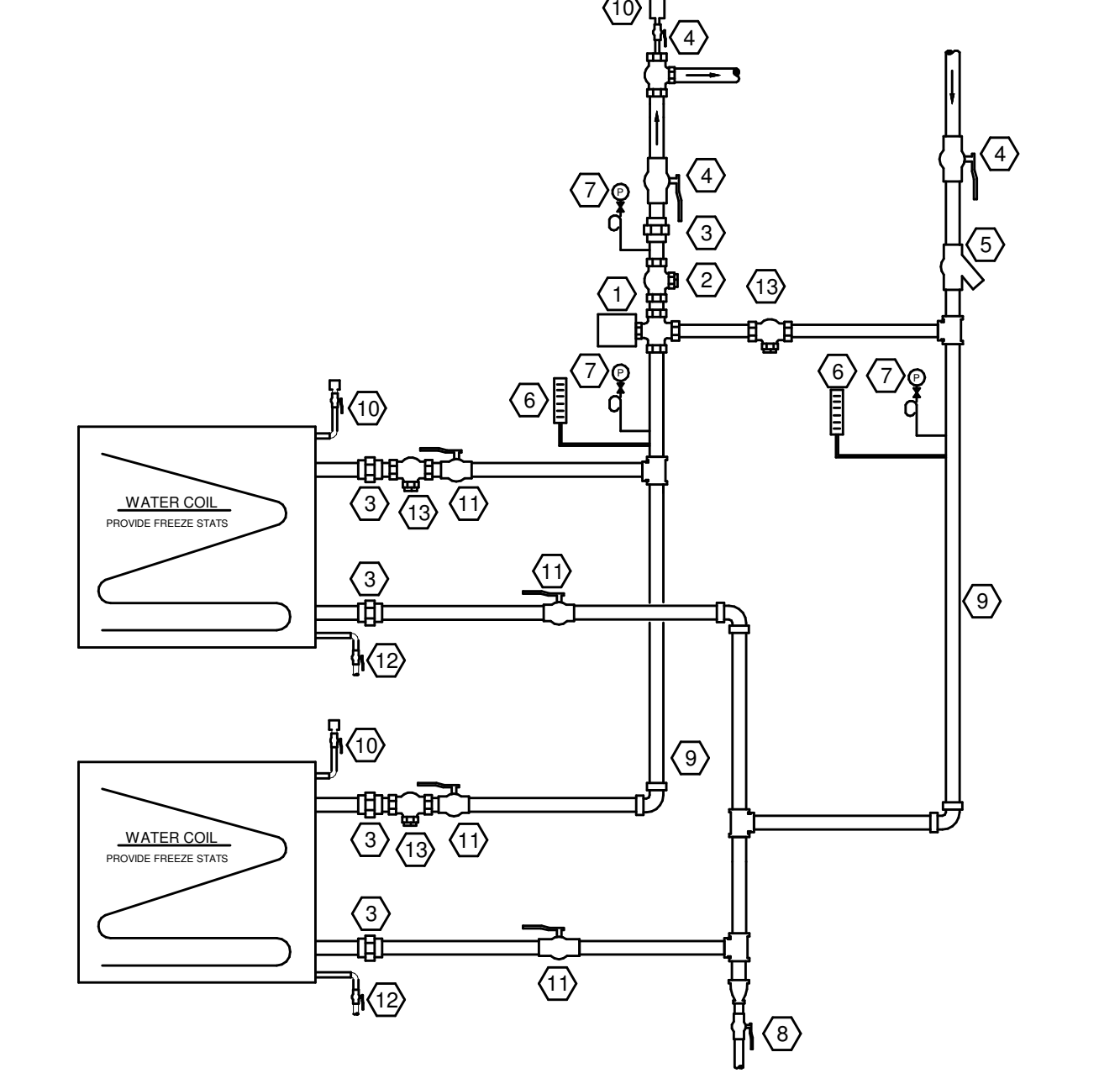
238239.00-04 - HOT WATER UNIT HEATER  
SCALE: NONE



238239.13-01 - CABINET UNIT HEATER  
SCALE: NONE



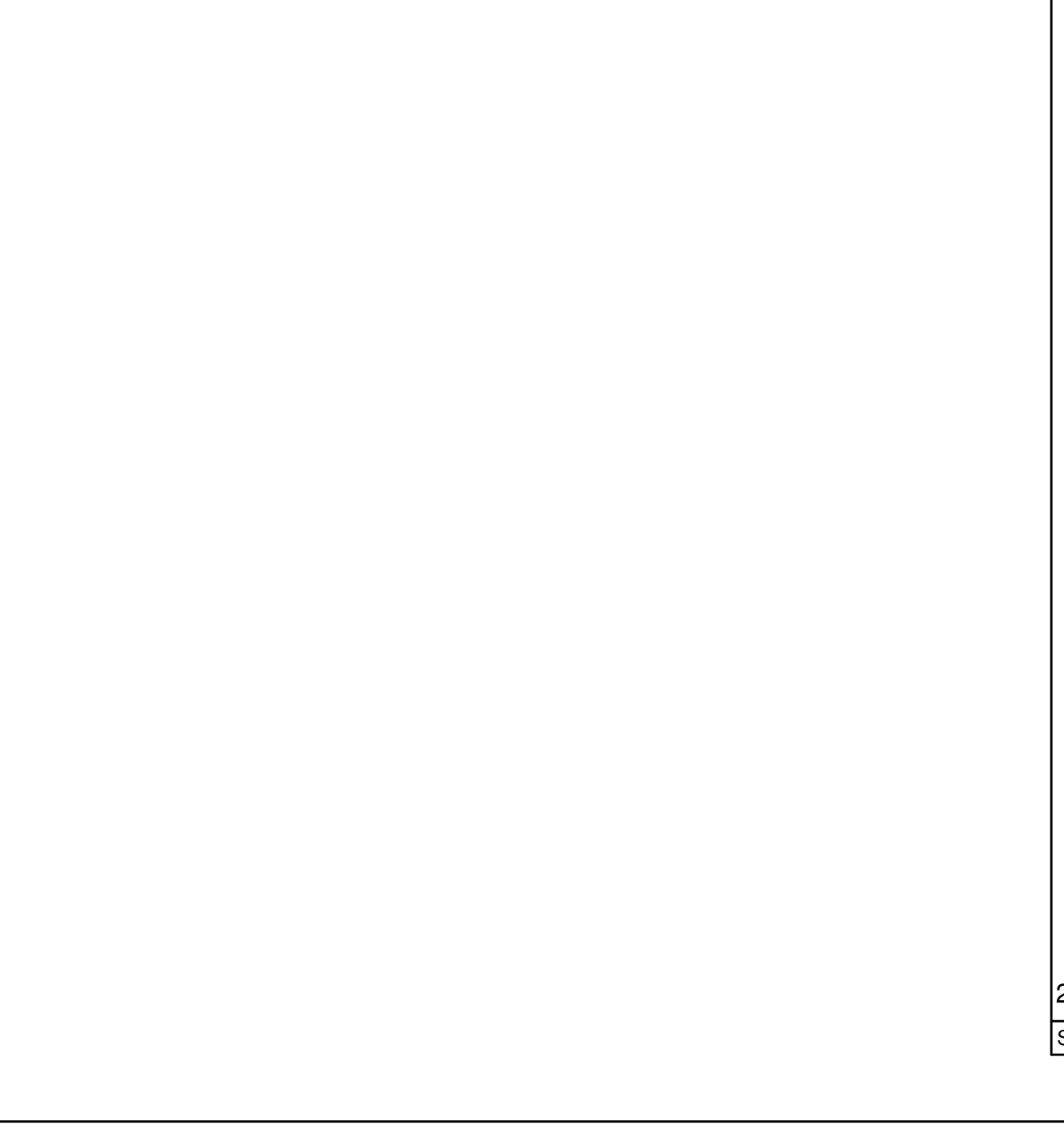
237300.00-01 - STACKED WATER COIL PIPING DIAGRAM A  
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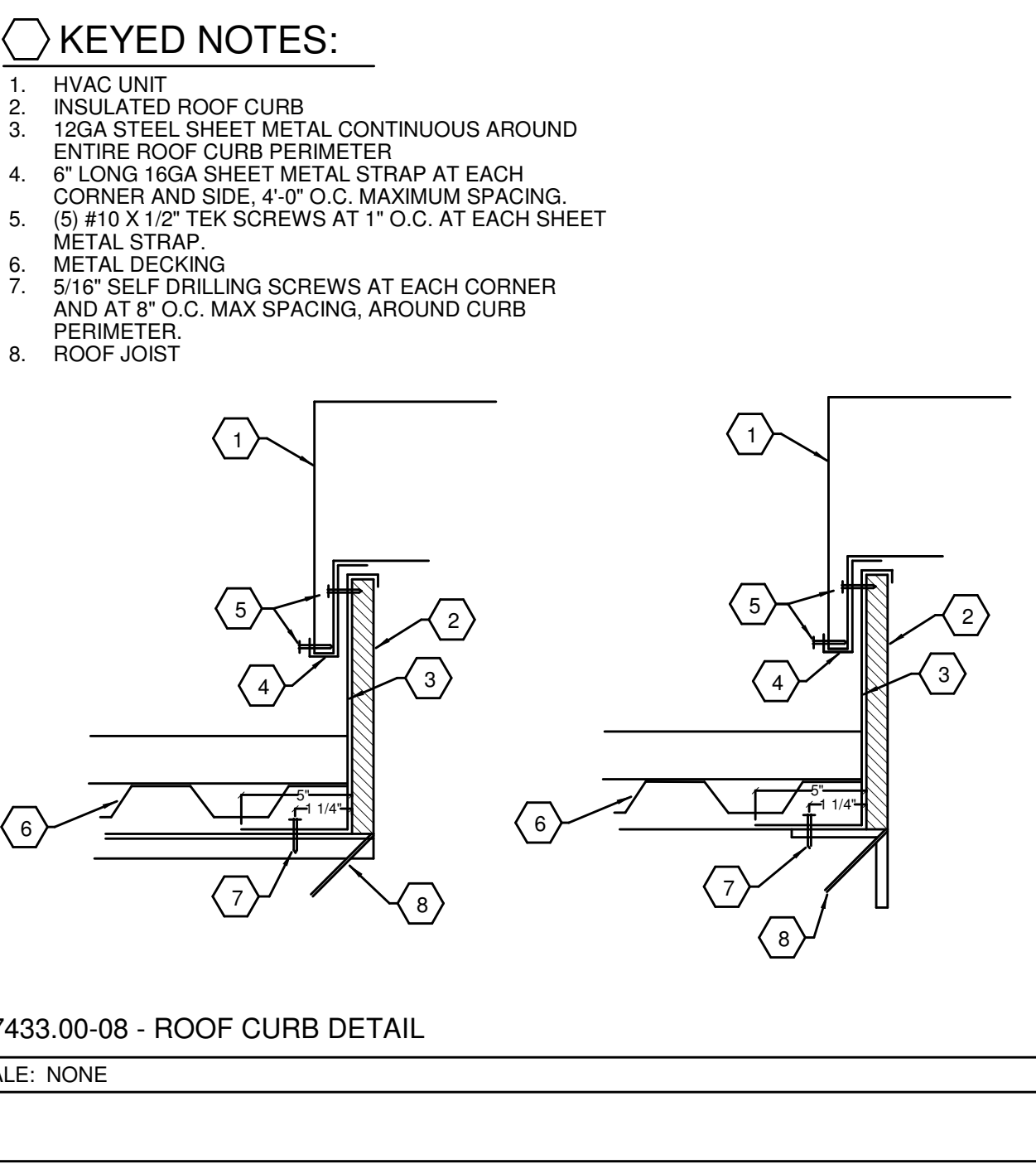
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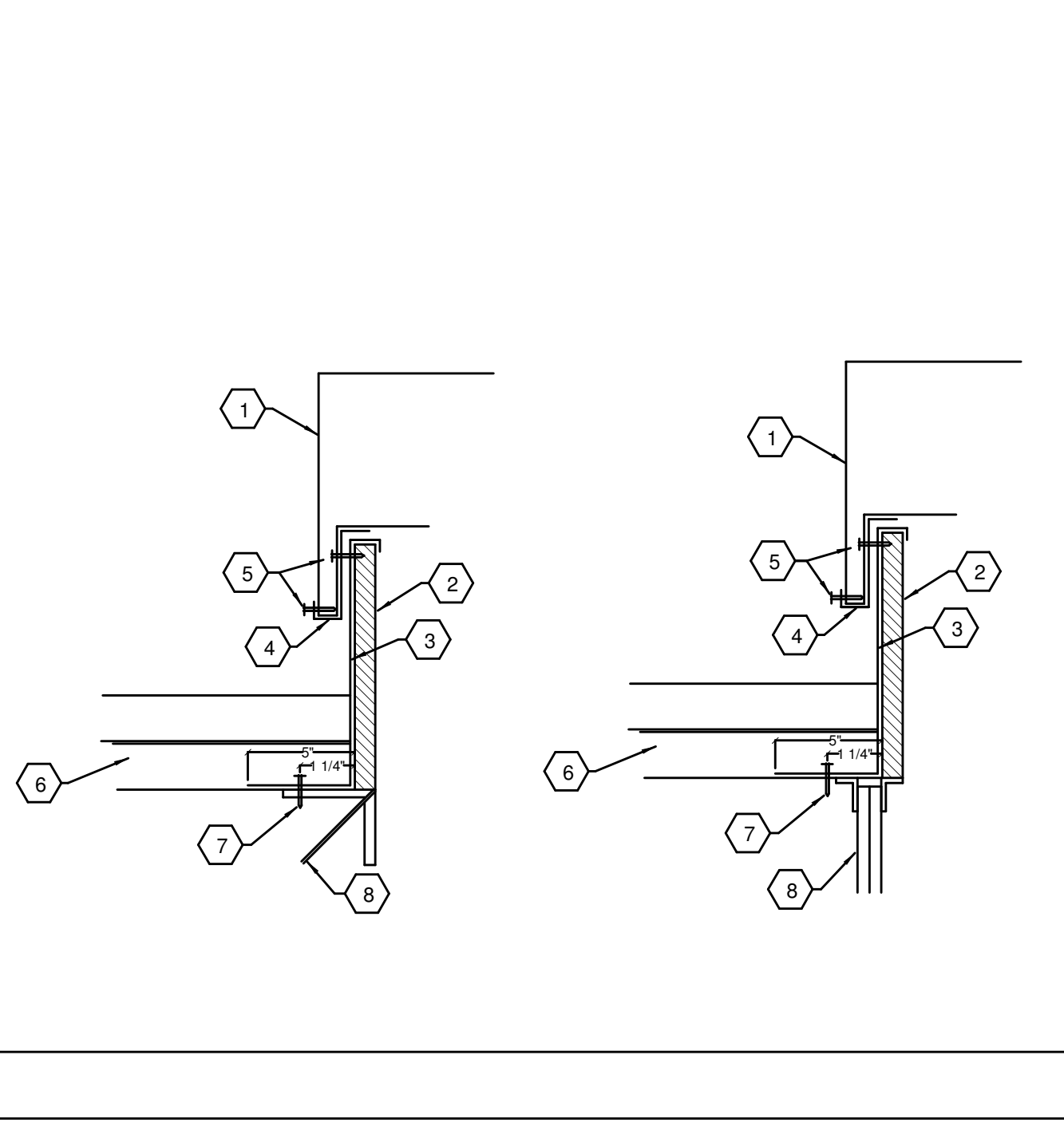
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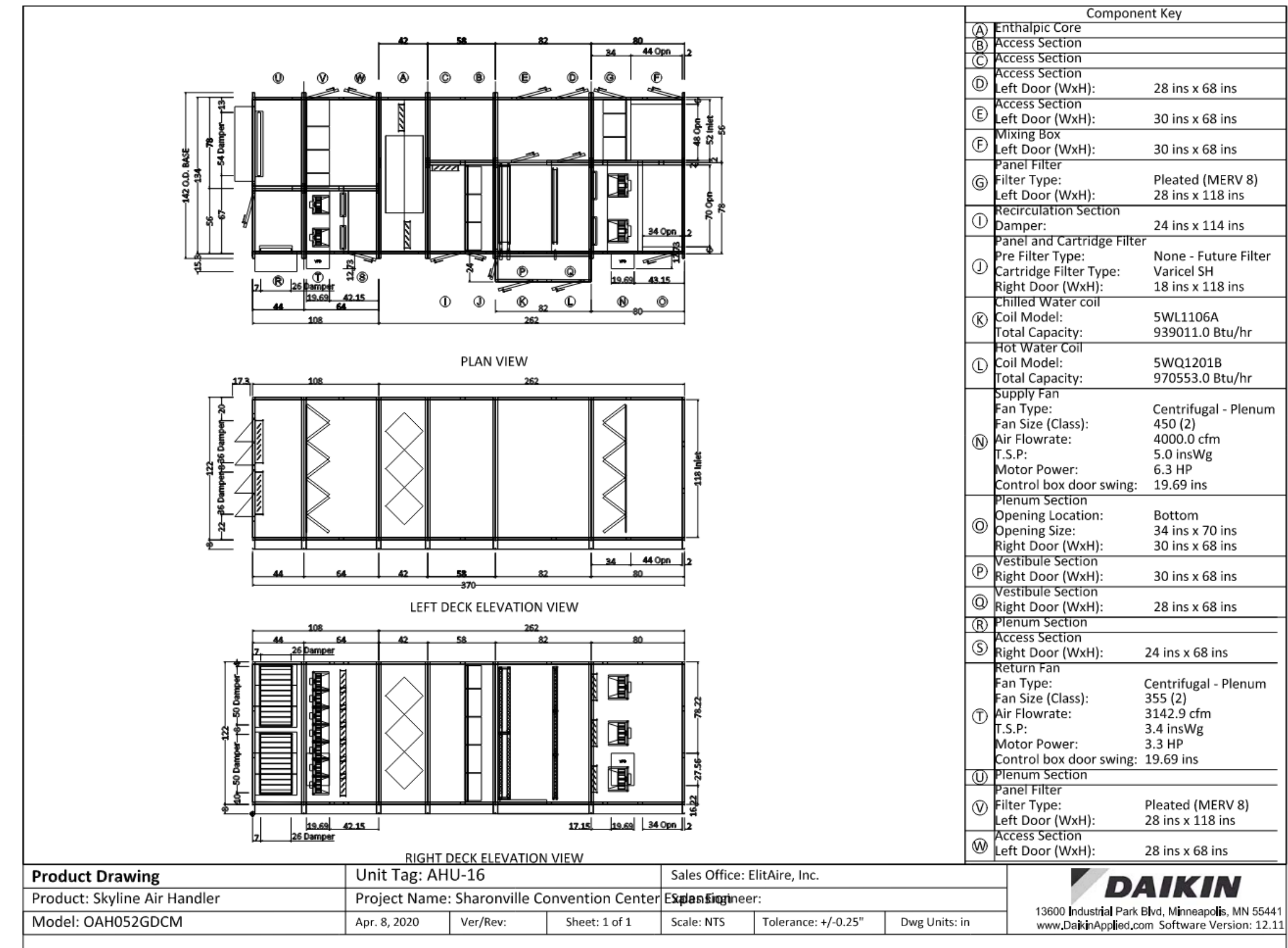
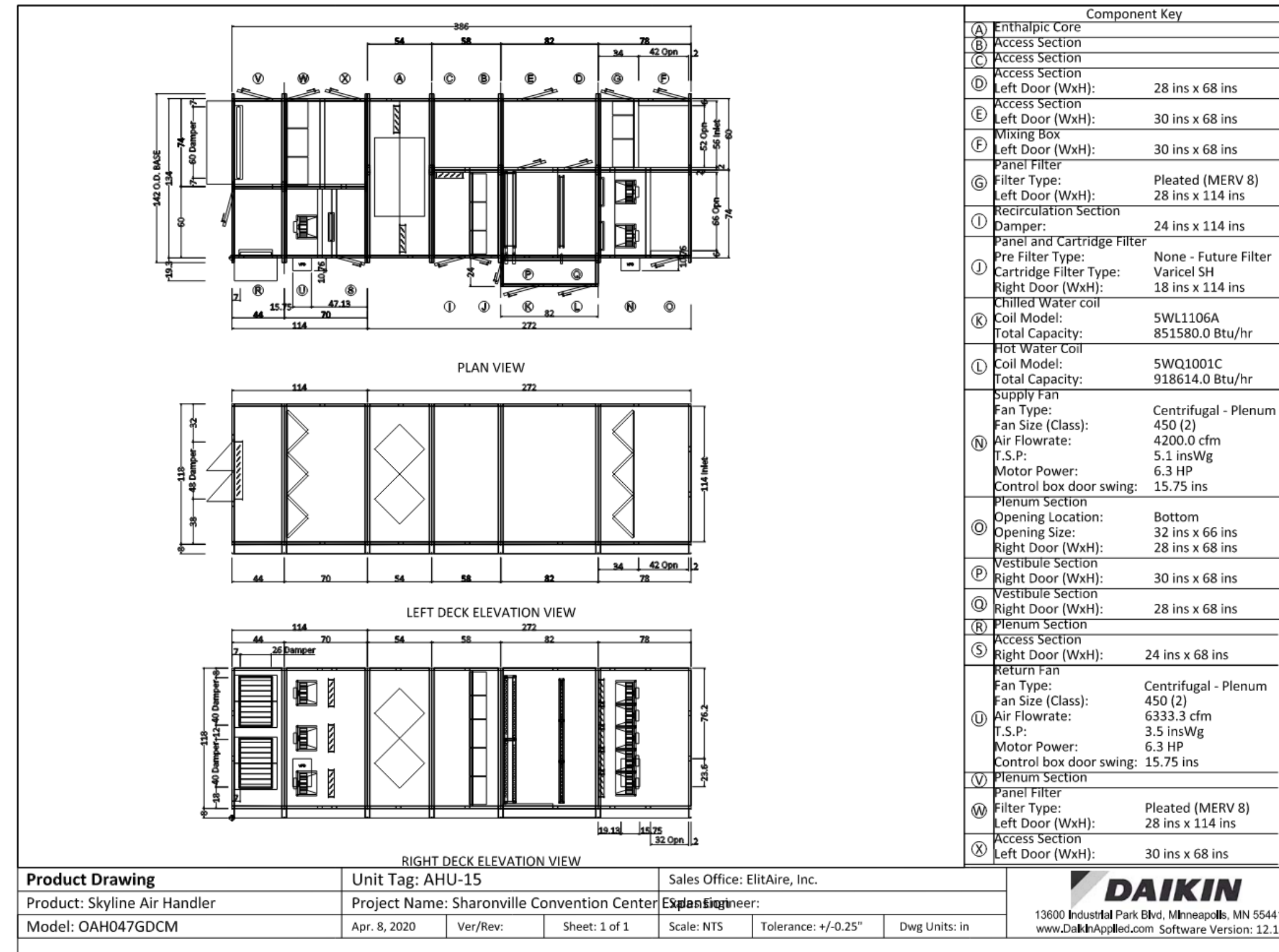
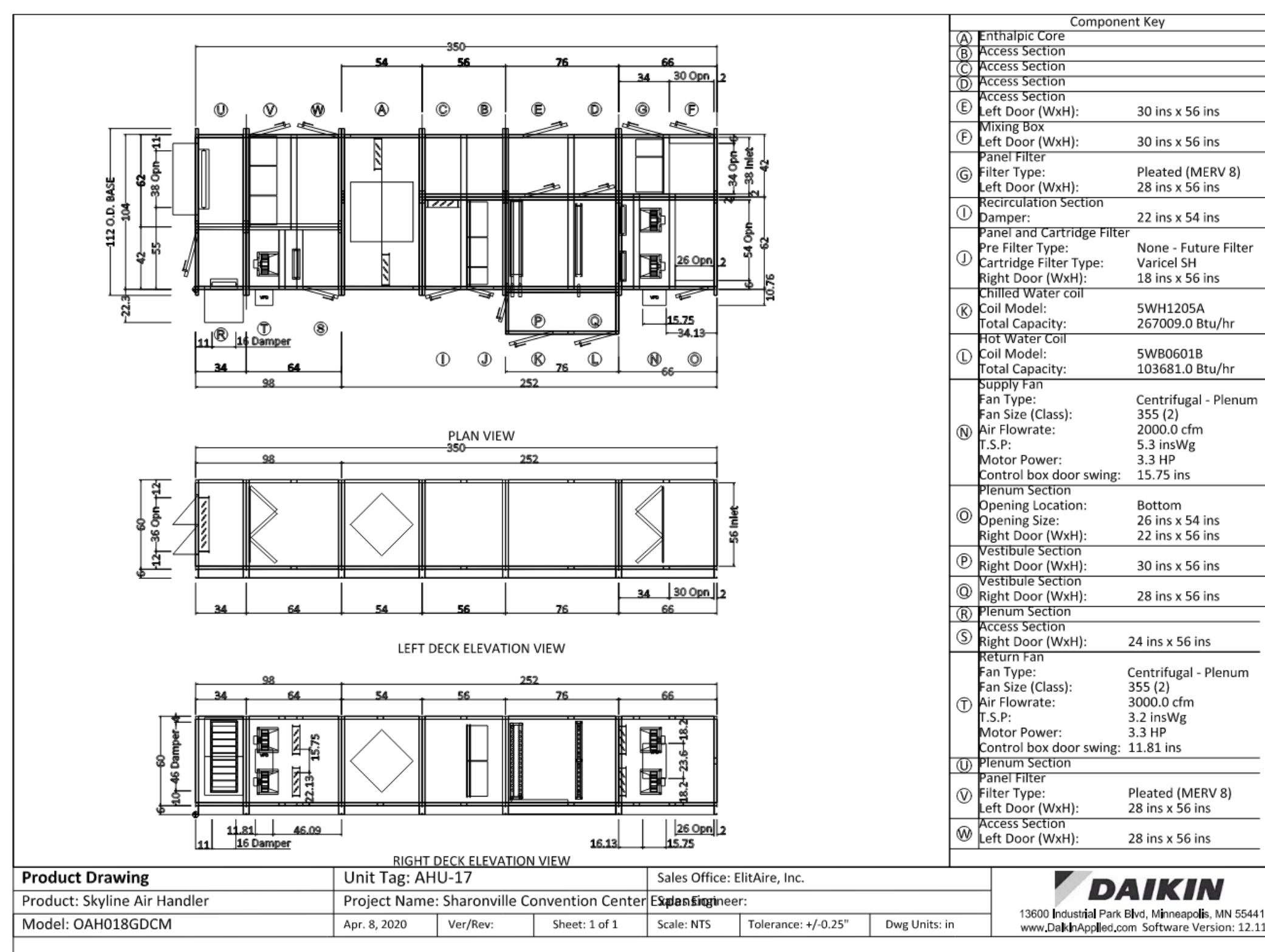
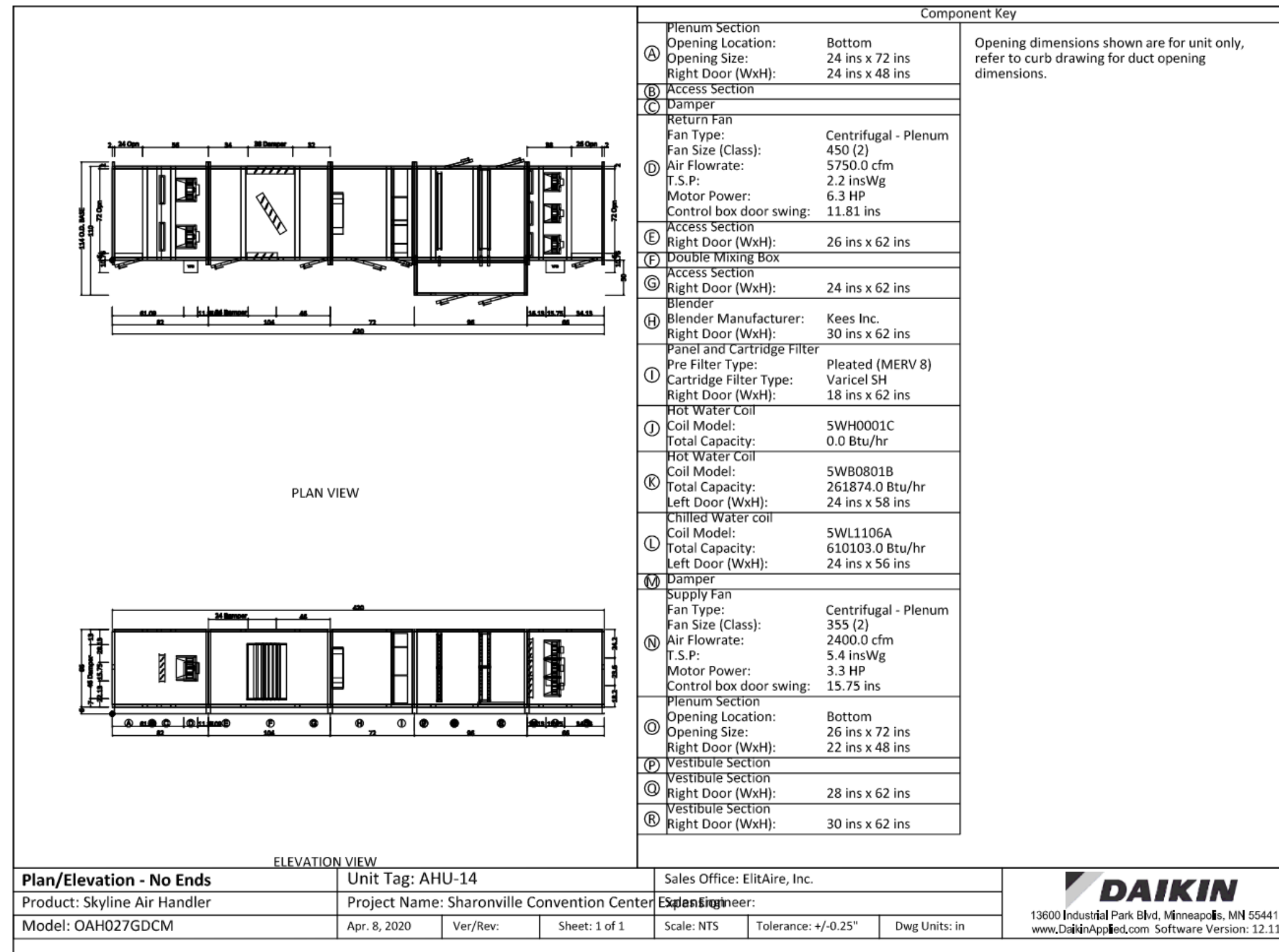
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SCALE: NONE



237433.00-08 - ROOF CURB DETAIL  
SCALE: NONE



237433.00-08 - ROOF CURB DETAIL  
SCALE: NONE



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1 <td>04/08/2020 <td>DKS <td>ISSUED FOR BIDDING AND PERMIT</td> </td></td>	04/08/2020 <td>DKS <td>ISSUED FOR BIDDING AND PERMIT</td> </td>	DKS <td>ISSUED FOR BIDDING AND PERMIT</td>	ISSUED FOR BIDDING AND PERMIT

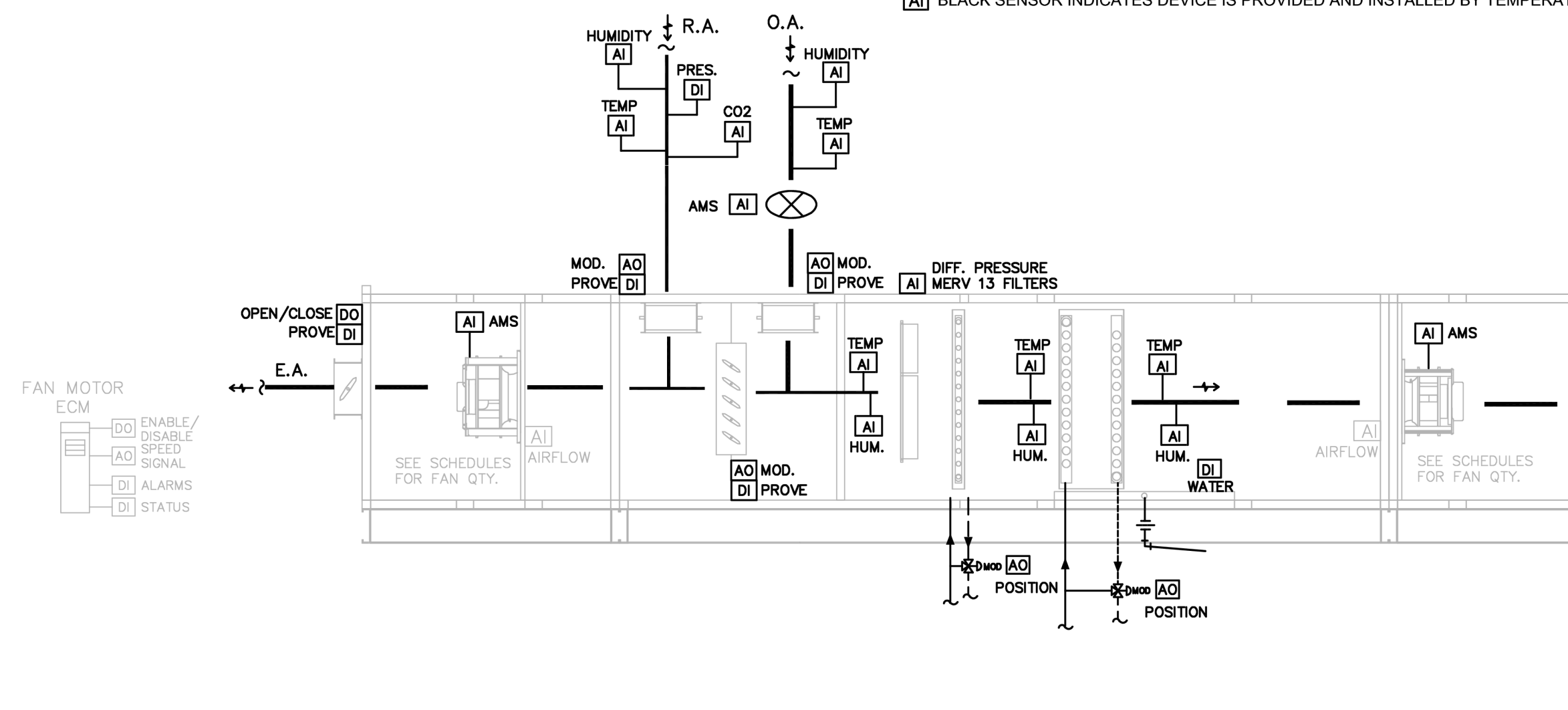
SHARONVILLE CONVENTION CENTER EXPANSION  
 CITY OF SHARONVILLE  
 11365 CHESTER RD., CINCINNATI OH 45246  
 MECHANICAL - AHU DETAILS

SCALE: AS NOTED  
 HORIZ:  
 VERT:  
 CONTRACT NO:  
 180634  
 SHEET  
 M-5.03  
 KLH JOB #: 21108.00

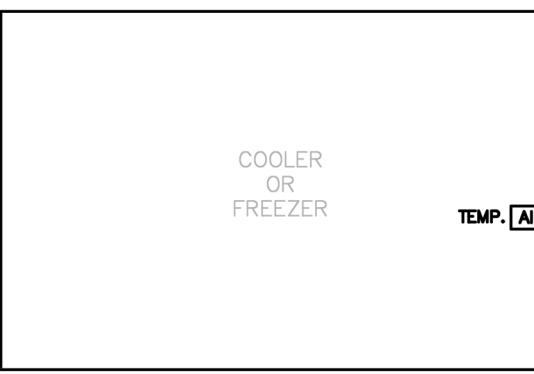


SEQUENCE OF OPERATION – AHU-14 VAV

- General:
  - Provide three-way, fail-safe closed, modulating control valve for chilled water coils.
  - Provide three-way, fail-safe open, modulating control valve for hot water coils.
  - All setpoints listed in this section are adjustable through the BAS. Control and monitoring points shall include but not be limited to the following:
- Interface:
  - The DDC system contractor is responsible to coordinate with the AHU supplier for proper coordination and interfacing of all specified data points, including any and all incidental programming required for proper display/commanding of the data points specified in equipment spec as well as all additional data points listed in this section.
- Startup:
  - Electric disconnect switch and circuit breaker shall be in the 'ON' position so that line voltage power is available at the AHU. The power switch of the integral controller should be in the 'ON' position.
  - A 'Hand-Off-Auto' switch at each of the supply and exhaust fan starters permit manual or automatic operation of each fan.
    - In 'Auto', the fan is started and stopped by the BAS.
    - In 'Hand', the fan is started regardless of the command from the BAS unless a system safety device is activated.
  - When the unit turns on, 24 VAC is supplied to the controller. The unit shall operate on an occupied/unoccupied cycle as controlled from the BAS. Occupancy shall be predetermined by and programmed into the BAS. The controller shall check the operating schedule and look for failures. If no failures or faults are detected, after 30 seconds, the unit shall commence start-up.
  - During the 'start-up' cycle the fan shall run with the dampers in the full recirculation position. Provide morning warm-up sequence with optimum start function. When the return air temperature reaches setpoint (68 deg F, adjustable), the minimum outside air damper shall open to the controlled minimum outdoor air position.
- Occupied Mode:
  - The BAS shall utilize an optimal start sequence that will determine the length of time required to bring each zone from current temperature to the occupied setpoint temperature which shall be determined using the difference between actual zone temperature and occupied setpoint. The BAS shall compare the difference with the historical performance of how quickly the zone has been able to warm up or cool down. The system shall wait as long as possible before starting, so that the temperature in each zone reaches occupied setpoint just in time for occupancy. Enable the AHU to occupied mode whenever the time schedule for the building indicates the building is occupied.
  - During occupied mode, the supply and return fan sequences shall commence, the bypass damper shall close and the outside air damper shall open. The heating and cooling sequences shall enable accordingly to maintain supply air temperature setpoint.
- Unoccupied Mode:
  - The BAS shall enable the AHU to unoccupied mode whenever the time schedule for the building indicates the building is unoccupied.
  - During unoccupied mode, the supply fan sequence shall cycle and the return damper shall open on a call for heating, cooling, or dehumidification, from zone temperature sensor. The return fan shall be off and the outside air damper shall close. The heating, cooling, or dehumidification sequences shall enable accordingly to maintain supply air temperature setpoint.
- Supply Fan Control:
  - The supply fan VFD speed shall be controlled from a duct static pressure sensor located 2/3 downstream in ductwork. Where this results in sensor being located downstream of major ductwork splits, multiple sensors shall be installed in each major branch to maintain minimum setpoint in each branch.
  - The supply fan shall be modulated to operational speed to maintain static pressure setpoint. When the sensor measures low pressure, the supply fan shall be ramped up to maintain setpoint. When the sensor measures high pressure, the supply fan shall be ramped down to maintain setpoint.
  - For systems with DDC control of individual zone boxes reporting to a central control system, static pressure setpoint shall be reset based on the zone requiring the most pressure. In this way the setpoint is reset lower until one zone damper is nearly wide open to save fan energy.
  - Initial static pressure setpoint shall be 1.0". Provide a high limit static pressure sensor in the supply fan discharge that will alarm the system and fail safe the air handler with manual reset on a high limit of 4.0" (adjustable). Provide a current transducer to prove fan operation. Provide a high and low limit current output for the transducer that will alarm the system.
  - Control and monitoring points shall include but not be limited to the following:
    - Supply Fan on-off status (DO/DI)
    - Supply Fan current (HL/LL)
    - Supply Fan VFD Speed controller (% max. speed) (AO)
    - Supply Fan Duct static pressure - 2/3rds (AI/AO) (HL/LL - Hard Wired)
- Minimum Outside Air Control:
  - Provide and install an integral or remote mounted air flow measuring station, located downstream of the minimum outside air damper which will modulate the outside air damper to maintain a constant minimum outside airflow as scheduled. If the minimum damper is full open and requires more fresh air, the return damper shall be modulated closed until the minimum outside air is achieved. If an integral airflow station/damper is utilized, the controller shall reside on the BAS network (hardwiring between independent controllers is not acceptable).
  - Control and monitoring points shall include but not be limited to the following:
    - Outside air damper position (% open) (AO)
    - Outside air CFM (AI)
- Economizer Control:
  - Provide dual enthalpy economizer control. Economizer control shall be enabled whenever the outside air enthalpy is lower than the return air enthalpy. Enthalpy shall be calculated from sensors which are tied to the same controller for accuracy. During economizer mode, the minimum outside air damper control shall be disabled and the minimum outside air damper shall be set at 100% opened. The economizer damper shall modulate open on a call for cooling and modulate closed on a call for heating. The return damper shall modulate inversely with the economizer damper.
  - Control and monitoring points shall include but not be limited to the following:
    - Outside air temperature (AI)
    - Outdoor Air Humidity (AI)
    - Return air temperature (AI)
    - Return Air Humidity (AI/HL/LL)
    - Return air damper position (% open) (AO)
- Supply Air Temperature Setpoint:
  - The supply air temperature setpoint shall be reset based on outside air temperature. Whenever the outside air temperature is 60 degrees or above, the supply air temperature setpoint shall be 55 degrees. Whenever the outside air temperature is 30 degrees or below, the supply air temperature setpoint shall be 60 degrees. The supply air temperature setpoint shall increase linearly from 55 to 60 degrees as the outside air temperature drops from 60 to 30 degrees. Provide a supply air temperature high limit of 90 degrees and low limit of 40 degrees that will alarm the system and place the air handler in fail safe mode with manual reset.
  - Control and monitoring points shall include but not be limited to the following:
    - Supply air temperature (AI/AO/HL/LL)
    - Outside air temperature (AI)
- Cooling Control:
  - Cooling shall be controlled to maintain supply air temperature setpoint. On a call for cooling the heating valve shall be closed. On a further call for cooling the economizer damper (if enabled) shall be modulated to full open position prior to the cooling valve being opened. On a further call for cooling the chilled water valve shall be modulated open.
  - Control and monitoring points shall include but not be limited to the following:
    - Supply air temperature (AI)
    - Chilled water valve position (% open) (AO)
- Heating Control:
  - Heating shall be controlled to maintain supply air temperature setpoint. On a call for heating the cooling valve shall be closed. On a further call for heating, the economizer damper (if enabled) shall be modulated to minimum position prior to the heating valve being opened. On a further call for heating the hot water valve shall be modulated open.
  - Control and monitoring points shall include but not be limited to the following:
    - Supply air temperature (AI)
    - Heating water valve position (% open) (AO)
- Filter Pressure Drop:
  - Provide static pressure differential switch across each filter which will alarm the system on high static pressure limits.
  - Control and monitoring points shall include but not be limited to the following:
    - Filter High Static (GA)
- Mixed Air Low Limit Control:
  - Provide a mixed air low limit whenever the mixed air temperature drops below 40 deg F dry bulb that will alarm the system, close economizer damper and modulate the outside air damper below minimum to maintain mixed air setpoint equal to supply air setpoint.
  - Control and monitoring points shall include but not be limited to the following:
    - Mixed air temperature (AI/HL/LL)
- Freeze Stat Control:
  - A low temperature cutout thermostat located in the discharge of the heating coil, will alarm the system and put the air handler in fail safe position when the temperature falls below 37 degrees. Provide an adjustable time delay of 5 minutes for start-up. The low temperature cutout thermostat shall require manual reset.
  - Control and monitoring points shall include but not be limited to the following:
    - Freeze-stat status (GA)
- Smoke Detector:
  - When the smoke detector is alarmed, the system shall be alarmed and the air handler shall fail safe with manual reset. Electrical contractor shall furnish, HVAC Contractor shall mount & Electrical contractor shall wire a UL listed photoelectric smoke detector per local code authority having jurisdiction.
  - Control and monitoring points shall include but not be limited to the following:
    - Smoke detector (GA)
    - Fan Shutdown - Hard Wired
- Shutdown:
  - At shutdown the air handler shall go to fail safe position. Fail safe position is defined by the following: The supply fan is off, the return air damper is fully open, the minimum outside air and economizer dampers are closed, the heating valve is open and the cooling valve is closed.
- BAS Alarms:
  - The BAS shall generate an alarm whenever the following conditions occur:
    - The supply fan is commanded on but fails to run (fan's current sensor indicates the fan is off for more than 60 seconds).
    - The supply fan is commanded off but continues to run (fan's current sensor the fan is running for more than 60 seconds).
    - The return fan is commanded on but fails to run (fan's current sensor indicates the fan is off for more than 60 seconds).
    - The return fan is commanded off but continues to run (fan's current sensor the fan is running for more than 60 seconds).
    - The supply air temperature is less than 40 degrees F or greater than 100 degrees F for more than 15 minutes.
    - The return air temperature is less than 50 degrees F or greater than 90 degrees F for more than 15 minutes.
    - The return air humidity is less than 10% RH or greater than 70% RH.
    - The pressure drop across the outside air filter exceeds setpoint of 1.0" WC (adjustable).
    - The pressure drop across the exhaust air filter exceeds setpoint of 1.0" WC (adjustable).
  - The BAS shall generate a critical alarm whenever the following conditions occur:
    - The outside air temperature is less than 40 degrees F or above 80 degrees F and the supply or exhaust fan failed to run.

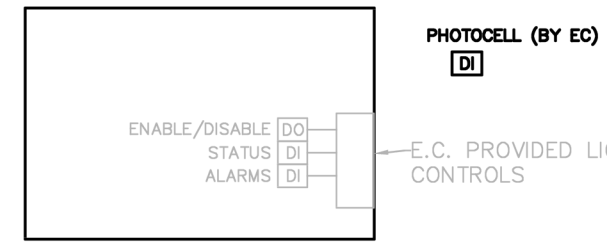


1 AHU-14 GALLERY VAV AHU  
SCALE: NONE



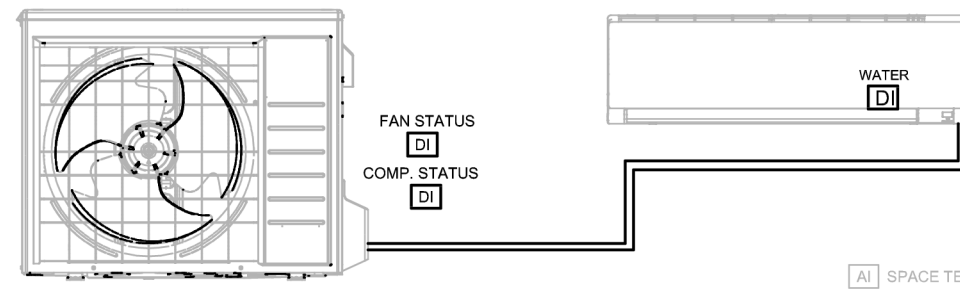
2 COOLER/FREEZER TEMPERATURE SENSORS  
SCALE: NONE

- Coolers/Freezers:
  - BAS Contractor shall install wall mounted temperature sensor in each cooler that will alarm the BAS if temperature rises above setpoint (35 degrees F, adjustable).
  - BAS Contractor shall install wall mounted temperature sensor in each freezer that will alarm the BAS if temperature rises above setpoint (28 degrees F, adjustable).
- Freezer temperature (AI)



3 LIGHTING CONTROLS  
SCALE: NONE

- Lighting Controls:
  - Electrical Contractor shall install photocell outside, with digital input into BAS.
  - The lighting control panel is being provided with a BASNET open-protocol controller. The BAS Contractor is to interface the data points from the lighting control panel into the DDC system front-end. Refer to equipment spec for a listing of the data points required to be available from the lighting control panel open-protocol controller. All listed data points are to be interfaced into the DDC system front-end.
- Control and monitoring points shall include but not be limited to the following:
  - Photocell (DI)
  - Enable/Disable (DO)
  - Status (DI)
  - Alarms (DI)



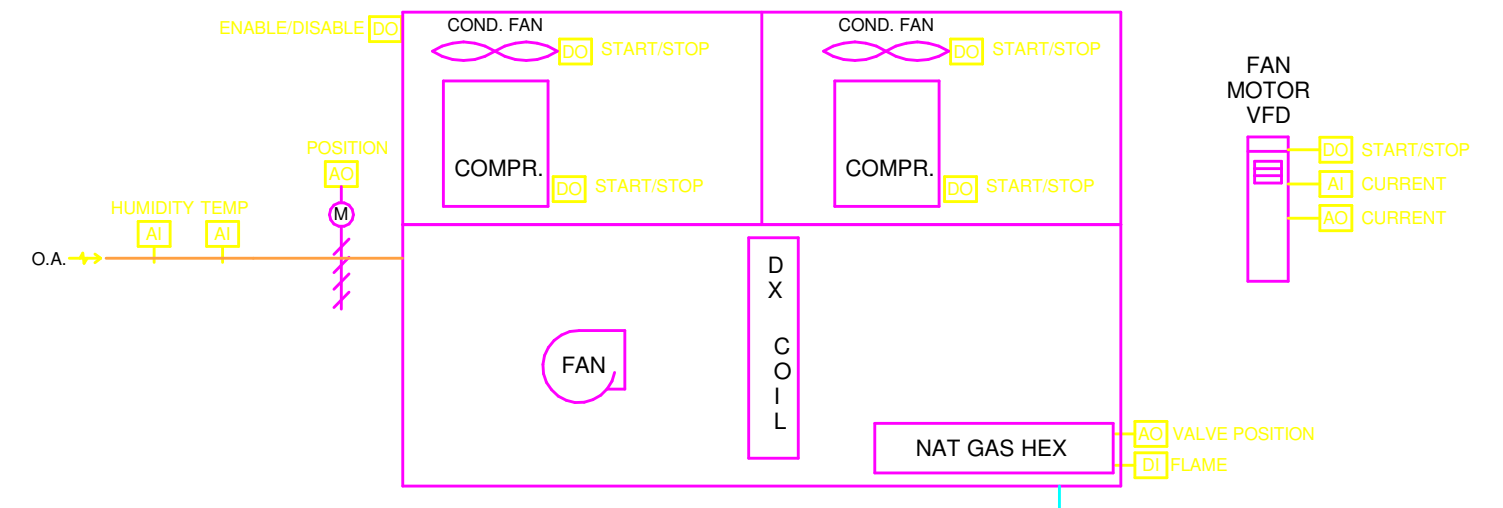
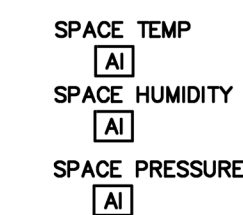
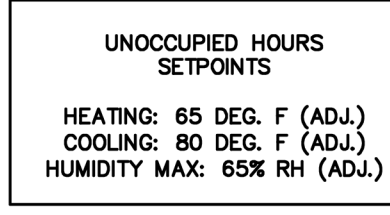
4 DUCTLESS SPLIT SYSTEMS  
SCALE: NONE

- Ductless Split System (BAS):
  - Unit shall have self contained controls by unit manufacturer. BAS contractor shall provide the following monitoring points:
    - Compressor Status (DI)
    - Condensing Unit Fan Status (DI)
    - Condensate Overflow (DI)

GENERAL NOTES:

- ALL ANALOG INPUTS (AI) SHALL BE CONFIGURED BY USER FOR HIGH AND LOW LIMITS.
- ALL DIGITAL OUTPUTS (DO) FOR ELECTRIC MOTOR LOADS SHALL INCORPORATE RUN TIME TOTALIZATION.

- [AI] GRAY SENSOR INDICATES DEVICE IS PROVIDED BY EQUIPMENT MANUFACTURER FROM THE FACTORY
- [AI] BLACK SENSOR INDICATES DEVICE IS PROVIDED AND INSTALLED BY TEMPERATURE CONTROLS CONTRACTOR

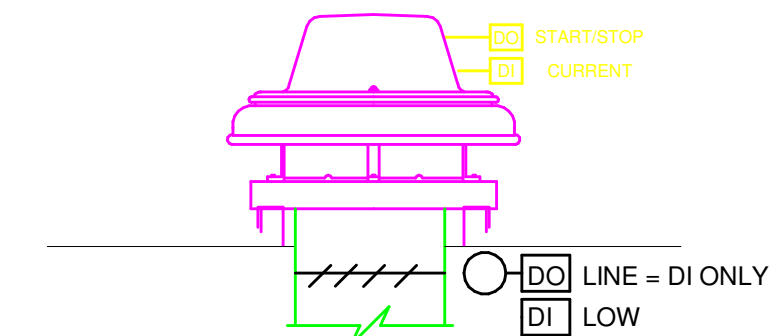


SEQUENCE OF OPERATION – KMUA-1 AND KMUA-2 CV Kitchen Makeup Air Unit

- General:
  - All setpoints listed in this section shall be adjustable.
- Startup:
  - The makeup air system shall be initiated by an auxiliary contact in the exhaust fan motor starter. See Kitchen Hood Exhaust Fan sequence of operation. At startup, the outdoor air damper shall be fully open. Provide an end switch for proper sequencing of damper operation and energizing of fan motor. The outdoor air damper shall have an end switch which will close a contact only after damper is completely opened. Once the contact is closed the supply fan shall be energized.
- Supply Fan Control:
  - The supply fan shall run continuously at constant speed. Provide a current transducer to prove fan operation. Provide complete interlock with exhaust fan control. When exhaust fan is off, supply fan shall be off.
- Supply Air Temperature Setpoint:
  - A discharge thermostat in the makeup air unit supply ductwork shall control damper operation and energizing of fan motor.
- Heating Control:
  - Natural gas heating valve shall modulate open to maintain supply air temperature setpoint.
- Cooling Control:
  - Cooling shall be controlled to maintain space temperature setpoint. On a call for cooling the heating shall be off. On a further call for cooling, the mechanical cooling shall be staged on.
- Filter Pressure Drop:
  - Provide static pressure differential switch across each filter which will alarm on high static pressure limits.
- Smoke Detector:
  - When the smoke detector is alarmed, the air handler shall fail safe with manual reset. Electrical contractor shall furnish, HVAC Contractor shall mount & Electrical contractor shall wire a UL listed photoelectric smoke detector per local code authority having jurisdiction.
- Anslul System Alarm:
  - Provide hardwire interlocks for Anslul system activation to shutdown makeup air unit.
- Shutdown:
  - At shutdown the air handler shall go to fail safe position. Fail safe position is defined by the following: The supply fan is off, the outside air damper is closed and the cooling is off and the heating is staged off.

23T-026 - PACKAGED ROOFTOP UNITS - DX AND GAS HEAT

SCALE: NONE



GENERAL NOTES:

- ALL ANALOG INPUTS (AI) SHALL BE CONFIGURED BY USER FOR HIGH AND LOW LIMITS.
- ALL DIGITAL OUTPUTS (DO) FOR ELECTRIC MOTOR LOADS SHALL INCORPORATE RUN TIME TOTALIZATION.

- [AI] GRAY SENSOR INDICATES DEVICE IS PROVIDED BY EQUIPMENT MANUFACTURER
- [AI] BLACK SENSOR INDICATES DEVICE IS PROVIDED BY TEMPERATURE CONTROLS CONTRACTOR

- Exhaust Fans:
  - Exhaust fan operation shall be controlled by the BAS. During occupied mode the exhaust fan damper shall open and fan shall start. During shutdown the exhaust fan damper shall be closed and fan shall be off. A current transducer shall indicate status into the BAS.
  - Control and monitoring points shall include but not be limited to the following:
    - Fan motor start/stop (DI)
    - Fan motor current (AI)

23T-027 - ROOF MOUNTED EXHAUST FAN - CONSTANT VOLUME

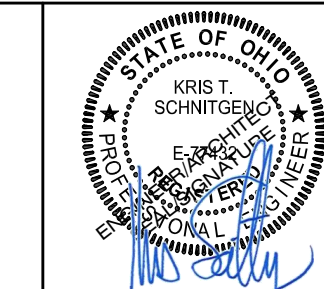
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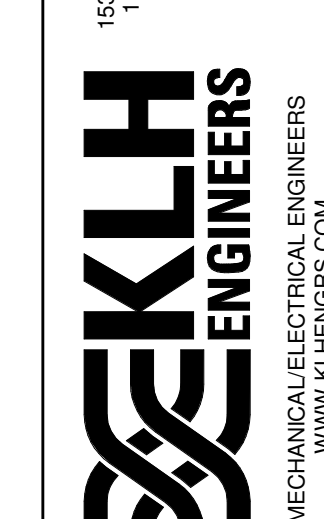
- Central Air Terminal Units:
  - VAV boxes with Water Reheat:
    - Provide two-way, fail open, modulating control valve for hot water coils.
    - Provide low voltage DDC controller, differential pressure transmitter, actuator and wiring for VAV boxes.
  - Temperature Controls Contractor shall field or factory mount controller at their expense. VAV box manufacturer shall furnish flow ring, 1.2" round damper shall be direct mounting of actuator, and control enclosure. Temperature Controls Contractor shall provide transformers with connection to line voltage junction box above ceiling provided by electrical contractor in various locations. Provide non-temperature sensors with room temperature setpoint adjustment capability (+/- 3 deg. F, adjustable thru BAS) and override feature (2 hours, adjustable thru BAS). On a call for heat, VAV damper shall modulate down to minimum setpoint. On a further call for heating, control valve shall open and modulate to maintain space temperature. On a call for cooling, control valve shall close and damper shall modulate open to maintain space temperature. Provide supply air temperature sensor lead to BAS.
  - Control and monitoring points shall include but not be limited to the following:
    - Reheat valve position (% open) (AO)
    - Damper position (AO)
    - Zone space temperature (AI)
    - Zone occupancy temperature override (AI)
    - Actual CFM (AI)
    - Discharge air temperature (AI)

23T-033 - SINGLE DUCT VAV BOX W/ HOT WATER REHEAT

SCALE: NONE



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04-18-2021	GCAM	REVISED FOR BIDDING AND PERMIT

DATE	BY	REVISIONS
04-15-2021	GCAM	ISSUED FOR BIDDING AND PERMIT

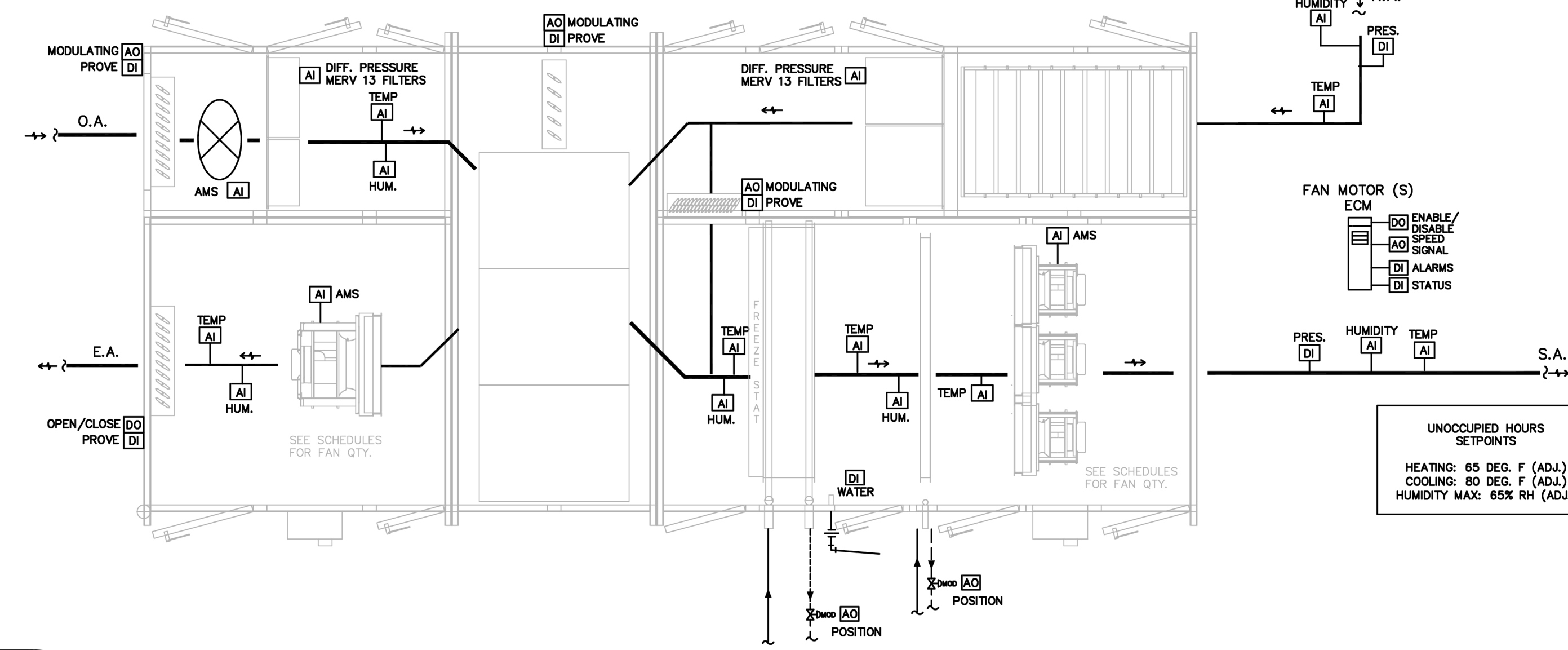
DATE	BY	REVISIONS
04-15-2021	GCAM	ISSUED FOR BIDDING AND PERMIT

SHARONVILLE CONVENTION CENTER EXPANSION  
CITY OF SHARONVILLE  
11395 CHESTER RD., CINCINNATI OH 45246  
MECHANICAL - CONTROL DIAGRAMS

SCALE: AS NOTED
CONTRACT NO:
180634
SHEET
M-5.05

SEQUENCE OF OPERATION - AHU-15 and AHU-16 Single Zone VAV

- General
  - Provide a two-way, normally closed, modulating control valve for chilled water coils.
  - Provide a two-way, normally open, modulating control valve for hot water coils.
  - All setpoints listed in this section are adjustable through the BAS. Control and monitoring points shall include but not be limited to the following:
- Interface
  - The DDC system contractor is responsible to coordinate with the AHU supplier for proper coordination and interfacing of all specified data points, including any and all incidental programming required for proper display/commanding of the data points specified in equipment spec as well as all additional data points listed in this section.
- Startup
  - Electric disconnect switch and circuit breaker shall be in the 'ON' position so that line voltage power is available at the AHU. The power switch of the integral controller should be in the 'ON' position.
  - A "Hand-Off-Auto" switch at each of the supply and exhaust fan starters permit manual or automatic operation of each fan.
    - In "Auto", the fan is started and stopped by the BAS.
    - In "Hand", the fan is started regardless of the command from the BAS unless a system safety device is activated.
  - When the unit turns on, 24 VAC is supplied to the controller. The unit shall operate on an occupied/unoccupied cycle as controlled from the BAS. Occupancy shall be predetermined by and programmed into the BAS. The controller shall check the operating schedule and look for failures. If no failures or faults are detected, after 30 seconds, the unit shall commence startup.
  - If the outside air temperature is 50 degrees F or lower (adjustable), the BAS shall start the exhaust fan and close the bypass damper. The BAS shall then start the supply fan sequence and close the bypass damper after a five minute time delay to precondition the energy recovery core.
  - If the outside air temperature is above 50 degrees F (adjustable), the BAS shall start the exhaust fan and supply fan sequences simultaneously and close the bypass dampers.



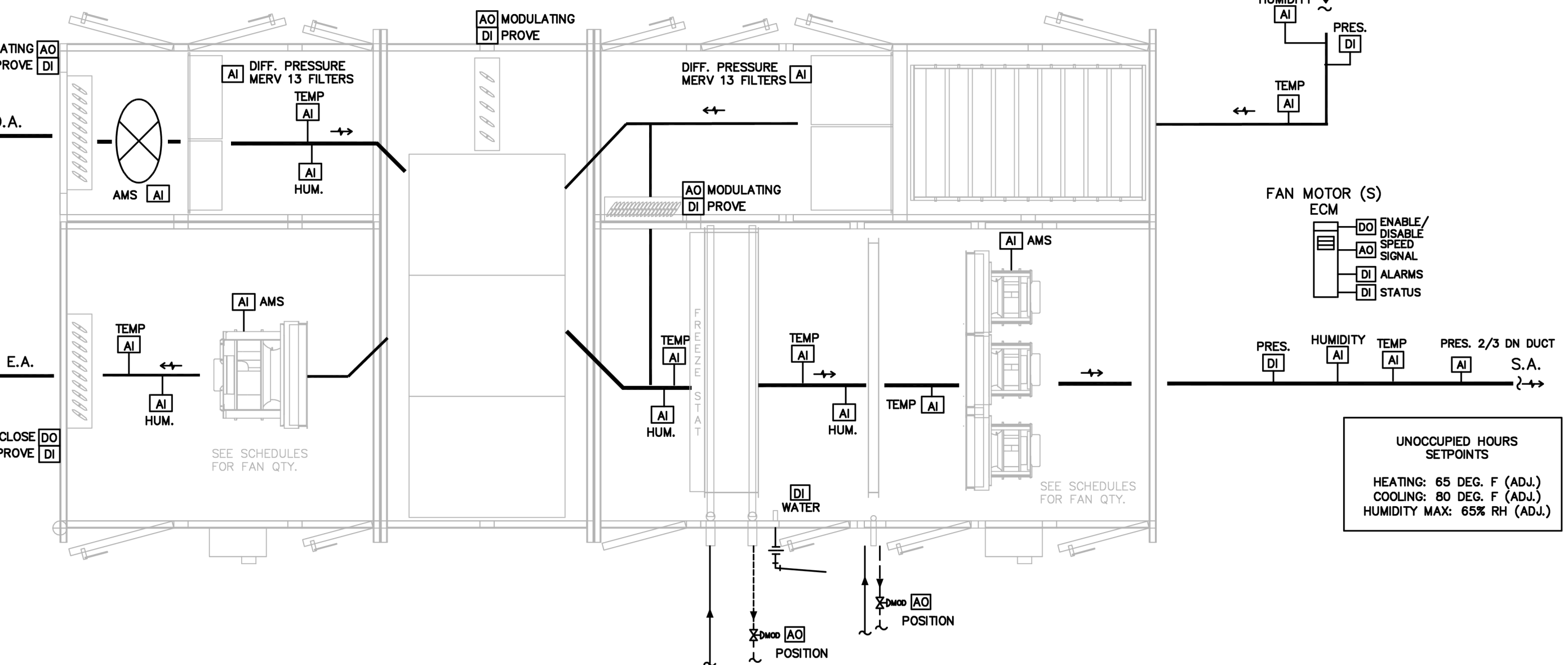
1 AHU-15 & AHU-16 SINGLE ZONE VAV  
SCALE: NONE

- Occupied Mode
  - The BAS shall utilize an optimal start sequence that will determine the length of time required to bring each zone from current temperature to the occupied temperature which shall be determined using the difference between actual zone temperature and occupied setpoint. The BAS shall compare the difference with the historical performance of how quickly the zone has been able to warm up or cool down. The system shall wait if possible before starting, so that the temperature in each zone reaches occupied setpoint just in time for occupancy, enable the AHU to occupied mode whenever the time schedule for the building indicates the building is occupied.
  - During occupied mode, the supply and return fan sequences shall commence, the bypass damper shall close and the outside air damper shall open. The heating and cooling sequences shall enable accordingly to maintain supply air temperature setpoint.
- Unoccupied Mode
  - The BAS shall enable the AHU to unoccupied mode whenever the time schedule for the building indicates the building is unoccupied.
  - During unoccupied mode, the supply fan sequence shall cycle and the return damper shall open on a call for heating, cooling, or dehumidification, from zone temperature sensor. The exhaust fan shall be off and the exhaust and outside air damper shall close. The heating, cooling, or dehumidification sequences shall enable accordingly to maintain supply air temperature setpoint.
- Supply Fan Control
  - The supply fan VFD speed shall be controlled from a wall mounted space temperature sensor. The supply fan shall be modulated to operational speed to maintain space temperature setpoint. When the space temperature begins to fall below setpoint, the supply fan shall be ramped down to a minimum of 50% of the total fan speed. When the space temperature begins to rise above setpoint, the supply fan shall be ramped up to maintain space temperature setpoint. Provide a high limit static pressure sensor in the supply fan discharge that will alarm the system and fail-safe the air handler with manual reset on a high limit of 4.0" (adjustable). Provide a current transducer to prove fan operation. Provide a high and low limit current cutout for the transducer that will alarm the system.
- Exhaust Fan Control
  - The exhaust fan shall vary to maintain a building space pressure of positive 10% during occupied hours and shall be off during unoccupied hours. Space pressure shall be calculated based on an offset between the measured outside air CFM and the measured exhaust CFM via the piezometer rings on the inlets of the fans. BAS to start exhaust fan based on building occupancy schedule. Two position exhaust fan damper to open whenever exhaust fan starts to be energized. Damper to open whether starter "HAND-OFF-AUTO" switch in HAND or AUTO. Exhaust fan runs once damper operation proven open by damper limit switch to be hardwired to prevent exhaust fan operation until damper proven open. Interlock active whether "HAND-OFF-AUTO" switch in HAND or AUTO.

- Minimum Outside Air Control
  - Provide and install an integral or remote mounted air flow measuring station, located downstream of the minimum outside air damper to measure actual O.A. CFM. If an integral air flow station/damper is utilized, the controller shall reside on the BAS network (hardwired or non-independent controllers is not acceptable). Provide carbon dioxide sensors in the return ductwork to measure occupancy levels. Outside air damper(s) shall modulate to maintain maximum carbon dioxide level setpoint at all times during occupied mode. CO2 levels shall be held below 1100 ppm (adjustable).
- Economizer Control
  - Provide dual enthalpy economizer control. Economizer control shall be enabled whenever the outside air enthalpy is lower than the return air enthalpy and outside air temperature is less than 70 degrees (adjustable). Enthalpy shall be calculated from sensors which are tied to the same controller for accuracy. During economizer mode, the minimum outside air damper control shall be disabled and the minimum outside air damper shall be set at 100% opened. The economizer damper shall modulate open on a call for cooling and modulate closed on a call for heating. The return damper shall modulate inversely with the economizer damper.
- Supply Air Temperature Setpoint
  - The supply air temperature setpoint shall be reset based on outside air temperature. Whenever the outside air temperature is 60 degrees or above, the supply air temperature setpoint shall be 55 degrees. Whenever the outside air temperature is 30 degrees or below, the supply air temperature setpoint shall be 60 degrees.
  - The supply air temperature setpoint shall increase linearly from 55 to 60 degrees as the outside air temperature drops from 60 to 30 degrees.
  - On a further call for heat, when fan is at minimum speed, the supply air temperature shall be reset up to a maximum of 90 degrees to maintain space temperature. On a call for cooling, supply air shall be reset down to cooling setpoint.
  - On a further call for heat with supply air at 90 degrees, fan shall be ramped up to maintain setpoint.
  - Provide a supply air temperature high limit of 100 degrees and low limit of 40 degrees that will alarm the system and place the air handler in fail safe mode with manual reset.
  - Provide dehumidification sequence so that when humidity is above 55% (adjustable), supply air setpoint shall be 53 degrees.

- Core Defrost Sequence
  - Exhaust leaving air temperature from the enthalpic plate shall be controlled to maintain a leaving air temperature of 32°F (adj) or higher. If leaving air temperature falls below 32°F, modulate the face and bypass damper to maintain exhaust air leaving set point.
  - Core bypass shall occur any time flowing through the core causes an energy penalty (i.e. the amount of energy recovery is not greater than the increased energy due to additional air pressure drop).
- Cooling Control
  - Cooling shall be controlled to maintain supply air temperature setpoint. On a call for cooling the pre-heat valve shall be closed. On a further call for cooling the economizer damper (if enabled) shall be modulated to full-open position prior to the cooling valve being opened. On a further call for cooling the chilled water valve shall be modulated open.
  - Chilled water valve position (% open) (AO)
- Re-Heat Control
  - On a call for heating, the supply fan shall modulate to minimum speed. On a further call for heating, the economizer damper (if enabled) shall be modulated to minimum position prior to the re-heat valve being opened. On a further call for heating the hot water re-heat valve shall be modulated open to maintain a maximum supply temperature of 90 degrees for heat. On a further call for heat, the supply fan speed shall be increased and the valve shall modulate to maintain 80 degrees supply air temperature until space temperature setpoint is achieved.
  - Heating water valve position (% open) (AO)
- De-humidification Control
  - When the space humidity, as measured by the humidity sensor in the main return duct, rises above 60% (adjustable), modulate the chilled water valve to full open. Modulate the re-heat coil to maintain space temperature setpoint. When the space humidity reaches setpoint, continue with normal heating & cooling operation.
  - Space relative humidity (AI)
- Filter Pressure Drop
  - Provide static pressure differential switch across each filter which will alarm the system on high static pressure limits defined by the dry pressure drop setpoint of the filter.
  - Filter High Static (GA)
- Mixed Air Low Limit Control
  - Provide a mixed air low limit whenever the mixed air temperature drops below 40 deg. F dry bulb that will alarm the system, close economizer damper and modulate the outside air damper below minimum to maintain mixed air setpoint equal to supply air setpoint.
  - Mixed air temperature (AI/ HL/ LL)
- Freeze Stat Control
  - A low temperature cutout thermostat located in the discharge of the heating coil, will alarm the system and put the air handler in fail safe position when the temperature falls below 37 degrees. Provide an adjustable time delay of 5 minutes for start-up. The low temperature cutout thermostat shall require manual reset.
  - Freeze-stat status (GA)
- Smoke Detector
  - When the smoke detector is alarmed, the system shall be alarmed and the air handler shall fail safe with manual reset. Electrical contractor shall furnish, HVAC Contractor shall mount & Electrical contractor shall wire a UL listed photoelectric smoke detector per local code authority having jurisdiction. Electrical contractor shall provide hard wire interlock to fire alarm system.
  - Smoke detector (GA)
  - Fan Shutdown - Hard Wired
- Shut Down
  - At shutdown the air handler shall go to fail safe position. Fail safe position is defined by the following: The supply fan is off, the return air damper is fully open, the minimum outside air and economizer dampers are closed, the heating valve is open and the cooling valve is closed.

2 AHU-17 KITCHEN VAV AHU  
SCALE: NONE



SEQUENCE OF OPERATION - AHU-17 VAV

- General
  - Provide a two-way, normally closed, modulating control valve for chilled water coils.
  - Provide a two-way, normally open, modulating control valve for hot water coils.
  - All setpoints listed in this section are adjustable through the BAS. Control and monitoring points shall include but not be limited to the following:
- Interface
  - The DDC system contractor is responsible to coordinate with the AHU supplier for proper coordination and interfacing of all specified data points, including any and all incidental programming required for proper display/commanding of the data points specified in equipment spec as well as all additional data points listed in this section.
- Startup
  - Electric disconnect switch and circuit breaker shall be in the 'ON' position so that line voltage power is available at the AHU. The power switch of the integral controller should be in the 'ON' position.
  - A "Hand-Off-Auto" switch at each of the supply and exhaust fan starters permit manual or automatic operation of each fan.
    - In "Auto", the fan is started and stopped by the BAS.
    - In "Hand", the fan is started regardless of the command from the BAS unless a system safety device is activated.
  - When the unit turns on, 24 VAC is supplied to the controller. The unit shall operate on an occupied/unoccupied cycle as controlled from the BAS. Occupancy shall be predetermined by and programmed into the BAS. The controller shall check the operating schedule and look for failures. If no failures or faults are detected, after 30 seconds, the unit shall commence start-up.
  - If the outside air temperature is 50 degrees F or lower (adjustable), the BAS shall start the exhaust fan and close the bypass damper. The BAS shall then start the supply fan sequence and close the bypass damper after a five minute time delay to precondition the energy recovery core.
  - If the outside air temperature is above 50 degrees F (adjustable), the BAS shall start the exhaust fan and supply fan sequences simultaneously and close the bypass dampers.

- Occupied Mode
  - The BAS shall utilize an optimal start sequence that will determine the length of time required to bring each zone from current temperature to the occupied temperature which shall be determined using the difference between actual zone temperature and occupied setpoint. The BAS shall compare the difference with the historical performance of how quickly the zone has been able to warm up or cool down. The system shall wait if possible before starting, so that the temperature in each zone reaches occupied setpoint just in time for occupancy, enable the AHU to occupied mode whenever the time schedule for the building indicates the building is occupied.
  - During occupied mode, the supply and return fan sequences shall commence, the bypass damper shall close and the outside air damper shall open. The heating and cooling sequences shall enable accordingly to maintain supply air temperature setpoint.
- Unoccupied Mode
  - The BAS shall enable the AHU to unoccupied mode whenever the time schedule for the building indicates the building is unoccupied.
  - During unoccupied mode, the supply fan sequence shall cycle and the return damper shall open on a call for heating, cooling, or dehumidification, from zone temperature sensor. The exhaust fan shall be off and the exhaust and outside air damper shall close. The heating, cooling, or dehumidification sequences shall enable accordingly to maintain supply air temperature setpoint.
- Supply Fan Control
  - The supply fan VFD speed shall be controlled from a duct static pressure sensor located 23 downstream in ductwork where this results in sensor being sited downstream of major ductwork splits, multiple sensors shall be installed in each major branch to maintain minimum speed in each branch.
  - The supply fan shall be modulated to operational speed to maintain static pressure setpoint. When the sensor measures low pressure, the supply fan shall be ramped up to maintain setpoint. When the sensor measures high pressure, the supply fan shall be ramped down to maintain setpoint.
  - For systems with DDC control of individual zone boxes reporting to a central control system, static pressure setpoint shall be reset based on the zone requiring the most pressure. In this way, the setpoint is reset lower until one zone damper is nearly wide open to save fan energy.
  - Initial static pressure setpoint shall be 1.0". Provide a high limit static pressure sensor in the supply fan discharge that will alarm and fail safe the air handler with manual reset on a high limit of 4.0" (adjustable). Provide a current transducer to prove fan operation. Provide a high and low limit current cutout for the transducer that will alarm.
- Exhaust Fan Control
  - The exhaust fan shall vary to maintain a building space pressure of positive 10% during occupied hours and shall be off during unoccupied hours. Space pressure shall be calculated based on an offset between the measured outside air CFM and the measured exhaust CFM via the piezometer rings on the inlets of the fans. BAS to start exhaust fan based on building occupancy schedule. Two position exhaust air damper to open whenever exhaust fan starts to be energized. Damper to open whether starter "HAND-OFF-AUTO" switch in HAND or AUTO. Exhaust fan runs once damper operation proven open by damper limit switch. Interlock to be hardwired to prevent exhaust fan operation until damper proven open. Interlock active whether "HAND-OFF-AUTO" switch in HAND or AUTO.
  - Provide a current status sensor to prove exhaust fan current.

- Minimum Outside Air Control
  - Provide and install an integral or remote mounted air flow measuring station, located downstream of the minimum outside air damper to measure actual O.A. CFM. If an integral air flow station/damper is utilized, the controller shall reside on the BAS network (hardwired or non-independent controllers is not acceptable). Provide carbon dioxide sensors in the return ductwork to measure occupancy levels. Outside air damper(s) shall modulate to maintain maximum carbon dioxide level setpoint at all times during occupied mode. CO2 levels shall be held below 1100 ppm (adjustable).
- Economizer Control
  - Provide dual enthalpy economizer control. Economizer control shall be enabled whenever the outside air enthalpy is lower than the return air enthalpy and outside air temperature is less than 70 degrees (adjustable). Enthalpy shall be calculated from sensors which are tied to the same controller for accuracy. During economizer mode, the minimum outside air damper control shall be disabled and the minimum outside air damper shall be set at 100% opened. The economizer damper shall modulate open on a call for cooling and modulate closed on a call for heating. The return damper shall modulate inversely with the economizer damper.
- Supply Air Temperature Setpoint
  - The supply air temperature setpoint shall be reset based on outside air temperature. Whenever the outside air temperature is 60 degrees or above, the supply air temperature setpoint shall be 55 degrees. Whenever the outside air temperature is 30 degrees or below, the supply air temperature setpoint shall be 60 degrees.
  - The supply air temperature setpoint shall increase linearly from 55 to 60 degrees as the outside air temperature drops from 60 to 30 degrees.
  - On a further call for heat, when fan is at minimum speed, the supply air temperature shall be reset up to a maximum of 90 degrees to maintain space temperature. On a call for cooling, supply air shall be reset down to cooling setpoint.
  - On a further call for heat with supply air at 90 degrees, fan shall be ramped up to maintain setpoint.
  - Provide a supply air temperature high limit of 100 degrees and low limit of 40 degrees that will alarm the system and place the air handler in fail safe mode with manual reset.
  - Provide dehumidification sequence so that when humidity is above 55% (adjustable), supply air setpoint shall be 53 degrees.

- Core Defrost Sequence
  - Exhaust leaving air temperature from the enthalpic plate shall be controlled to maintain a leaving air temperature of 32°F (adj) or higher. If leaving air temperature falls below 32°F, modulate the face and bypass damper to maintain exhaust air leaving set point.
  - Core bypass shall occur any time flowing through the core causes an energy penalty (i.e. the amount of energy recovery is not greater than the increased energy due to additional air pressure drop).
- Cooling Control
  - Cooling shall be controlled to maintain supply air temperature setpoint. On a further call for cooling the economizer damper (if enabled) shall be modulated to full-open position prior to the cooling valve being opened. On a further call for cooling the chilled water valve shall be modulated open.
  - Chilled water valve position (% open) (AO)
- Heating Control
  - Heating shall be controlled to maintain supply air temperature setpoint. On a call for heating, the cooling valve shall be closed. On a further call for heating, the economizer damper (if enabled) shall be modulated to minimum position prior to the heating valve being opened. On a further call for heating the hot water valve shall be modulated open.
  - Heating water valve position (% open) (AO)
- Filter Pressure Drop
  - Provide static pressure differential switch across each filter which will alarm the system on high static pressure limits defined by the dry pressure drop setpoint of the filter.
  - Filter High Static (GA)
- Mixed Air Low Limit Control
  - Provide a mixed air low limit whenever the mixed air temperature drops below 40 deg. F dry bulb that will alarm the system, close economizer damper and modulate the outside air damper below minimum to maintain mixed air setpoint equal to supply air setpoint.
  - Mixed air temperature (AI/ HL/ LL)
- Freeze Stat Control
  - A low temperature cutout thermostat located in the discharge of the heating coil, will alarm the system and put the air handler in fail safe position when the temperature falls below 37 degrees. Provide an adjustable time delay of 5 minutes for start-up. The low temperature cutout thermostat shall require manual reset.
  - Freeze-stat status (GA)
- Smoke Detector
  - When the smoke detector is alarmed, the system shall be alarmed and the air handler shall fail safe with manual reset. Electrical contractor shall furnish, HVAC Contractor shall mount & Electrical contractor shall wire a UL listed photoelectric smoke detector per local code authority having jurisdiction. Electrical contractor shall provide hard wire interlock to fire alarm system.
  - Smoke detector (GA)
  - Fan Shutdown - Hard Wired
- Shut Down
  - At shutdown the air handler shall go to fail safe position. Fail safe position is defined by the following: The supply fan is off, the return air damper is fully open, the minimum outside air and economizer dampers are closed, the heating valve is open and the cooling valve is closed.

- BAS Alarms
  - The BAS shall generate an alarm whenever the following conditions occur:
    - The supply fan is commanded on but fails to run (fan's current sensor indicates the fan is off for more than 60 seconds).
    - The supply fan is commanded off but continues to run (fan's current sensor the fan is running for more than 60 seconds).
    - The exhaust fan is commanded on but fails to run (fan's current sensor indicates the fan is off for more than 60 seconds).
    - The exhaust fan is commanded off but continues to run (fan's current sensor the fan is running for more than 60 seconds).
    - The supply air temperature is less than 40 degrees F or greater than 100 degrees F for more than 15 minutes.
    - The return air humidity is less than 10% RH or greater than 70% RH.
    - The pressure drop across the outside air filter exceeds setpoint of 1.0" WC (adjustable).
    - The pressure drop across the exhaust air filter exceeds setpoint of 1.0" WC (adjustable).
- The BAS shall generate a critical alarm whenever the following conditions occur
  - The outside air temperature is less than 40 degrees F or above 80 degrees F and the supply or exhaust fan failed to run.

09/15/2021

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REV	DATE	BY	CHKD	APP'D	REVISIONS
0	04-24-2021	GAM			ISSUED FOR BIDDING AND PERMIT
1	05-13-2021	GAM			REVISED FOR BIDDING AND PERMIT

SHARONVILLE CONVENTION CENTER EXPANSION  
CITY OF SHARONVILLE  
11365 CHESTER RD., CINCINNATI OH 45246

MECHANICAL - CONTROL DIAGRAMS

SCALE: AS NOTED  
HORIZ:  
VERT:  
CONTRACT NO:  
**180634**  
SHEET  
**M-5.06**  
PLN JOB #: 21108.00



### HVAC VENTILATION SCHEDULE

NUMBER	NAME	AREA	LEVEL	CEILING HEIGHT	AIR CHGS	OA CHGS	PEOPLE RED	OA PER PERSON	OA PER SQ FT.	REQ SUP	ACT SUP	REQ OA	ACT OA	ACT RET	ACT EXH	CRIT OA	PRESSURE	PCT OPERABLE	NATURAL VENTILATION
201	VESTIBULE	16 SF	SECOND LEVEL	13'-0"	0	0	0	0	0	1953	3000	596	900	3000	0	0.034	E	0	
202	CENTRAL ENTRANCE	275 SF	SECOND LEVEL	12'-11 1/2"	0	0	0	0	0	493	760	148	228	760	0	0.0276	E	0	
203	GALLERY	2440 SF	SECOND LEVEL	26'-3 3/4"	0	0	96	7.5	0.06	1627	2500	488	750	2500	0	0.4404	E	0	
204	WOMENS RR	508 SF	SECOND LEVEL	8'-5 3/32"	0	0	0	0	0	650	1000	195	300	0	0	N	0		
205	CLOS	18 SF	SECOND LEVEL	12'-11 31/32"	0	0	0	0	0	0	0	0	0	0	0	E	0		
206	MENS RR	394 SF	SECOND LEVEL	12'-11 31/16"	0	0	0	0	0	457	700	137	210	0	0	N	0		
207	JC	35 SF	SECOND LEVEL	12'-10 27/32"	0	0	0	0	0	0	0	0	0	0	0	N	0		
208	FAM RR	75 SF	SECOND LEVEL	12'-10 7/8"	0	0	0	0	0	0	0	0	0	0	0	N	0		
209	ELEC	48 SF	SECOND LEVEL	13'-0"	0	0	0	0	0	0	0	0	0	0	0	N	0		
210	RR	53 SF	SECOND LEVEL	12'-10 29/32"	0	0	0	0	0	53	80	16	24	0	0	N	0		
211	FIRST AID	210 SF	SECOND LEVEL	12'-11 11/16"	0	0	6	10	0.18	210	320	63	96	320	0	0.3812	E	0	
212	DATA	Redundant Space	SECOND LEVEL		0	0	0	0	0	0	350	0	0	0	0	E	0		
213	TICKETS	30 SF	SECOND LEVEL	13'-0"	0	0	0	0	0	0	0	0	0	0	0	E	0		
214	TICKETS	241 SF	SECOND LEVEL	12'-11 17/32"	0	0	5	7.5	0.12	170	260	51	78	260	0	0.3423	E	0	
214	STOR	89 SF	SECOND LEVEL	12'-11 21/32"	0	0	1	5	0.12	130	200	39	60	200	0	0.1	E	0	
215	SAFE	121 SF	SECOND LEVEL	12'-11 21/32"	0	0	1	5	0.12	70	110	21	33	110	0	0.2363	E	0	
216	MECH	20 SF	SECOND LEVEL	12'-11 27/32"	0	0	0	0	0	0	0	0	0	0	0	E	0		
217	NEW EXHIBIT HALL	9613 SF	SECOND LEVEL	29'-11 9/32"	0	0	1442	5	0.06	21159	21470	9733	9876	21470	0	0.4533	E	0	
217	NEW EXHIBIT HALL	11098 SF	SECOND LEVEL	16'-0"	0	0	1663	5	0.06	24402	24740	11225	11380	24740	0	0.4537	E	0	
218	CONCESSIONS	1785 SF	SECOND LEVEL	12'-11 9/32"	0	0	8	7.5	0.12	615	620	209	211	620	0	0.3935	E	0	
219	KITCHEN	Redundant Space	SECOND LEVEL		0	0	18	7.5	0.12	570	570	192	194	570	0	0.4736	E	0	
220	KITCHEN SUPPORT	450 SF	SECOND LEVEL	12'-11 15/16"	0	0	9	7.5	0.12	438	440	149	150	440	0	0.4045	E	0	
221	WALK-IN	178 SF	SECOND LEVEL	13'-0"	0	0	0	0	0	50	50	17	17	50	0	E	0		
222	ELEC	43 SF	SECOND LEVEL	12'-0"	0	0	0	0	0	0	0	0	0	0	0	E	0		
223	MECH	284 SF	SECOND LEVEL	14'-10 23/32"	0	0	0	0	0	150	150	51	51	0	0	N	0		
224	STOR	112 SF	SECOND LEVEL	13'-0"	0	0	1	5	0.12	59	80	20	30	80	0	0.3686	E	0	
225	OFFICE	246 SF	SECOND LEVEL	13'-0"	0	0	2	5	0.06	188	190	64	65	190	0	0.1631	E	0	
228	COFFEE/TEA STATION	67 SF	SECOND LEVEL	13'-0"	0	0	0	0	0	0	0	0	0	0	0	N	0		
230	RESTRM	50 SF	SECOND LEVEL	13'-0"	0	0	0	0	0	41	40	14	14	0	0	N	0		
231	W.I. COOLER	74 SF	SECOND LEVEL	13'-0"	0	0	0	0	0	0	0	0	0	0	0	E	0		
235	DISHWASHING	147 SF	SECOND LEVEL	13'-0"	0	0	4	7.5	0.12	109	110	37	37	110	0	0.5545	E	0	
236	LOADING DOCK	1359 SF	SECOND LEVEL	13'-0"	0	0	4	0	0	932	940	317	320	940	0	E	0		
240	VESTIBULE	Not Enclosed	SECOND LEVEL		0	0	0	0	0	0	0	0	0	0	0	E	0		
241	GALLERY	312 SF	SECOND LEVEL	13'-0"	0	0	1	0	0	0	0	0	0	0	0	E	0		
301	MEZZANINE	Redundant Space	THIRD LEVEL		0	0	9	5	0.06	1756	1770	597	602	1770	0	0.2022	E	0	
301	MEZZANINE	3288 SF	THIRD LEVEL	14'-11 3/32"	0	0	8	5	0.06	1609	1620	547	551	1620	0	0.2006	E	0	
301	MEZZANINE	4323 SF	THIRD LEVEL	12'-0"	0	0	0	0	0	0	140	0	0	140	0	0	E	0	
302	ELEC	278 SF	THIRD LEVEL	8'-0"	0	0	1	0	0	0	20	0	6	20	0	E	0		
303	DATA	Redundant Space	THIRD LEVEL		0	0	0	0	0	0	0	0	0	0	0	E	0		
303	DATA	75 SF	THIRD LEVEL	8'-0"	0	0	0	0	0	0	0	0	0	0	0	E	0		
304	ELEV EQUIP	118 SF	THIRD LEVEL	8'-0"	0	0	0	0	0	0	50	0	15	50	0	E	0		
305	DATA	Redundant Space	THIRD LEVEL		0	0	0	0	0	0	0	0	0	0	0	E	0		
306	ELECTRIC	Redundant Space	THIRD LEVEL		0	0	0	0	0	0	0	0	0	0	0	E	0		
307	MEZZANINE	Not Enclosed	THIRD LEVEL		0	0	9	5	0.06	1756	1770	597	602	1770	0	0.2022	E	0	
TOTAL		29497 SF																	



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 41975 800-854-8783  
 11111 THOMAS KENTUCKY  
 859-442-8688 FAX  
 LEVINGTON, KENTUCKY  
 NEW YORK, NEW YORK  
 LOUISVILLE, KENTUCKY



REV	DATE	BY
0 <td>04-24-2021 <td>CAM</td> </td>	04-24-2021 <td>CAM</td>	CAM
1 <td>09-15-2021 <td>CAM</td> </td>	09-15-2021 <td>CAM</td>	CAM

SHARONVILLE CONVENTION CENTER EXPANSION  
 CITY OF SHARONVILLE  
 11355 CHESTER RD, CINCINNATI OH 45246  
 MECHANICAL - SCHEDULES

SCALE: AS NOTED  
 HORIZ:  
 VERT:  
 CONTRACT NO:  
 180634  
 SHEET  
 M-6.02

DATE: 09/15/2021  
 DRAWN BY: [ ]  
 CHECKED BY: [ ]  
 APPROVED BY: [ ]  
 P.E. [ ]  
 P.O. [ ]

REVISIONS  
 0 REVISIONS FOR FINAL BIDDING  
 1 REVISION FOR BIDDING AND PERMIT

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**COMcheck Software Version 4.1.1.0**  
**Mechanical Compliance Certificate**

**Project Information**

Energy Code: 90.1 (2010) Standard  
 Project Title: Sharonville Convention Center Expansion  
 Location: Sharonville, Ohio  
 Climate Zone: 4a  
 Project Type: Addition

Construction Site: 13355 Chester Road Cincinnati, OH 45246  
 Owner/Agent: KUH Engineers Inc 1538 Alexandria Pike Suite 11 Fort Thomas, KY 41075  
 Designer/Contractor: KUH Engineers Inc 1538 Alexandria Pike Suite 11 Fort Thomas, KY 41075

**Mechanical Systems List**

**Quantity System Type & Description**

- AHU-14 (Single Zone):  
 Heating: 1 each - Hydronic or Steam Coil, Hot Water, Capacity = 262 kBtu/h  
 No minimum efficiency requirement applies  
 Cooling: 1 each - Hydronic Coil, Capacity = 610 kBtu/h, Air-Cooled Condenser, Air Economizer  
 No minimum efficiency requirement applies  
 Fan System: AHU-14 - Compliance (Motor nameplate HP method) - Passes  
 Fans:  
 FAN 1 Supply, Constant Volume, 12000 CFM, 3.3 motor nameplate hp  
 FAN 2 Return, Constant Volume, 10000 CFM, 6.3 motor nameplate hp
- DS-13.4 (Single Zone):  
 Heating: 1 each - Split System, Capacity = 12 kBtu/h, Air-Cooled Condenser, Air Economizer  
 Cooling: 1 each - Split System, Capacity = 12 kBtu/h, Air-Cooled Condenser, Air Economizer  
 Proposed Efficiency = 17.00 SEER, Required Efficiency = 13.00 SEER  
 Fan System: None
- AHU-15 (Single Zone):  
 Heating: 1 each - Hydronic or Steam Coil, Hot Water, Capacity = 918 kBtu/h  
 No minimum efficiency requirement applies  
 Cooling: 1 each - Hydronic Coil, Capacity = 852 kBtu/h, Air-Cooled Condenser, Air Economizer  
 No minimum efficiency requirement applies  
 Fan System: AHU-15 - Compliance (Motor nameplate HP method) - Passes  
 Fans:  
 FAN 3 Supply, Constant Volume, 21000 CFM, 6.3 motor nameplate hp  
 FAN 4 Return, Constant Volume, 19000 CFM, 6.3 motor nameplate hp
- AHU-16 (Single Zone):  
 Heating: 1 each - Hydronic or Steam Coil, Hot Water, Capacity = 971 kBtu/h  
 No minimum efficiency requirement applies  
 Cooling: 1 each - Hydronic Coil, Capacity = 939 kBtu/h, Air-Cooled Condenser, Air Economizer  
 No minimum efficiency requirement applies  
 Fan System: AHU-16 - Compliance (Motor nameplate HP method) - Passes  
 Fans:  
 FAN 5 Supply, Constant Volume, 24000 CFM, 6.3 motor nameplate hp  
 FAN 6 Return, Constant Volume, 22000 CFM, 6.3 motor nameplate hp
- AHU-17 (Single Zone):

Project Title: Sharonville Convention Center Expansion Report date: 05/15/20  
 Data filename: G:\21000-21999\21100-21199\21108\Project Data\Energy\Sharonville.cck Page 1 of 17

Section # & Req ID	Mechanical Rough-In Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
6.4.3.1.6 (ME1)	HVAC equipment efficiency verified. Non-NAECA HVAC equipment labeled as meeting 90.1.	Efficiency: _____	Efficiency: _____	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	See the Mechanical Systems list for values.
6.4.3.4.1 (ME3)	Stair and elevator shaft vents have motorized dampers that automatically close.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
6.4.3.4.2 (ME4)	Outdoor air and exhaust systems have motorized dampers that automatically shut when not in use and meet maximum leakage rates. Check gravity dampers where allowed.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
6.4.3.4.3 (ME3)	Enclosed parking garage ventilation has automatic contaminant detection and capacity to stage or modulate fans to 50% or less of design capacity.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
6.4.3.4.4 (ME3)	Ventilation fans >= 0.75 hp have automatic controls to shut off fan when not required.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
6.4.3.9 (ME6)	Demand control ventilation provided for spaces >500 R2 and >=40 people/1000 R2 occupant density and served by systems with air side economizer, auto modulating outside air damper control, or design airflow >3,000 cfm.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
6.4.3.10 (ME40)	Single zone HVAC systems with fan motors >=5 hp have variable airflow controls. Air conditioning equipment with a cooling capacity >=110,000 Btu/h has variable airflow controls.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met. See the Mechanical Systems list for values.
6.4.3.10 (ME40)	Single zone HVAC systems with fan motors >=5 hp have variable airflow controls. Air conditioning equipment with a cooling capacity >=110,000 Btu/h has variable airflow controls.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met. See the Mechanical Systems list for values.
6.4.3.10 (ME40)	Single zone HVAC systems with fan motors >=5 hp have variable airflow controls. Air conditioning equipment with a cooling capacity >=110,000 Btu/h has variable airflow controls.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met. See the Mechanical Systems list for values.
6.4.3.10 (ME40)	Single zone HVAC systems with fan motors >=5 hp have variable airflow controls. Air conditioning equipment with a cooling capacity >=110,000 Btu/h has variable airflow controls.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met. See the Mechanical Systems list for values.

Project Title: Sharonville Convention Center Expansion Report date: 05/15/20  
 Data filename: G:\21000-21999\21100-21199\21108\Project Data\Energy\Sharonville.cck Page 5 of 17

**Quantity System Type & Description**

- DS-2 (Single Zone):  
 Heating: 1 each - Hydronic or Steam Coil, Hot Water, Capacity = 262 kBtu/h  
 No minimum efficiency requirement applies  
 Cooling: 1 each - Hydronic Coil, Capacity = 108 kBtu/h, Air-Cooled Condenser, Air Economizer  
 No minimum efficiency requirement applies  
 Fan System: AHU-17 - Compliance (Motor nameplate HP method) - Passes  
 Fans:  
 FAN 19 Supply, Constant Volume, 8000 CFM, 2.4 motor nameplate hp  
 FAN 20 Return, Constant Volume, 6000 CFM, 3.3 motor nameplate hp
- DS-2 (Single Zone):  
 Heating: 1 each - Central Furnace, Gas, Capacity = 480 kBtu/h  
 Proposed Efficiency = 80.00% Ec, Required Efficiency = 80.00 % Ec  
 Cooling: 1 each - Single Package DX Unit, Capacity = 284 kBtu/h, Air-Cooled Condenser, Air Economizer  
 Proposed Efficiency = 9.80 EER, Required Efficiency = 9.80 EER + 9.5 IPLV  
 Fan System: KMAU-1.2 - Compliance (Motor nameplate HP method) - Passes  
 Fans:  
 FAN 21 Supply, Constant Volume, 7000 CFM, 7.5 motor nameplate hp
- KMAU-1 (Single Zone):  
 Heating: 1 each - Central Furnace, Gas, Capacity = 480 kBtu/h  
 Proposed Efficiency = 80.00% Ec, Required Efficiency = 80.00 % Ec  
 Cooling: 1 each - Single Package DX Unit, Capacity = 284 kBtu/h, Air-Cooled Condenser, Air Economizer  
 Proposed Efficiency = 9.80 EER, Required Efficiency = 9.80 EER + 9.5 IPLV  
 Fan System: KMAU-1.2 - Compliance (Motor nameplate HP method) - Passes  
 Fans:  
 FAN 21 Supply, Constant Volume, 7000 CFM, 7.5 motor nameplate hp
- PTAC-1 (Single Zone):  
 Heating Mode Capacity = 9 kBtu/h  
 Proposed Efficiency = 7.70 HSPF, Required Efficiency = 7.70 HSPF  
 Cooling Mode Capacity = 12 kBtu/h  
 Proposed Efficiency = 13.00 SEER, Required Efficiency = 13.00 SEER  
 Fan System: None
- CHIL-3:  
 Cooling: Water Chiller, Capacity 250 tons, Condenser Air-Cooled, Rotary Screw or Scroll Chiller  
 Proposed Efficiency: 9.66 EER-FL (Refer to mech. plans for proposed IPLV)  
 Required Efficiency: 9.562 EER-FL + 12.76 EER-IPLV

**Mechanical Compliance Statement**

Compliance Statement: The proposed mechanical design represented in this document is consistent with the building plans, specifications, and other calculations submitted with this permit application. The proposed mechanical systems have been designed to meet the 90.1 (2010) Standard requirements in COMcheck Version 4.1.1.0 and to comply with any applicable mandatory requirements listed in the inspection Checklist.

Kris T. Schnitzen, P.E. Signature: *[Signature]* Date: \_\_\_\_\_

Project Title: Sharonville Convention Center Expansion Report date: 05/15/20  
 Data filename: G:\21000-21999\21100-21199\21108\Project Data\Energy\Sharonville.cck Page 2 of 17

Section # & Req ID	Mechanical Rough-In Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
6.4.3.10 (ME40)	Single zone HVAC systems with fan motors >=5 hp have variable airflow controls. Air conditioning equipment with a cooling capacity >=110,000 Btu/h has variable airflow controls.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met. See the Mechanical Systems list for values.
6.4.3.10 (ME40)	Single zone HVAC systems with fan motors >=5 hp have variable airflow controls. Air conditioning equipment with a cooling capacity >=110,000 Btu/h has variable airflow controls.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met. See the Mechanical Systems list for values.
6.4.3.10 (ME40)	Single zone HVAC systems with fan motors >=5 hp have variable airflow controls. Air conditioning equipment with a cooling capacity >=110,000 Btu/h has variable airflow controls.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met. See the Mechanical Systems list for values.
6.4.3.10 (ME40)	Single zone HVAC systems with fan motors >=5 hp have variable airflow controls. Air conditioning equipment with a cooling capacity >=110,000 Btu/h has variable airflow controls.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met. See the Mechanical Systems list for values.
6.4.4.1.1 (ME7)	Insulation exposed to weather protected from damage. Insulation outside of the conditioned space and associated with cooling systems is vapor retardant.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
6.4.4.1.2 (ME8)	HVAC ducts and plenums insulated. Wherever ducts and plenums are installed in or under a slab, verification may need to occur during Foundation inspection.	R-_____	R-_____	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
6.4.4.1.3 (ME9)	HVAC piping insulation thickness. Where piping is installed in or under a slab, verification may need to occur during Foundation inspection.	_____ in.	_____ in.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Exceptions: null.
6.4.4.1.4 (ME11)	Thermally ineffective panel surfaces of sensible heating panels have insulation >= R-3.5.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Exception: Requirement does not apply.
6.4.4.2 (ME10)	Ducts and plenums sealed based on static pressure and location.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
6.4.4.2.2 (ME11)	Ductwork operating >=3 in. water column requires air leakage testing.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.

Project Title: Sharonville Convention Center Expansion Report date: 05/15/20  
 Data filename: G:\21000-21999\21100-21199\21108\Project Data\Energy\Sharonville.cck Page 6 of 17

**COMcheck Software Version 4.1.1.0**  
**Inspection Checklist**  
 Energy Code: 90.1 (2010) Standard

Requirements: 100.0% were addressed directly in the COMcheck software  
 Text in the "Comments/Assumptions" column is provided by the user in the COMcheck Requirements screen. For each requirement, the user certifies that a code requirement will be met and how that is documented, or that an exception is being claimed. Where compliance is itemized in a separate table, a reference to that table is provided.

Section # & Req ID	Plan Review	Complies?	Comments/Assumptions
4.2.2.4.4.2.1.6.7 (PR2)	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the mechanical systems and equipment and document where exceptions to the standard are claimed. Load calculations per acceptable engineering standards and handbooks.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
4.2.2.4.4.2.1.6.7 (PR6)	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the electrical systems and equipment and document where exceptions are claimed. Feeder conductors sized in accordance with approved plans and branch circuits sized for maximum drop of 3%.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
6.7.2.4 (PR3)	Detailed instructions for HVAC systems commissioning included on the plans or specifications for projects >=50,000 R2.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.

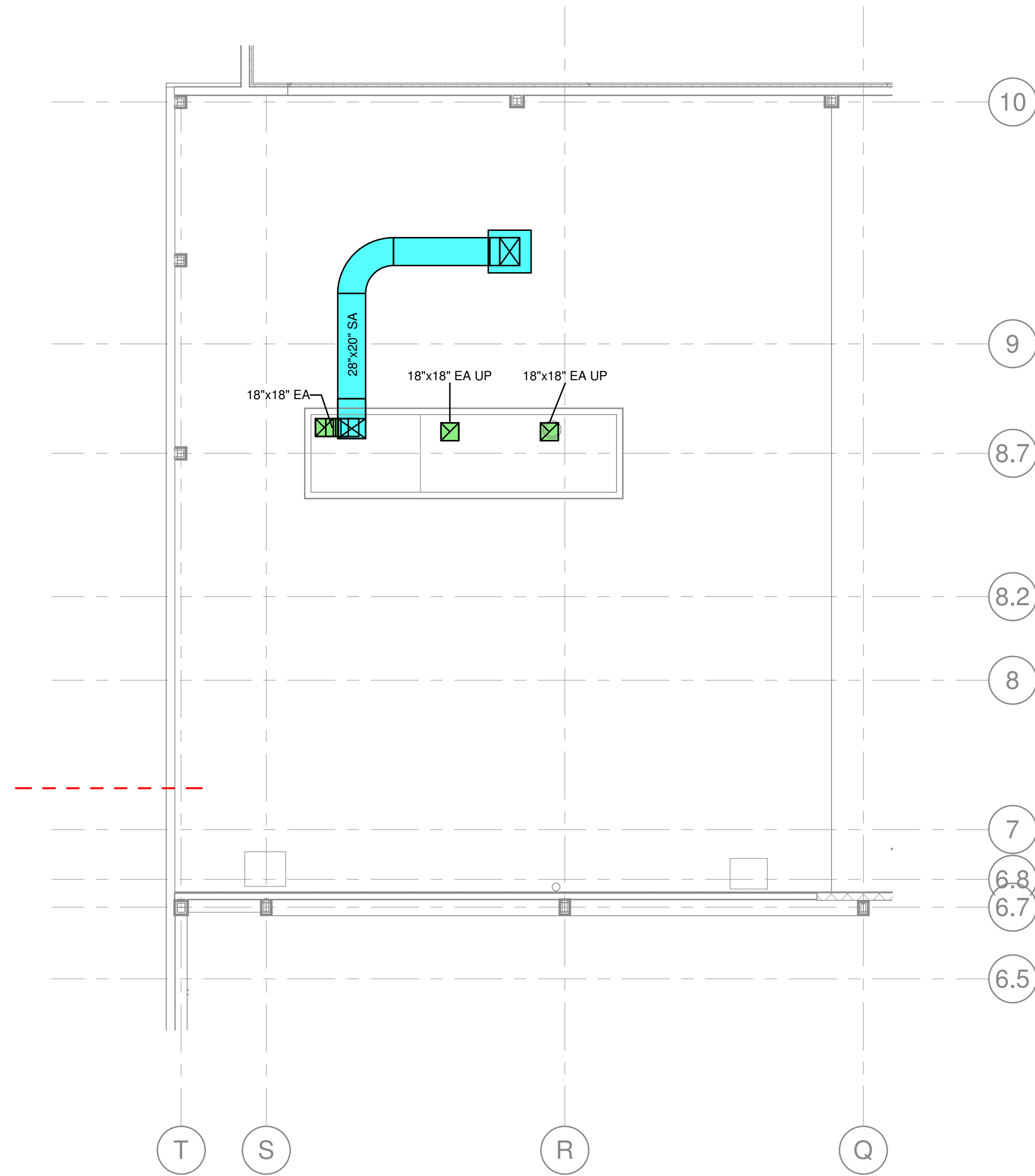
**Additional Comments/Assumptions:**

1 High Impact (Tier 1) 2 Medium Impact (Tier 2) 3 Low Impact (Tier 3)

Project Title: Sharonville Convention Center Expansion Report date: 05/15/20  
 Data filename: G:\21000-21999\21100-21199\21108\Project Data\Energy\Sharonville.cck Page 3 of 17

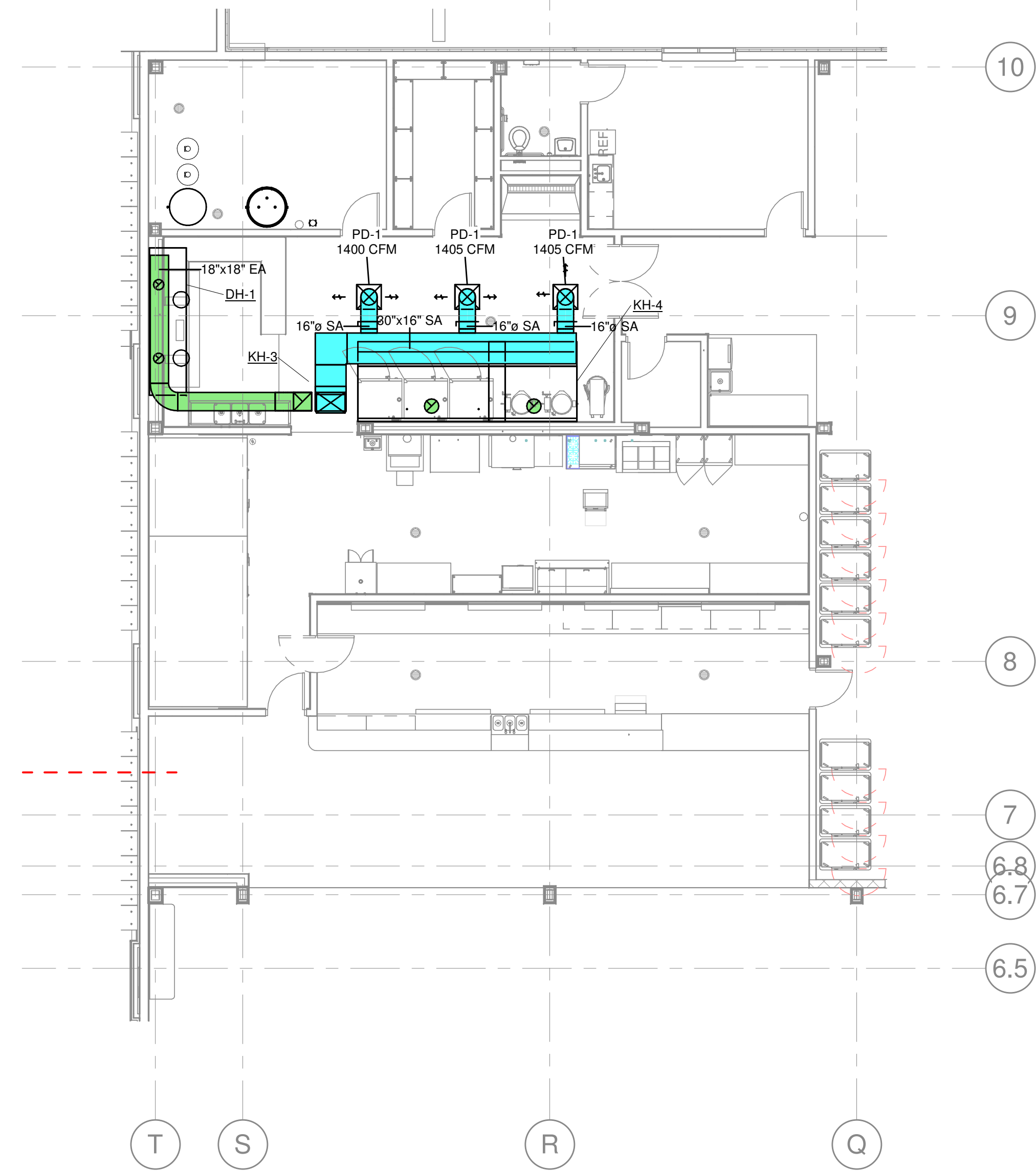
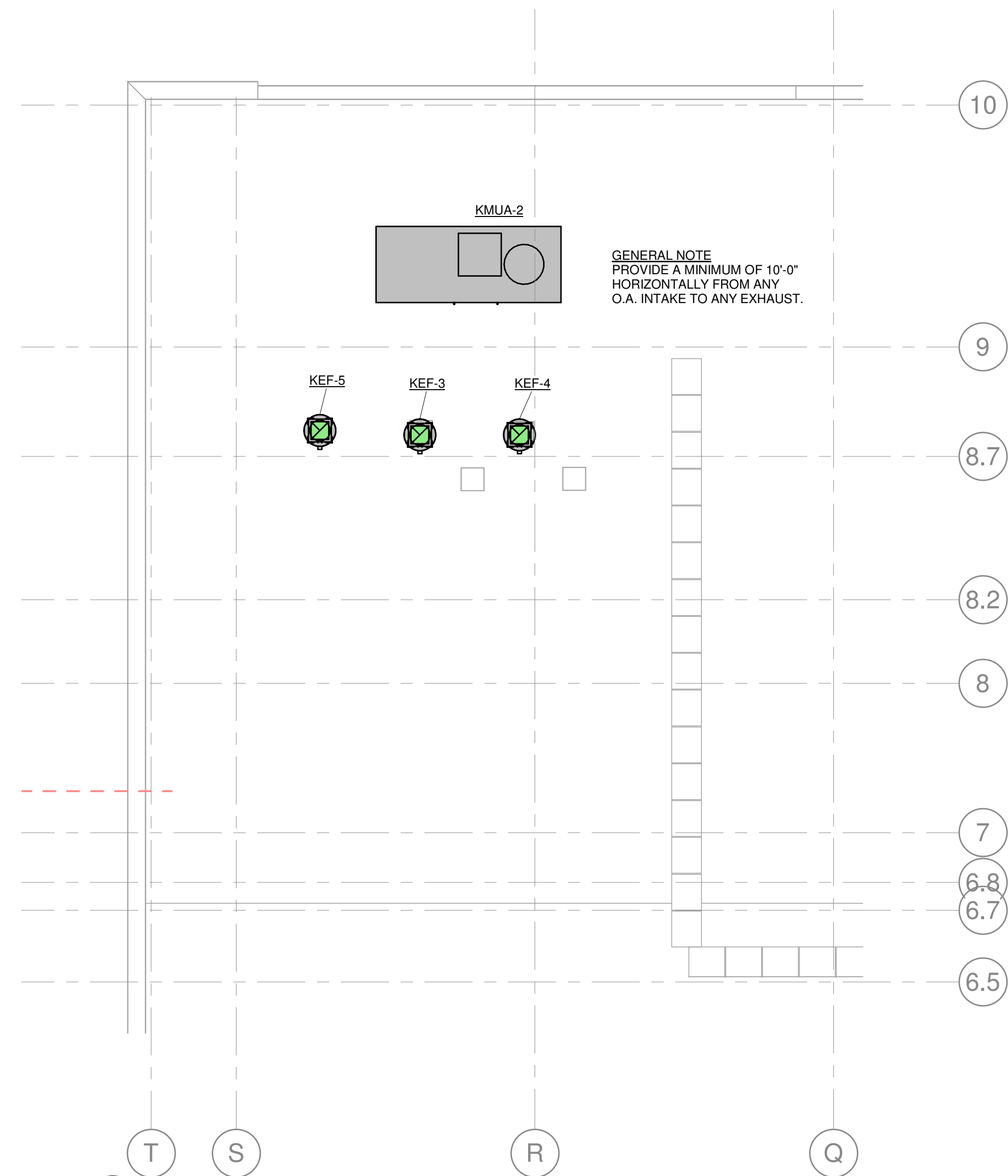
Section # & Req ID	Mechanical Rough-In Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
6.4.4.2.2 (ME11)	Ductwork operating >3 in. water column requires air leakage testing.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Exception: Requirement does not apply.
6.4.4.2.2 (ME11)	Ductwork operating >3 in. water column requires air leakage testing.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
6.4.4.2.2 (ME11)	Ductwork operating >3 in. water column requires air leakage testing.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
6.4.4.2.2 (ME11)	Ductwork operating >3 in. water column requires air leakage testing.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
6.4.4.2.2 (ME11)	Ductwork operating >3 in. water column requires air leakage testing.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
6.4.4.2.2 (ME11)	Ductwork operating >3 in. water column requires air leakage testing.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
6.4.4.2.2 (ME11)	Ductwork operating >3 in. water column requires air leakage testing.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
6.5.1.6.5.1 (ME12)	Air economizers provided where required, meet the requirements for design capacity, control signal, ventilation controls, high-limit shut-off, integrated economizer control, and provide a means to relieve excess outside air during operation.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Exceptions: null.
6.5.1.6.5.1 (ME12)	Air economizers provided where required, meet the requirements for design capacity, control signal, ventilation controls, high-limit shut-off, integrated economizer control, and provide a means to relieve excess outside air during operation.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Exception: Requirement does not apply.
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6.5.1.6.5.1 (ME12)	Air economizers provided where required, meet the requirements for design capacity, control signal, ventilation controls, high-limit shut-off, integrated econom				



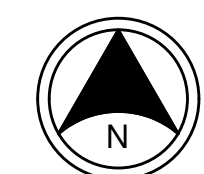


**2 MECHANICAL DUCTWORK THIRD LEVEL PLAN - ALT 1 & 7**  
M-10.01 1/8" = 1'-0"

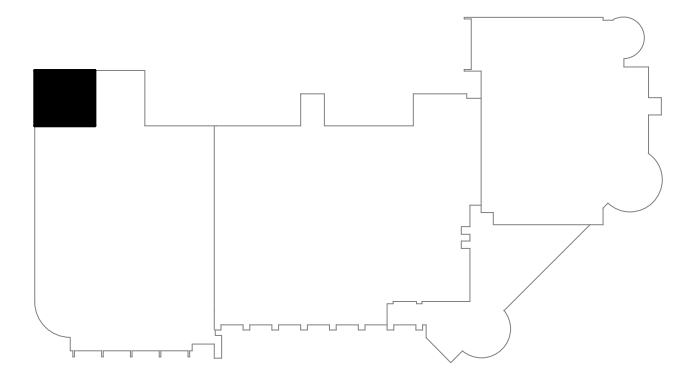
**3 MECHANICAL DUCTWORK ROOF PLAN - ALT 1 & 7**  
M-10.01 1/8" = 1'-0"



**1 MECHANICAL DUCTWORK SECOND LEVEL PLAN - ALT 1 & 7**  
M-10.01 1/8" = 1'-0"



KEYPLAN



1000 S. EVANS BLVD. SUITE 410  
111 FT. THOMAS, KENTUCKY 40375  
LEWISTON, KENTUCKY 40351  
NEW YORK, NEW YORK  
LOUISVILLE, KENTUCKY  
WWW.ALHERBS.COM



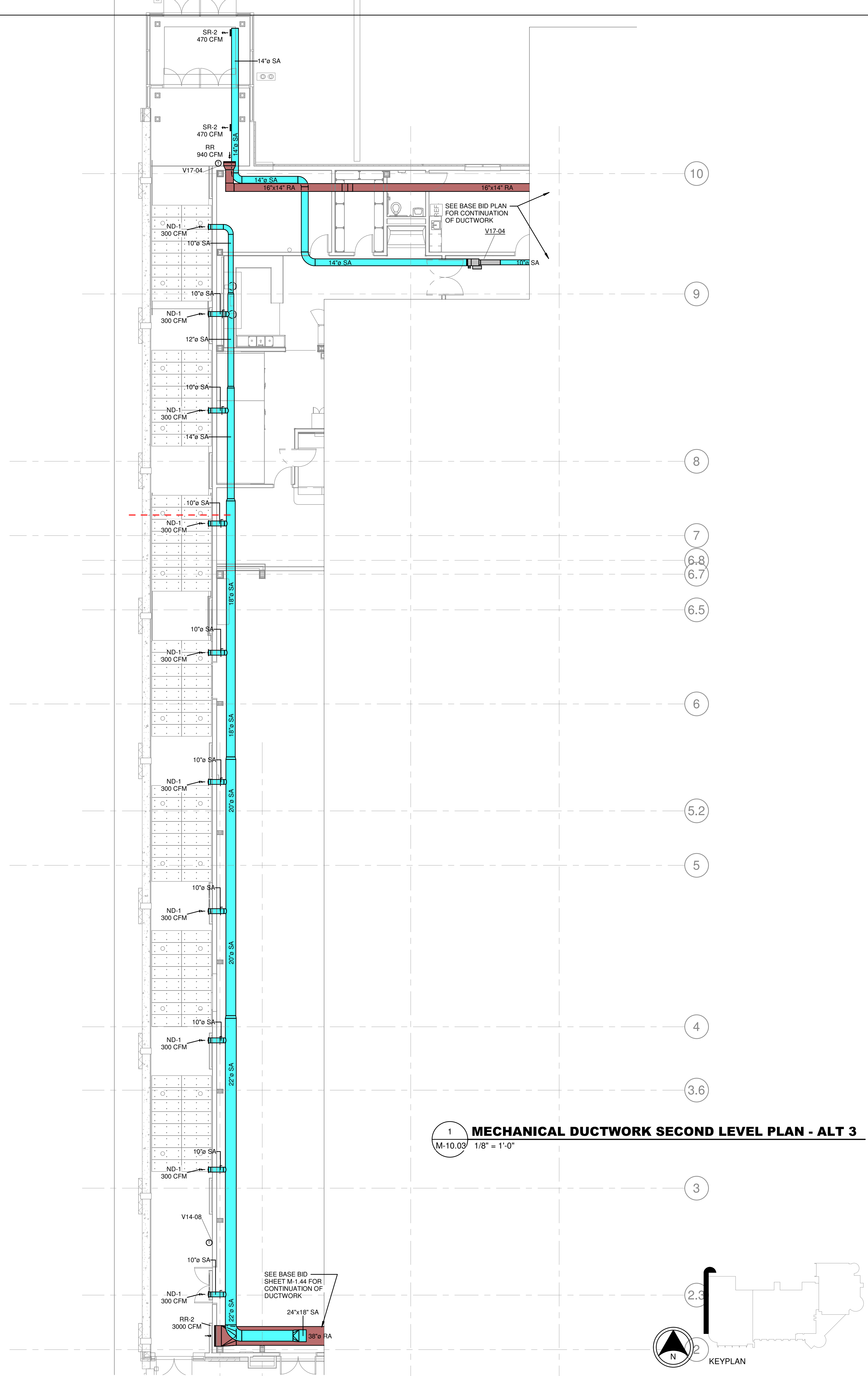
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1	09-13-2021	CAM

REV	DATE	REVISIONS
0	09/15/2021	ISSUED FOR FINAL BIDDING
1		ISSUED FOR BIDDING AND PERMIT

SHARONVILLE CONVENTION CENTER EXPANSION  
CITY OF SHARONVILLE  
11355 CHESTER RD., CINCINNATI OH 45246  
MECHANICAL DUCTWORK PLAN - ALTERNATES 1 & 7

SCALE: AS NOTED
HORIZ:
VERT:
CONTRACT NO:
180634
SHEET
M-10.01

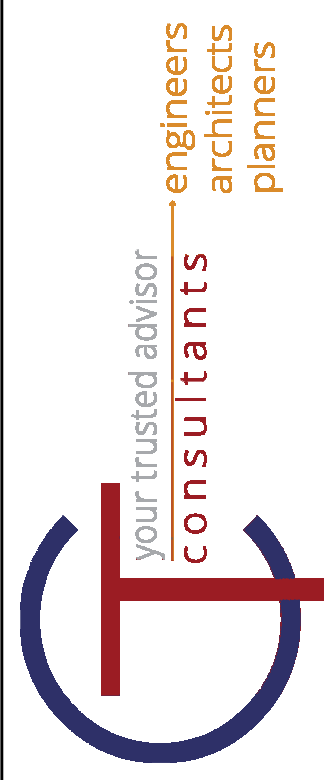
9/15/2021 1:26:09 PM



1 MECHANICAL DUCTWORK SECOND LEVEL PLAN - ALT 3  
M-10.03 1/8" = 1'-0"



1800 S. UNIVERSITY AVE. SUITE 1100  
LEVINSON, KENTUCKY 40351  
41075 800-254-8783  
111 FT. THOMAS, KENTUCKY 40371  
859-442-8688 FAX  
LEVINSON, KENTUCKY  
NEW YORK, NEW YORK  
LOUISVILLE, KENTUCKY  
WWW.ALHERBS.COM



BY: CAM  
DATE: 04-24-2021  
09-13-2021

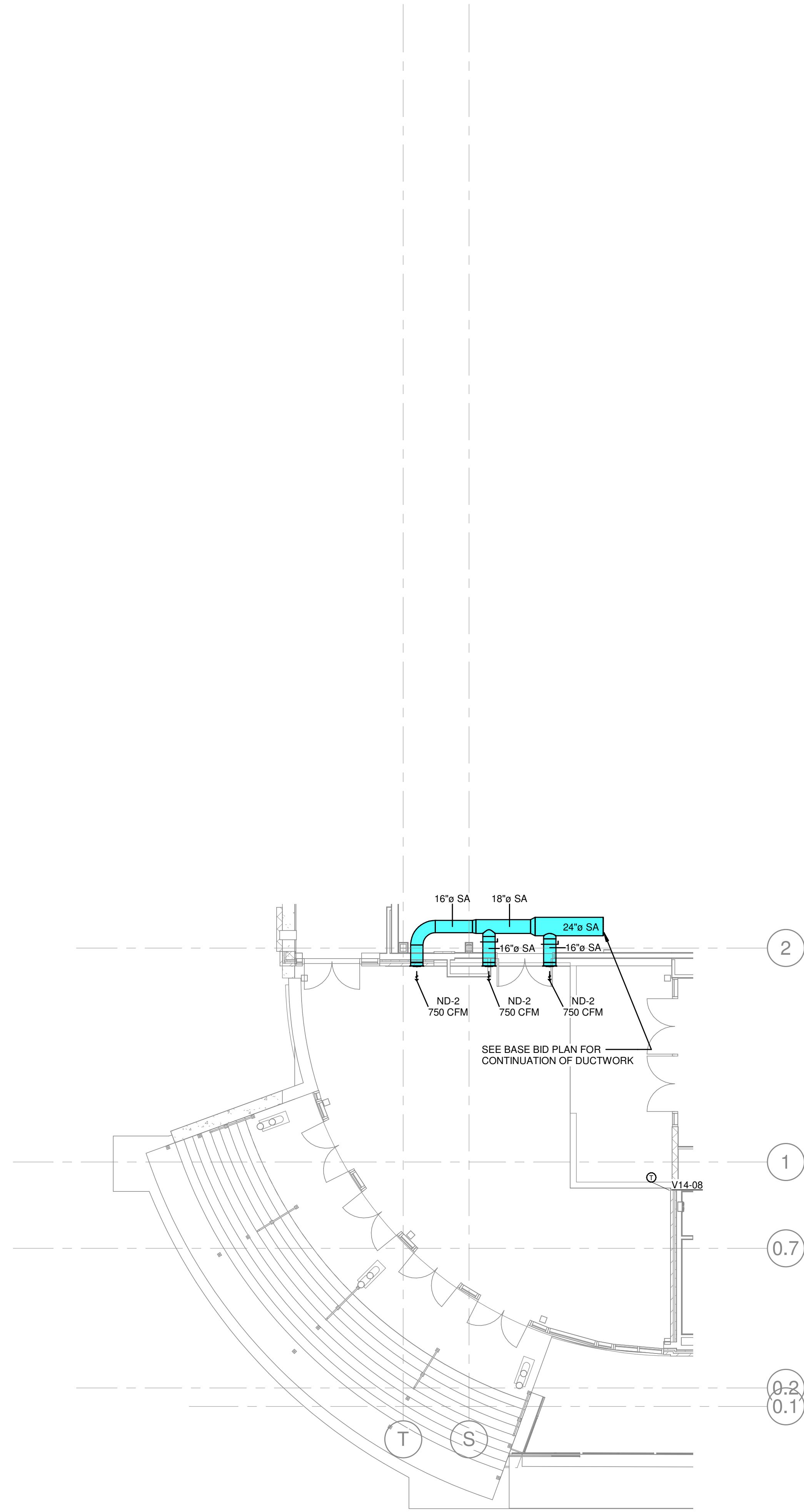
REV	DATE	REVISIONS
1	09/15/2021	ISSUED FOR FINAL ESTIMATE
2	09-13-2021	ISSUED FOR BIDDING AND PERMIT

DATE: 09/15/2021  
DRAWN BY: ESE  
CHECKED BY: KTS  
APPROVED BY: [Signature]  
P.E. [Signature] P.C.

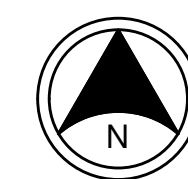
SHARONVILLE CONVENTION CENTER EXPANSION  
CITY OF SHARONVILLE  
11355 CHESTER RD., CINCINNATI OH 45246  
MECHANICAL DUCTWORK PLAN - ALTERNATE 3

SCALE: AS NOTED
HORIZ: [Blank]
VERT: [Blank]
CONTRACT NO: 180634
SHEET M-10.03
KLH JOB #: 21108.00

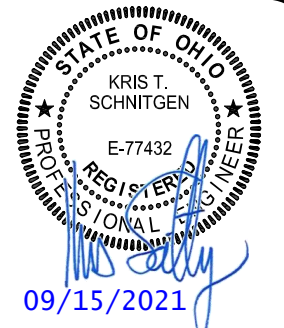
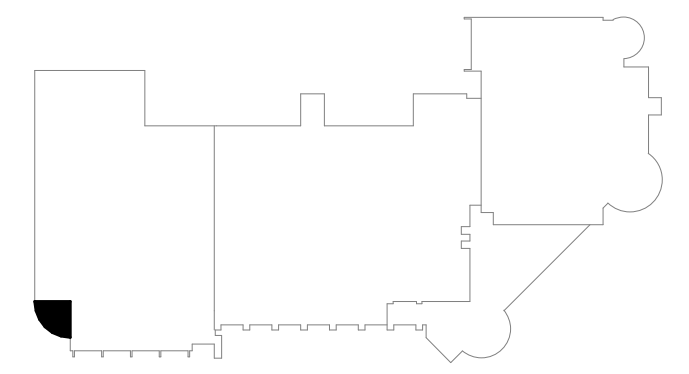
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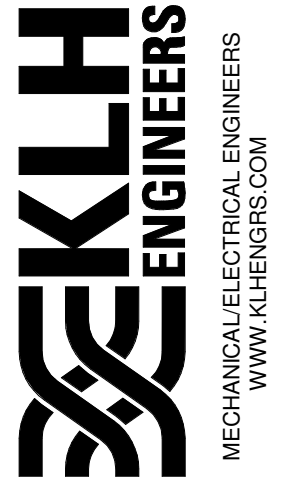
1 **MECHANICAL DUCTWORK SECOND LEVEL PLAN - ALT 8**  
M-10.08 1/8" = 1'-0"



KEYPLAN



1000 S. EVANS BLVD. SUITE 400  
111 FT. THOMAS, KENTUCKY 40350  
LEWINGTON, KENTUCKY 40329  
NEW YORK, NEW YORK 10014  
LOUISVILLE, KENTUCKY 40203  
859-442-8688 FAX  
WWW.ALHERBS.COM



BY: CAM  
DATE: 09-15-2021

DATE: 04-24-2021  
09-15-2021

REVISIONS  
REVISED FOR FINAL BIDDING AND PERMIT  
REVISED FOR BIDDING AND PERMIT

DATE: 09/15/2021  
DRAWN BY: ESE  
CHECKED BY: KTS  
APPROVED BY: [Signature]

SHARONVILLE CONVENTION CENTER EXPANSION  
CITY OF SHARONVILLE  
11355 CHESTER RD., CINCINNATI OH 45246  
MECHANICAL DUCTWORK PLAN - ALTERNATE 8

SCALE: AS NOTED  
HORIZ:  
VERT:  
CONTRACT NO:  
180634  
SHEET  
M-10.08  
KLH JOB #: 21108.00