STANDARD HVAC ABBREVIATIONS

AAV	AUTOMATIC AIR VENT	HD	HEAD	RO	REVERSE OSMOSIS
ACCESS	ACCESSORIES	HOA	HAND/OFF/AUTOMATIC	RPM	REVOLUTIONS PER MINUTE
AD	ACCESS DOOR	HP	HORSEPOWER	RS	REFRIGERANT SUCTION
AFF	ABOVE FINISHED FLOOR	HPR	HIGH PRESSURE RETURN	SA	SUPPLY AIR
AMP	AMPERE		(STEAM CONDENSATE)	SAT	SUPPLY AIR TEMPERATURE
AP	ACCESS PANEL	HSTAT	HUMIDISTAT	SC	SHADING COEFFICIENT
APD	AIR PRESSURE DROP	HTG	HEATING	SCD	SMOKE CONTROL DAMPER
ARI	AIR CONDITIONING AND REFRIGERATION INSTITUTE	HWR	HEATING HOT WATER RETURN	SD	SMOKE DETECTOR
ASME	AMERICAN SOCIETY OF MECHANICAL ENGINEERS	HWS	HEATING HOT WATER SUPPLY	SENS	SENSIBLE HEAT
BAS	BUILDING AUTOMATION SYSTEM	HZ	HERTZ	SP	STATIC PRESSURE
BD	BACKDRAFT DAMPER	I/O	INPUT/OUTPUT	TAB	TESTING, ADJUSTING, BALANCE
BHP	BRAKE HORSEPOWER	IAQ	INDOOR AIR QUALITY	TDH	TOTAL DYNAMIC HEAD
BTU	BRITISH THERMAL UNIT	IN HG	INCHES OF MERCURY	TDS	TOTAL DISSOLVED SOLIDS
BTUH	BRITISH THERMAL UNIT PER HOUR	IN WC	INCH WATER COLUMN	TSP	TOTAL STATIC PRESSURE
CD	CEILING DIFFUSER	IN WG	INCH WATER GAUGE	TSTAT	THERMOSTAT
CFH	CUBIC FEET PER HOUR	IPLV	INTERGRATED PART LOAD VALUE	UL	UNDERWRITERS LABORATORY
CFM	CUBIC FEET PER MINUTE	INST	INSTALLED	VAV	VARIABLE AIR VOLUME
CHWR	CHILLED WATER RETURN	KW	KILOWATT	VFD	VARIABLE FREQUENCY DRIVE
CHWS	CHILLED WATER SUPPLY	KWH	KILOWATT HOUR	WB	WET-BULB (TEMPERATURE)
CI	CAST IRON	LAT	LEAVING AIR TEMPERATURE	WG	WATER GAGE
CLG	COOLING	LBS/HR	POUNDS PER HOUR	WPD	WATER SIDE PRESSURE DROP
CO	CARBON MONOXIDE	LF	LINEAR FOOT (FEET)	WIRE	WIRED
CO2	CARBON DIOXODE	LPR	LOW PRESSURE RETURN		
COP	COEFFICIENT OF PERFORMANCE		(STEAM CONDENSATE)		
CV	CONSTANT VOLUME	LPS	LOW PRESSURE STEAM		
CWR	CONDENSER WATER RETURN	LWT	LEAVING WATER TEMPERATURE		
CWS	CONDENSER WATER SUPPLY	MAX	MAXIMUM		
DB	DECIBELS	MBH	1000 BTUH		
DB	DRY-BULB TEMPERATURE	MCA	MINIMUM BRANCH CIRCUIT AMPACITY		
DC	DISCONNECT	MERV	MINIMUM EFFICIENCY REPORTING VALUE		
DDC	DIRECT DIGITAL CONTROLS	MIN	MINIMUM		
DEG	DEGREE DELTA(CHANGE IN TEMPERATURE)	MOD	MOTOR OPERATED DAMPER		
DIA	DIAMETER	MPR	MEDIUM PRESSURE RETURN		
DIW	DEIONIZED WATER		(STEAM CONDENSATE)		
DP	DEW POINT TEMPERATURE	MPS	MEDIUM PRESSURE STEAM		
DX	DIRECT EXPANSION	MRI	MAGNETIC RESONANCE IMAGING		
EA	EXHAUST AIR	MVD	MANUAL VOLUME DAMPER		
EAT	ENTERING AIR TEMPERATURE	NA	NOT APPLICABLE		
EER	ENERGY EFFICIENCY RATIO	NC	NOISE CRITERIA		
EG	EXHAUST GRILLE	NC	NORMALLY CLOSED		
EMERG	EMERGENCY POWER	NO	NORMALLY OPEN		
ESP	EXTERNAL STATIC PRESSURE	NTS	NOT TO SCALE		
EWT	ENTERING WATER TEMPERATURE	OA	OUTSIDE AIR		
EX.	EXISTING	OCP	OVER CURRENT PROTECTION		
F	FAHRENHEIT	PD	PRESSURE DROP		
F&T	FLOAT AND THERMOSTATIC	PPM	PARTS PER MILLION		
FA	FREE AREA	PRS	PRESSURE REGULATING (VALVE) STATION		
FD	FIRE DAMPER	PRV	PRESSURE REGULATING VALVE		
FLA	FULL LOAD AMPERES	PSI	POUNDS PER SQUARE INCH		
FPM	FEET PER MINUTE	PSIA	POUNDS PER SQUARE INCH – ABSOLUTE		
FPS	FEET PER SECOND	PSIG	POUNDS PER SQUARE INCH – GAGE		
FT	FEET	RA	RETURN AIR		
FURN	FURNISHED	RAT	RETURN AIR TEMPERATURE		
GA	GAUGE	RH	RELATIVE HUMIDITY		
GAL	GALLONS	RL	REFRIGERANT LIQUID LINE		
GPM	GALLONS PER MINUTE	RLA	RUN LOAD AMPERE		

MECHANICAL LEGEND

SYMBOL	DESCRIPTION
PLAN-VIEW LINE TYPES	
	WORK SHOWN FADED INDICATES EXISTING WORK TO REMAIN OR NEW WORK BY OTHERS AS APPLICABLE
	WORK SHOWN BOLD-CONTINUOUS INDICATES NEW WORK
DRAWING SET APPEARANCE	
TO BETTER COMMUNICATE SCOPE TO PERMIT AGENCIES AND CONTRACTORS, EACH DRAWING IN THIS DRAWING SET HAS BEEN CREATED IN BOTH "COLOR" AND "BLACK AND WHITE". THERE EXISTS A COLOR LAYER WITHIN EACH DRAWING WHERE VISIBILITY IS CONTROLLED THROUGH THE PDF LAYER MANAGER. THIS LAYER VISIBILITY CAN BE TOGGLED DISPLAYING EITHER "COLOR" OR "BLACK AND WHITE". TO MAINTAIN SCOPE BASED SHADING WHEN PRINTING TO PAPER, BLACK AND WHITE NEEDS TO BE VISIBLE. FOR FURTHER INSTRUCTIONS, REFER TO CONTRACTOR RESOURCES ON OUR WEBSITE AND DOWNLOAD "DRAWING COLOR INSTRUCTIONS". WWW.KLHENGRS.COM - CONTRACTOR RESOURCES (RIGHT HAND SIDE OF PAGE).	
PIPING LINE TYPES	
HWS	HOT WATER SUPPLY
HWR	HOT WATER RETURN
CWS	CONDENSER WATER SUPPLY
CWR	CONDENSER WATER RETURN
CD	CONDENSATE DRAIN
	SUPPLY MAIN OR BRANCH
	RETURN MAIN OR BRANCH
MECHANICAL PIPING ACCESSORIES	
	MANUAL ISOLATION VALVE
	CHECK VALVE (DIRECTION OF FLOW INDICATED)
	PRESSURE RELIEF VALVE
	PRESSURE REGULATING VALVE
	AUTOMATIC BALANCING VALVE
	MANUAL BALANCING VALVE
	UNION
	TEMPERATURE & PRESSURE TEST PORT
	FLOW DIRECTION
	FLEX PIPING CONNECTOR
	THERMOMETER
	PRESSURE GAUGE
	Y-STRAINER
	STRAINER WITH BLOW OFF
	DRAIN VALVE (3/4" UNLESS OTHERWISE NOTED)
	3 WAY CONTROL VALVE (2 POSITION)
	3 WAY CONTROL VALVE (MODULATION)
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MECHANICAL AIR DEVICES	
SR	SUPPLY REGISTER
RR	RETURN REGISTER
ER	EXHAUST REGISTER
SG	SUPPLY GRILLE
MECHANICAL DUCTWORK	
UP	SUPPLY DUCT WITH ELBOW TURNED UP
DN	SUPPLY DUCT WITH ELBOW TURNED DOWN
UP	RETURN DUCT WITH ELBOW TURNED UP
DN	RETURN DUCT WITH ELBOW TURNED DOWN
UP	EXHAUST DUCT WITH ELBOW TURNED UP
DN	EXHAUST DUCT WITH ELBOW TURNED DOWN
24X12 SA	SUPPLY DUCT
24X12 RA	RETURN DUCT
24X12 EA	EXHAUST DUCT
24X12 OA	OUTSIDE AIR DUCT
	1" LINED DUCTWORK
	DUCT FLEX CONNECTOR
	FLEXIBLE DUCTWORK CONNECTION
	BRANCH TAKEOFF
	REDUCER, CONCENTRIC
	REDUCER, NONCONCENTRIC

MECHANICAL LEGEND

SYMBOL	DESCRIPTION
MECHANICAL DUCTWORK ACCESSORIES	
	DUCT WITH MANUAL VOLUME DAMPER
	ROUND ELBOW WITH TURNING VANES
	ELBOW WITH TURNING VANES
M	MOTOR OPERATED DAMPER - LINE VOLTAGE
M	MOTOR OPERATED DAMPER - LOW VOLTAGE
S	DUCT MOUNTED SMOKE DETECTOR (HARD WIRE INTERLOCK TO FAN MOTOR BY E.C.) FURNISHED BY E.C., INSTALLED BY M.C.
FD 1.5 HR	FIRE DAMPER - 1.5 HR
FD 3.0 HR	FIRE DAMPER - 3 HR
M S	COMBINATION FIRE/SMOKE DAMPER - 1.5 HR
MECHANICAL STATS & SENSORS	
TS	TEMPERATURE SENSOR
T	LOW VOLTAGE THERMOSTAT
T	LOW VOLTAGE THERMOSTAT WITH LOCKABLE GUARD
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	CONNECT TO EXISTING (FIELD VERIFY EXISTING UTILITY SERVICE TYPE, PRIOR TO MAKING CONNECTION)
UC 0'-1"	1" DOOR UNDERCUT

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1	PERMIT COMMENTS	03.06.23

MECHANICAL COVER SHEET

M0.01

KLH PROJECT # 24166.02

STANDARD HVAC ABBREVIATIONS

AAV	AUTOMATIC AIR VENT	HD	HEAD	RO	REVERSE OSMOSIS
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FD .5 HR	FIRE DAMPER - 1.5 HR
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MECHANICAL MISCELLANOUS	
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I	HARD WIRE INTERLOCK
	POINT OF DEMOLITION TO EXISTING (FIELD VERIFY EXISTING UTILITY SERVICE TYPE, PRIOR TO TERMINATING CONNECTION)
	CONNECT TO EXISTING (FIELD VERIFY EXISTING UTILITY SERVICE TYPE, PRIOR TO MAKING CONNECTION)
UC 0'-1"	1" DOOR UNDERCUT

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MECHANICAL COVER SHEET

M0.1

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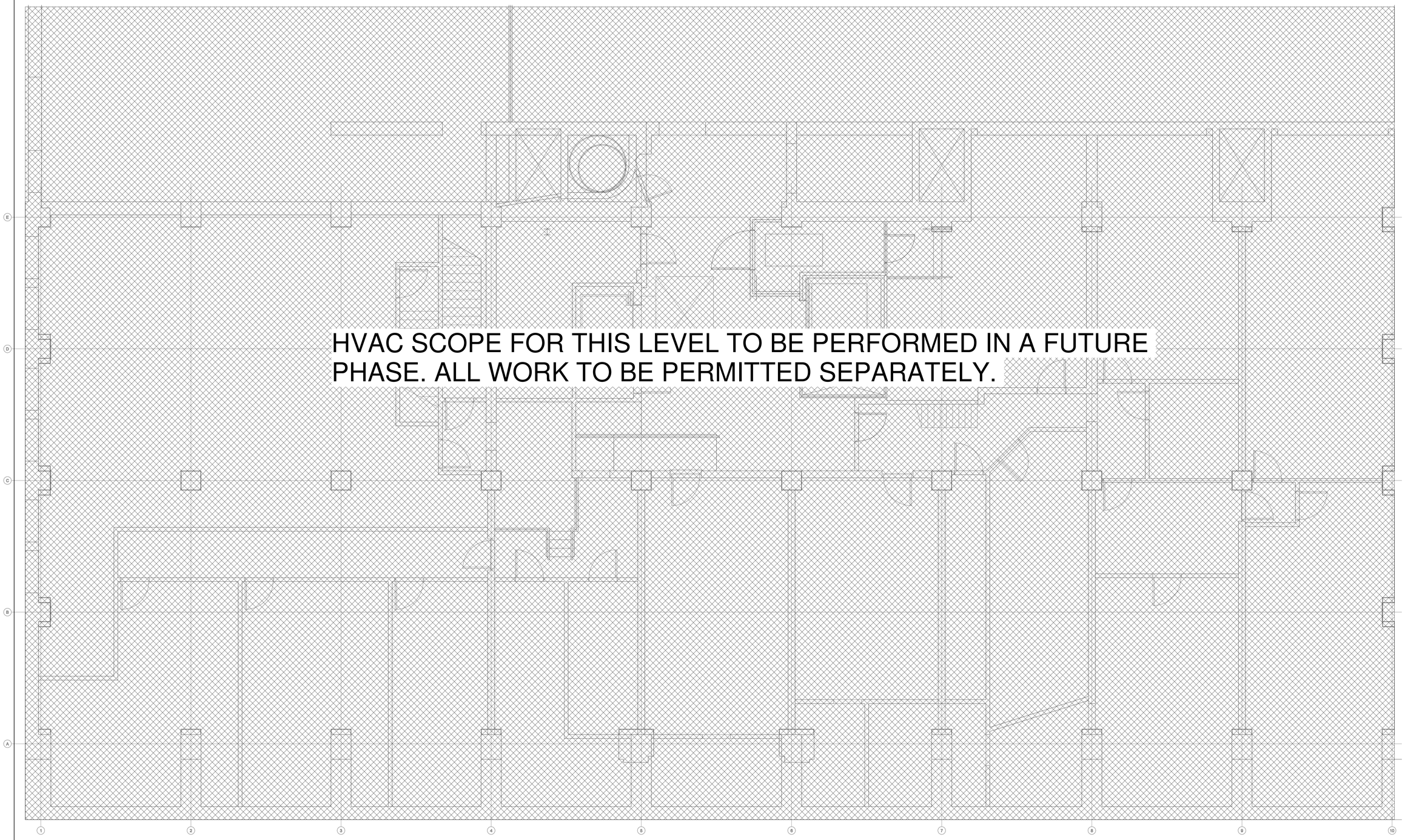

1 MECHANICAL PLAN - BASEMENT - OVERALL
1/4" = 1'-0"

N

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MECHANICAL PLAN - LEVEL 0

M3.00

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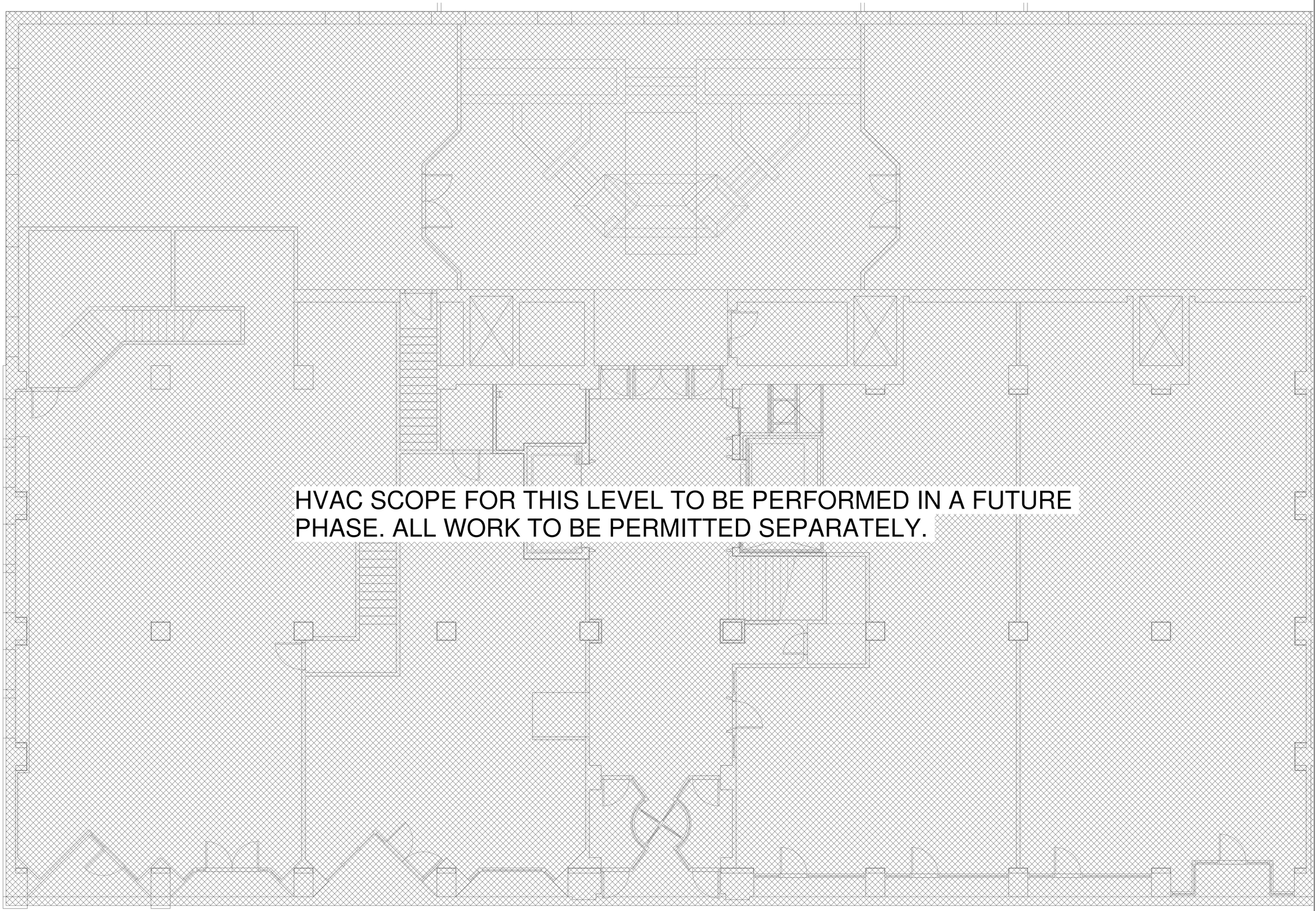

1 MECHANICAL PLAN - LEVEL 1 - OVERALL
1/4" = 1'-0"

N

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MECHANICAL PLAN - LEVEL 1

M3.01

KLH PROJECT # 24166.02

KEYED NOTES

H2 ROUTE CONDENSATE TO NEW FLOOR DRAIN.

WSHP-2-5

WSHP-2-5

H2

3/4" CD

1" CD

1" CD

EXISTING INDEPENDENT CONDITIONING FOR THIS AREA IS ASSUMED. THIS AREA IS DISINCLODED IN NEW BUILDING PLANT CALCULATIONS.

14"x14" EA

6" CWR - UP

6" CWS - UP

50 GPM

14"x14" EA UP

14"x14" OA UP

2 1/2" CWR

2 1/2" CWS

750 OA CFM

14"x14" OA

POLYPROPYLENE PIPING USED IN SECOND FLOOR TENANT SPACE.
PLENUM RETURN NOT ALLOWED PER CODE

1 1/2" CWS

1 1/2" CWR

1 1/4" CWR

1 1/4" CWS

1 1/4" CWS

1 1/4" CWR

WSHP-2-3

WSHP-2-4

3/4" CD

WSHP-2-3

WSHP-2-4

3/4" CD

WSHP-2-1

WSHP-2-2

WSHP-2-1

3/4" CD

WSHP-2-2

3/4" CD

1 1/4" CWS

1 1/4" CWS

1" CD

TENANT
200

1" CWS

1" CWR

1 1/4" CWS

1 1/4" CWS

2" CWR

2" CWS

2" CWR

2" CWS

1 MECHANICAL PLAN - LEVEL 2 - OVERALL
1/4" = 1'-0"

N

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MECHANICAL PLAN - LEVEL 2

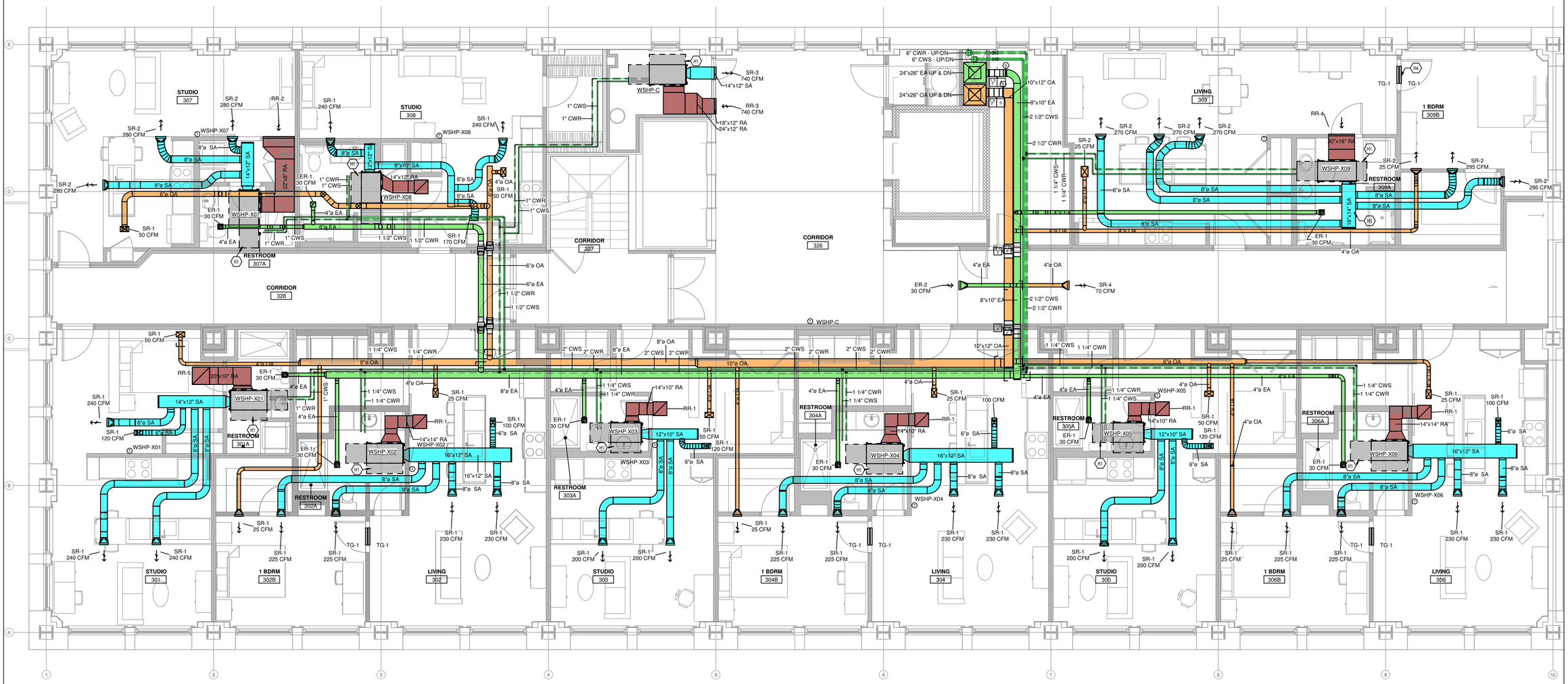
M3.02

KLH PROJECT # 24166.02

Note, the layout for the 3rd floor changed to mirror what is on floors 4-9. I just don't have an updated drawing showing the change. Please take this floor off the same as floors 4-9

KEYED NOTES

H1	ROUTE 1" PVC DRAIN PIPE FROM WSHP TO FLOOR DRAIN.
H4	INSTALL TRANSFER GRILLES ABOVE DOOR AS HIGH AS POSSIBLE (TYP).
H5	ALL SUPPLY AIR DUCTWORK, DOWNSTREAM OF WSHP DISCHARGE, SHALL BE INSULATED WITH A MINIMUM OF R6 THERMAL RESISTANCE VALUE (TYPICAL OF ALL WATER SOURCE HEAT PUMPS).



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414 WALNUT STREET
CINCINNATI, OH 45202

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ISSUE LOG:
PERMIT 12.08.22

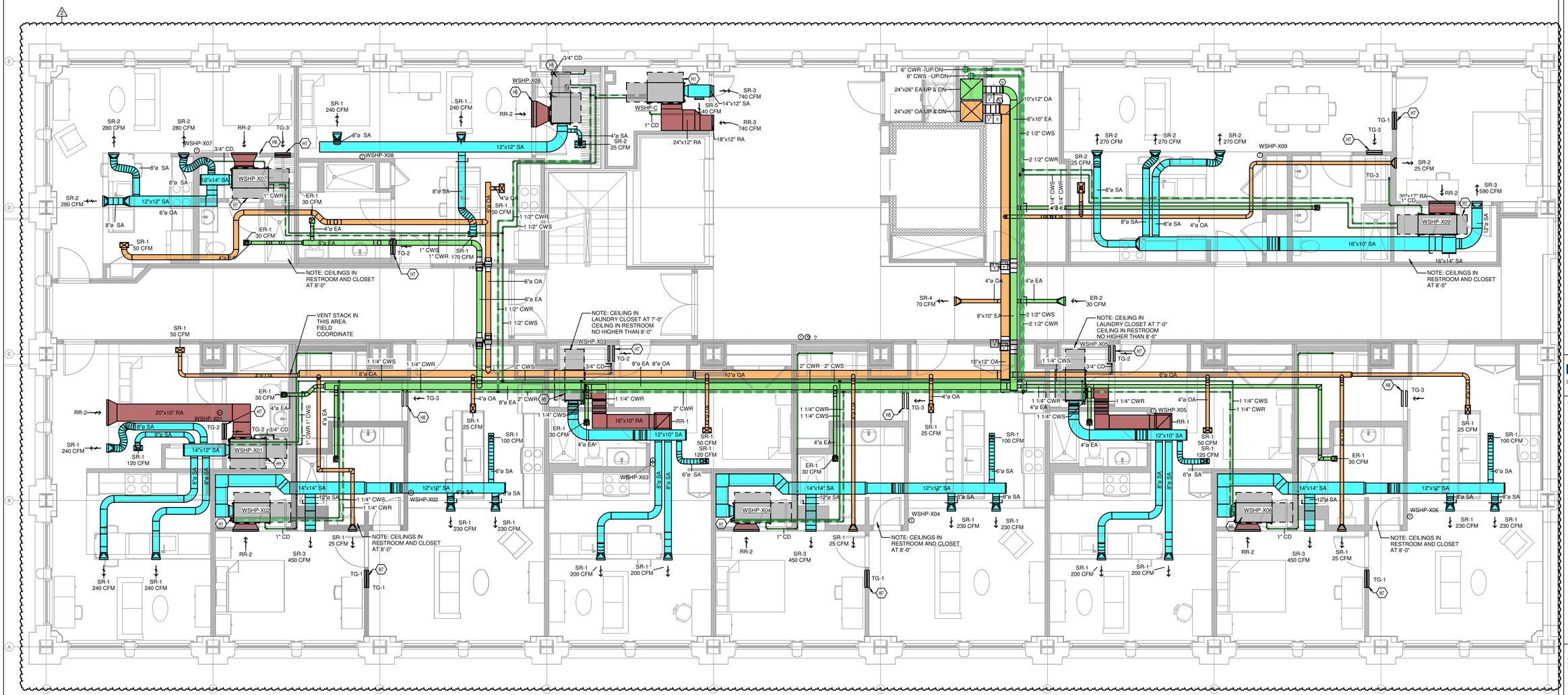
MECHANICAL PLAN - LEVEL 3

M3.03

KLH PROJECT # 24166.02

KEYED NOTES

H1	ROUTE 1" PVC DRAIN PIPE FROM WSHP TO WALL BOX DRAIN
H6	LINE DUCTWORK AND PLENUM BOX.
H7	PROVIDE HIGH-LOW TRANSFER GRILLE IN WALL.
H8	PROVIDE TRANSFER GRILLE ABOVE DOOR.



1 MECHANICAL PLAN - LEVEL 4 THROUGH 9 - OVERALL
1/4" = 1'-0"

N

STATE OF OHIO
KRIS T. SCHNITGEN
E-77432
REGISTERED
PROFESSIONAL ENGINEER
3/17/2023

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	PERMIT	12.08.22
2	OWNER COMMENTS	03.17.23

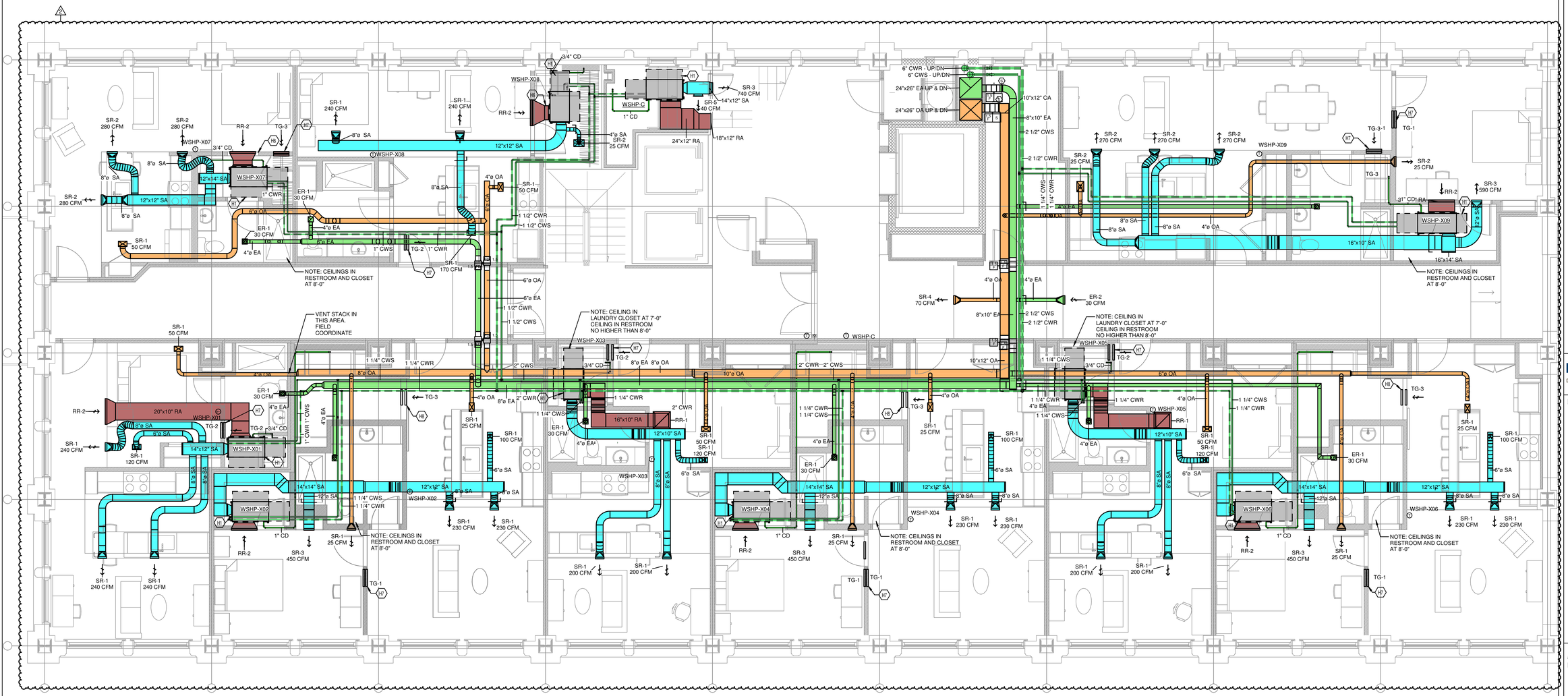
MECHANICAL PLAN - LEVEL 4-9

M3.04

KLH PROJECT # 24166.02

KEYED NOTES

H1	ROUTE 1" PVC DRAIN PIPE FROM WSHP TO WALL BOX DRAIN
H6	LINE DUCTWORK AND PLENUM BOX.
H7	PROVIDE HIGH-LOW TRANSFER GRILLE IN WALL.
H8	PROVIDE TRANSFER GRILLE ABOVE DOOR.



1 MECHANICAL PLAN - LEVEL 10 - OVERALL
1/4" = 1'-0"

N

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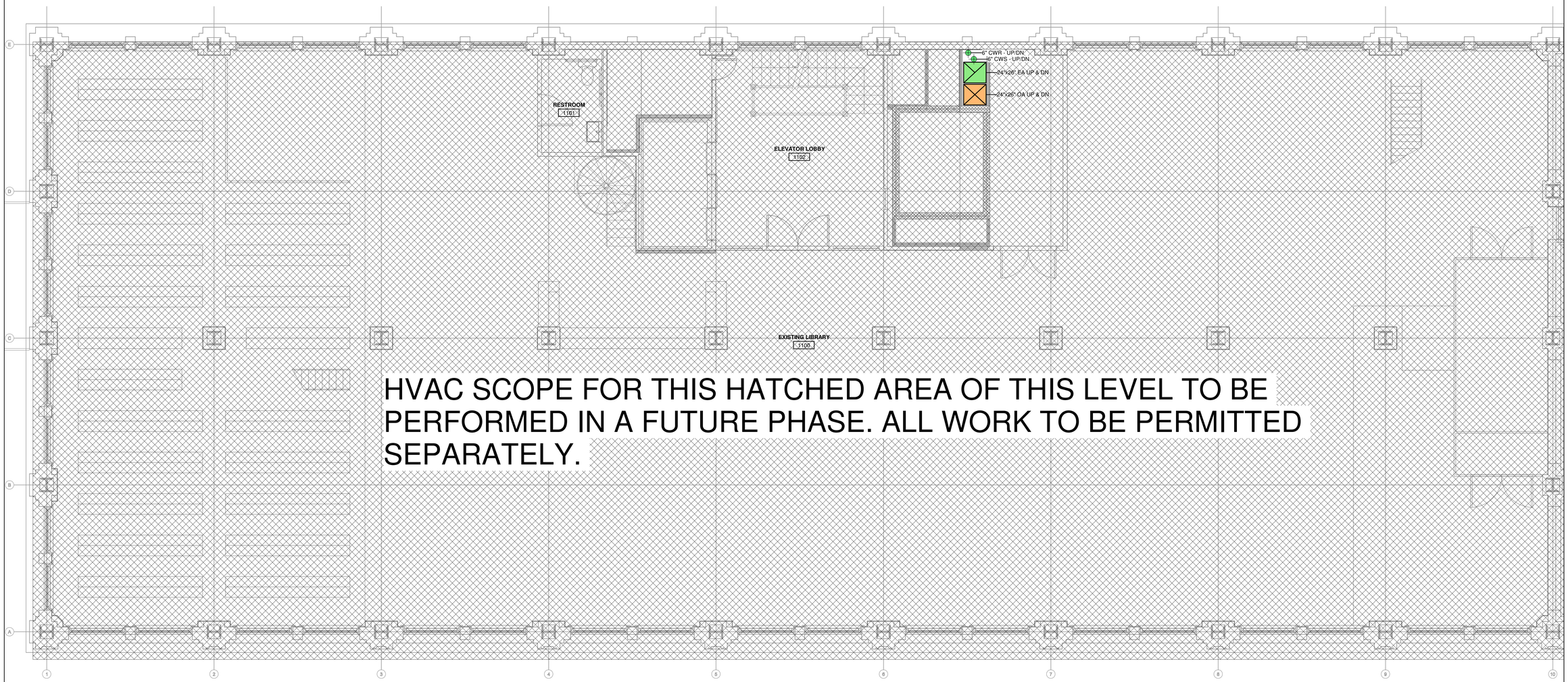
MECHANICAL PLAN - LEVEL 10

M3.10

KLH PROJECT # 24166.02



1 MECHANICAL PLAN - LEVEL 11 - OVERALL
1/4" = 1'-0"

N

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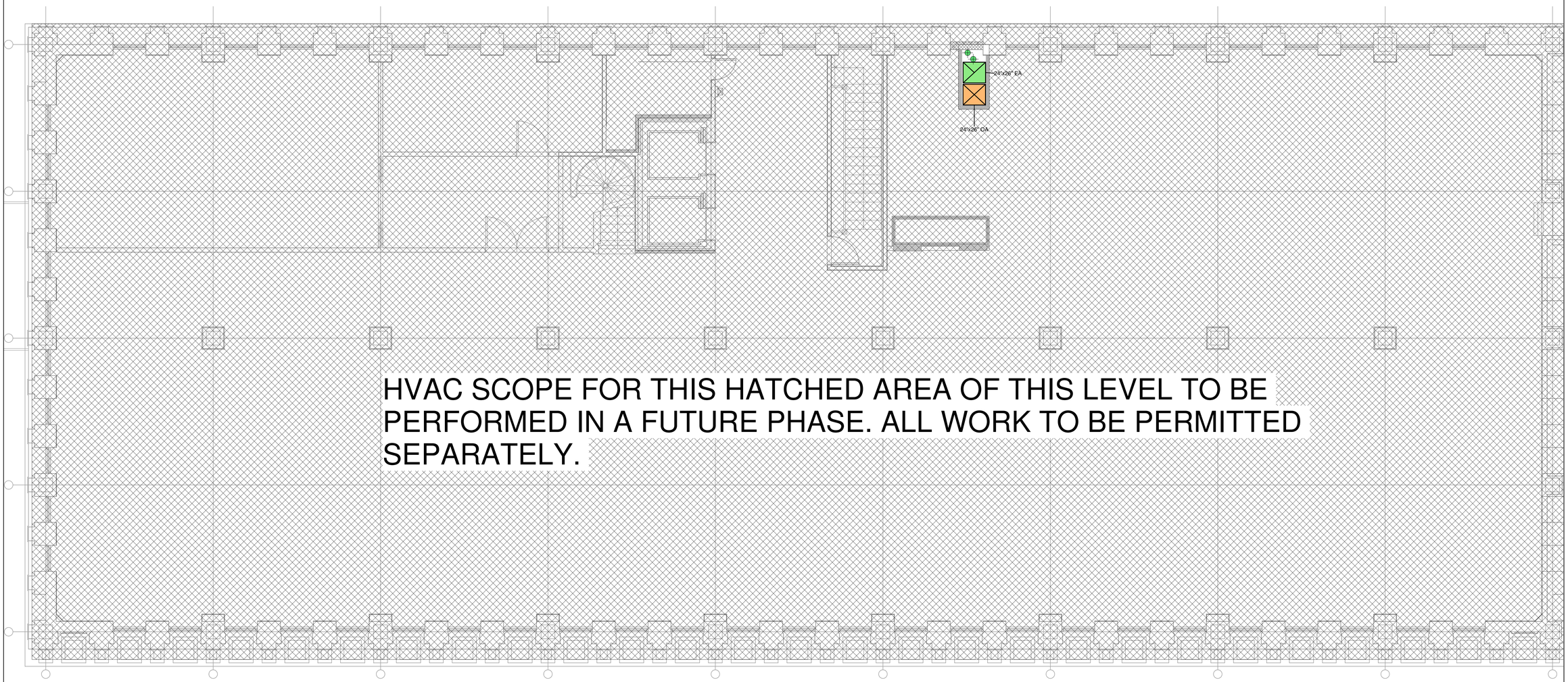
MECHANICAL PLAN - LEVEL 11

M3.11

KLH PROJECT # 24166.02



HVAC SCOPE FOR THIS HATCHED AREA OF THIS LEVEL TO BE PERFORMED IN A FUTURE PHASE. ALL WORK TO BE PERMITTED SEPARATELY.

1 MECHANICAL PLAN - LEVEL 12 - OVERALL
1/4" = 1'-0"

N

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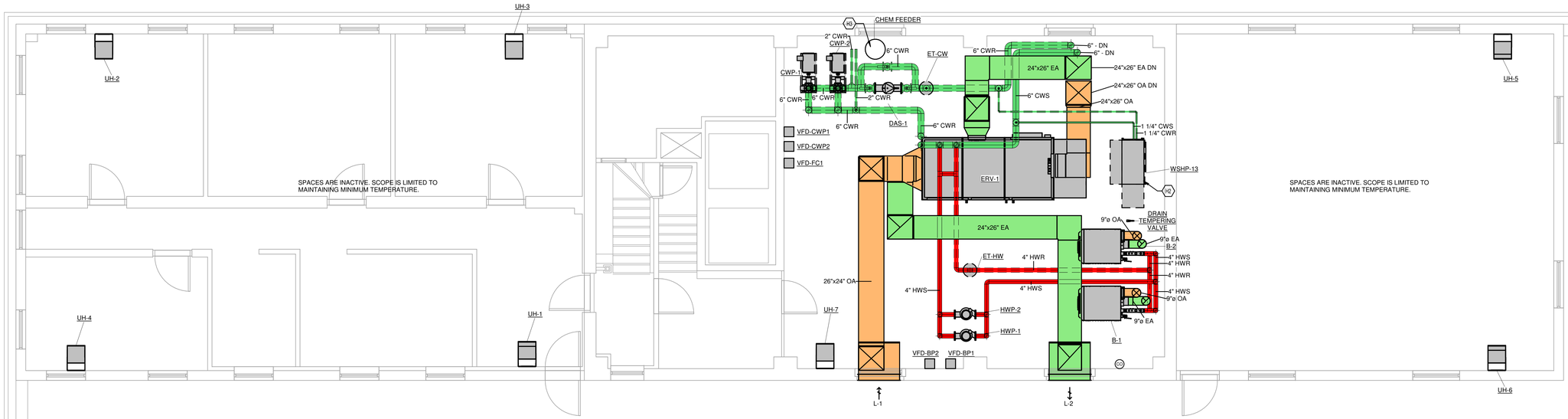
MECHANICAL PLAN - LEVEL 12

M3.12

KLH PROJECT # 24166.02

KEYED NOTES

H2	ROUTE CONDENSATE TO NEW FLOOR DRAIN.
H3	PROVIDE NEPTUNE DBF-5HP CHEMICAL FEEDER.



1 MECHANICAL PLAN - LEVEL 13 - OVERALL
1/4" = 1'-0"

N

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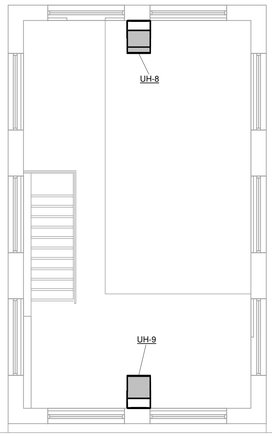
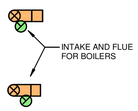
MECHANICAL PLAN - LEVEL 13

M3.13

KLH PROJECT # 24166.02





PROVIDE RAILING ON HIGH ROOF.

1 MECHANICAL PLAN - LEVEL 14 - OVERALL
1/4" = 1'-0"

N

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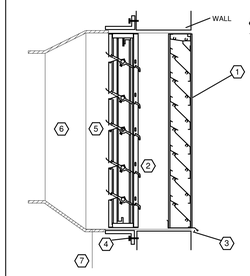
MECHANICAL PLAN - LEVEL 14

M3.14

KLH PROJECT # 24166.02



KEYED NOTES:

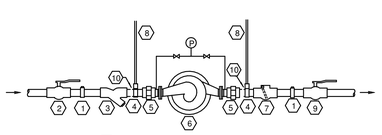
1. EXTERIOR WALL MOUNTED LOUVER
2. MOTOR OPER. DAMPER
3. CAULKING
4. ANCHOR TO WALL AT 12" O/C
5. PROVIDE INSULATED SHEET METAL PLENUM, FULL SIZE OF LOUVER, (MIN 12" DEEP)
6. TRANSITION INSULATED DUCT CONNECTION WITH ANGLED FITTING TO PLENUM FOR UNIFORM AIR FLOW
7. 3/4" PIPING TO FLOOR DRAIN

GENERAL NOTES:

A. REFER TO ARCHITECTURAL DRAWINGS FOR SIZES AND LOCATIONS.

233713.00-11 - INTAKE LOUVER

SCALE: NONE



KEYED NOTES:

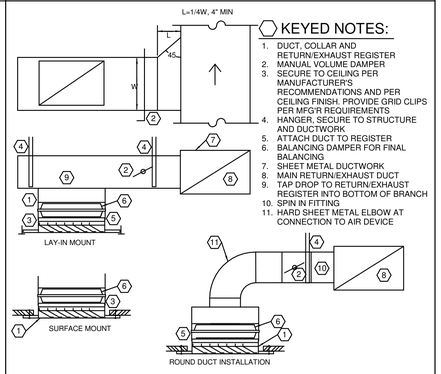
1. COMBINATION PRESSURE/TEMPERATURE TEST PLUG
2. SHUTOFF VALVE WITH HANDLER EXTENSION AND VALVE TAGS
3. STRAINER
4. CLEVIS HANGER
5. UNION
6. PUMP AND MOTOR WITH EQUIPMENT LABEL
7. CHECK VALVE
8. CLEVIS HANGER AND ROD, SECURE TO BUILDING STRUCTURE, DOUBLE NUT
9. SHUTOFF/AUTOMATIC BALANCING VALVE WITH PRESSURE/TEMPERATURE TEST PORT
10. REDUCER, IF REQUIRED

GENERAL NOTES:

A. INSULATE PIPING
B. INSULATE CHILLED ATER IMPELLER HOUSING

232123.13-01 - INLINE PUMP A

SCALE: NONE

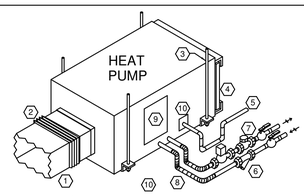


KEYED NOTES:

1. DUCT, COLLAR AND RETURN/EXHAUST REGISTER
2. MANUAL VOLUME DAMPER
3. SECURE TO CEILING PER MANUFACTURER'S RECOMMENDATIONS AND PER CEILING FINISH. PROVIDE GRID CLIPS PER MFGR REQUIREMENTS
4. HANGER, SECURE TO STRUCTURE AND DUCTWORK
5. ATTACH DUCT TO REGISTER
6. BALANCING DAMPER FOR FINAL BALANCING
7. SHEET METAL DUCTWORK
8. MAIN RETURN/EXHAUST DUCT
9. TAP DROP TO RETURN/EXHAUST REGISTER INTO BOTTOM OF BRANCH
10. SPIN IN FITTING
11. HARD SHEET METAL ELBOW AT CONNECTION TO AIR DEVICE

233713.00-21 - RETURN/EXHAUST REGISTER INSTALLATION

SCALE: NONE

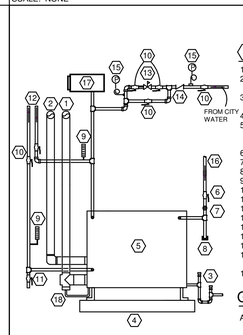


KEYED NOTES:

1. SUPPLY DUCT - 1/2" INTERNAL INSULATION
2. FLEXIBLE CONNECTION
3. GALVANIZED ALL-THREAD ROD WITH VIBRATION ISOLATOR (TYPICAL)
4. FILTER AND RACK
5. CONDENSATE LINE WITH TRAP
6. SHUTOFF VALVE, UNIONS, AND STRAINER (SUPPLY SIDE)
7. AUTOMATIC BALANCING VALVE, FULL PORT, 2 POSITION, 2-WAY CONTROL VALVE, UNIONS, AND SHUTOFF VALVE (RETURN SIDE) WITH PRESSURE TEST PORTS
8. FLEXIBLE HOSE KITS
9. SERVICE ACCESS PANEL
10. HIGH CONDENSATE LEVEL SWITCH.

238146.00-06 - WATER SOURCE HEAT PUMP

SCALE: NONE



KEYED NOTES:

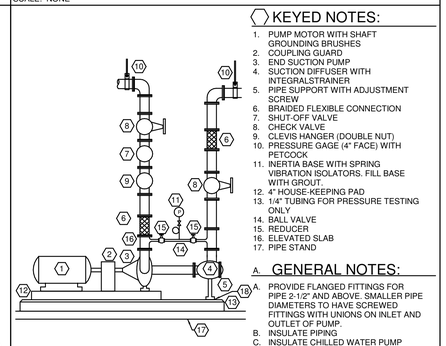
1. CPVC VENT WITH TERMINATION KIT
2. CPVC COMBUSTION INTAKE WITH TERMINATION KIT
3. CPVC CONDENSATE DRAIN, PIPE TO FLOOR DRAIN
4. 4" CONCRETE HOUSE KEEPING PAD
5. HIGH EFFICIENCY BOILER, PROVIDE MUFFLERS, OUTDOOR AIR RESET, PRESSURE RELIEF VALVE
6. GAS COCK
7. UNION
8. DRIP LEG
9. THERMOMETER
10. BALL VALVE WITH VALVE TAGS
11. 3/4" DRAIN VALVE, PIPE TO FLOOR DRAIN
12. HOT WATER PIPES WITH INSULATION
13. 3/4" PRESSURE REDUCING VALVE
14. BACKFLOW PREVENTER
15. PRESSURE GAUGE
16. GAS SUPPLY, BLACK STEEL PIPE
17. ASME 20 GALLON EXPANSION TANK WITH SIGHT GLASS
18. VENT STARTER TEE AND CONDENSATE TRAP HOUSE

GENERAL NOTES:

A. INSTALL ACCORDING TO MANUFACTURER'S INSTALLATION INSTRUCTIONS.
B. INSTALL ACCORDING TO NFPA, STATE AND LOCAL CODE REQUIREMENTS.

235200.00-03 - HIGH EFFICIENCY GAS BOILER

SCALE: NONE



KEYED NOTES:

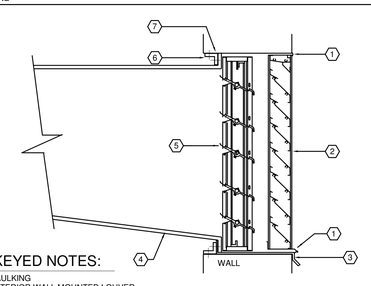
1. PUMP MOTOR WITH SHAFT GROUNDING BRUSHES
2. COUPLING GUARD
3. END SUCTION PUMP
4. SUCTION DIFFUSER WITH INTEGRALSTRAINER
5. PIPE SUPPORT WITH ADJUSTMENT SCREW
6. BRAIDED FLEXIBLE CONNECTION
7. SHUT-OFF VALVE
8. CHECK VALVE
9. CLEVIS HANGER (DOUBLE NUT)
10. PRESSURE GAGE (4" FACE) WITH PETCOCK
11. INERTIA BASE WITH SPRING VIBRATION ISOLATORS. FILL BASE WITH GROUT.
12. 4" HOUSE-KEEPING PAD
13. 1/4" TUBING FOR PRESSURE TESTING ONLY
14. BALL VALVE
15. REDUCER
16. ELEVATED SLAB
17. PIPE STAND

GENERAL NOTES:

A. PROVIDE FLANGED FITTINGS FOR PIPE 2-1/2" AND ABOVE. SMALLER PIPE DIAMETERS TO HAVE SCREWED FITTINGS WITH UNIONS ON INLET AND OUTLET OF PUMP.
B. INSULATE PIPING
C. INSULATE CHILLED WATER PUMP IMPELLER AND SUCTION DIFFUSER.
D. BALANCE VALVE IS NOT REQUIRED WHERE PUMP IS CONTROLLED BY A VARIABLE FREQUENCY DRIVE.
E. TRIPLE DUTY VALVE IS PERMISSABLE IN LIEU OF NOTES 7,8,9 IN NON-VFD APPLICATIONS.
F. OMIT NEOPRENE FOR SLAB ON GRADE APPLICATIONS.

232123.16-01 - BASE MOUNTED PUMP

SCALE: NONE



KEYED NOTES:

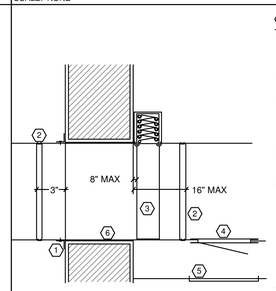
1. CAULKING
2. EXTERIOR WALL MOUNTED LOUVER
3. EXTENDED SILL
4. PITCH INSULATED DUCT 10 DEGREES TOWARD LOUVER AND SEAL WATERTIGHT
5. MOTOR OPER. DAMPER
6. CLIP ANGLE
7. ANCHOR TO WALL AT 12" O.C.

GENERAL NOTES:

A. WALL LOUVERS ARE FURNISHED AND INSTALLED BY THE GENERAL CONTRACTOR. REFER TO ARCHITECTURAL DRAWINGS FOR SIZES AND LOCATIONS. UNLESS SPECIFIED IN SECTION 23 37 13.00.

233713.00-07 - EXHAUST LOUVER DETAIL

SCALE: NONE



KEYED NOTES:

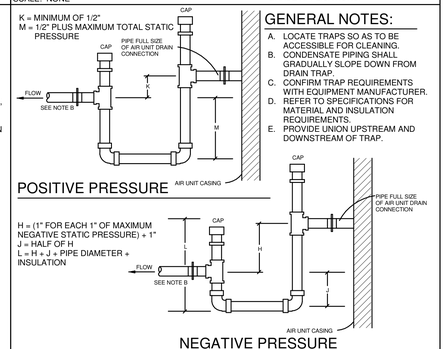
1. 1.5"x1.5" ANGLE (18 GA.) FASTEN TO ALL FOUR SIDES OF FIRE DAMPER (6" O.C.). DO NOT FASTEN TO WALLS
2. "SLIP BREAK AWAY" CONNECTIONS. DO NOT USE "C" DRIVES, SCREWS, OR RIVETS
3. FIRE DAMPER WITH WALL SLEEVE, (GAUGE PER MANUFACTURER) INTEGRAL WITH DAMPER OR FURNISHED SEPARATELY, FASTEN DAMPER TO SLEEVE
4. ACCESS DOOR IN DUCT
5. PROVIDE ARCHITECTURAL ACCESS PANEL IN NON-ACCESSIBLE WALLS OR CEILINGS
6. FASTENERS, 4 SIDES, 6" O.C. AT STUD & DRYWALL USE #10 SCREWS, PENETRATE STUD 1/2" MIN. AT MASONRY, USE #10 SELF-TAPPING CONCRETE SCREWS, PENETRATE WALL 1-1/2" MIN.

GENERAL NOTES:

A. INSTALLATION TO CONFORM TO NFPA 90A AND INSTRUCTIONS
B. FLOOR INSTALLATION IS SIMILAR TO THAT SHOWN
C. FIRE DAMPERS TO BEAR THE UL LABEL

233313.00-12 - FIRE DAMPER TYPE A

SCALE: NONE



GENERAL NOTES:

A. LOCATE TRAPS SO AS TO BE ACCESSIBLE FOR CLEANING.
B. CONDENSATE PIPING SHALL GRADUALLY SLOPE DOWN FROM DRAIN TRAP.
C. CONFIRM TRAP REQUIREMENTS WITH EQUIPMENT MANUFACTURER.
D. REFER TO SPECIFICATIONS FOR MATERIAL AND INSULATION REQUIREMENTS.
E. PROVIDE UNION UPSTREAM AND DOWNSTREAM OF TRAP.

NOTE: OUTDOOR UNITS AND UNITS LOCATED IN UNCONDITIONED SPACES WHICH PROVIDE COOLING IN THE WINTER MUST HAVE HEAT TRACE ON THE CONDENSATE PIPING.

232113.23-05 - CONDENSATE DRAIN TRAP POSITIVE & NEGATIVE

SCALE: NONE

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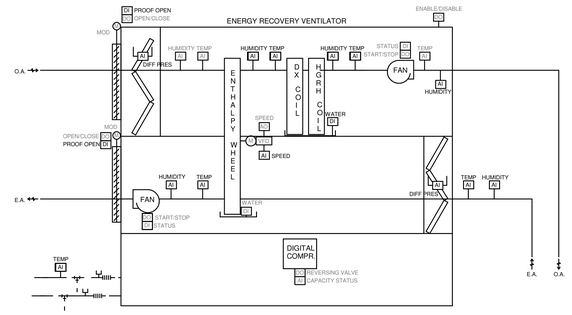
ISSUE LOG:

MECHANICAL - DETAILS

M5.01

KLH PROJECT # 24166.02



GENERAL NOTES:

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

GRAY SENSOR INDICATES DEVICE IS PROVIDED BY EQUIPMENT MANUFACTURER

BLACK SENSOR INDICATES DEVICE IS PROVIDED BY TEMPERATURE CONTROLS CONTRACTOR

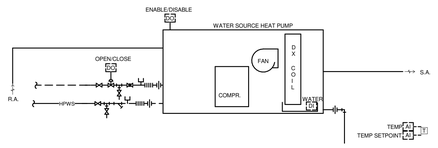
SEQUENCE OF OPERATION

1.1 Water Source Energy Recovery Dedicated Ventilation Units

1. Interface
   a. The energy recovery unit controllers are being provided with a BACNet or LON open-protocol controller. The BAS Contractor is to interface the data points from the energy recovery controller into the DDC system front-end. Refer to equipment spec for a listing of the data points required to be available from the energy recovery unit's open-protocol controller. All listed data points are to be interfaced into the DDC system front-end.
   b. The BAS system contractor is responsible to coordinate with the energy recovery units' 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.
   c. The BAS Contractor is to do a point-by-point verification of all read/write points between the energy recovery units and the DDC system. The point-by-point verification is to be done in conjunction with the energy recovery unit equipment supplier. The energy recovery unit equipment supplier is to provide a trained technician to work in conjunction with the BAS system contractor for the point-by-point verification. The data verification only needs to be done on one of each unique type of energy recovery system on the project. The BAS system contractor is to generate a point-by-point verification form for each unique energy recovery system and submit the form(s) to the Engineer for review before proceeding with DDC system interfacing of the balance of the energy recovery units.
2. Startup
   a. Electric disconnect switch and circuit breaker shall be in the 'ON' position so that line voltage power is available at the unit. The power switch of the integral controller should be in the 'ON' position.
   b. A "Hand-Off-Auto" switch at each of the supply and exhaust fan starters permit manual or automatic operation of each fan. i. In "Auto", the fan is started and stopped by the BAS. ii. In "Hand", the fan is started regardless of the command from the BAS unless a system safety device is activated.
   c. "Hand-Off-Auto" switch at the enthalpy wheel VFD shall permit manual or automatic operation of the wheel. i. In "Auto", the enthalpy wheel is started and stopped by the BAS. ii. In "Hand", the enthalpy wheel is started regardless of the command from the BAS unless a system safety device is activated.
   d. 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 FMS. The controller shall check the operating schedule and looks for failures. If no failures or faults are detected, after 30 seconds, the unit shall commence start-up.
   e. If the outside air temperature is 50 degrees F or lower (adjustable), the BAS shall start the exhaust fan and energy recover wheel sequences. The BAS shall then start the supply fan sequence after a five minute time delay to precondition the energy recovery wheel.
   f. If the outside air temperature is above 50 degrees F (adjustable), the BAS shall start the exhaust fan, energy recovery wheel and supply fan sequences simultaneously.
   g. At shutdown the energy recovery unit shall be at fail safe position.
3. Supply Fan Control
   a. The supply fan shall be set to the required constant amount of supply air flow. The BAS shall enable the ERV whenever the time schedule for the building indicates the building is occupied. The ERV controller shall command open the outside air damper and start the supply air fan. The supply fan shall not start unless the outside air damper is proven open.
4. Exhaust Fan Control
   a. The exhaust fan shall be set to the required constant amount of exhaust air flow. The BAS shall enable the ERV whenever the time schedule for the building indicates the building is occupied. The ERV controller shall command open the exhaust air damper and start the exhaust fan. The exhaust fan shall not start unless the exhaust damper is proven open.
5. Energy Recovery Wheel
   a. During occupied mode the energy wheel speeds shall modulate continuously, except during economizer operation when the wheel is off, to maintain supply air temperature setpoint. Wheel rotational speed shall be controlled and modulate by unit manufacturer. In the event of a wheel failure the BAS shall alarm, the wheel shall be turned off and both the outside air and exhaust air dampers shall be commanded open by the BAS.
6. Condenser Water
   a. On a call for heating or cooling, the 2-position condenser water control valve shall open
7. Supply Air Temperature Setpoint
   a. The supply air temperature setpoint shall be set to 70 degrees F (adjustable).
   b. Modify setpoints to maintain condition comfort.
8. Cooling/Heating Control
   a. Cooling and heating shall be controlled based on leaving air supply temperature whenever the system fans are proven on. When the supply temperature drifts from setpoint and the enthalpy wheel is at full speed, modulate the compressor to maintain leaving supply air temperature setpoint. Control the reversing valve to provide heating or cooling as needed. In mechanical cooling mode, modulate the hot gas reheat to maintain supply air temperature setpoint.
9. Filter Pressure Drop
   a. Provide pressure differential sensor across each filter.
      1) Exhaust air filter pressure differential sensor (AI)
      2) Outside air filter pressure differential sensor (AI)
10. Low Limit Control
    a. Provide a low limit whenever the supply air temperature drops below low limit that will alarm the system and shut down the ERV.
11. High Limit Control
    a. Provide a high limit whenever the supply air temperature exceeds high limit that will alarm the system and shut down the ERV.
12. Emergency Shutdown
    a. When the fire alarm system is alarmed, the energy recovery unit shall fail safe with manual reset. Electrical contractor shall provide hard wire interlock to energy recovery unit and fire alarm system.
13. Unoccupied / Shut Down
    a. At shutdown the energy recovery unit shall go to fail safe position. Fail safe position is defined by the following: The supply and exhaust fans are off, energy wheel is off, the outside air and exhaust dampers are closed, the hot gas reheat valve is closed and the compressors are off.
14. Enthalpy Wheel Frost Control
    a. To prevent frost or ice accumulation on the enthalpy wheel, the wheel shall periodically rotate to allow the exhaust air to warm the wheel. Wheel frost control shall occur when outside air temperatures are below 40 degrees F and the wheel is not rotating during normal operation or during building unoccupied times.

23T-044 - WATER SOURCE ENERGY RECOVERY DEDICATED VENTILATION UNIT - ENTHALPY WHEEL

SCALE: NONE



SEQUENCE OF OPERATION

1.1 GUEST ROOM WATER SOURCE HEAT PUMP SYSTEMS

A. Water Source Heat Pumps with Pre-Conditioned Outside Air

1. Interface
   a. The water-source heat pump controllers shall be furnished to the water source heat pump manufacturer and be installed by the water source heat pump manufacturer. The thermostats shall be furnished by the BAS contractor and installed and wired by the mechanical contractor. The BAS Contractor has no scope pertaining to the guest room heat pumps.
   b. The BAS system contractor is responsible to coordinate with the heat pump 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.
   c. The BAS Contractor is to do a point-by-point verification of all read/write points between the heat pumps and the DDC system. The point-by-point verification is to be done in conjunction with the heat pump equipment supplier. The heat pump equipment supplier is to provide a trained technician to work in conjunction with the BAS contractor for the point-by-point verification. The data verification only needs to be done on one of each unique type of heat pump on the project. The BAS contractor is to generate a point-by-point verification form for each unique heat pump and submit the form(s) to the Engineer for review before proceeding with BAS interfacing of the balance of the heat pumps.
2. Startup
   a. The unit shall operate on an occupied/unoccupied cycle as controlled from the BAS. Occupancy shall be predetermined by and programmed into the BAS.
   b. Provide a 5 minute (adjustable) time delay on compressor start during unoccupied mode to insure flow.
3. Supply Fan Control
   a. The supply fan speed shall be constant and set to the required CFM and cycle with heating and cooling mode.
4. Space Temperature Control
   a. BAS Contractor shall provide local wall mounted room thermostat with display of room temperature and setpoint (+/- 3 deg. F. adjustable from setpoint determined by BAS) and local occupant override feature (3 hours, adjustable thru BAS). Water source heat pump heating and cooling shall be controlled to maintain space temperature setpoint.
5. Cooling Control
   a. Cooling shall be controlled to maintain space temperature setpoint. On a call for cooling, the supply fan motor shall start, the 2-way condenser water control valve shall open, the reversing valve shall move to the cooling position and compressor(s) shall be staged on.
6. Heating Control
   a. Heating shall be controlled to maintain space temperature setpoint. On a call for heating, the supply fan motor shall start, the 2-way condenser water control valve shall open, the reversing valve(s) shall move to the heating position and compressor(s) shall be staged on.
7. Restart
   a. Provide automatic restart of system upon failure for 2 attempts (adjustable)
   b. After 2 attempts, alarm system and require manual reset.
8. Condensate Overflow
   a. Provide a high condensate sensor in the condensate pan. Upon detection of high condensate in the condensate pan, shut down water source heat pump and alarm the BAS.
9. Unoccupied Mode
   a. During the unoccupied mode of operation, the heat pump shall go into night setback.
10. Night Setback/Shut Down
    a. At night setback/shutdown the heat pump shall go to fail safe position. Fail safe position is defined by the following: The supply fan is off, the compressor(s) are off. The supply fan shall cycle in conjunction with either the heating or cooling system to maintain a minimum/maximum space temperature depending on the season.

23T-045 - WATER SOURCE HEAT PUMP - DECOUPLED VENTILATION

SCALE: NONE

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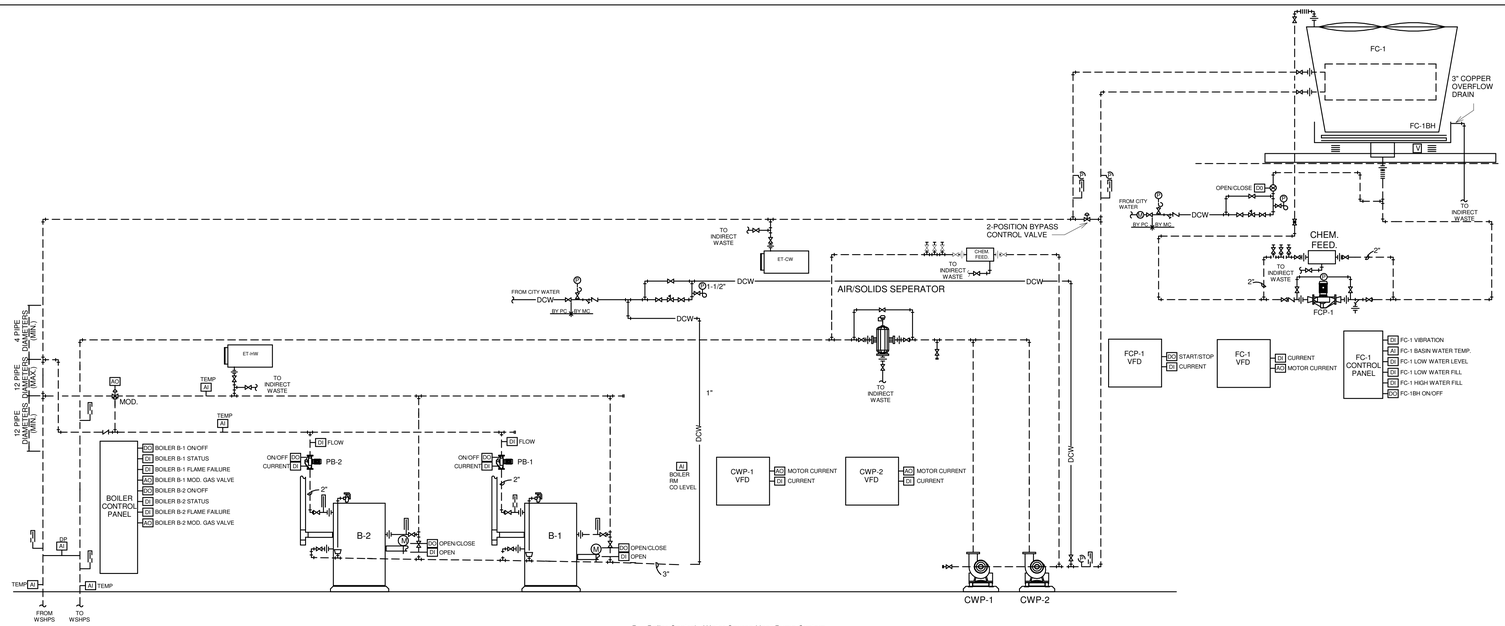
KLH PROJECT # 24166.02



1 HYDRONIC PIPING RISER DIAGRAM

SCALE: NONE

GENERAL NOTES:

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

KEYED MECHANICAL NOTES

1. PROVIDE SPLASH BLOCK.

SEQUENCE OF OPERATION

1.1 Pumps

A. Condenser Water - Closed Cell Cooling Tower Loop Pumps CTP-1

1. The fluid cooler pump shall be enabled via the DDC system when the CWR temperature reaches 85 degrees F (adjustable) or higher and run continuously at constant speed. The fluid cooler pump shall be disabled via the DDC system when the CWR temperature reaches 75 degrees F (adjustable) or lower.

B. Water Source Heat Pump - Loop Pumps CWP-1 and CWP-2

1. The lead condenser water pump shall be enabled via the DDC system and run continuously at variable speed. Provide a pressure differential pressure transducer in the piping system, located in the condenser water supply and return piping riser before the first branch piping takeoff to the first water source heat pump, that will modulate the VFD of the lead loop pump to maintain constant differential pressure setpoint.
2. The DDC controller shall alarm the system and automatically activate the stand-by pump when the lead pump fails after a 30 second time delay. Provide current sensors with a time delay function that, if flow is interrupted for more than thirty seconds, shall de-energize the lead pump and energize the stand-by pump. Provide lead/lag capability with BAS software to alternate the pump sequence based on pump run time (adjustable).

1.2 HVAC Plant

A. Fluid Cooler Control - Water Source Heat Pump System

1. The fluid cooler system consists of single cell cooling tower with variable frequency fan motor drive, fluid cooler loop pump and basin heater.
2. Cooling Mode:

a. Stage 1 Cooling: When the fluid cooler loop is enabled, the lead condenser water pump shall start and provide condenser water flow through the fluid cooler.
b. Stage 2 Cooling: As the condenser water return temperature increases to 95 degrees F (adjustable) and the HPWR temperature increases to 100 degrees F (adjustable), the cooling tower fan motor shall be energized at low speed and modulate to maintain condenser water return temperature of 95 degrees F (adjustable).

3. As the condenser water return and heat pump water return temperature decreases, the cooling tower fan motor and VFD shall modulate off. As the condenser water return temperature continues to decrease to 85 degrees F (adjustable) and the heat pump return water decreases to 90 degrees F (adjustable), the condenser water loop pump shall de-energize.
4. Makeup Water Control: Provide DDC solenoid valve. Upon detection of nominal low basin water level and the condenser water loop is enabled, solenoid valve shall open and fill the cooling tower basin. Upon detection of nominal high basin water level, solenoid valve shall close.
5. Cooling tower vibration: The cooling tower manufacturer shall provide a DDC cooling tower vibration sensor. Upon detection of excessive cooling tower operation vibration, the vibration sensor shall alarm the BAS and shutdown the cooling tower fan motor. Provide fan motor manual reset.
6. Low/High Basin Water Levels: Provide DDC low water level sensors in the cooling tower basin. Alarm BAS upon detection of low or high basin water levels.
7. Cooling Tower Electric Basin Heater(s): Provide a DDC basin water temperature sensor. Upon detection of low basin water temperature (40 degrees F adjustable), energize the cooling tower basin heater(s). Basin heater(s) shall energize only if low basin water level sensor has not alarmed the BAS. De-energize the basin heater(s) when basin water temperature can be maintained above setpoint for 10 minutes (adjustable).
8. Control and monitoring points shall include but not be limited to the following:

a. Condenser water return temperature (AI)
b. CT-1 fan motor current (AO)
c. CT-1 fan motor current (DI)
d. CT-1 nominal low basin water fill (DI)
e. CT-1 nominal high basin water fill (DI)
f. CT-1 makeup water solenoid valve open/close (DO)
g. CT-1 vibration (DI)
h. CT-1 low basin water level (DI)
i. CT-1 high basin water level (DI)
j. CT-1 basin water temperature (AI)
k. CT-1BH basin heater on/off (DO)

B. Boiler Control - Water Source Heat Pump System

1. The boilers will be fired to maintain the hot water supply temperature. A hot water supply temperature sensor shall fire the boilers through a controller. The BAS Contractor shall provide a control isolation valve in the supply piping for each boiler.
2. Provide modulating 3-way control valve between primary and secondary pumping systems. Valve shall modulate to maintain HPWS system water temperature.
3. Multiple Boilers: Boiler manufacturer shall provide staging and lead/lag control of boilers based on boiler run time.
4. The boiler loop shall be enabled via the DDC system when the HPWR temperature reaches 65 degrees F (adjustable) or lower. When the boiler loop is enabled, the lead boiler's hot water pump shall energize and be proven on via current sensor. Water flow through the lead boiler shall be proven via water flow switch. The lead boiler's combustion damper shall open and be proven open via damper actuator end switch. Boiler Room CO levels shall be below 100 ppm. The two position, three way heat exchanger bypass valve shall be closed to the heat exchanger and proven close via bypass valve actuator end switch.
5. When the boiler system is enabled and all safeties are satisfied, commence stage 1 heating.

a. Stage 1 heating: The lead boiler shall fire and modulate to maximum to maintain hot water supply temperature (180 degrees F, adjustable) prior to second boiler staging on.
b. Stage 2 heating: The second boiler shall be staged on when the lead boiler cannot maintain hot water supply temperature setpoint of 180 degrees F (adjustable) over a 10 minute (adjustable) period. The second boiler's hot water pump shall energize and be proven on via current sensor. Water flow through the second boiler shall be proven via water flow switch. The second boiler's combustion air damper shall open and be proven open via damper actuator end switch. Boiler Room CO levels shall be below 100 ppm.
c. Supply water temperature sensor shall be located downstream of all header connections of boilers near 3-way mixing valve.

6. The second boiler shall modulate down and then stage off when the hot water supply temperature setpoint (180 degrees F adjustable) can be met with one boiler, firing at maximum fire, over a 20 minute (adjustable) period.
7. The boiler loop shall be disabled via the DDC system when the HPWR temperature reaches 60 degrees F (adjustable) or higher. When the boiler loop is disabled, all boilers and boiler pumps shall de-energized. All boiler combustion air dampers shall close. The two position, HPHEV shall be open to the heat exchanger allowing condenser water to flow through the heat exchanger.
8. The 3-way modulating hot water control valve shall modulate to maintain HPWS temperature 55 degrees F, adjustable during heating mode).
9. Hot Water Return Temperature - Provide a temperature sensor in the hot water return piping main. When HWR temperature reaches 135 degrees F (adjustable) or lower, modulate the hot water bypass valve to the recirculating position until HWR temperature raises to 140 degrees F (adjustable).
10. Temperature Controls Contractor shall provide hard wire interlocks to the boiler control panel for the following:

a. "Remote Enable/Disable" for burner "Enable-Disable" control. When the remote signal closes for "Enable" the burner shall operate via its integral capacity controls to operate the burner. When the remote signal opens for "Disable" the burner shall commence an orderly shutdown."
b. "Call for Heat" signal to be used to activate the boiler's combustion air source. The "Call for Heat" signal shall come from a normally-open, non-powered contact in the boiler control panel.
c. "Combustion Air Proof" input signal to be used to allow sequenced firing of the burner to occur once combustion air availability is proven. Where combustion air dampers are specified.

11. ModBus Interface

a. BAS Contractor shall provide modbus interface for communication with boiler modbus points and DDC controls for new boilers.

12. Control and monitoring points shall include but not be limited to the following:

a. Boiler B-1 on/off (DO)
b. Boiler B-1 status (DI)
c. Boiler B-1 flame failure from boiler controls (DI)
d. Boiler B-1 modulating natural gas valve (AO)
e. Boiler B-1 water flow (DI)
f. Boiler B-1 Combustion air damper open/close (DO)
g. Boiler B-1 Combustion air damper open position (DI)
h. Pump PB-1 on/off (DO)
i. Pump PB-1 current (DI)
j. Boiler B-2 on/off (DO)
k. Boiler B-2 status (DI)
l. Boiler B-2 flame failure from boiler controls (DI)
m. Boiler B-2 modulating natural gas valve (AO)
n. Boiler B-2 water flow (AI)
o. Boiler B-2 Combustion air damper open/close (DO)
p. Boiler B-2 Combustion air damper open position (DI)
q. Pump PB-2 on/off (DO)
r. Pump PB-2 current (DI)
s. Hot Water modulating 3-Way Valve open/close (AO)
t. Hot water return temperature (AI)
u. Hot water supply temperature (AI)
v. HPWS temperature (AI)
w. HPWR temperature (AI)
x. HPHEV open/close (DO)
y. HPHEV open (DI)
z. Carbon monoxide sensor (AI)

13. Boiler Room Carbon Monoxide Sensor

a. Provide wall mounted carbon monoxide sensor in Boiler Room. Upon detection of carbon monoxide (100 ppm or greater, adjustable), boilers shall de-energize in an safe and orderly manner and BAS shall be alarmed. Provide manual boiler reset.

23T-050 - WSHP - FLUID COOLER, BOILERS, HEX

SCALE: NONE

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KLH PROJECT # 24166.02

HVAC WATER SOURCE HEAT PUMPS SCHEDULE - SHELL 2ND

Equipment shall be braced and labeled by the equipment manufacturer to withstand the minimum scheduled available fault current value for listed equipment.

EQUIPMENT MARK	DESCRIPTION	MANUFACTURER	MODEL	VOLTS	PHASE	CFM (cfm)	ESP (in WC)	NOMINAL TONS	MIN COP (COP)	ECWT CLG (Deg F)	LCWT CLG (Deg F)	ECWT HTG (Deg F)	LCWT HTG (Deg F)	COND GPM (gpm)	MIN EER (EER)	MAT CLG DB (Deg F)	MAT CLG WB (Deg F)	CLG MBH (mbh)	CLG SENS (mbh)	LAT CLG DB (Deg F)	LAT CLG WB (Deg F)	HTG MBH (mbh)	LAT HTG (Deg F)	FLA (amps)	MCA (amps)	OCP (amps)	AVAILABLE FAULT CURRENT
WSHP-2-1	CONCEALED HORIZONTAL WATER SOURCE HEAT PUMP	WATER FURNACE	UBH048	208	3	1635	0.5	4	4.9	85	97	65	53	9	13.0	76	65	46	33	55	54	58	87	21.3	24.7	35	
WSHP-2-2	CONCEALED HORIZONTAL WATER SOURCE HEAT PUMP	WATER FURNACE	UBH048	208	3	1635	0.5	4	4.9	85	97	65	53	9	13.0	76	65	46	33	55	54	58	87	21.3	24.7	35	
WSHP-2-3	CONCEALED HORIZONTAL WATER SOURCE HEAT PUMP	WATER FURNACE	UBH048	208	3	1635	0.5	4	4.9	85	97	65	53	9	13.0	76	65	46	33	55	54	58	87	21.3	24.7	35	
WSHP-2-4	CONCEALED HORIZONTAL WATER SOURCE HEAT PUMP	WATER FURNACE	UBH048	208	3	1635	0.5	4	4.9	85	97	65	53	9	13.0	76	65	46	33	55	54	58	87	21.3	24.7	35	
WSHP-2-5	CONCEALED HORIZONTAL WATER SOURCE HEAT PUMP	WATER FURNACE	UBH015	208	1	635	0.5	1.25	4.4	85	97	65	53	3	11.2	76	65	13	11	55	54	15	87	10	11.5	15	
WSHP-13	CONCEALED HORIZONTAL WATER SOURCE HEAT PUMP	WATER FURNACE	UBH048	208	3	1635	0.5	4	4.9	85	97	65	53	9	13.0	76	65	46	33	55	54	58	87	21.3	24.7	35	

HVAC BOILERS SCHEDULE

Equipment shall be braced and labeled by the equipment manufacturer to withstand the minimum scheduled available fault current value for listed equipment.

EQUIPMENT MARK	DESCRIPTION	LOCATION	STATUS	WEIGHT (lbs)	MANUFACTURER	MODEL	EMERGENCY	VOLTS	PHASE	HTG MBH (mbh)	HW EWT (Deg F)	HW LWT (Deg F)	HTG GPM (gpm)	MIN HTG AFUE	GAS HTG IN (mbh)	GAS HTG OUT (mbh)	MAX GAS PRESSURE (in WC)	MIN GAS PRESSURE (in WC)	FLA (amps)	OCP (amps)	SHEET NUMBER
B-1	CONDENSING BOILER	MECH 1301		2150	CAMUS	ARN-2500		208	3	2355	120	140	250	94.2	2500	2355	14	4	12	20	M3.13
B-2	CONDENSING BOILER	MECH 1301		2150	CAMUS	ARN-2500		208	3	2355	120	140	250	94.2	2500	2355	14	4	12	20	M3.13

HVAC COOLING TOWERS SCHEDULE

Equipment shall be braced and labeled by the equipment manufacturer to withstand the minimum scheduled available fault current value for listed equipment.

EQUIPMENT MARK	DESCRIPTION	WEIGHT (lbs)	MANUFACTURER	MODEL	VOLTS	PHASE	HEAD (ft)	FAN BHP (hp)	FAN HP (hp)	NOMINAL TONS	ECWT CLG (Deg F)	LCWT CLG (Deg F)	COND GPM (gpm)	MAT CLG DB (Deg F)	MAT CLG WB (Deg F)	CLG MBH (mbh)	HTG KW (kW)	FLA (amps)	MCA (amps)	OCP (amps)	AVAILABLE FAULT CURRENT	SHEET NUMBER
FC-1	CLOSED CIRCUIT COOLING TOWER (FLUID COOLER)	18204	MARLEY	MHF7105RLDANG	208	3	23.331	23.38	25	175	95	85	422	93	78	2100	7.5					M3.14

HVAC HYDRONIC PUMPS SCHEDULE

Equipment shall be braced and labeled by the equipment manufacturer to withstand the minimum scheduled available fault current value for listed equipment.

EQUIPMENT MARK	DESCRIPTION	LOCATION	WEIGHT (lbs)	MANUFACTURER	MODEL	VOLTS	PHASE	HEAD (ft)	FLOW (gpm)	PUMP (rpm)	BHP (hp)	HP (hp)	SHEET NUMBER
CWP-1	CLOSE COUPLED END SUCTION CENTRIFUGAL PUMP	MECH 1301	544	ARMSTRONG	4030	208	3	70	500	1800	10.65	15	M3.13
CWP-2	CLOSE COUPLED END SUCTION CENTRIFUGAL PUMP	MECH 1301	544	ARMSTRONG	4030	208	3	70	500	1800	10.65	15	M3.13
HWP-1	CLOSED COUPLED INLINE CENTRIFUGAL PUMP	MECHANICAL PENTHOUSE	279	ARMSTRONG	4380	208	3	25	250	1800	2.08	3	M3.13
HWP-2	CLOSED COUPLED INLINE CENTRIFUGAL PUMP	MECHANICAL PENTHOUSE	279	ARMSTRONG	4380	208	3	25	250	1800	2.08	3	M3.13

2

HVAC DIFFUSERS AND REGISTERS SCHEDULE

TAG	MANUFACTURER	MODEL	Size	MOUNTING	MATERIAL	FINISH	DAMPER TYPE	BORDER STYLE
ER-1	TITUS	350RL	6"x6"	CEILING	STEEL	STANDARD WHITE	OPPOSED BLADE	SURFACE MOUNT
ER-2	TITUS	350RL	4"x10"	CEILING	STEEL	STANDARD WHITE	OPPOSED BLADE	SURFACE MOUNT
RR-1	TITUS	300RLF1	20"x20"	CEILING	STEEL	STANDARD WHITE	OPPOSED BLADE	SURFACE MOUNT
RR-2	TITUS	300RLF1	18"x30"	SIDEWALL	STEEL	STANDARD WHITE	OPPOSED BLADE	SURFACE MOUNT
RR-3	TITUS	300RLF1	18"x12"	SIDEWALL	STEEL	STANDARD WHITE	OPPOSED BLADE	SURFACE MOUNT
SR-1	TITUS	301RL	10"x6"	SIDEWALL	STEEL	STANDARD WHITE	OPPOSED BLADE	SURFACE MOUNT
SR-2	TITUS	301RL	12"x8"	SIDEWALL	STEEL	STANDARD WHITE	OPPOSED BLADE	SURFACE MOUNT
SR-3	TITUS	301RL	12"x12"	SIDEWALL	STEEL	STANDARD WHITE	OPPOSED BLADE	SURFACE MOUNT
SR-4	TITUS	301RL	10"x6"	SIDEWALL	STEEL	STANDARD WHITE	OPPOSED BLADE	SURFACE MOUNT
SR-5	TITUS	301RL	10"x6"	CEILING	STEEL	STANDARD WHITE	OPPOSED BLADE	SURFACE MOUNT
TG-1	TITUS	350RL	12"x20"	SIDEWALL	STEEL	STANDARD WHITE	OPPOSED BLADE	SURFACE MOUNT
TG-2	TITUS	350RL	10"x18"	SIDEWALL	STEEL	STANDARD WHITE	OPPOSED BLADE	SURFACE MOUNT
TG-3	TITUS	350RL	18"x10"	SIDEWALL	STEEL	STANDARD WHITE	OPPOSED BLADE	SURFACE MOUNT

HVAC WATER SOURCE HEAT PUMPS SCHEDULE - TYPICAL FLOOR

Equipment shall be braced and labeled by the equipment manufacturer to withstand the minimum scheduled available fault current value for listed equipment.

EQUIPMENT MARK	DESCRIPTION	MANUFACTURER	MODEL	VOLTS	PHASE	CFM (cfm)	ESP (in WC)	NOMINAL TONS	MIN COP (COP)	ECWT CLG (Deg F)	LCWT CLG (Deg F)	ECWT HTG (Deg F)	LCWT HTG (Deg F)	COND GPM (gpm)	MIN EER (EER)	MAT CLG DB (Deg F)	MAT CLG WB (Deg F)	CLG MBH (mbh)	CLG SENS (mbh)	LAT CLG DB (Deg F)	LAT CLG WB (Deg F)	HTG MBH (mbh)	LAT HTG (Deg F)	FLA (amps)	MCA (amps)	OCP (amps)
WSHP-C	CONCEALED HORIZONTAL WATER SOURCE HEAT PUMP	WATER FURNACE	UBH024	208	1	740	0.5	2	4.8	85	97	65	53	4	12.5	76	65	15	15	55	54	10	87	17.6	21	30
WSHP-X01	CONCEALED HORIZONTAL WATER SOURCE HEAT PUMP	WATER FURNACE	UBH024	208	1	840	0.5	2	4.7	85	97	65	53	4	12.9	76	65	18	17	55	54	20	97	17.6	21	30
WSHP-X02	CONCEALED HORIZONTAL WATER SOURCE HEAT PUMP	WATER FURNACE	UBH030	208	1	1010	0.5	2.5	5	85	97	65	53	3	14.5	76	65	21	21	55	54	14	87	18.2	21.70	35
WSHP-X03	CONCEALED HORIZONTAL WATER SOURCE HEAT PUMP	WATER FURNACE	UBH015	208	1	520	0.5	1.25	4.5	85	97	65	53	6	11.4	76	65	11	11	55	54	7	87	10	11.5	15
WSHP-X04	CONCEALED HORIZONTAL WATER SOURCE HEAT PUMP	WATER FURNACE	UBH030	208	1	1010	0.5	2.5	5	85	97	65	53	3	14.5	76	65	21	21	55	54	14	87	18.2	21.70	35
WSHP-X05	CONCEALED HORIZONTAL WATER SOURCE HEAT PUMP	WATER FURNACE	UBH015	208	1	520	0.5	1.25	4.5	85	97	65	53	6	11.4	76	65	11	11	55	54	7	87	10	11.5	15
WSHP-X06	CONCEALED HORIZONTAL WATER SOURCE HEAT PUMP	WATER FURNACE	UBH030	208	1	1010	0.5	2.5	5	85	97	65	53	3	14.5	76	65	21	21	55	54	14	87	18.2	21.70	35
WSHP-X07	CONCEALED HORIZONTAL WATER SOURCE HEAT PUMP	WATER FURNACE	UBH024	208	1	840	0.5	2	4.7	85	97	65	53	4	12.9	76	65	18	17	55	54	18	94	17.60	21	30
WSHP-X08	CONCEALED HORIZONTAL WATER SOURCE HEAT PUMP	WATER FURNACE	UBH018	208	1	650	0.5	1.5	4.3	85	97	65	53	4	11.4	76	65	14	13	55	54	10	89	10.80	12.5	15
WSHP-X09	CONCEALED HORIZONTAL WATER SOURCE HEAT PUMP	WATER FURNACE	UBH042	208	1	1390	0.5	3.5	5.2	85	97	65	53	8	13.9	76	65	29	29	55	54	25	91	25.50	30	45

HVAC UNIT HEATERS SCHEDULE

Equipment shall be braced and labeled by the equipment manufacturer to withstand the minimum scheduled available fault current value for listed equipment.

EQUIPMENT MARK	DESCRIPTION	LOCATION	STATUS	WEIGHT (lbs)	MANUFACTURER	MODEL	EMERGENCY	VOLTS	PHASE	HTG KW (kW)	SHEET NUMBER
UH-1	CABINET UNIT HEATER	NORTH INACTIVE ROOM			QMARK	IUH-1020		208	3	10	
UH-2	CABINET UNIT HEATER	NORTH INACTIVE ROOM			QMARK	IUH-1020		208	3	10	
UH-3	CABINET UNIT HEATER	NORTH INACTIVE ROOM			QMARK	IUH-1020		208	3	10	
UH-4	CABINET UNIT HEATER	NORTH INACTIVE ROOM			QMARK	IUH-1020		208	3	10	
UH-5	CABINET UNIT HEATER	SOUTH INACTIVE ROOM			QMARK	IUH-1020		208	3	10	
UH-6	CABINET UNIT HEATER	SOUTH INACTIVE ROOM			QMARK	IUH-1020		208	3	10	
UH-7	CABINET UNIT HEATER	MECHANICAL ROOM			QMARK	IUH-1020		208	3	10	
UH-8	CABINET UNIT HEATER	ELEVATOR MACHINE ROO			QMARK	IUH-1020		208	3	10	
UH-9	CABINET UNIT HEATER	ELEVATOR MACHINE ROO			QMARK	IUH-1020		208	3	10	

HVAC LOAD SCHEDULE

THE HEATING AND COOLING LOAD CALCULATIONS ARE BASED ON THE CLTD/CLF (COOLING LOAD TEMPERATURE DIFFERENCE/COOLING LOAD FACTOR) METHOD. ASSUMPTIONS AND EXECUTION OF THESE METHODS ARE PER ASHRAE 183-2007...

HVAC LOADS

COOLING LOAD BREAKDOWN

- CROOF SENSIBLE HEAT GAIN FROM ROOF
- CWALL SENSIBLE HEAT GAIN FROM EXTERIOR WALLS
- CPART SENSIBLE HEAT GAIN FROM PARITIONS
- CGLASS SENSIBLE HEAT GAIN FROM GLAZING
- CSOLAR SENSIBLE HEAT GAIN FROM SOLAR GAIN THROGH GLAZING
- CLIGHTS SENSIBLE HEAT GAIN FROM INTERIOR LIGHTING
- CEQUIP SENSIBLE HEAT GAIN FROM PLUG LOADS, COMPUTERS, ETC.
- CPSENS SENSIBLE HEAT GAIN FROM PEOPLE
- CSSENS TOTAL SENSIBLE HEAT GAIN TO SPACE
- CFAN SENSIBLE HEAT GAIN FROM AIR HANDLER FAN
- COAS SENSIBLE HEAT GAIN FROM OUTDOOR VENTILATION AIR
- CTSENS TOTAL SENSIBLE HEAT GAIN
- CPLAT LATENT HEAT GAIN FROM PEOPLE
- COAL LATENT HEAT GAIN FROM OUTDOOR VENTILATION AIR
- CTLAT TOTAL LATENT HEAT GAIN
- CTOT TOTAL HEAT GAIN (SENSIBLE + LATENT)

HEATING LOAD BREAKDOWN

- HROOF HEAT LOSS FROM ROOF
- HWALL HEAT LOSS FROM EXTERIOR WALLS
- HPART HEAT LOSS FROM PARTITIONS
- HGLASS HEAT LOSS FROM GLAZING
- HSLAB HEAT LOSS FROM SLAB
- HSPACE TOTAL HEAT LOSS FROM SPACE
- HOA HEAT LOSS FROM OUTDOOR VENTILATION AIR
- HTOT TOTAL HEAT LOSS

EQUIPMENT MARK	CROOF	CWALL	CPART	CGLASS	CSOLAR	CLIGHTS	CEQUIP	CPSENS	CSSENS	CFAN	COAS	CTSENS	CPLAT	COAL	CTLAT	CTOT	HROOF	HWALL	HPART	HGLASS	HSLAB	HSPACE	HOA	HTOT
WSHP-C	0	0.2	0	2	5.5	7	0	0	14.8	0.5	0	15.3	0	0	0	15.3	0	0.6	0	9.5	0	10.2	0	10.2
WSHP-C	0	0.2	0	2	5.5	7	0	0	14.8	0.5	0	15.3	0	0	0	15.3	0	0.6	0	9.5	0	10.2	0	10.2
WSHP-C	0	0.2	0	2	5.5	7	0	0	14.8	0.5	0	15.3	0	0	0	15.3	0	0.6	0	9.5	0	10.2	0	10.2
WSHP-X01	0	0.4	0	4	8.6	2.3	1.1	0.4	17.2	0.5	0	17.3	0.4	0	0.4	17.7	0	1.5	0	19	0	20.6	0	20.6
WSHP-X01	0	0.4	0	4	8.6	2.3	1.1	0.4	17.2	0.5	0	17.3	0.4	0	0.4	17.7	0	1.5	0	19	0	20.6	0	20.6
WSHP-X01	0	0.4	0	4	8.6	2.3	1.1	0.4	17.2	0.5	0	17.3	0.4	0	0.4	17.7	0	1.5	0	19	0	20.6	0	20.6
WSHP-X02	0	0.3	0	2.7	10.3	3.6	1.8	0.7	19.7	0.6	0	20.8	0.6	0	0.6	21.4	0	1.2	0	12.7	0	13.9	0	13.9
WSHP-X02	0	0.3	0	2.7	10.3	3.6	1.8	0.7	19.7	0.6	0	20.8	0.6	0	0.6	21.4	0	1.2	0	12.7	0	13.9	0	13.9
WSHP-X02	0	0.3	0	2.7	10.3	3.6	1.8	0.7	19.7	0.6	0	20.8	0.6	0	0.6	21.4	0	1.2	0	12.7	0	13.9	0	13.9
WSHP-X03	0	0.1	0	1.3	5.1	2.4	1.1	0.4	10.8	0.3	0	10.8	0.4	0	0.4	11.2	0	0.6	0	6.3	0	6.9	0	6.9
WSHP-X03	0	0.1	0	1.3	5.1	2.4	1.1	0.4	10.8	0.3	0	10.8	0.4	0	0.4	11.2	0	0.6	0	6.3	0	6.9	0	6.9
WSHP-X03	0	0.1	0	1.3	5.1	2.4	1.1	0.4	10.8	0.3	0	10.8	0.4	0	0.4	11.2	0	0.6	0	6.3	0	6.9	0	6.9
WSHP-X04	0	0.3	0	2.7	10.3	3.6	1.8	0.7	19.7	0.6	0	20.8	0.6	0	0.6	21.4	0	1.2	0	12.7	0	13.9	0	13.9
WSHP-X04	0	0.3	0	2.7	10.3	3.6	1.8	0.7	19.7	0.6	0	20.8	0.6	0	0.6	21.4	0	1.2	0	12.7	0	13.9	0	13.9
WSHP-X04	0	0.3	0	2.7	10.3	3.6	1.8	0.7	19.7	0.6	0	20.8	0.6	0	0.6	21.4	0	1.2	0	12.7	0	13.9	0	13.9
WSHP-X05	0	0.1	0	1.3	5.1	2.4	1.1	0.4	10.8	0.3	0	10.8	0.4	0	0.4	11.2	0	0.6	0	6.3	0	6.9	0	6.9
WSHP-X05	0	0.1	0	1.3	5.1	2.4	1.1	0.4	10.8	0.3	0	10.8	0.4	0	0.4	11.2	0	0.6	0	6.3	0	6.9	0	6.9
WSHP-X05	0	0.1	0	1.3	5.1	2.4	1.1	0.4	10.8	0.3	0	10.8	0.4	0	0.4	11.2	0	0.6	0	6.3	0	6.9	0	6.9
WSHP-X06	0	0.3	0	2.7	10.3	3.6	1.8	0.7	19.7	0.6	0	20.8	0.6	0	0.6	21.4	0	1.2	0	12.7	0	13.9	0	13.9
WSHP-X06	0	0.3	0	2.7	10.3	3.6	1.8	0.7	19.7	0.6	0	20.8	0.6	0	0.6	21.4	0	1.2	0	12.7	0	13.9	0	13.9
WSHP-X06	0	0.3	0	2.7	10.3	3.6	1.8	0.7	19.7	0.6	0	20.8	0.6	0	0.6	21.4	0	1.2	0	12.7	0	13.9	0	13.9
WSHP-X07	0	0.4	0	3.4	8.7	2.1	1.1	0.4	16.3	0.5	0	17.3	0.4	0	0.4	17.7	0	1.5	0	15.9	0	17.4	0	17.4
WSHP-X07	0	0.4	0	3.4	8.7	2.1	1.1	0.4	16.3	0.5	0	17.3	0.4	0	0.4	17.7	0	1.5	0	15.9	0	17.4	0	17.4
WSHP-X07	0	0.4	0	3.4	8.7	2.1	1.1	0.4	16.3	0.5	0	17.3	0.4	0	0.4	17.7	0	1.5	0	15.9	0	17.4	0	17.4
WSHP-X08	0	0.2	0	2	6.9	2.3	1.1	0.4	13.3	0.4	0	13.4	0.4	0	0.4	13.8	0	0.9	0	9.5	0	10.4	0	10.4
WSHP-X08	0	0.2	0	2	6.9	2.3	1.1	0.4	13.3	0.4	0	13.4	0.4	0	0.4	13.8	0	0.9	0	9.5	0	10.4	0	10.4
WSHP-X08	0	0.2	0	2	6.9	2.3	1.1	0.4	13.3	0.4	0	13.4	0.4	0	0.4	13.8	0	0.9	0	9.5	0	10.4	0	10.4
WSHP-X09	0	0.8	0	4.7	16.2	3.7	1.8	0.7	28.2	0.9	0	28.8	0.6	0	0.6	29.4	0	2.9	0	22.2	0	25.1	0	25.1
WSHP-X09	0	0.8	0	4.7	16.2	3.7	1.8	0.7	28.2	0.9	0	28.8	0.6	0	0.6	29.4	0	2.9	0	22.2	0	25.1	0	25.1
WSHP-X09	0	0.8	0	4.7	16.2	3.7	1.8	0.7	28.2	0.9	0	28.8	0.6	0	0.6	29.4	0	2.9	0	22.2	0	25.1	0	25.1

HVAC ENERGY RECOVERY UNITS SCHEDULE

Equipment shall be braced and labeled by the equipment manufacturer to withstand the minimum scheduled available fault current value for listed equipment.

EQUIPMENT MARK	DESCRIPTION	MANUFACTURER	MODEL	VOLTS	PHASE	OACFM (cfm)	OA ESP (in WC)	OA HP (hp)	EA CFM (cfm)	EA ESP (in WC)	EA HP (hp)	MIN COP (COP)	OA EAT DB (Deg F)	OA EAT WB (Deg F)	OA LAT DB (Deg F)	OA LAT WB (Deg F)	EA EAT DB (Deg F)	EA EAT WB (Deg F)	EA LAT DB (Deg F)	EA LAT WB (Deg F)	CLG MBH (mbh)	CLG SENS (mbh)	LAT CLG DB (Deg F)	HTG MBH (mbh)	LAT HTG (Deg F)	MCA (amps)	OCP (amps)
ERV-1	PACKAGED AIR TO AIR ENERGY RECOVERY EQUIPMENT	ADDISON	PROW240C0A2DDBGAF1B6	208	3	5500	2	7.5	3000	1.5	2	4.2	93	75	85	71	75	63	91.5	75.3	337	197	70	306	70	104	125

HVAC LOUVER SCHEDULE

TAG	DESCRIPTION	MANUFACTURER	MODEL	FACE SIZE	FREE AREA	AIRFLOW	MAX PRESSURE DROP (in. w.g.)	MATERIAL	FINISH
L-1	INTAKE LOUVER	POTTORFF		42"x72"	11.00 SF	5500 CFM	0.1	ALUMINUM	BLACK FINISH G.C. TO FIELD PAINT TO MATCH CEILING OR WALLS
L-2	EXHAUST LOUVER	POTTORFF		42"x72"	11.00 SF	3000 CFM	0.1	ALUMINUM	BLACK FINISH G.C. TO FIELD PAINT TO MATCH CEILING OR WALLS

HVAC HYDRONIC ACCESSORIES SCHEDULE

EQUIPMENT MARK	Weight	DESCRIPTION	LOCATION	STATUS	MANUFACTURER	MODEL	STORAGE (Gal)	SHEET NUMBER
DAS-1	550	DIRT & AIR SEPARATOR	MECHANICAL PENTHOUSE		ARMSTRONG	DAS-6-R	21	M3.13
ET-CW	150	EXPANSION TANK	MECHANICAL PENTHOUSE		ARMSTRONG	50-L	13	M3.13
ET-HW	150	EXPANSION TANK	MECHANICAL PENTHOUSE		ARMSTRONG	50-L	13	M3.13

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2	OWNER COMMENTS	03.17.23

MECHANICAL - SCHEDULES

M6.00

KLH PROJECT # 24166.02

HVAC ELECTRICAL COORDINATION SCHEDULE

ABBREVIATIONS

- DC — LOCAL DISCONNECT
- MC — MOTOR CONTROL (POWER)
- SD — DUCT SMOKE DETECTOR
- CN — CONTROLS
- TS — TOGGLE SWITCH
- C/B — H.A.C.R. CIRCUIT BREAKER AT SOURCE PANELBOARD
- FUSE — FUSE AT LOCAL DISCONNECT (VERIFY FIELD RATING)
- FLA — OPERATING FULL LOAD AMPS
- MCA — MINIMUM CIRCUIT AMPACITY
- CP — CORD AND PLUG CONNECTION

CONTRACTOR TYPE

- EC — ELECTRICAL CONTRACTOR
- EX — EXISTING
- FC — FIRE PROTECTION CONTRACTOR
- GC — GENERAL CONTRACTOR
- HC — HVAC CONTRACTOR
- MFR — MANUFACTURER
- PC — PLUMBING CONTRACTOR
- OR — OWNER OR OTHERS

MOTOR CONTROL TYPE

- CS — COMBINATION STARTER
- MCC — MOTOR CONTROL STARTER
- MG — MAGNETIC STARTER OR CONTACT
- MS — MANUAL STARTER
- VFD — VARIABLE FREQUENCY DRIVE
- MSR — MANUAL STARTER W/ CONTROL RELAY
- OV — OVERCURRENT PROTECTION

CONTROL TYPE

- TC — TIMECLOCK
- CPT — CONTROL POWER TRANSFORMER
- BAS — BUILDING AUTOMATION SYSTEM
- LOW — LOW VOLTAGE CONTROLS
- LINE — LINE VOLTAGE CONTROLS
- RLINE — REVERSE ACTING LINE VOLTAGE THERMOSTAT
- MAN — MANUAL
- FA — FIRE ALARM
- CO — CARBON MONOXIDE SENSOR
- INT — INTEGRAL TO EQUIPMENT
- ASD — AREA SMOKE DETECTOR
- DSD — DUCT SMOKE DETECTOR

CONNECTION MARK	DESCRIPTION	VOLTS (V)	PHASE	EMERGENCY	BHP (HP)	HP (HP)	HTG (kW)	WATTS	FLA (A)	MCA (A)	OCP (A)	FED FROM	DC TYPE	DC FURN	DC INST	DC WIRE	MC TYPE	MC FURN	MC INST	MC WIRE	CN TYPE	CN FURN	CN INST	CN WIRE	FA SHUTDOWN	AVAILABLE FAULT CURRENT (A)
B-1	CONDENSING BOILER	208	3						12		20			EC	EC	EC	MG	MFR	MFR	MFR	BAS	HC	HC	HC		
B-2	CONDENSING BOILER	208	3						12		20			EC	EC	EC	MG	MFR	MFR	MFR	BAS	HC	HC	HC		
CWP-1	CLOSE COUPLED END SUCTION CENTRIFUGAL PUMP	208	3		10.65	15								EC	EC	EC	VFD	MC	EC	EC	BAS	HC	HC	HC		
CWP-2	CLOSE COUPLED END SUCTION CENTRIFUGAL PUMP	208	3		10.65	15								EC	EC	EC	VFD	MC	EC	EC	BAS	HC	HC	HC		
ERV-1	PACKAGED AIR TO AIR ENERGY RECOVERY EQUIPMENT	208	3		4.6				95.69	104	125			EC	EC	EC	VFD	MFR	MFR	MFR	BAS	HC	HC	HC	DUCT SMOKE	
FC-1	CLOSED CIRCUIT COOLING TOWER (FLUID COOLER)	208	3		23.38	25	7.5							EC	EC	EC	VFD	MFR	MFR	MFR	BAS	HC	HC	HC		
HWP-1	CLOSED COUPLED INLINE CENTRIFUGAL PUMP	208	3		2.08	3								EC	EC	EC	VFD	MC	EC	EC	BAS	HC	HC	HC		
HWP-2	CLOSED COUPLED INLINE CENTRIFUGAL PUMP	208	3		2.08	3								EC	EC	EC	VFD	MC	EC	EC	BAS	HC	HC	HC		
UH-1	CABINET UNIT HEATER	208	3				10		27.6					EC	EC	EC	MG	MFR	MFR	MFR	LINE	HC	EC	EC		
UH-2	CABINET UNIT HEATER	208	3				10		27.6					EC	EC	EC	MG	MFR	MFR	MFR	LINE	HC	EC	EC		
UH-3	CABINET UNIT HEATER	208	3				10		27.6					EC	EC	EC	MG	MFR	MFR	MFR	LINE	HC	EC	EC		
UH-4	CABINET UNIT HEATER	208	3				10		27.6					EC	EC	EC	MG	MFR	MFR	MFR	LINE	HC	EC	EC		
UH-5	CABINET UNIT HEATER	208	3				10		27.6					EC	EC	EC	MG	MFR	MFR	MFR	LINE	HC	EC	EC		
UH-6	CABINET UNIT HEATER	208	3				10		27.6					EC	EC	EC	MG	MFR	MFR	MFR	LINE	HC	EC	EC		
UH-7	CABINET UNIT HEATER	208	3				10		27.6					EC	EC	EC	MG	MFR	MFR	MFR	LINE	HC	EC	EC		
UH-8	CABINET UNIT HEATER	208	3				10		27.6					EC	EC	EC	MG	MFR	MFR	MFR	LINE	HC	EC	EC		
UH-9	CABINET UNIT HEATER	208	3				10		27.6					EC	EC	EC	MG	MFR	MFR	MFR	LINE	HC	EC	EC		
VFD-BP1	VARIABLE FREQUENCY DRIVE	208	3			5			16.7					EC	EC	EC	---	---	---	---	BAS	HC	HC	HC		
VFD-BP2	VARIABLE FREQUENCY DRIVE	208	3			5			16.7					EC	EC	EC	---	---	---	---	BAS	HC	HC	HC		
VFD-CWP1	VARIABLE FREQUENCY DRIVE	208	3			15			46.2					EC	EC	EC	---	---	---	---	BAS	HC	HC	HC		
VFD-CWP2	VARIABLE FREQUENCY DRIVE	208	3			15			46.2					EC	EC	EC	---	---	---	---	BAS	HC	HC	HC		
VFD-FC1	VARIABLE FREQUENCY DRIVE	208	3			25			74.8					EC	EC	EC	---	---	---	---	BAS	HC	HC	HC		
WSHP-2-1	CONCEALED HORIZONTAL WATER SOURCE HEAT PUMP	208	3			1			21.3	24.7	35			EC	EC	EC	MG	MFR	MFR	MFR	LOW	MFR	MFR	MFR		
WSHP-2-2	CONCEALED HORIZONTAL WATER SOURCE HEAT PUMP	208	3			1			21.3	24.7	35			EC	EC	EC	MG	MFR	MFR	MFR	LOW	MFR	MFR	MFR		
WSHP-2-3	CONCEALED HORIZONTAL WATER SOURCE HEAT PUMP	208	3			1			21.3	24.7	35			EC	EC	EC	MG	MFR	MFR	MFR	LOW	MFR	MFR	MFR		
WSHP-2-4	CONCEALED HORIZONTAL WATER SOURCE HEAT PUMP	208	3			1			21.3	24.7	35			EC	EC	EC	MG	MFR	MFR	MFR	LOW	MFR	MFR	MFR		
WSHP-2-5	CONCEALED HORIZONTAL WATER SOURCE HEAT PUMP	208	1			.5			10	11.5	15			EC	EC	EC	MG	MFR	MFR	MFR	LOW	MFR	MFR	MFR		
WSHP-13	CONCEALED HORIZONTAL WATER SOURCE HEAT PUMP	208	3			1			21.3	24.7	35			EC	EC	EC	MG	MFR	MFR	MFR	LOW	MFR	MFR	MFR		
WSHP-C	CONCEALED HORIZONTAL WATER SOURCE HEAT PUMP	208	1			.5			17.6	21	30			EC	EC	EC	MG	MFR	MFR	MFR	LOW	MFR	MFR	MFR		
WSHP-C	CONCEALED HORIZONTAL WATER SOURCE HEAT PUMP	208	1			.5			17.6	21	30			EC	EC	EC	MG	MFR	MFR	MFR	LOW	MFR	MFR	MFR		
WSHP-C	CONCEALED HORIZONTAL WATER SOURCE HEAT PUMP	208	1			.5			17.6	21	30			EC	EC	EC	MG	MFR	MFR	MFR	LOW	MFR	MFR	MFR		
WSHP-X01	CONCEALED HORIZONTAL WATER SOURCE HEAT PUMP	208	1			.5			17.6	21	30			EC	EC	EC	MG	MFR	MFR	MFR	LOW	MFR	MFR	MFR		
WSHP-X01	CONCEALED HORIZONTAL WATER SOURCE HEAT PUMP	208	1			.5			17.6	21	30			EC	EC	EC	MG	MFR	MFR	MFR	LOW	MFR	MFR	MFR		
WSHP-X01	CONCEALED HORIZONTAL WATER SOURCE HEAT PUMP	208	1			.5			17.6	21	30			EC	EC	EC	MG	MFR	MFR	MFR	LOW	MFR	MFR	MFR		
WSHP-X02	CONCEALED HORIZONTAL WATER SOURCE HEAT PUMP	208	1			.5			18.2	21.70	35			EC	EC	EC	MG	MFR	MFR	MFR	LOW	MFR	MFR	MFR		
WSHP-X02	CONCEALED HORIZONTAL WATER SOURCE HEAT PUMP	208	1			.5			18.2	21.70	35			EC	EC	EC	MG	MFR	MFR	MFR	LOW	MFR	MFR	MFR		
WSHP-X02	CONCEALED HORIZONTAL WATER SOURCE HEAT PUMP	208	1			.5			18.2	21.70	35			EC	EC	EC	MG	MFR	MFR	MFR	LOW	MFR	MFR	MFR		
WSHP-X03	CONCEALED HORIZONTAL WATER SOURCE HEAT PUMP	208	1			.5			10	11.5	15			EC	EC	EC	MG	MFR	MFR	MFR	LOW	MFR	MFR	MFR		
WSHP-X03	CONCEALED HORIZONTAL WATER SOURCE HEAT PUMP	208	1			.5			10	11.5	15			EC	EC	EC	MG	MFR	MFR	MFR	LOW	MFR	MFR	MFR		
WSHP-X03	CONCEALED HORIZONTAL WATER SOURCE HEAT PUMP	208	1			.5			10	11.5	15			EC	EC	EC	MG	MFR	MFR	MFR	LOW	MFR	MFR	MFR		
WSHP-X04	CONCEALED HORIZONTAL WATER SOURCE HEAT PUMP	208	1			.5			18.2	21.7	35			EC	EC	EC	MG	MFR	MFR	MFR	LOW	MFR	MFR	MFR		
WSHP-X04	CONCEALED HORIZONTAL WATER SOURCE HEAT PUMP	208	1			.5			18.2	21.7	35			EC	EC	EC	MG	MFR	MFR	MFR	LOW	MFR	MFR	MFR		
WSHP-X04	CONCEALED HORIZONTAL WATER SOURCE HEAT PUMP	208	1			.5			18.2	21.7	35			EC	EC	EC	MG	MFR	MFR	MFR	LOW	MFR	MFR	MFR		
WSHP-X05	CONCEALED HORIZONTAL WATER SOURCE HEAT PUMP	208	1			.5			10	11.5	15			EC	EC	EC	MG	MFR	MFR	MFR	LOW	MFR	MFR	MFR		
WSHP-X05	CONCEALED HORIZONTAL WATER SOURCE HEAT PUMP	208	1			.5			10	11.5	15			EC	EC	EC	MG	MFR	MFR	MFR	LOW	MFR	MFR	MFR		
WSHP-X05	CONCEALED HORIZONTAL WATER SOURCE HEAT PUMP	208	1			.5			10	11.5	15			EC	EC	EC	MG	MFR	MFR	MFR	LOW	MFR	MFR	MFR		
WSHP-X06	CONCEALED HORIZONTAL WATER SOURCE HEAT PUMP	208	1			.5			18.20	21.7	35			EC	EC	EC	MG	MFR	MFR	MFR	LOW	MFR	MFR	MFR		
WSHP-X06	CONCEALED HORIZONTAL WATER SOURCE HEAT PUMP	208	1			.5			18.20	21.7	35			EC	EC	EC	MG	MFR	MFR	MFR	LOW	MFR	MFR	MFR		
WSHP-X06	CONCEALED HORIZONTAL WATER SOURCE HEAT PUMP	208	1			.5			18.20	21.7	35			EC	EC	EC	MG	MFR	MFR	MFR	LOW	MFR	MFR	MFR		
WSHP-X07	CONCEALED HORIZONTAL WATER SOURCE HEAT PUMP	208	1			.5			17.60	21	30			EC	EC	EC	MG	MFR	MFR	MFR	LOW	MFR	MFR	MFR		
WSHP-X07	CONCEALED HORIZONTAL WATER SOURCE HEAT PUMP	208	1			.5			17.60	21	30			EC	EC	EC	MG	MFR	MFR	MFR	LOW	MFR	MFR	MFR		
WSHP-X07	CONCEALED HORIZONTAL WATER SOURCE HEAT PUMP	208	1			.5			17.60	21	30			EC	EC	EC	MG	MFR	MFR	MFR	LOW	MFR	MFR	MFR		
WSHP-X08	CONCEALED HORIZONTAL WATER SOURCE HEAT PUMP	208	1			.5			10.80	12.5	15			EC	EC	EC	MG	MFR	MFR	MFR	LOW	MFR	MFR	MFR		
WSHP-X08	CONCEALED HORIZONTAL WATER SOURCE HEAT PUMP	208	1			.5			10.80	12.5	15			EC	EC	EC	MG	MFR	MFR	MFR	LOW	MFR	MFR	MFR		
WSHP-X08	CONCEALED HORIZONTAL WATER SOURCE HEAT PUMP	208	1			.5			10.80	12.5	15			EC	EC	EC	MG	MFR	MFR	MFR	LOW	MFR	MFR	MFR		
WSHP-X09	CONCEALED HORIZONTAL WATER SOURCE HEAT PUMP	208	1			1			25.50	30	45			EC	EC	EC	MG	MFR	MFR	MFR	LOW	MFR	MFR	MFR		
WSHP-X09	CONCEALED HORIZONTAL WATER SOURCE HEAT PUMP	208	1			1			25.50	30	45			EC	EC	EC	MG	MFR	MFR	MFR	LOW	MFR	MFR	MFR		
WSHP-X09	CONCEALED HORIZONTAL WATER SOURCE HEAT PUMP	208	1			1			25.50	30	45			EC	EC	EC	MG	MFR	MFR	MFR	LOW	MFR	MFR	MFR		

HVAC VENTILATION SCHEDULE

NUMBER	NAME	AREA	AIR CHGS	OA CHGS	PEOPLE	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
200	TENANT	5477 SF	0	0	28	5	0.06	4153	12000	586	586	12000	0	0.0488	E	0	
201	TENANT	1388 SF	0	0	7	5	0.06	279	800	148	148	800	0	0.185	E	0	
301	STUDIO	420 SF	0	0	2	15	0	760	840	38	38	0	25	0.0452	P	0	
301A	RESTROOM	59 SF	0	0	0	0	0	0	0	0	0	0	30	0	N	0	
302	LIVING	405 SF	0	0	1	15	0	471	560	19	19	0	60	0.0339	P	0	
302A	RESTROOM	82 SF	0	0	0	0	0	0	0	0	0	0	30	0	N	0	
302B	1 BDRM	152 SF	0	0	2	15	0	371	450	38	38	0	0	0.0844	P	0	
303	STUDIO	412 SF	0	0	2	15	0	475	520	38	38	0	25	0.073	P	0	
303A	RESTROOM	49 SF	0	0	0	0	0	0	0	0	0	0	30	0	N	0	
304	LIVING	406 SF	0	0	1	15	0	471	560	19	19	0	60	0.0339	P	0	
304A	RESTROOM	82 SF	0	0	0	0	0	0	0	0	0	0	30	0	N	0	
304B	1 BDRM	152 SF	0	0	2	15	0	371	450	38	38	0	0	0.0844	P	0	
305	STUDIO	412 SF	0	0	2	15	0	475	520	38	38	0	25	0.073	P	0	
305A	RESTROOM	49 SF	0	0	0	0	0	0	0	0	0	0	30	0	N	0	
306	LIVING	398 SF	0	0	1	15	0	550	560	19	19	0	60	0.0339	P	0	
306A	RESTROOM	81 SF	0	0	0	0	0	0	0	0	0	0	30	0	N	0	
306B	1 BDRM	151 SF	0	0	2	15	0	433	450	38	38	0	0	0.0844	P	0	
307	STUDIO	248 SF	0	0	2	15	0	760	840	38	38	0	25	0.0452	P	0	
307A	RESTROOM	52 SF	0	0	0	0	0	0	0	0	0	0	30	0	N	0	
308	STUDIO	189 SF	0	0	2	15	0	633	650	38	38	0	25	0.0584	P	0	
308A	RESTROOM	91 SF	0	0	0	0	0	0	0	0	0	0	30	0	N	0	
309	LIVING	253 SF	0	0	1	15	0	680	800	19	19	0	60	0.0237	P	0	
309A	RESTROOM	97 SF	0	0	0	0	0	0	0	0	0	0	30	0	N	0	
309B	1 BDRM	170 SF	0	0	2	15	0	500	590	38	38	0	0	0.0644	P	0	
326	CORRIDOR	504 SF	0	0	0	0	0.06	455	550	70	70	550	0	0.1272	E	0	
327	CORRIDOR	170 SF	0	0	0	0	0.06	35	40	12	12	40	0	0.3	E	0	
328	CORRIDOR	251 SF	0	0	0	0	0.06	125	150	21	21	150	0	0.14	E	0	
1100	EXISTING LIBRARY	5806 SF	0	0	59	5	0.12	2642	16370	1498	1498	16370	0	0.0915	E	0	
1101	RESTROOM	53 SF	0	0	0	0	0	4	20	0	0	0	75	0	N	0	
1102	ELEVATOR LOBBY	304 SF	0	0	0	0	0	200	1240	0	0	1240	0	0	E	0	
1300	SHELL	1349 SF	0	0	0	0	0	0	270	0	0	270	0	0	E	0	
1301	MECH	911 SF	0	0	0	0	0	0	200	0	0	200	0	0	E	0	
1302	MECH	922 SF	0	0	0	0	0	0	180	0	0	180	0	0	E	0	
1400	STAIR	372 SF	0	0	0	0	0	0	30	0	0	30	0	0	E	0	
TOTAL		21917 SF															

STATE OF OHIO
KRIS T. SCHNITGEN
E-77432
REGISTERED
PROFESSIONAL ENGINEER
12/8/2022

KLH ENGINEERS
KOHRS LONNEMANN HEIL ENGINEERS, INC.
MECHANICAL/ELECTRICAL ENGINEERS
WWW.KLHENGRS.COM
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800-354-9783
859-442-8050
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LEXINGTON, KENTUCKY
LOUISVILLE, KENTUCKY
COLUMBUS, OHIO

MERCANTILE LIBRARY BUILDING
414 WALNUT STREET
CINCINNATI, OH 45202

modelgroup
DEVELOPMENT • CONSTRUCTION • MANAGEMENT

ISSUE LOG:

MECHANICAL - SCHEDULES

M6.01

KLH PROJECT # 24166.02

COM*check* Software Version 4.1.5.3
Mechanical Compliance Certificate

Project Information

Energy Code:	90.1 (2010) Standard
Project Title:	MERCANTILE LIBRARY
Location:	Cincinnati, Ohio
Climate Zone:	4a
Project Type:	Alteration

Construction Site:	Owner/Agent:	Designer/Contractor:
414 WALNUT STREET CINCINNATI, OH 45202		KLH Engineers 1538 Alexandria Pike Fort Thomas, KY 41075

Mechanical Systems List

Quantity System Type & Description

3 WSHP-(C, X01, X07)
Water Source Heat Pump
Heating Mode: Capacity = 25 kBtu/h,
Proposed Efficiency = 4.70 COP, Required Efficiency = 4.20 COP
Cooling Mode: Capacity = 24 kBtu/h,
Proposed Efficiency = 12.50 EER, Required Efficiency: 12.00 EER
Fan System: WSHP-024 -- Compliance (Motor nameplate HP method) : Passes

Fans:
FAN 024 Supply, Constant Volume, 855 CFM, 0.5 motor nameplate hp

SYSTEM VERIFICATION REQUIRED.

1 UH
Heating: 9 each - Unit Heater (UH), Electric, Capacity = 3 kBtu/h
No minimum efficiency requirement applies
Fan System: UH -- Compliance (Motor nameplate HP method) : Passes

Fans:
FAN UH Supply, Constant Volume, 1000 CFM, 0.1 motor nameplate hp

SYSTEM VERIFICATION REQUIRED.

3 WSHP-(X03, X05, 2-5)
Water Source Heat Pump
Heating Mode: Capacity = 15 kBtu/h,
Proposed Efficiency = 4.40 COP, Required Efficiency = 4.20 COP
Cooling Mode: Capacity = 15 kBtu/h,
Proposed Efficiency = 11.20 EER, Required Efficiency: 11.20 EER
Fan System: WSHP-015 -- Compliance (Motor nameplate HP method) : Passes

Fans:
FAN 015 Supply, Constant Volume, 635 CFM, 0.5 motor nameplate hp

SYSTEM VERIFICATION REQUIRED.

3 WSHP-(X02, X04, X06)
Water Source Heat Pump
Heating Mode: Capacity = 32 kBtu/h,
Proposed Efficiency = 5.00 COP, Required Efficiency = 4.20 COP

Quantity System Type & Description

Cooling Mode: Capacity = 30 kBtu/h,
Proposed Efficiency = 14.50 EER, Required Efficiency: 12.00 EER
Fan System: WSHP-030 -- Compliance (Motor nameplate HP method) : Passes

Fans:
FAN 030 Supply, Constant Volume, 1020 CFM, 0.5 motor nameplate hp

SYSTEM VERIFICATION REQUIRED.

1 WSHP-X08
Water Source Heat Pump
Heating Mode: Capacity = 19 kBtu/h,
Proposed Efficiency = 4.30 COP, Required Efficiency = 4.20 COP
Cooling Mode: Capacity = 18 kBtu/h,
Proposed Efficiency = 12.00 EER, Required Efficiency: 12.00 EER
Fan System: WSHP-018 -- Compliance (Motor nameplate HP method) : Passes

Fans:
FAN 018 Supply, Constant Volume, 750 CFM, 0.5 motor nameplate hp

SYSTEM VERIFICATION REQUIRED.

1 WSHP-X09
Water Source Heat Pump
Heating Mode: Capacity = 47 kBtu/h,
Proposed Efficiency = 5.20 COP, Required Efficiency = 4.20 COP
Cooling Mode: Capacity = 42 kBtu/h,
Proposed Efficiency = 13.90 EER, Required Efficiency: 12.00 EER
Fan System: WSHP-042 -- Compliance (Motor nameplate HP method) : Passes

Fans:
FAN 042 Supply, Constant Volume, 1460 CFM, 1.0 motor nameplate hp

SYSTEM VERIFICATION REQUIRED.

4 WSHP-2-(1, 2, 3, 4)
Water Source Heat Pump
Heating Mode: Capacity = 58 kBtu/h,
Proposed Efficiency = 4.90 COP, Required Efficiency = 4.20 COP
Cooling Mode: Capacity = 48 kBtu/h,
Proposed Efficiency = 13.00 EER, Required Efficiency: 12.00 EER
Fan System: WSHP-048 -- Compliance (Motor nameplate HP method) : Passes

Fans:
FAN 048 Supply, Constant Volume, 1635 CFM, 1.0 motor nameplate hp

SYSTEM VERIFICATION REQUIRED.

2 B-(1, 2)
Heating: Hot Water Boiler, Capacity 2355 kBtu/h, Gas, with Waterloop Heat Pump
Proposed Efficiency: 94.00 % Et, Required Efficiency: 80.00 % Et

PLANT COMPLIANCE REQUIRED.

Mechanical Compliance Statement

Compliance Statement: The proposed mechanical alteration project 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 COM*check* Version 4.1.5.3 and to comply with any applicable mandatory requirements listed in the Inspection Checklist.

Name - Title ____________ Signature ____________ Date ____________

COM*check* Software Version 4.1.5.3
Inspection Checklist

Energy Code: 90.1 (2010) Standard

Requirements: 100.0% were addressed directly in the COM*check* 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
4.2.2,6.4.4.2.1,6.7.2 [PR2][1]	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.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
4.2.2,8.4.1.1,8.4.1.2,8.7 [PR6][2]	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 connectors sized in accordance with approved plans and branch circuits sized for maximum drop of 3%.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.7.2.4 [PR5][1]	Detailed instructions for HVAC systems commissioning included on the plans or specifications for projects >=50,000 ft2.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.

Additional Comments/Assumptions:

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

Section # & Req.ID	Footing / Foundation Inspection	Complies?	Comments/Assumptions
6.4.3.8 [FO9][3]	Freeze protection and snow/ice melting system sensors for future connection to controls.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.

Additional Comments/Assumptions:

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

Section # & Req.ID	Mechanical Rough-In Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
6.4.1.4,6.4.1.5 [ME1][2]	HVAC equipment efficiency verified. Non-NAECA HVAC equipment labeled as meeting 90.1.	Efficiency:_____	Efficiency:_____	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Mechanical Systems list for values.*
6.4.3.4.1 [ME3][3]	Stair and elevator shaft vents have motorized dampers that automatically close.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.3.4.2, 6.4.3.4.3 [ME4][3]	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.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.3.4.5 [ME39][3]	Enclosed parking garage ventilation has automatic contaminant detection and capacity to stage or modulate fans to 50% or less of design capacity.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
6.4.3.4.4 [ME5][3]	Ventilation fans >0.75 hp have automatic controls to shut off fan when not required.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.3.9 [ME6][1]	Demand control ventilation provided for spaces >500 ft2 and >40 people/1000 ft2 occupant density and served by systems with air side economizer, auto modulating outside air damper control, or design airflow >3,000 cfm.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Systems with heat recovery.
6.4.3.10 [ME40][2]	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.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply. *See the Mechanical Systems list for values.*
6.4.3.10 [ME40][2]	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.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply. *See the Mechanical Systems list for values.*
6.4.3.10 [ME40][2]	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.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply. *See the Mechanical Systems list for values.*
6.4.3.10 [ME40][2]	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.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply. *See the Mechanical Systems list for values.*

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

Section # & Req.ID	Mechanical Rough-In Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
6.4.3.10 [ME40][2]	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.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply. *See the Mechanical Systems list for values.*
6.4.3.10 [ME40][2]	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.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply. *See the Mechanical Systems list for values.*
6.4.3.10 [ME40][2]	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.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply. *See the Mechanical Systems list for values.*
6.4.4.1.1 [ME7][3]	Insulation exposed to weather protected from damage. Insulation outside of the conditioned space and associated with cooling systems is vapor retardant.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.4.1.2 [ME8][2]	HVAC ducts and plenums insulated. Where ducts or plenums are installed in or under a slab, verification may need to occur during Foundation Inspection.	R-_____	R-_____	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.4.1.3 [ME9][2]	HVAC piping insulation thickness. Where piping is installed in or under a slab, verification may need to occur during Foundation Inspection.	_____ in.	_____ in.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.4.1.4 [ME41][3]	Thermally ineffective panel surfaces of sensible heating panels have insulation >= R-3.5.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.4.2.1 [ME10][2]	Ducts and plenums sealed based on static pressure and location.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.4.2.2 [ME11][3]	Ductwork operating >3 in. water column requires air leakage testing.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.4.2.2 [ME11][3]	Ductwork operating >3 in. water column requires air leakage testing.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
6.4.4.2.2 [ME11][3]	Ductwork operating >3 in. water column requires air leakage testing.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.4.2.2 [ME11][3]	Ductwork operating >3 in. water column requires air leakage testing.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.

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

Section # & Req.ID	Mechanical Rough-In Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
6.4.4.2.2 [ME11][3]	Ductwork operating >3 in. water column requires air leakage testing.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.4.2.2 [ME11][3]	Ductwork operating >3 in. water column requires air leakage testing.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.4.2.2 [ME11][3]	Ductwork operating >3 in. water column requires air leakage testing.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.5.2.2.1 [ME50][2]	Three-pipe hydronic systems using a common return for hot and chilled water are not used.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.5.2.3 [ME19][3]	Dehumidification controls provided to prevent reheating, recooling, mixing of hot and cold airstreams or concurrent heating and cooling of the same airstream.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.5.3.3 [ME42][3]	Multiple zone VAV systems with DDC of individual zone boxes have static pressure setpoint reset controls.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply. *See the Mechanical Systems list for values.*
6.5.3.3 [ME42][3]	Multiple zone VAV systems with DDC of individual zone boxes have static pressure setpoint reset controls.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply. *See the Mechanical Systems list for values.*
6.5.3.3 [ME42][3]	Multiple zone VAV systems with DDC of individual zone boxes have static pressure setpoint reset controls.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply. *See the Mechanical Systems list for values.*
6.5.3.3 [ME42][3]	Multiple zone VAV systems with DDC of individual zone boxes have static pressure setpoint reset controls.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply. *See the Mechanical Systems list for values.*
6.5.3.3 [ME42][3]	Multiple zone VAV systems with DDC of individual zone boxes have static pressure setpoint reset controls.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply. *See the Mechanical Systems list for values.*
6.5.3.3 [ME42][3]	Multiple zone VAV systems with DDC of individual zone boxes have static pressure setpoint reset controls.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply. *See the Mechanical Systems list for values.*
6.5.3.3 [ME42][3]	Multiple zone VAV systems with DDC of individual zone boxes have static pressure setpoint reset controls.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply. *See the Mechanical Systems list for values.*

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

Section # & Req.ID	Mechanical Rough-In Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
6.5.4.1 [ME25][3]	HVAC pumping systems >10 hp designed for variable fluid flow.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.5.4.3 [ME27][3]	Temperature reset by representative building loads in pumping systems >10 hp for chiller and boiler systems >300,000 Btu/h.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.5.4.4.1 [ME28][3]	Two-position automatic valve interlocked to shut off water flow when hydronic heat pump with pumping system >10 hp is off.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.5.4.4.2 [ME44][3]	Hydronic heat pumps and water-cooled unitary air conditioners with pump systems >5 hp have controls or devices to reduce pump motor demand.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.5.6.1 [ME56][1]	Exhaust air energy recovery on systems meeting Table 6.5.6.1.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.5.7.1.1 [ME32][2]	Kitchen hoods >5,000 cfm have make up air >=50% of exhaust air volume.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
6.5.7.1.2 [ME46][3]	Conditioned supply air to space with a kitchen hood shall not exceed the greater of a) supply flow required to meet space heating or cooling, or b) hood exhaust flow minus the available air transfer from available spaces.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
6.5.7.1.2 [ME46][3]	Conditioned supply air to space with a kitchen hood shall not exceed the greater of a) supply flow required to meet space heating or cooling, or b) hood exhaust flow minus the available air transfer from available spaces.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
6.5.7.1.2 [ME46][3]	Conditioned supply air to space with a kitchen hood shall not exceed the greater of a) supply flow required to meet space heating or cooling, or b) hood exhaust flow minus the available air transfer from available spaces.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
6.5.7.1.2 [ME46][3]	Conditioned supply air to space with a kitchen hood shall not exceed the greater of a) supply flow required to meet space heating or cooling, or b) hood exhaust flow minus the available air transfer from available spaces.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.

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

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MECHANICAL COMPLIANCE

M6.02

KLH PROJECT # 24166.02

Section # & Req.ID	Mechanical Rough-In Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
6.5.7.1.2 [ME46][3]	Conditioned supply air to space with a kitchen hood shall not exceed the greater of a) supply flow required to meet space heating or cooling, or b) hood exhaust flow minus the available air transfer from available spaces.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
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6.5.7.1.5 [ME49][3]	Approved field test used to evaluate design air flow rates and demonstrate proper capture and containment of kitchen exhaust systems.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
6.5.7.2 [ME33][1]	Fume hoods exhaust systems >=15,000 cfm have VAV hood exhaust and supply systems, direct make-up air or heat recovery.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
6.5.8.1 [ME34][2]	Unenclosed spaces that are heated use only radiant heat.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.

Additional Comments/Assumptions:

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

Section # & Req.ID	Rough-In Electrical Inspection	Complies?	Comments/Assumptions
8.4.2 [EL10][2]	At least 50% of all 125 volt 15- and 20-Amp receptacles are controlled by an automatic control device.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
10.4.1 [EL9][2]	Electric motors meet requirements where applicable.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.

Additional Comments/Assumptions:

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

Section # & Req.ID	Final Inspection	Complies?	Comments/Assumptions
6.4.3.1.2 [FI3][3]	Thermostatic controls have a 5 °F deadband.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.3.2 [FI20][3]	Temperature controls have setpoint overlap restrictions.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.3.3.1 [FI21][3]	HVAC systems equipped with at least one automatic shutdown control.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.3.3.2 [FI22][3]	Setback controls allow automatic restart and temporary operation as required for maintenance.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.3.5 [FI5][3]	Heat pump controls prevent supplemental electric resistance heat from coming on when not needed.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.3.5 [FI5][3]	Heat pump controls prevent supplemental electric resistance heat from coming on when not needed.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
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6.4.3.5 [FI5][3]	Heat pump controls prevent supplemental electric resistance heat from coming on when not needed.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.3.7 [FI6][3]	When humidification and dehumidification are provided to a zone, simultaneous operation is prohibited.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.7.2.1 [FI7][3]	Furnished HVAC as-built drawings submitted within 90 days of system acceptance.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.7.2.2 [FI8][3]	Furnished O&M manuals for HVAC systems within 90 days of system acceptance.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.

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

Section # & Req.ID	Final Inspection	Complies?	Comments/Assumptions
6.7.2.3 [FI9][1]	An air and/or hydronic system balancing report is provided for HVAC systems serving zones >5,000 ft2 of conditioned area.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.7.2.4 [FI10][1]	HVAC control systems have been tested to ensure proper operation, calibration and adjustment of controls.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
10.4.3 [FI24][2]	Elevators are designed with the proper lighting, ventilation power, and standby mode.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.

Additional Comments/Assumptions:

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