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ABBREVIATIONS

Ø	ROUND	LVR	LOUVER
ABV	ABOVE	LWT	LEAVING WATER TEMPERATURE
AC	AIR CONDITIONING	M/A	MIXED AIR
ADD	ADDENDUM	MAX	MAXIMUM
AFF	ABOVE FINISHED FLOOR	MBH	ONE THOUSAND BTU PER HOUR
AFUE	ANNUAL FUEL UTILIZATION EFFICIENCY	MD	MOTORIZED DAMPER
ALT	ALTERNATE	MECH	MECHANICAL
AP	ACCESS PANEL	MFR	MANUFACTURER
ARCH	ARCHITECT/ARCHITECTURAL	MIN	MINIMUM
BFF	BELOW FINISHED FLOOR	MISC	MISCELLANEOUS
BLW	BELOW	MTR	MOTOR
BTU	BRITISH THERMAL UNITS	MU/A	MAKE-UP/AIR
BTUH	BRITISH THERMAL UNITS PER HOUR	NC	NOISE CRITERIA
CAP	CAPACITY	NC	NORMALLY CLOSED
CFM	CUBIC FEET PER MINUTE	NIC	NOT IN CONTRACT
CLG	CEILING	NO	NORMALLY OPEN
D	DEGREE	NTS	NOT TO SCALE
DB	DRY BULB	O/A	OUTSIDE AIR
DIA	DIAMETER	PD	PRESSURE DROP
DN	DOWN	PLBG	PLUMBING
EA	EACH	PRESS	PRESSURE
EAT	ENTERING AIR TEMPERATURE	PSI	POUNDS PER SQUARE INCH
ELEC	ELECTRICAL	PSIG	POUNDS PER SQUARE INCH GAUGE
EQUIP	EQUIPMENT	PWR	POWER
EWT	ENTERING WATER TEMPERATURE	R/A	RETURN AIR
E/A	EXHAUST AIR	RH	RELATIVE HUMIDITY
EXIST	EXISTING	RL/A	RELIEF AIR
F	DEGREES FAHRENHEIT	RM	REMAIN
FD	FIRE DAMPER	RPM	REVOLUTIONS PER MINUTE
FL	FLOOR	SF	SQUARE FOOT
FPM	FEET PER MINUTE	S/A	SUPPLY AIR
FT	FOOT/FEET	SF	SQUARE FOOT
GC	GENERAL CONTRACTOR	SD	SMOKE DAMPER
GPM	GALLONS PER MINUTE	SP	STATIC PRESSURE
HP	HORSE POWER	T	THERMOSTAT
HTG	HEATING	TD	TEMPERATURE DROP
HTR	HEATER	TEMP	TEMPERATURE
HW	HOT WATER	TYP	TYPICAL
IN	INCH	VAV	VARIABLE AIR VOLUME
LB	POUND	VENT	VENTILATION
LAT	LEAVING AIR TEMPERATURE	WB	WET BULB
LP	LOW PRESSURE		

EQUIPMENT ABBREVIATIONS

AC	AIR CONDITIONING UNIT	EWH	ELECTRIC WATER HEATER
ACC	AIR COOLED CONDENSER	FCU	FAN COIL UNIT
ACCU	AIR COOLING CONDENSING UNIT	FP	FIRE PUMP
AHU	AIR HANDLING UNIT	GI	GREASE INTERCEPTOR
AS	AIR SEPARATOR	GRV	GRAVITY ROOF VENTILATOR
B	BOILER	HWP	HEATING WATER PUMP
CH	CHILLER	HX	HEAT EXCHANGER
CT	COOLING TOWER	HRU	HEAT RECOVERY UNIT
CUH	CABINET UNIT HEATER	PRV	POWER ROOF VENTILATOR
CWP	CONDENSER WATER PUMP	RE	RETURN/EXHAUST FAN
CHWP	CHILLED WATER PUMP	RTU	ROOFTOP UNIT
DBP	DOMESTIC WATER BOOSTER PUMP	SEP	SEWAGE EJECTOR PUMP
DC	DUCT MOUNTED COIL	SF	SUPPLY FAN
DCP	DOMESTIC WATER CIRCULATING PUMP	SP	SUMP PUMP
EF	EXHAUST FAN	UH	UNIT HEATER
EDC	ELECTRIC DUCT COIL	WH	WATER HEATER
ET	EXPANSION TANK		

MECHANICAL DUCT SYMBOLS

SYMBOL	DESCRIPTION
16x8	SQUARE DUCT SIZE TAG (WIDTH x HEIGHT)
16/8	OVAL DUCT SIZE TAG (WIDTH / HEIGHT)
16"Ø	ROUND DUCT SIZE TAG (DIAMETER)
S/A	SUPPLY AIR
O/A	OUTDOOR AIR
R/A	RETURN AIR
E/A	EXHAUST AIR
L/A	RELIEF AIR
	SUPPLY AIR DIFFUSER (4-WAY)
	RETURN AIR GRILLE
	RETURN AIR GRILLE WITH SOUND BOOT
	EXHAUST AIR GRILLE
	POINT OF EXISTING TO NEW CONNECTION
	POINT OF DISCONNECT TO EXISTING CONNECTION
M.C.	MECHANICAL CONTRACTOR
E.C.	ELECTRICAL CONTRACTOR
P.C.	PLUMBING CONTRACTOR
N.I.C.	NOT IN CONTRACT
AFF	ABOVE FINISHED FLOOR
DN	DOWN
UP	UP
X / X	SECTION CUT REFERRING DETAIL NUMBER REFERRING SHEET NUMBER

MECHANICAL ACCESSORIES SYMBOL LEGEND

SYMBOL	DESCRIPTION
FD	RECTANGULAR DUCT FIRE DAMPER W/ ACCESS DOOR (SEE DETAIL)
DD	RECTANGULAR DUCT MOUNTED DUCT DETECTOR. FURNISHED AND CONNECTED BY ELECTRICAL CONTRACTOR, INSTALLED BY MECHANICAL CONTRACTOR. CUTTING OF DUCT, INSTALLATION OF DETECTOR, AND DETERMINATION OF SAMPLING TUBE LENGTH SHALL BE THE MECHANICAL CONTRACTOR. PROVIDE REMOTE INDICATING LIGHT WITH EACH DETECTOR.
M	RECTANGULAR DUCT MOUNTED MOTOR OPERATED DAMPER, INTERLOCK WITH FAN AS INDICATED. (DAMPER BY M.C.)
M	ROUND DUCT MOTORIZED DAMPER

MECHANICAL PIPING SYMBOLS

SYMBOL	DESCRIPTION
	BUTTERFLY VALVE
	3-PIECE BALL VALVE
	CHECK VALVE
	STRAINER WITH BLOWDOWN VALVE WITH HOSE CONN.
	BALANCING VALVE
	B&G CIRCUIT SETTER
	UNION
	THERMOMETER
P	PRESSURE GAGE & COCK
	GAGE COCK
	FLOW SWITCH
	ECCENTRIC REDUCER
	CONCENTRIC REDUCER
	STEAM TRAP, F&T
	STEAM TRAP, TB
	CONTROL VALVE
	GAS COCK
	PRESSURE REDUCING/REGULATING VALVE
	SOLENOID VALVE

MECHANICAL PIPING SYSTEMS LEGEND

SYMBOL	DESCRIPTION
D	CONDENSATE DRAINAGE
	NATURAL GAS
GR	GEOTHERMAL WATER RETURN
GS	GEOTHERMAL WATER SUPPLY
R	REFRIGERANT

TESTING, ADJUSTING, AND BALANCING

1. THE MECHANICAL CONTRACTOR SHALL BALANCE ALL MECHANICAL SYSTEMS TO THE PERFORMANCE SPECIFICATIONS INDICATED ON PLANS AND PROVIDE THE ENGINEER WITH THREE COPIES OF A COMPLETE TEST AND BALANCE REPORT. THE REPORT IS TO BE ISSUED A MINIMUM OF TWO WEEKS PRIOR TO PROJECT COMPLETION. THE TEST AND BALANCE REPORT WILL BE SUBJECT TO REVIEW AND APPROVAL BY THE ENGINEER. ANY ADDITIONAL TESTING, ADJUSTING AND BALANCING REQUIRED (AT ENGINEER'S REQUEST) AFTER REVIEW OF THE INITIAL REPORT SHALL BE PROVIDED AT NO ADDITIONAL COST. TEST AND BALANCE REPORT TO BE COMPLETED BY AN INDEPENDENT, CERTIFIED TEST AND BALANCE CONTRACTOR.
2. CONDUCT TESTING AND BALANCING IN ACCORDANCE WITH TECHNICAL PORTIONS OF THE AABC "NATIONAL STANDARDS FOR TESTING AND BALANCING HVAC SYSTEMS", LATEST EDITION.
3. INSTRUMENTS USED FOR BALANCING MUST HAVE BEEN CALIBRATED WITHIN A PERIOD OF SIX (6) MONTHS PRIOR TO BALANCING. SUBMIT SERIAL NUMBERS, AND DATES OF CALIBRATION OF ALL INSTRUMENTS TO BE USED PRIOR TO THE START OF WORK.
4. SET HVAC SYSTEM AIRFLOW AND WATER FLOW RATES WITHIN THE FOLLOWING TOLERANCES:
   A. SUPPLY, RETURN, AND EXHAUST FANS AND EQUIPMENT WITH FANS: MINUS 5 TO PLUS 10 PERCENT.
   B. AIR OUTLETS AND INLETS: 0 TO MINUS 10 PERCENT.
   C. GEOTHERMAL CONDENSER WATER FLOW RATE: 0 TO MINUS 10 PERCENT.
5. REFER TO SPECIFICATION SECTION 230593 AND CONTRACT DRAWINGS IN THEIR ENTIRETY FOR ADDITIONAL REQUIREMENTS.

MECHANICAL GENERAL NOTES

SEE SPECIFICATIONS FOR ADDITIONAL PROJECT REQUIREMENTS. THESE GENERAL NOTES ARE INTENDED TO SUPPLEMENT THE SPECIFICATIONS. IN THE EVENT THAT THE VERBIAGE IS IN CONFLICT OR CONTRADICTS THE REQUIREMENTS LISTED HERE, THE QUESTION SHALL BE ASKED PRIOR TO BIDDING OR THE MORE STRINGENT SHALL APPLY AT THE ENGINEER'S DISCRETION.

1. DO NOT SCALE DRAWINGS. SEE ARCHITECTURAL DRAWINGS AND REFLECTED CEILING PLANS FOR EXACT LOCATION OF DOORS, WINDOWS, CEILING DIFFUSERS, ETC.
2. ALL EQUIPMENT LISTED IN PROJECT SCHEDULES IS TO BE CONSIDERED DESIGN BASIS EQUIPMENT. ALL COST ASSOCIATED WITH SUBSTITUTED/NON-DESIGN BASIS EQUIPMENT TO COMPLY WITH BASIS OF DESIGN, INCLUDING PROVIDING MAINTENANCE ACCESS, CLEARANCE, PIPING, SHEET METAL, ELECTRICAL, REPLACEMENT OF OTHER SYSTEM COMPONENTS, BUILDING ALTERATIONS, ETC., SHALL BE INCLUDED IN THE ORIGINAL BASE BID. NO ADDITIONAL COST ASSOCIATED WITH SUBSTITUTED/NON-DESIGN BASIS EQUIPMENT WILL BE APPROVED DURING CONSTRUCTION AND ALL COST WILL BE THE RESPONSIBILITY OF THE MECHANICAL CONTRACTOR. THIS INCLUDES ANY MODIFICATIONS TO ANY ASSOCIATED MECHANICAL, PLUMBING, OR ELECTRICAL SYSTEMS REQUIRED BY THIS SPECIFIC MANUFACTURER'S INSTALLATION INSTRUCTIONS.
3. ALL DUCTWORK SHALL BE GALVANIZED SHEET METAL CONSTRUCTED IN ACCORDANCE WITH THE LATEST SMACNA STANDARDS. ALL SUPPLY, RETURN AND OUTSIDE AIR DUCTWORK SHALL BE WRAPPED WITH 2" THICK DUCT WRAP WITH VAPOR BARRIER. INSULATION (INCLUDING FLEXIBLE DUCT INSULATION) SHALL HAVE A MINIMUM INSTALLED R-VALUE OF 6.0. TRANSFER DUCTS SHALL BE LINED WITH 1" THICK FIBERGLASS DUCT LINER FOR ACOUSTICAL PURPOSES. DUCT DIMENSIONS ON PLANS ARE FREE AREA SIZE.
4. SUPPLY AND RETURN DUCTWORK LOCATED OUTSIDE THE BUILDING SHALL BE WRAPPED WITH 3" THICK DUCT WRAP WITH VAPOR BARRIER HAVING A MINIMUM INSTALLED R VALUE OF 8.0. COVER EXTERNAL INSULATION WITH AN ALUMINUM OUTER ENCLOSURE AND SEAL WATER TIGHT.
5. ALL DUCTWORK SHALL BE SEALED PER THE REQUIREMENTS OF THE NORTH CAROLINA INTERNATIONAL MECHANICAL CODE. SEAL MEDIUM PRESSURE SUPPLY DUCTWORK FOR POSITIVE 3" PRESSURE CLASS, SMACNA SEAL CLASS A, SMACNA LEAKAGE CLASS 4. SEAL LOW PRESSURE SUPPLY, RETURN, OUTSIDE AIR, AND EXHAUST DUCTWORK FOR POSITIVE/NEGATIVE 2" PRESSURE CLASS, SMACNA SEAL CLASS A, SMACNA LEAKAGE CLASS 4.
6. ALL PIPING, DUCTS, VENTS, ETC., EXTENDING THROUGH WALLS AND ROOF SHALL BE FLASHED AND COUNTERFLASHED IN A WATERPROOF MANNER.
7. ALL PIPING AND DUCTWORK LOCATIONS SHALL BE COORDINATED WITH THE WORK UNDER OTHER DIVISIONS OF THE SPECIFICATIONS, TO AVOID INTERFERENCE.
8. UPON PROJECT COMPLETION, THE MECHANICAL CONTRACTOR IS RESPONSIBLE FOR PROVIDING THE OWNER INSTALLATION INFORMATION INCLUDING RECORD SUBMITTALS (WITH ANY SUBMITTAL REVIEW COMMENTS ADDRESSED) AND O&M MANUALS FOR EACH PIECE OF EQUIPMENT INCLUDING ALL SELECTED OPTIONS, THE NAME AND ADDRESS OF AT LEAST ONE SERVICE AGENCY, FULL CONTROL SYSTEM O&M AND CALIBRATION INFORMATION INCLUDING WIRING DIAGRAMS, SCHEMATICS, FULL SEQUENCE OF OPERATION, AND PROGRAMMED SETPOINTS. IN ADDITION, THE MECHANICAL CONTRACTOR SHALL BE RESPONSIBLE TO HIRE A REGISTERED DESIGN PROFESSIONAL TO COMMISSION THE INSTALLED SYSTEM AND PROVIDE THE OWNER AND CODE REVIEWER A SEALED STATEMENT OF SYSTEM COMMISSIONING (PER 2018 NCECC APPENDIX C1).
9. PROVIDE A ONE YEAR WARRANTY FOR ALL WORK PERFORMED BEGINNING ON THE DAY THE SYSTEM IS COMPLETELY OPERATIONAL AND ACCEPTABLE BY THE OWNER.
10. PROVIDE MANUFACTURER'S RECOMMENDED CLEARANCES AROUND ALL EQUIPMENT FOR MAINTENANCE AND FILTER REMOVAL.
11. CONDENSATE DRAIN PIPING SHALL BE SCHEDULE 40 PVC PIPE AND FITTINGS. DRAINS FROM AIR HANDLING UNITS SHALL BE TRAPPED. CONDENSATE DRAINS SHALL BE INSULATED WITH 1/2" THICK ARMAFLEX INSULATION. MINIMUM DRAIN SIZE SHALL BE 3/4".
12. ALL REFRIGERANT PIPE SHALL BE NITROGENIZED ACR COPPER TUBE. SIZE, INSULATE, AND INSTALL REFRIGERANT PIPING PER MANUFACTURER'S RECOMMENDATIONS. REFRIGERANT PIPING INSULATION EXPOSED OUTDOORS SHALL BE COVERED WITH AN OUTER ALUMINUM JACKET.
13. ANY DEVICE REQUIRING A THERMOSTAT FOR CONTROL SHALL BE FURNISHED WITH A THERMOSTAT WHETHER INDICATED ON THE DRAWINGS OR NOT.
14. INSTALL THE TOP OF ALL THERMOSTATS, SENSORS, AND SWITCHES AT 4'-0" (MAXIMUM) ABOVE FINISH FLOOR. COORDINATE EXACT THERMOSTAT LOCATION WITH OWNER PRIOR TO INSTALLATION. ANY DEVICE ON A PERIMETER WALL SHALL BE MOUNTED ON A FOAM-FILLED ELECTRICAL BOX, WITH ALL GAPS BETWEEN BOX AND WALL SEALED TO PREVENT INFILTRATION.
15. CONTRACTOR SHALL VERIFY LOCATION OF ALL ROOF PENETRATIONS WITH ARCHITECT & OWNER PRIOR TO INSTALLATION. NEW ROOF PENETRATIONS MADE THROUGH EXISTING ROOF SYSTEMS SHALL BE VERIFIED WITH THE OWNER'S EXISTING ROOF WARRANTY PRIOR TO INSTALLATION.
16. ROOF CURBS SHALL ALLOW A MINIMUM OF 8" ABOVE ROOF INSULATION FOR FLASHING, OR AS INDICATED ON THE DRAWINGS, WHICHEVER IS GREATER. IN ADDITION, ALL ROOF CURBS OR EQUIPMENT SUPPORT RAILS THAT SUPPORT EQUIPMENT, PIPING, CONDUIT, ETC. EXPOSED ON THE ROOF SHALL HAVE SUFFICIENT HEIGHT TO MAINTAIN A MINIMUM OF 18" CLEARANCE BELOW SUPPORTED EQUIPMENT FOR ROOF MAINTENANCE.
17. CONTRACTOR SHALL LOCATE EXHAUST FANS, OUTLETS, AND GAS FLUES A MINIMUM OF 15'-0" FROM ANY OUTSIDE AIR INTAKE.
18. DRYER VENT WALL CAPS SHALL BE PROVIDED WITH A BACKDRAFT DAMPER. DRYER VENT SHALL NOT EXCEED A TOTAL EQUIVALENT LENGTH OF 35'-0" WITH A 2.5' DEDUCTION FOR EACH 45° BEND AND A 5' DEDUCTION FOR EACH 90° BEND.
19. KITCHEN HOOD EXHAUST DUCT SHALL BE 16 GAUGE CARBON STEEL. ALL JOINTS AND SEAMS SHALL BE CONSTRUCTED WITH A CONTINUOUS LIQUID - TIGHT EXTERNAL WELD. ALL DUCTWORK SHALL SLOPE A MINIMUM OF 1/4 INCH PER FOOT TOWARD HOOD. PROVIDE CLEANOUTS AT EVERY CHANGE OF DIRECTION IN THE EXHAUST DUCT AND AT 20'-0" (MINIMUM) INTERVALS.
20. THE MECHANICAL CONTRACTOR SHALL PERFORM A LIGHT TEST (AS REQUIRED BY THE MECHANICAL CODE) FOR ALL JOINTS AND SEAMS IN THE PRESENCE OF THE LOCAL AUTHORITY HAVING JURISDICTION PRIOR TO CONCEALING KITCHEN HOOD EXHAUST DUCTWORK.
21. ALL GEOTHERMAL CONDENSER WATER PIPING SHALL BE SDR-11 HDPE PIPE. PROVIDE WITH MOLDED PE FITTINGS, HDPE RESIN SOCKET- OR BUTT-FUSION TYPE MADE TO MATCH HDPE PIPE DIMENSIONS AND CLASS.
22. ALL CONDENSER WATER PIPING SHALL PITCH DOWN IN DIRECTION OF FLOW WITH MANUAL AIR VENTS AT ALL HIGH POINTS AND 1/2" DRAIN VALVES AT ALL LOW POINTS.
23. PROVIDE UNIONS, FLANGES OR COUPLINGS AT CONNECTION TO ALL VALVES AND EQUIPMENT. DO NOT USE DIRECT WELDED OR THREADED CONNECTIONS TO VALVES, EQUIPMENT OR OTHER APPARATUS.
24. PROVIDE NON-CONDUCTING DIELECTRIC UNIONS WHENEVER CONNECTING DISSIMILAR METALS.
25. ALL ISOLATION VALVES, TERMINAL UNITS, CONTROLS, ETC. REQUIRING ACCESS AND SERVICE SHALL BE INSTALLED WITHIN 18" OF THE CEILING FOR SERVICE ACCESSIBILITY. LOCATIONS SHALL BE INDICATED ON THE CEILING GRID PER THE SPECIFICATIONS.
26. ALL EQUIPMENT CONCRETE PAD SIZES FOR MECHANICAL EQUIPMENT SHALL BE CONFIRMED WITH APPROVED SHOP DRAWING SUBMITTALS AND ASSOCIATED UNIT MANUFACTURER ANCHOR LOCATIONS PRIOR TO FABRICATION/INSTALLATION. THE MECHANICAL AND PLUMBING CONTRACTORS SHALL COORDINATE THE EXACT LOCATION OF MECHANICAL EQUIPMENT HOUSEKEEPING PADS WITH THE FLOOR DRAIN LOCATIONS PRIOR TO INSTALLATION OF DRAINS AT EQUIPMENT/PAD LOCATIONS.
27. DUCTWORK AND PIPING PASSING THROUGH/ABOVE ELECTRICAL ROOMS SHALL BE CLOSELY COORDINATED WITH THE ELECTRICAL CONTRACTOR. DUCTWORK OR PIPING SHALL NOT BE LOCATED ABOVE ELECTRICAL PANELS.
28. EQUIPMENT OPERATED DURING CONSTRUCTION SHALL USE FILTERED MEDIA TO PREVENT CONSTRUCTION DEBRIS FROM ENTERING COILS, DUCTWORK SYSTEMS, AIR TERMINALS ETC. AT COMPLETION OF CONSTRUCTION, MECHANICAL CONTRACTOR SHALL CLEAN ALL SYSTEMS WITH ALL CONTROL DEVICES WIDE OPEN AND REMOVE ANY REMAINING DEBRIS PRIOR TO TEST AND BALANCING. MECHANICAL CONTRACTOR SHALL REPLACE ALL FILTRATION WITH NEW FILTERS AT COMPLETION OF CONSTRUCTION. ANY DUCTWORK, AIR TERMINALS, AND/OR OTHER EQUIPMENT UPSTREAM OF FILTRATION SHALL BE CLEANED THOROUGHLY OF CONSTRUCTION DEBRIS BEFORE HANDING OVER TO OWNER.
29. COMMERCIAL DRYER EXHAUST DUCTWORK SHALL BE CONSTRUCTED OF GALVANIZED SHEET METAL NOT LESS THAN 0.0195 INCHES THICK. EXHAUST DUCT SHALL BE ASSEMBLED WITH SMOOTH INTERIOR SURFACE SO THAT THE JOINTS DO NOT PERMIT THE ACCUMULATION OF LINT, DO NOT USE SHEET METAL SCREWS AT JOINTS. ALL 90° TURN SHALL HAVE LONG RADIUS ELBOWS. ALL DUCTWORK SHALL BE INSTALLED PER THE DRYER MANUFACTURER'S RECOMMENDATIONS. COMMERCIAL DRYER EXHAUST DUCTWORK SHALL BE WRAPPED WITH TWO LAYERS OF 1 1/2" THICK THERMAL INSULATION BLANKET AS MANUFACTURED BY FIREMASTER (OR EQUAL). INSULATION SHALL BE INSTALLED PER NFPA-96 AND IN ACCORDANCE WITH MANUFACTURERS' RECOMMENDATIONS TO OBTAIN A 2-HOUR RATED ASSEMBLY. ASSEMBLY SHALL BE U.L. APPROVED.
30. PROVIDE COMBINATION FIRE/SMOKE DAMPERS WITH AN IONIZATION TYPE DUCT MOUNTED SMOKE DETECTOR IN DUCTED APPLICATIONS, OR SPOT DETECTORS IN OPENING APPLICATIONS (WITHIN 5'-0" OF THE DAMPER WITH NO AIR OUTLETS OR INLETS BETWEEN DETECTOR AND DAMPER), INSTALLED IN THE DUCT WIRED, TO CLOSE THE DAMPER UPON ACTIVATION. DUCT MOUNTED SMOKE DETECTORS AND SPOT DETECTORS SHALL BE SUPPLIED, WIRED FOR INTERFACE WITH FIRE ALARM SYSTEM AND UNIT SHUTDOWN BY THE ELECTRICAL CONTRACTOR. DETECTORS SHALL BE INSTALLED IN THE DUCT BY THE MECHANICAL CONTRACTOR.
31. THE MECHANICAL CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING RESTRAINTS TO RESIST THE EARTHQUAKE EFFECTS ON THE MECHANICAL SYSTEMS. THE REQUIREMENTS FOR THOSE RESTRAINTS ARE FOUND IN THE LOCAL BUILDING CODE AND ASCE 7. THE ANCHORAGE OF THE MECHANICAL SYSTEMS SHALL COMPLY WITH THE REQUIREMENTS OF THE LOCAL BUILDING CODE AND ASCE 7.
32. ALL MECHANICAL EQUIPMENT SHALL BE U.L. LISTED AND LABELED AS A COMPLETE PACKAGE, NOT THROUGH INDIVIDUAL COMPONENTS OR PARTS. PROVIDE REQUIRED 3RD PARTY FIELD UL LISTING SERVICES AS REQUIRED TO COMPLY.
33. FUME HOOD EXHAUST DUCT SHALL BE CONSTRUCTED OF STAINLESS STEEL, WITH WELDED JOINTS AND SEAMS. PREP ROOM AND CHEMICAL STORAGE EXHAUST DUCTWORK SHALL BE CONSTRUCTED OF APPROVED G90 GALVANIZED SHEET STEEL WITH NOMINAL THICKNESS OF 18 GAUGE. DUCTWORK AND EXHAUST SYSTEM SHALL MEET THE REQUIREMENTS OF NCMC SECTION 510.

COORDINATION DRAWINGS

THE MECHANICAL CONTRACTOR SHALL ORGANIZE COORDINATION MEETINGS TO DEVELOP A SET OF DRAWINGS WITH ALL CONTRACTORS (ELECTRICAL, MECHANICAL, PLUMBING, FIRE PROTECTION, IT/DATA, AND GENERAL CONTRACTOR). THE MECHANICAL CONTRACTOR WILL HAVE THE LEAD RESPONSIBILITY FOR THE COORDINATION DRAWINGS. THE MECHANICAL CONTRACTOR SHALL PRODUCE THE ORIGINAL DRAWINGS AND FORWARD THE DRAWINGS TO EACH OF THE OTHER CONTRACTORS FOR THEM TO ADD THEIR SYSTEMS TO THIS SET OF COORDINATION DRAWINGS. THE CONTRACTORS WILL DEVELOP THE DRAWINGS IN THIS ORDER: MECHANICAL, FIRE PROTECTION, PLUMBING, ELECTRICAL, IT/DATA (INCLUDING CABLE TRAY) AND GENERAL. THIS SHALL ALSO BE THE ORDER OF PRECEDENCE FOR INSTALLATION OF SYSTEMS. ANY RELOCATION OF SYSTEM ROUTINGS WILL BE FOUND IN THE COORDINATION PHASE AND NOTICED BY EACH OF THE CONTRACTORS. THESE DRAWINGS, WHEN COMPLETED, SHALL BE SIGNED OFF BY ALL OF THE ABOVE LISTED PARTIES. DRAWINGS SHALL BE COMPLETED PRIOR TO FABRICATION AND INSTALLATION OF DUCTWORK AND PIPING SYSTEMS, OR PURCHASE OF EQUIPMENT. THE FOLLOWING ITEMS REPRESENT THE MINIMUM REQUIREMENTS FOR SHOP DRAWINGS AND COORDINATION DRAWINGS:

1, ALL SHOP AND COORDINAGION DRAWINGS WILL BE 1/4" = 1'-O" SCALE
2. DRAWINGS WILL BE ORIGINAL DRAWINGS AND NOT OVERLAYS OF THE CONTRACT/DESIGN
3. COORDINATION DRAWINGS WILL BE DRAWN ON REPRODUCIBLE MATERIAL 48'x36".
4. COORDINATION DRAWINGS ARE NOT SHOP DRAWINGS AND ARE REQUIRED IN ADDITION TO SHOP DRAWINGS.
5. ONCE THE COMPLETE COORDINATION DRAWINGS HAVE BEEN COMPILED, THE MECHANICAL CONTRACTOR WILL DISTRIBUTE ONE SIGNED SET TO EACH OF THE FOLLOWING CONTRACTORS: ELECTRICAL, PLUMBING, FIRE PROTECTION, AND GENERAL. ADDITIONAL SETS WILL BE SENT TO THE OWNER, ARCHITECT, AND ENGINEER.

MECHANICAL SHEET INDEX

2018 NORTH CAROLINA ENERGY CONSERVATION CODE

COMMERCIAL ENERGY EFFICIENCY - MECHANICAL SUMMARY

C401 METHOD OF COMPLIANCE

- [x] 2018 NCECC CHAPTER 4
- [ ] ASHRAE 90.1-2013 PRESCRIPTIVE
- [ ] ASHRAE 90.1-2013 PERFORMANCE
- [ ] N/A (EXISTING LIGHTING, HVAC, AND DOM. WATER HEATING SYSTEMS TO REMAIN)
- [ ] COMCHECK PROVIDED (2018 NCECC)
- [ ] COMCHECK PROVIDED (90.1-2013)
- [ ] ENERGY MODELING DATA PROVIDED

C406 ADDITIONAL EFFICIENCY PACKAGE OPTIONS

- [ ] C406.2 EFFICIENT MECH EQUIPMENT
- [x] C406.3 REDUCED LTG DENSITY
- [ ] C406.4 ENHANCED LTG CONTROLS
- [ ] C406.5 ON-SITE RENEWABLE ENERGY
- [ ] C406.6 DEDICATED OA SYSTEM
- [ ] C406.7 SERVICE WATER HEATING

C301 CLIMATE ZONE
3A - PAMLICO COUNTY, NORTH CAROLINA
DESIGN CONDITIONS
EXTERIOR (ASHRAE 90.1-2013 TABLE D-1)
winter dry bulb 22.5° F.
summer dry bulb 93.3° F.
summer wet bulb 78.1° F.
INTERIOR (2018 NCECC SECTION C302.1)
winter dry bulb 72° F.
summer dry bulb 75° F.

C403.2 HEATING & COOLING LOADS AND EQUIPMENT & SYSTEM SIZING

BUILDING HEATING LOAD 2,289,200 BTUH (peak)
BUILDING COOLING LOAD 4,288,800 BTUH (peak)
INSTALLED HEATING CAPACITY 5,583,115 BTUH
INSTALLED COOLING CAPACITY 4,562,097 BTUH

C403.2.3 & C406.2 - REQUIRED & INCREASED HVAC EQUIPMENT PERFORMANCE

SYSTEM DESCRIPTION - GEOTHERMAL LOOP SERVING WSHP WITH HOT GAS REHEAT. ERV PROVIDING VENTILATION.

- [x] MINIMUM HVAC EQUIP EFFICIENCY COMPLIANCE - TABLE C403.2.3
- [ ] INCREASED HVAC EQUIP EFFICIENCY COMPLIANCE - 10% OVER TABLE C403.2.3

EQUIP TYPE	SIZE CATEGORY (BTUH)	SUBCATEGORY	C403.2.3 MINIMUM EFFICIENCY (a)	10% INCREASED EFF. (a)	DESIGN EFFIC.
TABLE C403.2.3(1) - UNITARY AIR CONDITIONERS AND CONDENSING UNITS					
AIR COND, AIR COOLED	< 65,000 (<= 5 TONS)	SPLIT SYSTEM & SINGLE PACKAGE	13.0 SEER	14.3 SEER	SEE SCHEDULE
a. DEDUCT 0.2 FROM THE REQUIRED EERS AND IEERS FOR UNITS WITH A HEATING SECTION OTHER THAN ELECTRIC RESISTANCE HEAT OR NO HEAT.					
TABLE C403.2.3(2) - ELECTRICALLY OPERATED UNITARY AND APPLIED HEAT PUMPS					
GWTR SRCE COOL MODE	< 17,000	86° EWT	12.2 SEER	13.4 SEER	SEE SCHEDULE
GWTR SRCE COOL MODE	>= 17,000 <135,000	86° EWT	13.0 EER	14.3 EER AT 86° EWT	SEE SCHEDULE
GROUND LOOP COOL MODE	< 135,000	68° EWT	4.3 COP	4.7 COP AT 70° EWT	SEE SCHEDULE

a. DEDUCT 0.2 FROM THE REQUIRED EERS AND IEERS FOR UNITS WITH A HEATING SECTION OTHER THAN ELECTRIC RESISTANCE HEAT OR NO HEAT.

C403.2.4 THRU C403.2.11

- [x] HVAC SYSTEMS ARE FULLY COMPLIANT WITH THE REQUIREMENTS FOR HVAC SYSTEM CONTROL, VENTILATION, ENERGY RECOVERY, DUCT AND PLENUM INSULATION AND SEALING, PIPING INSULATION, AND SYSTEM COMPLETION.

C403.2.12 - AIR SYSTEM DESIGN AND CONTROL

- [ ] ALL FANS INSTALLED ON THE PROJECT ARE 5 HP OR LESS AND ARE EXEMPT FROM THESE REQUIREMENTS.
- [x] FANS ABOVE 5 HP MEET THE CFM LIMITATIONS SHOWN BELOW:

OPTION 1 - FAN SYSTEM MOTOR NAMEPLATE HP - TABLE C403.2.12.1(1)

ALLOWABLE NAMEPLATE MOTOR HP	CONSTANT VOLUME MINIMUM CFM	VARIABLE VOLUME MINIMUM CFM	DESIGN CFM
7.5	6,818 CFM	5,000 CFM	SEE SCHEDULE
10	9,091 CFM	6,667 CFM	SEE SCHEDULE
15	13,636 CFM	10,000 CFM	SEE SCHEDULE
20	18,182 CFM	13,333 CFM	SEE SCHEDULE
25	22,727 CFM	16,667 CFM	SEE SCHEDULE
30	27,272 CFM	20,000 CFM	SEE SCHEDULE
40	36,364 CFM	26,667 CFM	SEE SCHEDULE
50	45,455 CFM	33,333 CFM	SEE SCHEDULE

C403.3 - ECONOMIZERS (PRESCRIPTIVE)

- [x] PROJECT INCLUDES AN AIR OR WATER ECONOMIZER COMPLIANT WITH C403.3
- [ ] PROJECT MEETS AN ECONOMIZER EXCEPTION LISTED IN C403.3

C403.4 - HYDRONIC AND MULTIPLE-ZONE HVAC SYSTEMS CONTROL AND EQUIPMENT (PRESCRIPTIVE)

- [x] PROJECT CONSISTS OF ONLY SINGLE ZONE DX SYSTEMS, EXEMPT FROM THE PRESCRIPTIVE REQUIREMENTS OF C403.4.
- [ ] PROJECT CONSISTS OF HVAC SYSTEMS FULLY COMPLIANT WITH THE PRESCRIPTIVE REQUIREMENTS OF C403.4.

C405.8 - ELECTRICAL MOTORS (MANDATORY REQUIREMENTS).

- [x] ELECTRICAL MOTORS HAVE BEEN SPECIFIED TO MEET MINIMUM EFFICIENCY REQUIREMENTS PER C405.8, EXCEPT WHERE EXEMPT.
- [ ] NOT APPLICABLE.

C408 - SYSTEM COMMISSIONING

- [ ] PROJECT AREA IS LESS THAN 10,000 SQUARE FEET AND IS EXEMPT FROM THE SYSTEM COMMISSIONING REQUIREMENTS OF SECTION C408.
- [x] PROJECT AREA IS GREATER THAN 10,000 SQUARE FEET AND REQUIRES SYSTEM COMMISSIONING PER SECTION C408.

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06/12/2024

CONSTRUCTION DOCUMENTS

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PAMLICO COUNTY
PAMLICO 6-12 SCHOOL
601 Main Street, Bayboro, NC, 28515

ENERGY STAR PARTNER

No.	Date	Description

ISSUE DATE: 06/12/24
PROJECT #: 2205
DRAWN BY: TAL
CHECKED BY: JWM

MECHANICAL LEGEND AND NOTES

M-001

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WATER SOURCE HEAT PUMP SCHEDULE

SYMBOL	EQUIP. SERVES	EQUIPMENT TYPE	EVAPORATOR COOLING COIL NOMINAL (TONS)	SUPPLY AIR FLOW	OUTSIDE AIR OCC. MIN.	OUTSIDE AIR DESIGN	ESP	COOLING CAPACITY TC (BTUH)	COOLING CAPACITY SHC (BTUH)	COOLING CAPACITY EER	HEATING CAPACITY BTUH	HEATING CAPACITY COP	REFRIG.	CONDENSER WATER GPM	CONDENSER WATER PD	CONDENSER WATER RUNOUT	FAN MOTOR HP	FAN MOTOR FLA	COMPRESSOR (EA) QTY	COMPRESSOR (EA) MOTOR LRA	COMPRESSOR (EA) MOTOR RLA	ELECTRICAL DATA VOLTAGE	ELECTRICAL DATA PHASE	ELECTRICAL DATA MCA	ELECTRICAL DATA MOCP	MANUFACTURER	MODEL	ASSOCIATED PUMP TAG	ACCESSORIES
WSHP-1-1.1	1502 MS ANIMAL SCIENCE	VERTICAL	3.0	1200	135	135	0.30	39213	28860	14.3	51836	5.2	R-410A	9.0	7.3	1/2"	0.50	16.9	1	72.0	13.5	265 V	1	20.3	30.0	ENERTECH	TVS036	CWP-3V	HGR, DAC
WSHP-1-1.2	1504 HS ANIMAL SCIENCE	VERTICAL	3.0	1200	105	105	0.30	39213	28860	14.3	51836	5.2	R-410A	9.0	7.3	1/2"	0.50	16.9	1	72.0	13.5	265 V	1	20.3	30.0	ENERTECH	TVS036	CWP-3V	HGR, DAC
WSHP-1-1.3	1506 HORTICULTURE	VERTICAL	3.0	1200	135	135	0.30	39213	28860	14.3	51836	5.2	R-410A	9.0	7.3	1/2"	0.50	16.9	1	72.0	13.5	265 V	1	20.3	30.0	ENERTECH	TVS036	CWP-3V	HGR, DAC
WSHP-1-1.4	1508 EMT CLASS	HORIZONTAL	5.0	2000	125	125	0.30	60821	40890	13.2	84171	4.4	R-410A	15.0	14.7	1/2"	1.00	22.1	1	52.0	7.8	460 V	3	12.4	20.0	ENERTECH	TZS060	CWP-5H	HGR, DAC
WSHP-1-1.5	1510 HVAC LAB	HORIZONTAL	5.0	2000	90	90	0.30	60821	40890	13.2	84171	4.4	R-410A	15.0	14.7	1/2"	1.00	22.1	1	52.0	7.8	460 V	3	12.4	20.0	ENERTECH	TZS060	CWP-5H	HGR, DAC
WSHP-1-2.1	2102 HS SS CLASSROOM	VERTICAL	3.0	1200	135	135	0.30	39213	28860	14.3	51836	5.2	R-410A	9.0	7.3	1/2"	0.50	16.9	1	72.0	13.5	265 V	1	20.3	30.0	ENERTECH	TVS036	CWP-3V	HGR, DAC
WSHP-1-2.2	2104 HS CLASSROOM	VERTICAL	3.0	1200	135	135	0.30	39213	28860	14.3	51836	5.2	R-410A	9.0	7.3	1/2"	0.50	16.9	1	72.0	13.5	265 V	1	20.3	30.0	ENERTECH	TVS036	CWP-3V	HGR, DAC
WSHP-1-2.3	2106 HS CLASSROOM	VERTICAL	3.0	1200	135	135	0.30	39213	28860	14.3	51836	5.2	R-410A	9.0	7.3	1/2"	0.50	16.9	1	72.0	13.5	265 V	1	20.3	30.0	ENERTECH	TVS036	CWP-3V	HGR, DAC
WSHP-1-2.4	2108 HS CLASSROOM	VERTICAL	3.0	1200	135	135	0.30	39213	28860	14.3	51836	5.2	R-410A	9.0	7.3	1/2"	0.50	16.9	1	72.0	13.5	265 V	1	20.3	30.0	ENERTECH	TVS036	CWP-3V	HGR, DAC
WSHP-1-2.5	2110 HS CLASSROOM	VERTICAL	3.0	1200	135	135	0.30	39213	28860	14.3	51836	5.2	R-410A	9.0	7.3	1/2"	0.50	16.9	1	72.0	13.5	265 V	1	20.3	30.0	ENERTECH	TVS036	CWP-3V	HGR, DAC
WSHP-1-3.1	MEDIA/COLLAB	VERTICAL	6.0	2400	360	360	0.75	68954	45860	13.2	89017	4.3	R-410A	18.0	18.8	1/2"	1.00	10.8	1	66.1	8.2	460 V	3	12.9	20.0	ENERTECH	TVS072	CWP-6V	HGR, DAC
WSHP-1-3.2	MEDIA/COLLAB	VERTICAL	6.0	2400	360	360	0.75	68954	45860	13.2	89017	4.3	R-410A	18.0	18.8	1/2"	1.00	10.8	1	66.1	8.2	460 V	3	12.9	20.0	ENERTECH	TVS072	CWP-6V	HGR, DAC
WSHP-2-1.1	1512 CLASSROOM	VERTICAL	3.0	1200	135	135	0.30	39213	28860	14.3	51836	5.2	R-410A	9.0	7.3	1/2"	0.50	16.9	1	72.0	13.5	265 V	1	20.3	30.0	ENERTECH	TVS036	CWP-3V	HGR, DAC
WSHP-2-1.2	1514 WOOD WORKING	HORIZONTAL	5.0	2000	90	90	0.50	60821	40890	13.2	84171	4.4	R-410A	15.0	14.7	1/2"	1.00	22.1	1	52.0	7.8	460 V	3	12.4	20.0	ENERTECH	TZS060	CWP-5H	HGR, DAC
WSHP-2-1.3	1516 WELDING LAB	HORIZONTAL	5.0	2000	120	120	0.50	60821	40890	13.2	84171	4.4	R-410A	15.0	14.7	1/2"	1.00	22.1	1	52.0	7.8	460 V	3	12.4	20.0	ENERTECH	TZS060	CWP-5H	HGR, DAC
WSHP-2-1.4	1718 BIOLOGY	VERTICAL	5.0	2000	125	125	0.30	59121	41032	13.8	78340	4.7	R-410A	15.0	15.0	1/2"	1.00	10.4	1	52.0	7.8	460 V	3	12.4	20.0	ENERTECH	TVS060	CWP-5V	HGR, DAC
WSHP-2-1.5	1716 PHYSICS	VERTICAL	5.0	2000	125	125	0.30	59121	41032	13.8	78340	4.7	R-410A	15.0	15.0	1/2"	1.00	10.4	1	52.0	7.8	460 V	3	12.4	20.0	ENERTECH	TVS060	CWP-5V	HGR, DAC
WSHP-2-2.1	2112 HS CLASSROOM	VERTICAL	3.0	1200	135	135	0.30	39213	28860	14.3	51836	5.2	R-410A	9.0	7.3	1/2"	0.50	16.9	1	72.0	13.5	265 V	1	20.3	30.0	ENERTECH	TVS036	CWP-3V	HGR, DAC
WSHP-2-2.2	2114 HS CLASSROOM	VERTICAL	3.0	1200	135	135	0.30	39213	28860	14.3	51836	5.2	R-410A	9.0	7.3	1/2"	0.50	16.9	1	72.0	13.5	265 V	1	20.3	30.0	ENERTECH	TVS036	CWP-3V	HGR, DAC
WSHP-2-2.3	2116 HS CLASSROOM	VERTICAL	3.0	1200	135	135	0.30	39213	28860	14.3	51836	5.2	R-410A	9.0	7.3	1/2"	0.50	16.9	1	72.0	13.5	265 V	1	20.3	30.0	ENERTECH	TVS036	CWP-3V	HGR, DAC
WSHP-2-2.4	2118 HS CLASSROOM	VERTICAL	3.0	1200	135	135	0.30	39213	28860	14.3	51836	5.2	R-410A	9.0	7.3	1/2"	0.50	16.9	1	72.0	13.5	265 V	1	20.3	30.0	ENERTECH	TVS036	CWP-3V	HGR, DAC
WSHP-2-2.5	2120 HS CLASSROOM	VERTICAL	3.0	1200	135	135	0.30	39213	28860	14.3	51836	5.2	R-410A	9.0	7.3	1/2"	0.50	16.9	1	72.0	13.5	265 V	1	20.3	30.0	ENERTECH	TVS036	CWP-3V	HGR, DAC
WSHP-2-2.6	2122 HS CLASSROOM	VERTICAL	3.0	1200	135	135	0.30	39213	28860	14.3	51836	5.2	R-410A	9.0	7.3	1/2"	0.50	16.9	1	72.0	13.5	265 V	1	20.3	30.0	ENERTECH	TVS036	CWP-3V	HGR, DAC
WSHP-2-2.7	MEDIA/COLLAB	HORIZONTAL	5.0	2000	200	200	0.75	60821	40890	13.2	84171	4.4	R-410A	15.0	14.7	1/2"	1.00	22.1	1	52.0	7.8	480 V	1	12.4	20.0	ENERTECH	TZS060	CWP-5H	HGR, DAC
WSHP-2-3.1	2221 MIDDLE SCHOOL STEM	VERTICAL	4.0	1600	280	280	0.30	50923	34563	16.8	62476	5.1	R-410A	12.0	10.6	1/2"	0.75	20.7	1	109.7	16.0	265 V	1	24.7	40.0	ENERTECH	TVS048	CWP-4V	HGR, DAC
WSHP-2-3.2	MEDIA/COLLAB	VERTICAL	5.0	2000	280	280	0.75	59121	41032	13.8	78340	4.7	R-410A	15.0	15.0	1/2"	1.00	10.4	1	52.0	7.8	460 V	3	12.4	20.0	ENERTECH	TVS060	CWP-5V	HGR, DAC
WSHP-2-3.3	1612 ADOBE	VERTICAL	6.0	2400	360	360	0.30	68954	45860	13.2	89017	4.3	R-410A	18.0	18.8	1/2"	1.00	10.8	1	66.1	8.2	460 V	3	12.9	20.0	ENERTECH	TVS072	CWP-6V	HGR, DAC
WSHP-3-1.1	1708 PHYSICAL SCIENCE	VERTICAL	5.0	2000	125	125	0.30	59121	41032	13.8	78340	4.7	R-410A	15.0	15.0	1/2"	1.00	10.4	1	52.0	7.8	460 V	3	12.4	20.0	ENERTECH	TVS060	CWP-5V	HGR, DAC
WSHP-3-1.2	1710 CHEMISTRY	VERTICAL	5.0	2000	125	125	0.30	59121	41032	13.8	78340	4.7	R-410A	15.0	15.0	1/2"	1.00	10.4	1	52.0	7.8	460 V	3	12.4	20.0	ENERTECH	TVS060	CWP-5V	HGR, DAC
WSHP-3-2.1	2218 MS 7TH CLASSROOM	VERTICAL	3.0	1200	135	135	0.30	39213	28860	14.3	51836	5.2	R-410A	9.0	7.3	1/2"	0.50	16.9	1	72.0	13.5	265 V	1	20.3	30.0	ENERTECH	TVS036	CWP-3V	HGR, DAC
WSHP-3-2.2	2220 MS 7TH CLASSROOM	VERTICAL	3.0	1200	135	135	0.30	39213	28860	14.3	51836	5.2	R-410A	9.0	7.3	1/2"	0.50	16.9	1	72.0	13.5	265 V	1	20.3	30.0	ENERTECH	TVS036	CWP-3V	HGR, DAC
WSHP-3-2.3	2222 MS 7TH CLASSROOM	VERTICAL	3.0	1200	135	135	0.30	39213	28860	14.3	51836	5.2	R-410A	9.0	7.3	1/2"	0.50	16.9	1	72.0	13.5	265 V	1	20.3	30.0	ENERTECH	TVS036	CWP-3V	HGR, DAC
WSHP-3-2.4	2224 MS 8TH CLASSROOM	VERTICAL	3.0	1200	135	135	0.30	39213	28860	14.3	51836	5.2	R-410A	9.0	7.3	1/2"	0.50	16.9	1	72.0	13.5	265 V	1	20.3	30.0	ENERTECH	TVS036	CWP-3V	HGR, DAC
WSHP-3-2.5	2226 MS 8TH CLASSROOM	VERTICAL	3.0	1200	135	135	0.30	39213	28860	14.3	51836	5.2	R-410A	9.0	7.3	1/2"	0.50	16.9	1	72.0	13.5	265 V	1	20.3	30.0	ENERTECH	TVS036	CWP-3V	HGR, DAC
WSHP-3-2.6	2228 MS 8TH CLASSROOM	VERTICAL	3.0	1200	135	135	0.30	39213	28860	14.3	51836	5.2	R-410A	9.0	7.3	1/2"	0.50	16.9	1	72.0	13.5	265 V	1	20.3	30.0	ENERTECH	TVS036	CWP-3V	HGR, DAC
WSHP-3-2.7	2230 MS SCIENCE	VERTICAL	5.0	2000	125	125	0.30	59121	41032	13.8	78340	4.7	R-410A	15.0	15.0	1/2"	1.00	10.4	1	52.0	7.8	460 V	3	12.4	20.0	ENERTECH	TVS060	CWP-5V	HGR, DAC
WSHP-3-2.8	2226 LANGUAGE	VERTICAL	5.0	2000	145	145	0.30	59121	41032	13.8	78340	4.7	R-410A	15.0	15.0	1/2"	1.00	10.4	1	52.0	7.8	460 V	3	12.4	20.0	ENERTECH	TVS060	CWP-5V	HGR, DAC
WSHP-3-2.9	RESOURCE ROOMS	HORIZONTAL	4.0	1600	180	180	0.75	49088	34682	15.9	62097	4.8	R-410A	12.0	9.9	1/2"	0.75	17.7	1	72.0	13.0	265 V	1	21.0	30.0	ENERTECH	TZS048	CWP-4H	HGR, DAC
WSHP-3-2.10	GUIDANCE OFFICE	HORIZONTAL	4.0	1600	135	135	0.75	49088	34682	15.9	62097	4.8	R-410A	12.0	9.9	1/2"	0.75	17.7	1	72.0	13.0	265 V	1	21.0	30.0	ENERTECH	TZS048	CWP-4H	HGR, DAC
WSHP-3-3.1	MEDIA/COLLAB	VERTICAL	3.0	1200	150	150	0.75	39213	28860	14.3	51836	5.2	R-410A	9.0	7.3	1/2"	0.50	16.9	1	72.0	13.5	265 V	1	20.3	30.0	ENERTECH	TVS036	CWP-3V	HGR, DAC
WSHP-3-3.2	MEDIA/COLLAB	VERTICAL	6.0	2400	350	350	0.75	68954	45860	13.2	89017	4.3	R-410A	18.0	18.8	1/2"	1.00	10.8	1	66.1	8.2	460 V	3	12.9	20.0	ENERTECH	TVS072	CWP-6V	HGR, DAC
WSHP-3-3.3	MEDIA/COLLAB	VERTICAL	6.0	2400	350	350	0.75	68954	45860	13.2	89017	4.3	R-410A	18.0	18.8	1/2"	1.00	10.8	1	66.1	8.2	460 V	3	12.9	20.0	ENERTECH	TVS072	CWP-6V	HGR, DAC
WSHP-4-1.1	1802 HS CTEC LAB 2D ART	VERTICAL	4.0	1600	250	250	0.30	50923	34563	16.8	62476	5.1	R-410A	12.0	10.6	1/2"	0.75	20.7	1	109.7	16.0	265 V	1	24.7	40.0	ENERTECH	TVS048	CWP-4V	HGR, DAC
WSHP-4-1.2	1804 HS CTEC LAB 3D	VERTICAL	4.0	1600	250	250	0.30	50923	34563	16.8	62476	5.1	R-410A	12.0	10.6	1/2"	0.75	20.7	1	109.7	16.0	265 V	1	24.7	40.0	ENERTECH	TVS048	CWP-4V	HGR, DAC
WSHP-4-1.3	1806 EC SC WITH LS	VERTICAL	4.0	1600	250	250	0.30	50923	34563	16.8	62476	5.1	R-410A	12.0	10.6	1/2"	0.75	20.7	1	109.7	16.0	265 V	1	24.7	40.0	ENERTECH	TVS048	CWP-4V	HGR, DAC
WSHP-4-1.4	1702 EC SC	VERTICAL	4.0	1600	250	250	0.30	50923	34563	16.8	62476	5.1	R-410A	12.0	10.6	1/2"	0.75	20.7	1	109.7	16.0	265 V	1	24.7	40.0	ENERTECH	TVS048	CWP-4V	HGR, DAC
WSHP-4-1.5	1704 HS CLASSROOM	VERTICAL	3.0	1200	135	135	0.30	39213	28860	14.3	51836	5.2	R-410A	9.0	7.3	1/2"	0.50	16.9	1	72.0	13.5	265 V	1	20.3	30.0	ENERTECH	TVS036	CWP-3V	HGR, DAC
WSHP-4-1.6	1706 HS CLASSROOM	VERTICAL	3.0	1200	135	135	0.30	39213	28860	14.3	51836	5.2	R-410A	9.0	7.3	1/2"	0.50	16.9	1	72.0	13.5	265 V	1	20.3	30.0	ENERTECH	TVS036	CWP-3V	HGR, DAC
WSHP-4-2.1	2208 MS 6TH CLASSOOM	VERTICAL	3.0	1200	135	135	0.30	39213	28860	14.3	51836	5.2	R-410A	9.0	7.3	1/2"	0.50	16.9	1	72.0	13.5	265 V	1	20.3	30.0	ENERTECH	TVS036	CWP-3V	HGR, DAC
WSHP-4-2.2	2210 MS 6TH CLASSROOM	VERTICAL	3.0	1200	135	135	0.30	39213	28860	14.3	51836	5.2	R-410A	9.0	7.3	1/2"	0.50	16.9	1	72.0	13.5	265 V	1	20.3	30.0	ENERTECH	TVS036	CWP-3V	HGR, DAC
WSHP-4-2.3	2212 MS 6TH CLASSROOM	VERTICAL	3.0	1200	135	135	0.30	39213	28860	14.3	51836	5.2	R-410A	9.0	7.3	1/2"	0.50	16.9	1	72.0	13.5	265 V	1	20.3	30.0	ENERTECH	TVS036	CWP-3V	HGR, DAC
WSHP-4-2.4	2214 MS 6TH CLASSROOM	VERTICAL	5.0	2000	125	125	0.30	59121	41032	13.8	78340	4.7	R-410A	15.0	15.0	1/2"	1.00	10.4	1	52.0	7.8	460 V	3	12.4	20.0	ENERTECH	TVS060	CWP-5V	HGR, DAC
WSHP-4-2.5	2216 MS 7TH SCIENCE	VERTICAL	5.0	2000	125	125	0.30	59121	41032	13.8	78340	4.7	R-410A	15.0	15.0	1/2"	1.00	10.4	1	52.0	7.8	460 V	3	12.4	20.0	ENERTECH	TVS060	CWP-5V	HGR, DAC
WSHP-4-3.1	MEDIA/COLLAB	VERTICAL	6.0	2400	360	360	0.75	68954	45860	13.2	89017	4.3	R-410A	18.0	18.8	1/2"	1.00	10.8	1	66.1	8.2	460 V	3	12.9	20.0	ENERTECH	TVS072	CWP-6V	HGR, DAC
WSHP-4-3.2	MEDIA/COLLAB	VERTICAL	4.0	1600	220	220	0.75	50923	34563	16.8	62476	5.1	R-410A	12.0	10.6	1/2"	0.75	20.7	1	109.7	16.0	265 V	1	24.7	40.0	ENERTECH	TVS048	CWP-4V	HGR, DAC
WSHP-5-1.1	1310 WRESTLING ROOM	HORIZONTAL	5.0	2000	95	95	0.50	60821	40890	13.2	84171	4.4	R-410A	15.0	14.7	1/2"	1.00	22.1	1	52.0	7.8	460 V	3	12.4	20.0	ENERTECH	TZS060	CWP-5H	HGR, DAC
WSHP-5-1.2	1308 WEIGHT ROOM	HORIZONTAL	5.0	2000	75	75	0.50	60821	40890	13.2	84171	4.4	R-410A	15.0	14.7	1/2"	1.00	22.1	1	52.0	7.8	460 V	3	12.4	20.0	ENERTECH	TZS060	CWP-5H	HGR, DAC
WSHP-5-2.1	LOCKER ROOMS	VERTICAL	3.0	1200	100	100	1.00	39213	28860	14.3	51836	5.2	R-410A	9.0	7.3	1/2"	0.50	16.9	1	72.0	13.5	265 V	1	20.3	30.0	ENERTECH	TVS036	CWP-3V	HGR, DAC
WSHP-5-2.2	LOCKER ROOMS	VERTICAL	4.0	1600	150	150	1.00	50923	34563	16.8	62476	5.1	R-410A	12.0	10.6	1/2"	0.75	20.7	1	109.7	16.0	265 V	1	24.7	40.0	ENERTECH	TVS048	CWP-4V	HGR, DAC
WSHP-5-2.3	LOCKER ROOMS	VERTICAL	2.0	800	50	50	1.00	27924	22526	14.8	34642	5.8	R-410A	6.0	5.7	1/2"	0.33	11.2	1	54.0	9.0	265 V	1	13.5	20.0	ENERTECH	TVS024	CWP-2V	HGR, DAC
WSHP-5-G1	MS GYM	VERTICAL	20.0	8000	200	755	1.25	237400	176800	13.2	298200	4.4	R-410A	50.0	9.0	2"	3.22	39.8	2	123.0	15.0	460 V	3	43.6	60.0	CLIMATEMASTER	RB-240	CWP-20	HGR,DAC,DCV,VFD
WSHP-5-G2	MS GYM	VERTICAL	20.0	8000	200	755	1.25	237400	176800	13.2	298200	4.4	R-410A	50.0	9.0	2"	3.22	39.8	2	123.0	15.0	460 V	3	43.6	60.0	CLIMATEMASTER	RB-240	CWP-20	HGR,DAC,DCV,VFD
WSHP-6-D1	DINING	VERTICAL	12.5	5000	520	520	1.25	165400	116900	14.4	198000	4.3	R-410A	35.0	6.5	1/2"	1.46	30.5	1	125.0	13.2	460 V	3	33.8	45.0	CLIMATEMASTER	RB-168	CWP-12.5	HGR,DAC,DCV,VFD
WSHP-6-K1	KITCHEN	VERTICAL	6.0	2400	200	200	0.75	68954	45860	13.2	89017	4.3	R-410A	18.0	18.8	1/2"	1.00	10.8	1	66.1	8.2	460 V	3	12.9	20.0	ENERTECH	TVS072	CWP-6V	HGR, DAC
WSHP-6-K2	KITCHEN	VERTICAL	2.0	800	50	50	0.75	27924	22526	14.8	34642	5.8	R-410A	6.0	5.7	1/2"	0.33	11.2	1	54.0	9.0	265 V	1	13.5	20.0	ENERTECH	TVS024	CWP-2V	HGR, DAC
WSHP-6-L1	LOBBY	VERTICAL	12.5	5000	700	700	1.25	165400	116900	14.4	198000	4.3	R-410A	35.0	6.5	1/2"	1.46	30.5	1	125.0	13.2	460 V	3	33.8	45.0	CLIMATEMASTER	RB-168	CWP-12.5	HGR,DAC,DCV,VFD
WSHP-7-G1	HS GYM	VERTICAL	25.0	10000	300	1405	1.25	311100	229300	13.3	369000	4.2	R-410A	62.5	11.0	2"	7.65	55.9	2	147.0	21.6	460 V	3	61.3	80.0	CLIMATEMASTER	RB-300	CWP-25	HGR,DAC,DCV,VFD
WSHP-7-G2	HS GYM	VERTICAL	25.0	10000	300	1405	1.25	311100	229300	13.3	369000	4.2	R-410A	62.5	11.0	2"	7.65	55.9	2	147.0	21.6	460 V	3	61.3	80.0	CLIMATEMASTER	RB-300	CWP-25	HGR,DAC,DCV,VFD
WSHP-8-A1	ADMIN	VERTICAL	3.0	1200	150	150	0.75	39213	28860	14.3	51836	5.2	R-410A	9.0	7.3	1/2"	0.50	16.9	1	72.0	13.5	265 V	1	20.3	30.0	ENERTECH	TVS036	CWP-3V	HGR, DAC
WSHP-8-A2	ADMIN	VERTICAL	5.0	2000	180	180	0.75	59121	41032	13.8	78340	4.7	R-410A	15.0	15.0	1/2"	1.00	10.4	1	52.0	7.8	460 V	3	12.4	20.0	ENERTECH	TVS060	CWP-5V	HGR, DAC

NOTES:

1. COOLING COIL CAPACITY AND EFFICIENCY BASED ON 80°/67° ENTERING AIR AND 85°F. ENTERING CONDENSER WATER TEMPERATURE. HEATING CAPACITY AND EFFICIENCY BASED ON 50° ENTERING CONDENSER WATER TEMPERATURE.
2. PROVIDE UNITS WITH: SCHNEIDER ELECTRIC SMART STRUCTURE WSHP CONTROLLER (OR EQUAL, BY CONTROLS CONTRACTOR), FILTER, U.L. LABEL, HOSE KIT, SELF BALANCING VALVE, BALL VALVE, AND STRAINER AS INDICATED ON WATER SOURCE HEAT PUMP PIPING DETAIL.
3. PROVIDE UNITS WITH REFRIGERANT DETECTION SYSTEMS (RDS)
4. PROVIDE COMBINATION THERMOSTAT, HUMIDITY SENSOR FOR HGR UNITS FOR SPACE HUMIDIDTY CONTROL.
5. PROVIDE HOT GAS REHEAT WHERE INDICATED FOR HUMIDITY CONTROL, INDICATED BY 'HGR', SEE SEQUENCE OF OPERATION.
6. PROVIDE CONSTANT SPEED AND VARIABLE SPEED UNITS WITH SINGLE POINT POWER CONNECTION. PROVIDE UNITS WITH INTEGRAL DISCONNECTS.
7. ALL WATER SOURCE HEAT PUMPS SHALL BE PROVIDED WITH OPEN PROTOCOL CONTROLLERS.
8. PROVIDE EACH UNIT WITH A IONIZATION TYPE SMOKE DETECTOR, INSTALLED IN THE RETURN DUCT WIRED TO SHUT DOWN THE UNIT UPON ACTIVATION. SMOKE DETECTOR SHALL BE SUPPLIED, WIRED FOR INTERFACE WITH FIRE ALARM SYSTEM AND UNIT SHUTDOWN BY THE ELECTRICAL CONTRACTOR. SMOKE DETECTOR SHALL BE INSTALLED IN THE RETURN DUCT BY THE MECHANICAL CONTRACTOR.
9. PROVIDE DEMAND CONTROL VENTILATION CONTROLS WHERE INDICATED FOR OUTSIDE AIR AIRFLOW/DAMPER CONTROL, INDICATED BY 'DCV', SEE SEQUENCE OF OPERATION.
10. PROVIDE DYNAMIC AIR CLEANING FILTERS FOR UNITS WHERE INDICATED , INDICATED BY 'DAC'.
11. PROVIDE UNITS WITH CONDENSATE PUMP WHEN NOT GRAVITY DRAINED

BID ALTERNATE #5: REPLACE SPECIFIED MECHANICAL HEAT PUMPS WITH MECHANICAL HEAT PUMPS THAT WILL SATISFY THE DOMESTIC CONTENT REQUIREMENTS TO QUALIFY FOR DOMESTIC CONTENT BONUS CREDIT BASED ON SECTIONS 45, 45Y, 48, AND 48E, OF THE INTERNAL REVENUE CODE. PUBLIC LAW 17-169, 136 STAT. 1818 (AUGUST 16, 2022), COMMONLY KNOWN AS THE INFLATION REDUCTION ACT OF 2022 (IRA).

BID ALTERNATE #6: EQUIPMENT USING REFRIGERANT R410A IS BEING PHASED OUT DUE TO ENVIRONMENTAL PROTECTION AGENCY (EPA) REGULATIONS. REFRIGERANT R454B IS BEING UTILIZED BY MOST MANUFACTURERS AS THE REPLACEMENT MOVING FORWARD. EQUIPMENT SELECTIONS HAVE NOT BEEN MADE AVAILABLE UNTIL RECENTLY. ALL EQUIPMENT BIDS SHALL CLEARLY INDICATE WHICH REFRIGERANT IS BASE BID, AND SHALL PROVIDE AN ALTERNATE FOR EQUAL EQUIPMENT UTILIZING R454B.

ENERGY RECOVERY VENTILATOR SCHEDULE

SYMBOL	SUPPLY AIR SUPPLY (CFM)	SUPPLY AIR SUPPLY E.SP. (IN H20)	SUPPLY AIR FAN HP	EXHAUST AIR EXH. (CFM)	EXHAUST AIR EXH. E.S.P. (IN H20)	EXHAUST AIR FAN HP	SUMMER SUPPLY AIR CONDITIONS (°F.) DRY BULB (F°)	SUMMER WET BULB (F°)	SUMMER SPECIFIC HUMIDITY	SUMMER ENTHALPY	WINTER SUPPLY AIR CONDITIONS (°F.) DRY BULF (F°)	WINTER WET BULB (F°)	WINTER SPECIFIC HUMIDITY	WINTER ENTHALPY	ELECTRICAL MCA	ELECTRICAL MOCP	ELECTRICAL Voltage	ELECTRICAL Phase	MANUFACTURER GREENHECK MODEL
ERV-1	1500	0.75	0.75 hp	1860	0.75	1.00 hp	93.3	78.1	0.017264	41.4	22.5	18.8	0.001201	6.7	4.8 A	15.0 A	460 V	3	ERV-45-15L
ERV-2	2100	0.75	1.50 hp	2535	0.75	2.00 hp	93.3	78.1	0.017264	41.4	22.5	18.8	0.001201	6.7	7.9 A	15.0 A	460 V	3	ERV-45-15L

NOTES:

1. REFER TO SPECIFICATION 237223 - AIR-TO-AIR ENERGY RECOVERY FOR ADDITIONAL REQUIREMENTS.
2. ENERGY WHEEL, HEAT AND HUMIDITY TRANSFER TYPE. AHRI CERTIFIED.
3. UL TESTED FLAMMABILITY AND SMOKE GENERATION THAT MEETS NFPA 90A AND 90B TEST STANDARDS FOR COMMERCIAL APPLICATIONS.
4. 10-YEAR WHEEL WARRANTY; 2-YEAR WARRANTY ON BALANCE OF UNIT FROM DATE OF SUBSTANTIAL COMPLETION.
5. UNIT TO BE CONTROLLED ON/OFF BY BAS.

ACCESSORIES:

A. BLOWER/MOTOR PACKAGES WITH ADJUSTABLE SHEAVES.
B. ACCESS DOORS FOR ACCESS TO BLOWERS, CORE AND FILTERS.
C. MERV-8 FILTERS FOR SUPPLY AND EXHAUST. PROVIDE FILTER MONITORING.
D. PREMIUM EFFICIENT BLOWER MOTORS.
E. INSULATED CABINET CONSTRUCTION.
F. MOUNTING FEET FOR INSTALLATION AT FLOOR LEVEL.
G. UNIT SUPPLY INTAKE AND EXHAUST LOW LEAKAGE MOTORIZED DAMPERS.

EQUIVALENT MANUFACTURERS LISTING

LISTING OF MANUFACTURER'S NAME DOES NOT GUARANTEE APPROVAL. ALL EQUIPMENT MUST MEET OR EXCEED QUALITY AND CAPACITIES OF SPECIFIED EQUIPMENT. FINAL APPROVAL WILL BE BASED ON EQUIPMENT SUBMITTALS. ANY MANUFACTURER NOT LISTED BUT WISHING TO BID THIS PROJECT SHALL SUBMIT A WRITTEN REQUEST A MINIMUM OF 7 DAYS PRIOR TO BID DATE OR AS INDICATED IN THE SPECIFICATIONS, ALL EQUIPMENT LISTED IN THE PROJECT SCHEDULE IS TO BE CONSIDERED DESIGN BASIS EQUIPMENT. PRIOR APPROVAL IS REQUIRED FOR ALL MANUFACTURERS NOT LISTED.

(ALPHABETICAL ORDER)
AIR DISTRIBUTION: CARNES, KRUEGER, METAL*AIRE, NAILOR, PRICE, TITUS, TUTTLE & BAILEY
DDC CONTROLS: ALERTON, HONEYWELL, SEIMENS, TRANE, SCHNEIDER ELECTRIC, JOHNSON CONTROLS, ALC
DUCTLESS SPLIT SYSTEMS: DAIKIN, MITSUBISHI, TRANE
ENERGY RECOVERY VENTILATORS: COOK, ENGINEERED AIR, GREENHECK
ELECTRIC WALL/UNIT HEATERS: BERKO, MARKEL, MODINE, QMARK, RAYWALL
FANS: COOK, GREENHECK, PENN, TWIN CITY
FIRE DAMPERS: GREENHECK, NAILOR, NCA, POTTORFF, RUSKIN, SAFE-AIRE
KITCHEN HOODS: CAPTIVE-AIRE, ACCUREX, SELECT AIR SYSTEMS
LAB EXHAUST FANS: COOK, GREENHECK, TWIN CITY
LOUVER: GREENHECK, POTTORFF, RUSKIN, SAFE-AIR
PUMPS & HYDRONIC EQUIPMENT: ARMSTRONG, BELL & GOSSETT, PATTERSON, TACO, GRUNDFOS
SPIRAL DUCTWORK: EASTERN SHEET METAL, HAMLIN, LINDAB, UNITED MCGILL
WATER SOURCE HEAT PUMPS: CARRIER, CLIMATE-MASTER, DAIKIN, FLORIDA HEAT PUMP, TRANE, ENERTECH/TETCO
100% OUTSIDE AIR MAKE-UP UNITS: AAON, ENGINEERED AIR, DESERT AIRE, GREENHECK

NOTE:
ALL COST ASSOCIATED WITH SUBSTITUTED/NON-DESIGN BASIS EQUIPMENT TO COMPLY WITH BASIS OF DESIGN, INCLUDING PROVIDING MAINTENANCE ACCESS, CLEARANCE, PIPING, SHEET METAL, ELECTRICAL, REPLACEMENT OF SYSTEM COMPONENTS, BUILDING ALTERATIONS, ETC., SHALL BE INCLUDED IN THE ORIGINAL BASE BID. NO ADDITIONAL COST ASSOCIATED WITH SUBSTITUTED/NON-DESIGN BASIS EQUIPMENT WILL BE APPROVED DURING CONSTRUCTION AND ALL COST WILL BE THE RESPONSIBILITY OF THE MECHANICAL CONTRACTOR.

PUMP SCHEDULE

SYMBOL	MANUFACTURER	MODEL NO.	TYPE	PUMP FLOW DESIGN	PUMP INDIVIDUAL PUMP HEAD	MOTOR POWER	Rated Speed (RPM)	VOLT	PH	REMARKS
CWP-2V	GEOFLO	UPS26-116	INLINE	6.0 GPM	32.9 FT	0.167 hp	--	208 V	1	A
CWP-3V	TACO	2400-45	INLINE	9.0 GPM	33.7 FT	0.330 hp	3450	208 V	1	B
CWP-4H	TACO	2400-45	INLINE	12.0 GPM	35.0 FT	0.330 hp	3450	208 V	1	B
CWP-4V	TACO	2400-50	INLINE	12.0 GPM	35.3 FT	0.500 hp	3450	208 V	1	B
CWP-5H	TACO	2400-50	INLINE	15.0 GPM	37.4 FT	0.500 hp	3450	208 V	1	B
CWP-5V	TACO	2400-50	INLINE	15.0 GPM	37.5 FT	0.500 hp	3450	208 V	1	B
CWP-6V	TACO	1915	INLINE	18.0 GPM	39.4 FT	0.500 hp	1760	208 V	1	B
CWP-12.5	TACO	1915	INLINE	31.3 GPM	36.1 FT	1.000 hp	1760	208 V	1	B
CWP-20	TACO	1911	INLINE	50.0 GPM	71.9 FT	2.000 hp	1760	208 V	1	C
CWP-25	TACO	1911	INLINE	62.5 GPM	73.7 FT	3.000 hp	1760	208 V	1	C

NOTES:

1. ALL PUMPS SHALL BE FURNISHED WITH HIGH EFFICIENCY MOTORS.

REMARKS:

A. PROVIDE ONE DOUBLE PUMP KIT AT ASSOCIATED WSHP WITH CONNECTIONS FOR THE KIT.
B. PROVIDE TWO PUMPS AT ASSOCIATED WSHP WITH INDIVIDUAL CONNECTIONS FOR EACH PUMP.
C. PROVIDE ONE PUMP AT ASSOCIATED WSHP WITH INDIVIDUAL CONNECTIONS FOR THE PUMP.

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CONSTRUCTION DOCUMENTS

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PAMLICO COUNTY
PAMLICO 6-12 SCHOOL
601 Main Street, Bayboro, NC, 28515

ENERGY STAR PARTNER

No.	Date	Description

ISSUE DATE: 06/12/24
PROJECT #: 2205
DRAWN BY: TAL
CHECKED BY: JWM

MECHANICAL SCHEDULES

M-002

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DUCTLESS A/C CONDENSING UNIT SCHEDULE

SYMBOL	MANUFACTURER	MODEL NO.	NOMINAL CAPACITY	TYPE	REFRIGERANT TYPE	REFRIGERANT CHARGE	LOW AMBIENT KIT	SUMMER AMBIENT DBT	WINTER AMBIENT DBT	EER	SOUND PRESSURE LEVEL	WEIGHT	MCA	MOCP	VOLT	PH	REMARKS
ODU-1	Mitsubishi Electric	PUY-A24NHA7(-BS)	2.0 ton	COOLING ONLY	R410A	7 lb	Yes	93.3 °F	22.5 °F	12.2	47	151 lb	19.0 A	26.0 A	208 V	1	
ODU-2	Mitsubishi Electric	PUY-A18NKA7(-BS)	1.5 ton	COOLING ONLY	R410A	4 lb	Yes	93.3 °F	22.5 °F	10.7	44	99 lb	11.0 A	28.0 A	208 V	1	
ODU-3	Mitsubishi Electric	PUY-A18NKA7(-BS)	1.5 ton	COOLING ONLY	R410A	4 lb	Yes	93.3 °F	22.5 °F	10.7	44	99 lb	11.0 A	28.0 A	208 V	1	
ODU-4	Mitsubishi Electric	PUY-A18NKA7(-BS)	1.5 ton	COOLING ONLY	R410A	4 lb	Yes	93.3 °F	22.5 °F	10.7	44	99 lb	11.0 A	28.0 A	208 V	1	

DUCTLESS A/C CONDENSING UNIT SCHEDULE NOTES:

1. COOLING CAPACITY @ 95 AMBIENT.
2. ALL UNITS SHALL BE U.L. LISTED AND ASHRAE 90.1 COMPLIANT.
3. MOUNT UNITS ON A 4" THICK CONCRETE PAD AND PROVIDE MANUFACTURER'S RECOMMENDED CLEARANCES AROUND UNITS.
4. MOUNT UNITS ON ROOF ON EQUIPMENT SUPPORT RAILS AS MFG. BY ROOF PRODUCTS AND SYSTEMS, CORP. (OR EQUAL) AND PROVIDE MANUFACTURER'S RECOMMENDED CLEARANCES AROUND UNITS.
5. PROVIDE UNITS WITH CONDENSER COIL HAIL GUARDS AND LOW AMBIENT CONTROLS.
6. PROVIDE UNIT COILS WITH SEACOAST PROTECTION
7. FOR REFRIGERANT LINE APPLICATIONS WITH A TOTAL EQUIVALENT LENGTH BETWEEN 50'-0" AND 175'-0".
   THE FOLLOWING ACCESSORIES SHALL BE PROVIDED;
   -COMPRESSOR CRANKCASE HEATER.
   - COMPRESSORT START ASSIST CAPACITOR AND RELAY (NOT REQUIRED FOR SCROLL COMPRESSORS OR THREE PHASE UNITS).
   - WIND BAFFLES (FOR UNIT MOUNTED ON ROOFS).
   - SEACOAST PROTECTION FOR COILS.
   -FOR HORIZONTAL CONFIGURATION: PROVIDE LIQUID LINE SOLENOID WITHIN 2'-0" OUTDOOR UNIT WITH FLOW ARROW POINTING TOWARD OUTDOOR UNIT. VAPOR LINE SHOULD SLOPE TOWARD INDOOR UNIT.
   - FOR INDOOR UNIT LOCATED ABOVE OUTDOOR UNIT (50'-0" MAX.), A LIQUID LINE (BI-FLOW) SOLENOID MUST BE INSTALLED WITHIN 2'-0" OF OUTDOOR UNIT WITH FLOW ARROW POINTING TOWARD OUTDOOR UNIT. AN INVERTED VAPOR LINE TRAP MUST BE INSTALLED AT INDOOR UNIT. THE TOP OF THE TRAP MUST BE GREATER THAN THE HEIGHT OF THE INDOOR COIL.
   -FOR INDOOR UNIT LOCATED BELOW OUTDOOR UNIT (150'-0" MAX); A LIQUID LINE (BI-FLOW) SOLENOID MUST BE INSTALLED WITHIN 2'-0" OF OUTDOOR UNIT.

BID ALTERNATE #6: EQUIPMENT USING REFRIGERANT R410A IS BEING PHASED OUT DUE TO ENVIRONMENTAL PROTECTION AGENCY (EPA) REGULATIONS. REFRIGERANT R454B IS BEING UTILIZED BY MOST MANUFACTURERS AS THE REPLACEMENT MOVING FORWARD. EQUIPMENT SELECTIONS HAVE NOT BEEN MADE AVAILABLE UNTIL RECENTLY. ALL EQUIPMENT BIDS SHALL CLEARLY INDICATE WHICH REFRIGERANT IS BASE BID, AND SHALL PROVIDE AN ALTERNATE FOR EQUAL EQUIPMENT UTILIZING R454B.

DUCTLESS A/C INDOOR UNIT SCHEDULE

SYMBOL	MANUFACTURER	MODEL NO.	DESIGN AIRFLOW	TOTAL CAPACITY	EAT(db)	EAT(wb)	UNIT WEIGHT	MCA	VOLT	PH	INTERLOCK ID	REMARKS
DSS-1	Mitsubishi Electric	PKA-A24KA7	775 CFM	24,000 Btu/h	90.0 °F	72.0 °F	46 lb	1.0 A	208 V	1	ODU-1	
DSS-2	Mitsubishi Electric	PKA-A18LA	455 CFM	18,000 Btu/h	90.0 °F	72.0 °F	28 lb	1.0 A	208 V	1	ODU-2	
DSS-3	Mitsubishi Electric	PKA-A18LA	455 CFM	18,000 Btu/h	90.0 °F	72.0 °F	28 lb	1.0 A	208 V	1	ODU-3	
DSS-4	Mitsubishi Electric	PKA-A18LA	455 CFM	18,000 Btu/h	90.0 °F	72.0 °F	28 lb	1.0 A	208 V	1	ODU-4	

DUCTLESS A/C UNIT SCHEDULE NOTES:

1. PROVIDE WITH FACTORY THERMOSTAT AND CONDENSATE PUMP.
2. INSTALL PER MANUFACTURER'S RECOMMENDATIONS.
3. SIZE AND INSTALL REFRIGERANT PIPING PER MANUFACTURER'S RECOMMENDATIONS.
4. INDOOR UNITS ARE POWERED BY THE CONDENSING UNITS.
5. IN EVERY ROOM SERVED BY A MINI-SPLIT INDOOR UNIT PROVIDE A TEMPERATURE SENSOR INTEGRATED INTO THE BAS WITH HIGH TEMPERATURE ALARM SET AT 80F (ADJ)

EXHAUST FAN SCHEDULE

SYMBOL	LOCATION	MANUFACTURER	MODEL NO.	TYPE	CFM	APPROX. ESP	DRIVE TYPE	FAN RPM	ELECTRICAL DATA WATTS	H.P.	VOLTAGE-PHASEØ	ACCESSORIES	CONTROL TYPE
EF-1	ADMIN OFFICE	GREENHECK	CSP-A250	CEILING	75	0.50	DIRECT	770	25	0.00	115 V-1Ø	A,B,F,G,O	2
EF-2	ADMIN OFFICE	GREENHECK	CSP-A250	CEILING	75	0.50	DIRECT	770	25	0.00	115 V-1Ø	A,B,F,G,O	2
EF-3	ADMIN OFFICE	GREENHECK	CSP-A250	CEILING	75	0.50	DIRECT	770	25	0.00	115 V-1Ø	A,B,F,G,O	2
EF-4	ADMIN OFFICE	GREENHECK	CSP-A250	CEILING	75	0.50	DIRECT	770	25	0.00	115 V-1Ø	A,B,F,G,O	2
EF-5	HS GIRLS V LOCKER 1202	GREENHECK	G-095-D	DOWNBLAST	400	0.50	DIRECT	1540	1000	0.13	115 V-1Ø	A,B,D,E	2
EF-6	HS GIRLS JV LOCKER 1203	GREENHECK	G-095-D	DOWNBLAST	400	0.50	DIRECT	1540	1000	0.13	115 V-1Ø	A,B,D,E	2
EF-7	ELECTRICAL ROOM	GREENHECK	G-120-A	DOWNBLAST	1,420	0.50	DIRECT	1406	1000	0.50	115 V-1Ø	A,C,D,E	1
EF-8	ELECTRICAL ROOM	GREENHECK	G-080-D	DOWNBLAST	180	0.50	DIRECT	1330	500	0.25	115 V-1Ø	A,C,D,E	1
EF-9	EQUIP 1314	GREENHECK	G-080-D	DOWNBLAST	180	0.50	DIRECT	1330	500	0.25	115 V-1Ø	A,C,D,E	1
EF-10	HS BOYS JV LOCKER 1208	GREENHECK	G-095-D	DOWNBLAST	400	0.50	DIRECT	1540	1000	0.13	115 V-1Ø	A,B,D,E	2
EF-11	HS BOYS LOCKER ROOM 1209	GREENHECK	G-095-D	DOWNBLAST	400	0.50	DIRECT	1540	1000	0.13	115 V-1Ø	A,B,D,E	2
EF-12	LNDR 1311	GREENHECK	SP-B150	CEILING	125	0.50	DIRECT	911	128	0.00	115 V-1Ø	A,B,F,G,O	5
EF-13	RR 1205B	GREENHECK	SP-B150	CEILING	125	0.50	DIRECT	911	128	0.00	115 V-1Ø	A,B,F,G,O	2
EF-14	RR 1207B	GREENHECK	SP-B150	CEILING	125	0.50	DIRECT	911	128	0.00	115 V-1Ø	A,B,F,G,O	2
EF-15	CUST 1206	GREENHECK	SP-B150	CEILING	125	0.50	DIRECT	911	128	0.00	115 V-1Ø	A,B,F,G,O	2
EF-16	MECH PENTHOUSE M2300	GREENHECK	SQ-90	INLINE	275	0.50	DIRECT	1643	0	0.10	115 V-1Ø	A,B,F,G	2
EF-17	MECH PENTHOUSE M2300	GREENHECK	SQ-90	INLINE	275	0.50	DIRECT	1643	0	0.10	115 V-1Ø	A,B,F,G	2
EF-18	KITCHEN	GREENHECK	CSP-A250	CEILING	75	0.50	DIRECT	770	25	0.00	115 V-1Ø	A,B,F,G,O	2
EF-19	KITCHEN	GREENHECK	CSP-A250	CEILING	75	0.50	DIRECT	770	25	0.00	115 V-1Ø	A,B,F,G,O	2
EF-20	KITCHEN	GREENHECK	CSP-A250	CEILING	75	0.50	DIRECT	770	25	0.00	115 V-1Ø	A,B,F,G,O	2
EF-21	DISHWASHING	GREENHECK	G-080-D	DOWNBLAST	180	0.50	DIRECT	1330	500	0.25	115 V-1Ø	A,B,D,E	3
EF-22	PUMP ROOM	GREENHECK	G-120-A	DOWNBLAST	1,440	0.50	DIRECT	1420	1000	0.50	115 V-1Ø	A,C,D,E	1,10
EF-23	TRADES LAB	GREENHECK	SQ-120	INLINE	520	0.25	DIRECT	753	500	0.13	115 V-1Ø	A,B,F,G	3
EF-24	WOOD WORKING	GREENHECK	SQ-120	INLINE	520	0.25	DIRECT	753	0	0.13	115 V-1Ø	A,C,F,G,K	3
EF-25	WELDING	GREENHECK	USF-15-B7	UTILITY SET	3,200	0.50	DIRECT	1641	0	1.50	460 V-3Ø	A,C,K,N,U	4
EF-26	1718 BIOLOGY	GREENHECK	SQ-120	INLINE	1,310	0.50	DIRECT	1629	1127	0.50	115 V-1Ø	A,B,F,G	5
EF-27	1716B & 2230B PREP ROOM	GREENHECK	G-080-D	DOWNBLAST	490	0.50	DIRECT	1426	500	0.25	115 V-1Ø	A,B,D,E	7
EF-28	FUME HOOD EXHAUST	GREENHECK	USF-04-B7	UTILITY SET	700	0.50	DIRECT	1702	0	0.25	460 V-1Ø	A,C,K,N,U	9
EF-29	1710 CHEMISTRY	GREENHECK	SQ-120	INLINE	1,650	0.50	DIRECT	1583	1127	0.50	115 V-1Ø	A,B,F,G	5
EF-30	1708B PREP ROOM	GREENHECK	G-080-D	DOWNBLAST	260	1.00	DIRECT	1651	500	0.25	115 V-1Ø	A,B,D,E	7
EF-31	1714 PHYSICAL SCIENCE	GREENHECK	SQ-120	INLINE	1,260	0.50	DIRECT	1583	1127	0.50	115 V-1Ø	A,B,F,G	5
EF-32	1804 HS CTEC LAB 3D ART	GREENHECK	G-120-A	DOWNBLAST	840	1.00	DIRECT	1411	500	0.50	115 V-1Ø	A,B,D,E	5
EF-33	1802 HS CTEC LAB 2D ART	GREENHECK	G-120-A	DOWNBLAST	840	1.00	DIRECT	1411	500	0.50	115 V-1Ø	A,B,D,E	5
EF-34	KILN	GREENHECK	SP-B150	CEILING	150	0.50	DIRECT	1050	128	0.00	115 V-1Ø	A,B,F,G,O	1
EF-35	2214 6TH SCIENCE	GREENHECK	G-099-A	DOWNBLAST	890	0.50	DIRECT	1547	500	0.25	115 V-1Ø	A,B,D,E	5
EF-36	1716 PHYSICS	GREENHECK	SQ-120	INLINE	1,310	0.50	DIRECT	1629	1130	0.50	115 V-1Ø	A,B,F,G	5
EF-37	2210 7TH SCIENCE	GREENHECK	G-099-A	DOWNBLAST	900	0.50	DIRECT	1558	500	0.25	115 V-1Ø	A,B,D,E	5
EF-38	2230 MS SCIENCE	GREENHECK	G-099-A	DOWNBLAST	960	0.50	DIRECT	1611	500	0.25	115 V-1Ø	A,B,D,E	5

EXHAUST FAN SCHEDULE ACCESSORIES:

- A. DISCONNECT SWITCH
- B. GRAVITY BACKDRAFT DAMPER
- C. MOTORIZED BACKDRAFT DAMPER
- D. PREFAB, ROOF CURB
- E. BIRDSCREEN
- F. ACOUSTICAL LINING
- G. HANGING BRACKETS WITH VIBRATION ISOLATION
- H. WL, WALL LOUVER DISCHARGE
- I. RCC OR GRS ROOF CAP (FLAT ROOF) OR RJ ROOF CAP (PITCHED ROOF)
- J. WALL MOUNTING COLLAR
- K. INLET GAURD
- M. 2" WASHABLE ALUMINUM FILTERS
- N. MOTORSIDE FAN GUARD
- O. EXHAUST GRILLE
- P. U.L. 762
- Q. VENTED ROOF CURB EXTENSION
- R. COMBINATION KITCHEN HOOD FAN CURB
- S. INTERLOCK WITH FUME HOOD
- T. PROVIDE DRAIN PLUG ACCESSORY
- U. ROOF SUPPORT RAILS
- V. VFD

EXHAUST FAN SCHEDULE CONTROLS:

1. WALL MOUNTED THERMOSTAT (REVERSE ACTING, SET FOR 80°)
2. INTERLOCK WITH ROOM LIGHT SWITCH (FAN SHALL OPERATE WHEN LIGHT IS ON IF ANY ROOM IS SERVED BY FAN)
3. WALL MOUNTED ON/OFF SWITCH WITH IDENTIFICATION LABEL
4. WALL MOUNTED MUSHROOM PUSH BUTTON SWITCH/STARTER WITH IDENTIFICATION LABEL
5. WALL MOUNTED TWIST TIMER WITH 0-3O MINUTE RANGE WITH IDENTIFICATION LABEL
6. CONTROLLED BY BUILDING AUTOMATION SYSTEM
7. CONTINUOUS OPERATION
8. CONTROLLED BY THE FACP AND FIREMAN'S MANUAL OVER-RIDE CONTROL PANEL IN FIRE COMMAND ROOM. NO MECHANICAL CONTROL POINTS REQUIRED BY M.C. FOR SMOKE CONTROL FANS
9. INTERLOCK WITH FUME HOOD
10. INTERLOCK WITH MECHANICAL ROOM 'CO' DETECTOR

EXHAUST FAN SCHEDULE NOTES:

1. ALL FANS SHALL BE U.L. LISTED AND LABELED AND SHALL BE AMCA CERTIFIED FOR SOUND AND AIR FLOW. ALL FANS INSTALLED INSIDE, ABOVE, OR ADJACENT TO OCCUPIED SPACES SHALL HAVE A MAXIMUM 9.0 INLET SONE LEVEL.
2. ALL FANS SHALL BE SUPPLIED BY ONE MANUFACTURER UNLESS NOTED OTHERWISE.
3. MECHANICAL CONTRACTOR SHALL PROVIDE MAGNETIC STARTER WITH AUXILIARY CONTACTS AS REQUIRED.
4. PROVIDE ALL DIRECT DRIVE FANS WITH SPEED CONTROLLERS.
5. BACKDRAFT DAMPER ON ROOF SUPPLY FANS SHALL BE MOTORIZED.

ELECTRIC HEATER SCHEDULE

SYMBOL	LOCATION	CFM	BTUH	ELECTRICAL KW	AMPS	VOLTAGE	PH	MANUFACTURER (MARKEL)	Equipment Weight	ACCESSORIES
EWH-1	S1 STAIR 01	175	6,824	2	7.50 A	277	1	E3324TD-RP	27 lb	A,B,D,G,H
EWH-2	V1300 VEST	175	5,120	1.5	4.10 A	277	1	E3322TD-RP	26 lb	A,B,D,G,H
EWH-3	S4 EXIT STAIR	175	6,824	2	7.20 A	277	1	E3324TD-RP	27 lb	A,B,D,G,H
EWH-4	V1500 VEST	175	2,560	0.75	6.25 A	120	1	E3321TD-RP	26 lb	A,B,D,G,H
EWH-5	V1700 VEST	175	2,560	0.75	6.25 A	120	1	E3321TD-RP	26 lb	A,B,D,G,H
EWH-6	S5 EXIT STAIR	175	6,824	2	7.20 A	277	1	E3324TD-RP	27 lb	A,B,D,G,H
EWH-7	E1210 ELECTRICAL ROOM	175	16,378	4.8	17.30 A	277	1	E3327TD-RP	29 lb	A,B,D,G,H
EWH-8	1314 EQPT.	175	7,677	3	10.80 A	277	1	E3325TD-RP	29 lb	A,B,D,G,H
EWH-9	1411 FIRE PUMP ROOM	175	16,378	4.8	17.30 A	277	1	E3327TD-RP	29 lb	A,B,D,G,H

NOTES:

1. HEATING CAPACITY BASED ON 65° F E.A.T.
2. SEE PLANS FOR TYPE OF THERMOSTAT REQUIRED (WALL MOUNTED OR UNIT MOUNTED). UNIT HEATERS SHOWN WITHOUT THERMOSTAT INDICATED SHALL BE PROVIDED WITH A UNIT MOUNTED THERMOSTAT.
3. SET TO MAINTAIN 45°F.

ELECTRIC HEATER ACCESSORIES:

- A. DISCONNECT SWITCH
- B. BUILT IN THERMOSTAT
- C. WALL MOUNTED THERMOSTAT
- D. WALL MOUNTING BRACKETS
- E. CEILING MOUNTED BRACKETS
- F. ADJUSTABLE DISCHARGE LOUVERS
- G. PENCIL PROOF LOUVERS
- H. CABINET FOR SURFACE MOUNTING

HVLS FAN SCHEDULE

SYMBOL	LOCATION	CFM	DRIVE	MAX RPM	ELECTRICAL DATA H.P.	VOLTAGE-PHASEØ	MANUFACTURER	MODEL
HVLS-1	LOBBY	71900	DIRECT	125	0.75	460 V-3Ø	GREENHECK	DS-6-12-70HV
HVLS-2	DINING	71900	DIRECT	125	0.75	460 V-3Ø	GREENHECK	DS-6-12-70HV
HVLS-3	CLASSROOM WING	71900	DIRECT	125	0.75	460 V-3Ø	GREENHECK	DS-6-12-70HV
HVLS-4	CLASSROOM WING	71900	DIRECT	125	0.75	460 V-3Ø	GREENHECK	DS-6-12-70HV

NOTES:

1. ALL FANS SHALL BE U.L. LISTED AND LABELED AND SHALL BE AMCA CERTIFIED FOR SOUND AND AIR FLOW.
2. ALL FANS SHALL BE SUPPLIED BY ONE MANUFACTURER UNLESS NOTED OTHERWISE.
3. MECHANICAL CONTRACTOR SHALL PROVIDE MAGNETIC STARTER WITH AUXILIARY CONTACTS AS REQUIRED.
4. PROVIDE WITH: A DIGITAL WALL CONTROLLER WITH FAULT CODE ACCESS AND DISPLAY CODE LOCK-OUT, BAS MONITORING/INTEGRATION, AVD FUSED DISCONNECT, INDUSTRIAL GRADE GEAR BOX, AIRFOIL RETAINERS, HUB CLIPS, SAFETY CABLES ,GRADE 8 BOLTS, FIRE DELAY, 12-YEAR LIMITED WARRANTY.
5. COORDINATE SUPPORT REQUIREMENTS WITH MANUFACTURER.
6. FANS SHALL SHUT-DOWN UPON SIGNAL FROM SPRINKLER MONITORING SYSTEM INDICATING WATER FLOW IN THE SPRINKLER SYSTEM. COORDINATE CONNECTION(S) WITH FP/FA CONTRACTORS.
7. SEE 12/M503 FOR FP INSTALLATION COORDINATION DETAIL

KITCHEN HOOD SCHEDULE

(FURNISHED AND INSTALLED BY THE M.C.)

KEF-1 CAPTIVE-AIRE MODEL DU240HFA EXHAUST FAN; 3,590 CFM, 1.4" E.S.P., 3-HP 460V-3PH FAN MOTOR, 311 LBS OPERATING WEIGHT.

MUA-1 CAPTIVE-AIRE MODEL A2-D.250-20D NATURAL GAS HEAT MAKE-UP AIR UNIT; 2872 CFM, 0.75" E.S.P., 2-HP 460V-3PH FAN MOTOR, 4.8A MCA, 15A MOCP,
163,610 INPUT BTUs, 150,521 OUTPUT BTUs, 48 DEG F TEMP RISE, 680 LBS OPERATING WEIGHT.

KH-1 CAPTIVE-AIRE MODEL 6624 ND-2-PSP-F; 11'-6"x6'-8"x2'-0" DEEP HOOD WITH 6" DEEP SUPPLY PLENUMS AT FRONT; 2300 CFM EXHAUST @ 1.02" S.P. (MAX.); 1840 CFM SUPPLY @ 0.17" S.P. (MAX.)

KH-2 CAPTIVE-AIRE MODEL 6624 ND-2-PSP-F; 6'-0"x6'-8"x2'-0" DEEP HOOD WITH 6" DEEP SUPPLY PLENUMS AT FRONT; 1290 CFM EXHAUST @ 0.438" S.P. (MAX.); 1032 CFM SUPPLY @ 0.15" S.P. (MAX.)

ALL 430 STAINLESS STEEL CONSTRUCTION. ALL COMPONENTS SHALL BE U.L. LISTED AND LABELED. PROVIDE A REMOTE CONTROL PANEL MOUNTED ON FACE OF HOOD WITH MASTER DISCONNECT SWITCH, STARTER FOR FAN, CONTROL VOLTAGE TRANSFORMER, FIRE CONTROL SYSTEM RELAY AND TERMINAL STRIP. MOUNT HOOD 6'-8" ABOVE FINISH FLOOR, PROVIDE STAINLESS STEEL ENCLOSURE AROUND TOP OF HOOD AS REQUIRED TO CLOSE TO CEILING. PROVIDE VERTICAL END PANELS FOR ENDS OF HOOD. HOOD SHALL BE PROVIDED WITH: AUTOMATICALLY OPERATED FIXED PIPE FIRE SUPPRESSION SYSTEM IN ACCORDANCE WITH NFPA 96, CONTROL SWITCHES AND PILOT LIGHT FOR EXHAUST FAN, TWO4' VAPORPROOF LED LAMP LIGHT FIXTURES (MIN. 2 PER HOOD), AND STAINLESS STEEL GREASE FILTERS. FIRE SUPPRESSION SYSTEM SHALL BE ANSUL R-102 WITH ANSULEX LIQUID FIRE SUPPRESSANT. REMOTE PULL STATION FOR ACTIVATION OF FIRE SUPPRESSION SYSTEM SHALL BE PROVIDED AND INSTALLED WHERE INDICATED ON THE PLANS. FIRE SUPPRESSION SYSTEM SHALL BE UL 300 LISTED. CONTRACTOR SHALL PROVIDE MANUAL VOLUME DAMPER IN EACH SUPPLY DUCT COLLAR FOR MAKE-UP AIR BALANCING.

ADDITIONAL FIRE SUPPRESSION NOTES (2018 NC FIRE CODE)

904.12.1 A MANUAL ACTUATION DEVICE SHALL BE LOCATED AT OR NEAR A MEANS OF EGRESS FROM THE COOKING AREA, A MINIMUM OF 10 FEET AND A MAXIMUM OF 20 FEET FROM THE KITCHEN EXHAUST SYSTEM. THE MANUAL ACTUATION DEVICE SHALL BE LOCATED A MINIMUM OF 3.5 FEET AND A MAXIMUM OF 4 FEET ABOVE THE FLOOR AND CLEARLY INDICATE THE HAZARD PROTECTED. THE MANUAL ACTUATION SHALL REQUIRE A MAXIMUM FORCE OF 40 POUNDS AND A MAXIMUM MOVEMENTOF 14 INCHES TO ACTUATE THE FIRE SUPPRESSION SYSTEM.

904.12.2 THE ACTUATION OF THE FIRE SUPPRESSION SYSTEM SHALL AUTOMATICALLY SHUT DOWN THE FUEL AND ELECTRICAL POWER SUPPLY TO THE COOKING EQUIPMENT. THE FUEL AND ELECTRICAL SUPPLY RESET SHALL BE MANUAL.

NOTES:

1. KITCHEN HOOD SHALL BE CONSTRUCTED AND INSTALLED PER NFPA 96.
2. UPON ACTIVATION OF FIRE CONTROL SYSTEM, KITCHEN HOOD EXHAUST FAN SHALL CONTINUE TO OPERATE. PROVIDE INTERLOCK FOR AUTOMATIC OPERATION OF FIRE SUPPRESSION SYSTEM WITH:
   A. CONTACTORS (BY ELEC. CONTR.)
   B. HOOD SUPPLY AND EXHAUST FANS
   C. REMOTE MANUAL PULL STATION
   D. ALL ASSOCIATED AIR HANDLING UNITS
   E. FIRE ALARM SYSTEM NOTIFICATION (BY ELEC. CONTR.)
   F. NATURAL GAS SHUT-OFF
3. SEE SHEET M-503 FOR HOOD DETAILS.
4. KITCHEN HOOD EXHAUST DUCT SHALL BE STAINLESS STEEL. ALL JOINTS AND SEAMS SHALL BE CONSTRUCTED WITH A CONTINUOUS LIQUID-TIGHT EXTERNAL WELD. ALL DUCTWORK SHALL SLOPE A MINIMUM OF 1/4 INCH PER FOOT TOWARD HOOD. PROVIDE CLEANOUTS AT EVERY CHANGE OF DIRECTION IN THE EXHAUST DUCT AND AT 20'-0" (MINIMUM) INTERVALS. THE MECHANICAL CONTRACTOR SHALL PERFORM A LIGHT TEST (AS REQUIRED BY MECHANICAL CODE) FOR ALL JOINTS AND SEAMS IN THE PRESENCE OF THE LOCAL AUTHORITY HAVING JURISDICTION PRIOR TO CONCEALING KITCHEN HOOD EXHAUST DUCTWORK.
5. ALL EXPOSED PIPING WITH FIRE SUPPRESSION SYSTEM SHALL BE COVERED WITH A CHROME SLEEVE.
6. MECHANICAL CONTRACTOR SHALL INSTALL 1/2" CONDUIT IN WALL FOR MANUAL PULL STATION. SEE PLANS FOR LOCATION OF MANUAL PULL STATION (MPS).
7. MECHANICAL CONTRACTOR SHALL BE RESPONSIBLE FOR HOOD CERTIFICATION IN COMPLIANCE WITH LOCAL CODE REQUIREMENTS. CERTIFICATION SHALL BE WITNESSED AND PERFORMED BY A PERSON CERTIFIED THROUGH AABC, TABB, NEBB OR NBC AND SHALL PROVIDE DOCUMENTATION OF PERFORMANCE TO THE CODE OFFICIAL. THIS SHALL INCLUDE WET TEST CAPTURE & CONTAINMENT.ALL EQUIPMENT SHALL BE ENERGIZED AND IN OPERATION DURING THE TEST. TEST SHALL ALSO INCLUDE VERIFYING ACTUAL FLOW RATES VERSUS DESIGN FLOW RATES.

VARIABLE SPEED KITCHEN HOODS

THE DCV (EMS) DEMAND VENTILATION SYSTEM IS DESIGNED TO AUTOMATICALLY REDUCE EXHAUST AND SUPPLY AIRFLOW QUANTITIES, WHILE ENSURING HOOD PERFORMANCE IS MAINTAINED. THE EMS USES VARIABLE FREQUENCY DRIVES (VFD) AND TEMPERATURE SENSORS IN THE EXHAUST DUCTS TO MODULATE THE FANS SPEED DURING COOKING OPERATION AND MAXIMIZE ENERGY SAVINGS. THE EMS LCD SCREEN INTERFACE PROVIDES FAN(S) CONTROL, SYSTEM CONFIGURATION, AND DIAGNOSTIC INFORMATION. CONSTRUCTION:

THE DCV INCLUDES:
- A SMART CONTROLLER
- LCD SCREEN INTERFACE
- DUCT TEMPERATURE SENSORS
- ROOM TEMPERATURE SENSOR
- VARIABLE FREQUENCY DRIVES

CONTROLS WILL BE LISTED BY ETL TO UL STANDARD 508A. THE SYSTEM INCLUDES A LCD SCREEN INTERFACE FOR FAN(S) AND HOOD LIGHTS CONTROL, WASH CONTROL (IF APPLICABLE), GAS VALVE RESET, PROGRAMMABLE SCHEDULE, MAX AIR OVERRIDE FUNCTION, PREPARATION TIME MODE, COOL DOWN MODE, AND DIAGNOSTICS INCLUDING VFD STATUS. THE LCD SCREEN SHOWS DESCRIPTIVE PLAIN TEXT EXPLAINING THE FUNCTIONS OR VALUES. THE LCD SCREEN INTERFACE WILL BE INSTALLED ON THE FACE OF THE HOOD, ON THE FACE OF THE UTILITY CABINET OR ON THE FACE OF A WALL MOUNTED CONTROL ENCLOSURE. CONTROL ENCLOSURE WILL BE NEMA 1 RATED AND LISTED FOR INSTALLATION INSIDE OF THE EXHAUST HOOD UTILITY CABINET. CONTROL ENCLOSURE MAY BE CONSTRUCTED OF STAINLESS STEEL OR PAINTED STEEL. THE SMART CONTROLLER WILL CONSTANTLY MONITOR THE EXHAUST AIR TEMPERATURE THROUGH THE RISER MOUNTED TEMPERATURE SENSOR AND MODULATE THE FAN SPEEDS ACCORDINGLY. A ROOM TEMPERATURE SENSOR WILL ALSO BE PROVIDED FOR FIELD INSTALLATION IN THE KITCHEN SPACE IN ORDER TO START THE FAN(S) BASED ON THE TEMPERATURE DIFFERENTIAL BETWEEN THE ROOM AND THE EXHAUST AIR IN THE DUCT RATHER THAN FIXED SET-POINTS. A PREPARATION TIME MODE IS AVAILABLE FOR MORNING OPERATION: DEDICATED MAKE-UP AIR WILL BE LOCKED OUT ONLY ALLOWING THE USE OF TRANSFER AIR DURING THIS MODE. EXHAUST FAN(S) WILL RUN AT LOW CFM WHILE MAINTAINING A BALANCED KITCHEN PRESSURE. A COOL DOWN MODE IS DESIGNED FOR EQUIPMENT COOL-DOWN PERIOD AT THE END OF THE DAILY COOKING OPERATIONS: SIMILARLY TO PREPARATION TIME MODE, DEDICATED MAKE-UP AIR WILL BE LOCKED OUT ONLY ALLOWING THE USE OF TRANSFER AIR DURING THIS MODE. EXHAUST FAN(S) WILL RUN AT LOW CFM WHILE MAINTAINING A BALANCED KITCHEN PRESSURE. FAN MAXIMUM/ MINIMUM SPEEDS WILL BE ADJUSTABLE FOR PROPER KITCHEN BALANCE. FAN DIRECTION CHANGE IS ALSO AVAILABLE FROM THE SMART CONTROLLER CONFIGURATION MENU WITHOUT NEED FOR REWIRING. DUCT TEMPERATURE SENSOR(S) WILL BE MOUNTED IN THE EXHAUST HOODRISER(S). TEMPERATURE PROBE WILL BE CONSTRUCTED OF STAINLESS STEEL. SYSTEM WILL BE FACTORY PRE-SET TO MODULATE FAN SPEED WITHIN A RANGE OF 45°F FOR 600°F AND 700°F COOKING APPLICATIONS AND A RANGE OF 5°F FOR 400°F COOKING APPLICATIONS. SETPOINTS ARE FULLY ADJUSTABLE THROUGH THE TOUCH SCREEN INTERFACE BASED ON APPLICATION NEEDS. THE MAX AIR OVERRIDE WILL HAVE AN ADJUSTABLE TIMEOUT VALUE. THE PANELS INCLUDE COLOR CODED WIRINGWITH AS-BUILT WIRING DIAGRAMS AND SPARE TERMINALS CONTROLLED BY THE FIRE SYSTEM MICRO SWITCH. THE PANEL IS FACTORY PRE-WIRED TO SHUT SUPPLY FANS DOWN IN A FIRE CONDITION. OPTIONS TO TURN ON THE EXHAUST FANS OR TURN OFF THE HOOD LIGHTS IN A FIRE CONDITION WILL BE CONFIGURABLE THROUGH THE SMART CONTROLLER, BUT ONLY THROUGH A PASSWORD PROTECTED MENU TO PREVENT ANY CHANGES AFTER A FIRE INSPECTION HAS BEEN PERFORMED.

BAS SHALL MONITOR STATUS AND FREQUENCY Hz OF KITCHEN FANS.

LOUVER SCHEDULE

SYMBOL	MANUFACTURER	MODEL NO.	DESIGN AIRFLOW	FREE AREA	FREE AREA VELOCITY	PD	DIMENSIONS WIDTH	DIMENSIONS HEIGHT	REMARKS	COMMENTS
L-1	RUSKIN	EME220DD	<varies>	2.3 SF	<varies>	0.02 in-wg	44"	15"	OUTSIDE/MAKE-UP AIR	B
L-2	RUSKIN	EME220DD	<varies>	2.3 SF	<varies>	0.19 in-wg	44"	15"	EXHAUST	
L-3	RUSKIN	EME220DD	3200 CFM	4.0 SF	808 FPM	0.02 in-wg	38"	30"	OUTSIDE/MAKE-UP AIR	
L-4	RUSKIN	EME220DD	1 CFM	3.7 SF	0 FPM	0.19 in-wg	48"	22"	EXHAUST	
L-5	RUSKIN	EME220DD	1600 CFM	2.0 SF	800 FPM	0.02 in-wg	36"	16"	OUTSIDE/MAKE-UP AIR	
L-6	RUSKIN	EME220DD	330 CFM	0.9 SF	371 FPM	0.02 in-wg	16"	16"	OUTSIDE/MAKE-UP AIR	
L-7	RUSKIN	EME220DD	<varies>	1.4 SF	<varies>	0.02 in-wg	20"	20"	OUTSIDE/MAKE-UP AIR	
L-8	RUSKIN	EME220DD	2350 CFM	4.0 SF	588 FPM	0.02 in-wg	72"	16"	OUTSIDE/MAKE-UP AIR	
L-9	RUSKIN	EME220DD	3200 CFM	5.6 SF	576 FPM	0.02 in-wg	40"	40"	OUTSIDE/MAKE-UP AIR	A
L-10	RUSKIN	EME220DD	1 CFM	0.5 SF	2 FPM	0.19 in-wg	12"	12"	EXHAUST	
L-11	RUSKIN	EME220DD	0 CFM	1.4 SF	0 FPM	0.19 in-wg	20"	20"	EXHAUST	
L-12	RUSKIN	EME220DD	1 CFM	1.8 SF	1 FPM	0.19 in-wg	28"	18"	EXHAUST	
L-13	RUSKIN	EME220DD	2100 CFM	2.7 SF	775 FPM	0.19 in-wg	30"	26"	EXHAUST	
L-14	RUSKIN	EME220DD	1 CFM	2.8 SF	0 FPM	0.19 in-wg	40"	20"	EXHAUST	

LOUVER SCHEDULE NOTES:

1. PROVIDE BAKED ENAMEL FINISH, COLOR BY ARCHITECT.
2. PROVIDE WITH BIRDSCREEN.
3. PROVIDE WITH DAMPER AS NOTED IN SCHEDULE
4. INSTALL WITH 18" DEEP INSULATED PLENUM.
5. PROVIDE FRAME TYPE REQUIRED FOR MOUNTING LOCATION.

- A. COORDINATE LOUVER WIDTH DIMENSION WITH DOOR FRAME SIZING TO MATCH
- B. COORDINATE FINAL LOUVER DIMENSIONS WITH WINDOW GLAZING FRAMING

FAN FILTER UNIT SCHEDULE

FF-1: ACS MODEL M-30 AIR CLEANER; 3,000 CFM, 3/4-HP 277V-1PH FAN MOTOR, 255 LBS OPERATING WEIGHT.

ACCESSORIES: PRESSURE GAUGE, PROVIDE EYE BOLTS AND VIBRATION ISOLATION FOR CEILING MOUNTED INSTALLATION, PROVIDE SILENCER

GRILLES, REGISTERS AND DIFFUSERS SCHEDULE

SYMBOL	DESCRIPTION	MANUF.	MODEL	MATERIAL	FACE SIZE	NECK SIZE	NECK WIDTH	NECK HEIGHT	INSTALLATION BORDER TYPE	OPTIONS DAMPER DESCRIPTION	NOTES
A	LOUVERED FACE DIFFUSER	TITUS	TDC	STEEL	12x12	6			TYPE 3 (LAY-IN)	---	SUPPLY
B	LOUVERED FACE DIFFUSER	TITUS	TDC	STEEL	12x12	8			TYPE 3 (LAY-IN)	---	SUPPLY
C	LOUVERED FACE DIFFUSER	TITUS	TDC	STEEL	24x24	6			TYPE 3 (LAY-IN)	---	SUPPLY
D	LOUVERED FACE DIFFUSER	TITUS	TDC	STEEL	24x24	8			TYPE 3 (LAY-IN)	---	SUPPLY
F	LOUVERED FACE DIFFUSER	TITUS	TDC	STEEL	24x24	10			TYPE 3 (LAY-IN)	---	SUPPLY
G	LOUVERED FACE DIFFUSER	TITUS	TDC	STEEL	24x24	12			TYPE 3 (LAY-IN)	---	SUPPLY
H	LOUVERED DBL DFL GRILLE	TITUS	300RL	STEEL	---		6	6	TYPE 1 (SURFACE)	---	SUPPLY
J	LOUVERED DBL DFL GRILLE	TITUS	300RL	STEEL	---		10	6	TYPE 1 (SURFACE)	---	SUPPLY
K	LOUVERED DBL DFL GRILLE	TITUS	300RL	STEEL	---		12	4	TYPE 1 (SURFACE)	---	SUPPLY
L	LOUVERED DBL DFL GRILLE	TITUS	300RL	STEEL	---		12	6	TYPE 1 (SURFACE)	---	SUPPLY
M	LOUVERED DBL DFL GRILLE	TITUS	300RL	STEEL	---		24	10	TYPE 1 (SURFACE)	---	SUPPLY
N	PERFORATED DIFFUSER	TITUS	PAR	STEEL	24x24	6			TYPE 3 (LAY-IN)	---	RETURN/EXHAUST
P	PERFORATED DIFFUSER	TITUS	PAR	STEEL	24x24	8			TYPE 3 (LAY-IN)	---	RETURN/EXHAUST
Q	PERFORATED DIFFUSER	TITUS	PAR	STEEL	24x24	10			TYPE 3 (LAY-IN)	---	RETURN/EXHAUST
R	PERFORATED DIFFUSER	TITUS	PAR	STEEL	24x24	12			TYPE 3 (LAY-IN)	---	RETURN/EXHAUST
S	PERFORATED DIFFUSER	TITUS	PAR	STEEL	24x24	16			TYPE 3 (LAY-IN)	---	RETURN/EXHAUST
T	PERFORATED DIFFUSER	TITUS	PAR	STEEL	24x24	18			TYPE 3 (LAY-IN)	---	RETURN/EXHAUST
U	LOUVERED GRILLE	TITUS	355RL	STEEL	---		12	12	TYPE 1 (SURFACE)	---	RETURN
V	LOUVERED GRILLE	TITUS	355RL	STEEL	---		24	24	TYPE 1 (SURFACE)	---	RETURN
W	LOUVERED GRILLE	TITUS	63FL	ALUMINUM	---		48	48	TYPE 1 (SURFACE)	---	RETURN
Y	LOUVERED GRILLE	TITUS	355RL	STEEL	---		6	6	TYPE 1 (SURFACE)	---	EXHAUST
Z	LOUVERED GRILLE	TITUS	355RL	STEEL	---		8	6	TYPE 1 (SURFACE)	---	EXHAUST

LINEAR SLOT DIFFUSER SCHEDULE

SYMBOL	DESCRIPTION	MANUF.	MODEL	MATERIAL	LINEAR DIFFUSER SLOT WIDTH	SLOT QTY	PLENUM NOM. LENGTH	PLENUM INSULATED	NECK SIZE	INSTALLATION BORDER TYPE	OPTIONS DAMPER DESCRIPTION	NOTES
LS1	LINEAR SLOT DIFFUSER	TITUS	FL-10	ALUMINUM	1	2	4' - 0"	Yes	8	TYPE 1 (SURFACE)	---	
LS2	LINEAR SLOT DIFFUSER	TITUS	FL-15	ALUMINUM	2	1	4' - 0"	Yes	8	TYPE 3 (LAY-IN)	---	
LS3	LINEAR SLOT DIFFUSER	TITUS	FL-15	ALUMINUM	2	2	4' - 0"	Yes	12	TYPE 3 (LAY-IN)	---	

AIR DISTRIBUTION SCHEDULE NOTES:

1. ALL CEILING AND WALL MOUNTED DEVICES SHALL BE FURNISHED WITH AN ENAMEL BRIGHT WHITE FINISH UNLESS NOTED OTHERWISE.
2. ALL DEVICES SHALL BE FURNISHED WITH FRAMES SUITABLE FOR THE TYPE OF INSTALLATION REQUIRED.
3. ALL LINEAR DIFFUSERS IN LAY-IN CEILINGS SHALL BE FURNISHED WITH END CAPS. ALL LINEAR DIFFUSERS IN HARD CEILINGS SHALL BE FURNISHED WITH END BORDERS. ALL LINEAR SUPPLY DIFFUSERS SHALL BE PROVIDED WITH INTEGRAL AIRFLOW PATTERN ADJUSTMENT BARS FOR HORIZONTAL/VERTICAL PATTERN ADJUSTMENT AT EACH SLOT.
4. ALL DOUBLE DEFLECTION SUPPLY GRILLES SHALL HAVE DAMPER BLADES ADJUSTED TO PROVIDE AIRFLOW PATTERN INDICATED BY FLOW ARROWS ON PLANS. DAMPERS SHALL BE ADJUSTED TO A 30 DEGREE POSITION UNLESS NOTED OTHERWISE ON PLANS.
5. ALL AIR DISTRIBUTION DEVICES LOCATED IN KITCHEN, LOCKER ROOMS, GYM AND TOILETS SHALL BE ALL ALUMINUM CONSTRUCTION.

ROOF MOUNTED GRAVITY VENTILATOR SCHEDULE

SYMBOL	LOCATION	SERVICE	CFM	MAX. THROAT VELOCITY (FPM)	MAX. SP DROP (IN.)	MANUFACTURER	MODEL	ACCESSORIES
GRI-1	HIGH ROOF GYM MEZZ	INTAKE	7690	1200	0.10	GREENHECK	FGI-42X42	A,B,C
GRI-2	LOCKER ROOF	INTAKE	95	2108	0.10	GREENHECK	GRSI-8	A,B,C
GRI-3	LOCKER ROOF	INTAKE	75	2108	0.10	GREENHECK	GRSI-8	A,B,C
GRI-4	FIRE PUMP ROOM	INTAKE	1260	1121	0.10	GREENHECK	GRSI-18	A,B,C
GRI-5	CLASSROOM ROOF	INTAKE	135	2108	0.10	GREENHECK	GRSI-8	A,B,C
GRI-6	CLASSROOM ROOF	INTAKE	135	2108	0.10	GREENHECK	GRSI-8	A,B,C
GRI-7	CLASSROOM ROOF	INTAKE	135	2108	0.10	GREENHECK	GRSI-8	A,B,C
GRI-8	CLASSROOM ROOF	INTAKE	125	2108	0.10	GREENHECK	GRSI-8	A,B,C
GRI-9	CLASSROOM ROOF	INTAKE	125	2108	0.10	GREENHECK	GRSI-8	A,B,C
GRR-1	LOCKER ROOF	RELIEF	225	608	0.10	GREENHECK	GRSR-8	A,B,C
GRR-2	KITCHEN ROOF	RELIEF	225	608	0.10	GREENHECK	GRSR-8	A,B,C
GRR-3	HIGH GYM ROOF MEZZ	RELIEF	550	671	0.10	GREENHECK	GRSR-12	A,B,C
GRR-4	CLASSROOM ROOF	RELIEF	150	405	0.10	GREENHECK	GRSR-8	A,B,C

NOTES:

1. PROVIDE ALL VENTILATORS WITH FACTORY ROOF CURBS. CURBS AND VENTILATORS SHALL BE INSTALLED LEVEL.

ACCESSORIES:

- A. ROOF CURB
- B. BIRD SCREEN
- C. GRAVITY BACK DRAFT DAMPER
- D. MOTORIZED DAMPER
- E. WASHABLE ALUMINUM FILTERS

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CONSTRUCTION DOCUMENTS

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150 Fayetteville St., Suite 520, Raleigh, NC 27601
Phone: 919-926-2200 - www.optimaengineering.com
North Carolina License Number C-0914

PAMLICO COUNTY
PAMLICO 6-12 SCHOOL
601 Main Street, Bayboro, NC, 28515

ENERGY STAR PARTNER

No.	Date	Description

ISSUE DATE: 06/12/24

PROJECT #: 2205
DRAWN BY: TAL
CHECKED BY: JWM

MECHANICAL SCHEDULES

M-003

Autodesk Docs://Pamlico High School 6-12/23-0082R_Pamlico HS_MEPPPT_R23.rvt
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AirQ Indoor Air Quality Design and Analysis

Project: Pamlico County School WSHP-C
Representative: Optima Engineering
Notes: 7.5cfm/person
0cfm/sq.ft.

Ventilated Space

Building Size — Area	750 ft³	Ceiling Height	10 ft	
Total Volume of Space	7500 ft³	277.8	ft³/person	
Total Airflow In, Vs	1000 cfm	37.04	cfm/person	
Ventilation Airflow, Vo	135 cfm	5	cfm/person	
Recirculation Airflow, RVr	865 cfm	32.04	cfm/person	
Recirculation Flow Factor, R	0.865			
Ventilation Effectiveness, Ev	0.8	Air Changes	8 /hour	

Occupants

Number of Occupants	27	person(s)
Level of Physical Activity	Standing, Desk Work	
Respiratory Flow	24	cfm/person
CO2 Generation	0.93	ft³/hr/person

ASHRAE 62 Ventilation Standard - Under this standard the following apply:

Ventilation Rate Procedure for this facility requires a ventilation rate (Vor) of 7.5 cfm/person

The Ventilation Rate Procedure is one way to achieve acceptable air quality. This procedure prescribes the rate at which ventilation must be delivered to a space and various means to condition that air. The ventilation rates in Table 2 are derived from psysiological considerations, subjective evaluations, and professional judgements.

$$\text{Required Filter Efficiency (Ef)} = \frac{Vor\,(Vo\,(1 - Ev) + Ev\,Vs) - Ev\,Vo\,Vs}{(Vs - Vo)(Ev\,Vs - Vor\,(1 - Ev))} = 0.1063$$

Equivalent to Dust Spot Efficiency: 60-65%
Equivalent to Minimum Efficiency Reporting Value (MERV): 11

Indoor Air Quality Procedure provides an alternative performance method for acieving acceptable air quality.
To control particulates to the proper level at the above ventilation rate, 60-65% filtration is used.
In addition to controlling the particulates, known contaminants also need to be controlled to an acceptable level. These are shown in the following pages.

General: Either the Ventilation Rate Procedure or the IAQ Procedure shall be used to design each ventilation system in a building, subject to the following considerations and restrictions.

Ventilation Rate Procedure: This is a prescriptive procedure in which outdoor air intake rates are determined based on space type/application, occupancy level, and floor area. Note: The Ventilation Rate Procedure minimum rates are based on contaminant sources and source strengths that are typical for the listed space types.

IAQ Procedure: This is a design procedure in which outdoor air intake rates and other system design parameters are based on an analysis of contaminant sources, contaminant concentration targets, and perceived acceptability targets. The IAQ Procedure allows credit to be taken for controls that remove contaminants (for example, air cleaning devices) or for other design techniques (for examples, selection of materials with lower source strengths) that can be reliably demonstrated to result in indoor contaminant concentrations equal to or lower than those achieved using the Ventilation Rate Procedure. The IAQ Procedure may also be used where the design is intended to attain specific target contaminant concentrations or levels of acceptability of perceived indoor air quality.

Indoor Air Quality Procedure: The Indoor Air Quality (IAQ) Procedure is a performance-based design approach in which the building and its ventilation system are designed to maintain the concentrations of specific contaminants at or below certain limits identified during the building design and to achieve the design target level of perceived indoor air quality acceptability by building occupants and/or visitors. For the purposes of this procedure, acceptable perceived indoor air quality excludes dissatisfaction related to thermal comfort, noise and vibration, lighting, and psychological stressors.

AirQ Indoor Air Quality Design and Analysis

Project: Pamlico County School WSHP-C
Representative: Optima Engineering
Notes: 7.5cfm/person
0cfm/sq.ft.

Ventilated Space: Area 750 ft³; Ceiling Height 10 ft; Total Volume of Space 7500 ft³, 277.8 ft³/person; Total Airflow In, Vs 1000 cfm, 37.04 cfm/person; Ventilation Airflow, Vo 135 cfm, 5 cfm/person; Recirculation Airflow, RVr 865 cfm, 32.04 cfm/person; Recirculation Flow Factor, R 0.865; Ventilation Effectiveness, Ev 0.8; Air Changes 8 /hour

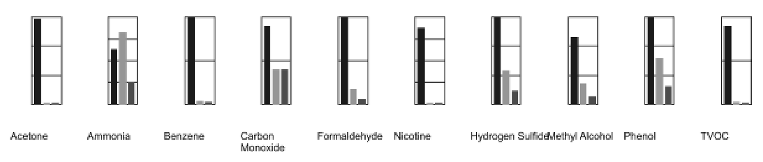
Occupants: Number of Occupants 27 person(s); Level of Physical Activity Standing, Desk Work; Respiratory Flow 24 cfm/person; CO2 Generation 0.93 ft³/hr/person

Smoking: ☐ Smoking in Space; Percent of people smoking 0; Cigarettes / hour / person 0

Filtration: Filter Efficiency 0 %

Contaminant	Generation Rate per Person (lb/min)	Smoking Generation Rate 1 cig/hour (lb/min)	Molecular Weight (g/mole)	Dynamic Air Cleaner Efficiency (%)	Typical Outside Concentration (ppm)	ASHRAE Limit (ppm)	Steady State Conc With Dynamic Air Cleaners and Typ. Outside Conc. (ppm)		Steady State Conc. Without Dynamic Air Cleaners and Typ. Outside Conc. (ppm)	
Acetone	1.746E-8	1.47E-8	58	25	0.001265	2.95	0.009977	OK	0.03075	OK
Ammonia	5.733E-7	2.205E-7	17	27	0.001727	2.5	1.017	OK	3.306	*
Benzene	5.88E-10	2.748E-8	78	10	0.002509	0.1	0.001772	OK	0.003248	OK
Carbon Monoxide	3.675E-7	2.205E-6	28	0	2.621	9	3.907	OK	3.907	OK
Formaldehyde	1.0E-20	8.818E-8	30	25	0.01631	0.1	0.005291	OK	0.01631	OK
Nicotine	1.0E-20	2.976E-7	162	20	0.0007551	0.07	0.0002832	OK	0.0007551	OK
Hydrogen Sulfide	4.0E-9	0	34.08	20	0	0.03	0.004313	OK	0.0115	OK
Methyl Alcohol	1.14E-7	0	32.04	20	0	1.15	0.1308	OK	0.3486	OK
Phenol	1.5E-8	0	94.11	20	0	0.03	0.005857	OK	0.01562	OK
TVOC	8.73E-8	0	56.11	35	0	9	0.03893	OK	0.1524	OK

* Indicates level exceeds 80% of ASHRAE limit



L=ASHRAE Limit w/o=Without Dynamic Air Cleaners w=With Dynamic Air Cleaners

AirQ Indoor Air Quality Design and Analysis

Project: Pamlico County School WSHP-C
Representative: Optima Engineering
Notes: 7.5cfm/person
0cfm/sq.ft.

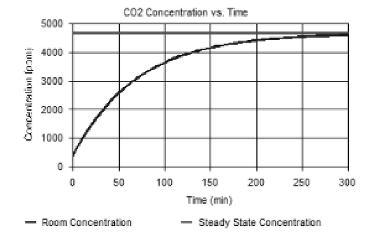
Ventilated Space: Area 750 ft³; Ceiling Height 10 ft; Total Volume of Space 7500 ft³, 277.8 ft³/person; Total Airflow In, Vs 1000 cfm, 37.04 cfm/person; Ventilation Airflow, Vo 135 cfm, 5 cfm/person; Recirculation Airflow, RVr 865 cfm, 32.04 cfm/person; Recirculation Flow Factor, R 0.865; Ventilation Effectiveness, Ev 0.8; Air Changes 8 /hour

Occupants: Number of Occupants 27 person(s); Level of Physical Activity Standing, Desk Work; Respiratory Flow 24 cfm/person; CO2 Generation 0.93 ft³/hr/person

CO2 Sources in Ventilated Space: Outdoor Concentration 400 ppm; Initial Indoor Concentration 400 ppm; CO2 Generation Rate by Non-Occupant Sources 0 ft³/hr

Steady State: After an infinite amount of time, The CO2 level is 4659 ppm

Instantaneous Level: At Time = 120 min; The CO2 level is 3902 ppm



Page 40.9, 1991 ASHRAE HVAC Applications Handbook

(Quoting ASHRAE 62-1999 from the Foreword section addemdum 62f page 1)
Addendum 62f addresses a lack of clarity in ANSI/ASHRAE Standard 62-1989 that has contributed to several misunderstandings regarding the significance of indoor carbon dioxide (CO2) levels. The standard previously led many users to conclude that CO2 was itself a comprehensive indicator of indoor air quality and a contaminant with its own health impacts, rather than simply a useful indicator of the concentration of human bioeffluents.

OSHA has a CO2 limit of 5000ppm as outlined in Table Z-1 Federal Register #: 58:35338-35351 Standard Number: 1910.1000

AirQ Indoor Air Quality Design and Analysis

Project: Pamlico County School WSHP-SL
Representative: Optima Engineering
Notes: 10cfm/person
.18cfm/sq.ft.

Ventilated Space: Area 1500 ft³; Ceiling Height 10 ft; Total Volume of Space 15000 ft³, 394.7 ft³/person; Total Airflow In, Vs 1800 cfm, 47.37 cfm/person; Ventilation Airflow, Vo 190 cfm, 5 cfm/person; Recirculation Airflow, RVr 1610 cfm, 42.37 cfm/person; Recirculation Flow Factor, R 0.8944; Ventilation Effectiveness, Ev 0.8; Air Changes 7.2 /hour

Occupants: Number of Occupants 38 person(s); Level of Physical Activity Standing, Desk Work; Respiratory Flow 24 cfm/person; CO2 Generation 0.93 ft³/hr/person

ASHRAE 62 Ventilation Standard - Under this standard the following apply:

Ventilation Rate Procedure for this facility requires a ventilation rate (Vor) of 17.1 cfm/person

Required Filter Efficiency (Ef) = 0.3256

Equivalent to Dust Spot Efficiency: 80-85%
Equivalent to Minimum Efficiency Reporting Value (MERV): 13

To control particulates to the proper level at the above ventilation rate, 80-85% filtration is used.

The Ventilation Rate Procedure is one way to achieve acceptable air quality. This procedure prescribes the rate at which ventilation must be delivered to a space and various means to condition that air. The ventilation rates in Table 2 are derived from psysiological considerations, subjective evaluations, and professional judgements.

Indoor Air Quality Procedure provides an alternative performance method for acieving acceptable air quality. In addition to controlling the particulates, known contaminants also need to be controlled to an acceptable level. These are shown in the following pages.

General: Either the Ventilation Rate Procedure or the IAQ Procedure shall be used to design each ventilation system in a building, subject to the following considerations and restrictions.

Ventilation Rate Procedure: This is a prescriptive procedure in which outdoor air intake rates are determined based on space type/application, occupancy level, and floor area. Note: The Ventilation Rate Procedure minimum rates are based on contaminant sources and source strengths that are typical for the listed space types.

IAQ Procedure: This is a design procedure in which outdoor air intake rates and other system design parameters are based on an analysis of contaminant sources, contaminant concentration targets, and perceived acceptability targets. The IAQ Procedure allows credit to be taken for controls that remove contaminants (for example, air cleaning devices) or for other design techniques (for examples, selection of materials with lower source strengths) that can be reliably demonstrated to result in indoor contaminant concentrations equal to or lower than those achieved using the Ventilation Rate Procedure. The IAQ Procedure may also be used where the design is intended to attain specific target contaminant concentrations or levels of acceptability of perceived indoor air quality.

Indoor Air Quality Procedure: The Indoor Air Quality (IAQ) Procedure is a performance-based design approach in which the building and its ventilation system are designed to maintain the concentrations of specific contaminants at or below certain limits identified during the building design and to achieve the design target level of perceived indoor air quality acceptability by building occupants and/or visitors. For the purposes of this procedure, acceptable perceived indoor air quality excludes dissatisfaction related to thermal comfort, noise and vibration, lighting, and psychological stressors.

AirQ Indoor Air Quality Design and Analysis

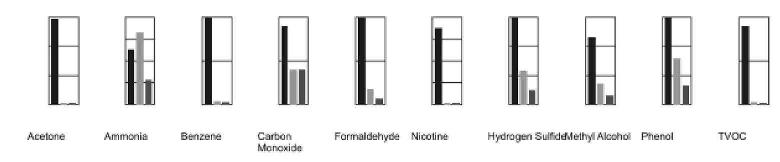
Project: Pamlico County School WSHP-SL
Representative: Optima Engineering
Notes: 10cfm/person
.18cfm/sq.ft.

Smoking: ☐ Smoking in Space; Percent of people smoking 0; Cigarettes / hour / person 0

Filtration: Filter Efficiency 0 %

Contaminant	Generation Rate per Person (lb/min)	Smoking Generation Rate 1 cig/hour (lb/min)	Molecular Weight (g/mole)	Dynamic Air Cleaner Efficiency (%)	Typical Outside Concentration (ppm)	ASHRAE Limit (ppm)	Steady State Conc With Dynamic Air Cleaners and Typ. Outside Conc. (ppm)		Steady State Conc. Without Dynamic Air Cleaners and Typ. Outside Conc. (ppm)	
Acetone	1.746E-8	1.47E-8	58	25	0.001265	2.95	0.01062	OK	0.03075	OK
Ammonia	5.733E-7	2.205E-7	17	27	0.001727	2.5	1.085	OK	3.306	*
Benzene	5.88E-10	2.748E-8	78	10	0.002509	0.1	0.001847	OK	0.003248	OK
Carbon Monoxide	3.675E-7	2.205E-6	28	0	2.621	9	3.907	OK	3.907	OK
Formaldehyde	1.0E-20	8.818E-8	30	25	0.01631	0.1	0.005634	OK	0.01631	OK
Nicotine	1.0E-20	2.976E-7	162	20	0.0007551	0.07	0.0003001	OK	0.0007551	OK
Hydrogen Sulfide	4.0E-9	0	34.08	20	0	0.03	0.004571	OK	0.0115	OK
Methyl Alcohol	1.14E-7	0	32.04	20	0	1.15	0.1386	OK	0.3486	OK
Phenol	1.5E-8	0	94.11	20	0	0.03	0.006207	OK	0.01562	OK
TVOC	8.73E-8	0	56.11	35	0	9	0.04173	OK	0.1524	OK

* Indicates level exceeds 80% of ASHRAE limit



L=ASHRAE Limit w/o=Without Dynamic Air Cleaners w=With Dynamic Air Cleaners

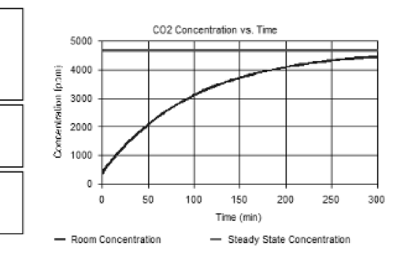
AirQ Indoor Air Quality Design and Analysis

Project: Pamlico County School WSHP-SL
Representative: Optima Engineering
Notes: 10cfm/person
.18cfm/sq.ft.

CO2 Sources in Ventilated Space: Outdoor Concentration 400 ppm; Initial Indoor Concentration 400 ppm; CO2 Generation Rate by Non-Occupant Sources 0 ft³/hr

Steady State: After an infinite amount of time, The CO2 level is 4659 ppm

Instantaneous Level: At Time = 120 min; The CO2 level is 3386 ppm



Page 40.9, 1991 ASHRAE HVAC Applications Handbook

(Quoting ASHRAE 62-1999 from the Foreword section addemdum 62f page 1)
Addendum 62f addresses a lack of clarity in ANSI/ASHRAE Standard 62-1989 that has contributed to several misunderstandings regarding the significance of indoor carbon dioxide (CO2) levels. The standard previously led many users to conclude that CO2 was itself a comprehensive indicator of indoor air quality and a contaminant with its own health impacts, rather than simply a useful indicator of the concentration of human bioeffluents.

OSHA has a CO2 limit of 5000ppm as outlined in Table Z-1 Federal Register #: 58:35338-35351 Standard Number: 1910.1000

AirQ Indoor Air Quality Design and Analysis

Project: Pamlico County School WSHP-G1
Representative: Optima Engineering
Notes: Seating area - 512 people, 7.5cfm/person .06cfm/sq. ft
Play Area - 50 people 0 cfm/person, .30cfm/sq. ft

Ventilated Space: Area 11350 ft³; Ceiling Height 32 ft; Total Volume of Space 363200 ft³, 646.3 ft³/person; Total Airflow In, Vs 20000 cfm, 35.59 cfm/person; Ventilation Airflow, Vo 2810 cfm, 5 cfm/person; Recirculation Airflow, RVr 17190 cfm, 30.59 cfm/person; Recirculation Flow Factor, R 0.8595; Ventilation Effectiveness, Ev 0.8; Air Changes 3.304 /hour

Occupants: Number of Occupants 562 person(s); Level of Physical Activity Moderate Exercise; Respiratory Flow 64 cfm/person; CO2 Generation 2.5 ft³/hr/person

ASHRAE 62 Ventilation Standard - Under this standard the following apply:

Ventilation Rate Procedure for this facility requires a ventilation rate (Vor) of 9.6 cfm/person

Required Filter Efficiency (Ef) = 0.1731

Equivalent to Dust Spot Efficiency: 60-65%
Equivalent to Minimum Efficiency Reporting Value (MERV): 11

To control particulates to the proper level at the above ventilation rate, 60-65% filtration is used.

The Ventilation Rate Procedure is one way to achieve acceptable air quality. This procedure prescribes the rate at which ventilation must be delivered to a space and various means to condition that air. The ventilation rates in Table 2 are derived from psysiological considerations, subjective evaluations, and professional judgements.

Indoor Air Quality Procedure provides an alternative performance method for acieving acceptable air quality. In addition to controlling the particulates, known contaminants also need to be controlled to an acceptable level. These are shown in the following pages.

General: Either the Ventilation Rate Procedure or the IAQ Procedure shall be used to design each ventilation system in a building, subject to the following considerations and restrictions.

Ventilation Rate Procedure: This is a prescriptive procedure in which outdoor air intake rates are determined based on space type/application, occupancy level, and floor area. Note: The Ventilation Rate Procedure minimum rates are based on contaminant sources and source strengths that are typical for the listed space types.

IAQ Procedure: This is a design procedure in which outdoor air intake rates and other system design parameters are based on an analysis of contaminant sources, contaminant concentration targets, and perceived acceptability targets. The IAQ Procedure allows credit to be taken for controls that remove contaminants (for example, air cleaning devices) or for other design techniques (for examples, selection of materials with lower source strengths) that can be reliably demonstrated to result in indoor contaminant concentrations equal to or lower than those achieved using the Ventilation Rate Procedure. The IAQ Procedure may also be used where the design is intended to attain specific target contaminant concentrations or levels of acceptability of perceived indoor air quality.

Indoor Air Quality Procedure: The Indoor Air Quality (IAQ) Procedure is a performance-based design approach in which the building and its ventilation system are designed to maintain the concentrations of specific contaminants at or below certain limits identified during the building design and to achieve the design target level of perceived indoor air quality acceptability by building occupants and/or visitors. For the purposes of this procedure, acceptable perceived indoor air quality excludes dissatisfaction related to thermal comfort, noise and vibration, lighting, and psychological stressors.

Design Approaches: Select one or a combination of the following design approaches to determine minimum space and system outdoor airflow rates and all other design parameters deemed relevant (e.g., air cleaning efficiencies and supply airflow rates).

AirQ Indoor Air Quality Design and Analysis

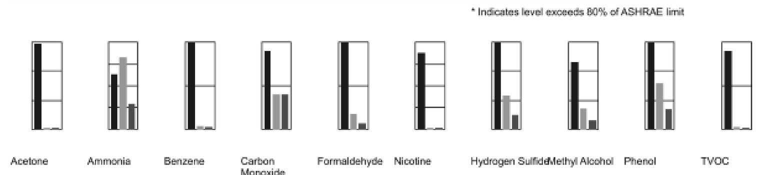
Project: Pamlico County School WSHP-G1
Representative: Optima Engineering
Notes: Seating area - 512 people, 7.5cfm/person .06cfm/sq. ft
Play Area - 50 people 0 cfm/person, .30cfm/sq. ft

Smoking: ☐ Smoking in Space; Percent of people smoking 0; Cigarettes / hour / person 0

Filtration: Filter Efficiency 0 %

Contaminant	Generation Rate per Person (lb/min)	Smoking Generation Rate 1 cig/hour (lb/min)	Molecular Weight (g/mole)	Dynamic Air Cleaner Efficiency (%)	Typical Outside Concentration (ppm)	ASHRAE Limit (ppm)	Steady State Conc With Dynamic Air Cleaners and Typ. Outside Conc. (ppm)		Steady State Conc. Without Dynamic Air Cleaners and Typ. Outside Conc. (ppm)	
Acetone	1.746E-8	1.47E-8	58	25	0.001265	2.95	0.01118	OK	0.03075	OK
Ammonia	5.733E-7	2.205E-7	17	27	0.001727	2.5	1.144	OK	3.306	*
Benzene	5.88E-10	2.748E-8	78	10	0.002509	0.1	0.00191	OK	0.003248	OK
Carbon Monoxide	3.675E-7	2.205E-6	28	0	2.621	9	3.907	OK	3.907	OK
Formaldehyde	1.0E-20	8.818E-8	30	25	0.01631	0.1	0.00593	OK	0.01631	OK
Nicotine	1.0E-20	2.976E-7	162	20	0.0007551	0.07	0.0003146	OK	0.0007551	OK
Hydrogen Sulfide	4.0E-9	0	34.08	20	0	0.03	0.004791	OK	0.0115	OK
Methyl Alcohol	1.14E-7	0	32.04	20	0	1.15	0.1452	OK	0.3486	OK
Phenol	1.5E-8	0	94.11	20	0	0.03	0.006506	OK	0.01562	OK
TVOC	8.73E-8	0	56.11	35	0	9	0.04418	OK	0.1524	OK

* Indicates level exceeds 80% of ASHRAE limit



L=ASHRAE Limit w/o=Without Dynamic Air Cleaners w=With Dynamic Air Cleaners

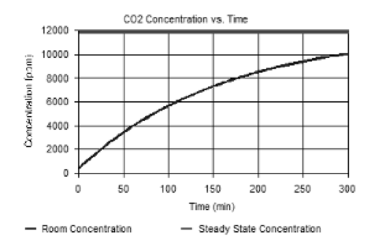
AirQ Indoor Air Quality Design and Analysis

Project: Pamlico County School WSHP-G1
Representative: Optima Engineering
Notes: Seating area - 512 people, 7.5cfm/person .06cfm/sq. ft
Play Area - 50 people 0 cfm/person, .30cfm/sq. ft

CO2 Sources in Ventilated Space: Outdoor Concentration 400 ppm; Initial Indoor Concentration 400 ppm; CO2 Generation Rate by Non-Occupant Sources 0 ft³/hr

Steady State: After an infinite amount of time, The CO2 level is 11850 ppm

Instantaneous Level: At Time = 120 min; The CO2 level is 6401 ppm



Page 40.9, 1991 ASHRAE HVAC Applications Handbook

(Quoting ASHRAE 62-1999 from the Foreword section addemdum 62f page 1)
Addendum 62f addresses a lack of clarity in ANSI/ASHRAE Standard 62-1989 that has contributed to several misunderstandings regarding the significance of indoor carbon dioxide (CO2) levels. The standard previously led many users to conclude that CO2 was itself a comprehensive indicator of indoor air quality and a contaminant with its own health impacts, rather than simply a useful indicator of the concentration of human bioeffluents.

OSHA has a CO2 limit of 5000ppm as outlined in Table Z-1 Federal Register #: 58:35338-35351 Standard Number: 1910.1000

AirQ Indoor Air Quality Design and Analysis

Project: Pamlico County School WSHP-G2
Representative: Optima Engineering
Notes: Seating area - 202 people, 7.5cfm/person .06cfm/sq. ft
Play Area - 100 people 0 cfm/person, .30cfm/sq. ft

Ventilated Space: Area 7650 ft³; Ceiling Height 32 ft; Total Volume of Space 244800 ft³, 810.6 ft³/person; Total Airflow In, Vs 15450 cfm, 51.16 cfm/person; Ventilation Airflow, Vo 1510 cfm, 5 cfm/person; Recirculation Airflow, RVr 13940 cfm, 46.16 cfm/person; Recirculation Flow Factor, R 0.9023; Ventilation Effectiveness, Ev 0.8; Air Changes 3.787 /hour

Occupants: Number of Occupants 302 person(s); Level of Physical Activity Moderate Exercise; Respiratory Flow 64 cfm/person; CO2 Generation 2.5 ft³/hr/person

ASHRAE 62 Ventilation Standard - Under this standard the following apply:

Ventilation Rate Procedure for this facility requires a ventilation rate (Vor) of 11 cfm/person

Required Filter Efficiency (Ef) = 0.1435

Equivalent to Dust Spot Efficiency: 60-65%
Equivalent to Minimum Efficiency Reporting Value (MERV): 11

To control particulates to the proper level at the above ventilation rate, 60-65% filtration is used.

The Ventilation Rate Procedure is one way to achieve acceptable air quality. This procedure prescribes the rate at which ventilation must be delivered to a space and various means to condition that air. The ventilation rates in Table 2 are derived from psysiological considerations, subjective evaluations, and professional judgements.

Indoor Air Quality Procedure provides an alternative performance method for acieving acceptable air quality. In addition to controlling the particulates, known contaminants also need to be controlled to an acceptable level. These are shown in the following pages.

General: Either the Ventilation Rate Procedure or the IAQ Procedure shall be used to design each ventilation system in a building, subject to the following considerations and restrictions.

Ventilation Rate Procedure: This is a prescriptive procedure in which outdoor air intake rates are determined based on space type/application, occupancy level, and floor area. Note: The Ventilation Rate Procedure minimum rates are based on contaminant sources and source strengths that are typical for the listed space types.

IAQ Procedure: This is a design procedure in which outdoor air intake rates and other system design parameters are based on an analysis of contaminant sources, contaminant concentration targets, and perceived acceptability targets. The IAQ Procedure allows credit to be taken for controls that remove contaminants (for example, air cleaning devices) or for other design techniques (for examples, selection of materials with lower source strengths) that can be reliably demonstrated to result in indoor contaminant concentrations equal to or lower than those achieved using the Ventilation Rate Procedure. The IAQ Procedure may also be used where the design is intended to attain specific target contaminant concentrations or levels of acceptability of perceived indoor air quality.

Indoor Air Quality Procedure: The Indoor Air Quality (IAQ) Procedure is a performance-based design approach in which the building and its ventilation system are designed to maintain the concentrations of specific contaminants at or below certain limits identified during the building design and to achieve the design target level of perceived indoor air quality acceptability by building occupants and/or visitors. For the purposes of this procedure, acceptable perceived indoor air quality excludes dissatisfaction related to thermal comfort, noise and vibration, lighting, and psychological stressors.

Design Approaches: Select one or a combination of the following design approaches to determine minimum space and system outdoor airflow rates and all other design parameters deemed relevant (e.g., air cleaning efficiencies and supply airflow rates).

AirQ Indoor Air Quality Design and Analysis

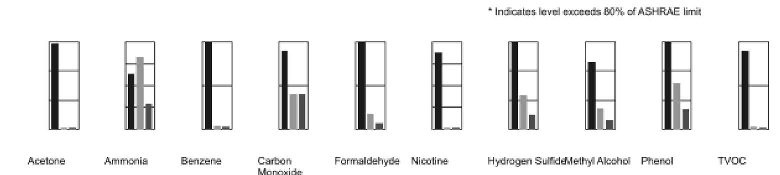
Project: Pamlico County School WSHP-G2
Representative: Optima Engineering
Notes: Seating area - 202 people, 7.5cfm/person .06cfm/sq. ft
Play Area - 100 people 0 cfm/person, .30cfm/sq. ft

Smoking: ☐ Smoking in Space; Percent of people smoking 0; Cigarettes / hour / person 0

Filtration: Filter Efficiency 0 %

Contaminant	Generation Rate per Person (lb/min)	Smoking Generation Rate 1 cig/hour (lb/min)	Molecular Weight (g/mole)	Dynamic Air Cleaner Efficiency (%)	Typical Outside Concentration (ppm)	ASHRAE Limit (ppm)	Steady State Conc With Dynamic Air Cleaners and Typ. Outside Conc. (ppm)		Steady State Conc. Without Dynamic Air Cleaners and Typ. Outside Conc. (ppm)	
Acetone	1.746E-8	1.47E-8	58	25	0.001265	2.95	0.01118	OK	0.03075	OK
Ammonia	5.733E-7	2.205E-7	17	27	0.001727	2.5	1.144	OK	3.306	*
Benzene	5.88E-10	2.748E-8	78	10	0.002509	0.1	0.00191	OK	0.003248	OK
Carbon Monoxide	3.675E-7	2.205E-6	28	0	2.621	9	3.907	OK	3.907	OK
Formaldehyde	1.0E-20	8.818E-8	30	25	0.01631	0.1	0.00593	OK	0.01631	OK
Nicotine	1.0E-20	2.976E-7	162	20	0.0007551	0.07	0.0003146	OK	0.0007551	OK
Hydrogen Sulfide	4.0E-9	0	34.08	20	0	0.03	0.004791	OK	0.0115	OK
Methyl Alcohol	1.14E-7	0	32.04	20	0	1.15	0.1452	OK	0.3486	OK
Phenol	1.5E-8	0	94.11	20	0	0.03	0.006506	OK	0.01562	OK
TVOC	8.73E-8	0	56.11	35	0	9	0.04418	OK	0.1524	OK

* Indicates level exceeds 80% of ASHRAE limit



L=ASHRAE Limit w/o=Without Dynamic Air Cleaners w=With Dynamic Air Cleaners

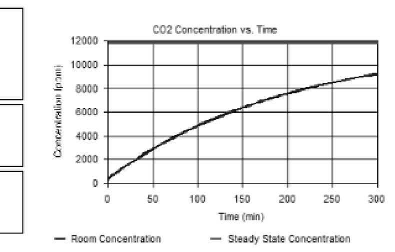
AirQ Indoor Air Quality Design and Analysis

Project: Pamlico County School WSHP-G2
Representative: Optima Engineering
Notes: Seating area - 202 people, 7.5cfm/person .06cfm/sq. ft
Play Area - 100 people 0 cfm/person, .30cfm/sq. ft

CO2 Sources in Ventilated Space: Outdoor Concentration 400 ppm; Initial Indoor Concentration 400 ppm; CO2 Generation Rate by Non-Occupant Sources 0 ft³/hr

Steady State: After an infinite amount of time, The CO2 level is 11850 ppm

Instantaneous Level: At Time = 120 min; The CO2 level is 5516 ppm



Page 40.9, 1991 ASHRAE HVAC Applications Handbook

(Quoting ASHRAE 62-1999 from the Foreword section addemdum 62f page 1)
Addendum 62f addresses a lack of clarity in ANSI/ASHRAE Standard 62-1989 that has contributed to several misunderstandings regarding the significance of indoor carbon dioxide (CO2) levels. The standard previously led many users to conclude that CO2 was itself a comprehensive indicator of indoor air quality and a contaminant with its own health impacts, rather than simply a useful indicator of the concentration of human bioeffluents.

OSHA has a CO2 limit of 5000ppm as outlined in Table Z-1 Federal Register #: 58:35338-35351 Standard Number: 1910.1000

AirQ Indoor Air Quality Design and Analysis

Project: Pamlico County School WSHP-L
Representative: Optima Engineering
Notes: 7.5cfm/person
.06cfm/sq.ft.

Ventilated Space: Area 5700 ft³; Ceiling Height 24.5 ft; Total Volume of Space 139700 ft³, 1154 ft³/person; Total Airflow In, Vs 5000 cfm, 41.32 cfm/person; Ventilation Airflow, Vo 605 cfm, 5 cfm/person; Recirculation Airflow, RVr 4395 cfm, 36.32 cfm/person; Recirculation Flow Factor, R 0.879; Ventilation Effectiveness, Ev 0.8; Air Changes 2.148 /hour

Occupants: Number of Occupants 121 person(s); Level of Physical Activity Standing, Desk Work; Respiratory Flow 24 cfm/person; CO2 Generation 0.93 ft³/hr/person

ASHRAE 62 Ventilation Standard - Under this standard the following apply:

Ventilation Rate Procedure for this facility requires a ventilation rate (Vor) of 10.3 cfm/person

Required Filter Efficiency (Ef) = 0.1648

Equivalent to Dust Spot Efficiency: 60-65%
Equivalent to Minimum Efficiency Reporting Value (MERV): 11

To control particulates to the proper level at the above ventilation rate, 60-65% filtration is used.

The Ventilation Rate Procedure is one way to achieve acceptable air quality. This procedure prescribes the rate at which ventilation must be delivered to a space and various means to condition that air. The ventilation rates in Table 2 are derived from psysiological considerations, subjective evaluations, and professional judgements.

Indoor Air Quality Procedure provides an alternative performance method for acieving acceptable air quality. In addition to controlling the particulates, known contaminants also need to be controlled to an acceptable level. These are shown in the following pages.

General: Either the Ventilation Rate Procedure or the IAQ Procedure shall be used to design each ventilation system in a building, subject to the following considerations and restrictions.

Ventilation Rate Procedure: This is a prescriptive procedure in which outdoor air intake rates are determined based on space type/application, occupancy level, and floor area. Note: The Ventilation Rate Procedure minimum rates are based on contaminant sources and source strengths that are typical for the listed space types.

IAQ Procedure: This is a design procedure in which outdoor air intake rates and other system design parameters are based on an analysis of contaminant sources, contaminant concentration targets, and perceived acceptability targets. The IAQ Procedure allows credit to be taken for controls that remove contaminants (for example, air cleaning devices) or for other design techniques (for examples, selection of materials with lower source strengths) that can be reliably demonstrated to result in indoor contaminant concentrations equal to or lower than those achieved using the Ventilation Rate Procedure. The IAQ Procedure may also be used where the design is intended to attain specific target contaminant concentrations or levels of acceptability of perceived indoor air quality.

Indoor Air Quality Procedure: The Indoor Air Quality (IAQ) Procedure is a performance-based design approach in which the building and its ventilation system are designed to maintain the concentrations of specific contaminants at or below certain limits identified during the building design and to achieve the design target level of perceived indoor air quality acceptability by building occupants and/or visitors. For the purposes of this procedure, acceptable perceived indoor air quality excludes dissatisfaction related to thermal comfort, noise and vibration, lighting, and psychological stressors.

Design Approaches: Select one or a combination of the following design approaches to determine minimum space and system outdoor airflow rates and all other design parameters deemed relevant (e.g., air cleaning efficiencies and supply airflow rates).

AirQ Indoor Air Quality Design and Analysis

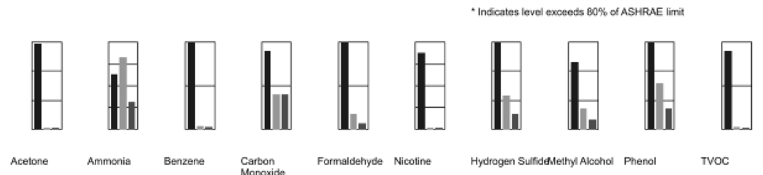
Project: Pamlico County School WSHP-L
Representative: Optima Engineering
Notes: 7.5cfm/person
.06cfm/sq.ft.

Smoking: ☐ Smoking in Space; Percent of people smoking 0; Cigarettes / hour / person 0

Filtration: Filter Efficiency 0 %

Contaminant	Generation Rate per Person (lb/min)	Smoking Generation Rate 1 cig/hour (lb/min)	Molecular Weight (g/mole)	Dynamic Air Cleaner Efficiency (%)	Typical Outside Concentration (ppm)	ASHRAE Limit (ppm)	Steady State Conc With Dynamic Air Cleaners and Typ. Outside Conc. (ppm)		Steady State Conc. Without Dynamic Air Cleaners and Typ. Outside Conc. (ppm)	
Acetone	1.746E-8	1.47E-8	58	25	0.001265	2.95	0.01184	OK	0.03075	OK
Ammonia	5.733E-7	2.205E-7	17	27	0.001727	2.5	1.213	OK	3.306	*
Benzene	5.88E-10	2.748E-8	78	10	0.002509	0.1	0.001982	OK	0.003248	OK
Carbon Monoxide	3.675E-7	2.205E-6	28	0	2.621	9	3.907	OK	3.907	OK
Formaldehyde	1.0E-20	8.818E-8	30	25	0.01631	0.1	0.006282	OK	0.01631	OK
Nicotine	1.0E-20	2.976E-7	162	20	0.0007551	0.07	0.0003316	OK	0.0007551	OK
Hydrogen Sulfide	4.0E-9	0	34.08	20	0	0.03	0.00505	OK	0.0115	OK
Methyl Alcohol	1.14E-7	0	32.04	20	0	1.15	0.1531	OK	0.3486	OK
Phenol	1.5E-8	0	94.11	20	0	0.03	0.006858	OK	0.01562	OK
TVOC	8.73E-8	0	56.11	35	0	9	0.04712	OK	0.1524	OK

* Indicates level exceeds 80% of ASHRAE limit



L=ASHRAE Limit w/o=Without Dynamic Air Cleaners w=With Dynamic Air Cleaners

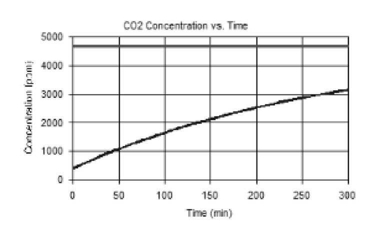
AirQ Indoor Air Quality Design and Analysis

Project: Pamlico County School WSHP-L
Representative: Optima Engineering
Notes: 7.5cfm/person
.06cfm/sq.ft.

CO2 Sources in Ventilated Space: Outdoor Concentration 400 ppm; Initial Indoor Concentration 400 ppm; CO2 Generation Rate by Non-Occupant Sources 0 ft³/hr

Steady State: After an infinite amount of time, The CO2 level is 4659 ppm

Instantaneous Level: At Time = 120 min; The CO2 level is 3849 ppm



Page 40.9, 1991 ASHRAE HVAC Applications Handbook

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OSHA has a CO2 limit of 5000ppm as outlined in Table Z-1 Federal Register #: 58:35338-35351 Standard Number: 1910.1000

AirQ Indoor Air Quality Design and Analysis

Project: Pamlico County School WSHP-D
Representative: Optima Engineering
Notes: 7.5 CFM/Person
0.18 CFM/SF

Ventilated Space: Area 3750 ft³; Ceiling Height 25 ft; Total Volume of Space 93750 ft³, 520.8 ft³/person; Total Airflow In, Vs 8000 cfm, 44.44 cfm/person; Ventilation Airflow, Vo 900 cfm, 5 cfm/person; Recirculation Airflow, RVr 8000 cfm, 39.44 cfm/person; Recirculation Flow Factor, R 1; Ventilation Effectiveness, Ev .8; Air Changes 5.12 /hour

Occupants: Number of Occupants 180 person(s); Level of Physical Activity Sedentary, at Ease; Respiratory Flow 16 cfm/person; CO2 Generation 0.62 ft³/hr/person

ASHRAE 62 Ventilation Standard - Under this standard the following apply:

Ventilation Rate Procedure for this facility requires a ventilation rate (Vor) of 11.3 cfm/person

Required Filter Efficiency (Ef) = 0.1792

Equivalent to Dust Spot Efficiency: 60-65%
Equivalent to Minimum Efficiency Reporting Value (MERV): 11

To control particulates to the proper level at the above ventilation rate, 60-65% filtration is used.

The Ventilation Rate Procedure is one way to achieve acceptable air quality. This procedure prescribes the rate at which ventilation must be delivered to a space and various means to condition that air. The ventilation rates in Table 2 are derived from psysiological considerations, subjective evaluations, and professional judgements.

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Design Approaches: Select one or a combination of the following design approaches to determine minimum space and system outdoor airflow rates and all other design parameters deemed relevant (e.g., air cleaning efficiencies and supply airflow rates).

AirQ Indoor Air Quality Design and Analysis

Project: Pamlico County School WSHP-D
Representative: Optima Engineering
Notes: 7.5 CFM/Person
0.18 CFM/SF

Ventilated Space: Area 3750 ft³; Ceiling Height 25 ft; Total Volume of Space 93750 ft³, 520.8 ft³/person; Total Airflow In, Vs 8000 cfm, 44.44 cfm/person; Ventilation Airflow, Vo 900 cfm, 5 cfm/person; Recirculation Airflow, RVr 8000 cfm, 39.44 cfm/person; Recirculation Flow Factor, R 1; Ventilation Effectiveness, Ev .8; Air Changes 5.12 /hour

Occupants: Number of Occupants 180 person(s); Level of Physical Activity Sedentary, at Ease; Respiratory Flow 16 cfm/person; CO2 Generation 0.62 ft³/hr/person

Smoking: ☐ Smoking in Space; Percent of people smoking 0; Cigarettes / hour / person 0

Filtration: Filter Efficiency 0 %

Contaminant	Generation Rate per Person (lb/min)	Smoking Generation Rate 1 cig/hour (lb/min)	Molecular Weight (g/mole)	Dynamic Air Cleaner Efficiency (%)	Typical Outside Concentration (ppm)	ASHRAE Limit (ppm)	Steady State Conc With Dynamic Air Cleaners and Typ. Outside Conc. (ppm)		Steady State Conc. Without Dynamic Air Cleaners and Typ. Outside Conc. (ppm)	
Acetone	1.746E-8	1.47E-8	58	25	0.001265	2.95	0.01118	OK	0.03075	OK
Ammonia	5.733E-7	2.205E-7	17	27	0.001727	2.5	1.144	OK	3.306	*
Benzene	5.88E-10	2.748E-8	78	10	0.002509	0.1	0.00191	OK	0.003248	OK
Carbon Monoxide	3.675E-7	2.205E-6	28	0	2.621	9	3.907	OK	3.907	OK
Formaldehyde	1.0E-20	8.818E-8	30	25	0.01631	0.1	0.00593	OK	0.01631	OK
Nicotine	1.0E-20	2.976E-7	162	20	0.0007551	0.07	0.0003146	OK	0.0007551	OK
Hydrogen Sulfide	4.0E-9	0	34.08	20	0	0.03	0.004791	OK	0.0115	OK

* Indicates level exceeds 80% of ASHRAE limit

L=ASHRAE Limit w/o=Without Dynamic Air Cleaners w=With Dynamic Air Cleaners

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PAMLICO COUNTY
PAMLICO 6-12 SCHOOL
601 Main Street, Bayboro, NC, 28515

ENERGY STAR PARTNER

No.	Date	Description

ISSUE DATE:	06/12/24
PROJECT #:	2205
DRAWN BY:	TAL
CHECKED BY:	JWM

MECHANICAL VENTILATION CALCULATIONS

M-004

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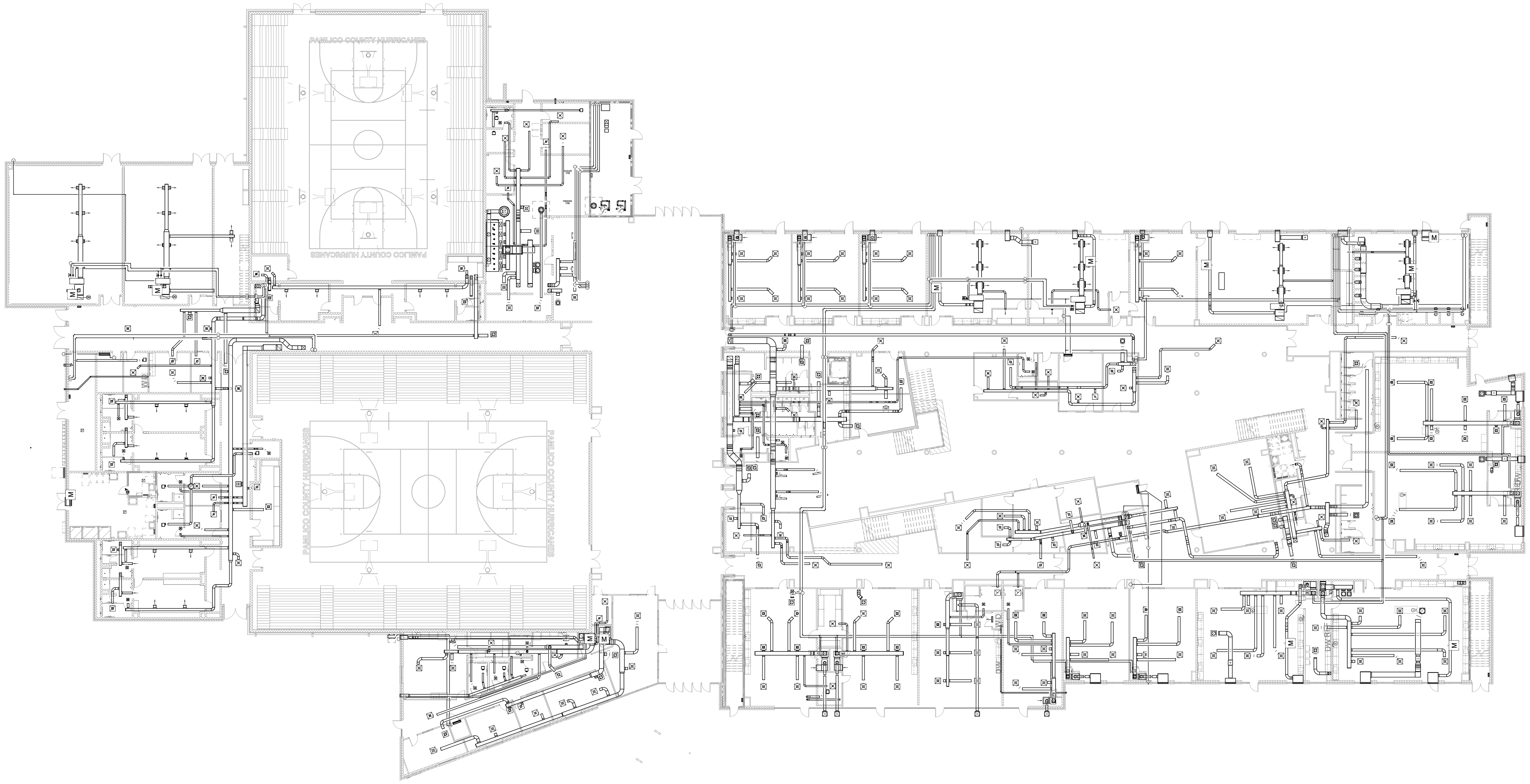

1 OVERALL FIRST FLOOR MECHANICAL PLAN
1" = 20'-0"

RATED WALL LEGEND	
SYMBOL	DESCRIPTION
	1 HR FIRE RATED
	2 HR FIRE RATED

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No.	Date	Description

ISSUE DATE:	06/12/24
PROJECT #:	2205
DRAWN BY:	TAL
CHECKED BY:	JWM

OVERALL FIRST FLOOR MECHANICAL PLAN

M-101

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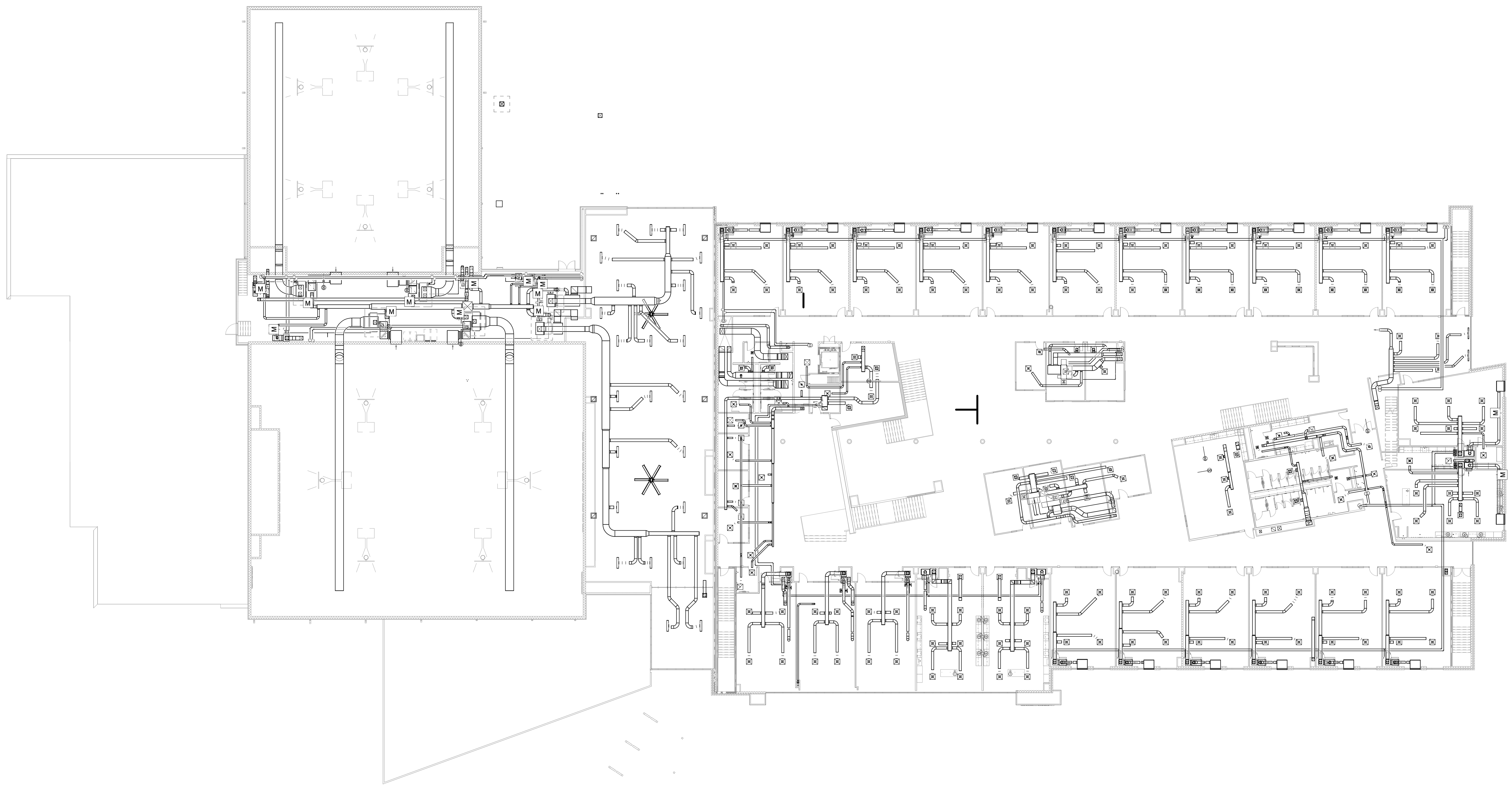

1 **OVERALL SECOND FLOOR MECHANICAL PLAN**
1" = 20'-0"

RATED WALL LEGEND

SYMBOL	DESCRIPTION
	1 HR FIRE RATED
	2 HR FIRE RATED

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ENERGY STAR PARTNER

No.	Date	Description

ISSUE DATE: 06/12/24

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OVERALL SECOND FLOOR MECHANICAL PLAN

M-102

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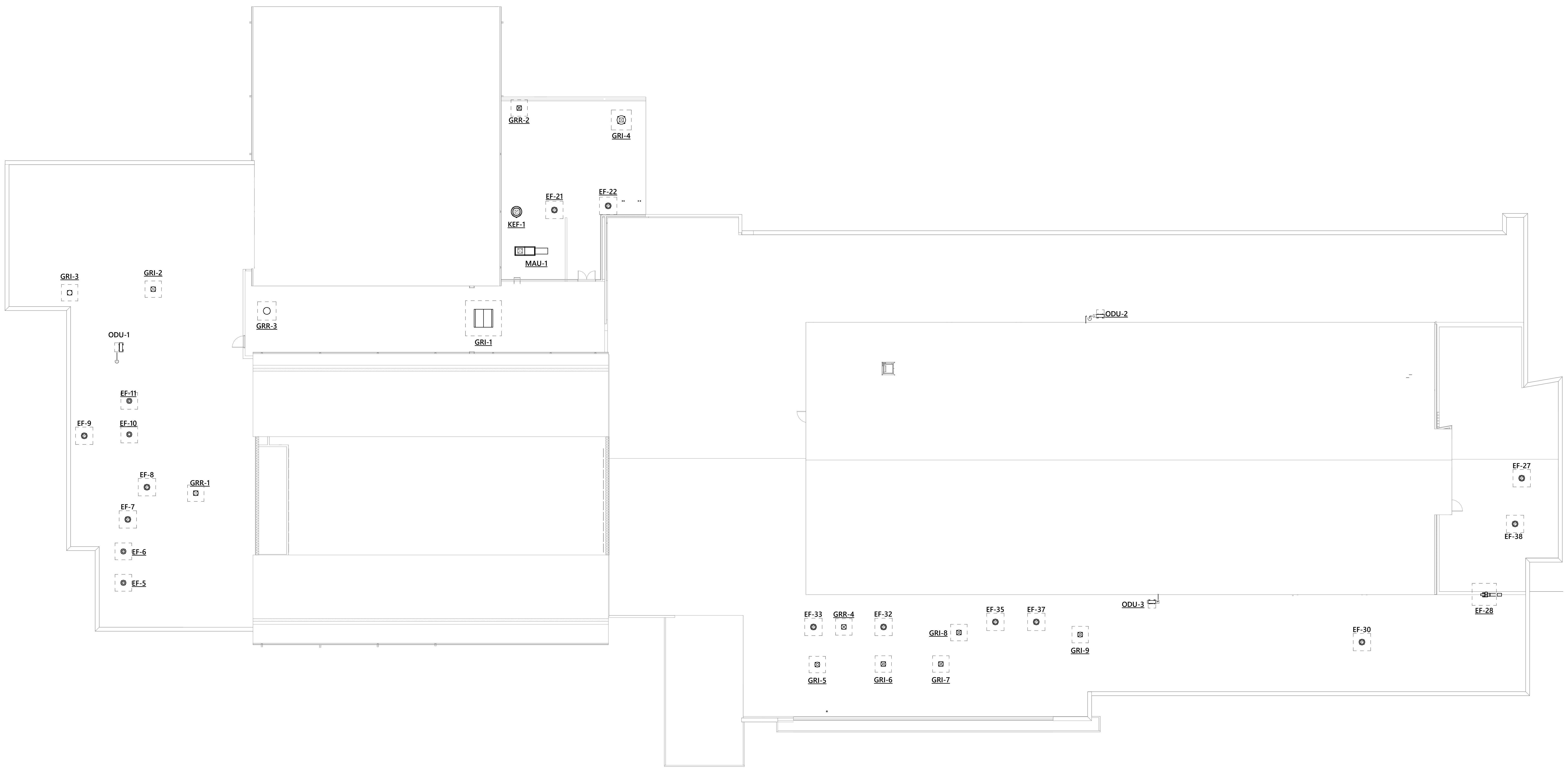

1 OVERALL ROOF MECHANICAL PLAN
1" = 20'-0"

RATED WALL LEGEND

SYMBOL	DESCRIPTION
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	2 HR FIRE RATED

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ENERGY STAR PARTNER

No.	Date	Description

ISSUE DATE: 06/12/24
PROJECT #: 2205
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OVERALL ROOF MECHANICAL PLAN

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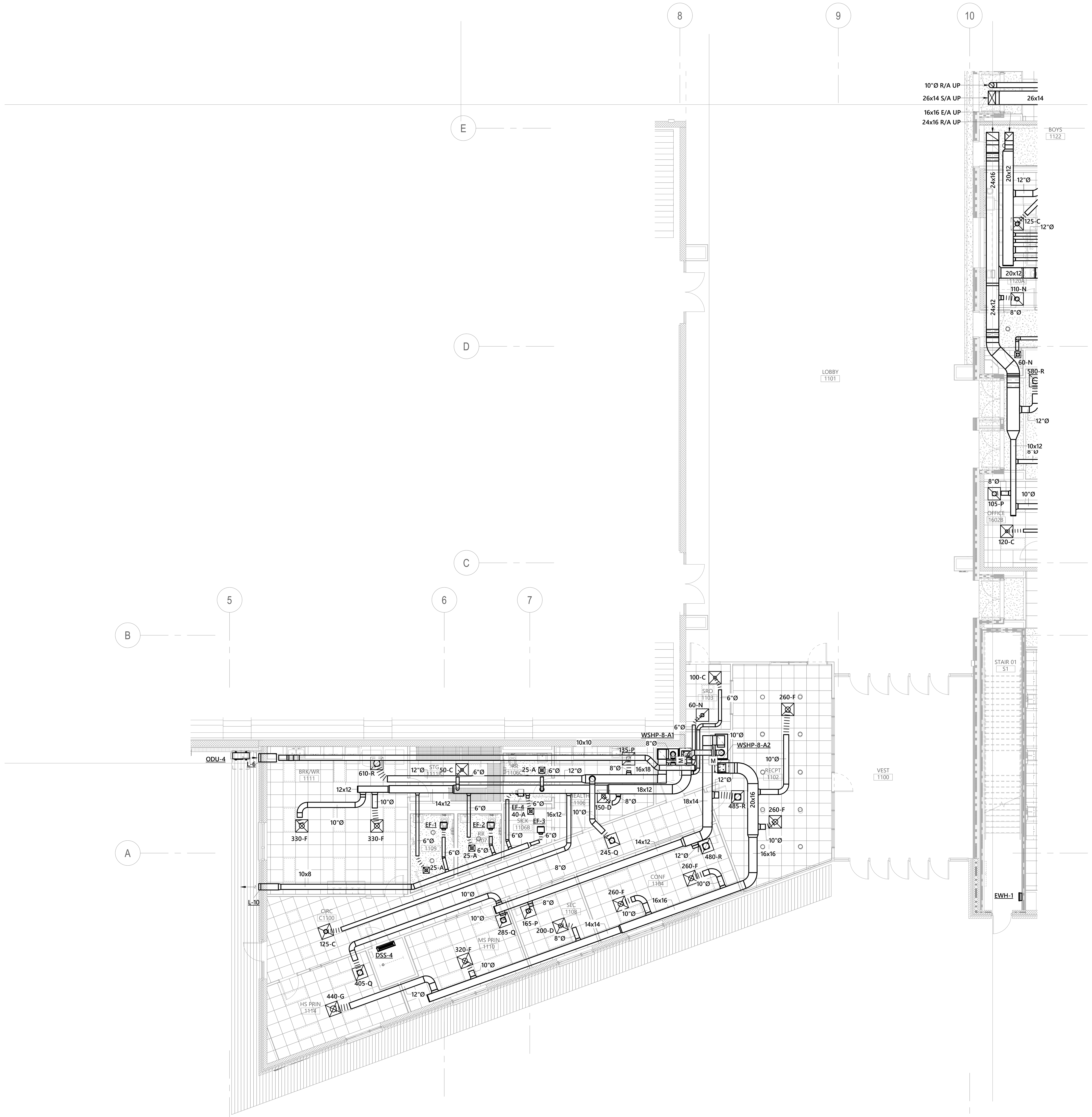

1 FIRST FLOOR MECHANICAL PLAN - AREA A

1/8" = 1'-0"

RATED WALL LEGEND

SYMBOL	DESCRIPTION
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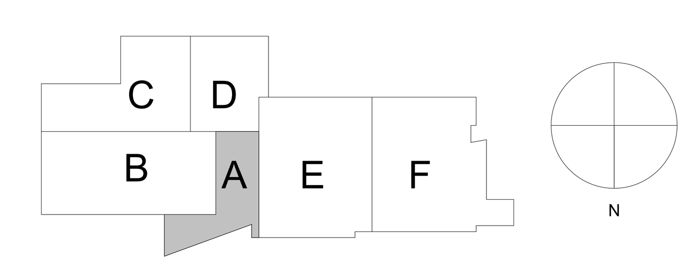
	2 HR FIRE RATED

KEYPLAN



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601 Main Street, Bayboro, NC, 28515

ENERGY STAR PARTNER

No.	Date	Description

ISSUE DATE:	06/12/24
PROJECT #:	2205
DRAWN BY:	TAL
CHECKED BY:	JWM

FIRST FLOOR MECHANICAL PLAN - AREA A

M-111A

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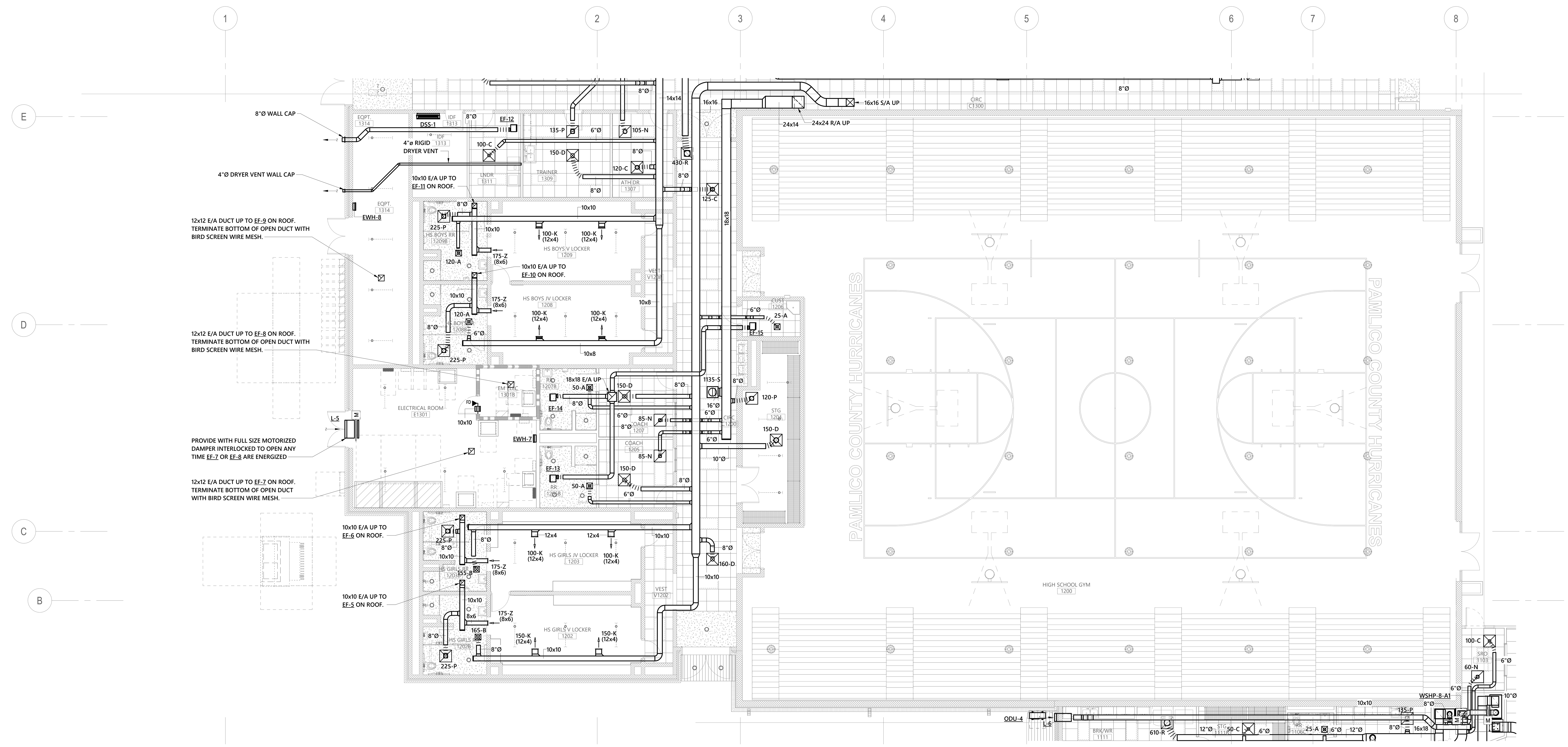

1 FIRST FLOOR MECHANICAL PLAN - AREA B

1/8" = 1'-0"

RATED WALL LEGEND

SYMBOL	DESCRIPTION
	1 HR FIRE RATED
	2 HR FIRE RATED

KEYPLAN

C D B A E F

N

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ENERGY STAR PARTNER

No.	Date	Description

ISSUE DATE: 06/12/24

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DRAWN BY: TAL

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FIRST FLOOR MECHANICAL PLAN - AREA B

M-111B

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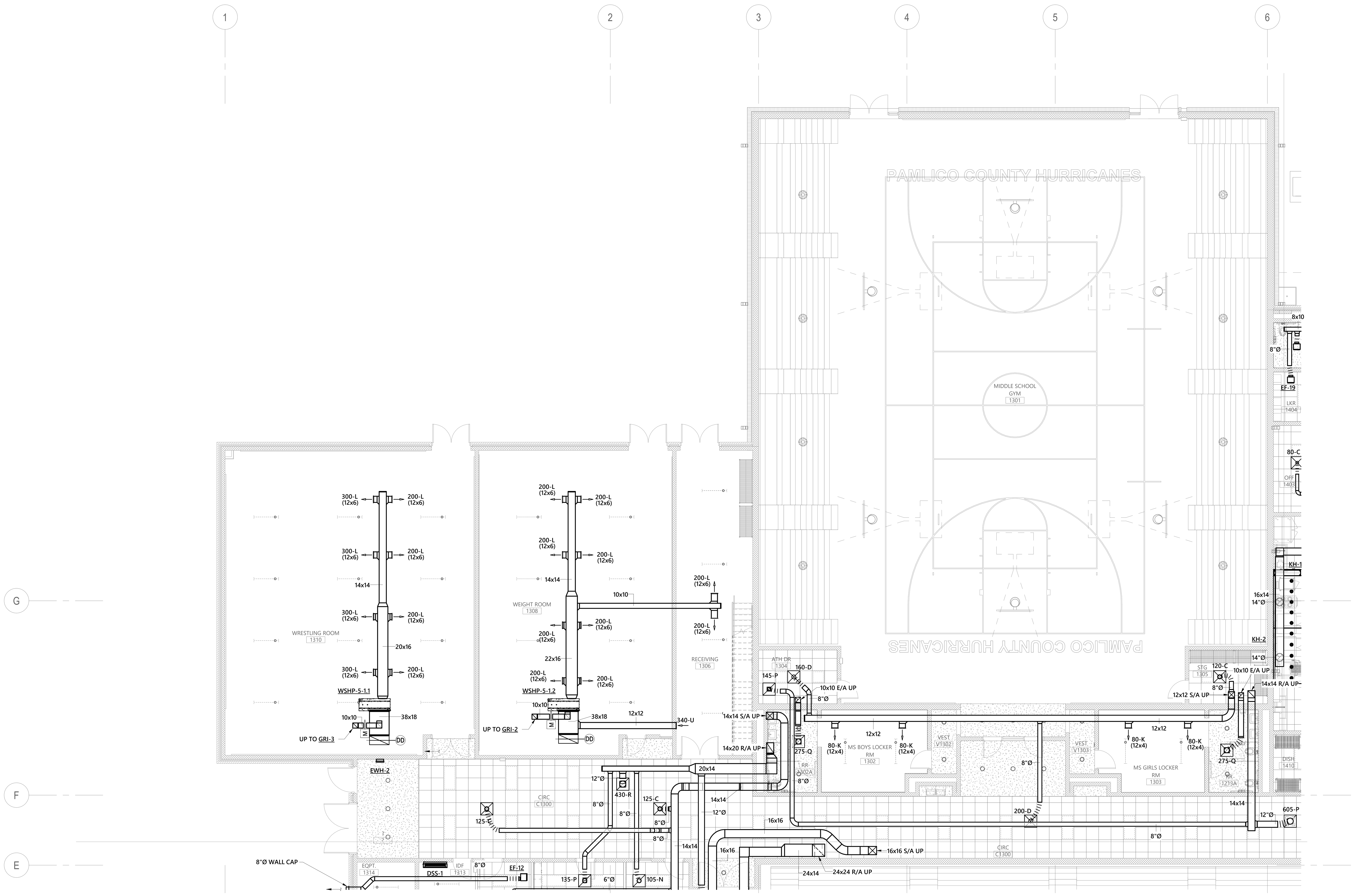
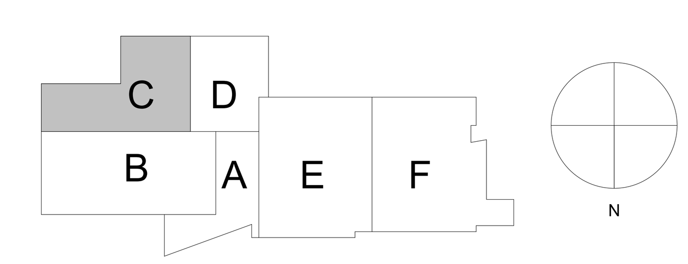


1 FIRST FLOOR MECHANICAL PLAN - AREA C

1/8" = 1'-0"

RATED WALL LEGEND	
SYMBOL	DESCRIPTION
	1 HR FIRE RATED
	2 HR FIRE RATED

KEYPLAN



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FIRST FLOOR MECHANICAL PLAN - AREA C

M-111C

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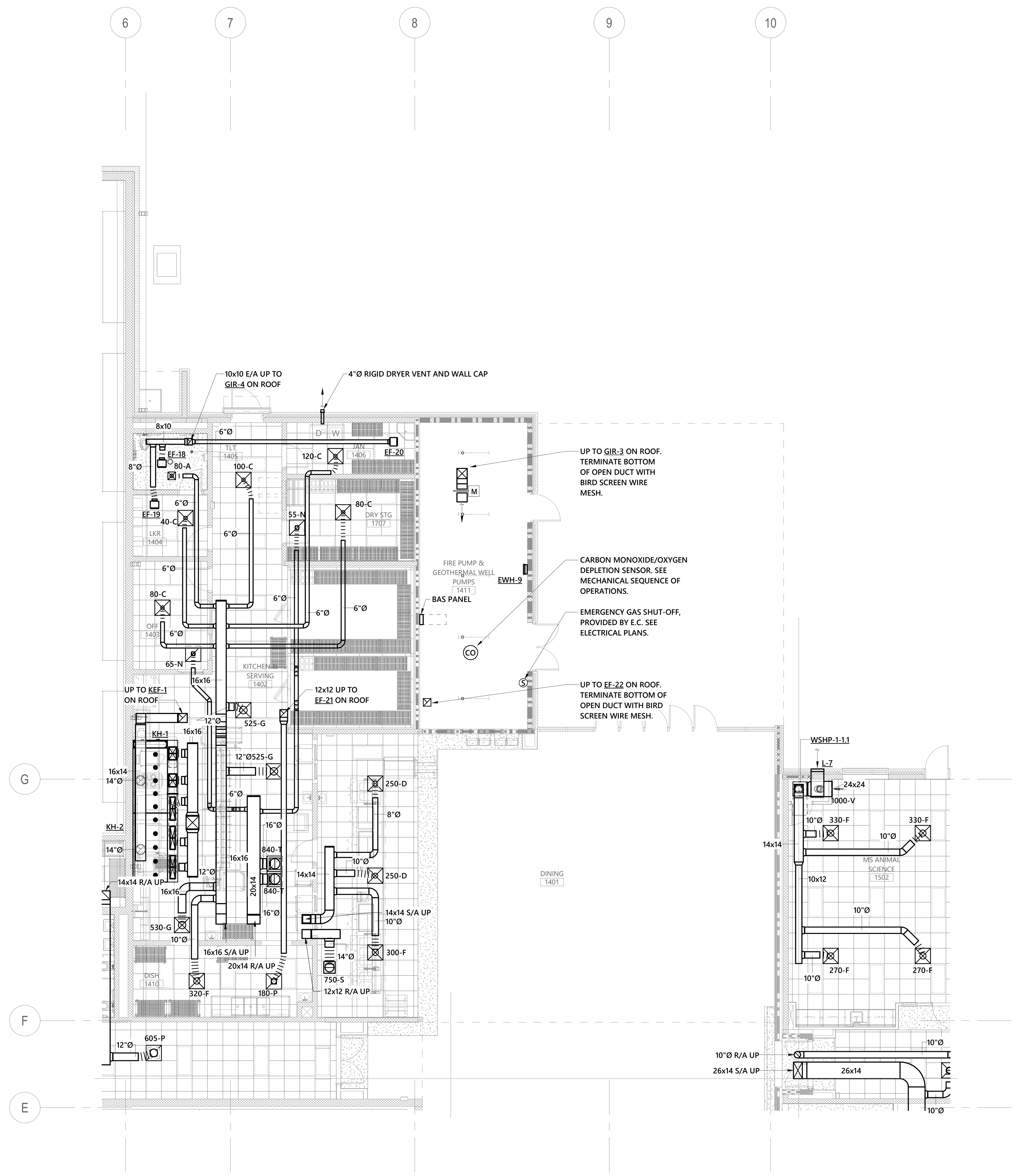


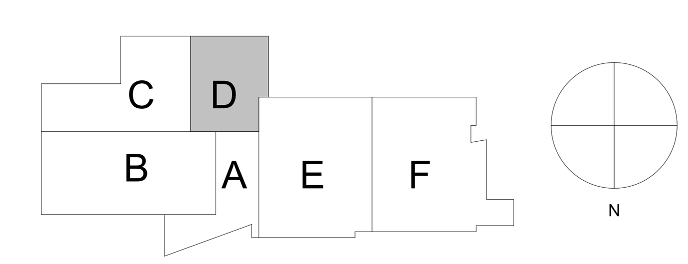
1 FIRST FLOOR MECHANICAL PLAN - AREA D

1/8" = 1'-0"

RATED WALL LEGEND

SYMBOL	DESCRIPTION
	1 HR FIRE RATED
	2 HR FIRE RATED

KEYPLAN



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ISSUE DATE: 06/12/24

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FIRST FLOOR MECHANICAL PLAN - AREA D

M-111D

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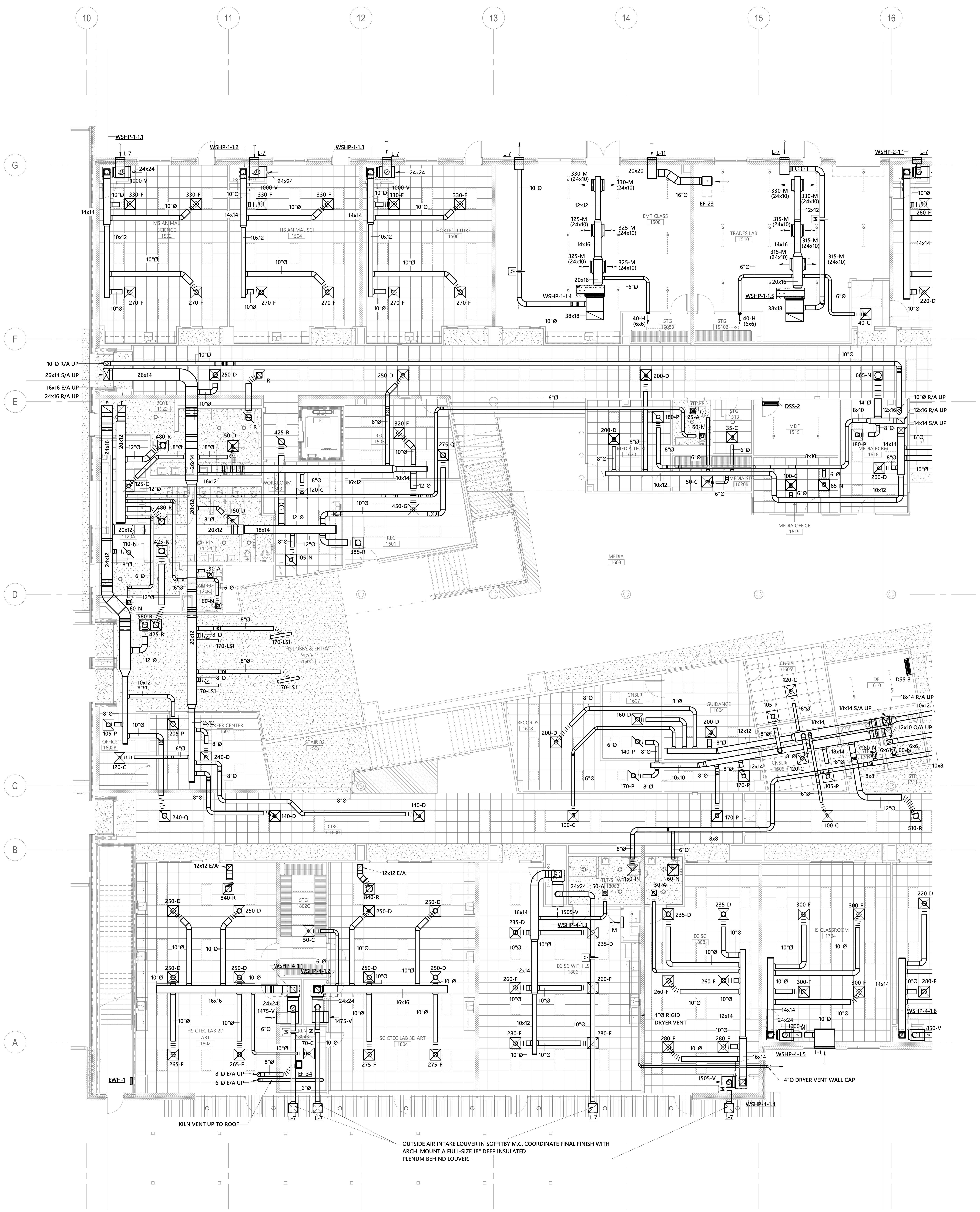
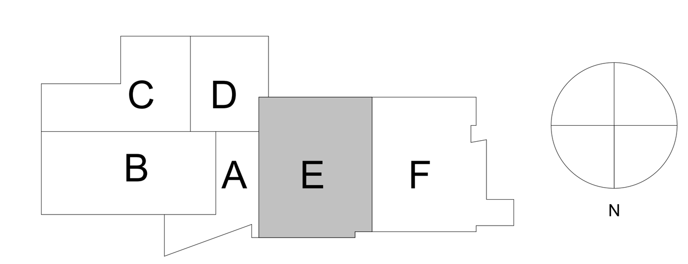


1 FIRST FLOOR MECHANICAL PLAN - AREA E
1/8" = 1'-0"

RATED WALL LEGEND	
SYMBOL	DESCRIPTION
	1 HR FIRE RATED
	2 HR FIRE RATED

KEYPLAN



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PROJECT #:	2205
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FIRST FLOOR MECHANICAL PLAN - AREA E

M-111E

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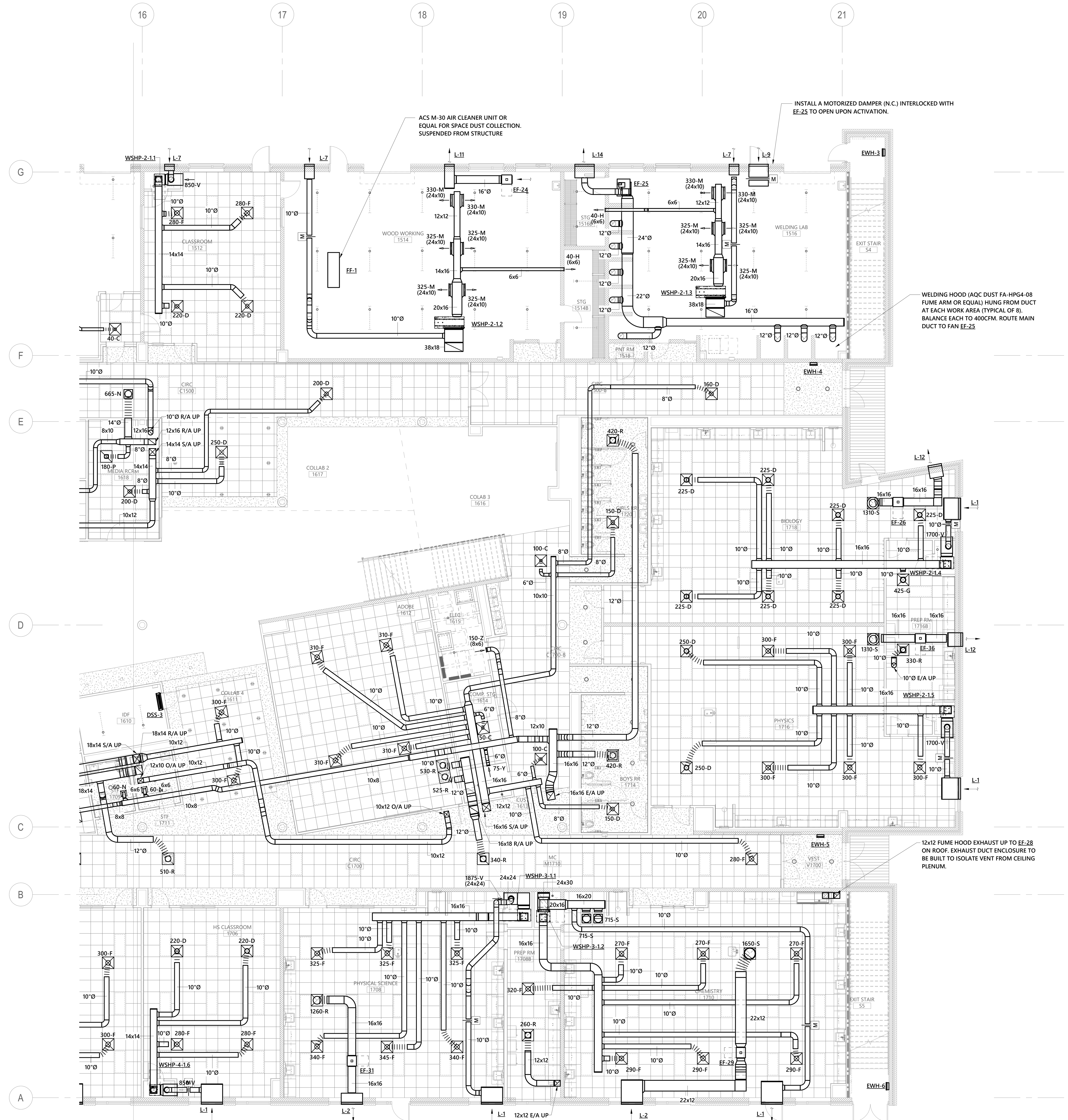


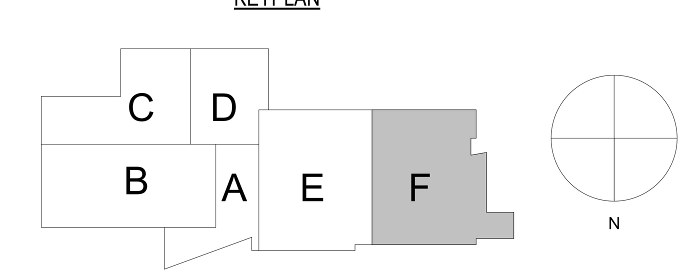
1 **FIRST FLOOR MECHANICAL PLAN - AREA F**

1/8" = 1'-0"

RATED WALL LEGEND

SYMBOL	DESCRIPTION
	1 HR FIRE RATED
	2 HR FIRE RATED

KEYPLAN



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DRAWN BY: TAL
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FIRST FLOOR MECHANICAL PLAN - AREA F

M-111F

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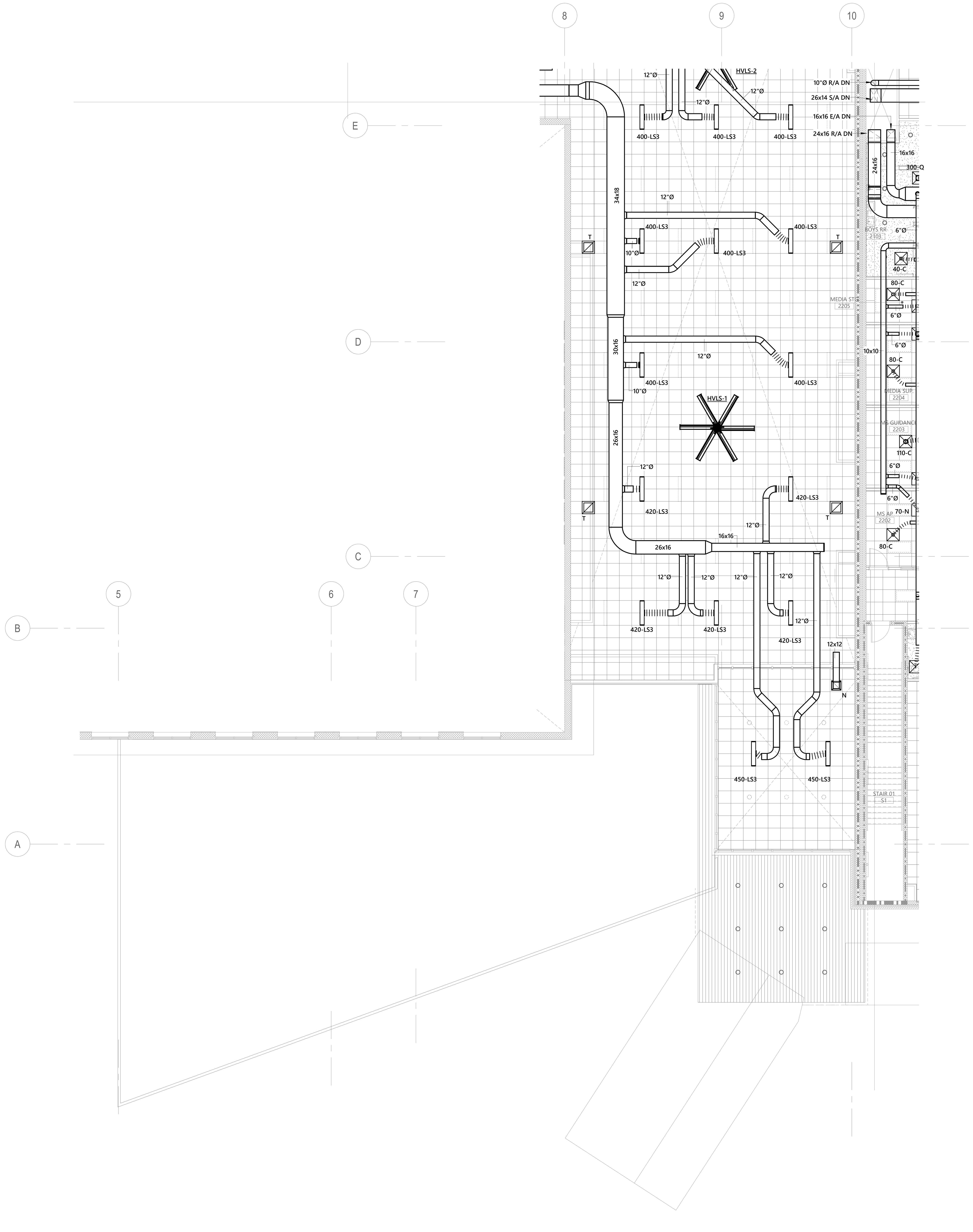
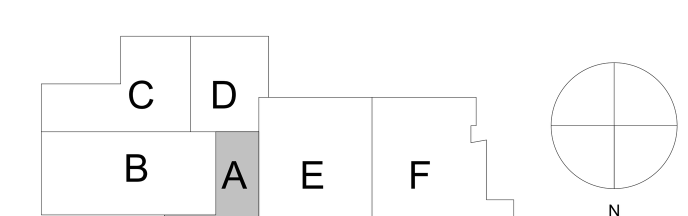


1 SECOND FLOOR PLAN - AREA A

1/8" = 1'-0"

RATED WALL LEGEND	
SYMBOL	DESCRIPTION
	1 HR FIRE RATED
	2 HR FIRE RATED

KEYPLAN



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SECOND FLOOR MECHANICAL PLAN - AREA A

M-112A

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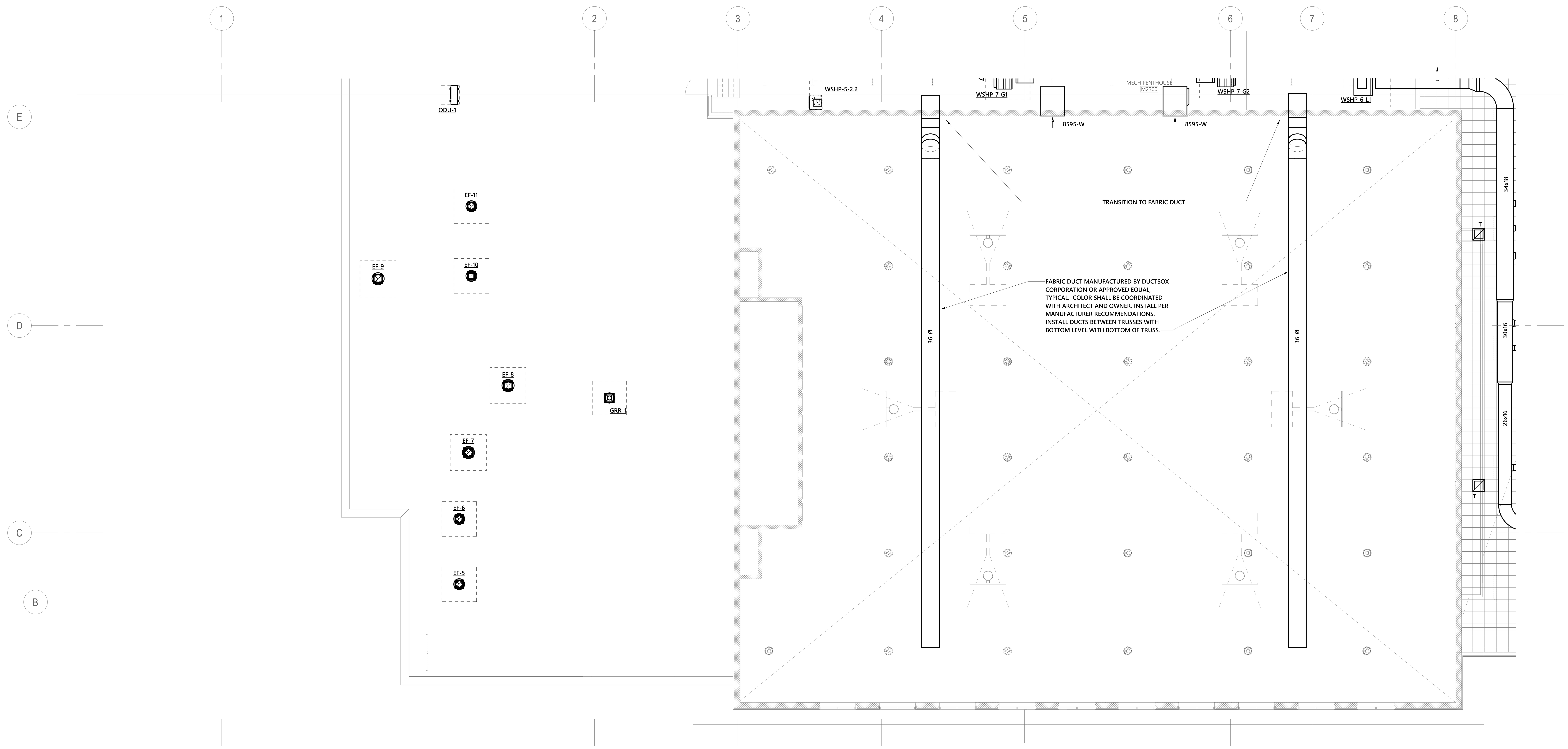
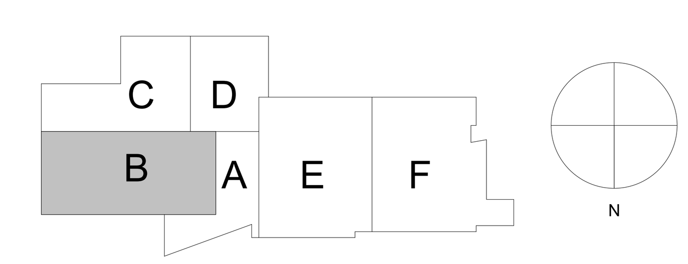


1 SECOND FLOOR MECHANICAL PLAN - AREA B
1/8" = 1'-0"

RATED WALL LEGEND	
SYMBOL	DESCRIPTION
	1 HR FIRE RATED
	2 HR FIRE RATED

KEYPLAN



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SECOND FLOOR MECHANICAL PLAN - AREA B

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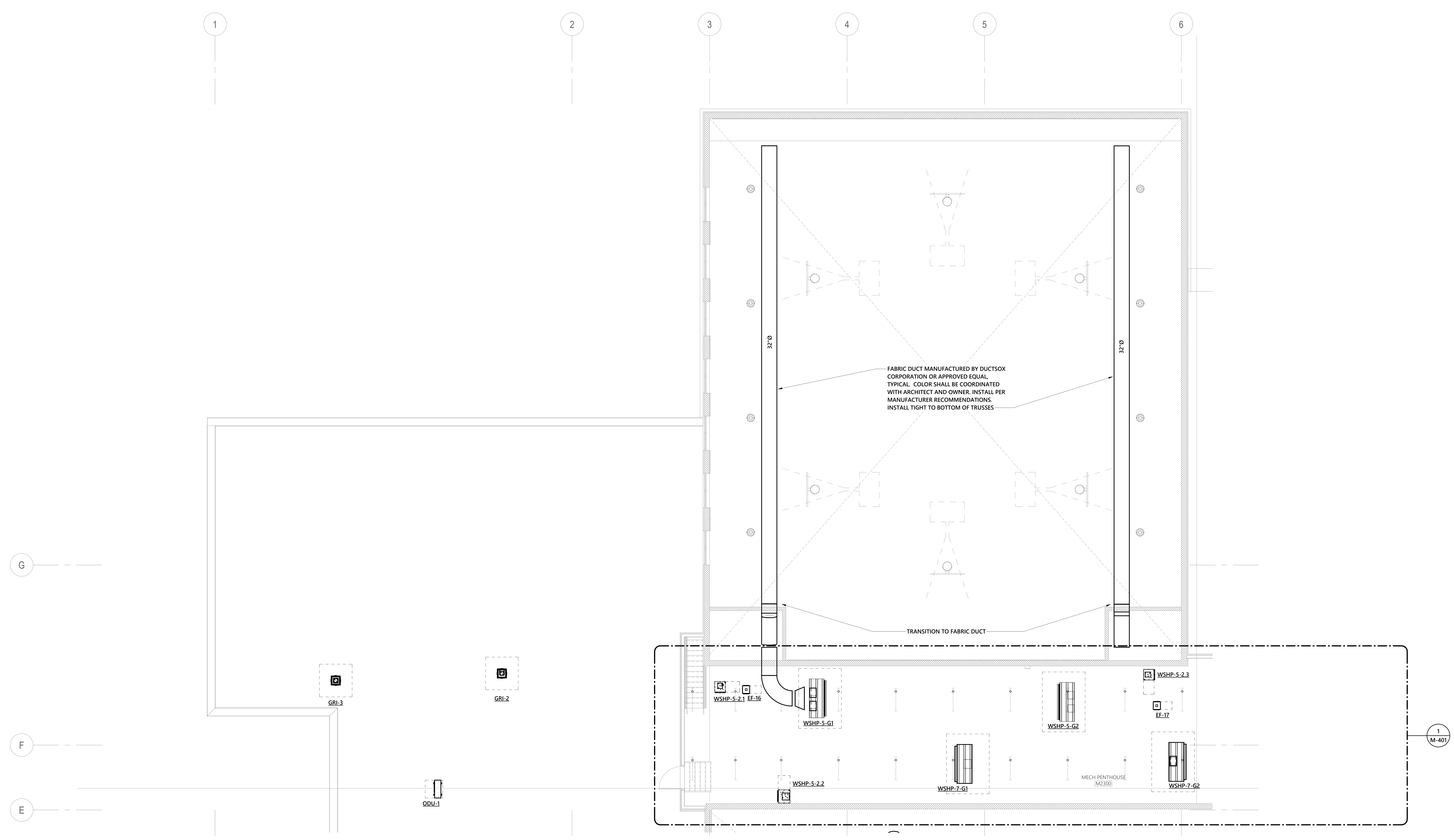


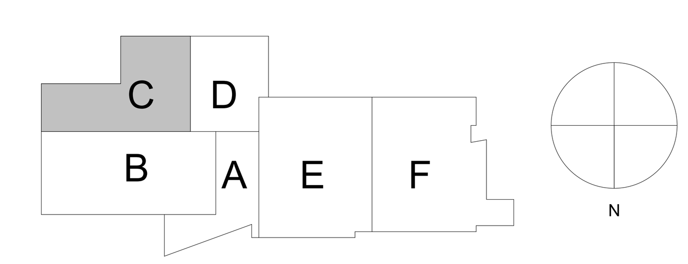
1 SECOND FLOOR MECHANICAL PLAN - AREA C

1/8" = 1'-0"

RATED WALL LEGEND

SYMBOL	DESCRIPTION
	1 HR FIRE RATED
	2 HR FIRE RATED

KEYPLAN



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SECOND FLOOR MECHANICAL PLAN - AREA C

M-112C

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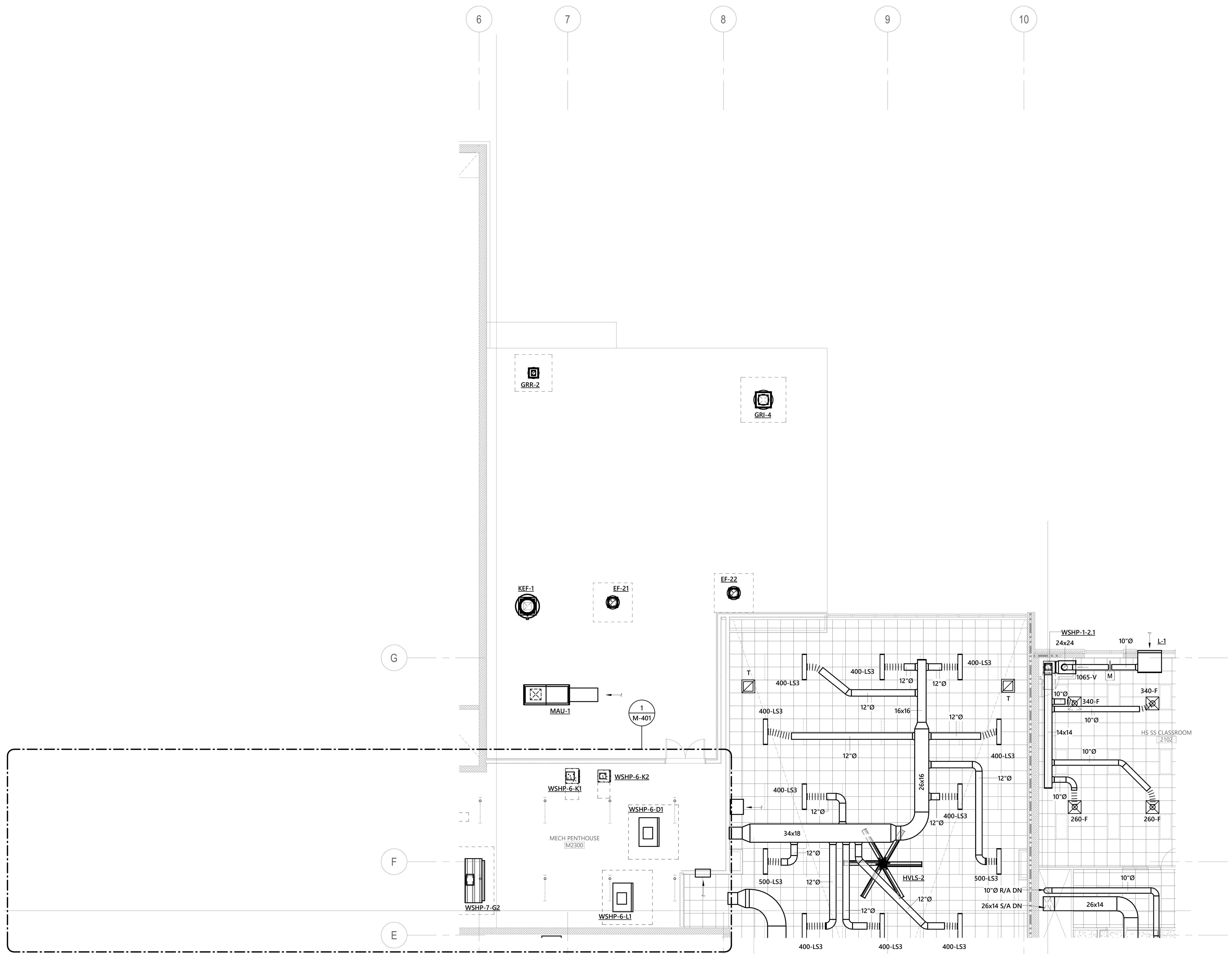


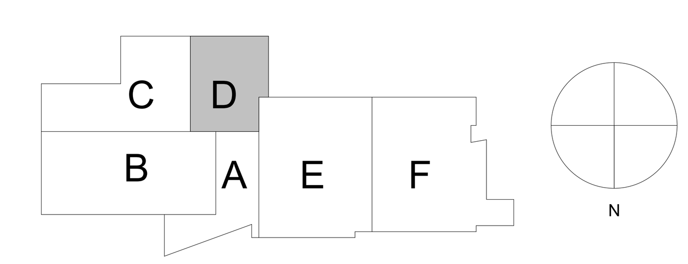
1 SECOND FLOOR MECHANICAL PLAN - AREA D

1/8" = 1'-0"

RATED WALL LEGEND

SYMBOL	DESCRIPTION
	1 HR FIRE RATED
	2 HR FIRE RATED

KEYPLAN



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ISSUE DATE: 06/12/24

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SECOND FLOOR MECHANICAL PLAN - AREA D

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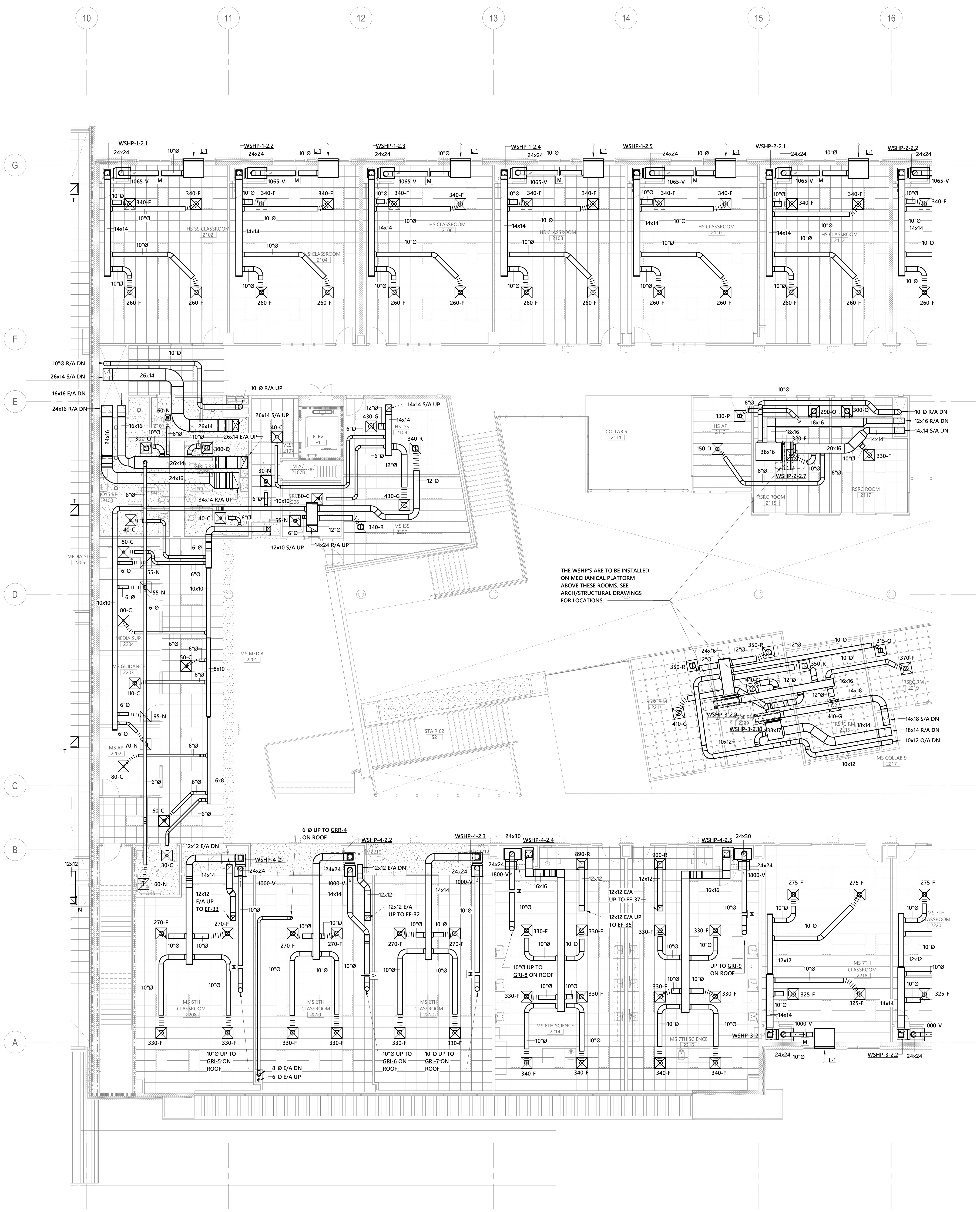
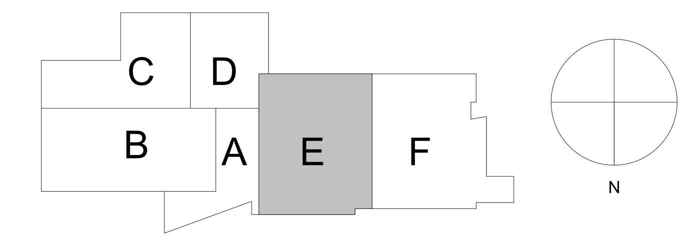


GENERAL NOTE:
1. M.C. TO COORDINATE FINAL MECHANICAL DUCT AND PIPING SIZE/LOCATION PENETRATIONS THROUGH HOLLOW CORE FLOOR WITH G.C. PRIOR TO ISSUANCE OF HOLLOW CORE SHOP DRAWINGS
2. COORDINATE ALL DUCT RUNS WITH FINAL STRUCTURAL LAYOUT THROUGH IN-BETWEEN ROOF TRUSSES

RATED WALL LEGEND

SYMBOL	DESCRIPTION
	1 HR FIRE RATED
	2 HR FIRE RATED

KEYPLAN



1 SECOND FLOOR MECHANICAL PLAN - AREA E
1/8" = 1'-0"

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SECOND FLOOR MECHANICAL PLAN - AREA E

M-112E

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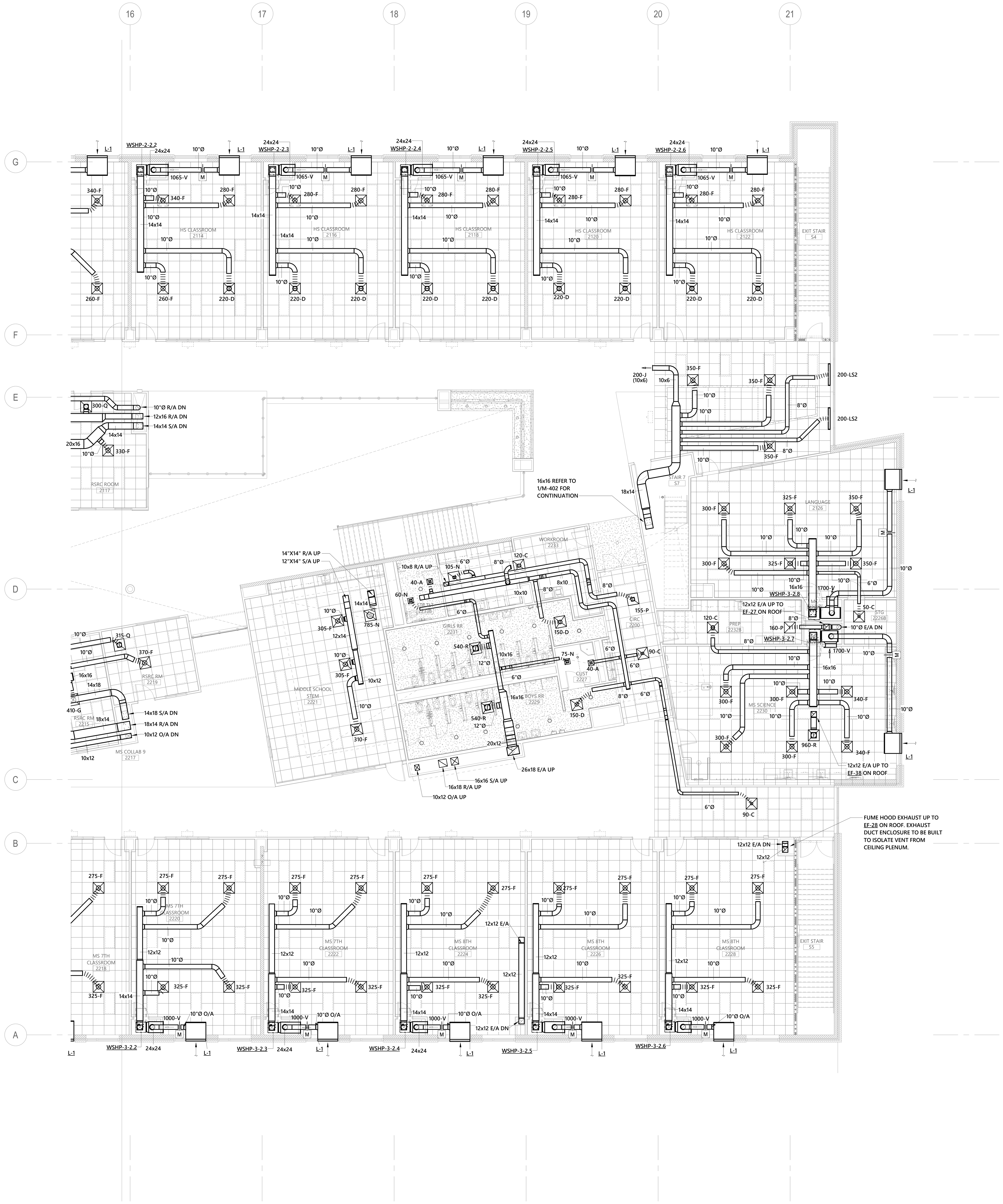


1 SECOND FLOOR MECHANICAL PLAN - AREA F

1/8" = 1'-0"

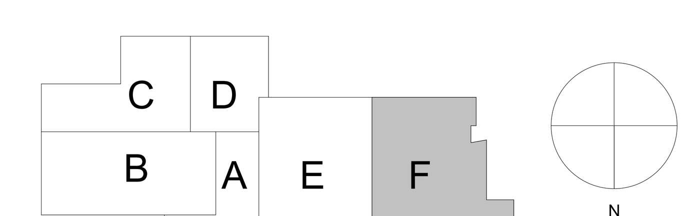
GENERAL NOTE:

1. M.C. TO COORDINATE FINAL MECHANICAL DUCT AND PIPING SIZE/LOCATION PENETRATIONS THROUGH HOLLOW CORE FLOOR WITH G.C. PRIOR TO ISSUANCE OF HOLLOW CORE SHOP DRAWINGS
2. COORDINATE ALL DUCT RUNS WITH FINAL STRUCTURAL LAYOUT THROUGH IN-BETWEEN ROOF TRUSSES

RATED WALL LEGEND

SYMBOL	DESCRIPTION
	1 HR FIRE RATED
	2 HR FIRE RATED

KEYPLAN



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SECOND FLOOR MECHANICAL PLAN - AREA F

M-112F

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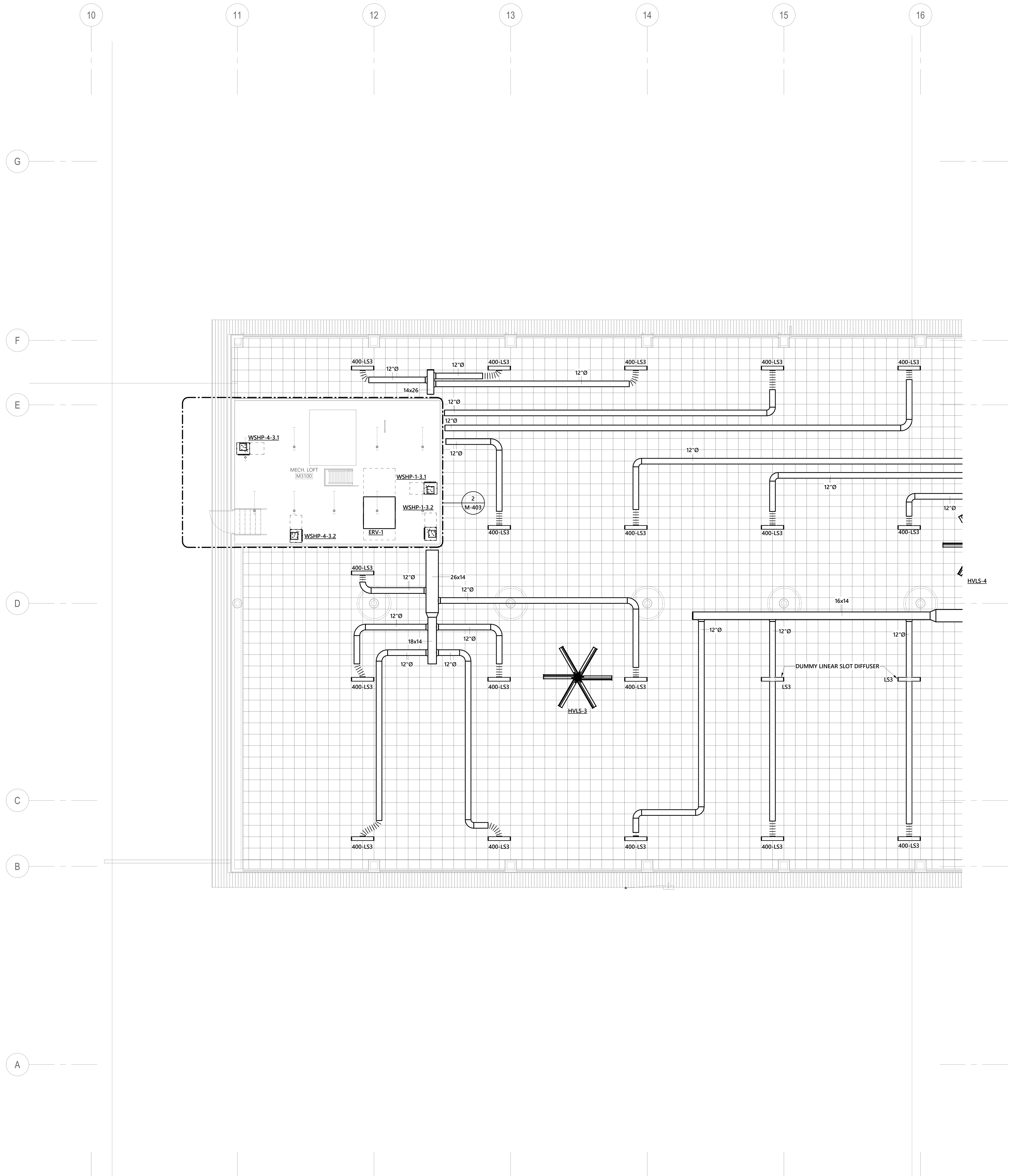
GENERAL NOTE:
1. M.C. TO COORDINATE FINAL MECHANICAL DUCT AND PIPING SIZE/LOCATION PENETRATIONS THROUGH HOLLOW CORE FLOOR WITH G.C. PRIOR TO ISSUANCE OF HOLLOW CORE SHOP DRAWINGS
2. COORDINATE ALL DUCT RUNS WITH FINAL STRUCTURAL LAYOUT THROUGH IN-BETWEEN ROOF TRUSSES



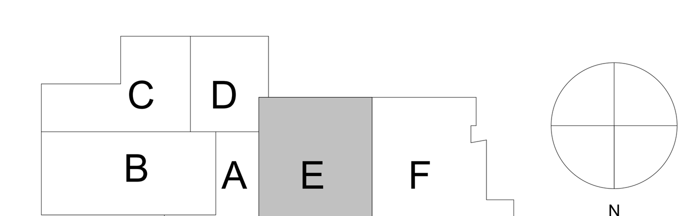
1 SECOND FLOOR CLERESTORY MECHANICAL PLAN - AREA E

1/8" = 1'-0"

RATED WALL LEGEND

SYMBOL	DESCRIPTION
	1 HR FIRE RATED
	2 HR FIRE RATED

KEYPLAN



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ENERGY STAR PARTNER

No.	Date	Description

ISSUE DATE: 06/12/24

PROJECT #: 2205
DRAWN BY: TAL
CHECKED BY: JWM

SECOND FLOOR CLERESTORY MECHANICAL PLAN - AREA E

M-113E

OPTIMA# 23-0082R

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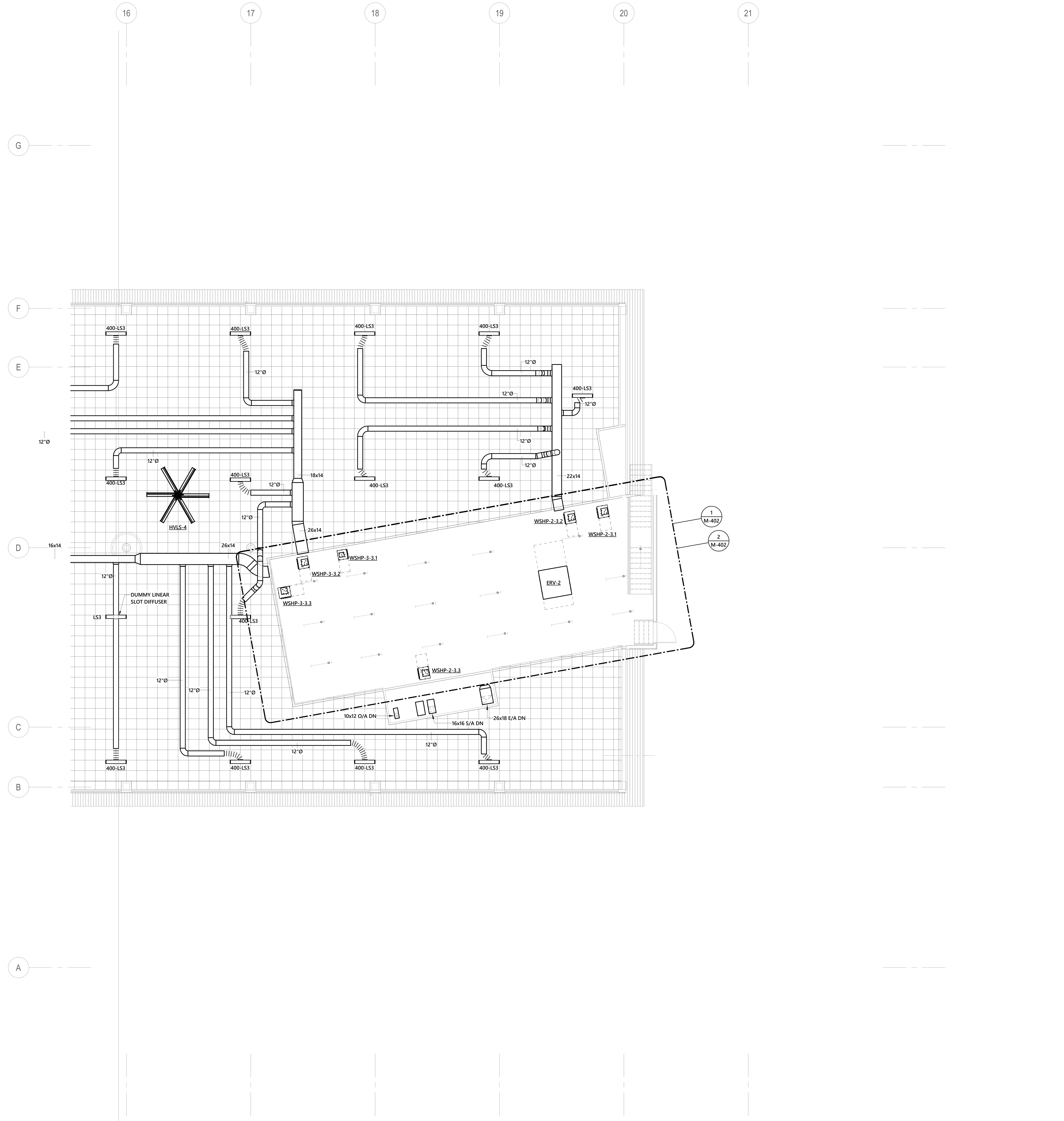


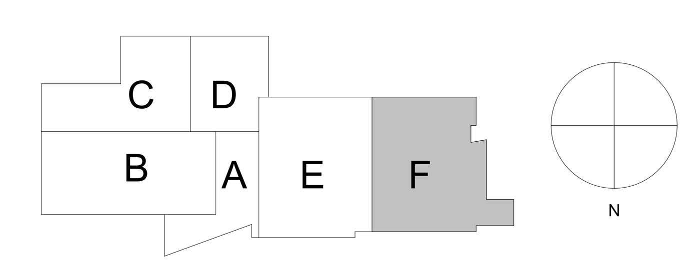
1 SECOND FLOOR CLERESTORY MECHANICAL PLAN - AREA F

1/8" = 1'-0"

GENERAL NOTE:
1. M.C. TO COORDINATE FINAL MECHANICAL DUCT AND PIPING SIZE/LOCATION PENETRATIONS THROUGH HOLLOW CORE FLOOR WITH G.C. PRIOR TO ISSUANCE OF HOLLOW CORE SHOP DRAWINGS
2. COORDINATE ALL DUCT RUNS WITH FINAL STRUCTURAL LAYOUT THROUGH IN-BETWEEN ROOF TRUSSES

RATED WALL LEGEND	
SYMBOL	DESCRIPTION
	1 HR FIRE RATED
	2 HR FIRE RATED

KEYPLAN



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ISSUE DATE:	06/12/24
PROJECT #:	2205
DRAWN BY:	TAL
CHECKED BY:	JWM

SECOND FLOOR CLERESTORY MECHANICAL PLAN - AREA F

M-113F

OPTIMA# 23-0082R

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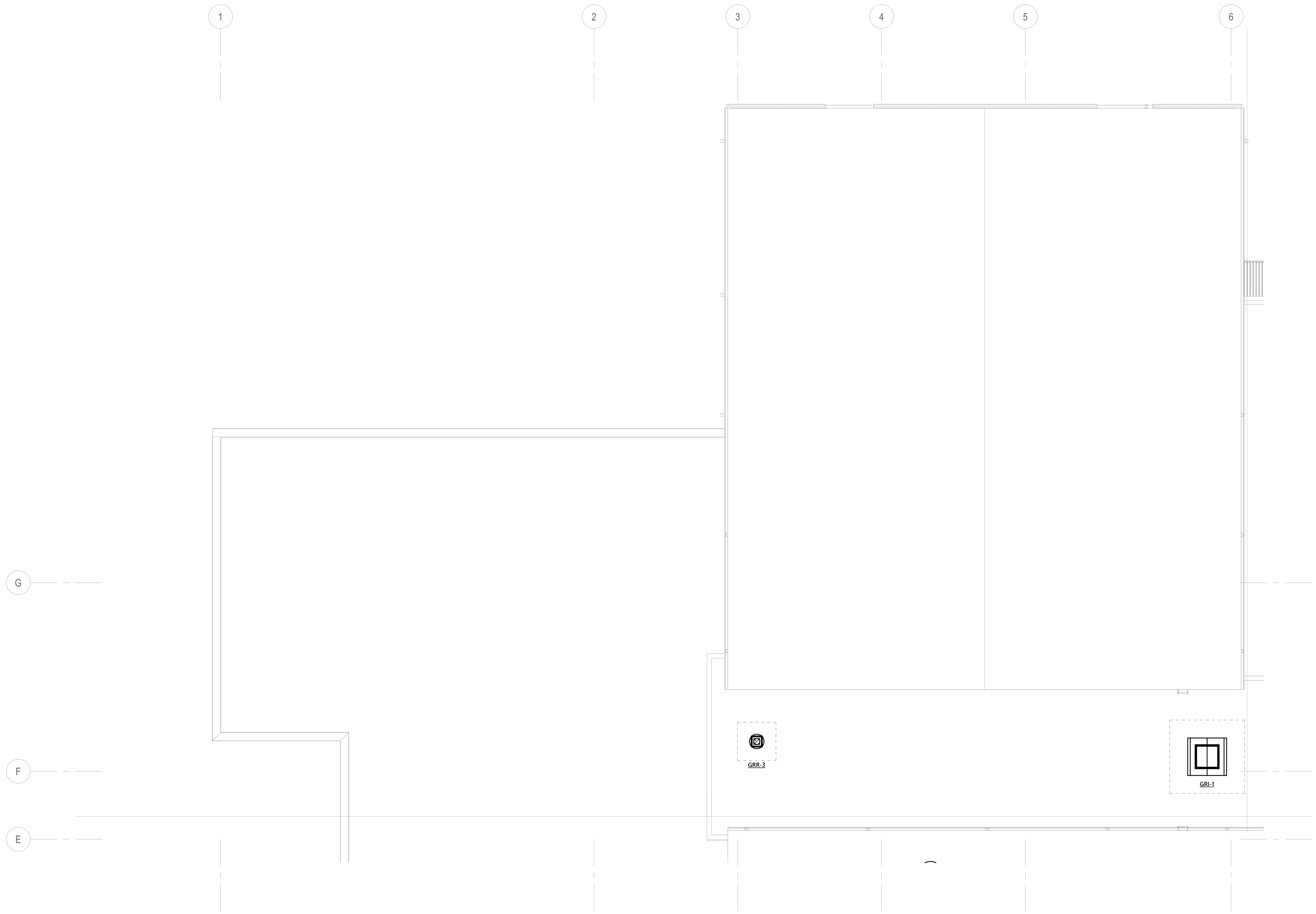
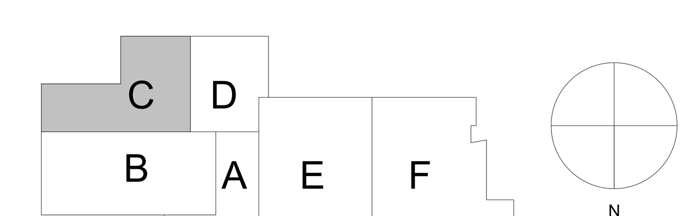


1 ROOF MECHANICAL PLAN - AREA C
1/8" = 1'-0"

RATED WALL LEGEND	
SYMBOL	DESCRIPTION
	1 HR FIRE RATED
	2 HR FIRE RATED

KEYPLAN



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ROOF MECHANICAL PLAN - AREA C

M-114C

OPTIMA# 23-0082R

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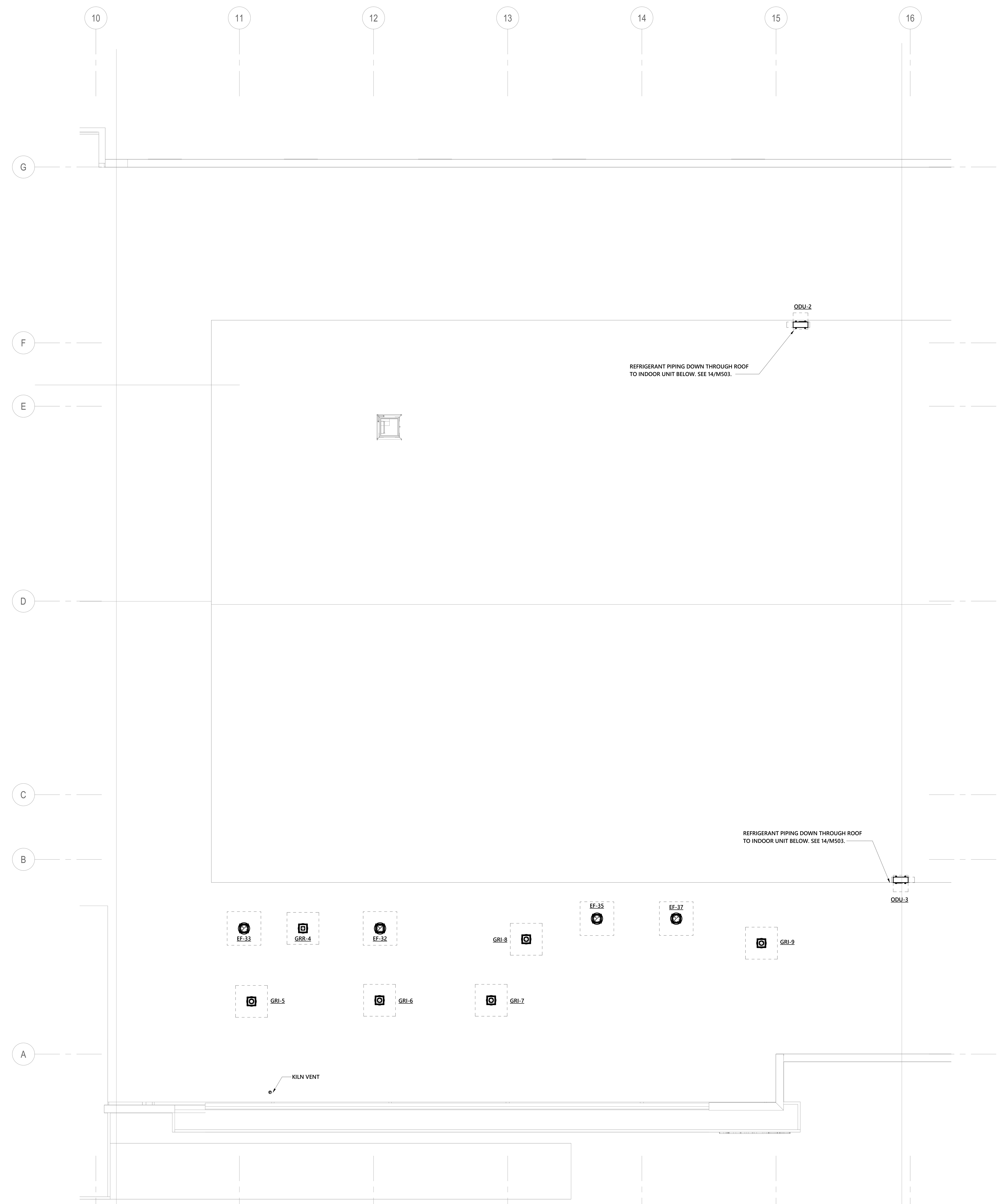
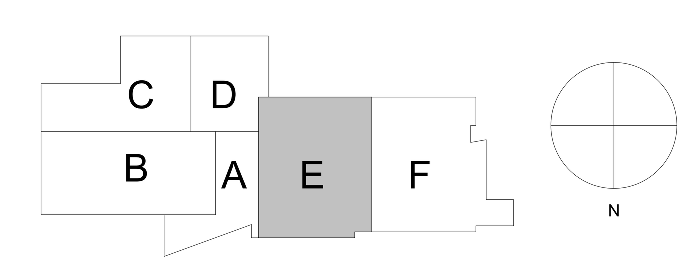


1 ROOF MECHANICAL PLAN - AREA E
1/8" = 1'-0"

RATED WALL LEGEND	
SYMBOL	DESCRIPTION
	1 HR FIRE RATED
	2 HR FIRE RATED

KEYPLAN



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ROOF MECHANICAL PLAN - AREA E

M-114E

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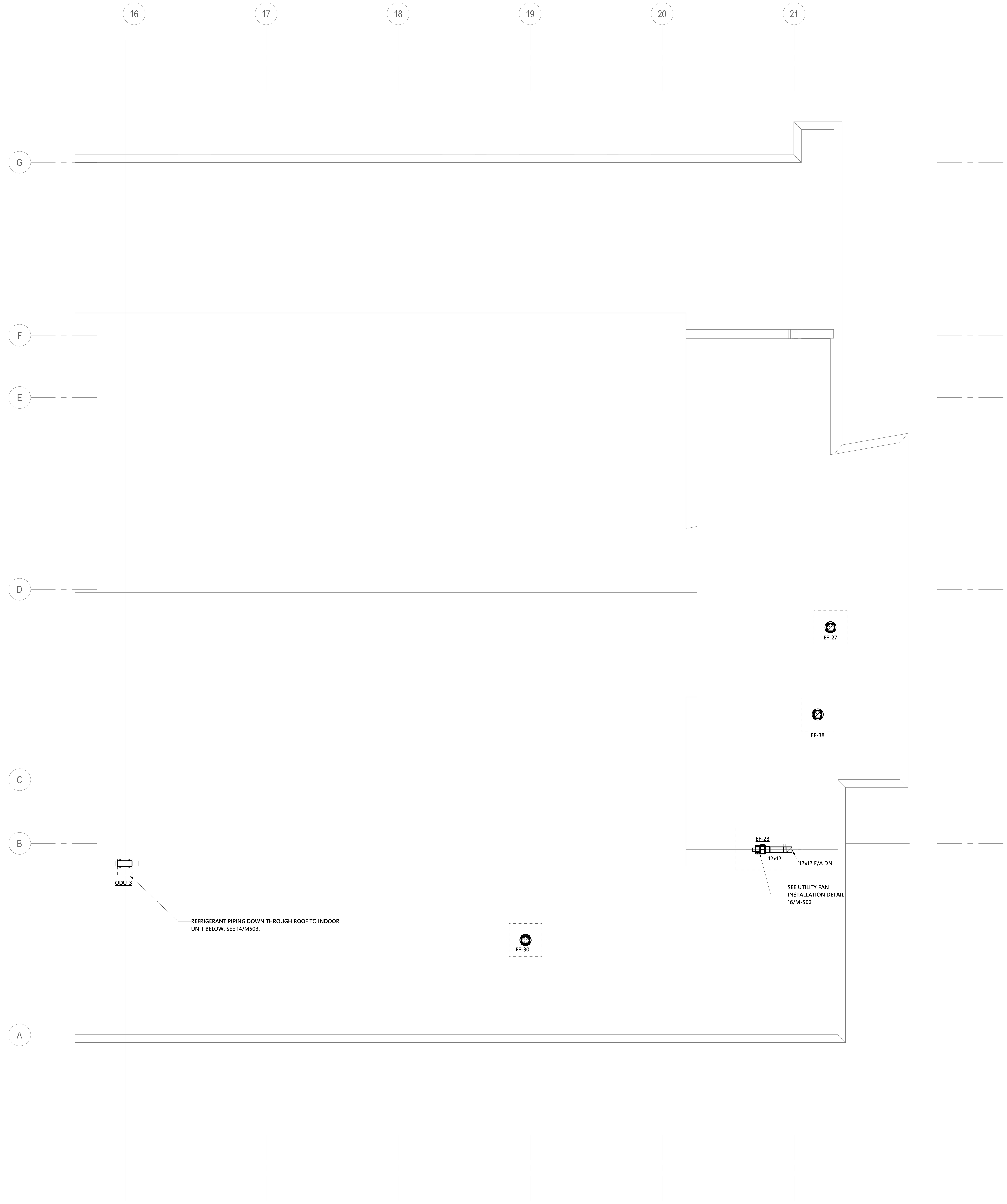
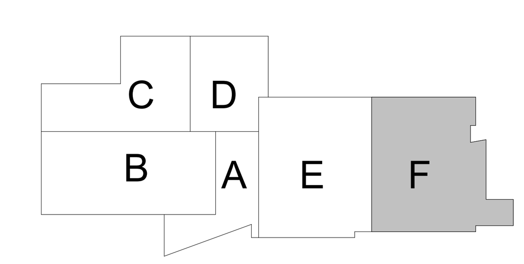


1 ROOF MECHANICAL PLAN - AREA F
1/8" = 1'-0"

RATED WALL LEGEND	
SYMBOL	DESCRIPTION
	1 HR FIRE RATED
	2 HR FIRE RATED

KEYPLAN



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ISSUE DATE:	06/12/24
PROJECT #:	2205
DRAWN BY:	TAL
CHECKED BY:	JWM

ROOF MECHANICAL PLAN - AREA F

M-114F

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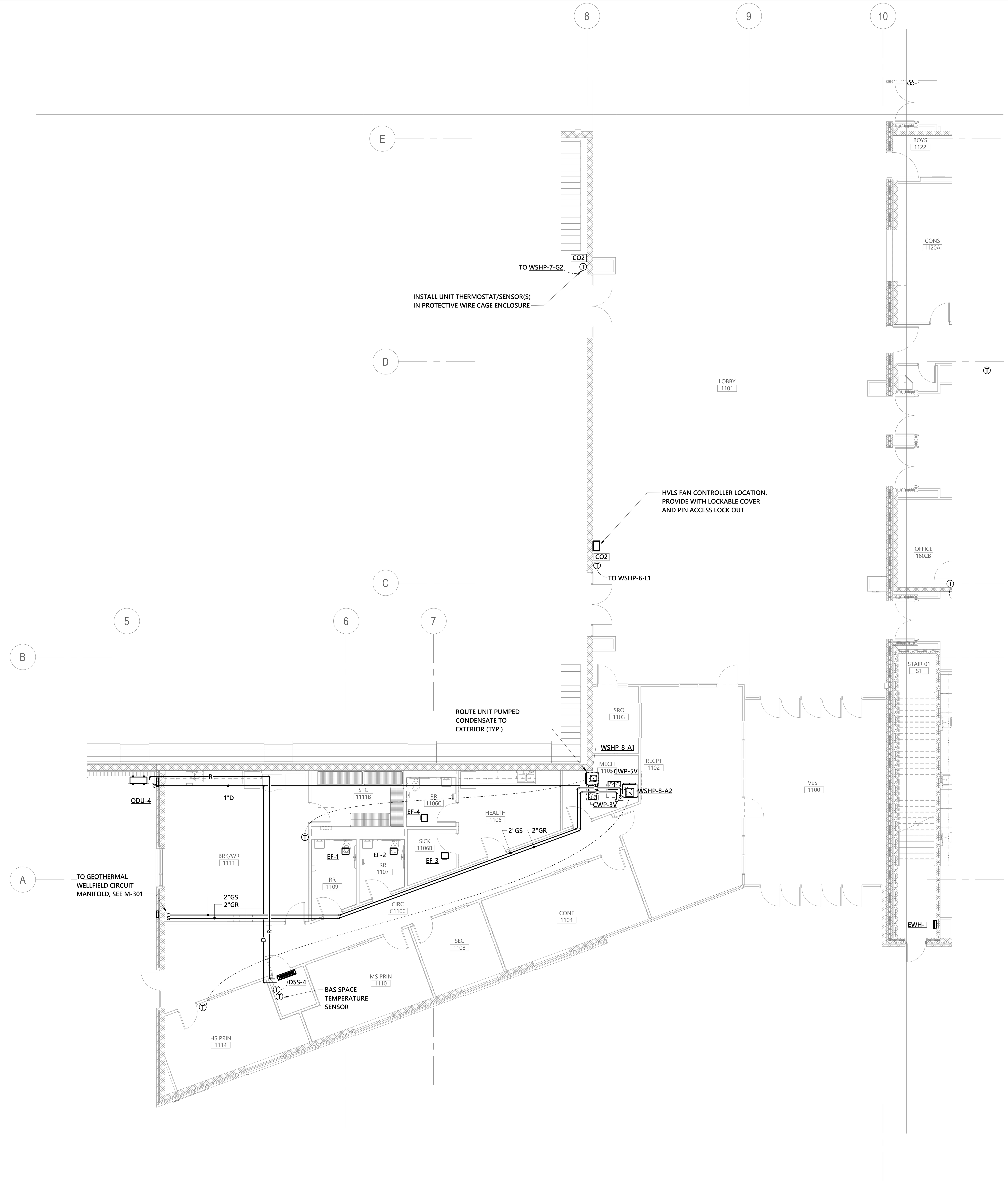
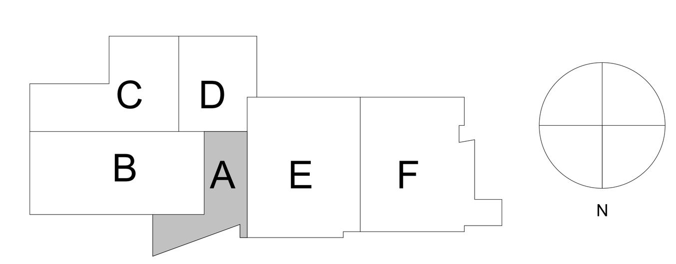


RATED WALL LEGEND

SYMBOL	DESCRIPTION
	1 HR FIRE RATED
	2 HR FIRE RATED

KEYPLAN



1 FIRST FLOOR MECHANICAL PIPING PLAN - AREA A
1/8" = 1'-0"

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ISSUE DATE: 06/12/24

PROJECT #: 2205
DRAWN BY: TAL
CHECKED BY: JWM

FIRST FLOOR MECHANICAL PIPING PLAN - AREA A

M-211A

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OPTIMA# 23-0082R

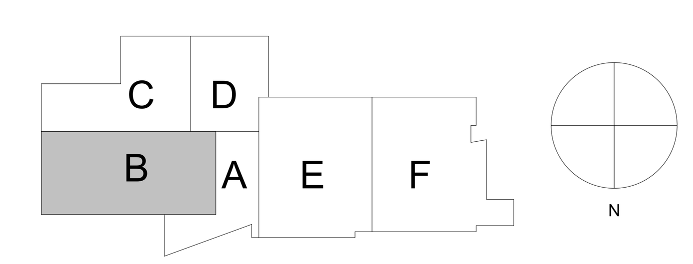
1 FIRST FLOOR MECHANICAL PIPING PLAN - AREA B

1/8" = 1'-0"

RATED WALL LEGEND

SYMBOL	DESCRIPTION
	1 HR FIRE RATED
	2 HR FIRE RATED

KEYPLAN



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FIRST FLOOR MECHANICAL PIPING PLAN - AREA B

M-211B

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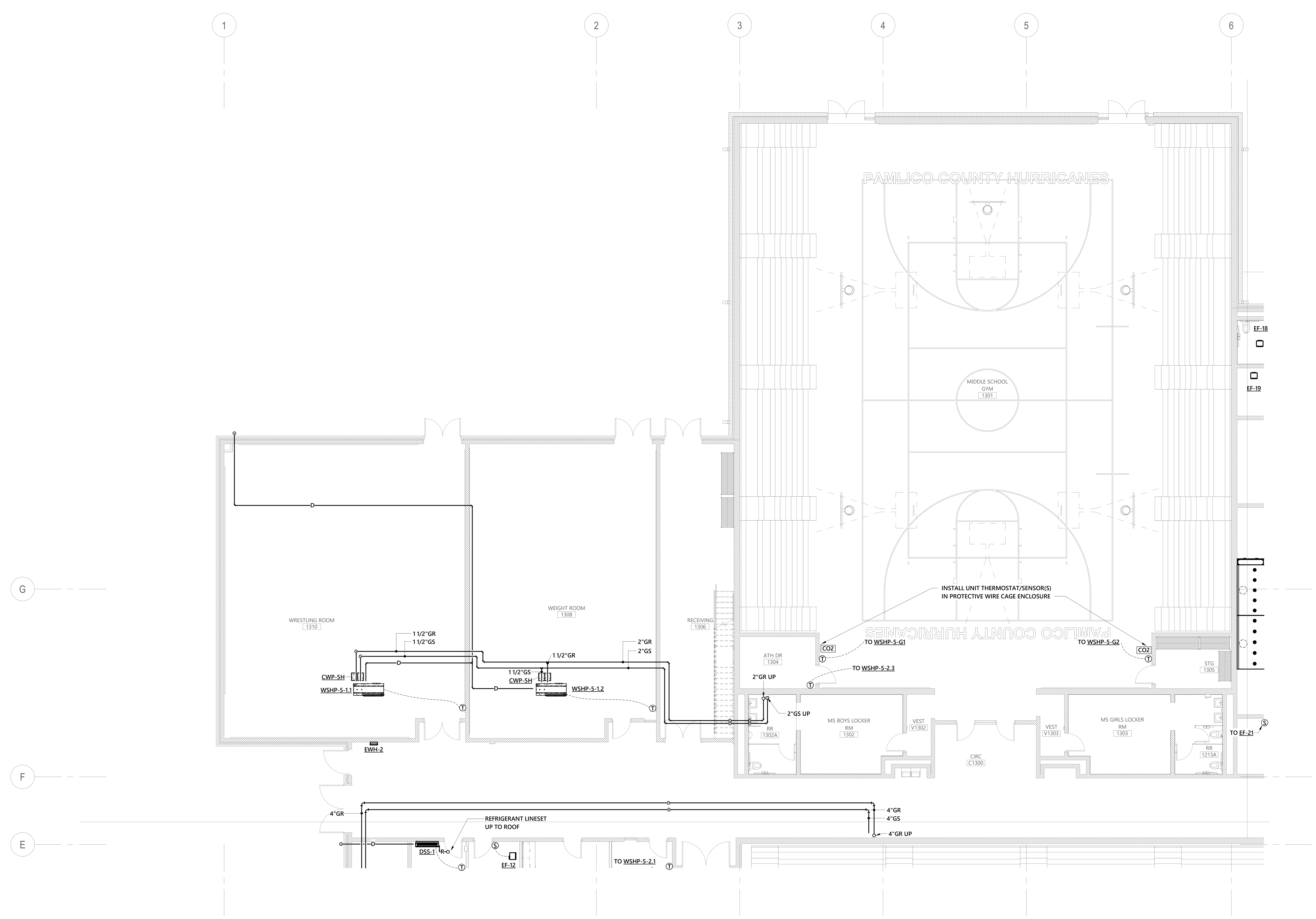
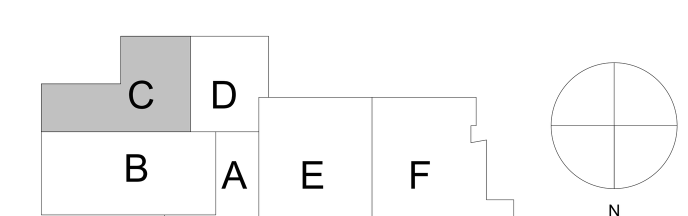


1 FIRST FLOOR MECHANICAL PIPING PLAN - AREA C
1/8" = 1'-0"

RATED WALL LEGEND	
SYMBOL	DESCRIPTION
	1 HR FIRE RATED
	2 HR FIRE RATED

KEYPLAN



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FIRST FLOOR MECHANICAL PIPING PLAN - AREA C

M-211C

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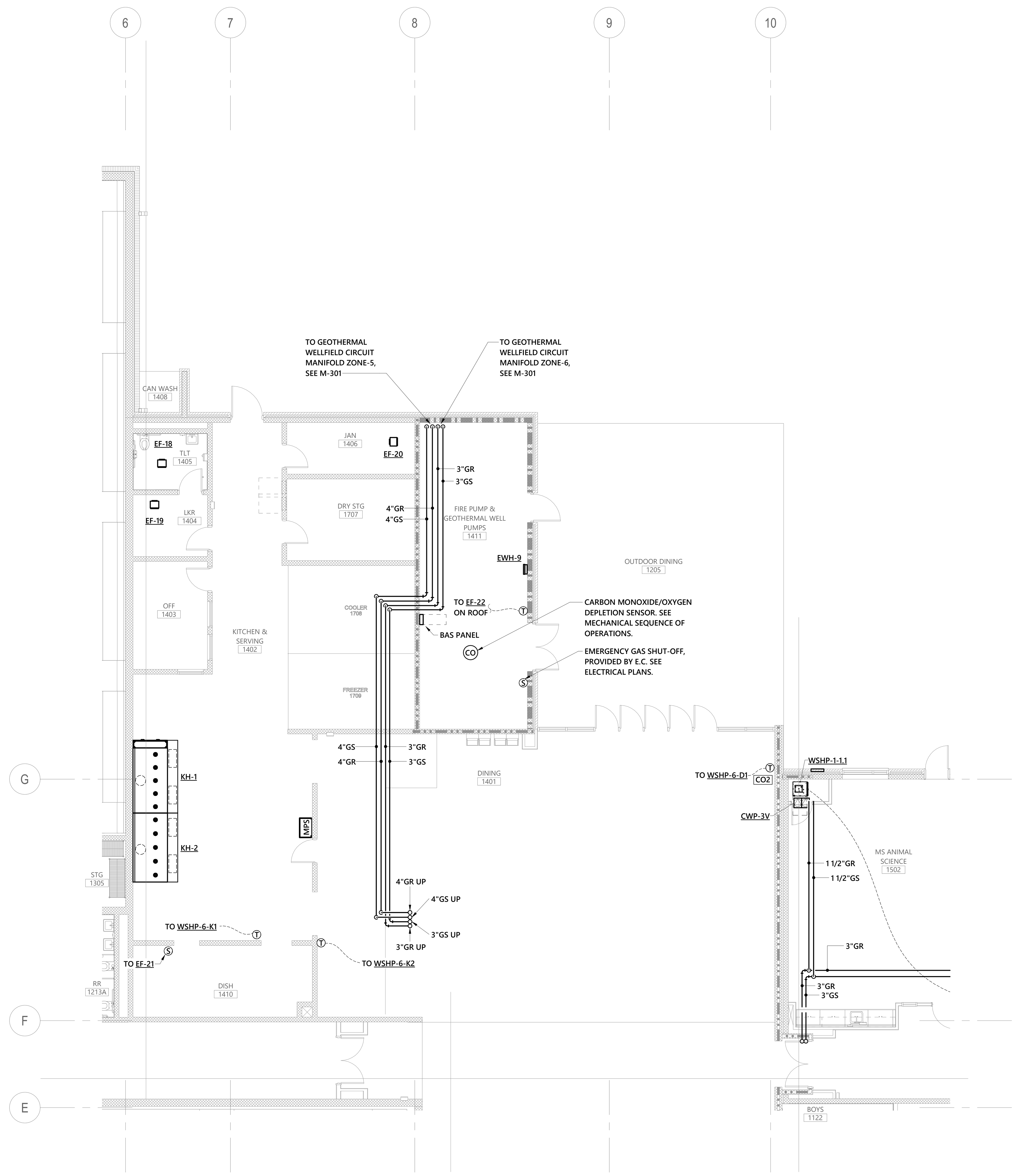


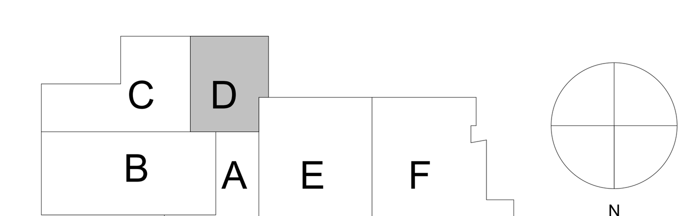
1 FIRST FLOOR MECHANICAL PIPING PLAN - AREA D

1/8" = 1'-0"

RATED WALL LEGEND

SYMBOL	DESCRIPTION
	1 HR FIRE RATED
	2 HR FIRE RATED

KEYPLAN



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FIRST FLOOR MECHANICAL PIPING PLAN - AREA D

M-211D

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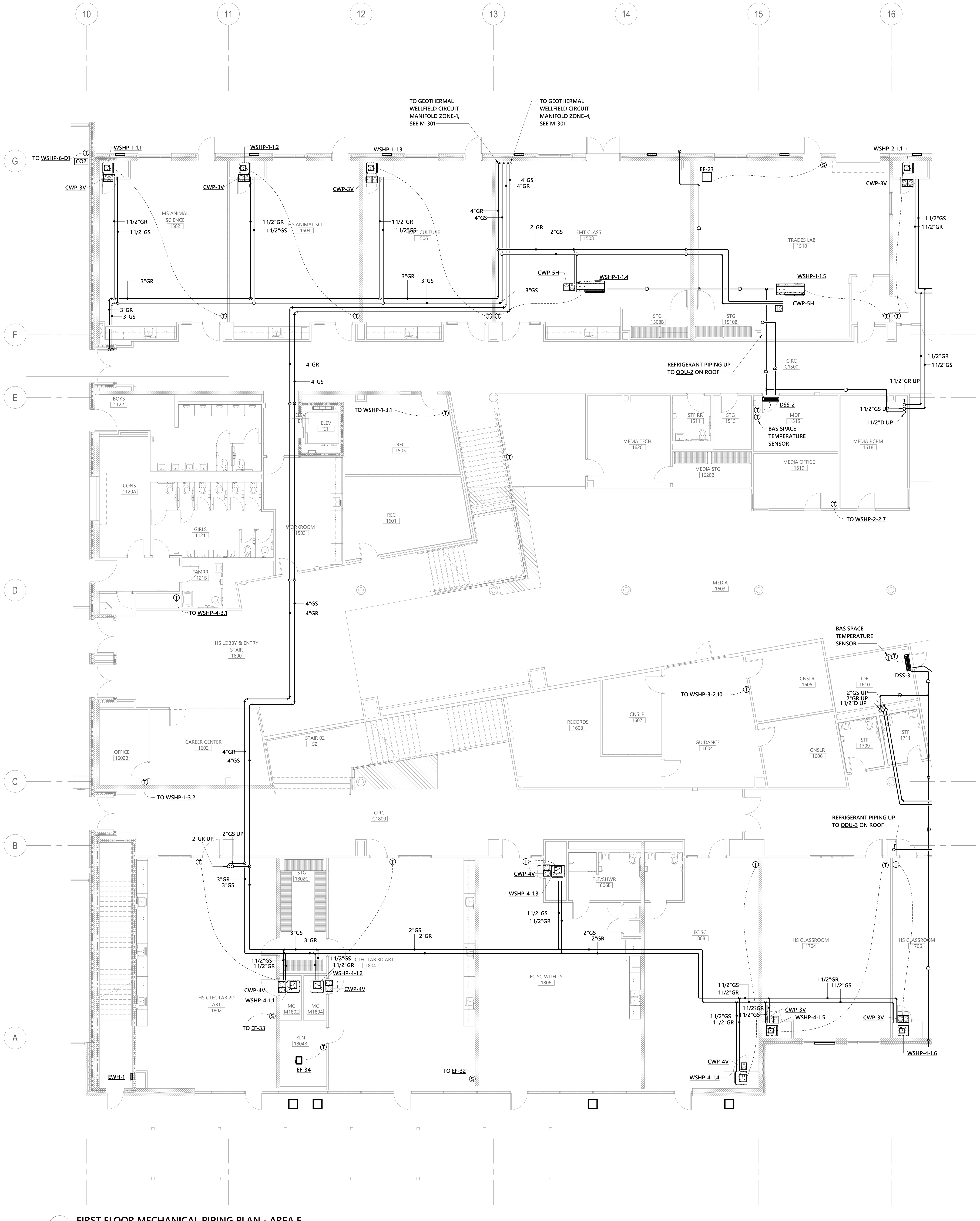
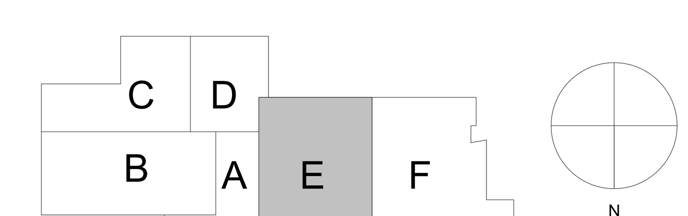


1 FIRST FLOOR MECHANICAL PIPING PLAN - AREA E
1/8" = 1'-0"

RATED WALL LEGEND

SYMBOL	DESCRIPTION
	1 HR FIRE RATED
	2 HR FIRE RATED

KEYPLAN



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DRAWN BY: TAL
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FIRST FLOOR MECHANICAL PIPING PLAN - AREA E

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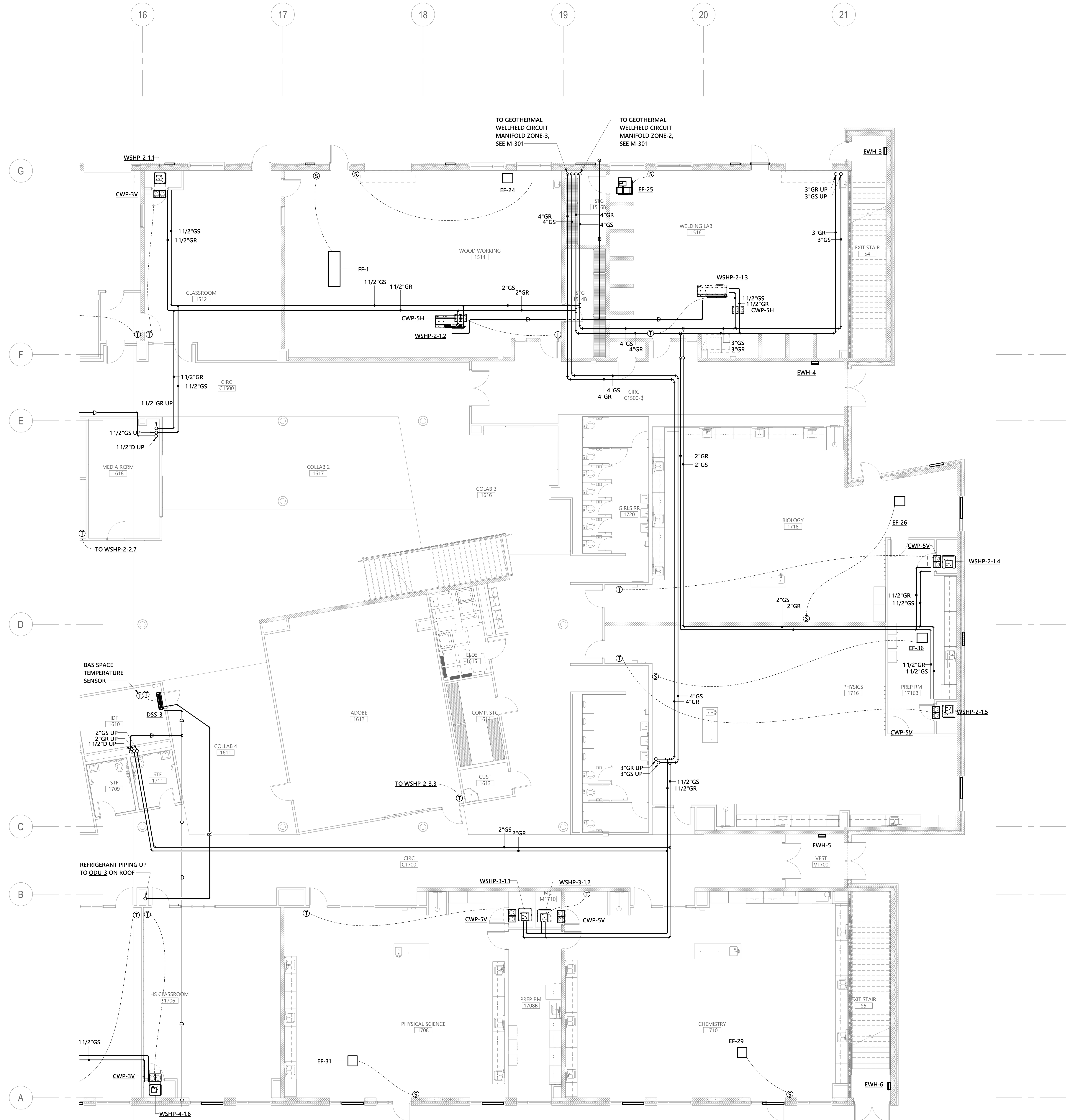

1 **FIRST FLOOR MECHANICAL PIPING PLAN - AREA F**
1/8" = 1'-0"

RATED WALL LEGEND

SYMBOL	DESCRIPTION
	1 HR FIRE RATED
	2 HR FIRE RATED

KEYPLAN

C D B A E F

N

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FIRST FLOOR MECHANICAL PIPING PLAN - AREA F

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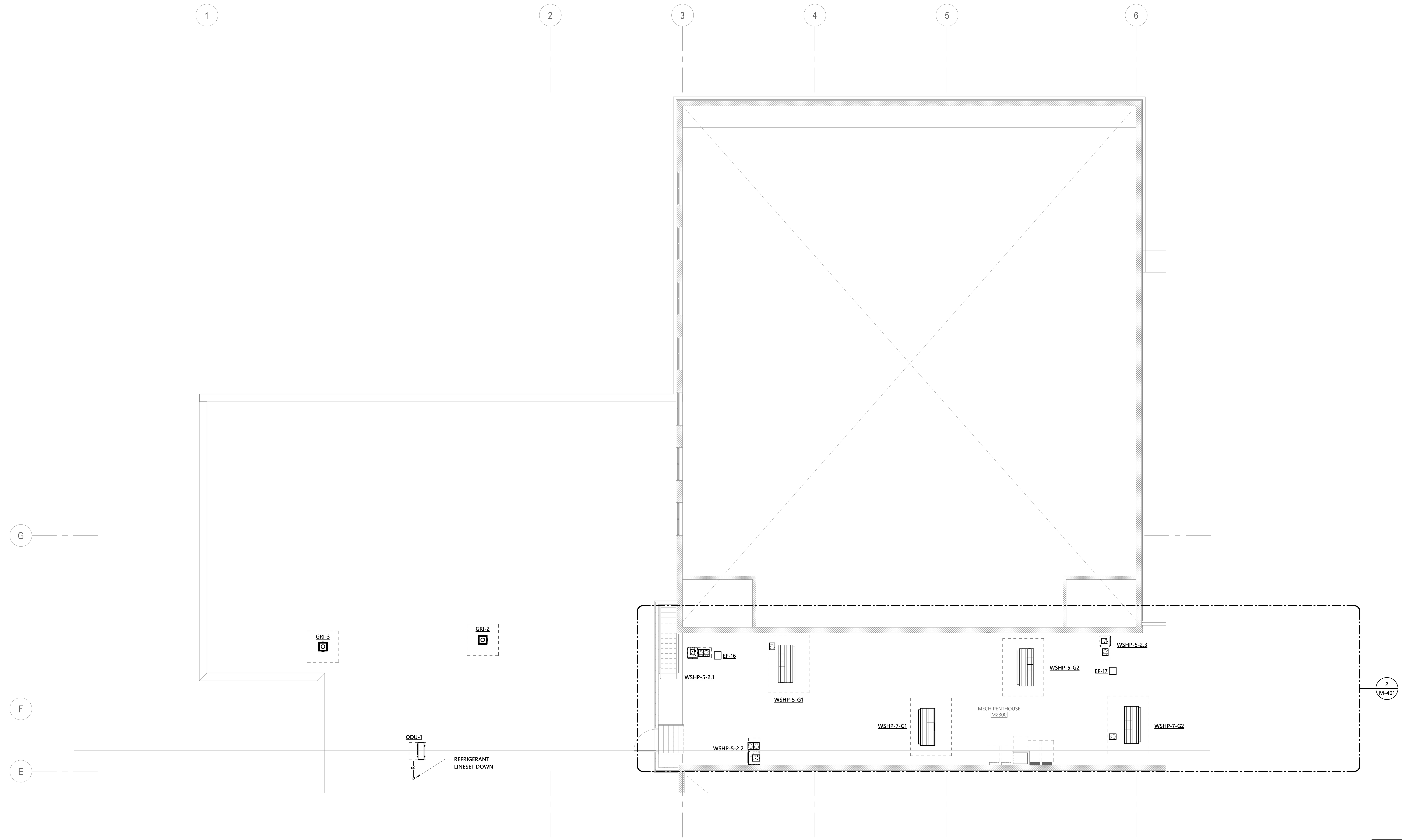


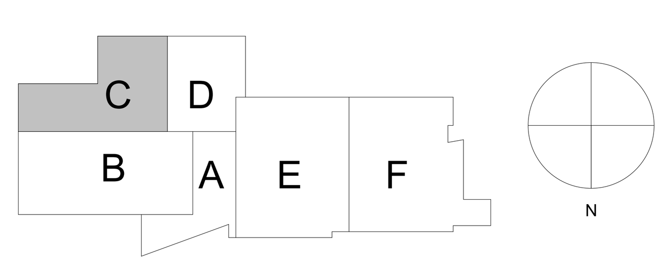
1 SECOND FLOOR MECHANICAL PIPING PLAN - AREA C

1/8" = 1'-0"

RATED WALL LEGEND

SYMBOL	DESCRIPTION
	1 HR FIRE RATED
	2 HR FIRE RATED

KEYPLAN



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NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 040316 THOMAS A. LANDEN 06/12/2024

CONSTRUCTION DOCUMENTS

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150 Fayetteville St., Suite 520, Raleigh, NC 27601
Phone: 919-926-2200 - www.optimaengineering.com
North Carolina License Number C-0914

PAMLICO COUNTY PAMLICO 6-12 SCHOOL

601 Main Street, Bayboro, NC, 28515

ENERGY STAR PARTNER

No.	Date	Description

ISSUE DATE:	06/12/24
PROJECT #:	2205
DRAWN BY:	TAL
CHECKED BY:	JWM

SECOND FLOOR MECHANICAL PIPING PLAN - AREA C

M-212C

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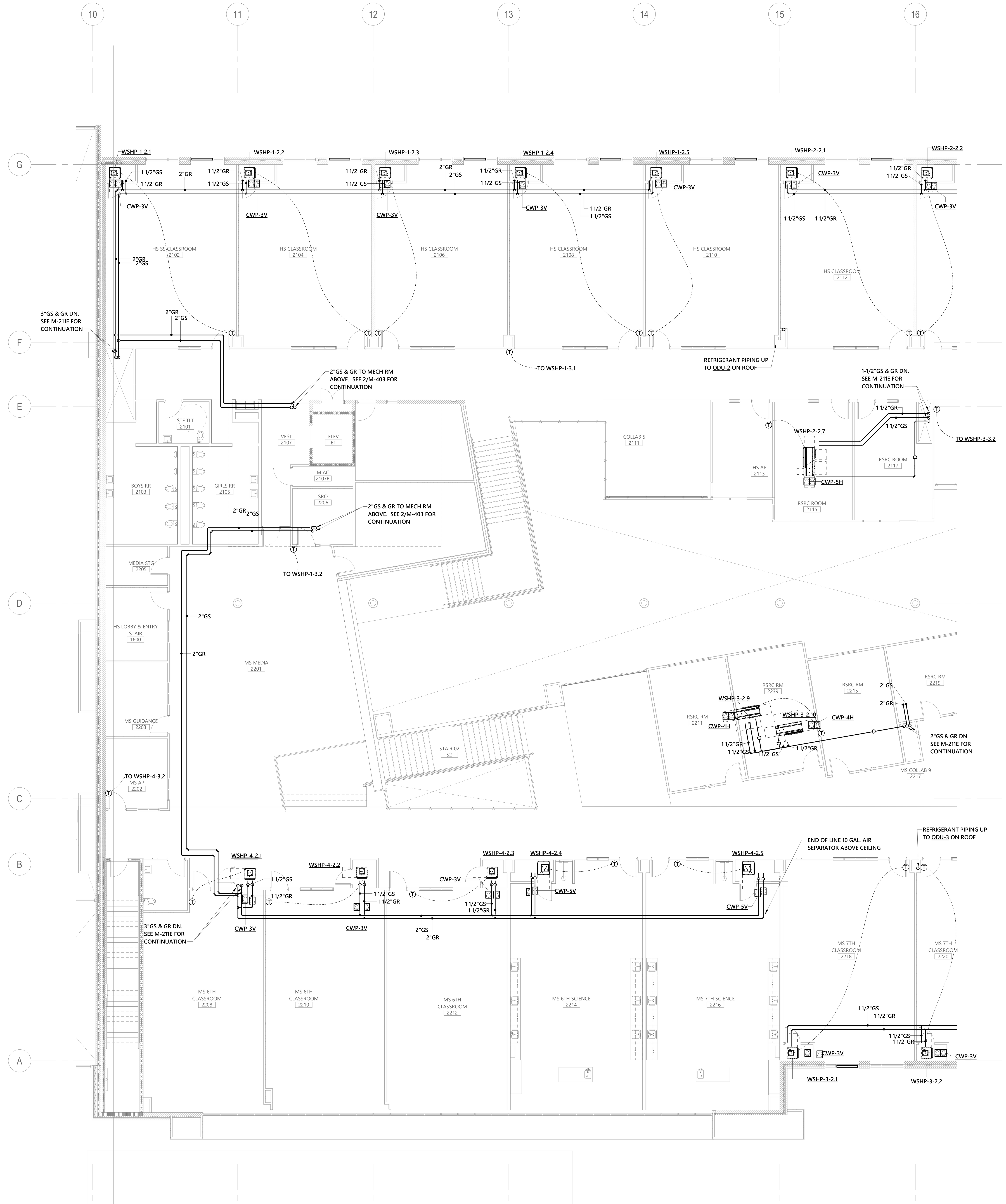
GENERAL NOTE:
1. M.C. TO COORDINATE FINAL MECHANICAL DUCT AND PIPING SIZE/LOCATION PENETRATIONS THROUGH HOLLOW CORE FLOOR WITH G.C. PRIOR TO ISSUANCE OF HOLLOW CORE SHOP DRAWINGS

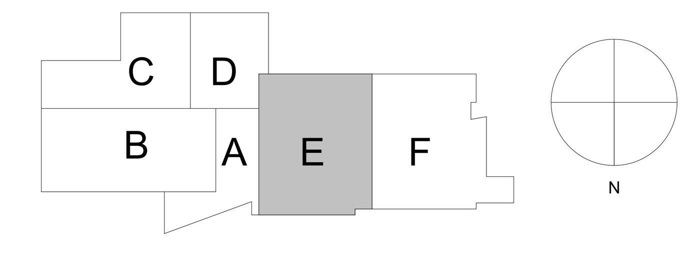


SECOND FLOOR MECHANICAL PIPING PLAN - AREA E
1/8" = 1'-0"

RATED WALL LEGEND

SYMBOL	DESCRIPTION
	1 HR FIRE RATED
	2 HR FIRE RATED

KEYPLAN



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ENERGY STAR PARTNER

No.	Date	Description

ISSUE DATE: 06/12/24
PROJECT #: 2205
DRAWN BY: TAL
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SECOND FLOOR MECHANICAL PIPING PLAN - AREA E

M-212E

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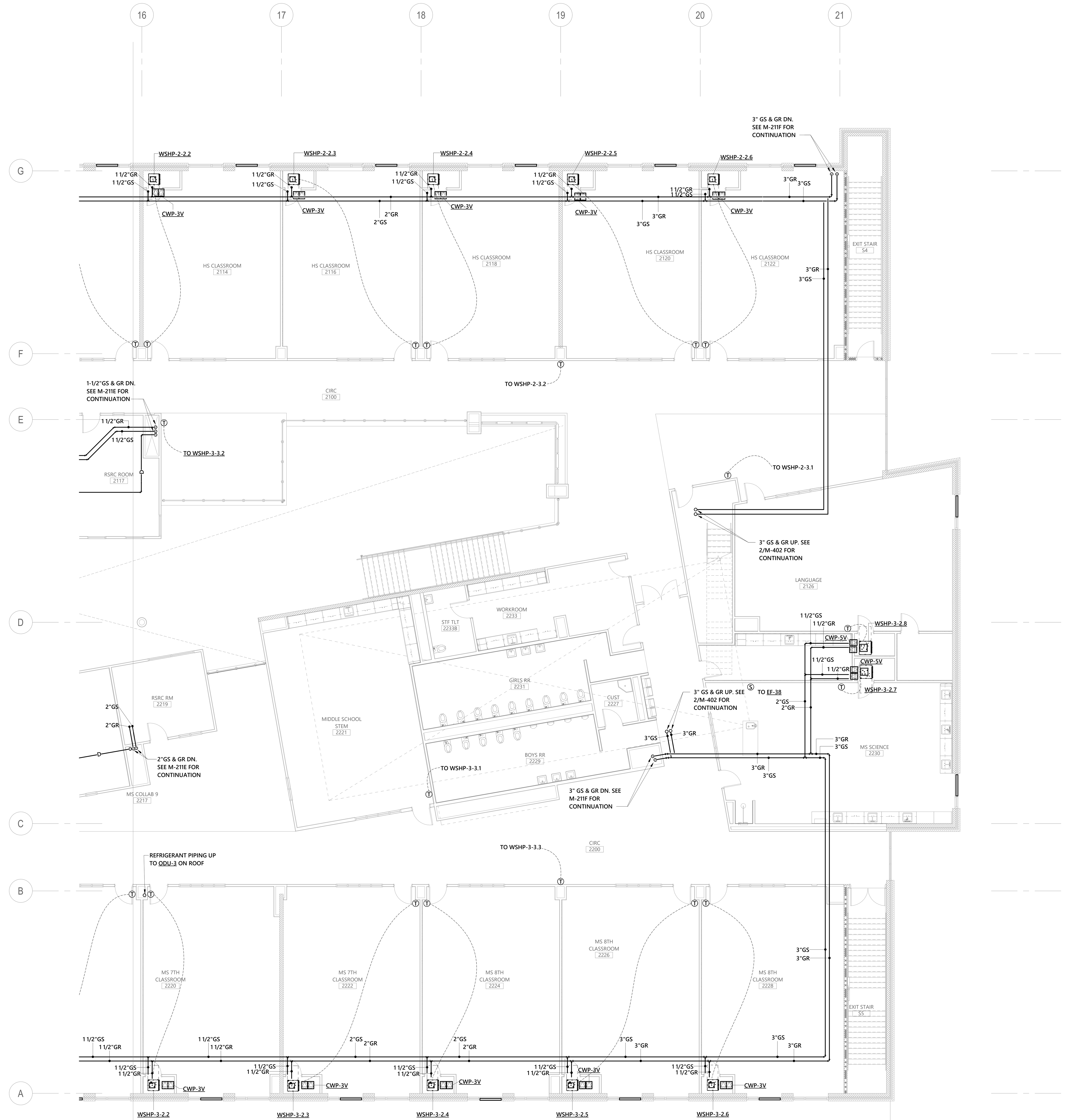
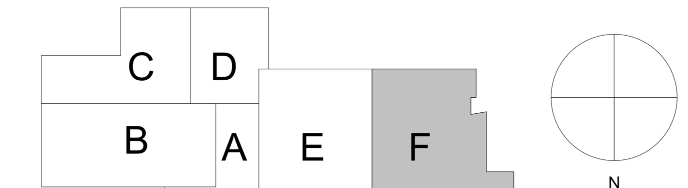


1 SECOND FLOOR MECHANICAL PIPING PLAN - AREA F
1/8" = 1'-0"

RATED WALL LEGEND

SYMBOL	DESCRIPTION
	1 HR FIRE RATED
	2 HR FIRE RATED

KEYPLAN



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No.	Date	Description

ISSUE DATE: 06/12/24
PROJECT #: 2205
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CHECKED BY: JWM

SECOND FLOOR MECHANICAL PIPING PLAN - AREA F

M-212F

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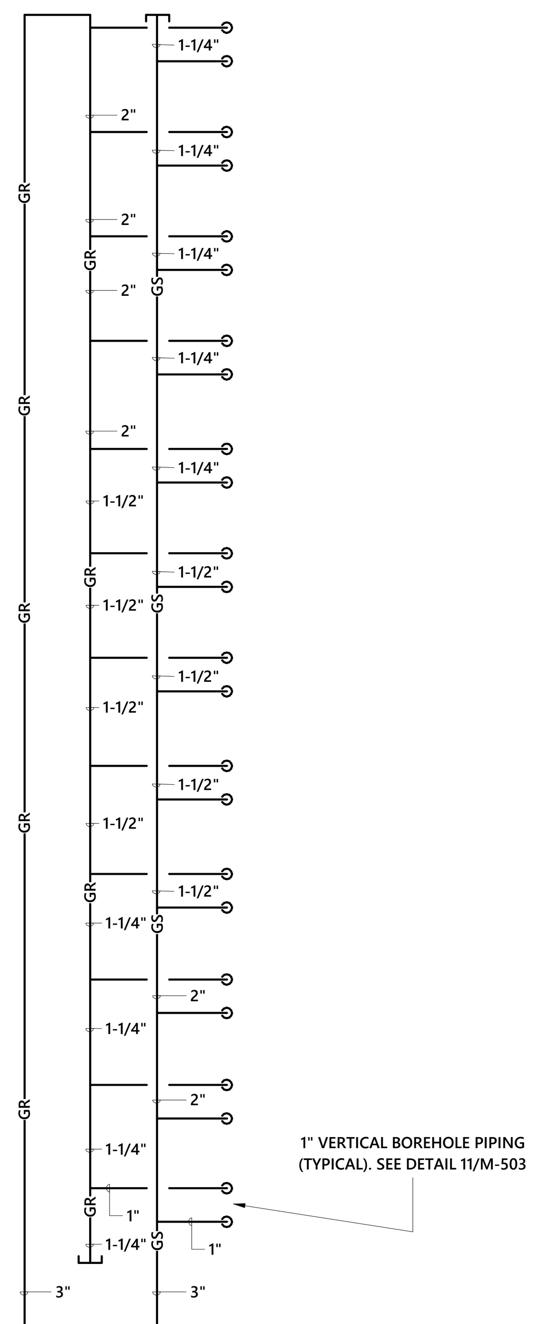
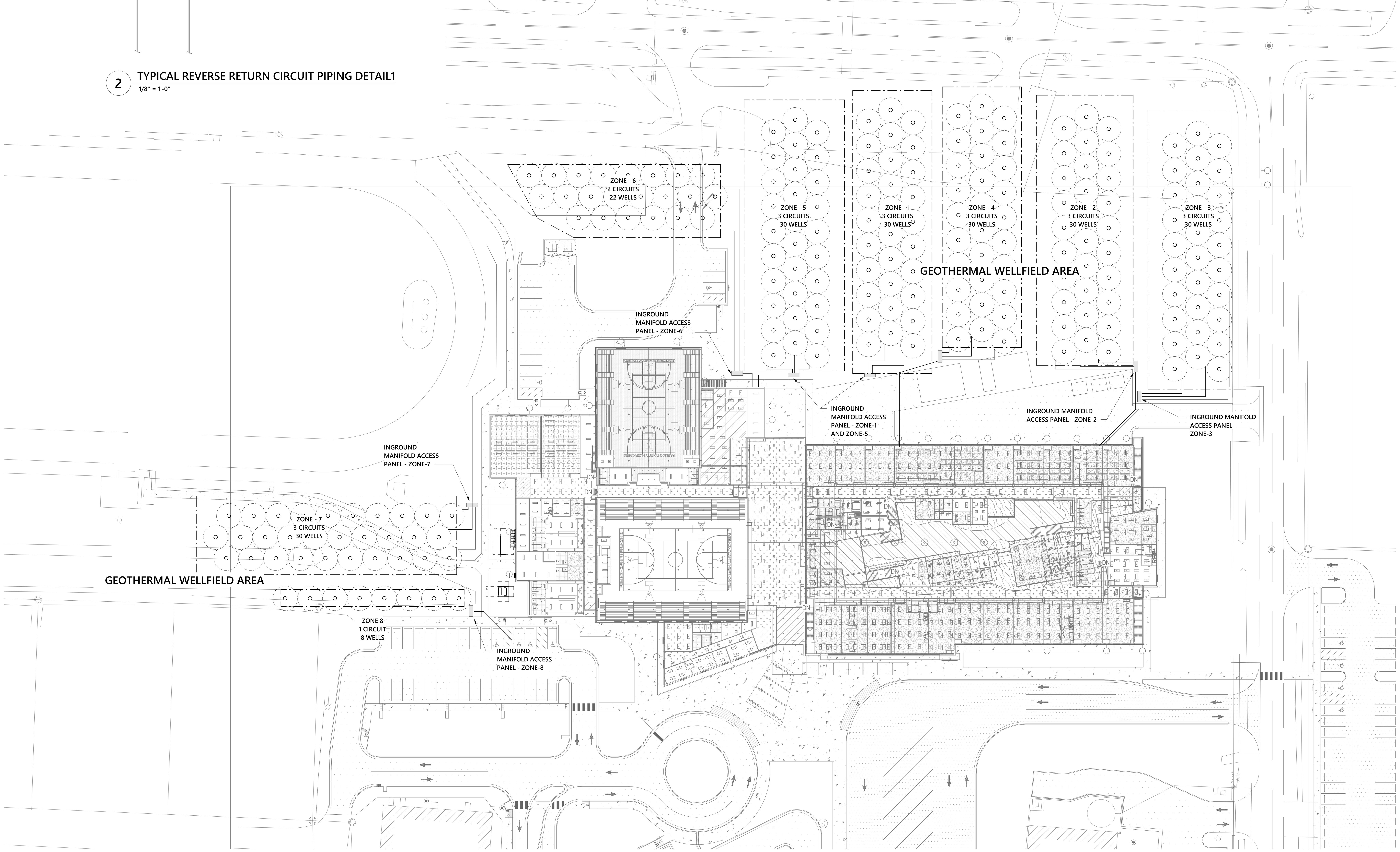


2 TYPICAL REVERSE RETURN CIRCUIT PIPING DETAIL1

1/8" = 1'-0"



1 MECHANICAL SITE PLAN

1" = 40'-0"

GEOTHERMAL WELLFIELD SPECIFICATION

1. DRILLING MUST BE PERFORMED BY A CERTIFIED NORTH CAROLINA WELL DRILLER.
2. LOCATE WELLS A MINIMUM OF 20' APART. COORDINATE EXACT WELLFIELD LAYOUT BASED ON ACTUAL SITE CONDITIONS.
3. COORDINATE EXACT GEOTHERMAL PIPING LOCATIONS AND DEPTHS WITH ALL OTHER UNDERGROUND UTILITY LOCATIONS, SEE CIVIL PLANS.
4. SEE DETAILS 10 AND 11 ON M-503 FOR TRACER WIRE AND WARNING TAPE INSTALLATION REQUIREMENTS.
5. GEOTHERMAL WELLFIELD IS DESIGNED BASED ON THE FOLLOWING:

<u>SITE SPECIFIC PARAMETERS:</u>
SOIL CONDUCTIVITY - 1.12 BTU/HR*FT*F
UNDISTRIBUTED SOIL TEMPERATURE - 66.5 DEG F

<u>UTILIZING THE FOLLOWING VARIABLES:</u>

<u>ZONE-1</u>
PEAK ZONE COOLING LOAD - (557,512) MBH
PEAK ZONE HEATING LOAD - (515,344) MBH
BASIC WELLFIELD GRID - 3 CIRCUITS, 10 WELLS PER CIRCUIT
WELL SEPARATION DISTANCE - 20' MINIMUM
BORE DIAMETER - 5"∅
BORE DEPTH - 300'
U-TUBE DIAMETER - 1" HDPE, SDR-11
GROUT CONDUCTIVITY - 1.2 BTU/HR*FT*°F

<u>ZONE-2</u>
PEAK ZONE COOLING LOAD - (737,787) MBH
PEAK ZONE HEATING LOAD - (713,238) MBH
BASIC WELLFIELD GRID - 3 CIRCUITS, 10 WELLS PER CIRCUIT
WELL SEPARATION DISTANCE - 20' MINIMUM
BORE DIAMETER - 5"∅
BORE DEPTH - 300'
U-TUBE DIAMETER - 1" HDPE, SDR-11
GROUT CONDUCTIVITY - 1.2 BTU/HR*FT*°F

<u>ZONE-3</u>
PEAK ZONE COOLING LOAD - (731,262) MBH
PEAK ZONE HEATING LOAD - (703,431) MBH
BASIC WELLFIELD GRID - 3 CIRCUITS, 10 WELLS PER CIRCUIT
WELL SEPARATION DISTANCE - 20' MINIMUM
BORE DIAMETER - 5"∅
BORE DEPTH - 300'
U-TUBE DIAMETER - 1" HDPE, SDR-11
GROUT CONDUCTIVITY - 1.2 BTU/HR*FT*°F

<u>ZONE-4</u>
PEAK ZONE COOLING LOAD - (638,310) MBH
PEAK ZONE HEATING LOAD - (572,482) MBH
BASIC WELLFIELD GRID - 3 CIRCUITS, 10 WELLS PER CIRCUIT
WELL SEPARATION DISTANCE - 20' MINIMUM
BORE DIAMETER - 5"∅
BORE DEPTH - 300'
U-TUBE DIAMETER - 1" HDPE, SDR-11
GROUT CONDUCTIVITY - 1.2 BTU/HR*FT*°F

<u>ZONE-5</u>
PEAK ZONE COOLING LOAD - (691,750) MBH
PEAK ZONE HEATING LOAD - (840,783) MBH
BASIC WELLFIELD GRID - 3 CIRCUITS, 10 WELLS PER CIRCUIT
WELL SEPARATION DISTANCE - 20' MINIMUM
BORE DIAMETER - 5"∅
BORE DEPTH - 300'
U-TUBE DIAMETER - 1" HDPE, SDR-11
GROUT CONDUCTIVITY - 1.2 BTU/HR*FT*°F

<u>ZONE-6</u>
PEAK ZONE COOLING LOAD - (359,112) MBH
PEAK ZONE HEATING LOAD - (449,197) MBH
BASIC WELLFIELD GRID - 2 CIRCUITS, 11 WELLS PER CIRCUIT
WELL SEPARATION DISTANCE - 20' MINIMUM
BORE DIAMETER - 5"∅
BORE DEPTH - 300'
U-TUBE DIAMETER - 1" HDPE, SDR-11
GROUT CONDUCTIVITY - 1.2 BTU/HR*FT*°F

<u>ZONE-7</u>
PEAK ZONE COOLING LOAD - (588,000) MBH
PEAK ZONE HEATING LOAD - (784,400) MBH
BASIC WELLFIELD GRID - 3 CIRCUITS, 30 WELLS PER CIRCUIT
WELL SEPARATION DISTANCE - 20' MINIMUM
BORE DIAMETER - 5"∅
BORE DEPTH - 300'
U-TUBE DIAMETER - 1" HDPE, SDR-11
GROUT CONDUCTIVITY - 1.2 BTU/HR*FT*°F

<u>ZONE-8</u>
PEAK ZONE COOLING LOAD - (96,034) MBH
PEAK ZONE HEATING LOAD - (88,914) MBH
BASIC WELLFIELD GRID - 1 CIRCUITS, 8 WELLS PER CIRCUIT
WELL SEPARATION DISTANCE - 20' MINIMUM
BORE DIAMETER - 5"∅
BORE DEPTH - 300'
U-TUBE DIAMETER - 1" HDPE, SDR-11
GROUT CONDUCTIVITY - 1.2 BTU/HR*FT*°F

AS A VALUE ENGINEERING OPTION, ALTERNATE WELLFIELD LAYOUTS MAY BE SUMBITTED DURING THE BIDDING PROCESS UTILIZING DIFFERENT COMBINATIONS OF THE VARIABLES, PROVIDED ALL NORTH CAROLINA STATE REGULATIONS ARE MET. CONTRACTOR SHALL SUBMIT FULL CALCULATIONS USING ALTERNATIVE METHODS FOR REVIEW AND APPROVAL BY THE MECHANICAL ENGINEER. ALTERNATE WELLFIELD DESIGNS MUST HAVE SIMILAR STAGING CAPACITY (DESIGN HAS 7 STAGES WITH 14.3% TOTAL LOAD CAPACITY EACH). WELLFIELD SUBSTITUTIONS, LIKE EQUIPMENT SUBSTITUTIONS, REQUIRE A 2-WEEK PRIOR APPROVAL BEFORE BID DAY. SHOULD PUMPING SYSTEM HEAD REQUIREMENTS AND/OR HORSEPOWERS CHANGE, OR ANY OTHER BUILDING SIDE CHANGE RESULT FROM REDESIGN OF THE WELLFIELD, ANY ADDITIONAL COSTS (INCLUDING ELECTRICAL CHANGES AND SITE CHANGES) SHALL BE THE RESPONSIBILITY OF THE MECHANICAL CONTRACTOR.

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ENERGY STAR PARTNER

No.	Date	Description

ISSUE DATE:	06/12/24
PROJECT #:	2205
DRAWN BY:	TAL
CHECKED BY:	JWM

MECHANICAL GEOTHERMAL SITE PLAN

M-301

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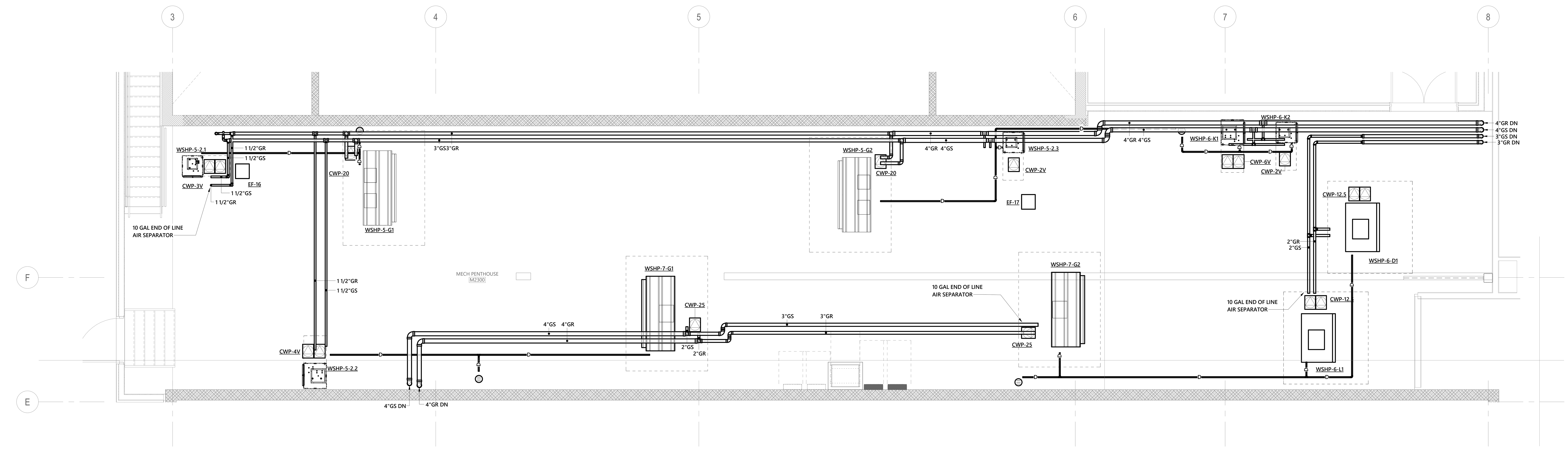
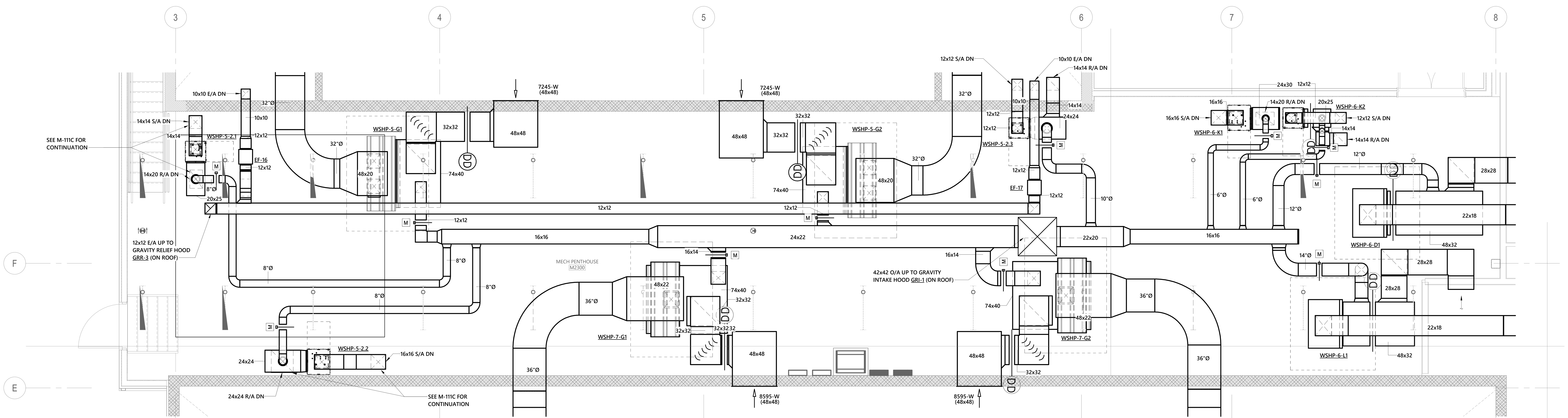


2 MECH PENTHOUSE M2300 ENLARGED MECHANICAL PIPING PLAN

1/4" = 1'-0"



1 MECH PENTHOUSE M2300 ENLARGED MECHANICAL DUCTWORK PLAN

1/4" = 1'-0"

RATED WALL LEGEND

SYMBOL	DESCRIPTION
	1 HR FIRE RATED
	2 HR FIRE RATED

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ENERGY STAR PARTNER

No.	Date	Description

ISSUE DATE: 06/12/24

PROJECT #: 2205
DRAWN BY: TAL
CHECKED BY: JWM

ENLARGED MECHANICAL PLANS - MECH PENTHOUSE M2300

M-401

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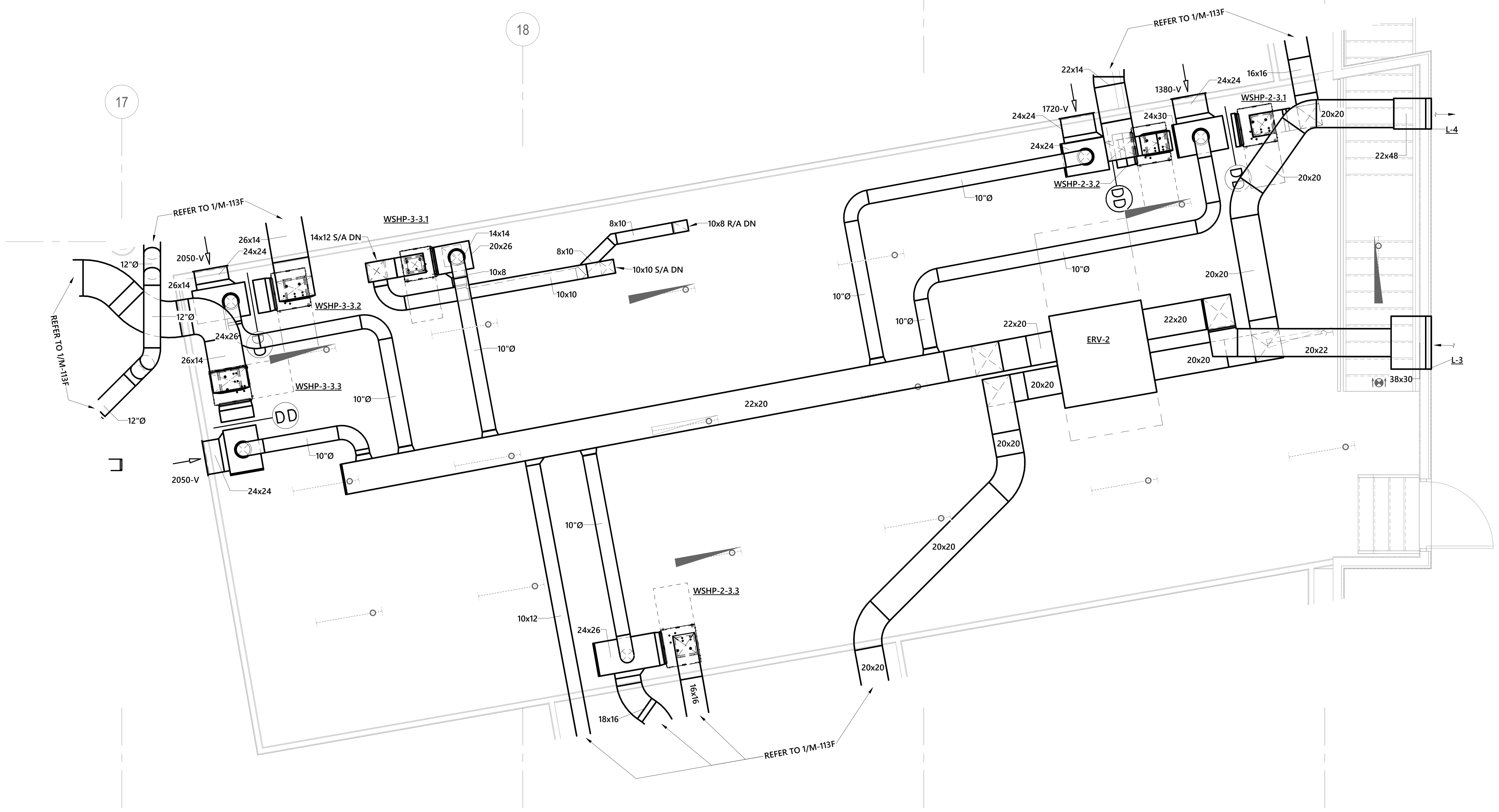
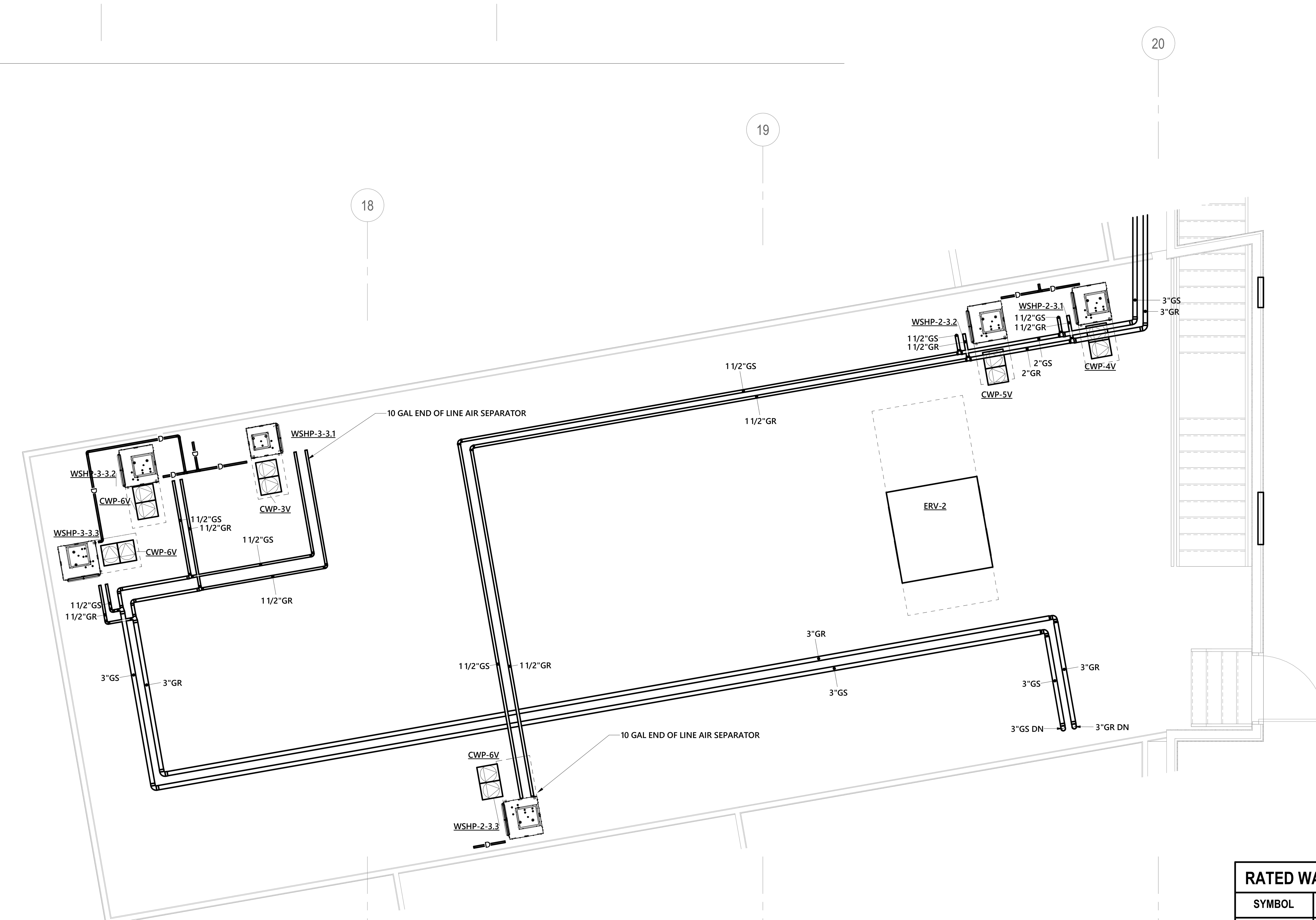


1 MECH LOFT M3000 ENLARGED MECHANICAL DUCTWORK PLAN
1/4" = 1'-0"



2 MECH LOFT M3000 ENLARGED MECHANICAL PIPING PLAN
1/4" = 1'-0"

RATED WALL LEGEND

SYMBOL	DESCRIPTION
	1 HR FIRE RATED
	2 HR FIRE RATED

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ISSUE DATE: 06/12/24
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ENLARGED MECHANICAL PLANS - MECH LOFT M3000

M-402

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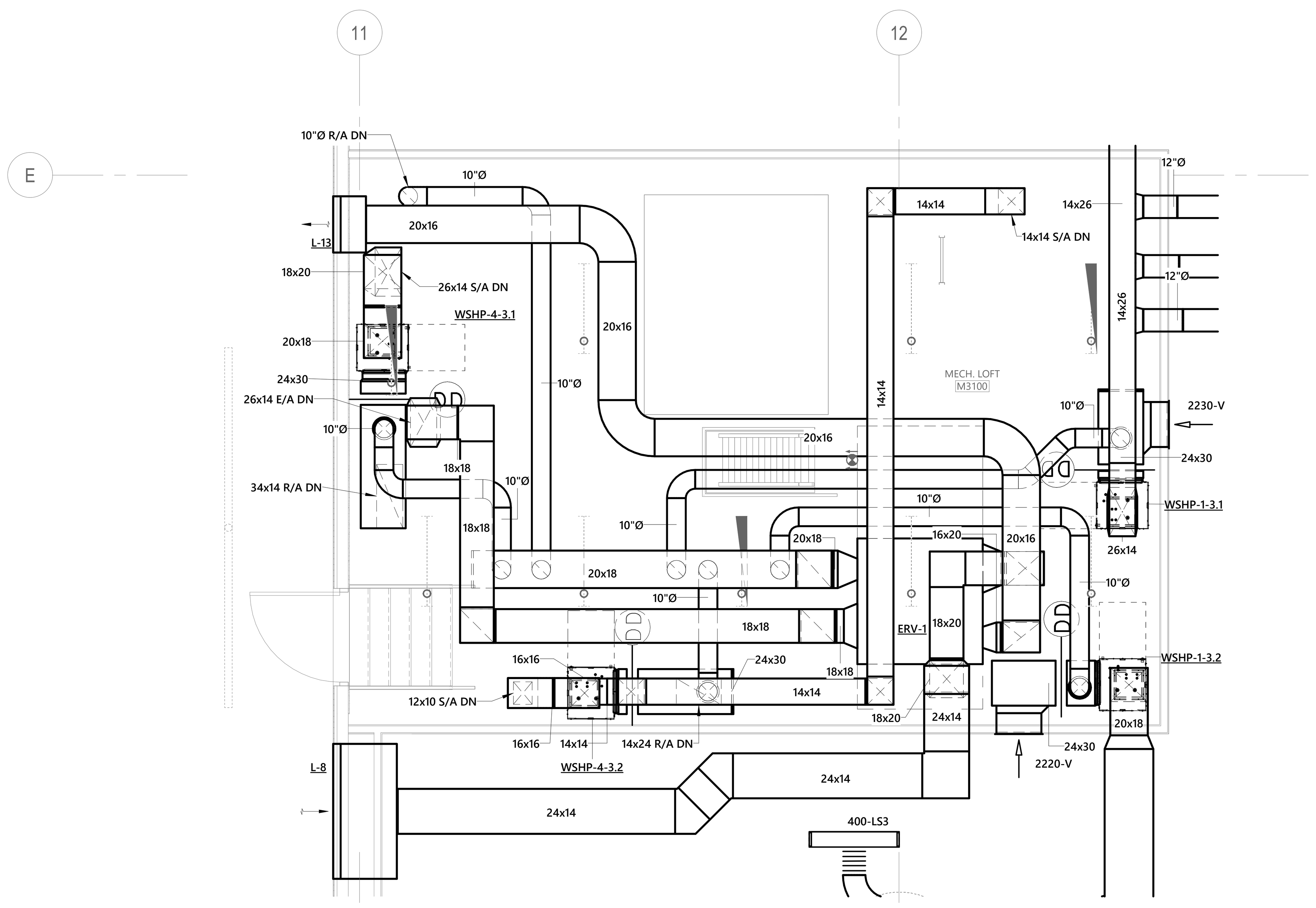
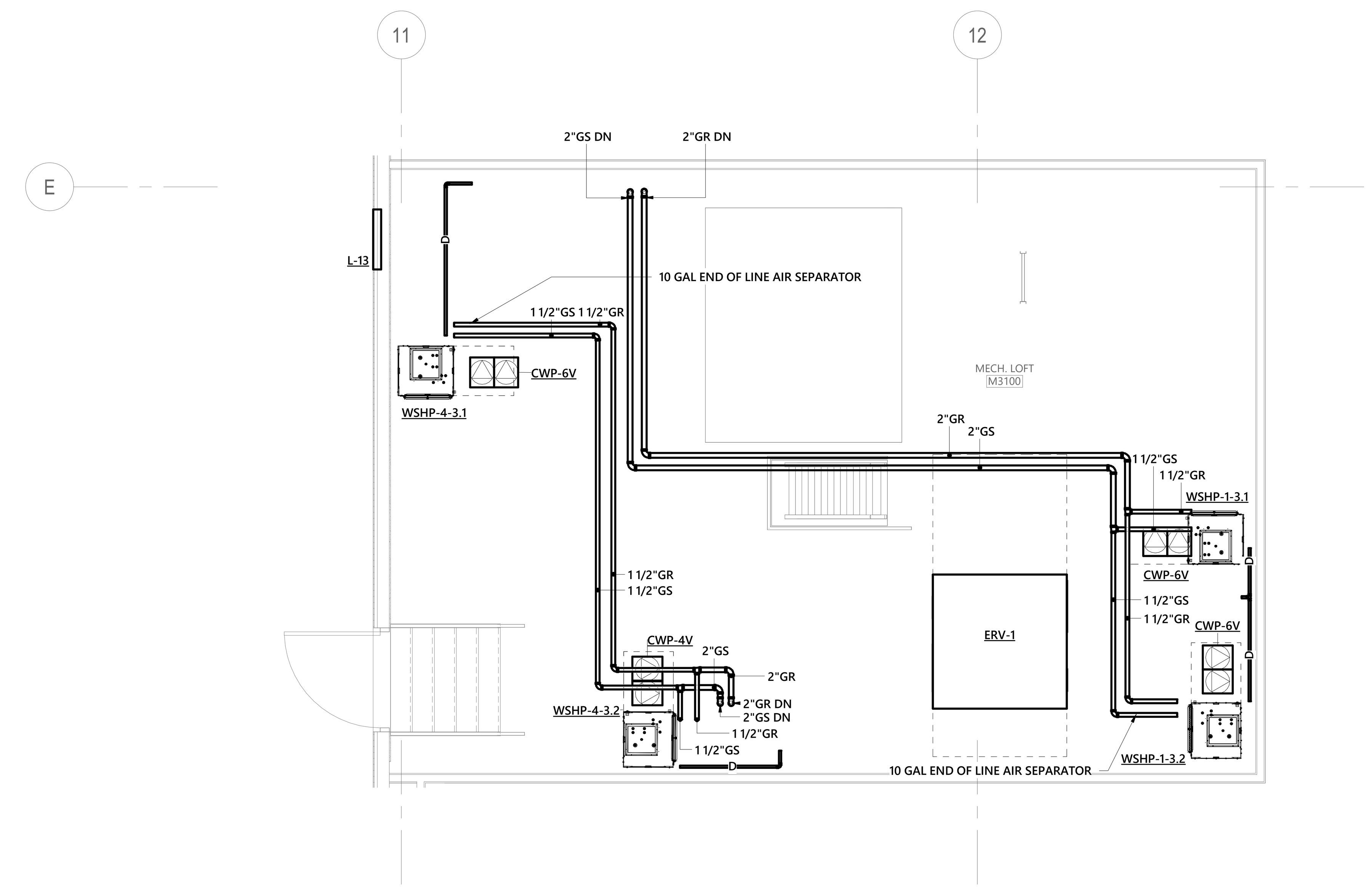


1 MECH LOFT M3100 ENLARGED MECHANICAL DUCTWORK PLAN
1/4" = 1'-0"



2 MECH LOFT M3100 ENLARGED MECHANICAL PIPING PLAN
1/4" = 1'-0"

RATED WALL LEGEND

SYMBOL	DESCRIPTION
	1 HR FIRE RATED
	2 HR FIRE RATED

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ISSUE DATE: 06/12/24
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ENLARGED MECHANICAL PLANS - MECH LOFT M3100

M-403

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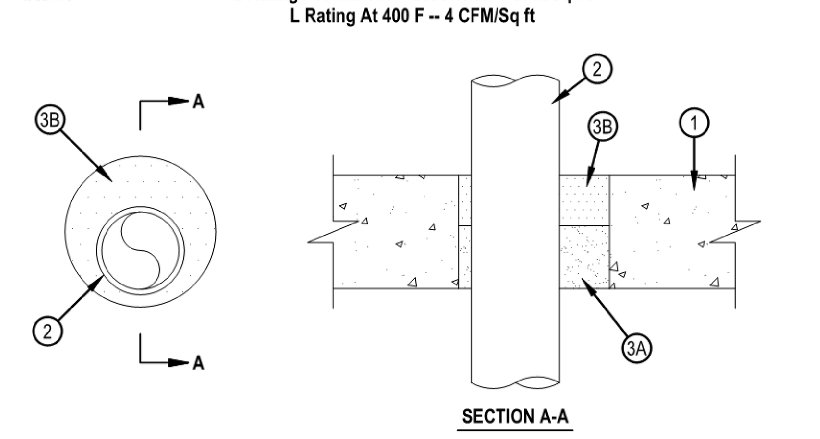
System No. C-AJ-2141

CAJ 2141

Classified by Underwriters Laboratories, Inc. to UL 1479

F Rating — 3 Hr
T Rating — 2 Hr
L Rating At Ambient — Less Than 1 CFM/Sq Ft
L Rating At 400 F — 4 CFM/Sq ft



SECTION A-A

1. Floor or Wall Assembly — Min 4-1/2 in. (114 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m3) concrete. Wall may also be constructed of any UL Classified Concrete Blocks*. Max diam of opening is 6 in. (152 mm).
See Concrete Blocks* (CAZT) category in the Fire Resistance Directory for names of manufacturers.
2. Through Penetrants — One nonmetallic pipe or conduit to be installed either concentrically or eccentrically within the firestop system. The annular space between the pipe or conduit and the periphery of the opening shall be min 1/2 in. (13 mm) to max 2 in. (51 mm). The pipe or conduit to be rigidly supported on both sides of floor or wall. The following types and sizes of pipes or conduits may be used:
   A. Polyvinyl Chloride (PVC) Pipe — Nom 3 in. (76 mm) diam (or smaller) Schedule 40 PVC pipe for use in closed (process or supply) piping systems.
   B. Chlorinated Polyvinyl Chloride (CPVC) Pipe — Nom 3 in. (76 mm) diam (or smaller) SDR 17 CPVC pipe for use in closed (process or supply) piping systems.
3. Firestop System — The firestop system shall consist of the following:
   A. Forming Material* — Min 2-1/2 in. (64 mm) thickness of forming material foamed into opening as a permanent form. Forming material to be recessed from top surface of floor or from both surfaces of wall as required to accommodate the required thickness of fill material.
   HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — CF812 or CF-AS CJP Foam Sealant
   B. Fill, Void or Cavity Material* — Sealant — Min 2 in. (51 mm) thickness of fill material applied with annulus flush with top surface of floor or within both surfaces of wall.
   HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — FS-ONE Sealant or FS-ONE MAX Intumescent Sealant

* Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.

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Hilti Firestop Systems

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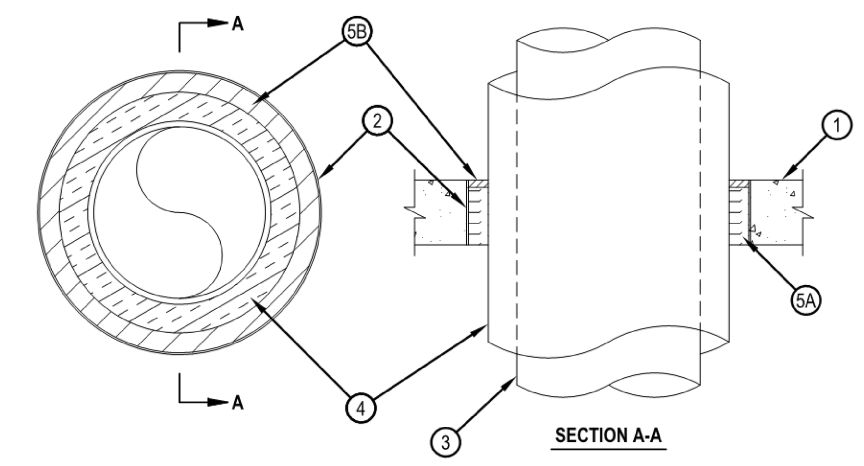
SYSTEM NO. C-AJ-2141

System No. C-AJ-5091

CAJ 5091

Classified by Underwriters Laboratories, Inc. to UL 1479 and CAN/ULC-S115

F Rating — 2 Hr
T Ratings — 0 and 1 Hr (See Items 2 and 4)
L Rating At Ambient — 4 CFM/Sq Ft
L Rating At 400 F — Less Than 1 CFM/Sq Ft



SECTION A-A

1. Floor or Wall Assembly — Min 4-1/2 in. (114 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m³) concrete. Wall may also be constructed of any UL Classified Concrete Blocks*. Max diam of opening is 29 in. (737 mm).
See Concrete Blocks (CAZT) category in the Fire Resistance directory for names of manufacturers.
2. Metallic Sleeve — (Optional) — Nom 30 in. (762 mm) diam (or smaller) Schedule 10 (or heavier) steel pipe sleeve cast or grouted into floor or wall assembly, flush with floor or wall surfaces or extending a max of 3 in. (76 mm) above floor or beyond both surfaces of wall. If the steel sleeve extends beyond the top surface of the floor or both surfaces of the wall, the T Rating of the firestop system is 0 hr.
2A. Sheet Metal Sleeve — (Optional) - Max 6 in. (152 mm) diam, min 26 ga galv steel provided with a 26 ga galv steel square flange spot welded to the sleeve at approximately mid- height, or flush with bottom of sleeve in floors, and sized to be a min of 2 in. (51 mm) larger than the sleeve diam. The sleeve is to be cast in place flush with bottom surface of floor and may extend a max of 1 in. (25 mm) above the top surface of the floor.
2B. Sheet Metal Sleeve — (Optional) - Max 12 in. (305 mm) diam, min 24 ga galv steel provided with a 24 ga galv steel square flange spot welded to the sleeve at approximately mid- height, or flush with bottom of sleeve in floors, and sized to be a min of 2 in. (51 mm) larger than the sleeve diam. The sleeve is to be cast in place flush with bottom surface of floor and may extend a max of 1 in. (25 mm) above the top surface of the floor.
3. Through Penetrants — One metallic pipe or tubing to be installed either concentrically or eccentrically within the firestop system. Pipe or tubing to be rigidly supported on both sides of floor or wall assembly. The following types and sizes of metallic pipes or tubing may be used:
   A. Steel Pipe — Nom 12 in. (305 mm) diam (or smaller) Schedule 10 (or heavier) steel pipe.
   B. Iron Pipe — Nom 12 in. (305 mm) diam (or smaller) cast or ductile iron pipe.
   C. Copper Pipe — Nom 6 in. (152 mm) diam (or smaller) Regular (or heavier) copper pipe.
   D. Copper Tubing — Nom 6 in. (152 mm) diam (or smaller) Type L (or heavier) copper tubing.

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Hilti Firestop Systems

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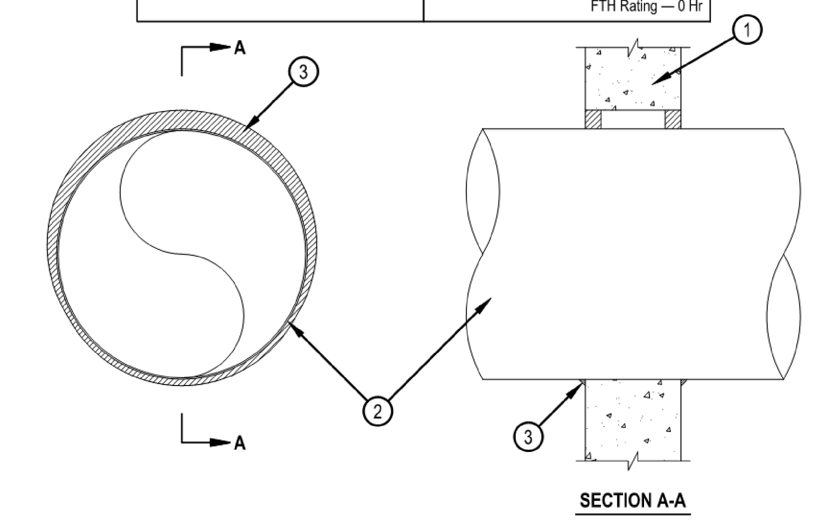
System No. W-J-7022

WJ 7022

Classified by Underwriters Laboratories, Inc. to UL 1479 and CAN/ULC-S115

ANSI/UL1479 (ASTM E814)	CAN/ULC S115
F Ratings — 1 & 2 Hr (See Items 1 and 3)	F Ratings — 1 & 2 Hr (See Items 1 and 3)
T Rating — 0 Hr	FT Rating — 0 Hr
	FH Ratings — 1 & 2 Hr (See Items 1 and 3)
	FTH Rating — 0 Hr



SECTION A-A

1. Wall Assembly — Min 4-3/4 in. and 6 in. (121 and 152 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m3) concrete for 1 and 2 hr ratings , respectively. Wall may also be constructed of any UL Classified Concrete Blocks*. Max diam of opening is 21- 1/2 in (546 mm).
See Concrete Blocks (CAZT) category in the Fire Resistance Directory for names of manufacturers.
2. Through Penetrant — Nom galv steel duct to be installed concentrically or eccentrically within the firestop system. The annular space between duct and periphery of opening shall be min 0 in. (point contact) and max 1-1/2 in. (38 mm). Duct to be rigidly supported on both sides of wall assembly.
   A. Spiral Wound HVAC Duct — Nom 20 in. (508 mm) diam (or smaller) No. 24 MSG (or heavier) galv steel spiral wound duct.
   A. Sheet Metal Duct — Nom 12 in.(305 mm) diam (or smaller) No. 28 MSG (or heavier) galv sheet steel duct.
3. Fill, Void or Cavity Material* — Sealant — Min 5/8 in. and 1-1/4 in. (16 and 32 mm) thickness of fill material applied within annulus, flush with both surfaces of wall assembly for 1 or 2 hr F Ratings, respectively. At the point contact location between duct and periphery of opening, a min 1/2 in. (13 mm) diam bead of sealant shall be applied at the periphery/duct interface on both surfaces of wall assembly.
HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — CP 601S Elastomeric Firestop Sealant, CFS-S SIL GG Sealant, FS-ONE Sealant or CP606 Flexible Firestop Sealant

*Bearing the UL Classification Mark

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Hilti Firestop Systems

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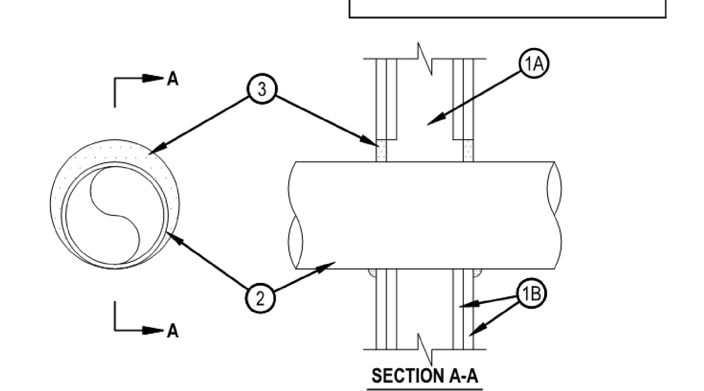
SYSTEM NO. W-J-7022

System No. W-L-1054

WL 1054

Classified by Underwriters Laboratories, Inc. to UL 1479 and CAN/ULC-S115

ANSI/UL 1479 (ASTM E814)	CAN/ULC S115
F Ratings —1 and 2 Hr (See Items 1 and 3)	F Ratings — 1 and 2 Hr (See Items 1 and 3)
T Rating — 0 Hr	FT Rating — 0 Hr
L Rating (Without Movement) at Ambient — Less Than 1 CFM/sq ft	FH Ratings —1 and 2 Hr (See Items 1 and 3)
L Rating (Without Movement) at 400°F — Less Than 1 CFM/sq ft	FTH Rating — 0 Hr
M Rating (Movement) — See Table 1	FTH Rating — 0 Hr
	L Rating at Ambient — Less Than 5.1 L/s/m2
	L Rating at 204°C — Less Than 5.1 L/s/m2



SECTION A-A

1. Wall Assembly — The 1 or 2 hr fire-rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300 or U400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:
   A. Studs — Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. (51 by 102 mm) lumber spaced 16 in. (406 mm) OC. Steel studs to be min 2-1/2 in. (64 mm) wide and spaced max 24 in. (610 mm) OC. For M Rating, steel studs to be min 3-5/8 in. (92 mm) wide. When steel studs are used and the diam of opening exceeds the width of stud cavity, the opening shall be framed on all sides using lengths of steel stud installed between the vertical studs and screw-attached to the steel studs at each end. The framed opening in the wall shall be 4 to 6 in. (102 to 152 mm) wider and 4 to 6 in. (102 to 152 mm) higher than the diam of the penetrating item such that, when the penetrating item is installed in the opening, a 2 to 3 in. (51 to 76 mm) clearance is present between the penetrating item and the framing on all four sides.
   B. Gypsum Board* — 5/8 in. (16 mm) thick, 4 ft (122 cm) wide with square or tapered edges. The gypsum board type, thickness, number of layers, fastener type and sheet orientation shall be as specified in the individual U300 or U400 Series Design in the UL Fire Resistance Directory. Max diam of opening is 32-1/4 in. (819 mm) for steel stud walls. Max diam of opening is 14-1/2 in. (368 mm) for wood stud walls.
   The F and FH Ratings of the firestop system are equal to the fire rating of the wall assembly. The M Rating is applicable only to 1 hr rated walls.

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Hilti Firestop Systems

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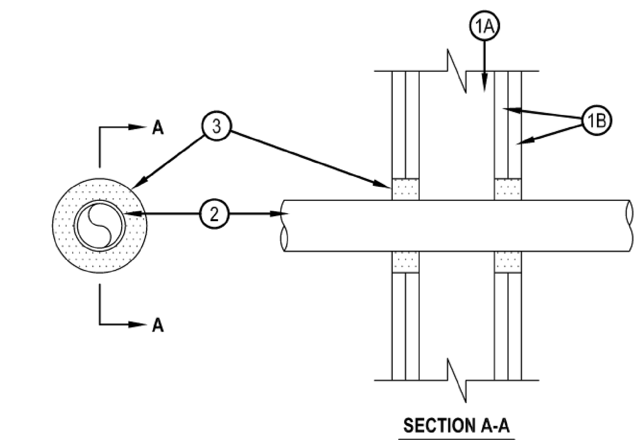
System No. W-L-2098

WL 2098

F Ratings — 1 and 2 Hr (See Item 1)
T Ratings — 1 and 2 Hr (See Item 1)
L Rating At Ambient — Less Than 1 CFM/Sq Ft
L Rating At 400 F — 4 CFM/Sq Ft



SECTION A-A

1. Wall Assembly — The fire-rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300 or U400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:
   A. Studs — Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. lumber spaced 16 in. OC. Steel studs to be min 2-1/2 in. wide and spaced max 24 in. OC.
   B. Gypsum Board* — 5/8 in. thick, 4 ft wide with square or tappered edges. The gypsum wallboard type, thickness, number of layers, fastener type and sheet orientation shall be as specified in the individual Wall and Partition Design. Max diam of opening is 4-3/8 in.
   The hourly F and T Ratings of the firestop system are equal to the hourly fire rating of the wall assembly in which it is installed.
2. Through Penetrants — One nonmetallic pipe installed within the firestop system. Pipe to be rigidly supported on both sides of floor or wall assembly. The space between pipe and periphery of opening shall be min 3/4 in. to max 1-1/4 in. Pipe to be rigidly supported on both sides of the floor or wall assembly. The following types and sizes of nonmetallic pipes may be used:
   A. Polyvinyl Chloride (PVC) Pipe — Nom 2 in. diam (or smaller) Schedule 40 PVC pipe for use in closed (process or supply) piping system.
   B. Chlorinated Polyvinyl Chloride (CPVC) Pipe — Nom 2 in. diam (or smaller) SDR17 CPVC pipe for use in closed (process or supply) piping systems.
   3. Fill, Void or Cavity Materials* — Sealant — Installed to completely fill the annular space between the pipes and gypsum wallboard on both sides of wall.
   HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — FS-One Sealant

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Hilti Firestop Systems

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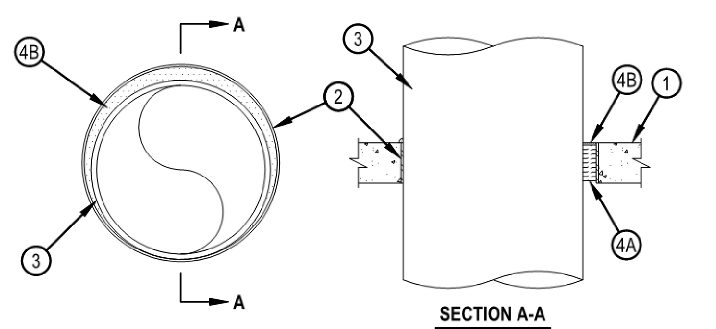
SYSTEM NO. WS-L-2098

System No. C-AJ-1226

CAJ 1226

F Rating — 3 Hr
T Rating — 0 Hr
L Rating At Ambient — Less Than 1 CFM/Sq Ft
L Rating At 400 F — 4 CFM/Sq Ft



SECTION A-A

1. Floor or Wall Assembly — Min 4-1/2 in. thick reinforced lightweight or normal weight (100-150 pcf) concrete. Wall may also be constructed of any UL Classified Concrete Blocks*. Max diam of opening is 32 in.
2. Metallic Sleeve — (Optional) Nom 32 in. diam (or smaller) Schedule 40 (or heavier) steel sleeve cast or grouted into floor or wall assembly, flush with floor or wall surfaces or extending a max of 3 in. above floor or beyond both surfaces of wall.
2A. Sheet Metal Sleeve — (Optional) Max 6 in. diam, min 26 ga galv steel provided with a 26 ga galv steel square flange spot welded to the sleeve at approx mid-height, or flush with bottom of sleeve in floors, and sized to be a min of 2 in. larger than the sleeve diam. The sleeve is to be cast in place and may extend a max of 4 in. below the bottom of the deck and a max of 1 in. above the top surface of the concrete floor.
2B. Sheet Metal Sleeve — (Optional) - Max 12 in. diam, min 24 ga galv steel provided with a 24 ga galv steel square flange spot welded to the sleeve at approx mid-height, or flush with bottom of sleeve in floors, and sized to be a min of 2 in. larger than the sleeve diam. The sleeve is to be cast in place and may extend a max of 4 in. below the bottom of the deck and a max of 1 in. above the top surface of the concrete floor.
3. Through-Penetrant — One metallic pipe, tube or conduit to be installed either concentrically or eccentrically within the firestop system. The annular space between penetrant and periphery of opening shall be min 0 in. (point contact) to max 1-7/8 in. Penetrant may be installed with continuous point contact. Penetrant to be rigidly supported on both sides of floor or wall assembly. The following types and sizes of metallic penetrants may be used:
   A. Steel Pipe — Nom 30 in. diam (or smaller) Schedule 10 (or heavier) steel pipe.
   B. Iron Pipe — Nom 30 in. diam (or smaller) cast or ductile iron pipe.
   C. Copper Pipe — Nom 6 in. diam (or smaller) Regular (or heavier) copper pipe.
   D. Copper Tubing — Nom 6 in. diam (or smaller) Type L (or heavier) copper tubing.
   E. Conduit — Nom 6 in. diam (or smaller) steel conduit.
   F. Conduit — Nom 4 in. diam (or smaller) steel electrical metallic tubing (EMT).
4. Firestop System — The firestop system shall consist of the following:
   A. Packing Material — Min 4 in. thickness of min 4 pcf mineral wool batt insulation firmly packed into opening as a permanent form. Packing material to be recessed from top surface of floor or sleeve or from both surfaces of wall or sleeve as required to accommodate the required thickness of fill material.
   B. Fill, Void or Cavity Material* — Sealant — Min 1/4 in. thickness of fill material applied within the annulus, flush with top surface of floor or sleeve or with both surfaces of wall or sleeve. At the point or continuous contact locations between penetrant and concrete or sleeve, a min 1/4 in. diam bead of fill material shall be applied at the concrete or sleeve/ pipe penetrant interface on the top surface of floor and on both surfaces of wall.
   HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — FS-One Sealant

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Hilti Firestop Systems

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SYSTEM NO. C-AJ-1226

System No. C-AJ-5091

CAJ 5091

Classified by Underwriters Laboratories, Inc. to UL 1479 and CAN/ULC-S115

F Rating — 2 Hr
T Ratings — 0 and 1 Hr (See Items 2 and 4)
L Rating At Ambient — 4 CFM/Sq Ft
L Rating At 400 F — Less Than 1 CFM/Sq Ft

4. Pipe Covering — Min 1/2 in. (13 mm) to max 2 in. (51 mm) thick hollow cylindrical heavy density (min 3.5 pcf or 56 kg/m³) glass fiber units jacketed on the outside with an all-service jacket. Longitudinal joints sealed with metal fasteners or factory-applied, self-sealing lap tape. Transverse joints secured with metal fasteners or with butt tape supplied with the product. The annular space between the insulated pipe and the edge of the periphery of the opening shall be min 1/2 in. (13 mm) to max 12 in. (305 mm). When thickness of pipe covering is less than 2 in. (51 mm), the T Rating for the firestop system is 0 hr.
   See Pipe Equipment Covering — Materials — (BRGU) category in the Building Materials Directory for names of manufacturers. Any pipe covering material meeting the above specifications and bearing the UL Classification Marking with a Flame Spread Index of 25 or less and a Smoke Developed Index of 50 or less may be used.
4A. Pipe Covering — (Not Shown) — As an alternate to Item 4, max 2 in. (51 mm) thick cylindrical calcium silicate (min 14 pcf or 224 kg/m³) units sized to the outside diam of the pipe or tube may be used. Pipe insulation secured with stainless steel bands or min 18 AWG stainless steel wire spaced max 12 in. (305 mm) OC. The annular space shall be min 1/2 in. (13 mm) to max 12 in. (305 mm).
5. Firestop System — The firestop system shall consist of the following:
   A. Packing Material — Min 4 in. (102 mm) thickness of min 4 pcf (64 kg/m³) mineral wool batt insulation firmly packed into opening as a permanent form. Packing material to be recessed from top surface of floor or from both surfaces of wall as required to accommodate the required thickness of fill material.
   B. Fill, Void or Cavity Material* — Sealant — Min 1/2 in. (13 mm) thickness of fill material applied within the annulus, flush with top surface of floor or with both surfaces of wall.
   HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — FS-One Sealant

*Bearing the UL Classification Mark

Hilti Firestop Systems

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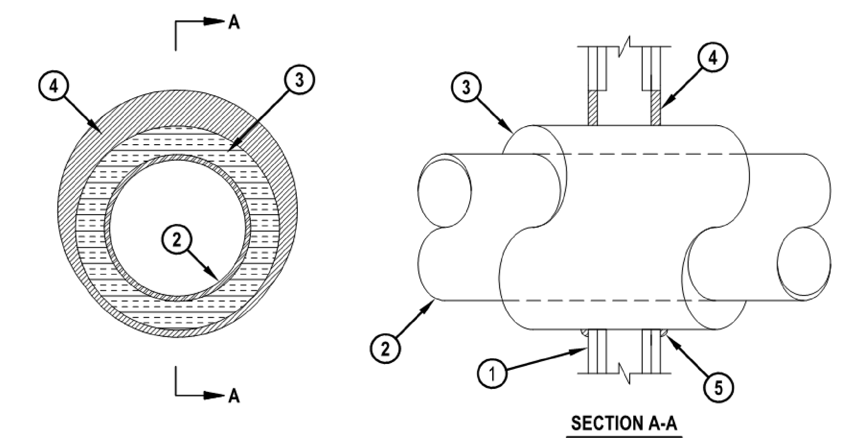
SYSTEM NO. C-AJ-5091

System No. W-L-5029

WL 5029

Classified by Underwriters Laboratories, Inc. to UL 1479 and CAN/ULC-S115

ANSI/UL1479 (ASTM E814)	CAN/ULC S115
F Ratings — 1, 2 and 3 Hr (See Items 1, 3 and 4)	F Ratings — 1, 2 and 3 Hr (See Items 1, 3 and 4)
T Ratings — 0, 1/2, 1 and 1-1/4 Hr (See Item 3)	FT Ratings — 0, 1/2, 1 and 1-1/4 Hr (See Item 3)
L Rating At Ambient — 4 CFM/Sq Ft	FH Ratings — 1, 2 and 3 Hr (See Items 1, 2 and 4)
L Rating At 400 F — Less Than 1 CFM/Sq Ft	FTH Ratings — 0, 1/2, 1 and 1-1/4 Hr (See Item 3)
	L Rating At Ambient — 4 CFM/Sq Ft
	L Rating At 400 F — Less Than 1 CFM/Sq Ft



SECTION A-A

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Hilti Firestop Systems

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System No. W-L-1054

WL 1054

2. Through-Penetrants — One metallic pipe, conduit or tubing to be installed either concentrically or eccentrically within the firestop system. The annular space shall be min 0 in. to max 2-1/4 in. (57 mm). Pipe may be installed with continuous point contact. Pipe, conduit or tubing to be rigidly supported on both sides of wall assembly. The following types and sizes of metallic pipes, conduits or tubing may be used:
   A. Steel Pipe — Nom 30 in. (762 mm) diam (or smaller) Schedule 10 (or heavier) steel pipe.
   B. Iron Pipe — Nom 30 in. (762 mm) diam (or smaller) cast or ductile iron pipe.
   C. Conduit — Nom 4 in. (102 mm) diam (or smaller) steel electrical metallic tubing or 6 in. (152 mm) . diam steel conduit.
   D. Copper Tubing — Nom 6 in. (152 mm) diam (or smaller) Type L (or heavier) copper tubing.
   E. Copper Pipe — Nom 6 in. (152 mm) diam (or smaller) regular (or heavier) copper pipe.
3. Fill, Void or Cavity Material* — Sealant — Min 5/8 in. (16 mm) thickness of fill material applied within the annulus, flush with both surfaces of wall. At the point or continuous contact locations between pipe and wall, a min 1/2 in. (13 mm) diam bead of fill material shall be applied at the pipe wall interface on both surfaces of wall.
HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — FS-ONE MAX Intumescent Sealant

Movement Direction	Penetrant Item	Nominal Penetrant Diameter	Annular Space	Movement	Sealant Depth	F-Rating	L Rating with Movement
Y	2A, 2C*	2 in.	Max 2-1/4 in.	5%	5/8 in.	1 hr	N/A
Z	2A, 2C*	2 in.	2-1/4 in.	0.25 in.	5/8 in.	1 hr	N/A

* Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.

Hilti Firestop Systems

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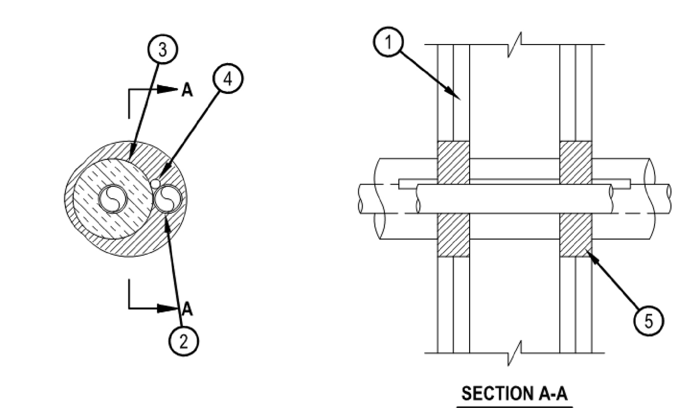
SYSTEM NO. W-L-1054

System No. W-L-8047

WL 8047

F Rating – 2 Hr
T Rating – 1/4 Hr



SECTION A-A

1. Wall Assembly -- The 2 hr fire-rated gypsum board/stud wall assembly shall be constructed of the materials and in the manner described in the individual U300 or U400 Series Wall or Partition Design in the UL Fire Resistance Directory and shall include the following construction features:
   A. Studs -- Wall framing shall consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. lumber spaced max 16 in. OC. Steel studs to be min 3-1/2 in. wide and spaced max 24 in. OC.
   B. Gypsum Board* -- The gypsum board type, thickness number of layers, fastener type and sheet orientation shall be specified in the individual Wall and Partition Design in the UL Fire Resistance Directory. Max diam of opening is 4-1/2 in.
2. Through Penetrants -- One or more pipe or tubing to be installed concentrically or eccentrically within the opening. The space between any penetrant and the periphery of the opening shall be min 0 in. (point contact) to max 1-1/4 in. Pipes or tubing to be rigidly supported on both sides of wall assembly. The following types and sizes of metallic pipes or tubing may be used:
   A. Copper Tube -- Nom 1 in. diam (or smaller) Type L (or heavier) copper tube.
   B. Copper Pipe -- Nom 1 in. diam (or smaller) Regular (or heavier) copper pipe.
3. Tube Insulation - Plastics+ -- Nom 3/4 in. thick acrylonitrile butadiene/polyvinyl chloride (AB/PVC) flexible foam furnished in the form of tubing. Tube insulation to be installed on one or more of the metallic pipes or tubes.
   See Plastics+ (QMFZ2) category in the Plastics Recognized Component Directory for names of manufacturers. Any Recognized Component tube insulation material meeting the above specifications and having a UL 94 Flammability Classification of 94-5VA may be used.
4. Cables -- Max of one 4 pair No. 18 AWG (or smaller) cable with PVC insulation and jacket materials.
5. Fill, Void or Cavity Material - Sealant* -- Min 1-1/4 in. thickness of fill material applied within annulus between penetrants and gypsum board, flush with both surfaces of wall. At point contact, a 1/4 in. bead of fill material shall be applied at the penetrant/gypsum board interface on both sides of wall.
   HILTI CONSTRUCTION CHEMCIALS, DIV OF HILTI INC -- FS-ONE Sealant

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Hilti Firestop Systems

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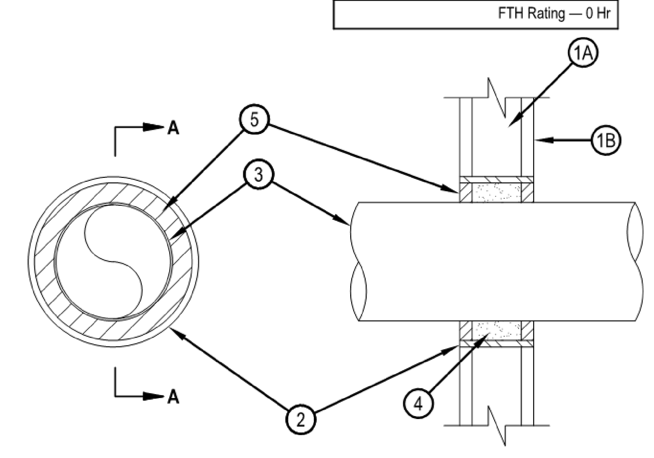
SYSTEM NO. W-L-8047

System No. W-L-7017

WL 7017

Classified by Underwriters Laboratories, Inc. to UL 1479 and CAN/ULC-S115

ANSI/UL1479 (ASTM E814)	CAN/ULC S115
F Rating — 1 Hr	F Rating — 1 Hr
T Rating — 0 Hr	FT Rating — 0 Hr
	FH Rating — 1 Hr
	FTH Rating — 0 Hr



SECTION A-A

1. Wall Assembly — The fire-rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner described in the individual U300, U400, V400 or W400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:
   A. Studs — Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. (51 by 102 mm) lumber spaced 16 in. (406 mm) OC. Steel studs to be min 2-1/2 in. (64 mm) wide and spaced max 24 in. (610 mm) OC.
   B. Gypsum Board* — One layer of nom 5/8 in. (16 mm) thick gypsum board, as specified in the individual Wall and Partition Design. Max diam of opening is 8-5/8 in. (219 mm).
2. Metallic Sleeve — Nom 8 in. (203 mm) diam (or smaller) Schedule 40 (or heavier) steel sleeve cast into wall assembly with joint compound and installed flush with wall surfaces.
3. Air Duct — Nom 6 in. (152 mm) diam (or smaller) prefabricated No. 28 MSG galv sheet metal duct. A min 1/2 in. (13 mm) to max 1-1/2 in. (38 mm) annular space is required within the firestop system. Duct to be rigidly supported on both sides of wall assembly.
4. Forming Material* — Foamed plastic forming material foamed into opening as a permanent form. Forming material to be recessed from both surfaces of wall as required to accommodate the required thickness of fill material.
   HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — CF812 or CF-AS CJP Foam Sealant
5. Fill, Void or Cavity Material* — Min 5/8 in. (16 mm) thickness of fill material applied within annulus, flush with both surfaces of wall.
   HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — FS-ONE Sealant

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Hilti Firestop Systems

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SYSTEM NO. W-L-7017

System No. W-L-5029

WL 5029

1. Wall Assembly — The 1, 2 or 3 hr fire-rated gypsum board/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300, U400, V400 or W400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:
   A. Studs — Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. (51 by 102 mm) lumber spaced 16 in. (406 mm) OC. Steel studs to be min 2-1/2 in. (64 mm) wide for 1 and 2 hr F and FH rating and 3-1/2 in. (89 mm) wide for 3 hr F and FH rating and spaced max 24 in. (610 mm) OC.
   B. Gypsum Board* — Min 5/8 in. (16 mm) thick with square or tapered edges. The gypsum board type, thickness, number of layers, fastener type and sheet orientation shall be as specified in the individual Wall and Partition Design. Max diam of opening is 18-5/8 in. (473 mm).
   The hourly F and FH Ratings of the firestop system are equal to the hourly fire rating of the wall assembly in which it is installed.
2. Through Penetrants — One metallic pipe or tubing to be installed within the firestop system. Pipe or tubing to be rigidly supported on both sides of wall assembly. The following types and sizes of metallic pipes or tubing may be used:
   A. Steel Pipe — Nom 12 in. (305 mm) diam (or smaller) Schedule 10 (or heavier) steel pipe.
   B. Iron Pipe — Nom 12 in. (305 mm) diam (or smaller) cast or ductile iron pipe.
   C. Copper Tubing — Nom 6 in. (152 mm) diam (or smaller) Type L (or heavier) copper tubing. When the hourly F or FH Rating of the firestop system is 3 hr, the nom diam of copper tube shall not exceed 4 in. (102 mm).
   D. Copper Pipe — Nom 6 in. (152 mm) diam (or smaller) Regular (or heavier) copper pipe. When the hourly F or FH Rating of the firestop system is 3 hr, the nom diam of copper pipe shall not exceed 4 in. (102 mm).
3. Pipe Covering* — Nom 1, 1-1/2 or 2 in. (25, 38 or 51 mm) thick hollow cylindrical heavy density (min 3.5 pcf or 56 kg/m3) glass fiber units jacketed on the outside with an all service jacket. Longitudinal joints sealed with metal fasteners or factory-applied self-sealing lap tape. Transverse joints secured with metal fasteners or with butt tape supplied with the product. For 1 and 2 hr F and FH Ratings, the annular space between insulated penetrant and periphery of opening shall be min 0 in. (point contact) to max 1-7/8 in. (48 mm). For 3 hr F and FH Ratings, the annular space shall be min 0 in. (point contact) to max 1-1/4 in. (32 mm).
   See Pipe and Equipment Covering — Materials (BRGU) category in the Building Material Directory for the names of manufacturers. Any pipe covering material meeting the above specifications and bearing the UL Classification Marking with a Flame Spread Index of 25 or less and a Smoke Developed Index of 50 or less may be used.
   The hourly T, FT, FTH Ratings of the firestop system are 1/2 hr for 1 hr rated walls and 1 hr for 2 hr rated walls. For 3 hr rated walls, the hourly T, FT and FTH Ratings when steel and iron pipes are used are 1 hr. For 3 hr rated walls, the hourly T, FT and FTH Ratings when copper penetrants are used are 1-1/4 hr for 2 in. (51 mm) thick pipe covering and 0 hr for pipe covering thickness less than 2 in. (51 mm).
3A. Pipe Covering* — (Not Shown) — As an alternate to Item 3, max 2 in. (51 mm) thick cylindrical calcium silicate (min 14 pcf) units sized to the outside diam of the pipe or tube may be used. Pipe insulation secured with stainless steel bands or min 18 AWG stainless steel wire spaced max 12 in. (305 mm) OC. When the alternate pipe covering is used, the T and FT Rating shall be as specified in item 3 above.
   See Pipe and Equipment Covering — Materials (BRGU) category in the Building Materials Directory for names of manufacturers. Any pipe covering material meeting the above specifications and bearing the UL Classification Marking with a Flame Spread Index of 25 or less and a Smoke Developed Index of 50 or less may be used.
4. Fill, Void or Cavity Material* — Sealant — For 1 and 2 hr F and FH Rating, min 5/8 in. (16 mm) thickness of fill material applied within the annulus, flush with both surfaces of wall. For 3 hr F and FH Rating, min 1 in. (25 mm) thickness of fill material applied within the annulus, flush with both surfaces of wall. At the point contact location between pipe covering and gypsum board, a min 1/2 in. (13 mm) diam bead of fill material shall be applied at the pipe covering/gypsum board interface on both surfaces of wall.
   HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — FS-One Sealant

*Bearing the UL Classification Mark

Hilti Firestop Systems

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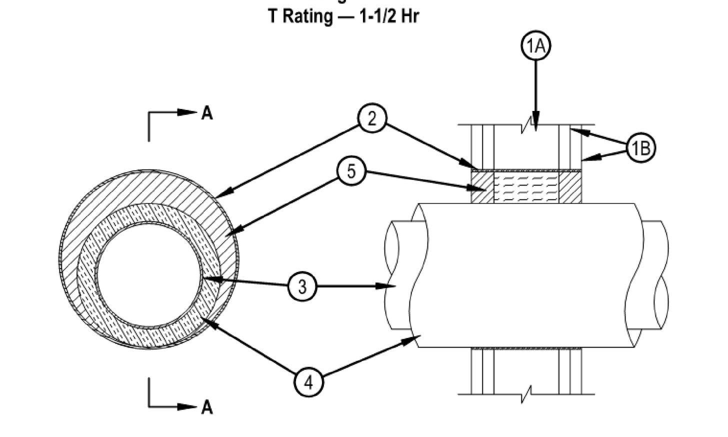
Page: 2 of 2

SYSTEM NO. W-L-5029

System No. W-L-7018

F Rating — 2 Hr
T Rating — 1-1/2 Hr



SECTION A-A

1. Wall Assembly — The 2 hr fire-rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300 or U400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:
   A. Studs — Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. lumber spaced 16 in. OC. Steel studs to be min 2-1/2 in. wide and spaced max 24 in. OC.
   B. Gypsum Board* — Two layers of nom 5/8 in. thick gypsum wallboard as specified in the individual Wall and Partition Design No. Max diam of opening is 9 in.
2. Metallic Sleeve — Cylindrical sleeve fabricated from min 0.016 in. thick (No. 28 gauge) galv steel sheet steel and having a min 2 in. lap along the longitudinal seam. Length of sleeve to be 1/8 in. less than thickness of wall. Sleeve to be installed by coiling the sheet metal to a diam smaller than the through opening, inserting the coil through the openings and releasing the coil to let it uncoil against the circular cutouts in the gypsum wallboard layers.
3. Steel Duct — Nom 6 in. diam (or smaller) No. 28 gauge (or heavier) galv steel duct to be installed concentrically within the firestop system. Duct to be rigidly supported on both sides of the wall assembly.
4. Pipe Covering* — Nom 1 in. thick hollow cylindrical heavy density (3.5 pcf) glass fiber units jacketed on the outside with an all service jacket. Longitudinal joints sealed with metal fasteners or factory-applied self-sealing lap tape. Tranverse joints secured with metal fasteners or with butt tape supplied with the product. The annular space between the insulated pipe and the steel sleeve shall be min 0 in. (point contact) to max 1 in.
   See Pipe Equipment Covering — Materials — (BRGU) Category in the Building Materials Directory for names of manufacturers. Any pipe covering material meeting the above specifications and bearing the UL Classification Marking with a Flame Spread Index of 25 or less and a Smoke Developed Index of 50 or less may be used.
5. Fill, Void or Cavity Material* — Sealant — Min 1-1/4 in. depth of sealant applied within the annulus, flush with each surface of the wall assembly. At the point contact location between insulated pipe and wall, a min 1/2 in. diam bead of sealant shall be applied on both surfaces of wall, lapping 1/4 in. beyond the periphery of the opening.
   HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — FS-ONE Sealant

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Hilti Firestop Systems

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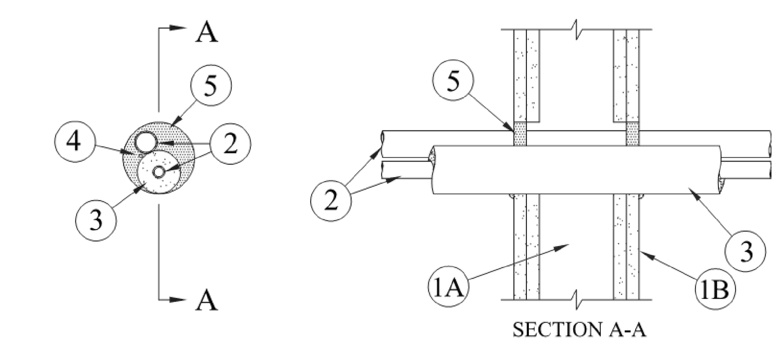
SYSTEM NO. W-L-7018

System No. W-L-8039

May 19, 2005
F Ratings – 1 & 2 Hr (See Item 1)
T Ratings – 0 & 1/2 Hr (See Item 1)



SECTION A-A

1. **Wall Assembly** – The 1 or 2 hr fire rated gypsum board/stud wall assembly shall be constructed of the materials and in the manner described in the individual U300, U400 or V400 Series Wall or Partition Design in the UL Fire Resistance Directory and shall include the following construction features:
   A. **Studs** – Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 in. by 4 in. (51 mm by 102 mm) lumber spaced 16 in. (406 mm) OC. Steel studs to be min 3-1/2 in. (89 mm) wide spaced max 24 in. (610 mm) OC.
   B. **Gypsum Board*** – The gypsum board type, thickness, number of layers, fastener type and sheet orientation shall be as specified in the individual U300 or U400 Series Design in the UL Fire Resistance Directory. Max diam of opening is 4 in. (102 mm)
   The hourly F Rating of the firestop system is equal to the hourly fire rating of the wall assembly in which it is installed. The hourly T Rating is 0 and 1/2 Hr for 1 and 2 Hr rated assemblies, respectively.
2. **Through Penetrants** – A max of two pipes or tubes and one cable installed eccentrically or concentrically within the opening. Annular space between penetrants and periphery of opening to be min 0 in. (point contact) to max 1-1/2 in. (0 mm to max 38 mm). Separation between penetrants to be min 0 in. (point contact) to max 1-1/2 in. (0 mm to max 38 mm). Penetrants to be rigidly supported on both sides of the wall. The following types and sizes of penetrants may be used:
   A. **Copper Tubing** – Nom 1 in. (25 mm) diam (or smaller) Type L (or heavier) copper tubing.
   B. **Copper Pipe** – Nom 1 in. (25 mm) diam (or smaller) Regular (or heavier) copper pipe.
   C. **Steel Pipe** – Nom 1 in. (25 mm) diam (or smaller) Schedule 5 (or heavier) steel pipe.
   D. **Cables** – Max 7/C No. 12 AWG multiconductor power and control cables; XLPE or PVC insulation with XLPE or PVC jacket.
3. **Tube Insulation-Plastics+** – Nom 3/4 in. (19 mm) thick (or less) acrylonitrile butadiene/polyvinyl chloride (AB/PVC) flexible foam furnished in the form of tubing. The tube insulation may be installed on a max of one pipe or tube. Annular space between the tube insulation and periphery of opening to be min 0 in. (point contact) to max 1-1/2 in. (0 mm to max 38 mm). Space between insulated and uninsulated penetrants to be 0 in. (point contact) to max 1-1/2 in. (0 mm to max 38 mm).
   See **Plastics** (QMFZ2) category in the Plastics Recognized Component Directory for names of manufacturers. Any Recognized Component tube insulation material meeting the above specifications and having a UL 94 Flammability Classification of 94-5A may be used.
4. **Cables** – Max two 7/C (or less) No. 12 AWG (or smaller) multiconductor power and control cables with XLPE or PVC insulation with XLPE or PVC jacket. Cables to be spaced min 0 in. (point contact) to max 1 in. (0 mm to max 25 mm) from the insulated through penetrants and min 1/2 in. to max 1 in. (13 mm to max 25 mm) from non-insulated through penetrants. The space between the cables and the periphery of the opening shall be min 0 in. (point contact) to max 1 in. (0 mm to max 25 mm). Cables to be rigidly supported on both sides of wall assembly.
5. **Fill, Void or Cavity Material*** – **Caulk or Sealant** – Min 5/8 in. (16 mm) thickness of caulk applied within annulus, flush with both surfaces of wall. Min 1/4 in. (6 mm) diam bead of caulk applied to gypsum board/penetrant interface at point contact location on both sides of wall.
   3M COMPANY– CP 25WB+, IC 15WB+ caulk or FB-3000 WT sealant

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W-L-8039 • 1 of 1

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PAMLICO 6-12 SCHOOL
601 Main Street, Bayboro, NC, 28515

ENERGY STAR PARTNER

No.	Date	Description

ISSUE DATE:	06/12/24
PROJECT #:	2205
DRAWN BY:	TAL
CHECKED BY:	JWM

U.L. PENETRATION DETAILS

M-501

Sheet No. 38 of 42

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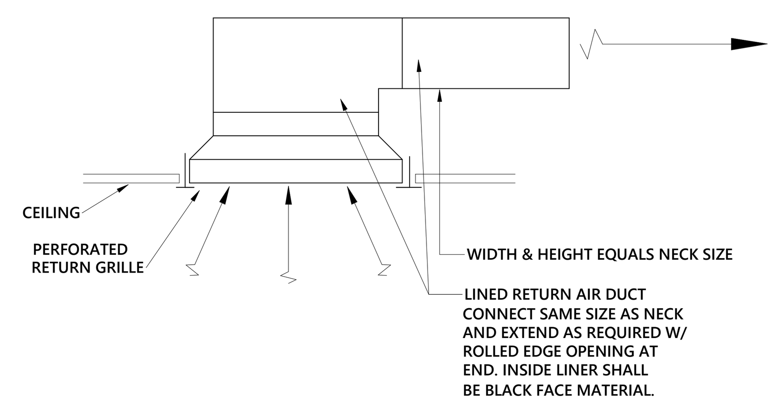
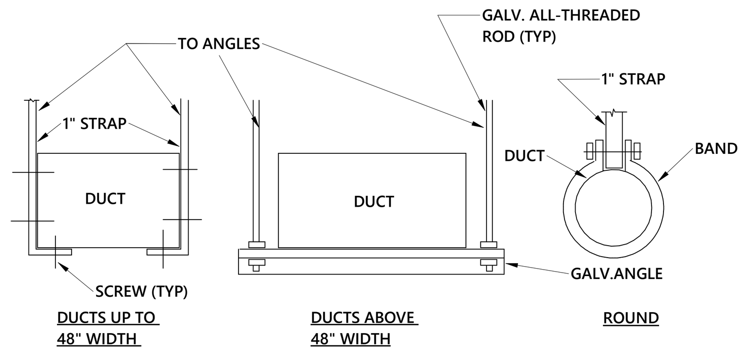


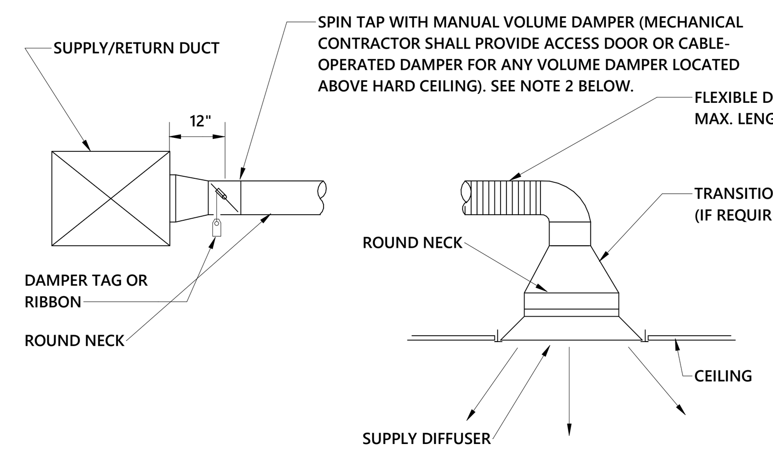
5 RETURN GRILLE W/SOUND ATTENUATION
NOT TO SCALE



LOW PRESSURE DUCTWORK

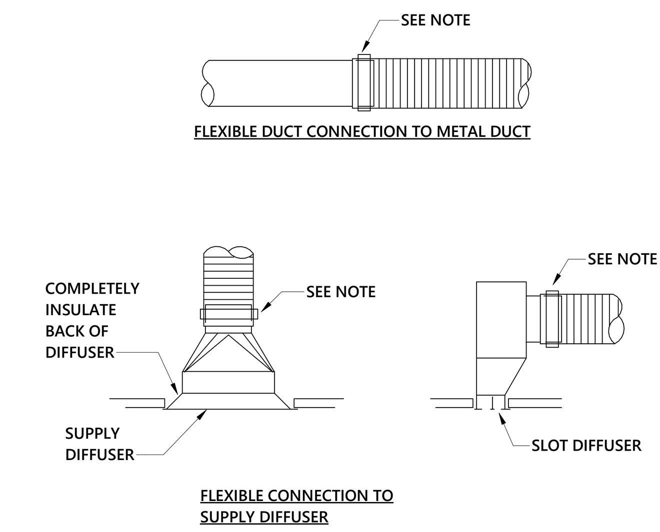
NOTE:
ALL DUCTWORK AND EQUIPMENT HANGERS AND SUPPORTS MUST BE PURCHASED THRU THE METAL DECKING MANUFACTURER. HANGERS SCREWED INTO THE DECK WILL NOT BE ACCEPTABLE. COORDINATE WITH GENERAL CONTRACTOR.

4 DUCTWORK HANGER DETAILS
NO SCALE



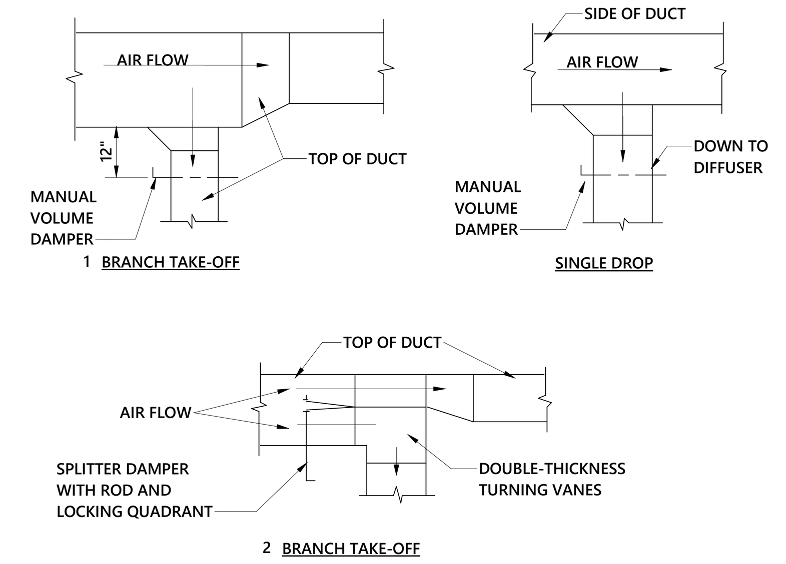
NOTE:
1. MANUAL VOLUME DAMPERS SHALL BE PROVIDED FOR ALL SUPPLY, RETURN AND GENERAL EXHAUST RUNOUTS.
2. ALL MANUAL VOLUME DAMPERS (FOR INSULATED DUCTWORKS) SHALL BE PROVIDED WITH AN ELEVATED REGULATOR (STAND-OFF) EQUAL TO DURO DYNE SEST SERIES AND FULL-LENGTH SHAFT. STAND SHALL EXTEND A MINIMUM OF 2" BEYOND DUCTWORK WITH EXTENDED TAB/SHAFT.
3. CONTRACTOR TO COORDINATE WITH ARCHITECT FOR DESIRED DAMPER ACCESS STYLE CABLE-OPERATED DAMPER ADJUSTMENT SHALL BE THROUGH AIR TERMINAL. FACE OPERATION (CONCEALED MOUNTING) OR THROUGH CEILING-MOUNTED RECESSED PORTS EQUAL TO MAT RT-CCM.

3 SPIN TAP TO ROUND NECK DIFFUSER
NOT TO SCALE



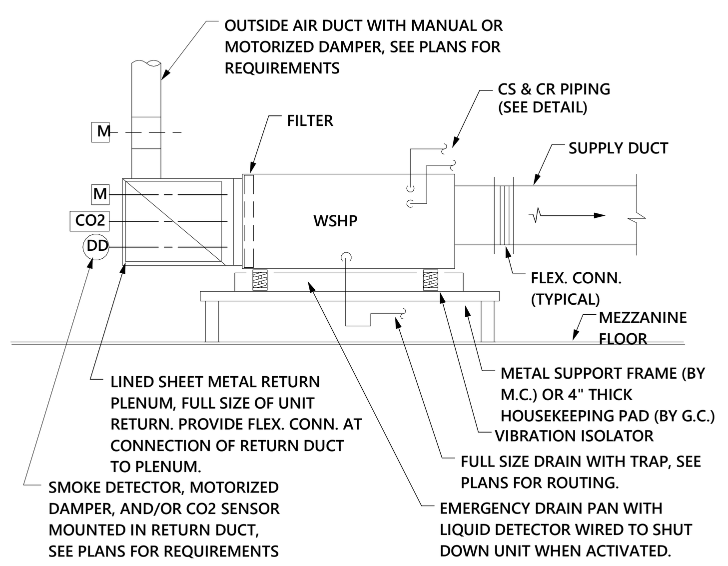
NOTE:
ALL FLEXIBLE DUCT CONNECTIONS TO SHEET METAL SHALL BE SECURED WITH APPROVED STRAP AND SEALANT.

2 FLEX CONNECTION DETAIL
NOT TO SCALE



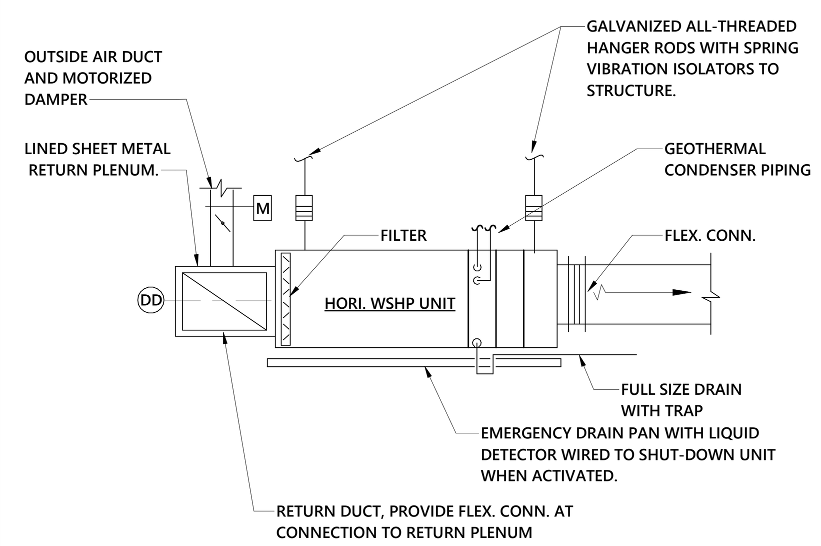
NOTE:
1. USE BRANCH TAKE-OFF ① WHEN MAIN AND BRANCH DUCTS ARE DIFFERENT DEPTHS
2. USE BRANCH TAKE-OFF ② WHEN MAIN AND BRANCH DUCTS ARE SAME DEPTHS
3. MANUAL VOLUME DAMPERS SHALL BE PROVIDED FOR ALL SUPPLY, RETURN AND GENERAL EXHAUST SINGLE DROP DUCT RUNS.

1 DUCTWORK DETAILS
NOT TO SCALE



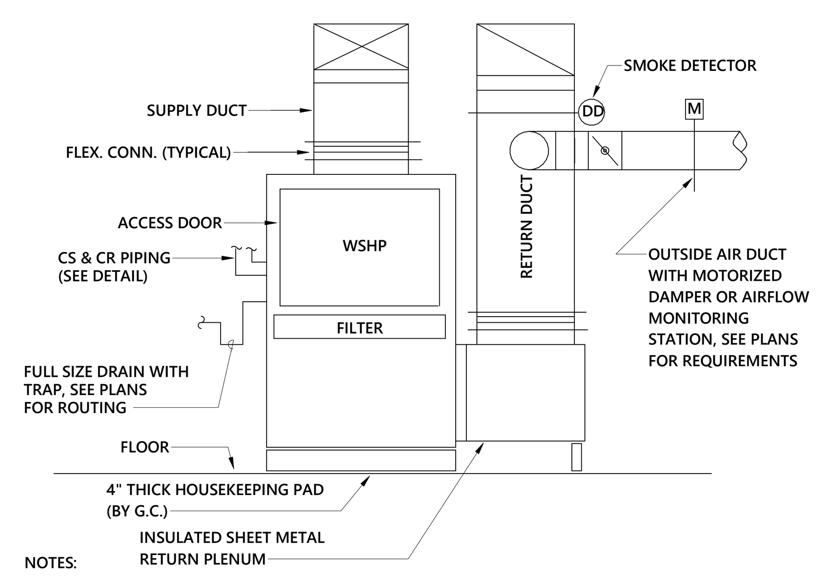
NOTES:
1. SEE PLANS FOR SIZE AND ROUTING OF DUCTWORK AND PIPING.
2. SEE 1/M-503 FOR PIPING DETAILS.
3. PROVIDE EACH UNIT WITH A IONIZATION TYPE SMOKE DETECTOR, INSTALLED IN THE RETURN DUCT WIRED TO SHUT DOWN THE UNIT UPON ACTIVATION. SMOKE DETECTOR SHALL BE SUPPLIED, WIRED FOR INTERFACE WITH FIRE ALARM SYSTEM AND UNIT SHUTDOWN BY THE ELECTRICAL CONTRACTOR. SMOKE DETECTOR SHALL BE INSTALLED IN THE RETURN DUCT BY THE MECHANICAL CONTRACTOR.
4. HORIZONTAL UNIT INSTALLATION IS SHOWN, VERTICAL UNIT INSTALLATION IS SIMILAR.

10 HORIZONTAL FLOOR MOUNT WSHP DETAIL
NO SCALE



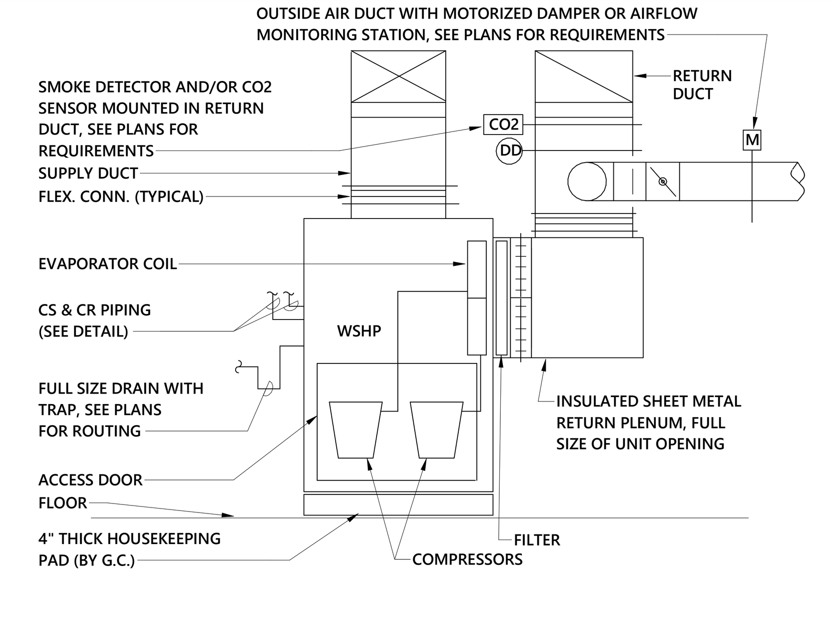
NOTES
1. SEE PLANS FOR SIZE AND ROUTING OF DUCTWORK AND PIPING.
2. SEE 1/M-503 FOR PIPING DETAILS.
3. PROVIDE EACH UNIT WITH A IONIZATION TYPE SMOKE DETECTOR, INSTALLED IN THE RETURN DUCT WIRED TO SHUT DOWN THE UNIT UPON ACTIVATION. SMOKE DETECTOR SHALL BE SUPPLIED, WIRED FOR INTERFACE WITH FIRE ALARM SYSTEM AND UNIT SHUTDOWN BY THE ELECTRICAL CONTRACTOR. SMOKE DETECTOR SHALL BE INSTALLED IN THE RETURN DUCT BY THE MECHANICAL CONTRACTOR.

9 HORIZONTAL CEILING HUNG WSHP UNIT DETAIL
NOT TO SCALE



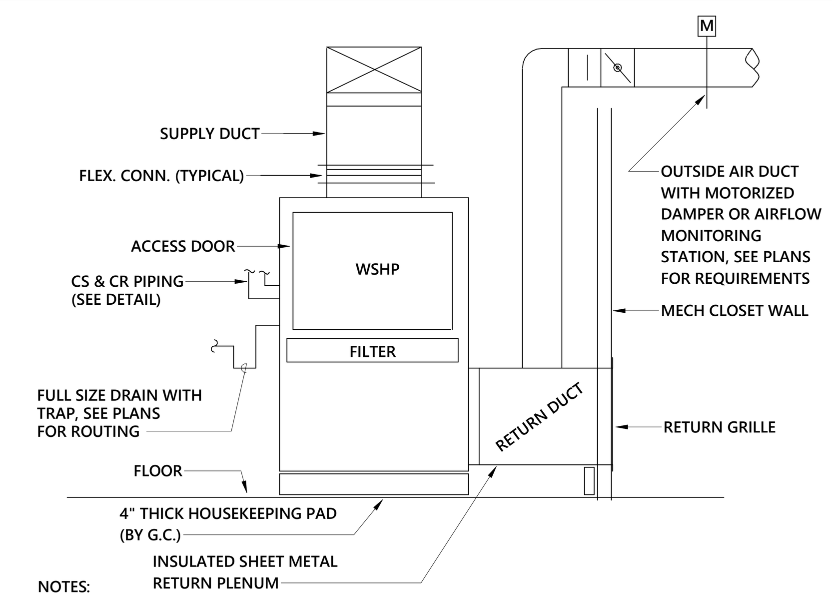
NOTES:
1. SEE PLANS FOR SIZE AND ROUTING OF DUCTWORK AND PIPING.
2. SEE 1/M-503 FOR PIPING DETAILS.
3. PROVIDE EACH UNIT WITH A IONIZATION TYPE SMOKE DETECTOR, INSTALLED IN THE RETURN DUCT WIRED TO SHUT DOWN THE UNIT UPON ACTIVATION. SMOKE DETECTOR SHALL BE SUPPLIED, WIRED FOR INTERFACE WITH FIRE ALARM SYSTEM AND UNIT SHUTDOWN BY THE ELECTRICAL CONTRACTOR. SMOKE DETECTOR SHALL BE INSTALLED IN THE RETURN DUCT BY THE MECHANICAL CONTRACTOR.

8 UPFLOW WSHP DETAIL (CONSTANT VOLUME MECH PLFM)
NO SCALE



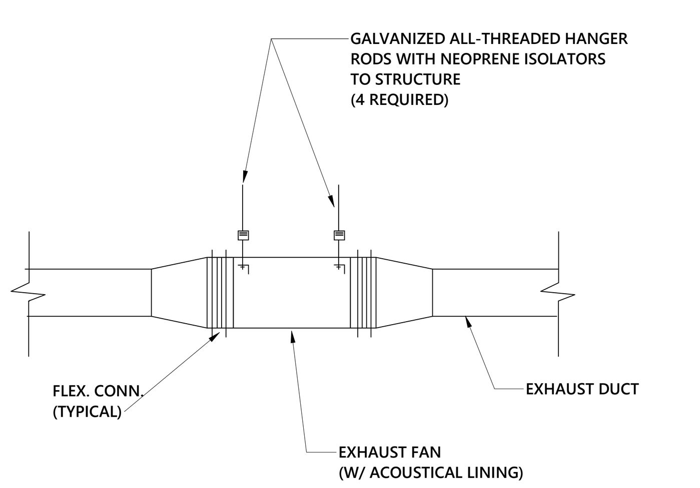
NOTES:
1. SEE PLANS FOR SIZE AND ROUTING OF DUCTWORK AND PIPING.
2. SEE 1/M-503 FOR PIPING DETAILS.
3. PROVIDE EACH UNIT WITH A IONIZATION TYPE SMOKE DETECTOR, I INSTALLED IN THE RETURN DUCT WIRED TO SHUT DOWN THE UNIT UPON ACTIVATION. SMOKE DETECTOR SHALL BE SUPPLIED, WIRED FOR INTERFACE WITH FIRE ALARM SYSTEM AND UNIT SHUTDOWN BY THE ELECTRICAL CONTRACTOR. SMOKE DETECTOR SHALL BE INSTALLED IN THE RETURN DUCT BY THE MECHANICAL CONTRACTOR.

7 UPFLOW WSHP DETAIL (VARIABLE VOLUME)
NO SCALE



NOTES:
1. SEE PLANS FOR SIZE AND ROUTING OF DUCTWORK AND PIPING.
2. SEE 1/M-503 FOR PIPING DETAILS.
3. PROVIDE EACH UNIT WITH A IONIZATION TYPE SMOKE DETECTOR, INSTALLED IN THE RETURN DUCT WIRED TO SHUT DOWN THE UNIT UPON ACTIVATION. SMOKE DETECTOR SHALL BE SUPPLIED, WIRED FOR INTERFACE WITH FIRE ALARM SYSTEM AND UNIT SHUTDOWN BY THE ELECTRICAL CONTRACTOR. SMOKE DETECTOR SHALL BE INSTALLED IN THE RETURN DUCT BY THE MECHANICAL CONTRACTOR.

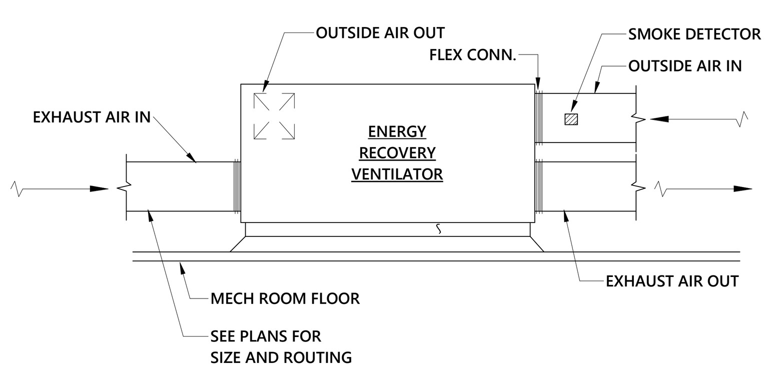
6 UPFLOW WSHP DETAIL (CONSTANT VOLUME CLASSROOM)
NO SCALE



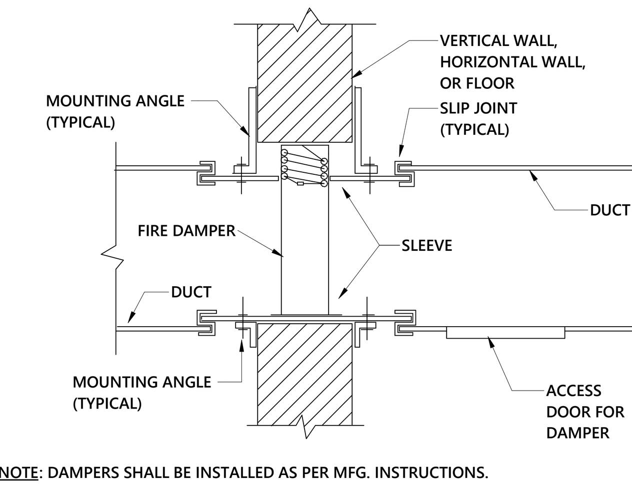
NOTES:
1. COORDINATE LOCATION OF FAN WITH OTHER TRADES TO INSURE SERVICE CLEARANCES.
2. MECHANICAL CONTRACTOR SHALL PROVIDE ACCESS DOOR IN CEILING IF REQUIRED.

15 INLINE EXHAUST FAN DETAIL
NO SCALE

NOTES:
1. PROVIDE PHOTO ELECTRIC TYPE SMOKE DETECTOR LOCATED IN THE OUTSIDE AIR INTAKE DUCT. THE SMOKE DETECTOR SHALL BE WIRED TO SHUT-DOWN THE SUPPLY FAN WHEN ACTIVATED. SMOKE DETECTOR TO BE PROVIDED BY THE ELEC. CONTR.; INSTALLED IN THE DUCT BY THE MECHANICAL CONTRACTOR AND WIRED TO SHUT DOWN THE SUPPLY FAN BY THE ELEC. CONTR.



14 ENERGY RECOVERY VENTILATOR
NOT TO SCALE

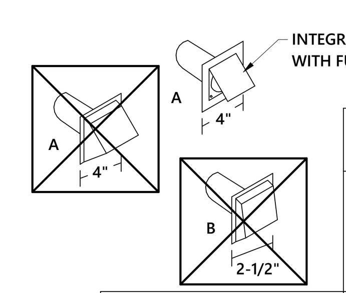


NOTE: DAMPERS SHALL BE INSTALLED AS PER MFG. INSTRUCTIONS.

FIRE DAMPER SHALL BE RUSKIN TYPE DIBD2 STYLE B 1 1/2 HOUR UL, INSTALLED IN ACCORDANCE WITH NFPA. ACCESS DOOR SHALL BE RUSKIN MODEL ADC2 LOCATED ON ACCESSIBLE CEILING SIDE OF WALL. IF ACCESSIBLE CEILING NOT AVAILABLE, MECHANICAL CONTRACTOR SHALL PROVIDE ACCESS DOOR IN CEILING (OR WALL) TO MATCH FINISH COLOR. DAMPER SHALL BE EQUIPPED FOR HORIZONTAL OR VERTICAL MOUNTING AS REQUIRED. WHERE ROUND DUCTS REQUIRE A DAMPER, AN ENCLOSURE WITH ROUND DUCT CONNECTION WILL BE REQUIRED WITH TYPE B DAMPER INSIDE. ALL MODELS ARE RUSKIN (APPROVED EQUAL ACCEPTABLE).

13 DAMPER - LOW PRESSURE FIRE
NOT TO SCALE

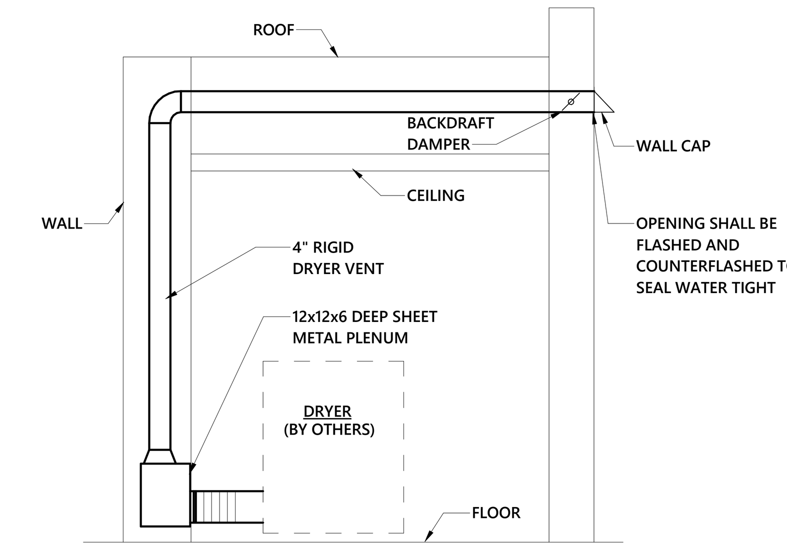
NOTES:
1. DRYER VENT WALL CAPS SHALL BE SECURED TO BUILDING WITH STAINLESS STEEL FASTENERS.
2. DRYER VENT CAPS TO BE ALIGN HORIZONTALLY & VERTICALLY ACROSS THE BUILDING ELEVATIONS. SEE ARCHITECTURAL ELEVATIONS FOR LOCATIONS. GC TO NOTIFY ARCHITECT SHOULD A WALL CAP NEED TO BE RELOCATED.
3. DRYER VENT CAPS SHALL NOT BE HAVE SCREENS OR LOUVERS



	NUMBER OF 90° TURNS	BEST PERFORMANCE MAXIMUM LENGTH OF 4"Ø RIGID METAL DUCT EXHAUST HOOD TYPE A 4" OPENING	 B 2-1/2" OPENING
PRE-APPROVED 6.0 CU. FT. CAPACITY DRYER AS NOTED ON PLANS.	0	90 FT.	60 FT.
	1	60 FT.	45 FT.
	2	45 FT.	35 FT.
	3	35 FT.	25 FT.

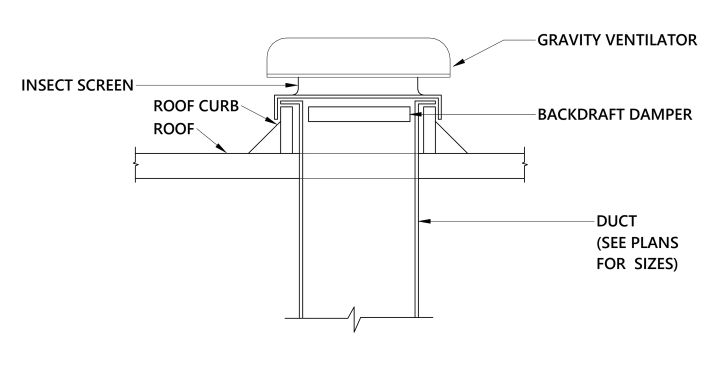
EXHAUST LENGTH CALCULATION:
1. DETERMINE THE NUMBER OF 90° TURNS NEEDED FOR YOUR INSTALLATION. IF YOU EXHAUST TO THE SIDE OR BOTTOM OF DRYER, ADD ONE TURN
2. THE MAXIMUM LENGTH OF 4" RIGID (ALUMINUM OR GALVANIZED) DUCT WHICH CAN BE TOLERATED IS SHOWN IN THE TABLE. A TURN OF 45° OR LESS MAY BE IGNORED. TWO 45° TURNS WITHIN THE DUCT LENGTH SHOULD BE TREATED AS A 90° DEGREE ELBOW. A TURN OVER 45° SHOULD BE TREATED AS A 90° ELBOW.

12 DRYER ALLOWABLE VENT LENGTH DETAIL
NOT TO SCALE



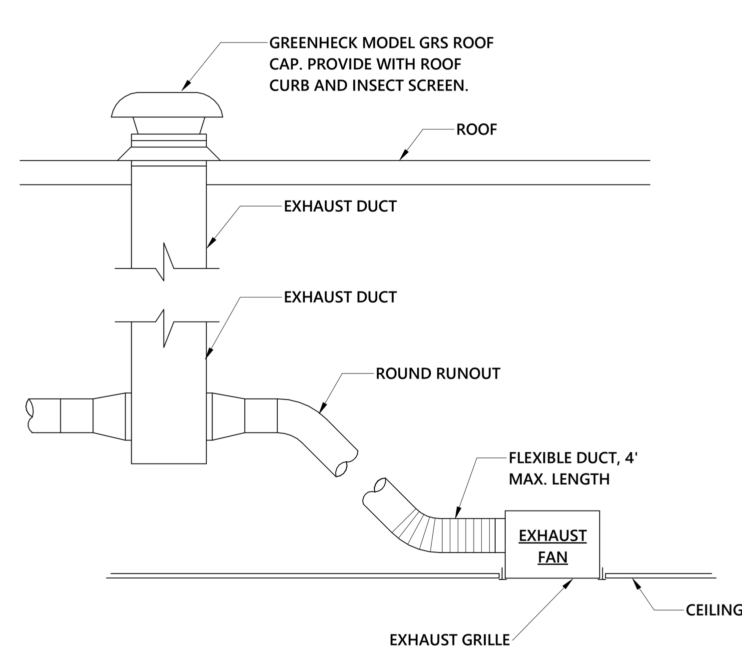
NOTES:
1. DRYER VENT PIPING SHALL BE GALVANIZED SHEET METAL AND SHALL HAVE A SMOOTH INTERIOR FINISH WITH JOINTS RUNNING IN THE DIRECTION OF THE AIR FLOW.
2. MAXIMUM LENGTH OF DRYER VENT SHALL NOT EXCEED 45' IN TOTAL LENGTH (DEDUCT 10' FOR EACH 90° ELBOW AND 5' FOR EACH 45° ELBOW).
3. DRYER VENT SHALL BE NONSCREENED WITH A BACKDRAFT DAMPER AND MINIMUM SIZE OF 4".

11 DRYER VENT THRU WALL
NOT TO SCALE

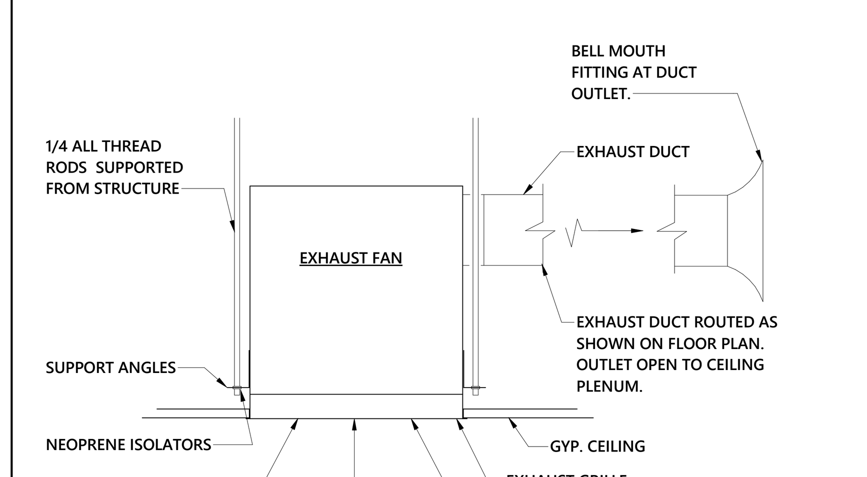


NOTE: SECURE VENTILATOR TO CURB WITH NON-FERROUS SCREWS. MIN. 2 PER SIDE, 4-INCHES FROM CORNERS AND MAX. 12-INCHES ON CENTER. PROVIDE EDPM WASHERS FOR BOTH SIDES OF ROOF CURB.

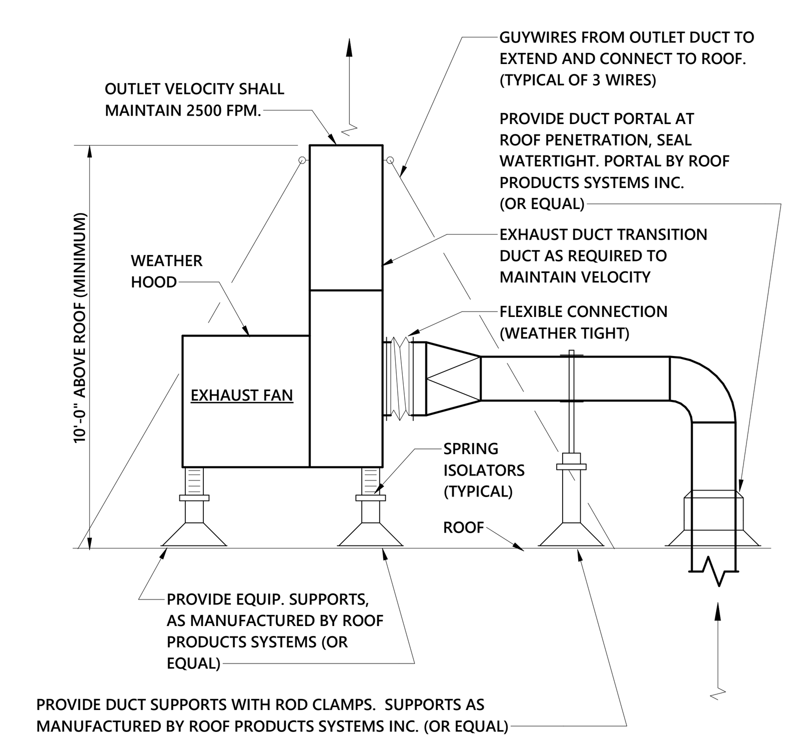
19 GRAVITY VENTILATOR DETAIL
NO SCALE



18 EXHAUST FAN AT CEILING AND VENTED THRU ROOF
NOT TO SCALE



17 EXHAUST FAN DETAIL
NOT TO SCALE



16 UTILITY EXHAUST FAN
NOT TO SCALE

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NORTH CAROLINA PROFESSIONAL ENGINEER 043118 THOMAS A. LANGE 06/12/2024

CONSTRUCTION DOCUMENTS

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PAMLICO COUNTY
PAMLICO 6-12 SCHOOL
601 Main Street, Bayboro, NC, 28515

ENERGY STAR PARTNER

No.	Date	Description

ISSUE DATE: 06/12/24
PROJECT #: 2205
DRAWN BY: TAL
CHECKED BY: JWM

MECHANICAL DETAILS

M-502

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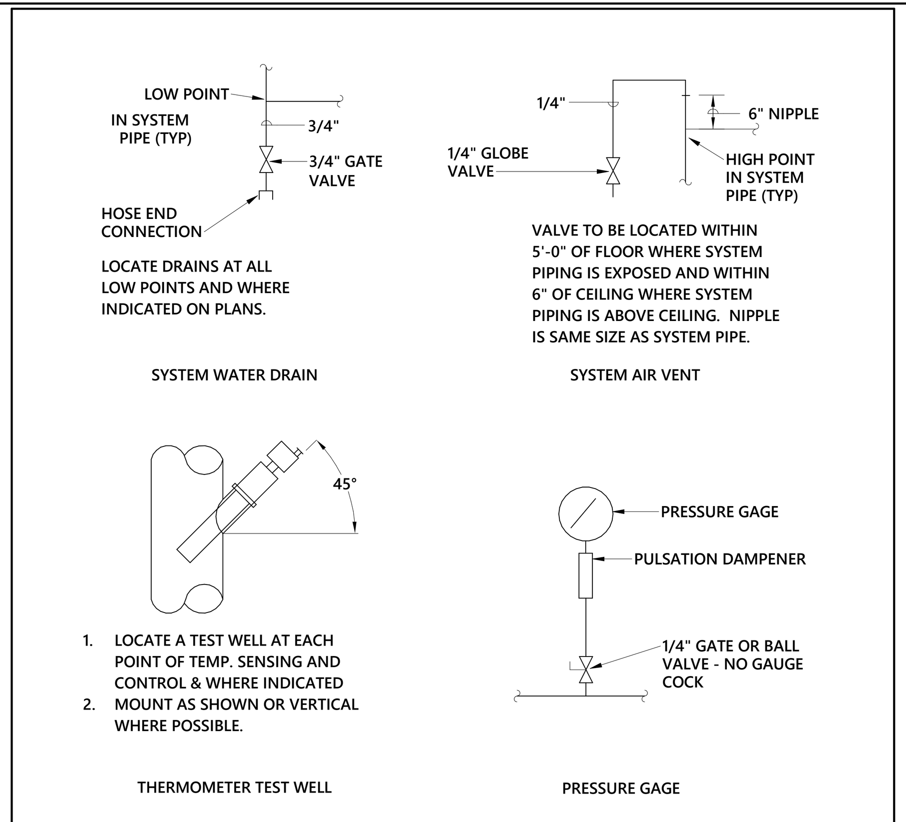
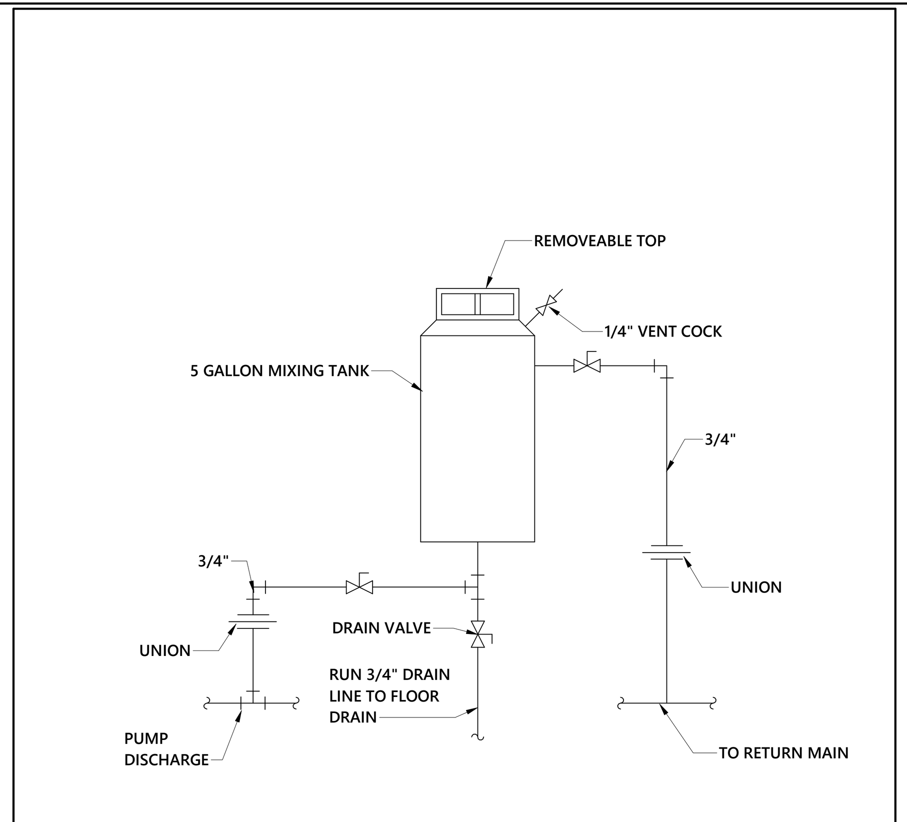
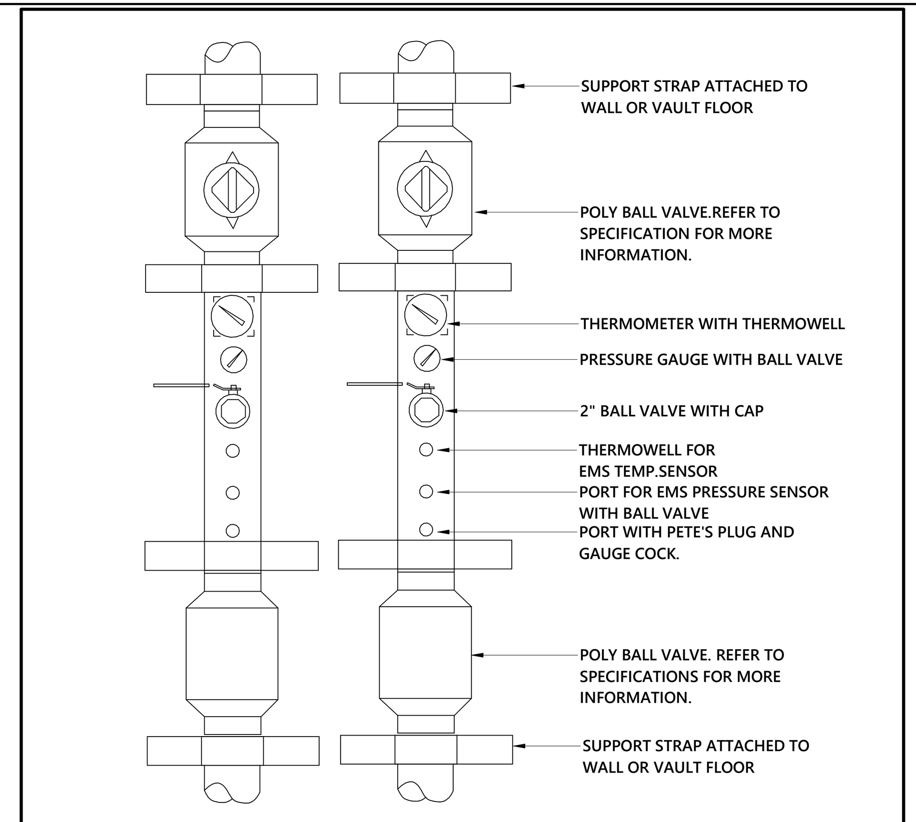


4 **PIPING SPECIALTIES**
NO SCALE

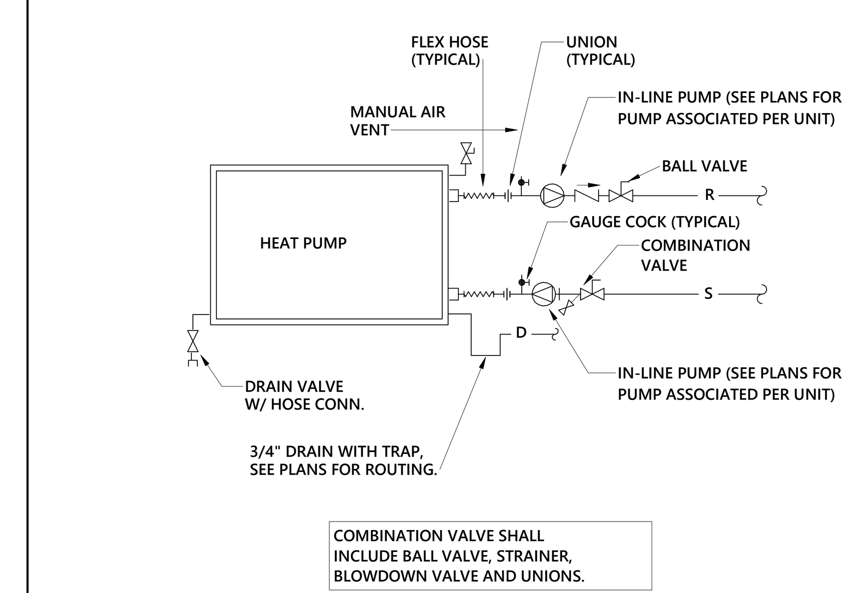


3 **CHEMICAL FEEDER FOR CLOSED WATER SYSTEM**
NOT TO SCALE

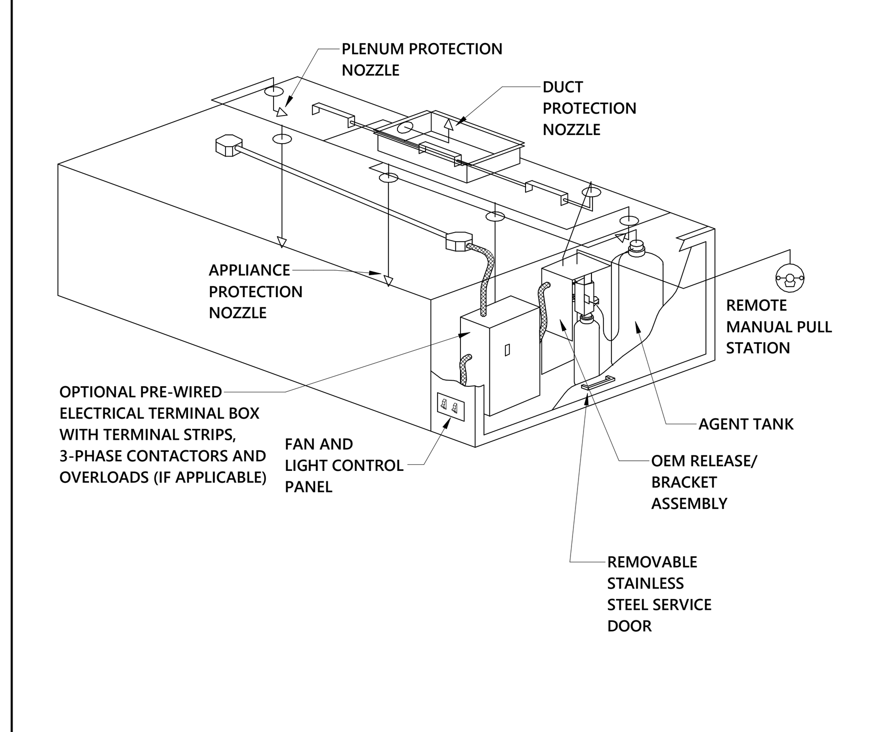


2 **PURGE PORT DETAIL**
NO SCALE

NOTE:
PROVIDE IN-LINE CIRCULATOR PUMP (SEE PUMP SCHEDULE) INTERLOCKED WITH THE HEAT PUMP COMPRESSOR, PUMP SHALL START WHEN COMPRESSOR IS ACTIVATED FOR HEATING OR COOLING FOR ALL UNITS.

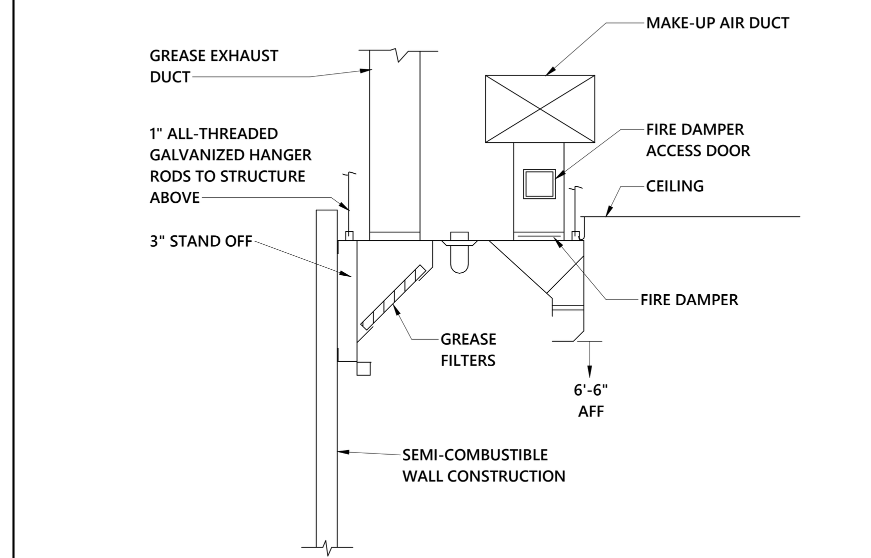


1 **WATER SOURCE HEAT PUMP PIPING**
NO SCALE



8 **KITCHEN HOOD FIRE SUPRESSION**
NO SCALE

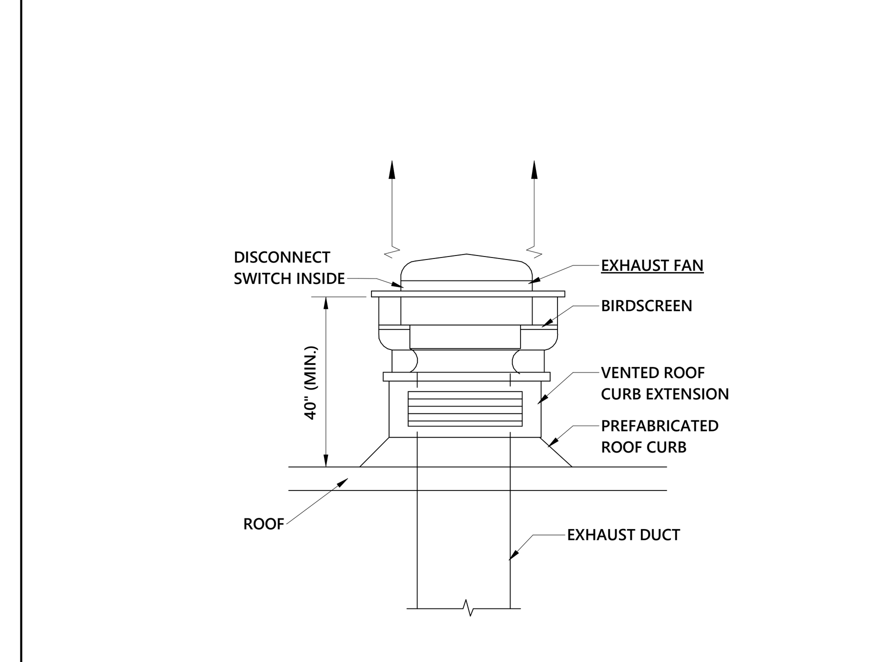
NOTE:
SEE MECHANICAL EQUIPMENT SCHEDULES FOR ADDITIONAL REQUIREMENTS AND SPECIFICATIONS FOR THE KITCHEN HOOD.



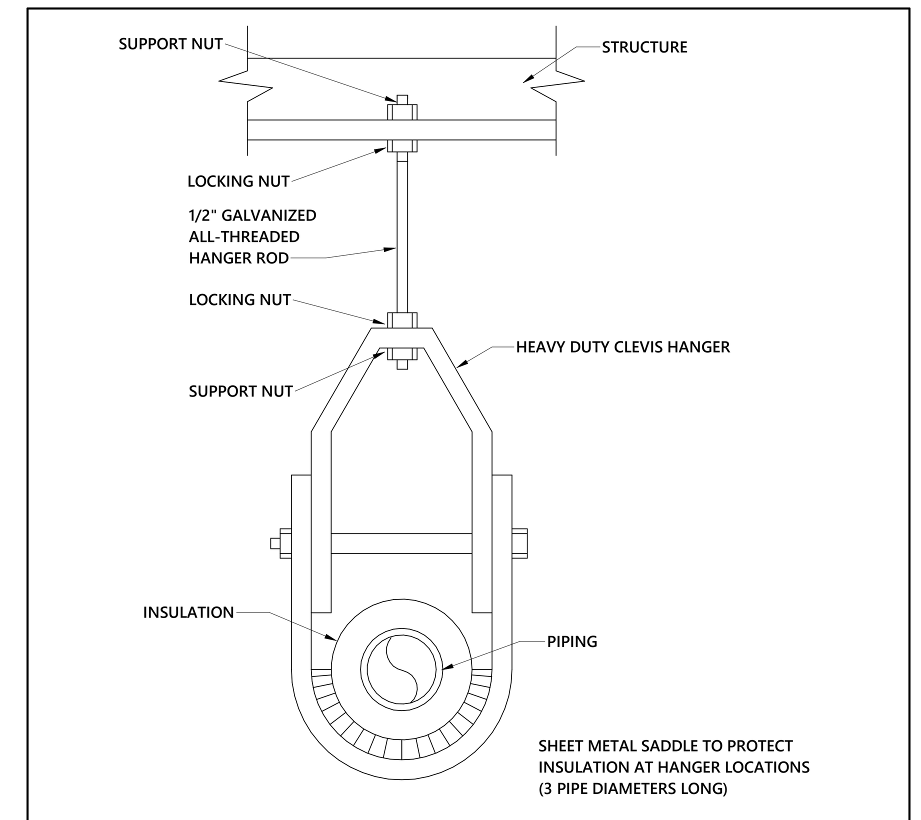
NOTES:
1. INSTALL FIRE SUPPRESSION SYSTEM PER MANUFACTURER'S RECOMMENDATIONS.
2. LOCATE HANGER RODS AT EACH CORNER OF THE HOOD AND AS RECOMMENDED BY THE MANUFACTURER. INSTALL HOOD SUPPORTS PER MANUFACTURER'S RECOMMENDATIONS.
3. SEE STRUCTURAL DRAWINGS FOR STRUCTURAL SUPPORT.

7 **EXHAUST HOOD SYSTEM (KITCHEN)**
NOT TO SCALE

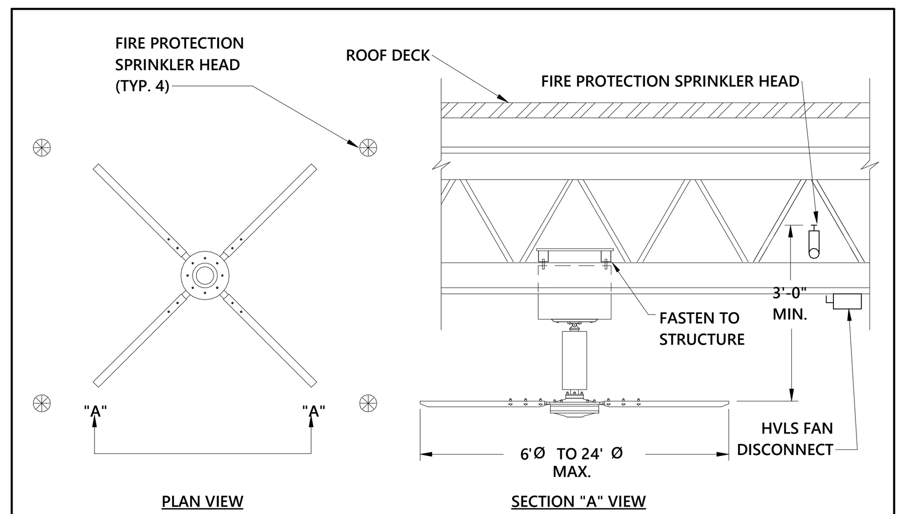
NOTE:
KITCHEN HOOD MAKE-UP AIR FAN INTAKE SHALL BE A MINIMUM OF 10'-0" AWAY FROM KITCHEN HOOD EXHAUST FAN OUTLET.



6 **KITCHEN HOOD EXHAUST FAN (FLAT ROOF)**
NOT TO SCALE

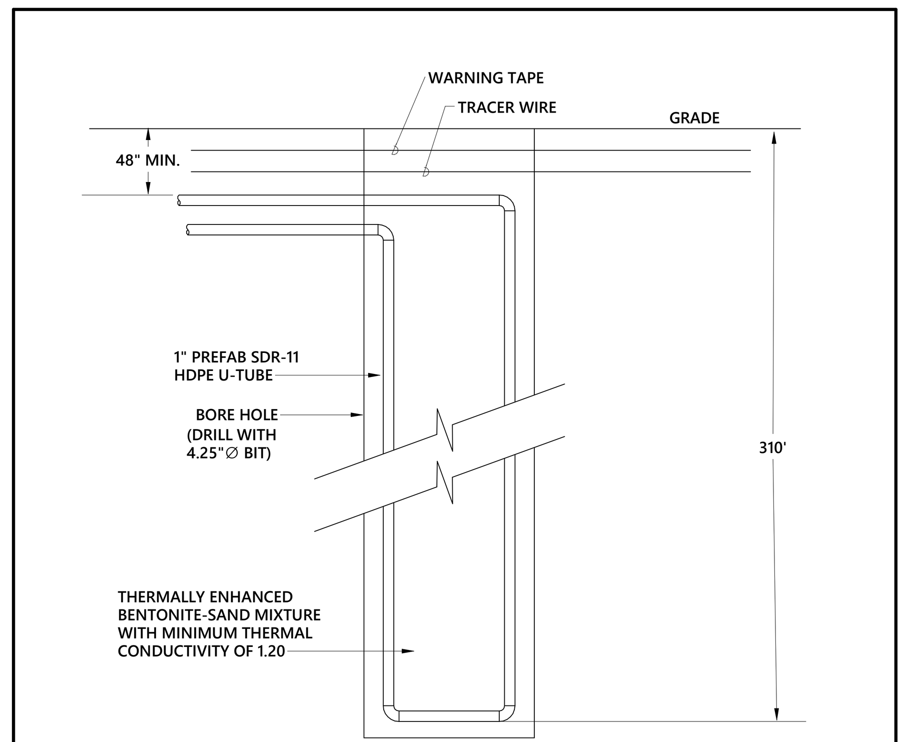


5 **PIPE HANGER DETAIL**
NOT TO SCALE



NOTES:
1. NFPA 13, 11.1.7 - HIGH VOLUME LOW SPEED (HVLS) FANS INSTALLED IN BUILDINGS EQUIPPED WITH SPRINKLERS, INCLUDING ESFR SPRINKLERS SHALL COMPLY WITH THE FOLLOWING:
   A. THE MAXIMUM FAN DIAMETER SHALL BE 24FT.
   B. THE HVLS FAN SHALL BE CENTERED APPROXIMATELY BETWEEN FOUR ADJACENT SPRINKLERS.
   C. THE VERTICAL CLEARANCE FROM THE HVLS FAN TO SPRINKLER DEFLECTOR SHALL BE MINIMUM OF 3FT.
   D. ALL HVLS FANS SHALL BE INTERLOCKED TO SHUT DOWN IMMEDIATELY UPON RECEIVING A WATER FLOW SIGNAL FROM THE ALARM SYSTEM IN ACCORDANCE WITH REQUIREMENTS OF NFPA 72.
2. EC SHALL LOCATE THE HVLS FAN DISCONNECT OUTSIDE THE FAN BLADE CLEARANCE.

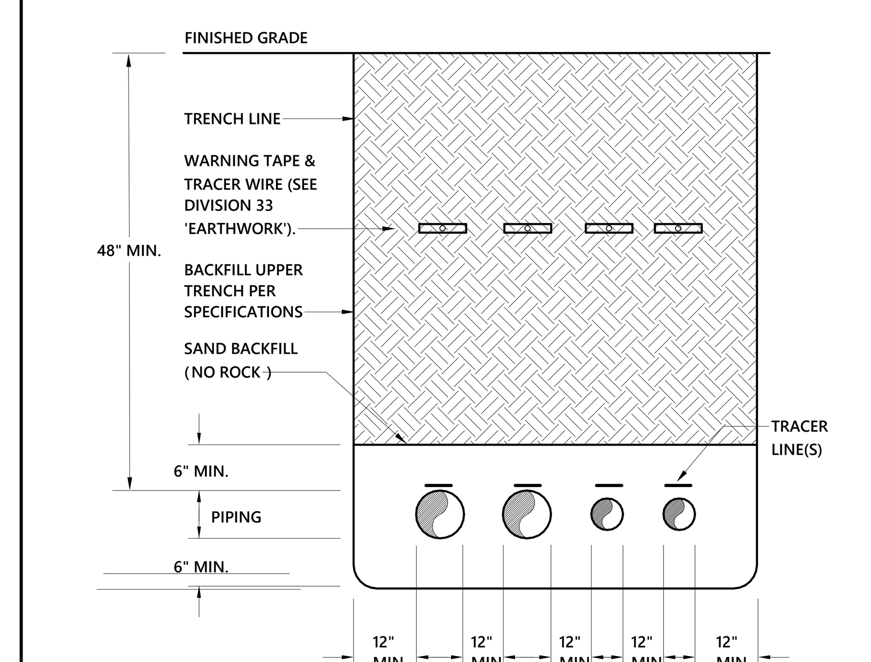
12 **HVLS FAN COORDINATION DETAIL**
NOT TO SCALE



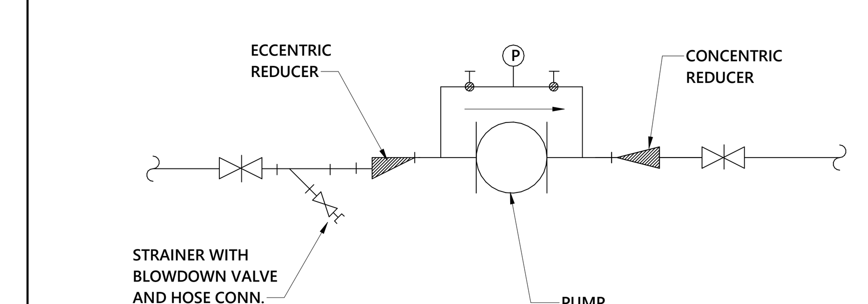
NOTE:
INSTALL WARNING TAPE AND TRACER WIRE ABOVE ALL UNDERGROUND PIPING

11 **GEOTHERMAL WELL DETAIL**
NO SCALE

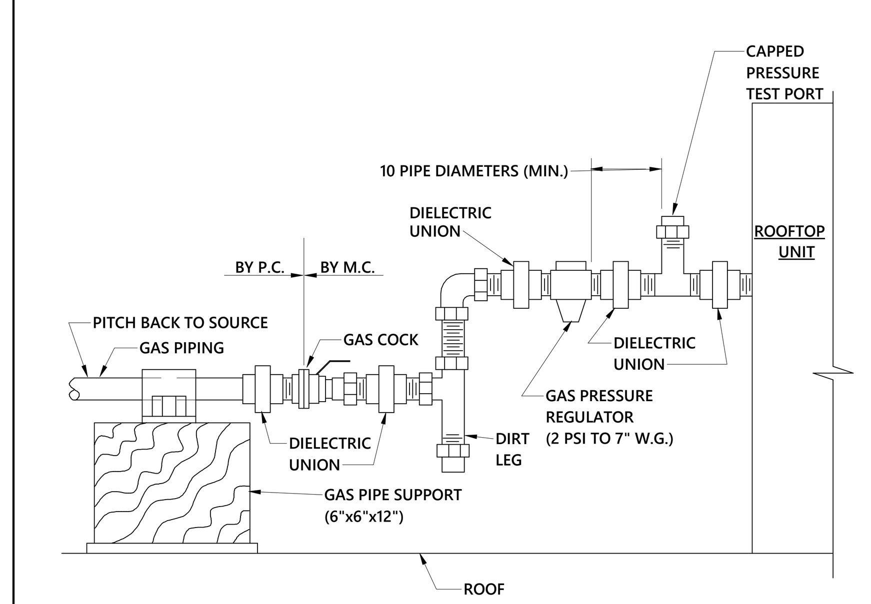
NOTE:
SEE PLANS FOR ROUTING OF PIPING. DETAIL IS FOR VALVE AND ACCESSORY INDICATION ONLY.



10 **PIPING TRENCH**
NO SCALE

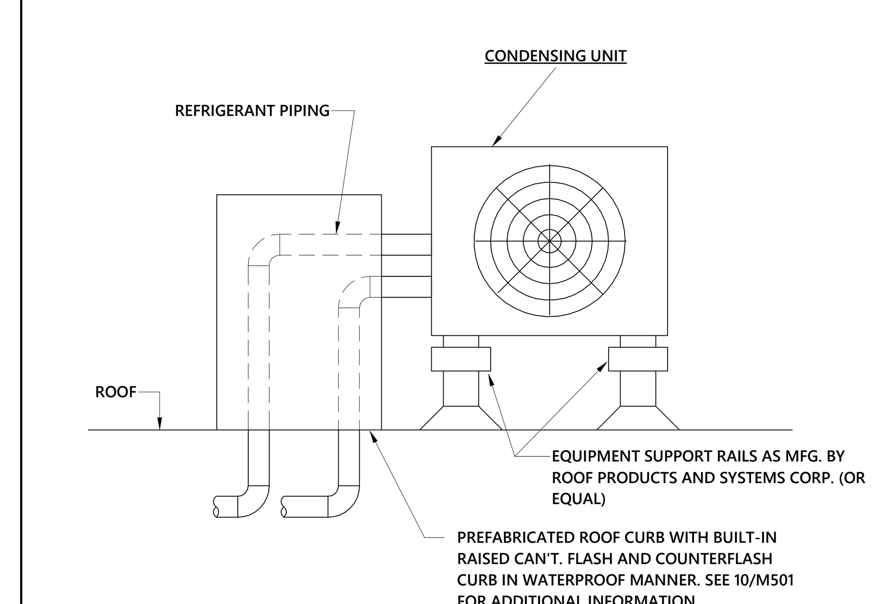


9 **INLINE PUMP DETAIL**
NOT TO SCALE



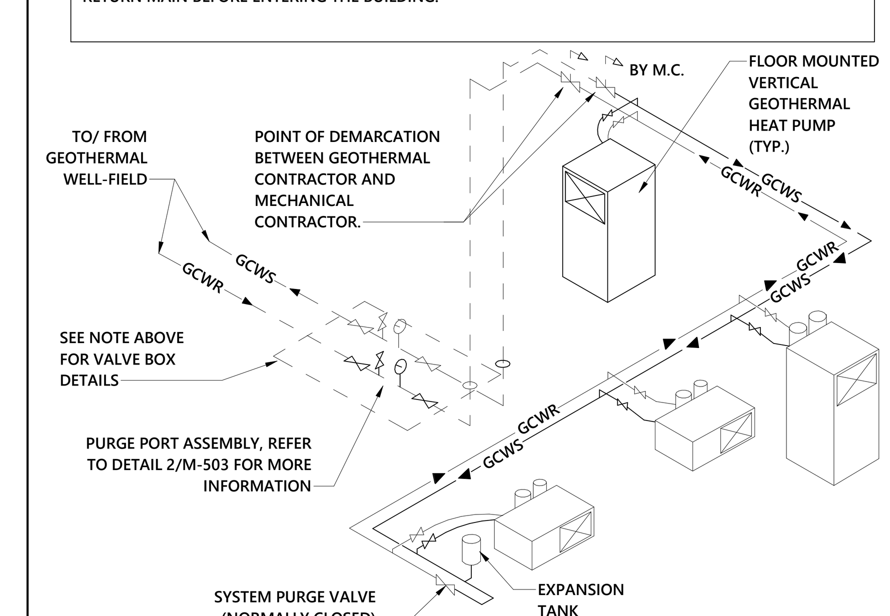
NOTE:
GAS PIPING AND SHUT-OFF VALVE SHALL BE BY PLBG. CONTR., DIRT LEG, REGULATOR, AND FINAL CONNECTION TO UNIT SHALL BE BY MECH. CONTR.

15 **GAS CONNECTION TO MAU (WITH REGULATOR)**
NOT TO SCALE



14 **ROOF - MOUNTED CONDENSING UNIT**
NOT TO SCALE

WELL FIELD NOTE:
REFER TO RESPECTIVE WELL FIELD FOR LAYOUT AND MAIFOLD/BUILDING PIPING SIZE ROUTING. LOOP PURGE PORTS SHALL BE LOCATED IN RECESSED VALVE BOX WITH PAINTED HINGED METAL COVER (COORD. FINISH COLOR WITH ARCH.) INSTALLED LEVEL WITH GRADE. PURGE PORT ASSEMBLY SHALL BE LOCATED IN INDIVIDUAL RECESSED POLYMER VALVE BOXES INSTALLED LEVEL WITH GRADE. EACH WELL FIELD CIRCUIT SHALL BE HEADERED TOGETHER INTO A COMMON 4" SUPPLY AND RETURN MAIN BEFORE ENTERING THE BUILDING.



13 **BUILDING GEOTHERMAL PIPING DIAGRAM**
NOT TO SCALE

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ENERGY STAR PARTNER

No.	Date	Description

ISSUE DATE:	06/12/24
PROJECT #:	2205
DRAWN BY:	TAL
CHECKED BY:	JWM

MECHANICAL DETAILS

M-503

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SEQUENCE OF OPERATION - MECHANICAL SYSTEMS

A COMPLETE AND OPERATIONAL DDC CONTROL SYSTEM (BAS) SHALL BE INSTALLED IN ACCORDANCE WITH THE SPECIFICATIONS (SECTION 230900) AND AS INTENDED ON THESE PLANS. ALL CONTROLS SHALL BE DDC/ELECTRONIC WITH ELECTRIC ACTUATION OF ALL VALVES AND DAMPERS. CONTROL SYSTEM SHALL BE BACNET OR LONMARK COMPATIBLE.

GENERAL:
BUILDING AUTOMATION SYSTEM (BAS) SHALL PROVIDE PROGRAMMED/TIMED OPERATION OF HVAC SYSTEM AND SYSTEM COMPONENTS BY PLACING THE SYSTEM IN "OCCUPIED" OR "UNOCCUPIED" MODES BASED ON THE OWNERS OPERATING SCHEDULE. BAS SHALL BE WEB (IP) BASED TO ALLOW INTERNET ACCESS FOR REMOTE OPERATION OF SYSTEM. BAS SHALL ALLOW GLOBAL OPERATION OF COOLING, HEATING, CO2, AND HUMIDITY SETPOINTS. BAS SHALL ALSO ALLOW EITHER ZONE BY ZONE OR GLOBAL OVERRIDE OF SYSTEM OPERATION WHILE IN THE UNOCCUPIED MODE. OVERRIDE SHALL
ACTIVATE ALL LIGHTS, RECEPTACLES, AND HVAC SYSTEM EQUIPMENT, INCLUDING CENTRAL PLANT, REQUIRED TO MAINTAIN "OCCUPIED" SPACE CONDITIONS IN THE OVERRIDE ZONE FOR A TIME PERIOD OF 2 HOURS, TIME PERIOD SHALL BE ADJUSTABLE THROUGH THE BUILDING AUTOMATION SYSTEM.

THERMOSTATS
THERMOSTATS FOR WSHP UNITS SHALL BE PROVIDED WHERE INDICATED ON THE DRAWINGS, AND PER THE SPECIFICATIONS. THERMOSTATS SHALL HAVE ROTARY SWITCH ADJUSTMENT WITH NUMERICAL INDICATION, INITIALLY SET IN THE OCCUPIED MODE FOR COOLING TO 75° AND HEATING TO 70°. THERMOSTATS SHALL HAVE A 3° RANGE IN WHICH THEY ARE SATISFIED (IF SET TO 70°, SATISFIED ANYWHERE BETWEEN 68.5° AND 71.5°). ROTARY SWITCH SHALL HAVE THE CAPABILITY TO ADJUST THE HEATING AND COOLING SETPOINTS BY 3° IN EITHER DIRECTION, BUT MAINTAIN A MINIMUM 4° SPREAD BETWEEN THE HEATING AND COOLING SETPOINT. UNOCCUPIED SETTINGS SHALL BE 85° COOLING AND 60° HEATING. THERMOSTAT SHALL HAVE PUSHBUTTON OVERRIDE TO PLACE ONLY THAT ZONE INTO THE OCCUPIED MODE FOR TWO HOURS. LOFT WSHP SETPOINTS SHALL BE 80° COOLING AND 60° HEATING, ONLY TEMPORARILY CHANGING TO OCCUPIED SETPOINTS FOR A TWO HOUR DURATION IF THE PUSHBUTTON OVERRIDE IS ACTIVATED.

OCCUPIED SETBACK MODE SHALL BE ENABLED DURING THE OCCUPIED MODE IF THE OCCUPANCY SENSOR DE-ENERGIZES THE LIGHTS IN THE ROOM. OCCUPIED SETBACK MODE SHALL DRIFT THE COOLING AND HEATING SETPOINTS BY 3° EACH WAY (COOLING TO 78° AND HEATING TO 67°). OCCUPIED MODE IS RESTORED WHEN OCCUPANCY SENSOR RE-ENERGIZES THE LIGHTS.

CO2 SENSORS
CO2 SENSORS SHALL BE PROVIDED WHERE INDICATED ON THE DRAWINGS, SEQUENCES OF OPERATION, AND PER THE SPECIFICATIONS. CO2 SENSORS INSTALLED IN ROOMS VENTILATED 'DCV' UNITS SHALL MONITOR CO2 LEVELS IN THESE ROOMS AND REPORT BACK TO THE BAS. SHOULD THE CO2 LEVEL IN A SPACE EXCEED 1500 PPM DURING UNOCCUPIED TIMES FOR A CONTINUOUS 15 MINUTE INTERVAL, ASSOCIATED DOAS UNIT SHALL BE ENERGIZED UNTIL PPM HOLDS BELOW 1500 PPM FOR A CONTINUOUS 15 MINUTE INTERVAL. SENSOR SHALL ALARM BAS SHOULD CO2 LEVELS EXCEED 2500 PPM AT ANY TIME. CO2 SENSORS IN LOBBY, DINING, AND GYMNASIUMS SHALL CONTROL DEMAND CONTROL VENTILATION SEQUENCE AS OUTLINED.

ENERGY RECOVERY VENTILATORS (ERV):
WHEN PLACED IN THE OCCUPIED MODE, ENERGY RECOVERY VENTILATORS (ERVS) SHALL BE INDEXED "ON". UNITS SHALL BE ALLOWED TO START FOLLOWING A FIVE MINUTE DELAY. SUPPLY FAN, EXHAUST FAN, AND ENERGY RECOVERY WHEEL ARE ACTIVATED.

IN THE UNOCCUPIED MODE, UNIT SHALL REMAIN OFF UNLESS COMMANDED ON BY THE ZONE IS SCHEDULED ON VIA THE DDC SYSTEM OVERRIDE PANEL.

DUCT SMOKE DETECTOR INSTALLED IN THE EXHAUST DUCT SHALL SHUT DOWN UNIT AND ACTIVATE FIRE ALARM SYSTEM UPON DETECTION OF SMOKE

NOTE:
COORDINATE EXACT SEQUENCE OF OPERATION FOR ENERGY RECOVERY UNITS WITH MANUFACTURER, MANUFACTURER AND ENGINEER TO APPROVE FINAL SEQUENCE PRIOR TO PROGRAMMING. BAS VENDOR SHALL VERIFY ALL OPERATION/MONITORING POINTS COMPATIBILITY AT SUBMITTAL PHASE.

SINGLE ZONE GEOTHERMAL WATER SOURCE HEAT PUMPS:
UNITS SHALL BE PROVIDED WITH A TWO-WAY CONDENSER WATER CONTROL VALVE INTERLOCKED WITH THE HEAT PUMP COMPRESSOR (UNLESS NOTED OTHERWISE). ON A CALL FOR HEATING OR COOLING, VALVE SHALL OPEN TO THE UNIT AND HEAT PUMP HEATING/COOLING SYSTEM SHALL START ON A TWO MINUTE DELAY. WHILE IN THE UNOCCUPIED MODE, THE UNIT SHALL CYCLE AS NOTED ABOVE TO MAINTAIN SETBACK TEMPERATURES. IF ACTIVATED DURING THE UNOCCUPIED MODE, THE UNIT SHALL RUN FOR A MINIMUM OF 20 MINUTES AND SHALL NOT BE ALLOWED TO RESTART FOR A MINIMUM OF FIVE MINUTES FOLLOWING SHUT-DOWN.

A CENTRAL TIMED OVERRIDE PANEL SHALL BE LOCATED IN THE ADMIN AREA, TO TEMPORARILY PLACE ANY ZONE INTO THE OCCUPIED MODE. WHEN PLACED IN OVERRIDE, UNIT SHALL OPERATE AS IF IN THE OCCUPIED MODE.

UNITS EQUIPPED WITH VARIABLE SPEED COMPRESSORS AND FANS SHALL UTILIZE THEIR INTERNAL CONTROLS TO MODULATE COMPRESSOR AND FAN STAGES TO MAINTAIN SPACE TEMPERATURE.

UNITS SHALL BE PROVIDED WITH A WALL MOUNTED DDC SENSOR FOR SPACE TEMPERATURE CONTROL. WHILE IN THE OCCUPIED MODE THE SUPPLY FAN, CONDENSER WATER CONTROL VALVE, AND HEAT PUMP HEATING/COOLING SYSTEM SHALL CYCLE ON UPON A CALL FOR HEATING OR COOLING AS REQUIRED TO MAINTAIN SPACE TEMPERATURE. SENSOR SHALL ALSO SEND A SIGNAL TO ITS ZONE DEDICATED OUTSIDE AIR SYSTEM TO INDICATE STATUS AS HEAT, COOL, OR SATISFIED.

FOR UNITS PROVIDED WITH MOTORIZED OUTSIDE AIR DAMPERS (INDICATED BY 'DCV' IN EQUIPMENT SCHEDULE), DAMPER SHALL BE CLOSED WHEN IN THE UNOCCUPIED MODE. WHEN PLACED INTO THE OCCUPIED MODE BY THE BAS, OUTSIDE AIR DAMPER SHALL REMAIN CLOSED FOR MORNING WARM-UP IF SPACE TEMPERATURE IS BELOW SETPOINT. ONCE THE SPACE TEMPERATURE SETPOINT IS REACHED, THE OUTSIDE AIR DAMPER SHALL OPEN TO THE MINIMUM POSITION (OCC MIN OA CFM AS INDICATED IN WSHP SCHEDULE), AND SHALL REMAIN OPEN WHILE IN THE OCCUPIED MODE. MOTORIZED DAMPER SHALL VARY THE VOLUME OF OUTSIDE AIR BASED ON CO2 LEVEL AS MEASURED BY A SPACE OR DUCT MOUNTED CO2 SENSOR. OUTSIDE AIR DAMPER SHALL MODULATE OPEN IF CO2 READING RISES ABOVE 500 PPM ABOVE OUTSIDE AIR CO2 LEVEL, DAMPER SHALL MODULATE CLOSED UNTIL MINIMUM POSITION IS REACHED. BAS SHALL CONTINUALLY MONITOR THE AMOUNT OF OUTSIDE AIR PROVIDED TO EACH ZONE, AND ALARM CENTRAL BAS IF CO2 SENSOR READING IS ABOVE 1000 PPM.

FOR UNITS WITH HUMIDITY CONTROLS (SHOWN WITH HOT GAS REHEAT 'HGR' IN WSHP SCHEDULE), WITH SYSTEM IN OCCUPIED OR UNOCCUPIED MODE, HUMIDITY CONTROL SYSTEM SHALL BE CAPABLE OF BEING ACTIVATED. UNDER NORMAL OPERATION, UNIT SHALL BE CONTROLLED AS OUTLINED ABOVE. IF SPACE HUMIDITY REACHES 60% RH IN THE OCCUPIED MODE OR 65% IN THE UNOCCUPIED MODE (ADJUSTABLE), HUMIDITY CONTROL SEQUENCE SHALL BE ENERGIZED THROUGH THE DDC SYSTEM. UNIT OUTSIDE AIR DAMPER SHALL CLOSE TO MINIMUM POSITION. CONDENSER WATER CONTROL VALVE SHALL OPEN AND UNIT COMPRESSORS SHALL BE MODULATED TO REHEAT AIR TO MAINTAIN SPACE CONDITIONS AS REQUIRED. WHEN SPACE HUMIDITY DROPS BELOW 55% RH IN THE OCCUPIED MODE OR 60% IN THE UNOCCUPIED MODE, BAS SHALL DEACTIVATE HUMIDITY CONTROL SEQUENCE, AND CONTROL OF THE UNITS SHALL REVERT BACK TO NORMAL OPERATION. IF SPACE HUMIDITY REACHES 65% IN THE OCCUPIED MODE OR 70% IN UNOCCUPIED MODE, AND ALARM SHALL BE SENT TO CENTRAL BAS.

NON-CLASSROOM UNIT: (UNITS WITH O.A./RETURN AIR MIXING BOXES):
WHEN PLACED IN THE OCCUPIED MODE BY THE BAS, THE UNITS SHALL BE INDEXED ON. UNITS SHALL START ON A FIVE MINUTE DELAY RELATIVE TO THE START OF THE WSHP LOOP PUMP. WHILE IN OCCUPIED MODE, THE SUPPLY FAN SHALL RUN CONTINUOUSLY AND THE CONDENSER WATER CONTROL VALVE AND HEAT PUMP COOLING/HEATING SYSTEM SHALL CYCLE AS REQUIRED TO MAINTAIN SPACE TEMPERATURE.

WHILE IN THE UNOCCUPIED MODE, THE UNIT FAN SHALL BE OFF AND SHALL ENERGIZE ONLY WITH A CALL FOR HEATING OR COOLING AS REQUIRED TO MAINTAIN SETBACK TEMPERATURE. IF ACTIVATED DURING THE UNOCCUPIED MODE, THE UNIT SHALL RUN FOR A MINIMUM OF FIVE MINUTES FOLLOWING SHUT-DOWN.

FOR UNITS EQUIPPED WITH VARIABLE FREQUENCY DRIVE FOR THE SUPPLY FAN, FAN SHALL START AT LOW SPEED (30%). ON A RISE IN TEMPERATURE ABOVE SETPOINT, THE CONDENSER WATER CONTROL VALVE SHALL OPEN, THE FIRST STAGE OF HEAT PUMP COOLING SHALL ACTIVATE, AND DX COIL LOWER SECTION RETURN AIR MOTORIZED DAMPER (INTERLOCED WITH UNIT COMPRESSOR STAGE 1) SHALL OPEN. ON A CONTINUOUS RISE IN SPACE TEMPERATURE, VARIABLE FREQUENCY DRIVE SHALL INCREASE FAN SPEED, HEAT PUMP SHALL ACTIVATE SECOND STAGE OF COOLING, AND DX COIL UPPER SECTION RETURN AIR MOTORIZED DAMPER (INTERLOCKED WITH UNIT COMPRESSOR STAGE 2) SHALL OPEN AS NECESSARY TO MAINTAIN DISCHARGE TEMPERATURE, UNTIL SPACE TEMPERATURE IS SATISFIED. AS THE SPACE TEMPERATURE DROPS BELOW SETPOINT, THE SUPPLY FAN SPEED SHALL RESET FROM MAXIMUM TO MINIMUM. AS THE SPACE TEMPERATURE CONTINUES TO DROP, THE CONDENSER WATER CONTROL VALVE SHALL OPEN, THE FIRST STAGE OF HEAT PUMP HEATING SHALL ACTIVATE, AND DX COIL LOWER SECTION RETURN AIR MOTORIZED DAMPER SHALL OPEN. ON A CONTINUED DROP IN SPACE TEMPERATURE, VARIABLE FREQUENCY DRIVE SHALL INCREASE FAN SPEED, HEAT PUMP SHALL ACTIVATE SECOND STAGE OF HEATING, AND DX COIL UPPER SECTION RETURN AIR MOTORIZED DAMPER SHALL OPEN AS NECESSARY TO MAINTAIN DISCHARGE TEMPERATURE, UNTIL SPACE TEMPERATURE IS SATISFIED.

FOR UNITS PROVIDED WITH MOTORIZED OUTSIDE AIR DAMPERS (INDICATED BY 'DCV' IN EQUIPMENT SCHEDULE), DAMPER SHALL BE CLOSED WHEN IN THE UNOCCUPIED MODE. WHEN PLACED INTO THE OCCUPIED MODE BY THE BAS, OUTSIDE AIR DAMPER SHALL REMAIN CLOSED FOR MORNING WARM-UP IF SPACE TEMPERATURE IS BELOW SETPOINT. ONCE THE SPACE TEMPERATURE SETPOINT IS REACHED, THE OUTSIDE AIR DAMPER SHALL OPEN TO THE MINIMUM POSITION (OCC MIN OA CFM AS INDICATED IN WSHP SCHEDULE), AND SHALL REMAIN OPEN WHILE IN THE OCCUPIED MODE. MOTORIZED DAMPER SHALL VARY THE VOLUME OF OUTSIDE AIR BASED ON CO2 LEVEL AS MEASURED BY A SPACE OR DUCT MOUNTED CO2 SENSOR. OUTSIDE AIR DAMPER SHALL MODULATE OPEN IF CO2 READING RISES ABOVE 500 PPM ABOVE OUTSIDE AIR CO2 LEVEL, DAMPER SHALL MODULATE CLOSED UNTIL MINIMUM POSITION IS REACHED. BAS SHALL CONTINUALLY MONITOR THE AMOUNT OF OUTSIDE AIR PROVIDED TO EACH ZONE, AND ALARM CENTRAL BAS IF CO2 SENSOR READING IS ABOVE 1000 PPM.

FOR UNITS WITH HUMIDITY CONTROLS (SHOWN WITH HOT GAS REHEAT 'HGR' IN WSHP SCHEDULE, AND HUMIDISTATS INSTALLED IN THEIR ZONES), WITH SYSTEM IN OCCUPIED OR UNOCCUPIED MODE, HUMIDITY CONTROL SYSTEM SHALL BE CAPABLE OF BEING ACTIVATED. UNDER NORMAL OPERATION, UNIT SHALL BE CONTROLLED AS OUTLINED ABOVE. IF SPACE HUMIDITY REACHES 60% RH IN THE OCCUPIED MODE OR 65% IN THE UNOCCUPIED MODE (ADJUSTABLE), HUMIDITY CONTROL SEQUENCE SHALL BE ENERGIZED THROUGH THE DDC SYSTEM. UNIT OUTSIDE AIR DAMPER SHALL CLOSE TO MINIMUM POSITION. CONDENSER WATER CONTROL VALVE SHALL OPEN AND UNIT COMPRESSORS SHALL BE MODULATED TO REHEAT AIR TO MAINTAIN SPACE CONDITIONS AS REQUIRED. WHEN SPACE HUMIDITY DROPS BELOW 55% RH IN THE OCCUPIED MODE OR 60% IN THE UNOCCUPIED MODE, BAS SHALL DEACTIVATE HUMIDITY CONTROL SEQUENCE, AND CONTROL OF THE UNITS SHALL REVERT BACK TO NORMAL OPERATION. IF SPACE HUMIDITY REACHES 65% IN THE OCCUPIED MODE OR 70% IN UNOCCUPIED MODE, AND ALARM SHALL BE SENT TO CENTRAL BAS.

GYMNASIUM WSHP STAGING
GYMNASIUM SHALL BE STAGED SUCH THAT G1 SHALL ACT AS THE FIRST STAGE OF HEATING AND COOLING, AND LOW OCCUPANCY CONSTANT VENTILATION DURING OCCUPIED TIMES. G1 SUPPLY FAN SHALL RUN CONTINUOUSLY IN THE OCCUPIED MODE AND COMPRESSORS SHALL CYCLE AS NEEDED FOR HEATING AND COOLING. G2 SHALL ACT AS THE SECOND STAGE OF HEATING, COOLING, DEHUMIDIFICATION, AND VENTILATION, OPERATING AS OUTLINED FOR NON-CLASSROOM UNITS (WITH O.A./RETURN AIR MIXING BOXES). THERMOSTAT SETPOINTS FOR G2 SHALL BE SET 2° HOTTER/COLDER THAN SETPOINTS FOR PRIMARY UNIT G1, AND UNIT SHALL ONLY BE ACTIVATED UPON A CALL FOR HEATING AND COOLING FROM THE THERMOSTAT, BY THE CO2 SENSOR INSTALLED IN THE SPACE UTILIZING DEMAND CONTROL VENTILATION AS DESCRIBED IN THE SEQUENCE, OR BY THE SPACE MOUNTED HUMIDISTAT ACTIVIATING THE DEHUMIDIFICATION SEQUENCE.

HVAC SCHEDULING
INITIAL SCHEDULES OF OPERATION SHALL BE COORDINATED AND CONFIRMED BY THE OWNER, AND PROGRAMMED BY THE CONTROLS CONTRACTOR. MODIFICATION OF SCHEDULES SHALL BE A PART OF REQUIRED OWNER TRAINING. DISCREET SCHEDULES SHALL BE PROVIDED FOR EACH DEDICATED OUTSIDE AIR UNIT, EACH INDIVIDUAL CLASSROOM WING, AUDITORIUM, STAGE, ADMINISTRATION AREA, MEDIA CENTER, CAFETERIA, KITCHEN AREA, AND GYMNASIUM.

SCHOOL CALENDAR SHALL BE PROGRAMMED INTO THE BAS SUCH THAT THE SYSTEMS REMAIN UNOCCPUIED ON DAYS THE SCHOOL IS CLOSED AND ON TEACHER WORKDAYS.

ENERGY RECOVERY VENTILATOR (ERV) UNITS SHALL OPERATE IN THE OCCUPIED MODE FROM OPENING BELL TO CLOSING BELL.

ADMINISTRATION AREA SHALL REMAIN IN THE OCCPUIED MODE DURING THE SUMMER, EXACT HOURS TO BE COORDINATED WITH THE OWNER. REMAINING WSHP'S SHALL BE INITIALLY SET TO BE IN THE OCCUPIED MODE FROM 30 MINUTES BEFORE THE OPENING BELL TO 30 MINUTES PRIOR TO THE CLOSING BELL, UNTIL MODIFIED BY START/STOP OPTIMIZATION. AFTER HOURS OPERATION FOR ALL ZONES SHALL BE COORDINATED WITH THE OWNER WITH INPUT FROM THE KITCHEN, ATHLETIC, LIBRARY, AND FINE ARTS STAFF.

OVERRIDE PANEL
A CENTRAL OVERRIDE PANEL SHALL BE LOCATED IN THE ADMIN ZONE. PANEL SHALL BE PROVIDED WITH TIMERS, LABELS, AND LED INDICATOR LIGHT FOR EACH AREA SERVED. SOFTWARE SHALL BE PROGRAMMED FOR FULLY FUNCTIONAL OVERRIDE, TO SET HVAC EQUIPMENT, RECEPTACLES, AND LIGHTING INTO THE OCCUPIED MODE FOR A SET PERIOD OF TIME. ALL OVERRIDES SHALL ALSO HAVE REMOTE CAPABILITIES THRU IP BASED ACCESS.

PANEL SHALL INCLUDE THE DISCREET ZONES FOR EACH INDIVIDUAL CLASSROOM WING, ADMINISTRATION AREA, CAFETERIA, LOBBY, KITCHEN AREA, AND GYMNASIUMS. CLASSROOM WING ACTIVATION SHALL ALSO PLACE ENERGY RECOVERY VENTILATION (ERV) SYSTEMS SERVING THAT WING INTO THE OCCUPIED MODE.

START/STOP OPTIMIZATION
BAS SHALL PROVIDE START/STOP OPTIMIZATION (SSO) FOR ALL EQUIPMENT AND SYSTEMS. SSO SHALL BE CAPABLE OF LEARNING BUILDING THERMAL CHARACTERISTICS AND RESPOND TO VARIABLE CONDITIONS. SSO SHALL START/STOP CONTROLLED EQUIPMENT AS LATE AS POSSIBLE PRIOR TO OCCUPIED TIME PERIOD AND AS EARLY AS POSSIBLE PRIOR TO UNOCCUPIED TIME PERIOD. SSO SHALL BE CALCULATED BASED ON OUTDOOR AIR TEMPERATURE, ZONE TEMPERATURES, AND CONTROL SETPOINT/SETBACK TEMPERATURES.

SMOKE DETECTORS
SMOKE DETECTOR SHALL BE PROVIDED IN THE RETURN DUCT PRIOR TO THE OUTSIDE AIR DUCT CONNECTION. DETECTOR SHALL INTERFACE WITH FIRE ALARM SYSTEM AND SHUT-DOWN UNIT FANS UPON ACTIVATION. WHERE APPLICABLE, DETECTORS SHALL BE INSTALLED IN THE LOWER SECTION OF
THE RETURN AIR PLENUM BUILT BEHIND THE UNIT (SEE MECHANICAL DRAWINGS FOR DETAILS).

IDF/MDF ROOM SPLIT SYSTEMS:
UNITS SHALL PROVIDE COOLING IN DATA/SERVER ROOMS ON A CONTINUOUS BASIS. SUPPLY FAN AND COOLING CYCLE SHALL CYCLE WITH A CALL FOR COOLING TO MAINTAIN ROOM TEMPERATURE SETPOINT OF 75° F. BAS SHALL MONITOR SYSTEM STATUS AND SHALL ALSO MONITOR ROOM TEMPERATURE. AN ALARM SHALL BE ACTIVATED IF THE ROOM TEMPERATURE RISES ABOVE 85° F.

UNIT HEATERS
UNIT HEATERS SHALL BE PROVIDED WITH A LOW VOLTAGE THERMOSTAT. UNIT HEAT AND FAN SHALL BE ENERGIZED WHEN SPACE TEMPERATURE FALLS BELOW SETPOINT. INITIAL SYSTEM SETPOINTS SHALL BE 50° F.

EXHAUST FANS
CONTROL DEVICES (SWITCHES, THERMOSTATS, INTERLOCKS, ETC.) SHALL BE PROVIDED AS REQUIRED TO COMPLY WITH INTENT OF OPERATION AS INDICATED ON THE FAN SCHEDULE. ELECTRICAL AND MECHANICAL ROOM EXHAUST FANS SHALL BE SET TO MAINTAIN 85° F.

DOMESTIC HOT WATER SYSTEM
BAS SHALL HAVE GLOBAL CONTROL OVER DOMESTIC WATER HEATING SYSTEM. WATER HEATERS SHALL CYCLE ON AND OFF BASED ON THIER TANK TEMPERATURES, TO MAINTAIN 140° FOR WH-1 AND WH-2. AN ALARM SHALL BE GENERATED SHOULD EITHER TANK DEVIATE FROM SETPOINT BY 10° EITHER HIGH OR LOW. AN ALARM SHALL ALSO BE GENERATED SHOULD THE DOMESTIC HWS TEMPERATURE DEVIATE FROM SETPOINT BY 10° EITHER HIGH OR LOW. CIRCULATION PUMPS SHALL OPERATE ON A SCHEDULED BASIS BASED ON BUILDING OCCUPANCY. THE PUMPS SHALL BE CAPABLE OF OPERATING ON SEPARATE SCHEDULES, SHOULD THE KITCHEN SCHEDULE DIFFER FROM THE ENTIRE BUILDING. A TEMPERATURE SENSOR SHALL BE MOUNTED IN THE END OF THE LINE CAPABLE OF OVERRIDING THE PUMP SHOULD THE LOOP TEMPERATURE FALL BELOW 105° FOR CP-1 OR 130° FOR CP-2. BAS SHALL ALSO MONITOR BOTH DOMESTIC HWR TEMPERATURES AND DOMESTIC WATER SUPPLY TEMPERATURE FOR TRACKING PURPOSES. COORDINATE ALL TEMPERATURE SENSOR LOCATIONS WITH PLUMBING CONTRACTOR.

WATER HEATER ROOM OXYGEN DEPLETION
PROVIDE A CARBON MONOXIDE SENSOR IN THE WATER HEATER ROOM, TIED INTO THE CENTRAL DDC SYSTEM TO ALARM OXYGEN DEPLETION. THE SENSOR SHALL ACTIVATE AN AUDIBLE AND VISUAL ALARM INSIDE THE ROOM, ACTIVATE THE VENTILATION FAN, ALARM SHALL BE SENT TO THE DDC IF CO LEVELS EXCEED 50 PPM OVER A CONTINUOUS 8 HOUR PERIOD, OR IF THEY EXCEED 100 PPM OVER A CONTINUOUS 60 SECOND PERIOD.

A PUSH BUTTON EMERGENCY GAS SHUTOFF SWITCH SHALL BE PROVIDED AT THE INDICATED MECHANICAL ROOMS TO CLOSE A SOLENOID VALVE IN THE GAS LINE SERVING DOMESTIC WATER HEATERING EQUIPMENT. ACTIVATION OF THE SWITCH SHALL CLOSE THE GAS VALVE AND ALARM THE CENTRAL BAS (VALVE AND SWITCH BY P.C.)

NOTES:
1. SEE SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
2. ALL CONTROL SETPOINTS SHALL BE ADJUSTABLE BY THE USER SCHOOL STAFF, AND MAINTENANCE DEPARTMENT. INDICATED SCHEDULES AND SETPOINTS SHOULD BE USED FOR ORIGINAL SYSTEM SET-UP. ANY CHANGES IN SETPOINT SETTINGS REQUIRED FOR INTENDED SYSTEM OPERATION SHALL BE APPROVED BY THE ENGINEER AND SHALL BE DISCREETLY INDICATED ON THE AS-BUILT DRAWINGS.
3. IONIZATION TYPE DUCT SMOKE DETECTORS SHALL BE PROVIDED BY THE ELECTRICAL CONTRACTOR, INSTALLED IN THE DUCT BY THE MECHANICAL CONTRACTOR AND WIRED TO SHUT DOWN THE UNIT AND FOR FIRE ALARM INTERFACE BY THE ELECTRICAL CONTRACTOR.
4. ELECTRICAL CONTRACTOR SHALL PROVIDE A DEDICATED 120V CIRCUIT IN A J-BOX FOR CONTROL POWER. CONTROLS CONTRACTOR SHALL EXTEND 120V POWER FROM J-BOX TO CONTROL PANELS, DAMPER ACTUATORS, TRANSFORMERS, ETC. AS REQUIRED FOR OPERATION OF CONTROL SYSTEM. BAS CONTRACTOR SHALL PROVIDE ALL 120V
5. BAS SHALL ALLOW GLOBAL OPERATION OF HEAT PUMP SETPOINTS.
6. ALL FACTORY INSTALLED EQUIPMENT SAFETIES (HIGH LIMIT, LOW LIMIT, LOW TEMP., HIGH TEMP., LOW FLOW, HEAD PRESSURE, ETC.) SHALL BE ACTIVE TO PROTECT EQUIPMENT PER MANUFACTURER'S RECOMMENDATIONS. BAS SHALL MONITOR ALL EQUIPMENT SAFETIES AND ACTIVATE ALARMS TO REPORT ACTIVATION OF EQUIPMENT SAFETIES.
7. MECHANICAL CONTRACTOR SHALL COORDINATE ALL EQUIPMENT COMMUNICATION/INTEGRATION REQUIREMENTS PRIOR TO EQUIPMENT SUBMITTALS. EQUIPMENT SUBMITTALS SHALL BE REVIEWED AND APPROVED BY THE CONTROLS VENDOR (APPROVAL SHALL BE INDICATED ON THE SUBMITTAL) PRIOR TO SUBMITTING TO THE DESIGN TEAM FOR APPROVAL. ANY SUBMITTALS RECEIVED WITHOUT CONTROLS VENDOR APPROVAL WILL BE RETURNED WITHOUT REVIEW.

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601 Main Street, Bayboro, NC, 28515

ENERGY STAR PARTNER

No.	Date	Description

ISSUE DATE:	06/12/24
PROJECT #:	2205
DRAWN BY:	TAL
CHECKED BY:	JWM

MECHANICAL CONTROLS SEQUENCES OF OPERATION

M-601

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POINTS LIST - INPUT/OUTPUT SUMMARY

SYSTEM, APPARATUS, OR AREA POINT DESCRIPTION	INPUTS: ANALOG: MEASURED												CALC.				BINARY					
	TEMPERATURE	PRESSURE	RH	KW	AIR FLOW	WATER FLOW	CO2	VELOCITY	RPM	VOLTS	AMPS	HERTZ	KWH	ENTHALPY	RUN TIME	EFFICIENCY	STATUS	FILTER	SMOKE	FREEZE	AIR FLOW	METER
Geothermal Plant																						
Geothermal Supply Temp - CIRCUIT 1	X																					
Geothermal Return Temp - CIRCUIT 1	X																					
Geothermal Supply Temp - CIRCUIT 2	X																					
Geothermal Return Temp - CIRCUIT 2	X																					
Geothermal Supply Temp - CIRCUIT 3	X																					
Geothermal Return Temp - CIRCUIT 3	X																					
Geothermal Supply Temp - CIRCUIT 4	X																					
Geothermal Return Temp - CIRCUIT 4	X																					
Geothermal Supply Temp - CIRCUIT 5	X																					
Geothermal Return Temp - CIRCUIT 5	X																					
Geothermal Supply Temp - CIRCUIT 6	X																					
Geothermal Return Temp - CIRCUIT 6	X																					
Geothermal Supply Temp - CIRCUIT 7	X																					
Geothermal Return Temp - CIRCUIT 7	X																					
Geothermal Supply Temp - CIRCUIT 8	X																					
Geothermal Return Temp - CIRCUIT 8	X																					
WSHP																						
Supply Fan																	X					
Supply VFD on/off																						
Supply VFD Speed																						
Supply VFD Status																	X					
CW Valve																						
Compressor #1																	X					
Compressor #2 & RA Damper #2																	X					
Space Temp	X																					
Space CO2							X															
Space RH			X																			
Supply Temp	X																					
Over-ride																						
Setpoint Adjust																						
Return Air Smoke (by elec. contr.)																			X			
OA Damper (damper by controls contr.)																						
Hot Gas Reheat Valve																						
Reversing Valve																						
Safety																	X					
Condensate Overflow																	X					
Local Occupancy																	X					
Circulator Pump(s)																	X					
Refrigerant Detection System																						
ERVs																						
Supply Fan																	X					
Exhaust Fan																	X					
Heat Wheel Exh Fan																	X					
Exhaust Damper																						
Return Damper																						
Entering Supply Air Temp	X																					
Leaving Supply Air Temp	X																					
Leaving Supply Air RH			X																			
Entering Exhaust Air Temp	X																					
Entering Exhaust Air RH			X																			
Override																						
Exhaust Air Smoke																			X			
Supply Filter Status																		X				
Exhaust Filter Status																		X				
Fans																						
Core Toilet Fans																						
Misc. Fans																						
Split Systems (Server/Data Rooms)																						
Supply Fan																	X					
DX Compressor																	X					
Space Temp	X																					
Supply Temp	X																					
Override																						
Setpoint Adjust																						
Misc. Points																						
Freezer Temp	X																					
Cooler Temp	X																					
OA Temp	X													X								
OA CO2							X							X								
Dew Point	X													X								
Domestic Water Meter						X											X					
NG Gas Meter									X								X					
Fire Alarm Status																	X					
Kitchen Hood/MAU/KEF																	X					

SYSTEM, APPARATUS, OR AREA POINT DESCRIPTION	OUTPUTS: DIGITAL				OUTPUTS: ANALOG				SYSTEM FEATURES: ALARMS					SYSTEM FEATURES: PROGRAMS											GENERAL	SUPPLMENT. NOTES
	OFF-ON	OFF-AUTO-ON	OFF-HI-LO	OPEN-CLOSE	DMPR. POS.	VALVE POS.	SETPOINT ADJ.	STEP CONTROL	HI ANALOG	LO ANALOG	HI BINARY	LO BINARY	PROOF	TIME SCHEDULING	DEMAND LIMITING	DUTY CYCLE	START/STOP OPT.	ENTHALPY OPT.	SMOKE CNT.	TREND	ALARM INSTRUCT	MAIN. WK. ORD.	OCC. OVERRIDE	BYPASS C'OVER	COLOR GRAPHIC	
Geothermal Plant																										
Geothermal Supply Temp - CIRCUIT 1																										
Geothermal Return Temp - CIRCUIT 1																										
Geothermal Supply Temp - CIRCUIT 2																										
Geothermal Return Temp - CIRCUIT 2																										
Geothermal Supply Temp - CIRCUIT 3																										
Geothermal Return Temp - CIRCUIT 3																										
Geothermal Supply Temp - CIRCUIT 4																										
Geothermal Return Temp - CIRCUIT 4																										
Geothermal Supply Temp - CIRCUIT 5																										
Geothermal Return Temp - CIRCUIT 5																										
Geothermal Supply Temp - CIRCUIT 6																										
Geothermal Return Temp - CIRCUIT 6																										
Geothermal Supply Temp - CIRCUIT 7																										
Geothermal Return Temp - CIRCUIT 7																										
Geothermal Supply Temp - CIRCUIT 8																										
Geothermal Return Temp - CIRCUIT 8																										
WSHP														X	X		X								X	
Supply Fan	X												X													
Supply VFD on/off		X																								WHERE APPLICABLE
Supply VFD Speed							X																			WHERE APPLICABLE
Supply VFD Status													X													WHERE APPLICABLE
CW Valve				X																						
Compressor #1	X												X													
Compressor #2 & RA Damper #2	X				X								X													WHERE APPLICABLE
Space Temp																										
Space CO2																										WHERE INDICATED
Space RH																										WHERE INDICATED
Supply Temp																										
Over-ride																							X			
Setpoint Adjust							X																			
Return Air Smoke (by elec. contr.)																					X					WHERE INDICATED
OA Damper (damper by controls contr.)					X																					WHERE INDICATED
Hot Gas Reheat Valve				X																						WHERE INDICATED
Reversing Valve				X																						WHERE INDICATED
Safety																										
Condensate Overflow																										
Local Occupancy																										
Circulator Pump(s)	X												X													
Refrigerant Detection System											X															
ERVs														X	X		X								X	
Supply Fan	X												X													
Exhaust Fan	X												X													
Heat Wheel Exh Fan	X												X													
Exhaust Damper					X																					
Return Damper					X																					
Entering Supply Air Temp																										
Leaving Supply Air Temp																										
Leaving Supply Air RH																										
Entering Exhaust Air Temp																										
Entering Exhaust Air RH																										
Override																							X			
Exhaust Air Smoke																					X					
Supply Filter Status																										
Exhaust Filter Status																										
Fans																									X	
Core Toilet Fans	X													X												
Misc. Fans																										SEE HVLS/FAN SCHEDULES
Split Systems (Server/Data Rooms)														X											X	
Supply Fan	X												X													
DX Compressor																										
Space Temp									X																	
Supply Temp																										
Override																							X			
Setpoint Adjust							X																			
Misc. Points																										
Freezer Temp									X																	
Cooler Temp									X																	
OA Temp																										
OA CO2																										
Dew Point																										
Domestic Water Meter									X																	
NG Gas Meter									X																	
Fire Alarm Status																										
Kitchen Hood/MAU/KEF													X													

GENERAL NOTE:
INPUT/OUTPUT SUMMARY IS A GENERAL LIST OF CONTROL POINTS REQUIRED FOR THE OPERATION OF THE MECHANICAL SYSTEM. IN ADDITION TO CONTROL POINTS INDICATED, THE CONTROLS CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ADDITIONAL POINTS AS REQUIRED FOR OPERATION OF THE MECHANICAL SYSTEM AS SPECIFIED AND OUTLINED IN THE SEQUENCE OF OPERATION, AND TO COMPLY WITH THE SPECIFICATIONS.

SYSTEM, APPARATUS, OR AREA POINT DESCRIPTION	INPUTS: ANALOG: MEASURED												CALC.							BINARY							
	TEMPERATURE	PRESSURE	RH	KW	AIR FLOW	WATER FLOW	CO2	VELOCITY	THERMS	VOLTS	AMPS	HERTZ	KWH	ENTHALPY	RUN TIME	EFFICIENCY	KVA	POWER FACTOR	KVAR	STATUS	FILTER	SMOKE	FREEZE	AIR FLOW	METER	OVER-RIDE	LEVEL
Domestic H.W.																											
Circulation Pump																				X							
Domestic Cold Water Temp	X																										
WH Storage Tank	X																										
Building Domestic HWS Temp	X																										
Building End of Line Temp	X																										
Kitchen System HWS Temp	X																										
Kitchen System End of Line Temp	X																										
Electrical Systems																											
Main Service - Total Elec Demand				X																							
Main Service - Total Elec Consumption													X														
Current - Phase A											X																
Current - Phase B											X																
Current - Phase C											X																
Average Current											X																
Voltage - AB Line-to-Line										X																	
Voltage - BC Line-to-Line										X																	
Voltage - CA Line-to-Line										X																	
Voltage - Avg Line-to-Line										X																	
Voltage - AN Line-to-Neutral										X																	
Voltage - BN Line-to-Neutral										X																	
Voltage - CN Line-to-Neutral										X																	
Voltage - Avg Line-to-Neutral										X																	
KW Total (Real Power)				X																							
KW Demand				X																							
KW Maximum Demand				X																							
KVA Total (Apparent Power)																	X										
KVAR Total (Reactive Power)																			X								
KWH Total (Energy)													X														
Power Factor																		X									
Frequency												X															
Total Building Consumption				X									X														
Total Standby Power Consumption				X									X														
Total Life Safety Consumption				X									X														
Emergency Generator																											
Current - Phase A											X																
Current - Phase B											X																
Current - Phase C											X																
Average Current											X																
Voltage - AB Line-to-Line										X																	
Voltage - BC Line-to-Line										X																	
Voltage - CA Line-to-Line										X																	
Voltage - Avg Line-to-Line										X																	
Voltage - AN Line-to-Neutral										X																	
Voltage - BN Line-to-Neutral										X																	
Voltage - CN Line-to-Neutral										X																	
Voltage - Avg Line-to-Neutral										X																	
KW Total (Real Power)				X																							
KW Demand				X																							
KW Maximum Demand				X																							
KVA Total (Apparent Power)																	X										
KVAR Total (Reactive Power)																			X								
KWH Total (Energy)													X														
Power Factor																		X									
Frequency												X															

SYSTEM, APPARATUS, OR AREA POINT DESCRIPTION	OUTPUTS: DIGITAL				OUTPUTS: ANALOG				SYSTEM FEATURES: ALARMS					SYSTEM FEATURES: PROGRAMS									GENERAL	SUPPLMENT. NOTES
	OFF-ON	OFF-AUTO-ON	OFF-HI-LO	OPEN-CLOSE	DMPR. POS.	VALVE POS.	SETPOINT ADJ.	STEP CONTROL	HI ANALOG	LO ANALOG	HI BINARY	LO BINARY	PROOF	TIME SCHEDULING	DEMAND LIMITING	DUTY CYCLE	START/STOP OPT.	ENTHALPY OPT.	SMOKE CNT.	TREND	ALARM INSTRUCT	MAIN. WK. ORD.	COLOR GRAPHIC	
Domestic H.W.														X									X	
Circulation Pump		X											X											Typical of 2
Domestic Cold Water Temp																								
WH Storage Tank																								Typical of 3
Building Domestic HWS Temp																								
Building End of Line Temp																								
Kitchen System HWS Temp																								
Kitchen System End of Line Temp																								

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ENERGY STAR PARTNER

No.	Date	Description

ISSUE DATE: 06/12/24

PROJECT #: 2205
DRAWN BY: TAL
CHECKED BY: JWM

MECHANICAL CONTROL POINTS LIST

M-602

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