

3/20/2024 5:26:42 PM Autodesk Docs/1/23/25-01 ROPS WE Condiff ES/23500 MEP Central v2.dwg

A

B

C

D

E

FANS											
MARK	CAPACITY, CFM	STATIC PRESSURE, IN. H2O	MAX. DAMPER PRESSURE DROP, IN. H2O	INLET dBA	MOTOR HP	MAX. BHP	MANUF.	MODEL NO.	LOCATION	SERVICE	QTY.
F-1	200	0.25	.15	48	0.07	.03	GREENHECK	G-070-VG	B104 - Boys RR	CAF RESTROOMS	1
F-2	250	0.25	.09	52	0.1	.04	GREENHECK	G-080-VG	C109 - STORAGE	MISC	1
F-CLINIC	235	0.25	.08	51	0.1	.04	GREENHECK	G-080-VG	CLINIC	CLINIC	1
F-DW	0	0.00			0		GREENHECK	G-090-VG			0
F-KIT	0	0.00			0		GREENHECK	G-120-VG			0

PUMPS (BELL & GOSSETT)									
MARK	MAX. CAP., GPM	MIN. CAP., GPM	HEAD, FT. H2O	HP	MAX. BHP	SIZE	SERIES	SYSTEM / AREA SERVED	VOLTAGE, V
BP-1	70	70	5	0.5			110	BOILER-1 CIRCULATION	120
BP-2	70	70	5	0.5			110	BOILER-2 CIRCULATION	120
CDP-1	430	0	65	15		1510	1510	CONDENSER LOOP DUTY	480
CDP-2	430	0	65	15		1510	1510	CONDENSER LOOP STANDBY	480
CTP-1	430	0	40	0		1510	1510	COOLING TOWER DUTY	480
CTP-2	430	0	40	0		1510	1510	COOLING TOWER STANDBY	480

COOLING TOWER									
MARK	MANUFACTURER	MODEL	OUTDOOR TEMP., °F WB	APPROACH, °F	COOLING RANGE, °F	FLOW RATE, GPM	PRESSURE DROP, PSI	FAN MOTOR HP	VOLTAGE, V
CT-1	BAC	XES3E-8518-05G							

HOT WATER BOILERS						
MARK	MANUFACTURER	MODEL NO.	CAPACITY MBH, NET IBR	BURNER FIRING RATE, CFH	MINIMUM AHRI THERMAL EFF., %	MINIMUM TURNDOWN
B-1	ENDURA	1500	1400.0	1500	93.5	11:1
B-2	ENDURA	1500	1400.0	1500	93.5	11:1

DUCTLESS SPLIT SYSTEM AIR CONDITIONING UNITS							
MARK	MANUFACTURER	MODEL NO.	COOLING CAPACITY, MBH	COOLING (SEER)	AIR FLOW, 290 CFM	OUTDOOR UNIT MARK	QUANTITY
DSS-1	MITSUBISHI	PKA-A12	12	13.8	290	PUY-A12	4

ELECTRIC UNIT HEATERS									
MARK	CFM	HEATING CAPACITY WATTS	MBH	MOTOR HP	ARRGMT	MANUFACTURER	MODEL	VOLTAGE, V	QUANTITY
EUH-1	400	3,300	11.3	0.01	VERTICAL	TRANE	5103	208	2

WALL HEATERS							
MARK	MANUFACTURER	HEATING CAPACITY, KW	HEATING CAPACITY, MBH	MODEL NO.	REMARKS	VOLTAGE, V	QUANTITY
WH-1	MARKEK	2	6.8	3452	RECESSED	208	5

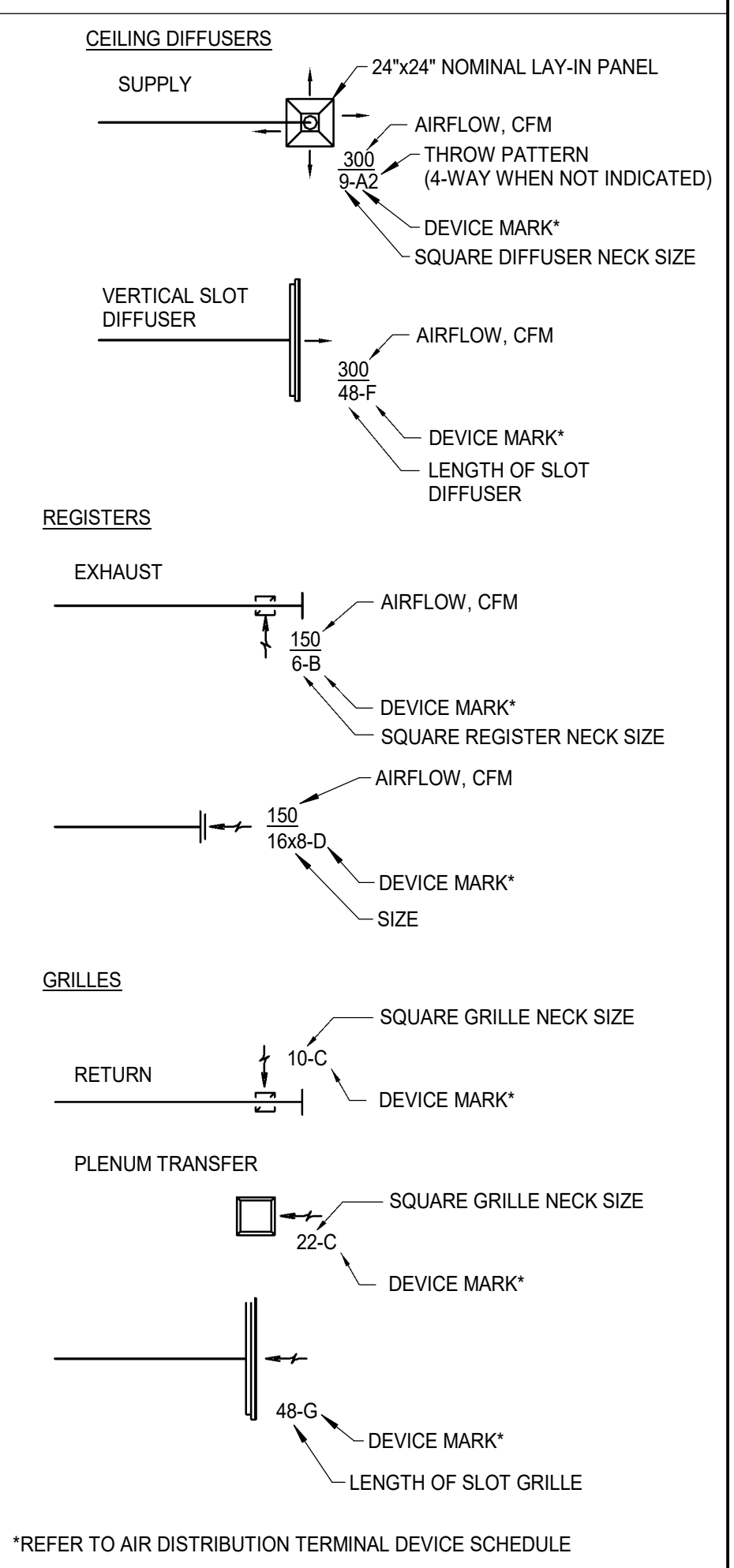
BRAZED PLATE HEAT EXCHANGERS											
HOT SIDE						COLD SIDE					
MARK	GPM	MEDIUM	EWI, °F	LWT, °F	WPD, FT. H2O	GPM	MEDIUM	EWI, °F	LWT, °F	WPD, FT. H2O	MANUF. MODEL
HX	430.0		70.0	90.0	0	430.0		60.0	50.0	0.0	

WATER SOURCE HEAT PUMP (OFCI)															
MARK	SUPPLY AIRFLOW (CFM)	ESP (IN. H2O)	FAN SPEED	COOLING CAPACITY - TOTAL (MBH)	COOLING CAPACITY - SENSIBLE (MBH)	COOLING ENTERING AIR TEMP. °F DB	COOLING ENTERING AIR TEMP. °F WB	HEATING CAPACITY (MBH)	HEATING ENTERING AIR TEMP. °F DB	COMPRESS OR INPUT MAX KW	WATER SIDE FLOW (GPM)	WATER SIDE PD (FT H2O)	ARRANGEMENT	MODEL	QTY
HP-1	835	0.15	HIGH	28.3	20.2	75	63	33.8	70	2.44	7.0	12.8	VERTICAL	TTV-038	1
DOAS-1	5,200	17.2	0	480	1.25	0	5.07	1,538	5,200	43.9	150.0	120.0	8.1	208.1	81.8
HP-2	835	0.15	HIGH	28.3	20.2	75	63	33.8	70	2.44	7.0	12.8	VERTICAL	TTV-038	1
HP-3	990	0.15	HIGH	19.3	18.1	67	75	21.6	70	2.44	4.5	7.7	HORIZONTAL	50PCH018	2
HP-4	1,470	0.15	HIGH	38.3	32.0	75	63	41.0	70	2.44	9.0	12.5	VERTICAL	TTV-038	3
HP-5	1,600	0.42	LOW	47.8	35.0	75	63	60.1	70	2.44	12.0	6.5	VERTICAL	TTV-038	19

DEDICATED OUTSIDE AIR ROOFTOP UNITS																																																														
MARK	OUTDOOR AIR, CFM	EER	MOP, A	VOLTAGE, V	SUPPLY FAN										GAS FURNACE										COOLING COIL										REHEAT COIL LEAVING AIR TEMP., °DB	TOTAL ENERGY RECOVERY WHEEL										EXHAUST FAN				RETURN AIR FILTER		CONDENSER SECTION				COOLING G COIL		OUTDOOR AIR FILTER		MAX. WEIGHT, LBS.	MANF.	MODEL
					EXT. S.P., IN. H2O		QTY.	HP	MAX BHP	MAX RPM	AIRFLOW, CFM	ENT. AIR, °F	INPUT, MBH	OUTPUT, MBH	MODULATION	CAPACITY, MBH	ENTERING AIR, °DB	ENTERING AIR TEMP., °WB	LEAVING AIR TEMP., °DB	LEAVING AIR TEMP., °WB	P.D., FT. H2O	RUNOUT	SUMMER										WINTER				AIRFLOW, CFM	EXT. S.P., IN. H2O	HP	TOTAL MAX BHP	MAX RPM	TYPE	EFF	COOLING EWT	COOLING LWT	HEATING EWT	HEATING LWT	GPM	TYPE	EFF												
					EXHAUST AIR, CFM	EXHAUST APD, IN-WG																	EXHAUST LAT °DB/WB	OUTSIDE EAT °DB/WB	RETURN EAT °DB/WB	SUPPLY LAT °DB/WB	EXHAUST LAT °DB	OUTSIDE EAT °DB	RETURN EAT °DB	SUPPLY LAT °DB																																
DOAS-1	5,200	17.2	0	480	1.25	0	5.07	1,538	5,200	43.9	150.0	120.0	8.1	209.1	81.8	67.6	54.7	54.4	75	81.8	19.5	0	70	43.9	4680	1.00	2.48	1,750	30.0	0	70	43.9	4680	1.00	2.48	1,750	30.0	0	70	43.9	4680	1.00	2.48	1,750	6,000	TRANE	HORIZON															
DOAS-3	4,720	14.6	0	480	1.00	0	4.74	1,516	4,720	37.1	150.0	120.0	8.1	231.6	83.7	68.8	52.8	52.6	75	83.7	27	0	70	37.1	4250	0.75	2.58	2,220	30.0	0	70	37.1	4250	0.75	2.58	2,220	30.0	0	70	37.1	4250	0.75	2.58	2,220	6,000	TRANE	HORIZON															
DOAS-4	2,530	15.6	0	480	0.75	0	2.17	2,849	2,530	47.1	50.0	40.0	8.1	90.5	81.0	67.2	55.9	55.6	75	81	15.6	0	70	47.1	2502	0.50	.31	2,427	10.0	0	70	47.1	2502	0.50	.31	2,427	10.0	0	70	47.1	2502	0.50	.31	2,427	3,500	TRANE	HORIZON															
DOAS-5	3,240	18.7	0	480	1.00	0	1.96	2,019	3,240	42.3	150.0	120.0	8.1	144.6	82.2	67.9	53.3	53.1	75	88.4	2850	.73	89.1	95	75	82.2	20.3	0	90	42.3	8502	0.75	1.21	1,712	28.0	0	90	42.3	8502	0.75	1.21	1,712	5,500	TRANE	HORIZON																	

WATER SOURCE HEAT PUMP ROOFTOP UNIT																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
MARK	TOTAL AIR, CFM	OUTDOOR AIR, CFM	EER	MOP, A	VOLTAGE, V	SUPPLY FAN					GAS FURNACE					COOLING COIL					REHEAT COIL LEAVING AIR TEMP., °DB	TOTAL ENERGY RECOVERY WHEEL										RETURN AIR FILTER				CONDENSER SECTION					COOLING COIL		OUTDOOR AIR FILTER			MANF.	MODEL																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
						EXT. S.P. IN. H2O	HP	MAX BHP	MAX RPM	AIRFLOW, CFM	ENT. AIR, °F	INPUT, MBH	OUTPUT, MBH	CAPACITY, MBH	ENTERING AIR, °DB	ENTERING AIR TEMP., °WB	LEAVING AIR TEMP., °DB	LEAVING AIR TEMP., °WB	SUMMER					WINTER					EXHAUST FAN				COOLING EWT	COOLING LWT	HEATING EWT	HEATING LWT	GPM FLOW	GPM	TYPE	EFF	MAX. WEIGHT, LB																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
																			EXHAUST APD, IN-WG	EXHAUST LAT °DB/WB		EXHAUST OUT °DB/WB	OUTSIDE EAT °DB/WB	RETURN EAT °DB/WB	SUPPLY LAT °DB/WB	APD, IN-WG	EXHAUST LAT °DB	OUTSIDE EAT °DB	RETURN EAT °DB	SUPPLY LAT °DB	AIRFLOW, CFM	EXT. S.P. IN. H2O										QTY.	HP	TOTAL MAX BHP	MAX RPM			TYP.	EFF.	COOLING	COOLING	HEATING	HEATING																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
PAC-CAF	8,000	3,550	14.6	0	480	0.75	0	6.78	2,098	8,000	57.1	400.0	324.0	248.0	78.4	65.3	55.1	55.0	86.4	3050	25	88.9	95	75	82.6		21	0	70	40.9	3050	0.25	1	HP	1.06	1,643																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														</

DIFFUSER, REGISTER & GRILLE LEGEND



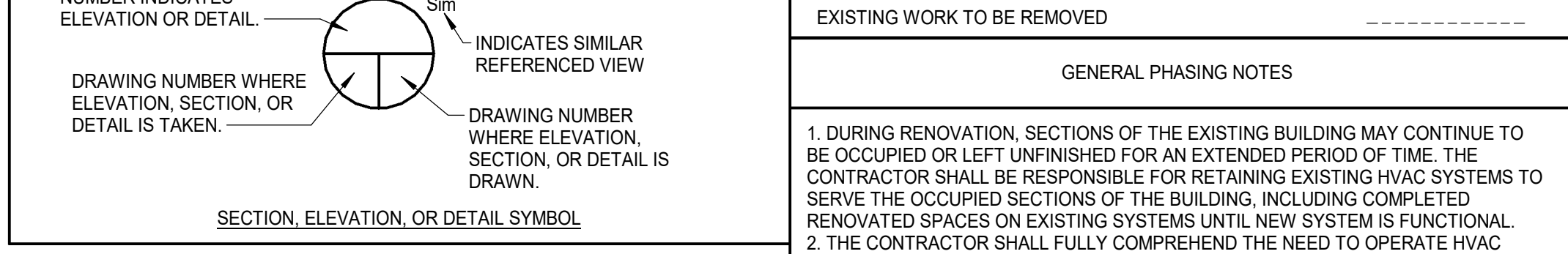
STANDARD ABBREVIATIONS

SYMBOL	ABBREVIATION	DESCRIPTION
Ø	DIAMETER	
ABV	ABOVE	
APF	ABOVE FINISHED FLOOR	
APD	AIR PRESSURE DROP	
AUTO	AUTOMATIC	
AAV	AUTOMATIC AIR VENT	
AUX	AUXILIARY	
BEL	BELOW	
BTU	BRITISH THERMAL UNIT	
BTUH	BTU PER HOUR	
CAP	CAPACITY	
CFM	CUBIC FEET PER MINUTE	
CO	CLEANOUT	
CONN	CONNECT	
CONT	CONTINUATION	
CR	CONTROL RELAY	
CTR	CURRENT RELAY	
CW	COLD WATER	
DB	DRY BULB	
dB	DECIBEL	
DDC	DIRECT DIGITAL CONTROL	
DISC	DISCONNECT SWITCH	
DP	DOUBLE POLE	
DN	DOWN	
EXT	EXISTING	
EA	EACH	
EAT	ENTERING AIR TEMPERATURE	
ELEC	ELECTRIC	
EQUIP	EQUIPMENT	
ENT	ENTERING	
EWI	ENTERING WATER TEMP	
ESP	EXTERNAL STATIC PRESSURE	
ETR	EXISTING TO REMAIN	
F	FAHRENHEIT	
FA	FIRE ALARM	
FDPR	FIRE DAMPER	
FS/DR	COMBINATION FIRE/SMOKE DAMPER	
FIN FL	FINISHED FLOOR	
FL	FLOOR	
FLA	FULL LOAD AMPS	
FR	FROM or FAN RELAY	
FS	FIRESTAT	
FT	FEET	
GAL	GALLONS	
GPM	GALLONS PER MINUTE	
H2O	WATER COLUMN or WATER GAUGE	
HOA	HAND-OFF-AUTOMATIC	
HP	HORSEPOWER	
HZ	HERTZ	
IN	INCHES	
KW	KILOWATTS	
LAT	LEAVING AIR TEMPERATURE	
LBS	POUNDS	
LVD	LOW VOLTAGE MOTOR OPERATED DAMPER	
LWT	LEAVING WATER TEMPERATURE	
MAV	MANUAL AIR VENT	
MAX	MAXIMUM	
MBH	THOUSAND BTU PER HOUR	
MECH	MECHANICAL	
MIN	MINIMUM	
MOT	MOTOR OPERATED DAMPER (LINE VOLTAGE)	
MP SW	MOTOR PROTECTIVE SWITCH	
MVD	MOUNTED	
MVD	MANUAL VOLUME DAMPER	
NC	NORMALLY CLOSED	
NIC	NOT IN CONTRACT	
NO	NORMALLY OPEN	
NTS	NOT TO SCALE	
OA	OUTSIDE AIR	
OAS	OUTSIDE AIR SYSTEM	
OBD	OPPOSED BLADE DAMPER	
OCC	OCCUPANCY or OCCURRED	
PD	PRESSURE DROP	
RA	RETURN AIR	
RECT	RECTANGULAR	
SDR	DUCT SMOKE DETECTOR	
SDPR	SMOKE DAMPER	
SS	STAINLESS STEEL	
SIS	START-STOP	
SUSP	SUSPENDED	
SW	SWITCH	
TEMP	TEMPERATURE	
TYP	TYPICAL	
V	VOLT	
VERT	VERTICAL	
W	WATTS	
WB	WET BULB	
WC	WATER COLUMN	
WG	WATER GAUGE	
WT	WEIGHT	
W	WITH	

COORDINATION NOTE

ALL DUCTWORK AND PIPES SHALL BE COORDINATED WITH OTHER DUCTS, PIPES, LIGHTS, STRUCTURAL SYSTEM, CEILING SUPPORTS AND FRAMING BEFORE INSTALLATION. MINOR DUCT OFFSETS AND TRANSITIONS SHALL BE PROVIDED AS REQUIRED. WHERE TRANSITIONS ARE REQUIRED, CROSS SECTIONAL AREA OF DUCT SHALL NOT BE REDUCED. MEASUREMENTS FOR VERTICAL CLEARANCES OF DUCTWORK SHALL BE TAKEN AT THE JOB SITE BEFORE FABRICATION OF ANY DUCTWORK.

IDENTIFICATION KEY



GENERAL PHASING NOTES

1. DURING RENOVATION, SECTIONS OF THE EXISTING BUILDING MAY CONTINUE TO BE OCCUPIED OR LEFT UNFINISHED FOR AN EXTENDED PERIOD OF TIME. THE CONTRACTOR SHALL BE RESPONSIBLE FOR RETAINING EXISTING HVAC SYSTEMS TO SERVE THE OCCUPIED SECTIONS OF THE BUILDING, INCLUDING COMPLETED RENOVATED SPACES ON EXISTING SYSTEMS UNTIL NEW SYSTEM IS FUNCTIONAL.

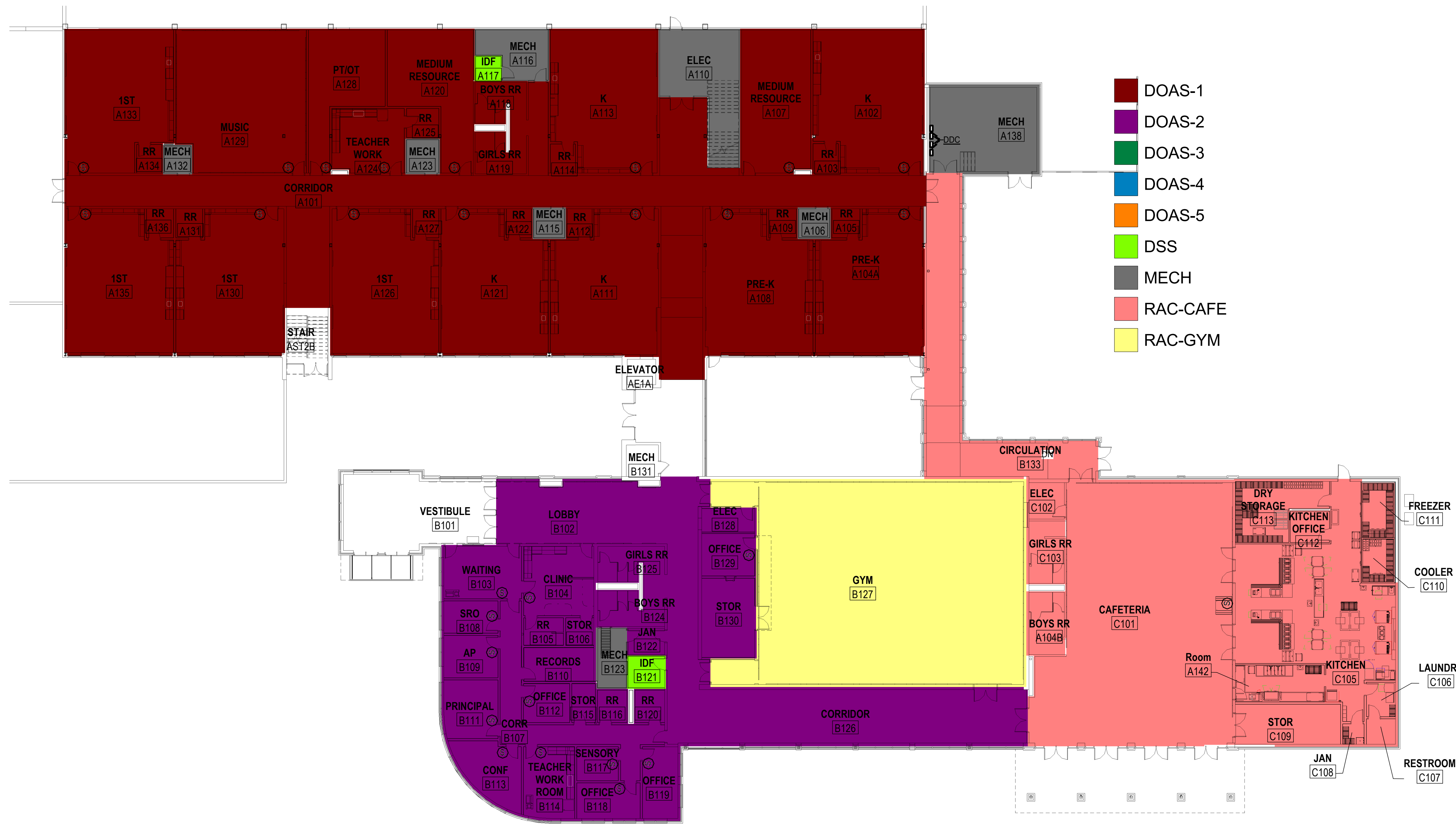
2. THE CONTRACTOR SHALL FULLY COMPREHEND THE NEED TO OPERATE HVAC SYSTEMS DURING CONSTRUCTION AND SHALL SEAL OFF DUCTWORK SERVING AREAS UNDER CONSTRUCTION, INCLUDING PROVIDING TEMPORARY FILTERS ON ALL AIR INLETS.

3. DURING RENOVATION, PORTIONS OF THE RENOVATED BUILDING WILL BE REOCCUPIED AS SECTIONS BECOME COMPLETE. THE CONTRACTOR SHALL MAINTAIN HVAC FOR THE REOCCUPIED SECTIONS OF THE BUILDING FOR THE REMAINDER OF THE PROJECT.

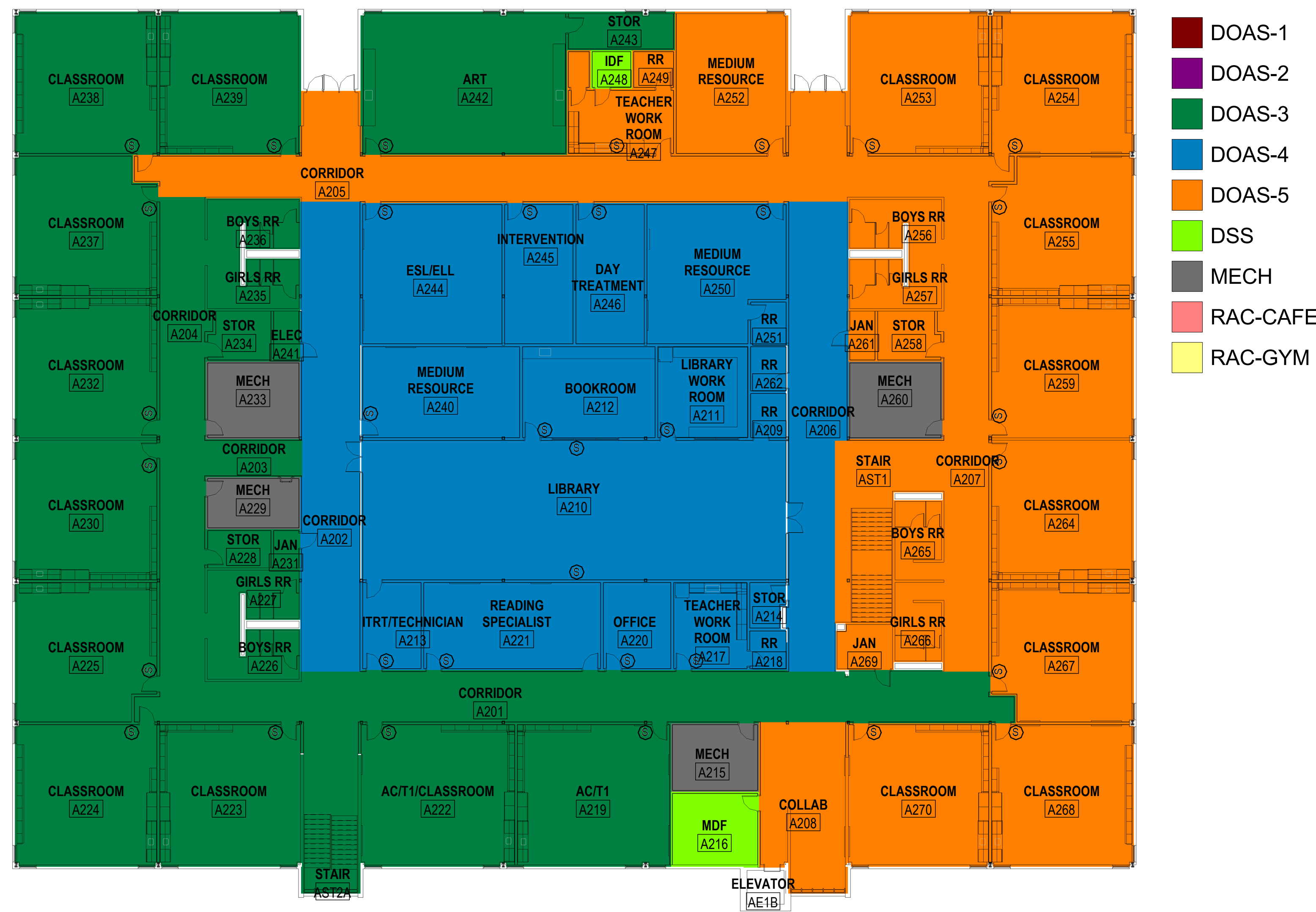
4. ANY NECESSARY SHUT DOWNS SHALL BE LIMITED IN SCOPE AND DURATION AND SHALL BE FULLY COORDINATED WITH, AND PREAPPROVED BY, THE OWNER.

5. ALL AIRSIDE SYSTEMS SHALL BE TESTED AND BALANCED AT THE END OF THE PHASE IN WHICH THEY ARE INSTALLED. IN ADDITION, EACH AIR SYSTEM SHALL BE BACKCHECKED AS PART OF THE FINAL PHASE. FOR SYSTEMS WITH PHASES ENDING PRIOR TO THE NEW MECHANICAL SYSTEM COMPLETION, A FULL TEST AND BALANCE SHALL BE REQUIRED ONCE SWITCHED ON TO THE NEW SYSTEM. BACKCHECK SHALL CONSTITUTE A SAMPLING OF NO LESS THAN 25% OF EACH OF THE SYSTEM COMPONENTS (AIR TERMINALS AND EQUIPMENT), WHERE MORE THAN 25% OF THE SAMPLED ITEMS DO NOT MEET THE PREVIOUS SUBMITTED VALUES FOR ANY INDIVIDUAL SYSTEM, THE ENTIRE SYSTEM SHALL BE REBALANCED. ALL REPORTS SHALL BE SUBMITTED FOR EACH PHASE AND FINAL COMPLETION FOR REVIEW.

MECHANICAL SHEET INDEX	
SHEET NUMBER	SHEET NAME
M-001	MECHANICAL LEGEND, SCHEDULES, AND NOTES
MD101	MECHANICAL DEMOLITION - FIRST FLOOR AREA A
MD102	MECHANICAL DEMOLITION - FIRST FLOOR AREA B
M-002	MECHANICAL ZONING PLAN
MD103	MECHANICAL DEMOLITION - SECOND FLOOR AREA A
M-101	MECHANICAL DUCTWORK - FIRST FLOOR AREA A
M-102	MECHANICAL DUCTWORK - FIRST FLOOR AREA B
M-103	MECHANICAL DUCTWORK - FIRST FLOOR AREA C
M-104	MECHANICAL DUCTWORK - SECOND FLOOR AREA A
M-105	MECHANICAL ROOF PLAN
M-201	MECHANICAL PIPING - FIRST FLOOR AREA A
M-202	MECHANICAL PIPING - FIRST FLOOR AREA B
M-203	MECHANICAL PIPING - FIRST FLOOR AREA C
M-204	MECHANICAL PIPING - SECOND FLOOR AREA A
M-301	MECHANICAL CONTROLS AND SEQUENCES
M-302	MECHANICAL CONTROLS AND SEQUENCES
M-401	MECHANICAL SECTIONS AND ENLARGED PLANS
M-501	MECHANICAL DETAILS



2 MECHANICAL ZONING PLAN - FIRST FLOOR
SCALE: 1/16" = 1'-0"



1 MECHANICAL ZONING PLAN - SECOND FLOOR
SCALE: 1/16" = 1'-0"

- DOAS-1
- DOAS-2
- DOAS-3
- DOAS-4
- DOAS-5
- DSS
- MECH
- RAC-CAFE
- RAC-GYM

DESCRIPTION
BY
MARK DATE
REVISIONS

ASCENT
ENGINEERING GROUP
5228 VALLEYVIEW DRIVE, SUITE 4
ROANOKE, VIRGINIA 24019
(540) 355-4444
D:DW 23900 C:

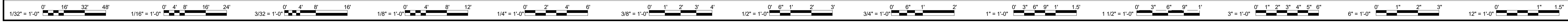
DATE	03/22/2024
PROJECT	23125-01
DESIGNED	DWR
DRAWN	DWR
CHECKED	

RRMM
ARCHITECTS, PC
28 Church Ave SW
Roanoke, Virginia 24011
(540)344-1212



PROJECT W.E. CUNDIFF ELEMENTARY SCHOOL ADDITIONS AND RENOVATIONS
ROANOKE COUNTY PUBLIC SCHOOLS
1200 HARDY RD
VINTON, VA
DRAWING MECHANICAL ZONING PLAN

SHEET
M-002



3/20/2024 5:26:53 PM Autodesk Docs\\23125-01 ROPS WE Condif ES\\23000 MEP Central v2.dwg

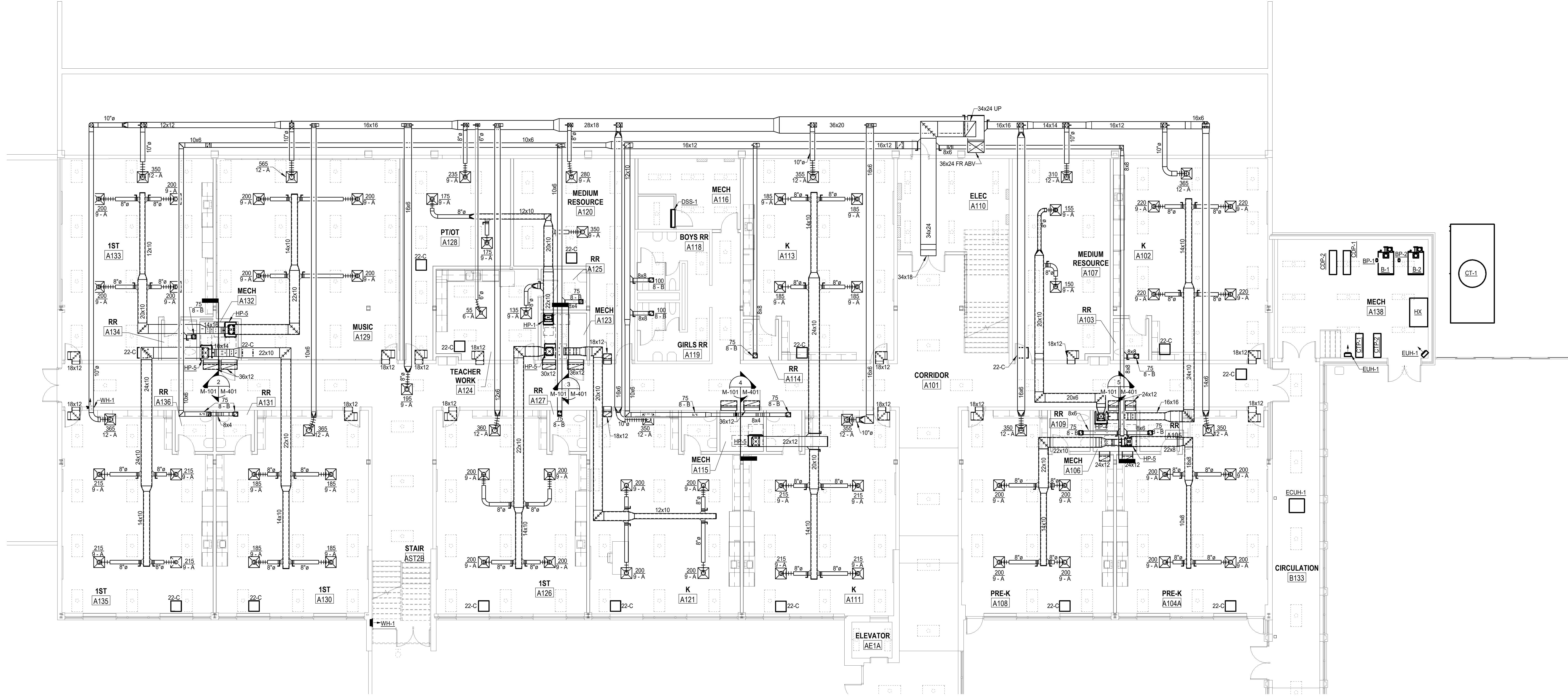
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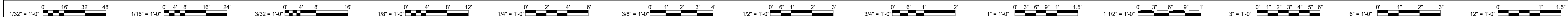
B

A



MECHANICAL DUCTWORK PLAN - FIRST FLOOR AREA A
SCALE: 1/8" = 1'-0"

KEY PLAN AREA A
NOT TO SCALE

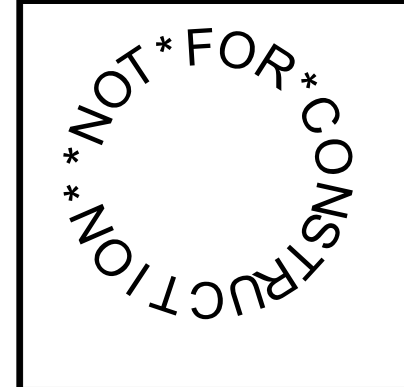


DESCRIPTION
BY
MARK DATE
REVISIONS

ASCENT
ENGINEERING GROUP
5528 VALLEYVIEW DRIVE, SUITE 4
ROANOKE, VIRGINIA 24019
(540) 365-4444
D: DWR 23900 C: ---

DATE	PROJECT	DESIGNED	DRAWN	CHECKED
03/22/2024	23125-01	DWR	DWR	---

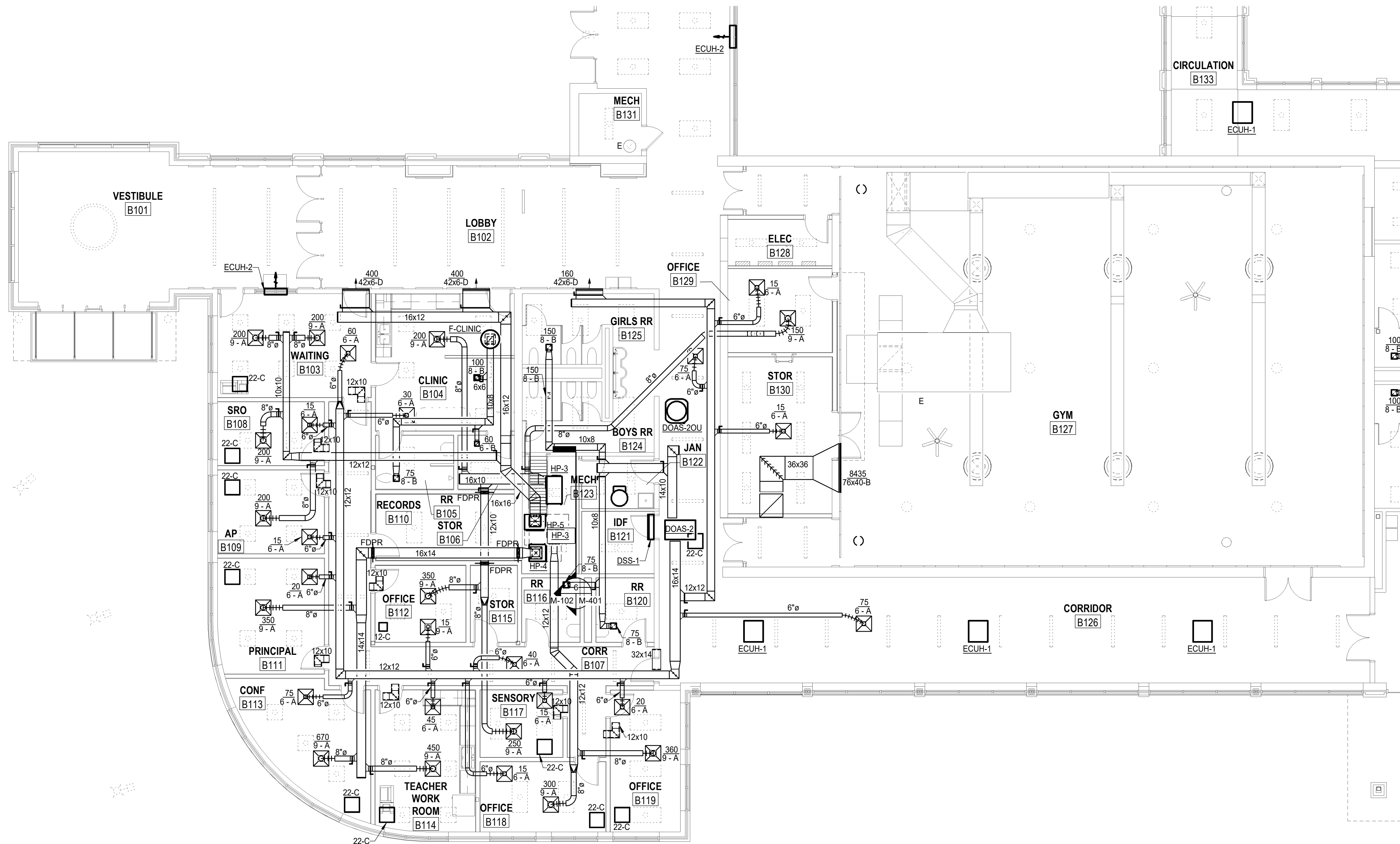
RRMM
ARCHITECTS, PC
28 Church Ave SW
Roanoke, Virginia 24011
(540) 344-1212



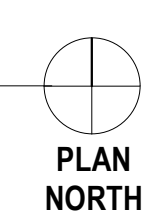
PROJECT: W.E. CUNDIFF ELEMENTARY SCHOOL ADDITIONS AND RENOVATIONS
ROANOKE COUNTY PUBLIC SCHOOLS
1200 HARDY RD
VINTON, VA
DRAWING: MECHANICAL DUCTWORK - FIRST FLOOR AREA A

SHEET
M-101

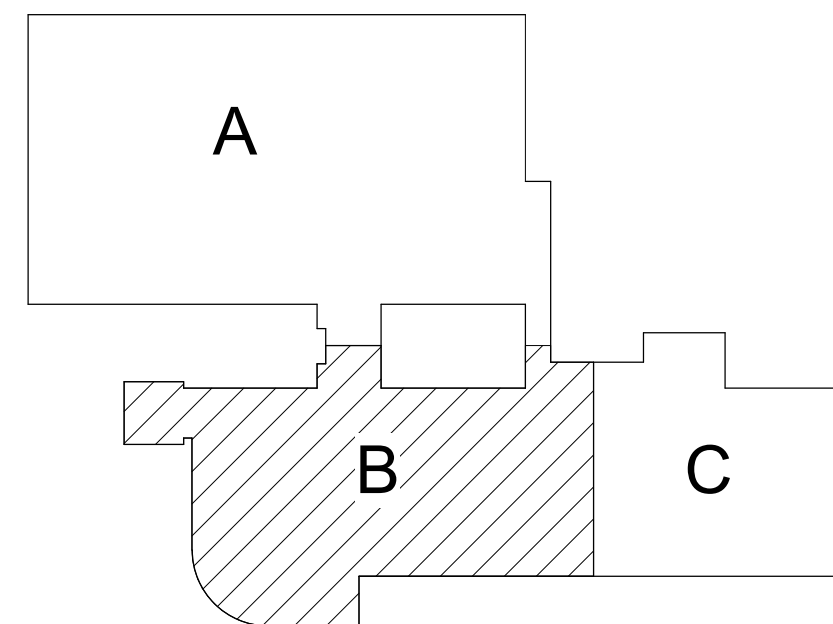
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MECHANICAL DUCTWORK PLAN - FIRST FLOOR AREA B
SCALE: 1/8" = 1'-0"



KEY PLAN AREA B
NOT TO SCALE



PROJECT W.E. CUNDIFF ELEMENTARY SCHOOL ADDITIONS AND RENOVATIONS
ROANOKE COUNTY PUBLIC SCHOOLS
1200 HARDY RD
VINTON, VA

DRAWING MECHANICAL DUCTWORK - FIRST FLOOR AREA B

SHEET
M-102

DATE 03/22/2024
PROJECT 23125-01
DESIGNED DWR
DRAWN DWR
CHECKED

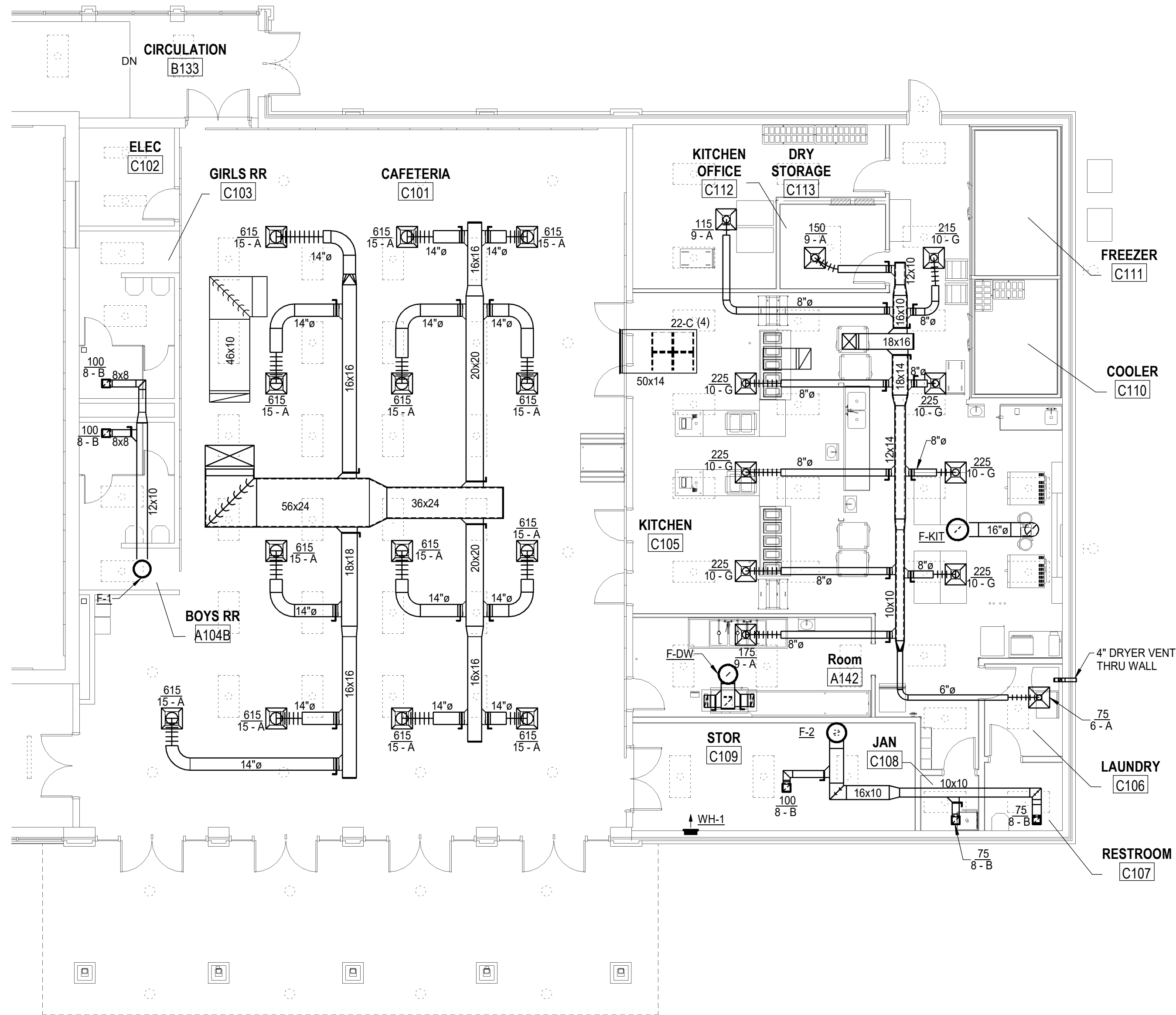
RRMM
ARCHITECTS, PC
28 Church Ave SW
Roanoke, Virginia 24011
(540)344-1212

NOT FOR CONSTRUCTION

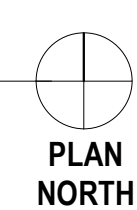
ASCENT
ENGINEERING GROUP
5528 VALLEYVIEW DRIVE, SUITE 4
ROANOKE, VIRGINIA 24019
(540) 265-4444
D: DWR 23900 C: --

DESCRIPTION
BY
MARK DATE
REVISIONS

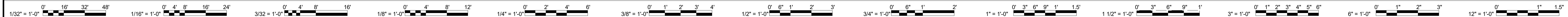
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MECHANICAL DUCTWORK PLAN - FIRST FLOOR AREA C
M-103 SCALE: 1/8" = 1'-0"



KEY PLAN AREA C
NOT TO SCALE

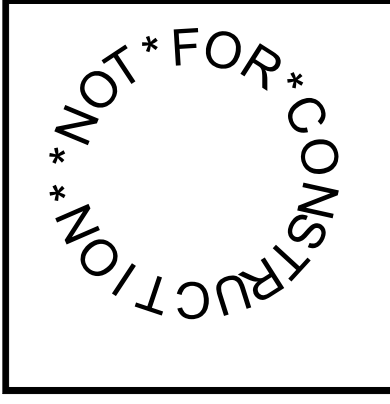


PROJECT W.E. CUNDIFF ELEMENTARY SCHOOL ADDITIONS AND RENOVATIONS
ROANOKE COUNTY PUBLIC SCHOOLS
1200 HARDY RD
VINTON, VA
DRAWING MECHANICAL DUCTWORK - FIRST FLOOR AREA C

SHEET
M-103

DATE	PROJECT	DESIGNED	DRAWN	CHECKED
03/22/2024	23125-01	DWR	DWR	-

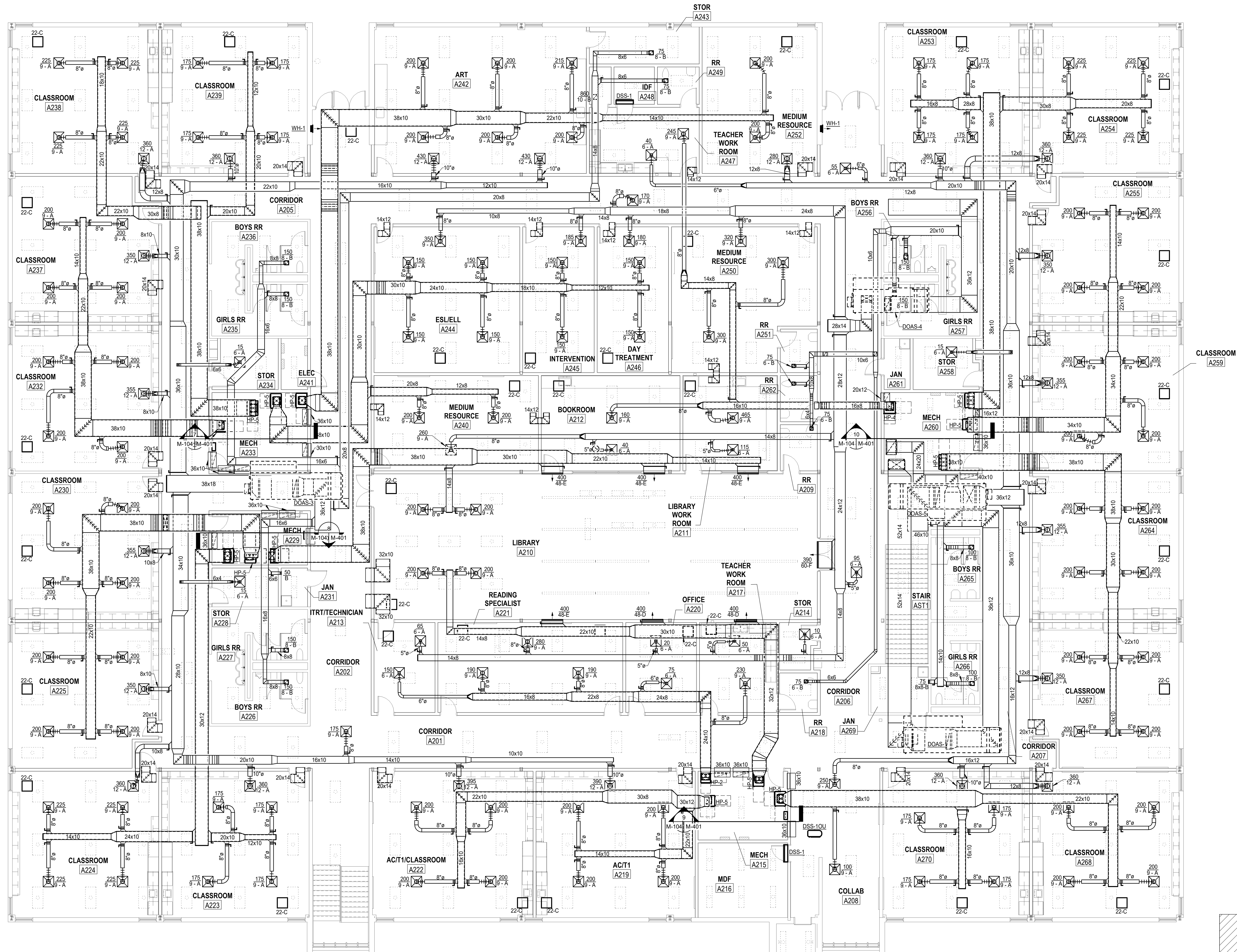
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28 Church Ave SW
Roanoke, Virginia 24011
(540)344-1212



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ROANOKE, VIRGINIA 24019
(540) 265-4444
D:DWR 23900 C: -

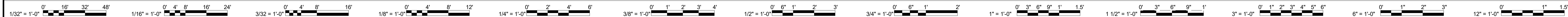
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MECHANICAL DUCTWORK PLAN - SECOND FLOOR AREA A
M-104 SCALE: 1/8" = 1'-0"

KEY PLAN AREA A
NOT TO SCALE



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ROANOKE COUNTY PUBLIC SCHOOLS
1200 HARDY RD
VINTON, VA
DRAWING MECHANICAL DUCTWORK - SECOND FLOOR AREA A

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M-104

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PROJECT 23125-01
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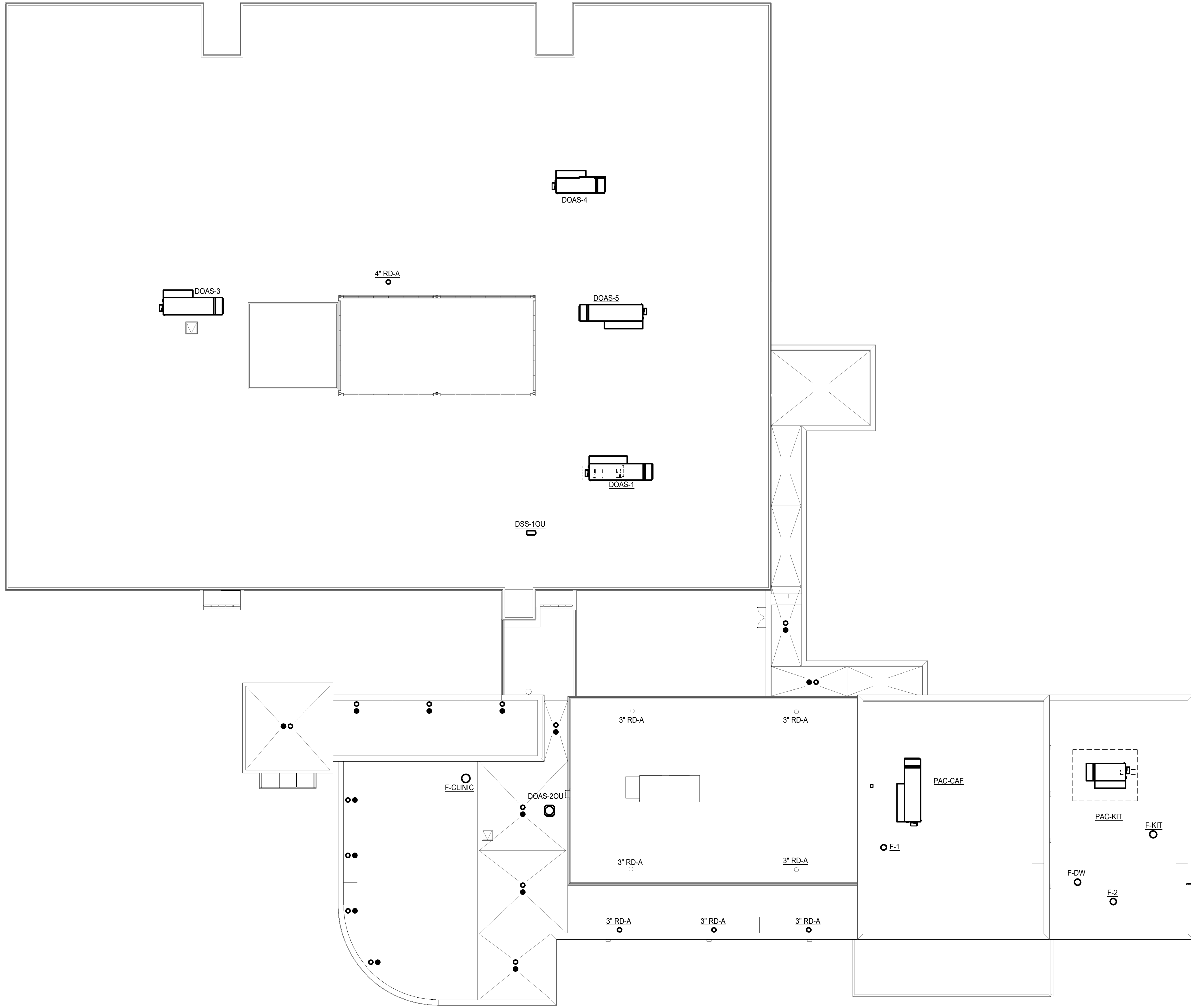
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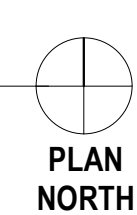
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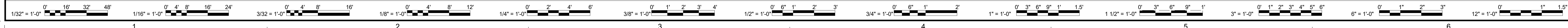
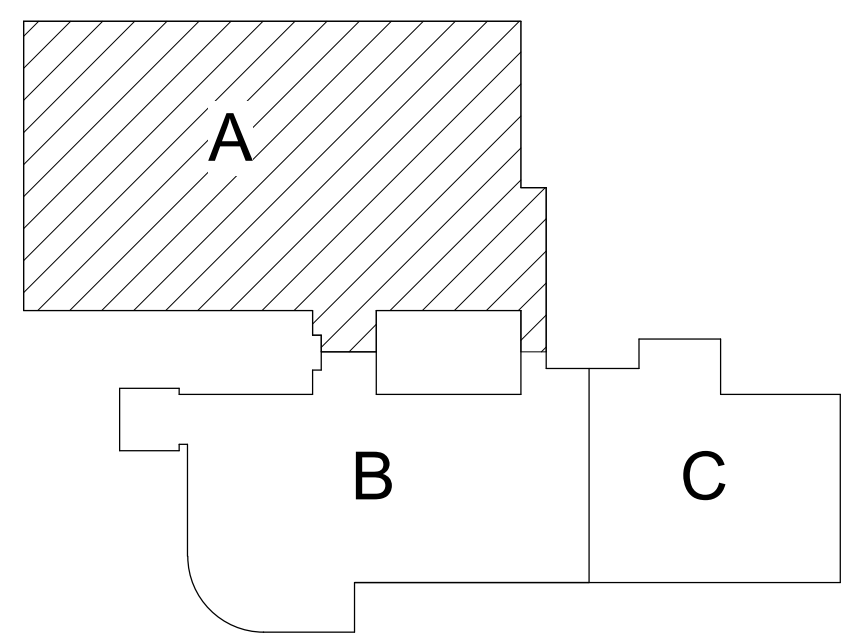
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1 MECHANICAL ROOF PLAN - AREA A
M-105 SCALE: 1/16" = 1'-0"



KEY PLAN AREA A
NOT TO SCALE



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1200 HARDY RD
VINTON, VA
DRAWING MECHANICAL ROOF PLAN

SHEET
M-105

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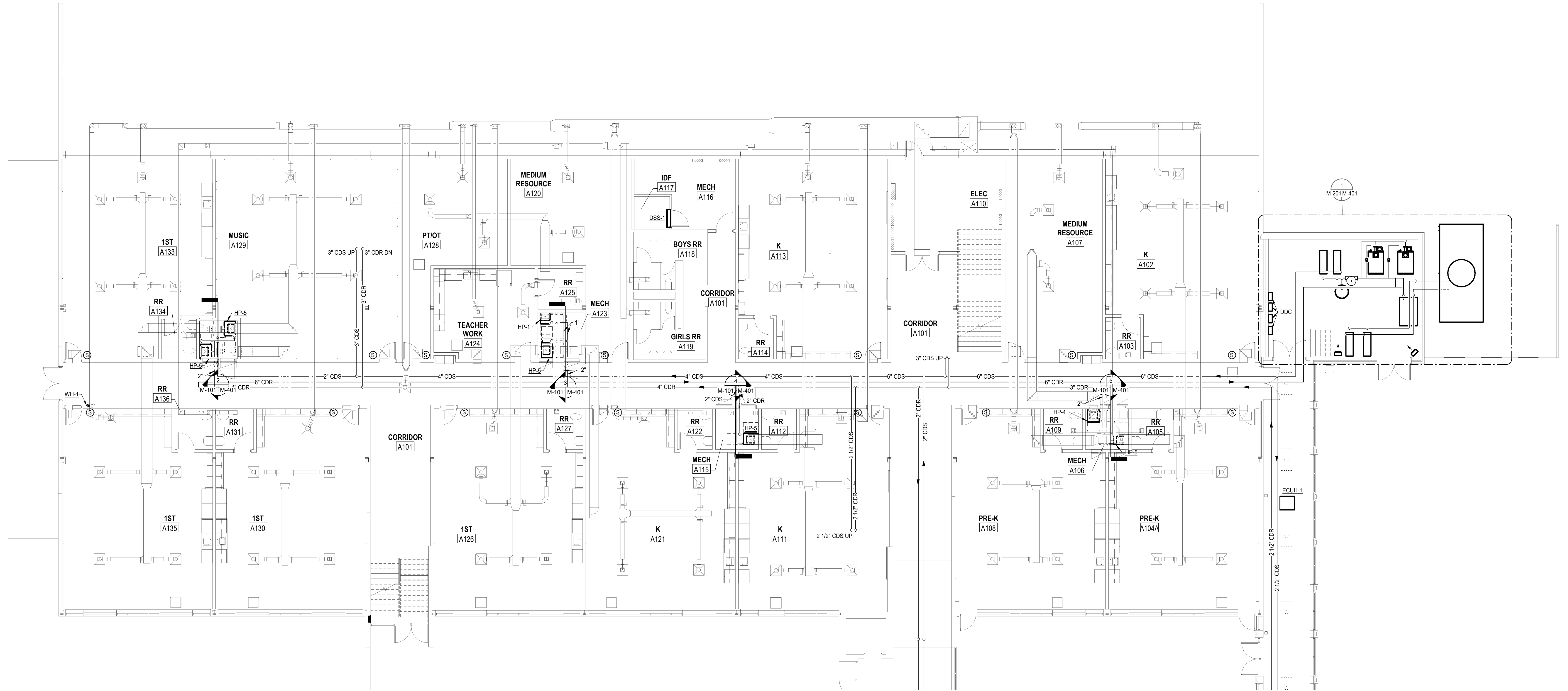
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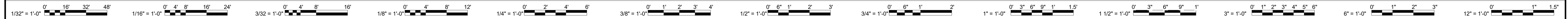
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MECHANICAL PIPING PLAN - FIRST FLOOR AREA A
M-201 SCALE: 1/8" = 1'-0"

KEY PLAN AREA A
NOT TO SCALE
PLAN NORTH



E

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C

B

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5528 VALLEYVIEW DRIVE, SUITE 4
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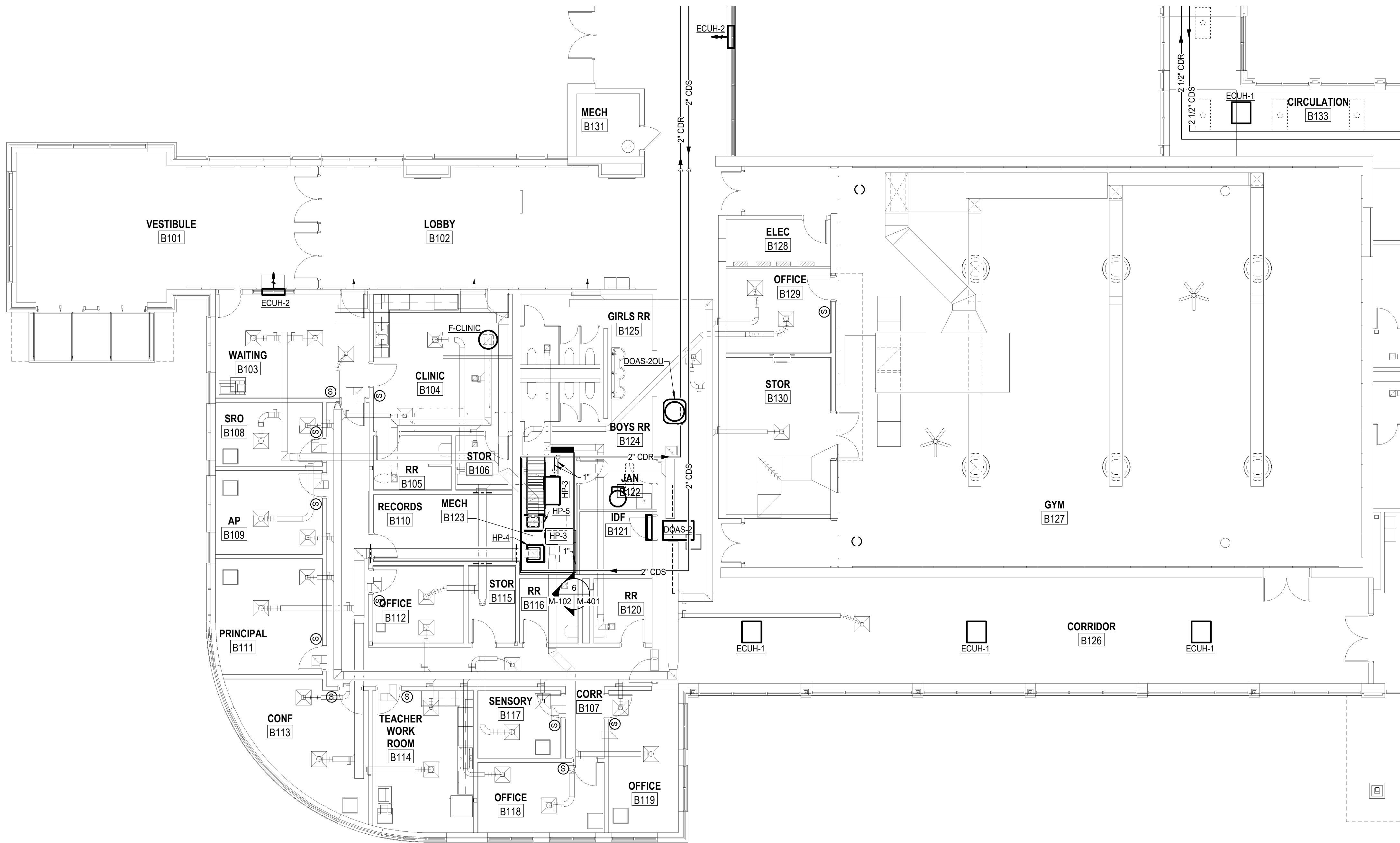
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Roanoke, Virginia 24011
(540) 344-1212

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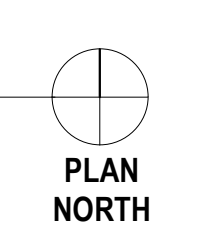
PROJECT W.E. CUNDIFF ELEMENTARY SCHOOL ADDITIONS AND RENOVATIONS
ROANOKE COUNTY PUBLIC SCHOOLS
1200 HARDY RD
VINTON, VA
DRAWING MECHANICAL PIPING - FIRST FLOOR AREA A

SHEET
M-201

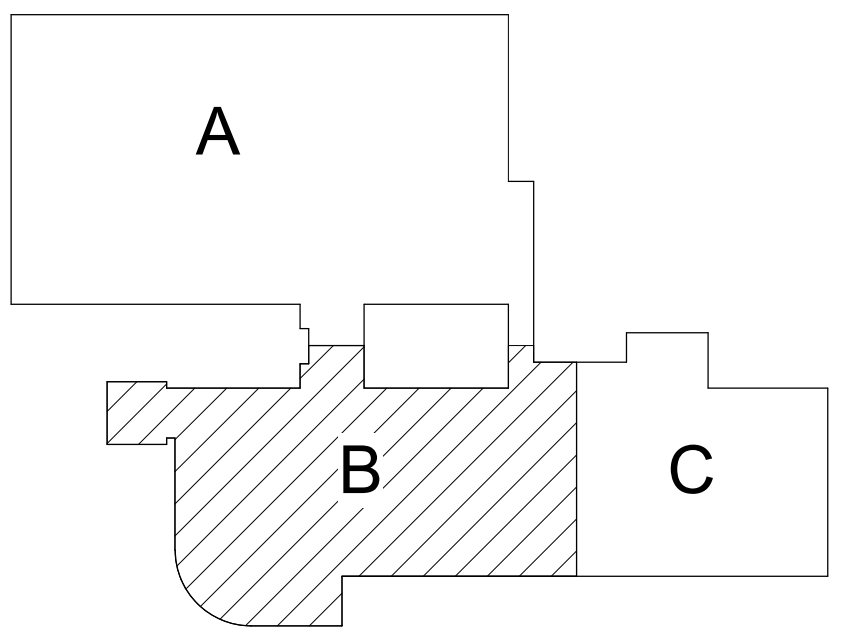
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MECHANICAL PIPING PLAN - FIRST FLOOR AREA B
SCALE: 1/8" = 1'-0"



KEY PLAN AREA B
NOT TO SCALE



PROJECT		W.E. CUNDIFF ELEMENTARY SCHOOL ADDITIONS AND RENOVATIONS ROANOKE COUNTY PUBLIC SCHOOLS 1200 HARDY RD VINTON, VA	
DRAWING		MECHANICAL PIPING - FIRST FLOOR AREA B	
SHEET		M-202	
DATE		03/22/2024	
PROJECT		23125-01	
DESIGNED		DWR	
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BY		---	
REVISIONS		---	
DESCRIPTION		---	

5228 VALLEYPOINTE PKWY, SUITE 4
ROANOKE, VIRGINIA 24019
(540) 265-4444

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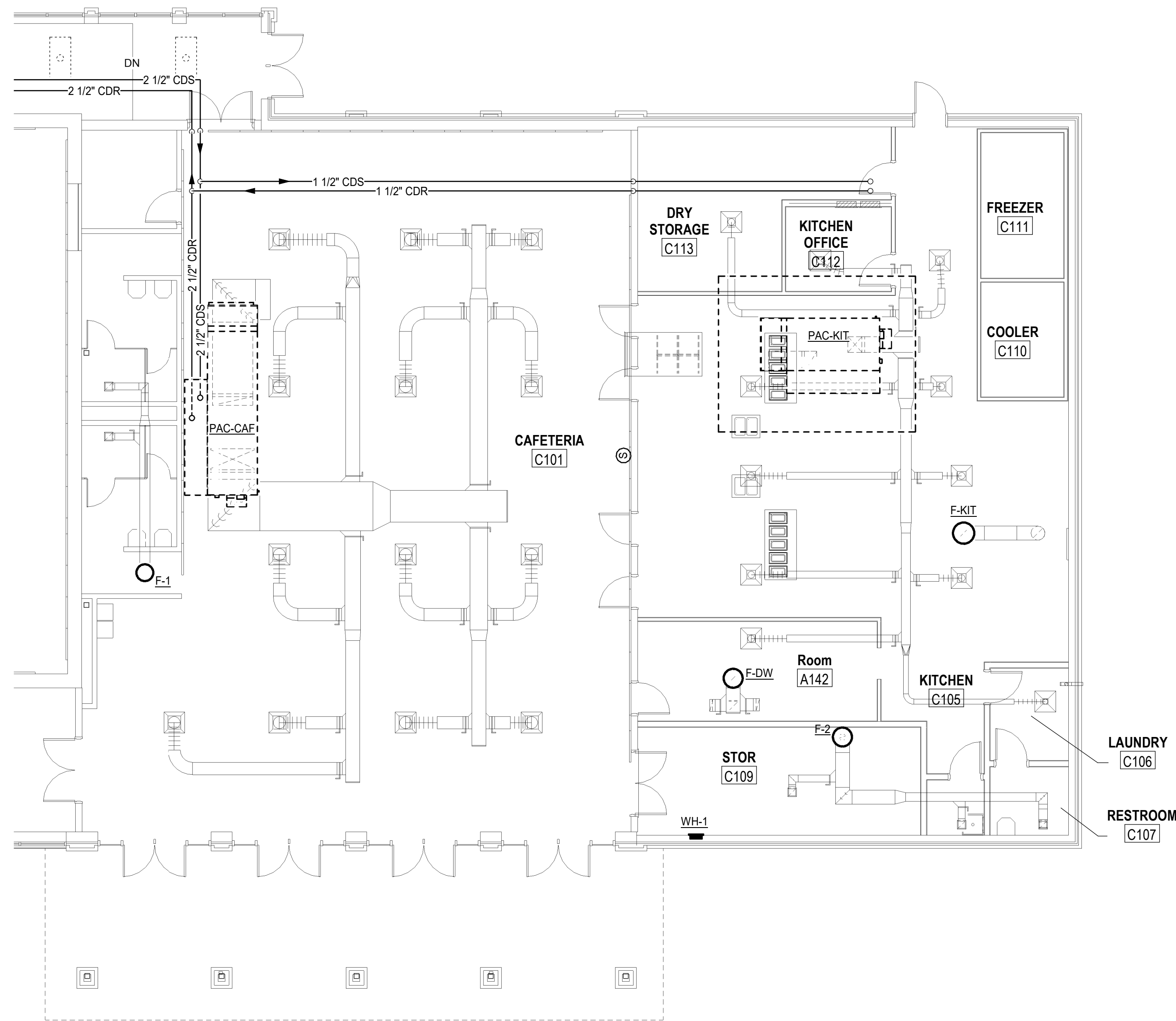
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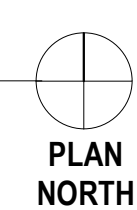
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1 MECHANICAL PIPING PLAN - FIRST FLOOR AREA C
M-203 SCALE: 1/8" = 1'-0"



KEY PLAN AREA C
NOT TO SCALE



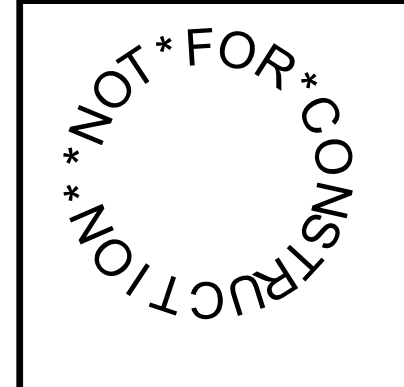
PROJECT W.E. CUNDIFF ELEMENTARY SCHOOL ADDITIONS AND RENOVATIONS
ROANOKE COUNTY PUBLIC SCHOOLS
1200 HARDY RD
VINTON, VA

DRAWING MECHANICAL PIPING - FIRST FLOOR AREA C

SHEET
M-203

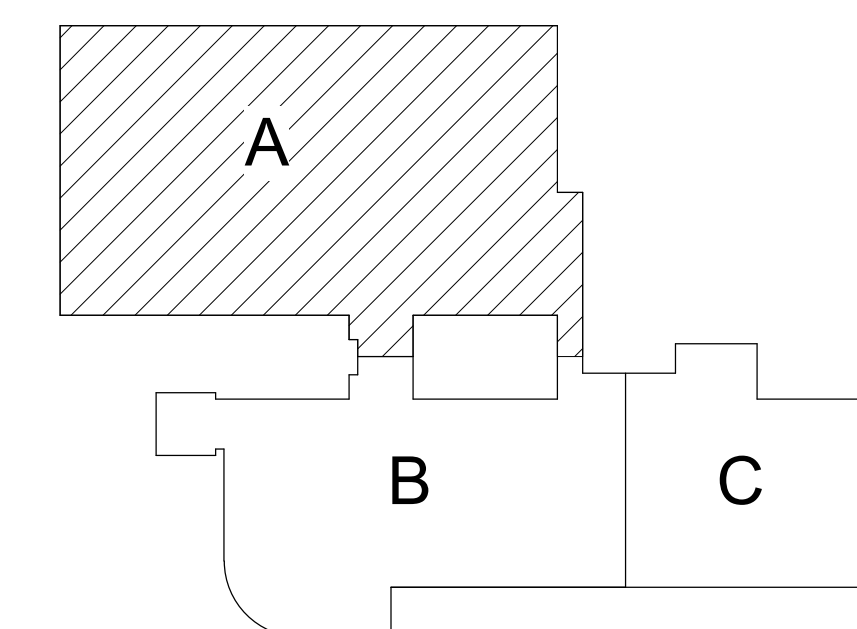
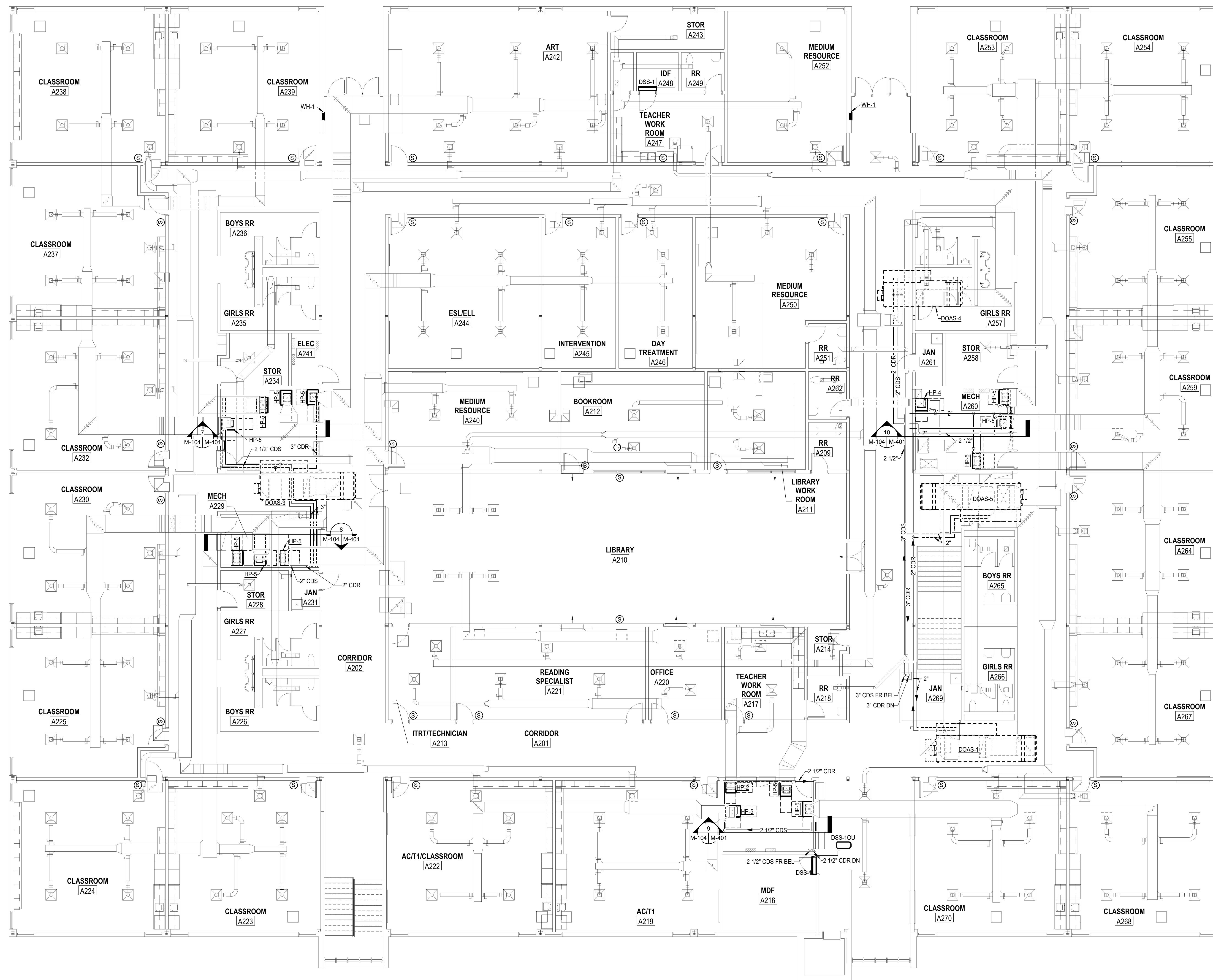
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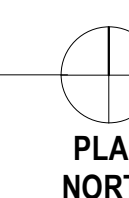


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(540) 265-4444
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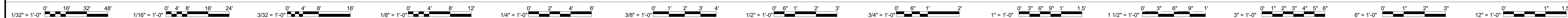
MARK	DATE	BY	DESCRIPTION



1 MECHANICAL PIPING PLAN - SECOND FLOOR AREA A
M-204 SCALE: 1/8" = 1'-0"



KEY PLAN AREA A
NOT TO SCALE



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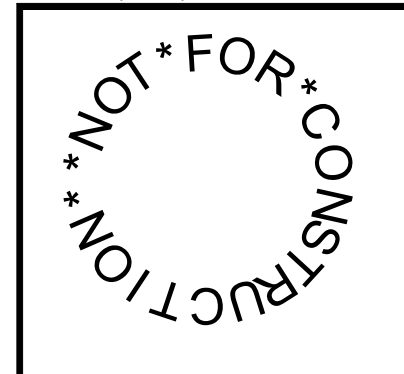
5225 VALLEYPOINTE PKWY, SUITE 4
ROANOKE, VIRGINIA 24019
(540) 265-4444

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DATE	03/22/2024
PROJECT	23125-01
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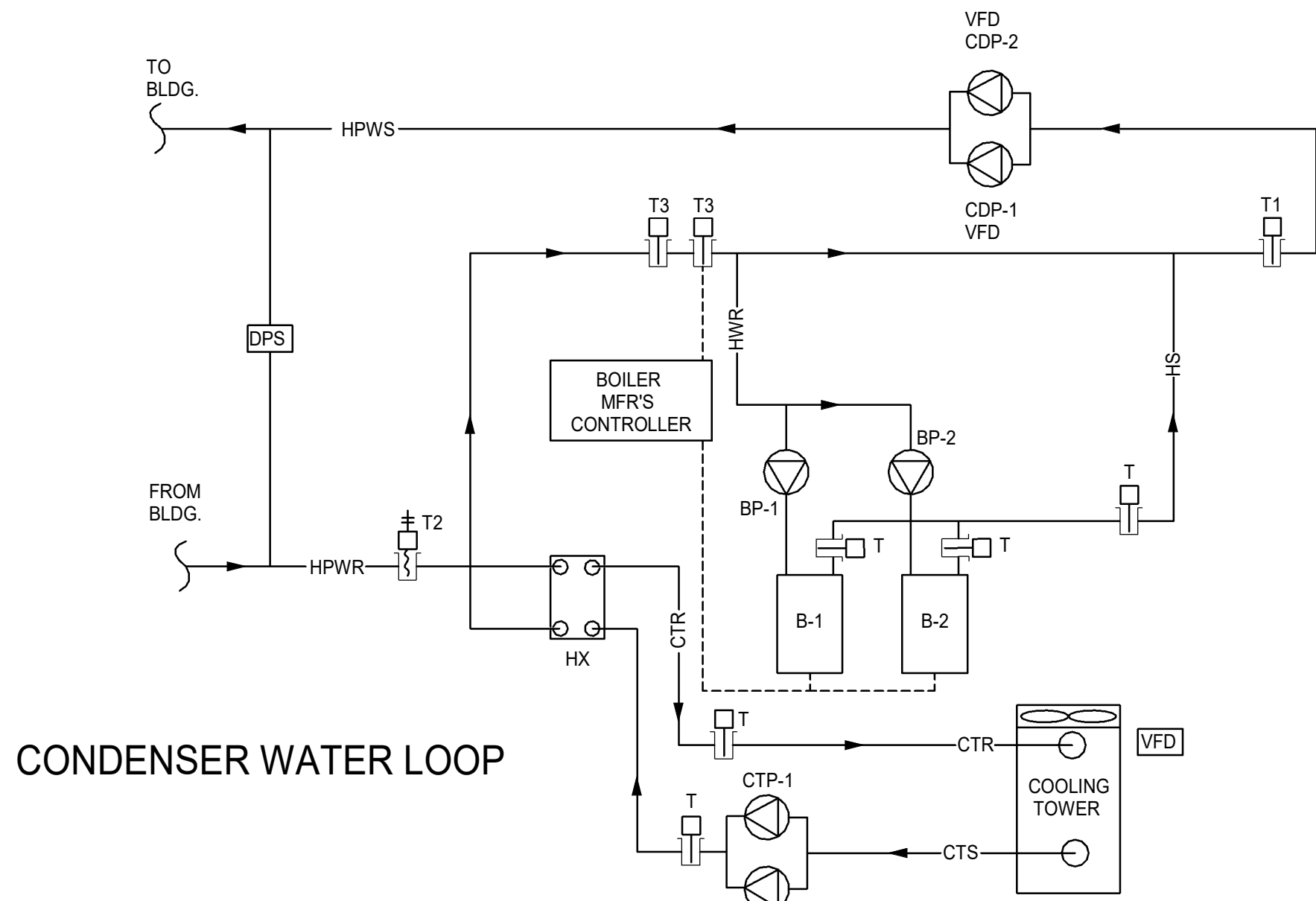


PROJECT
W.E. CUNDIFF ELEMENTARY SCHOOL ADDITIONS AND RENOVATIONS
ROANOKE COUNTY PUBLIC SCHOOLS
1200 HARDY RD
VINTON, VA
DRAWING
MECHANICAL PIPING - SECOND FLOOR AREA A

SHEET

M-204

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CONDENSER WATER LOOP

SYSTEM WATER PUMP (CDP-1, CDP-2)

1. SELECTION OF MAIN SYSTEM PUMP SHALL BE ALTERNATED WEEKLY; UPON FAILURE OF THE MAIN PUMP, THE STAND-BY PUMP SHALL RUN; STAND-BY PUMP SHALL SHUT OFF ONCE MAIN RESUMES NORMAL OPERATION. SHOULD BOTH PUMPS FAIL, ZONE 13 HEAT PUMPS AND RTU-AUX SHALL BE DISABLED.
2. SYSTEM PUMP SHALL RUN CONTINUOUSLY.
3. PUMP SPEED SHALL BE CONTROLLED TO MAINTAIN THE SYSTEM PRESSURE SETPOINT AT THE WORSE CASE OF THE SYSTEM PRESSURE SENSORS; PUMP SHALL RAMP SO NO SENSOR DROPS BELOW ITS PRESSURE SETPOINT, ALLOWING THE OTHER SENSOR TO POSSIBLY EXCEED ITS SETPOINT.

HEAT ADDITION:

1. WHENEVER SYSTEM PUMP (CDP-1, CDP-2) IS RUNNING AND THE HEAT PUMP LOOP RETURN WATER (T2) IS BELOW 80°F, THE EMS SHALL ENABLE THE BOILER CONTROLLER/SEQUENCER. EMS SHALL DISABLE BOILER CONTROLLER/SEQUENCER WHEN HEAT PUMP LOOP RETURN WATER IS ABOVE 65°F (T2) OR WHEN HEAT PUMP LOOP TEMPERATURE (T1) EXCEEDS 80°F.
2. WHEN ENABLED, BOILER MANUFACTURER'S CONTROLLER SEQUENCES BOILERS' PUMPS AND BOILERS FIRING TO MAINTAIN HEAT PUMP LOOP RETURN WATER SETPOINT (65°F); RETURN WATER SENSOR CONTROLLING BOILERS IS FURNISHED BY BOILER MANUFACTURER.
3. EMS MONITORS SUPPLY WATER TEMPERATURE FROM EACH BOILER AND BOILER ALARMS VIA BACNET.

HEAT REJECTION:

1. COOLING TOWER PUMPS (CTP-1, CTP-2); PUMPS SHALL OPERATE AS MAINSTAND-BY. MAIN PUMP SELECTION SHALL BE ALTERNATED WEEKLY. STAND-BY PUMP SHALL START UPON IF MAIN PUMP FAILS TO OPERATE; STAND-BY SHALL SHUT OFF ONCE MAIN RESUMES NORMAL OPERATION. WHENEVER SYSTEM PUMP (CDP-1, CDP-2) IS OPERATING AND THE HEAT PUMP LOOP RETURN TEMPERATURE IS 85°F OR HIGHER, THE COOLING TOWER PUMP SHALL RUN; PUMP SHALL STOP WHEN HEAT PUMP LOOP RETURN TEMPERATURE DROPS BELOW 78°F. COOLING TOWER PUMP (CTP-1, CTP-2) SHALL NOT RUN IF SYSTEM PUMP (CDP-1, CDP-2) IS NOT RUNNING. PUMPS CTP-1 AND CTP-2 SPEED SHALL BE MODULATED SECONDARY TO COOLING TOWER FAN TO MAINTAIN TEMPERATURE.
2. COOLING TOWER: COOLING TOWER FAN SHALL BE OFF WHEN COOLING TOWER PUMP (CTP-1, CTP-2) IS OFF, BOTH VIA SOFTWARE AND HARDWARE INTERLOCKS. WHEN COOLING TOWER PUMP (CTP-1, CTP-2) IS RUNNING, THE TOWER FAN SHALL BE ENABLED WHEN LEAVING WATER TEMPERATURE IS ABOVE 85°F AND SHALL MODULATE SPEED TO MAINTAIN 85°F LEAVING WATER TEMPERATURE. ONCE ENABLED, FAN SHALL REMAIN ENABLED UNTIL PUMP TURNS OFF OR LEAVING WATER TEMPERATURE DROPS BELOW 82°F. WHEN PUMP SPEED IS AT MINIMUM, WATER TEMPERATURE SHALL BE RESET BASED ON OUTSIDE AIR CONDITIONS.
3. TOWER MAKE-UP WATER VALVE, VIBRATION CUT-OUT SWITCH, AND PAN HEATER ARE CONTROLLED BY MANUFACTURER'S CONTROLS.

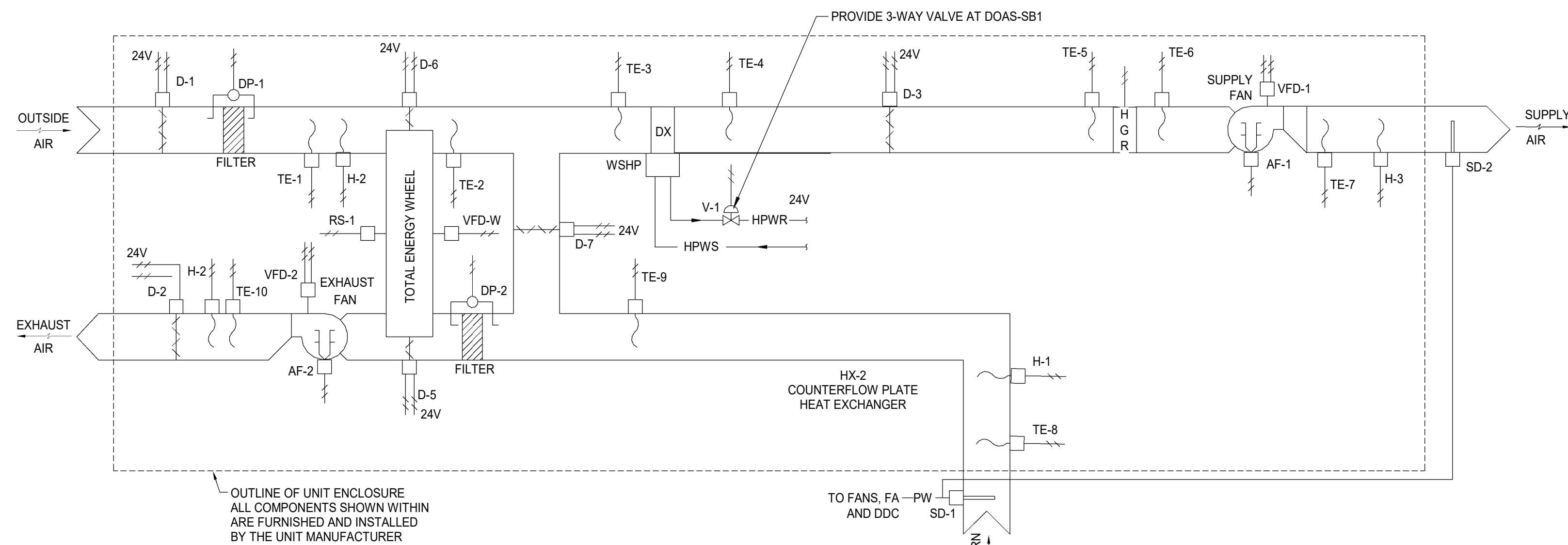
ALARMS AND SAFETIES:

PUMPS, PUMP VFDS, AND BOILER FAILURES SHALL BE ALARMED IN EMS.

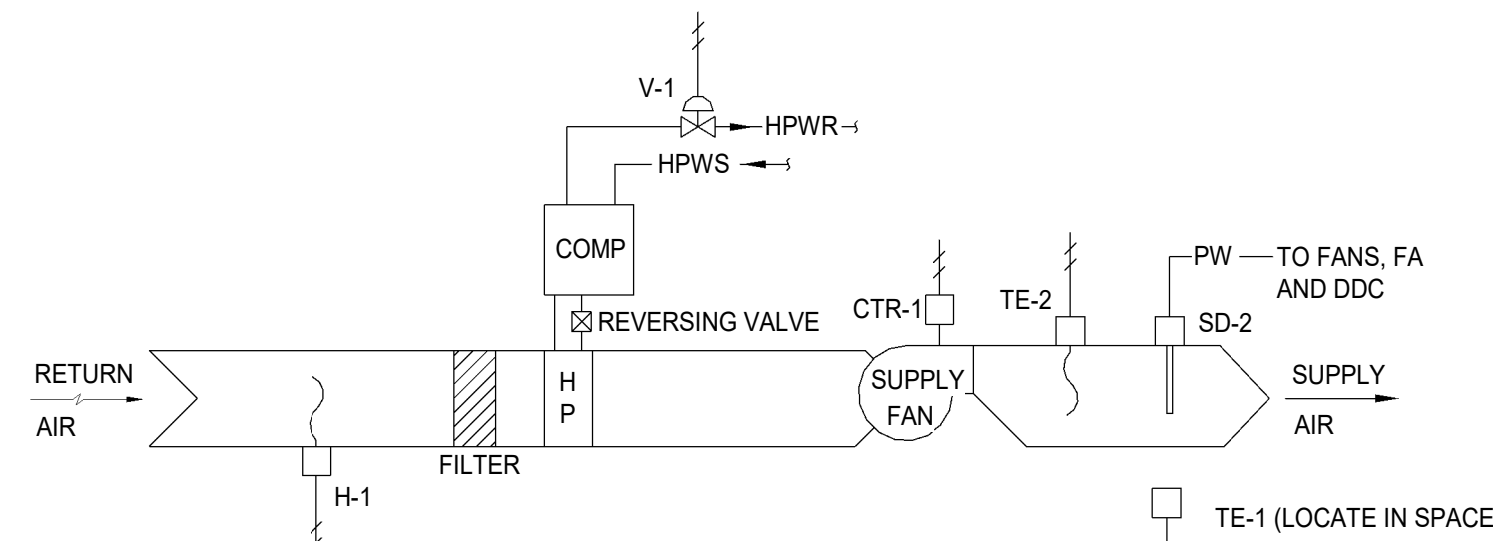
COOLING TOWER FAN SHALL BE HARDWIRED TO COOLING TOWER PUMP (CTP-1, CTP-2) SO THAT FAN CANNOT RUN UNLESS PUMP IS RUNNING.

ALL HEAT PUMPS SHALL BE LOCKED-OUT WHENEVER THERE IS NO HEAT PUMP LOOP FLOW.

BUILDING IMPENDING FREEZE ALARM SHALL BE GENERATED BY MONITORING BUILDING HEAT PUMP LOOP RETURN WATER TEMPERATURE. ALARM CONDITION SHALL BE WHENEVER OUTDOOR AIR TEMPERATURE IS BELOW 35°F (ADJUSTABLE) AND WHEN RETURN TEMPERATURE DROPS BELOW 50°F (ADJUSTABLE) FOR 40 MINUTES. THIS ALARM SHALL BE DISPLAYED IN THE EMS AND ALSO BE PROVIDED TO MCPS SECURITY DIVISION VIA HARDWARE CONNECTION TO THE SECURITY SYSTEM INSTALLED AT THE BUILDING VIA A CONTACT OUTPUT IN THE EMS. RCPs SECURITY DIVISION WILL CONNECT TO EMS PROVIDED RELAY AND MONITOR THIS OUTPUT THROUGH THE SECURITY SYSTEMS HARDWARE AND SOFTWARE.



DEDICATED OUTDOOR AIR UNITS (DOAS-1,3,4,5)



WATER SOURCE HEAT PUMPS

WATER SOURCE HEAT PUMP

ENERGY MANAGEMENT SYSTEM CONTROL SEQUENCES

WATER SOURCE HEAT PUMPS SHALL BE CONTROLLED THROUGH THE EMS TO INCLUDE CONDENSER WATER VALVE. PACKAGED CONTROLS WITH BACNET INTERFACE IS NOT ACCEPTABLE.

HEAT PUMPS SHALL BE INDEXED OCCUPIED/UNOCCUPIED VIA START/STOP ZONE COMMANDS. DURING UNOCCUPIED MODES, HEAT PUMPS SHALL NORMALLY BE OFF. DURING OCCUPIED MODES, HEAT PUMP SUPPLY FANS SHALL RUN CONTINUOUSLY. EACH HEAT PUMP SHALL OPERATE AS FOLLOWS:

UNOCCUPIED:

1. NIGHT SET-BACK/SET-UP: FAN AND COMPRESSOR SHALL CYCLE TO SATISFY SET-BACK/SET-UP TEMPERATURE; REVERSING VALVE SHALL BE POSITIONED FOR HEATING OR COOLING AS NEEDED.
2. WARM-UP/COOL-DOWN: HEAT PUMPS SHALL PERFORM WARM-UP/COOL-DOWN INDIVIDUALLY TO SATISFY THEIR OCCUPIED SPACE TEMPERATURE SETPOINT, PERFORMING OPTIMIZED START INDIVIDUALLY TO ACHIEVE THE OCCUPIED SPACE TEMPERATURE AT THE START OF OCCUPANCY.
3. OVERRIDE: INDIVIDUAL OVERRIDE OF THE UNOCCUPIED SPACE SHALL BE MADE BY MANUAL SELECTION AT THE SPACE TEMPERATURE SENSOR.

OCCUPIED: THE FAN SHALL RUN UPON A CALL FOR HEATING OR COOLING. COMPRESSOR SHALL CYCLE IN EITHER HEATING OR COOLING MODE TO MAINTAIN SPACE TEMPERATURES; REVERSING VALVE SHALL BE POSITIONED FOR HEATING OR COOLING AS NEEDED.

COMPRESSOR: UPON A CALL FOR COMPRESSOR OPERATION, THE WATER CONTROL VALVE SHALL BE COMMANDED OPEN FIRST. WHEN THE VALVE IS FULLY OPEN AND END SWITCH ON THE CONTROL VALVE SHALL ENABLE THE OPERATION OF THE COMPRESSOR. COMPRESSOR OPERATION SHALL BE CYCLED BASED UPON LOAD CONDITIONS AS SENSED BY THE SPACE TEMPERATURE SENSOR. COMPRESSOR OPERATION SHALL BE OVERRIDDEN BY A PRESET THREE MINUTE MINIMUM ON/OFF TIME DELAY IN ORDER TO MAINTAIN OIL RETURN WHEN THE UNIT IS EITHER INITIALLY ENERGIZED, MANUALLY RESET, SWITCHED BETWEEN MODES, OR CYCLED WITHIN A SINGLE MODE. WHEN THE DEMAND FOR COMPRESSOR OPERATION IS SATISFIED, THE COMPRESSOR SHALL STOP AND THE WATER CONTROL VALVE SHALL THEN CLOSE; POSITIVE PROOF OF COMPRESSOR OFF STATUS (CURRENT SWITCH) IS REQUIRED BEFORE VALVE CAN CLOSE.

REVERSING VALVE: THE REVERSING VALVE SHALL BE ENERGIZED IN THE COOLING MODE. ONCE THE VALVE IS ENERGIZED FOR COOLING IT SHALL STAY ENERGIZED UNTIL A HEATING CYCLE IS INITIATED. THE REVERSING VALVE OPERATION SHALL BE DELAYED AFTER COMPRESSOR SHUTDOWN TO REDUCE NOISE DUE TO REFRIGERANT MIGRATION. IN THE EVENT OF A POWER FAILURE THE REVERSING VALVE SHALL FAIL TO THE HEATING MODE.

TIMED STARTS: HEAT PUMPS SHALL PERFORM RANDOM START ON POWER UP TO PREVENT ALL UNITS IN THE BUILDING FROM ENERGIZING AT THE SAME TIME. THE FAN AND COMPRESSOR STARTS SHALL BE DELAYED FROM 3 TO 32 SECONDS WHEN POWER HAS EITHER BEEN RESTORED AFTER A LOSS OR OUTAGE, OR AFTER THE UNIT IS ENABLED. IF THERE IS NO CALL FOR COOLING OR HEATING, OR IF NO FAN OPERATION IS REQUIRED DURING THE DELAY, THE TIME DELAY SHALL BE ALLOWED TO TIME OUT. A RANDOM NUMBER GENERATOR IN SOFTWARE SHALL BE USED TO GENERATE THE DELAY.

SAFETIES: THE FOLLOWING SAFETIES SHALL BE PROVIDED, EITHER BY THE CONTROLS CONTRACTOR OR BY HEAT PUMP MANUFACTURER. CONTROLS CONTRACTOR SHALL VERIFY SAFETIES PROVIDED BY HEAT PUMP MANUFACTURER TO ELIMINATE REDUNDANCY AND TO ASSURE THAT ALL REQUIRED SAFETIES ARE PROVIDED:

1. COMPRESSOR SHALL BE PREVENTED FROM OPERATING IF FAN COMMAND AND STATUS DO NOT MATCH AFTER 30 SECOND VERIFICATION DELAY.
2. COMPRESSOR SHALL BE OPERATED WITH MINIMUM 3 MINUTE ON AND 3 MINUTE OFF CYCLES TO MAINTAIN OIL RETURN FOR EXTENDED LIFE OF THE COMPRESSOR.
3. SPACE TEMPERATURE SENSOR FAILURE SHALL SHUTDOWN HEAT PUMP AND INITIATE A SENSOR FAILURE ALARM.
4. A CONDENSATE OVERFLOW SWITCH ALARM SHALL SHUT DOWN FAN AND COMPRESSOR AND INITIATE AN EMS ALARM.
5. HEAT PUMPS SHALL BE DISABLED IF SYSTEM PUMP IS NOT OPERATING.
6. EMS SHALL MONITOR UNIT FAILURE GENERAL ALARM.

DEDICATED OUTDOOR WATER SOURCE HEAT PUMP (DOAS-1, DOAS-3, DOAS-4, DOAS-5)

EQUIPMENT MANUFACTURER'S CONTROL SEQUENCES

UNIT SHALL RUN CONTINUOUSLY DURING THE OCCUPIED MODE AND BE OFF DURING THE UNOCCUPIED MODE UNLESS UNOCCUPIED HUMIDITY CONTROL IS REQUIRED.

UNOCCUPIED HUMIDITY CONTROL: THE UNIT IS OFF UNLESS THE SPACE HUMIDITY RISES ABOVE 60% RH (ADJ.). AT THIS POINT THE UNIT IS ENABLED AND OPERATES IN RECIRCULATION MODE. THE HEAT PUMP IS CONTROLLED TO MAINTAIN THE DX COIL LEAVING TEMPERATURE AT SET POINT. THE UNIT WILL CONTINUE TO OPERATE UNTIL THE SPACE HUMIDITY DROPS BELOW 55% RH (ADJ.).

WHEN THE UNIT IS STARTED, THE OUTSIDE AIR DAMPER AND EXHAUST AIR DAMPER SHALL OPEN. WHEN THEY ARE PROVEN OPEN BY END SWITCHES THE SUPPLY AND EXHAUST FANS SHALL START. THE ENERGY WHEEL BYPASS DAMPERS, D-5 AND D-6, AND RECIRCULATION DAMPER D-7 ARE CLOSED.

COOLING/DEHUMIDIFICATION: MECHANICAL COOLING SHALL BE DISABLED AT OUTDOOR AIR TEMPERATURES BELOW 55°F. THE HEAT PUMP COOLING / DEHUMIDIFICATION OUTPUT SHALL BE CONTROLLED TO MAINTAIN SPACE TEMPERATURE AND HUMIDITY THROUGH SUPPLY AIR DEW POINT. COMPRESSORS SHALL CYCLE AND STEP SUBJECT TO 50°F DX LEAVING COIL AIR LOW LIMIT AND / OR SUPPLY AIR 60°F HIGH LIMIT. REHEAT HX-2 DAMPER CONTROL: DAMPERS D-3 AND D-4 SHALL BE CLOSED WHEN THE UNIT IS OFF. WHEN THE UNIT IS RUNNING AND COOLING IS REQUIRED, DAMPER D-4 SHALL MODULATE OPEN TO THE HEAT EXCHANGER AND DAMPER D-3 CLOSED TO MAINTAIN SUPPLY AIR TEMPERATURE SETPOINT. ONCE DAMPER D-4 HAS FULLY OPENED AND THE AIR TEMPERATURE AS SENSED BY T-7 IS BELOW 70°F, THE HOT GAS REHEAT SHALL MODULATE TO MAINTAIN DISCHARGE AIR TEMPERATURE. SUPPLY AIR TEMPERATURE SHALL BE RESET BASED ON OUTDOOR AIR TEMPERATURES. RESET SCHEDULE SHALL BE COMPLETELY ADJUSTABLE AND INVERSELY PROPORTIONAL BETWEEN 80 AND 65 DEGREES.

HEATING: HEATING SHALL BE DISABLED AT OUTDOOR TEMPERATURES ABOVE 70°F (ADJ.). AT OUTDOOR TEMPERATURES BELOW 55°F (ADJ.), THE REVERSING VALVE SHALL BE POSITIONED FOR HEAT AND COMPRESSORS SHALL CYCLE AND STEP TO MAINTAIN 70°F (ADJ.) SUPPLY AIR TEMPERATURE. THE SUPPLY AIR DEHUMIDIFICATION CYCLE SHALL OVERRIDE THE HEATING CYCLE TO PREVENT SUPPLY AIR DEW POINT FROM EXCEEDING 55°F.

ENERGY WHEEL DAMPER CONTROL: DAMPERS D-5 AND D-6 SHALL BE CLOSED WHEN THE UNIT IS OFF. WHEN THE UNIT IS RUNNING, DAMPERS D-5 AND D-6 SHALL BE NORMALLY CLOSED.

WINTER DEFROST MODE: DAMPERS D-5 AND D-6 SHALL MODULATE TO PREVENT THE EXHAUST LEAVING AIR TEMPERATURE FROM DROPPING BELOW 33°F.

ECONOMIZER MODE: ECONOMIZER OPERATION IS DISABLED WHEN OUTDOOR AIR ENTHALPY IS ABOVE 26 BTU/LB, OR WHEN OUTDOOR AIR TEMPERATURE IS BELOW 50°F. WHEN ECONOMIZER IS ENABLED AND OUTSIDE AIR TEMPERATURE IS BELOW SUPPLY AIR COOLING SETPOINT, DAMPERS D-5 AND D-6 SHALL MODULATE OPEN TO BY-PASS ENERGY WHEEL TO MAINTAIN SUPPLY AIR TEMPERATURE SETPOINT.

BY-PASS DAMPERS SHALL OPERATE INDEPENDENTLY.

CONDENSER WATER VALVE V-1 SHALL BE CONTROLLED BY THE UNIT CONTROLLER BASED ON HEAD PRESSURE. FLOW SWITCH IN WATER SUPPLY SHALL DISABLE THE COMPRESSORS IN THE EVENT OF NO WATER FLOW WHILE THE VALVE IS COMMANDED OPEN; THE DOAS FANS SHALL CONTINUE TO OPERATE, UNLESS DISABLED BY THE LOW DISCHARGE TEMPERATURE LIMIT.

CONDENSER COMPARTMENT ELECTRIC HEATER: HEATER SHALL BE ENABLED WHENEVER OUTSIDE AIR TEMPERATURES DROP TO 40°F AND SHALL CYCLE TO MAINTAIN COMPARTMENT TEMPERATURE SETPOINT. AN ALARM SHALL ENUNCIATE IN THE BAS IF COMPARTMENT TEMPERATURES DROP BELOW 38°F. HEATER SHALL HAVE HIGH TEMPERATURE LOCKOUT ABOVE 80°F.

ENERGY MANAGEMENT SYSTEM CONTROL SEQUENCES

CONSTANT TEMPERATURE DISCHARGE DEDICATED OUTDOOR AIR UNIT.

MANUFACTURER FURNISHED CONTROLS. EMS PROVIDED START/STOP VIA HARDWARE TO MANUFACTURER'S CONTROLLER AND CONTROLS THE ISOLATION VALVE. UNIT SHALL BE OFF DURING ZONE'S UNOCCUPIED MODE AND SHALL RUN CONTINUOUSLY DURING OCCUPIED MODE (SCHEDULED OR OVERRIDE).

EMS PROVIDES SPACE HUMIDITY SENSORS FOR DOAS. IN THE UNOCCUPIED MODE WHEN SPACE HUMIDITY EXCEEDS 70% THE EMS SHALL ENABLE THE ASSOCIATED DOAS TO OPERATE IN THE UNOCCUPIED MODE. DOAS SHALL BE DISABLED WHEN SPACE HUMIDITY FALLS BELOW 65%.

EMS MONITORS THE FOLLOWING POINTS THROUGH BACNET:

- SUPPLY FAN STATUS
- EXHAUST FAN STATUS
- OUTDOOR AIR DAMPER POSITION
- OUTDOOR AIR INTAKE TEMPERATURE
- RECIRCULATION DAMPER
- ENERGY WHEEL FACE AND BY-PASS DAMPER POSITIONS
- ENERGY WHEEL DISCHARGE AIR TEMPERATURE
- HEAT PUMP COIL DISCHARGE AIR TEMPERATURE
- HX-2 FACE AND BY-PASS DAMPER POSITION
- HX-2 DISCHARGE AIR TEMPERATURE
- COMPRESSOR STATUS
- REVERSING VALVE MODE (HEATING/COOLING)
- DEHUMIDIFICATION HOT GAS REHEAT STATUS
- SUPPLY AIR TEMPERATURE
- SUPPLY AIR HUMIDITY
- RETURN AIR TEMPERATURE
- RETURN AIR HUMIDITY
- EXHAUST AIR TEMPERATURE
- EXHAUST AIR HUMIDITY
- EXHAUST AIR DAMPER POSITION

THROUGH BACNET EMS PROVIDES THE FOLLOWING CONTROL:

- OCCUPIED/UNOCCUPIED MODE COMMAND
- SUPPLY AIR TEMPERATURE SETPOINT
- SUPPLY AIR TEMPERATURE DEWPOINT.

CONTROL LEGEND

HOLDING COILS	COMBINATION FUSIBLE MOTOR STARTER RELAY	
MOTOR		
MOTOR PROTECTIVE SWITCH		
DISCONNECT SWITCH (FUSED)		
DISCONNECT		
PILOT LIGHT		
T/STAT OR RELAY		
SET POINT-CLOSE BELOW 65°F	65°F	
SET POINT-CLOSE ABOVE 65°F	65°F	
ELECTRICAL WIRING, ABOVE 100 VOLT	PW	
TWIST SHIELDED PAIR, 24 VOLT		
DDC SENSOR (GENERIC)		
DUCT-MOUNTED SMOKE DETECTOR		
MOTORIZED CONTROL DAMPER		
COIL (TYPE XX)	X X	
FILTERS		
CONTROL AIR TUBING	CA	

AIRFLOW MEASURING STATION	AF	FREEZE PROTECTION STATION	FP
ANALOG INPUT	AI	FIRE ALARM SYSTEM	F.A.
ANALOG OUTPUT	AO	GAS HEATER	GH
CARBON DIOXIDE SENSOR	CO2	HEATING COIL	HC
CONTROL RELAY	CR	HOT GAS REHEAT COIL	HG
COOLING COIL	CC	HUMIDITY SENSOR	HE
CURRENT RELAY	CTR	PNEUMATIC ELECTRIC	PE
DIGITAL INPUT	DI	PHASE LOSS	PLP
DIGITAL OUTPUT	DO	PROTECTION	PS
DIRECT DIGITAL	DD	START-STOP	SS
CONTROL PANEL	DDC	SMOKE DETECTOR	SD
DIRECT EXPANSION COIL	DX	TEMP SENSOR	TE
ELECTRIC COIL	EH		
ELECTRIC PNEUMATIC FAN RELAY	EP		
	FR		

ALL ITEMS SHOWN ON CONTROL DIAGRAMS AND WIRING 100 VOLTS OR LESS SHALL BE INCLUDED AS A PART OF SECTION 239000 EXCEPT POWER WIRING OVER 100 VOLTS. ITEMS MARKED ▲ OR ITEMS SPECIFIED TO BE FURNISHED WITH EQUIPMENT, WIRING OVER 100 VOLTS AND ITEMS MARKED ▲ SHALL BE FURNISHED AS A PART OF DIVISION 26. ALL OVERLOADS, HOA SWITCHES, AUXILIARY CONTACTS AND PILOT LIGHTS SHALL BE INTEGRAL WITH THE MOTOR STARTERS UNLESS SHOWN OTHERWISE.

ALL WIRING SHOWN ON ELECTRIC SEQUENCE CONTROLS SHALL BE OVER 100 VOLTS UNLESS NOTED OTHERWISE. RELAYS FROM THE CONTROL SYSTEM SHALL BE LOCATED ADJACENT TO THE CONTROLLED DEVICE (MOTOR OR MOTOR STARTER), AND MAY BE LOCATED WITHIN STARTER HOUSINGS WHERE SPACE IS AVAILABLE AND WHERE APPROVED BY NEC.

ALL SEQUENCES OF OPERATION, FLOW DIAGRAMS, AND POINTS LIST ARE COMPLEMENTARY. ALL CONTROL STRATEGIES SHALL BE SATISFIED EVEN IF SOME OF THE REQUIRED CONTROL POINTS, ALARM, OR SOFTWARE HAVE BEEN INADVERTENTLY LEFT OFF OF THE POINTS LIST OR FLOW DIAGRAM. SIMILARLY, CONTROL POINTS, ALARM, AND SOFTWARE STRATEGIES INDICATED ON THE POINTS LIST SHALL BE PROVIDED EVEN IF A WRITTEN SEQUENCE OR FLOW DIAGRAM DEVICE HAS BEEN INADVERTENTLY OMITTED.

CONTROL ITEMS MARKED THUS "VENTILATION-ON-OFF" SHALL HAVE PLATE ENGRAVED WITH THE WORDING CONTAINED WITHIN THE QUOTE ". " MARKS PLUS EQUIPMENT IDENTIFICATION.

*QTY AS REQUIRED/INDICATED ON PLANS.

**P/T PORT PROVIDED BY DIV. 23. INSTALLED BY DIV. 23. INSTALL WITHIN 6" OF ASSOCIATED SENSOR.

DESCRIPTION	BY	DATE	REVISIONS

ASCENT
ENGINEERING GROUP
5228 VALLEYVIEW DRIVE, SUITE 4
ROANOKE, VIRGINIA 24019
(540) 255-4444
D:DW 23900 C:---

DATE	03/22/2024	PROJECT	23125-01	DW 1
DESIGNED		DRAWN		
CHECKED				

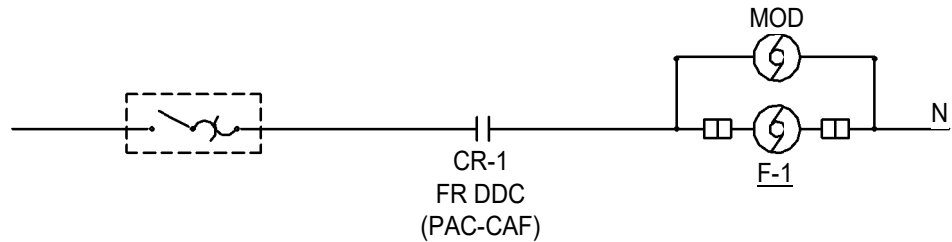
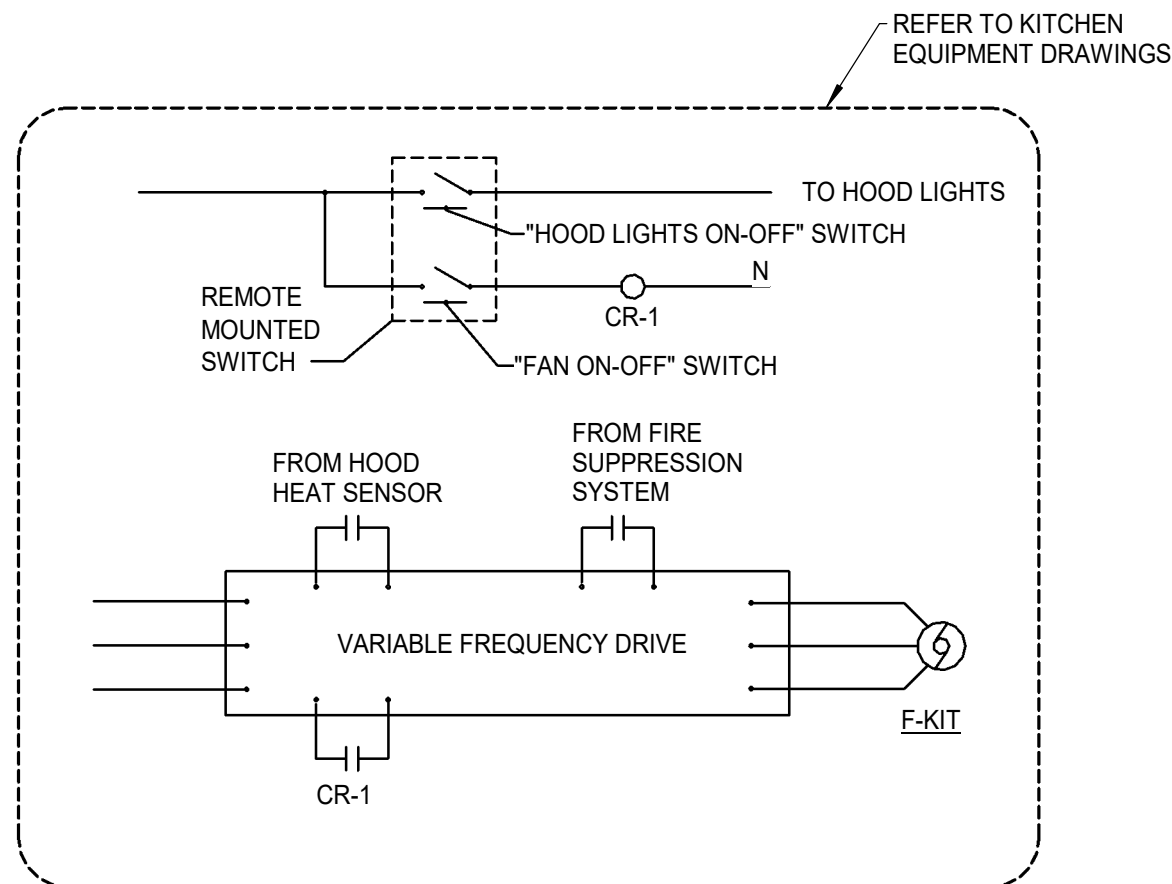
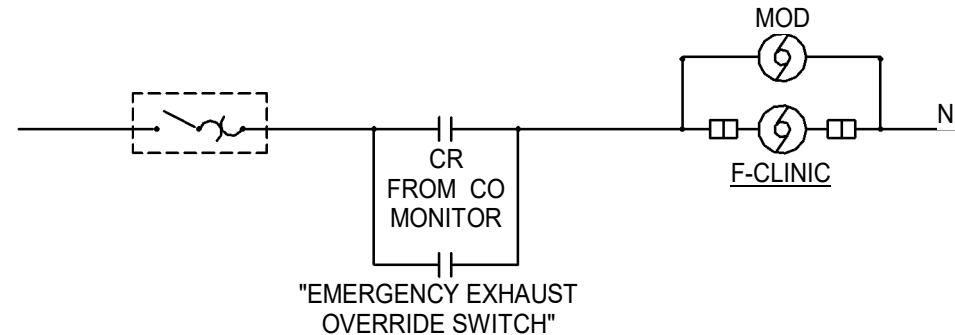
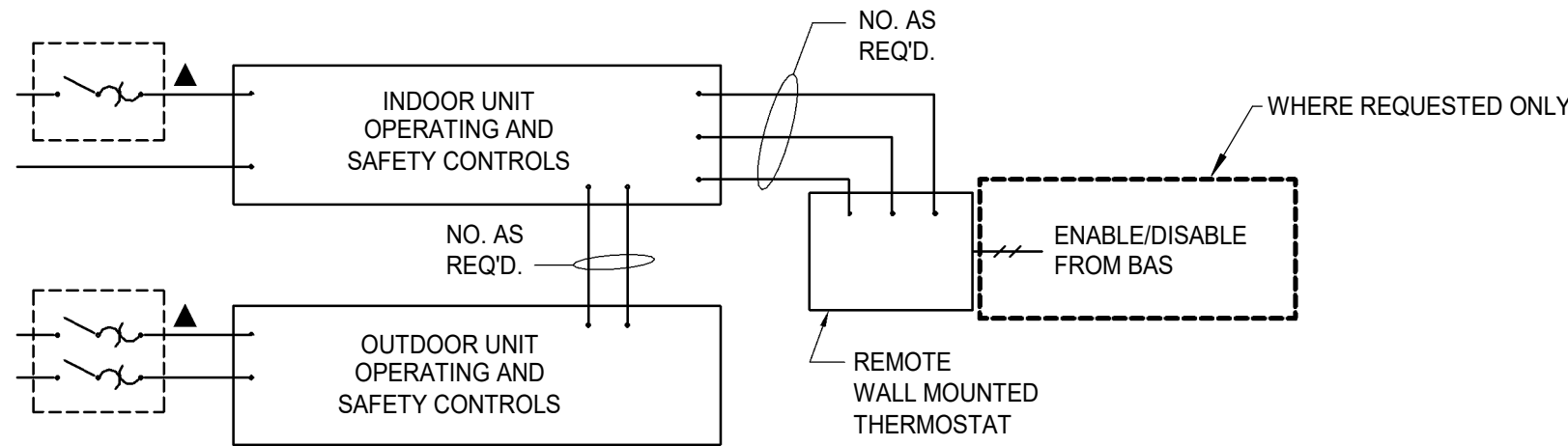
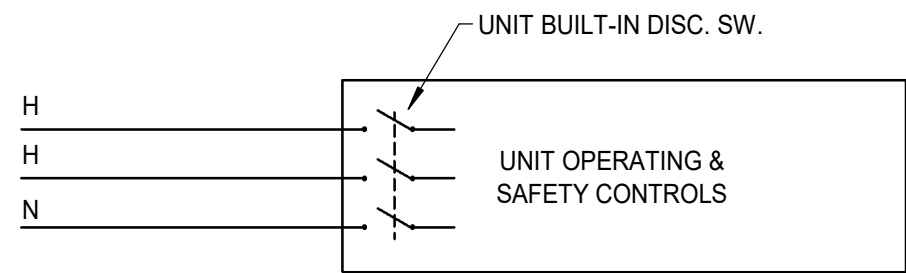
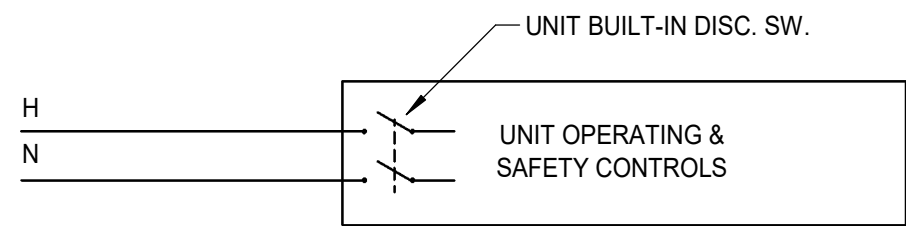
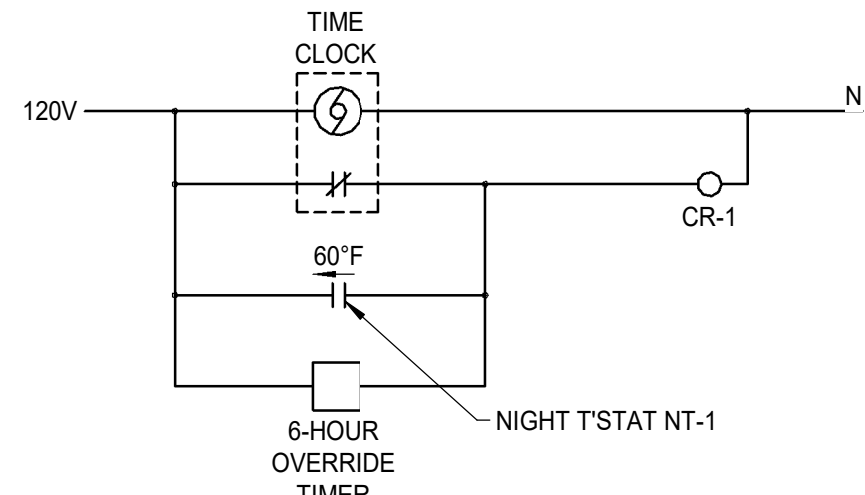
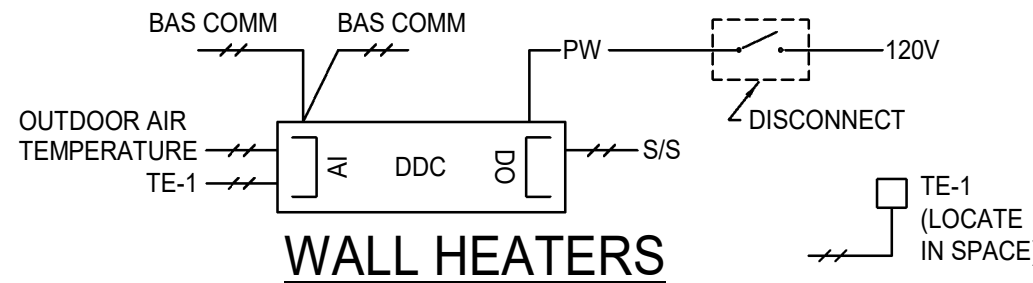
RRMM
ARCHITECTS, PC
28 Church Ave SW
Roanoke, Virginia 24011
(540)344-1212



PROJECT W.E. CUNDIFF ELEMENTARY SCHOOL ADDITIONS AND RENOVATIONS
ROANOKE COUNTY PUBLIC SCHOOLS
1200 HARDY RD
VINTON, VA
DRAWING MECHANICAL CONTROLS AND SEQUENCES
SHEET M-301

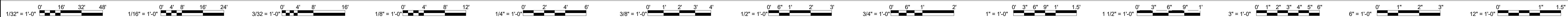
3/20/2024 5:28:07 PM Autodesk Docs\\23125-01 RCPS WE Condif ES\\23900 MEP Central v2.dwg

- FUME HOOD INTERLOCKED FANS:**
1. THE BAS SHALL CONTROL FAN IN A ON-OFF FASHION. THE BAS SHALL DISABLE THE FAN ANYTIME THE ASSOCIATED AIR HANDLER IS IN OCCUPIED MODE AND THE ASSOCIATED FUME HOOD FAN IS OPERATING. ANY TIME THE AIR HANDLER IS IN OCCUPIED MODE AND ASSOCIATED FUME HOOD FAN IS NOT OPERATING, THE BAS SHALL ENABLE THE FAN TO RUN AT THE SCHEDULED CFM.
- LIGHTING CONTROL:**
1. LIGHTING CONTROL: THE DDC SHALL CONTROL CONTACTORS LC1 THROUGH LC7 TO TURN ON IN RESPONSE TO THE PHOTO CELL AND OFF IN RESPONSE TO THE OWNER'S PRESET SCHEDULE. EACH CONTACTOR SHALL HAVE THEIR OWN SCHEDULE. ALTHOUGH THE PROGRAMMING SHALL BE SUCH THAT THE OWNER CAN CHOOSE TO SYNCHRONIZE THEM WITH A SINGLE RADIO BUTTON LOCATED ON THE GRAPHICS SCREEN FOR THE LIGHTS. AT NO TIME SHOULD ANY LIGHTS ASSOCIATED WITH CONTACTORS LC1 THROUGH LC7 BE ON WHEN THE PHOTO CELL SENSES DAYLIGHT.
- UNIT HEATERS AND CABINET UNIT HEATERS:**
1. ON A FALL IN SPACE TEMPERATURE, AS SENSED BY TE-1, CR-1 SHALL ENERGIZE THE UNIT FAN AND OPEN V-1 TO MAINTAIN SPACE TEMPERATURE.
- ELECTRIC WALL HEATERS AND ELECTRIC UNIT HEATERS:**
1. THE DDC SHALL DISABLE ELECTRIC HEAT AT OUTDOOR TEMPERATURES ABOVE 40°F (ADJ.). SPACE SETPOINT SHALL BE 55°F (ADJ.). THE DDC SHALL ALSO STAGGER THE ENABLE COMMANDS OF ALL ELECTRIC HEATERS BY A MINIMUM OF 1 MINUTE (ADJ.) SO AS TO LIMIT THE INSTANTANEOUS DEMAND.
- THERMOSTATICALLY CONTROLLED FANS:**
1. THE BAS SHALL MONITOR SPACE TEMPERATURE/HUMIDITY AND MODULATE THE SPEED OF THE FAN USING A 0-10V SIGNAL TO THE ECM MOTOR TO MAINTAIN SPACE SETPOINT. (70°F / 60% RH ADJ.)
- DUCTLESS SPLIT SYSTEMS:**
1. DUCTLESS SPLIT SYSTEMS: THE DDC SHALL MONITOR THE SPACE TEMPERATURE OF ALL ROOMS SERVED BY DUCTLESS SPLIT SYSTEMS AND ALARM WHEN SPACE EXCEEDS SETPOINT. ALARM VALUE SETPOINTS SHALL BE COORDINATED WITH OWNER.
- DOMESTIC HOT WATER RECIRCULATION PUMP CONTROL:**
1. PUMPS (HWCP QUANTITY AS REQUIRED) SHALL BE ENABLED AND DISABLED WITH OCCUPANCY.
- KITCHEN HOOD CONTROL:**
1. KITCHEN HOOD CONTROLLER SHALL BE PROGRAMMED TO RUN THE KITCHEN HOOD FANS DURING OCCUPANCY. MANUFACTURERS STANDARD "PREP MODE" SHALL BE USED DURING TIMES WHEN THE SPACE IS OCCUPIED BUT NEITHER THE SPACE TEMPERATURE OR DUCT TEMPERATURE REQUIRE THE FANS TO RUN IN STANDARD MODULATION MODE. TAB AGENT SHALL PROVIDE THE MINIMUM VFD SETPOINT NECESSARY TO ACHIEVE ~~xxx~~ CFM OF TOTAL EXHAUST THROUGH THE HOOD DURING PREP MODE. ALL OTHER MODES AND SETPOINTS SHALL BE AS RECOMMENDED BY THE HOOD MANUFACTURER.
- MAIN SWITCHBOARD:**
1. THE DDC SHALL MONITOR THE MAIN SWITCHBOARD FOR CURRENT POWER USAGE AND REPORT THAT VALUE ON A SCREEN. THE BAS SHALL ALSO ALARM ON ANY POWER OUTAGE.



SIMILAR FANS

F-2

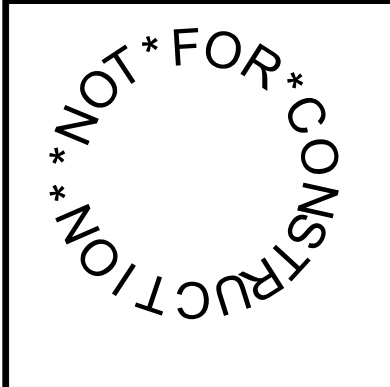


DESCRIPTION
BY
MARK DATE
REVISIONS

ASCENT
ENGINEERING GROUP
5228 VALLEYPOINTE PKWY, SUITE 4
ROANOKE, VIRGINIA 24019
(540) 265-4444
D:DW R 23900 C: ---

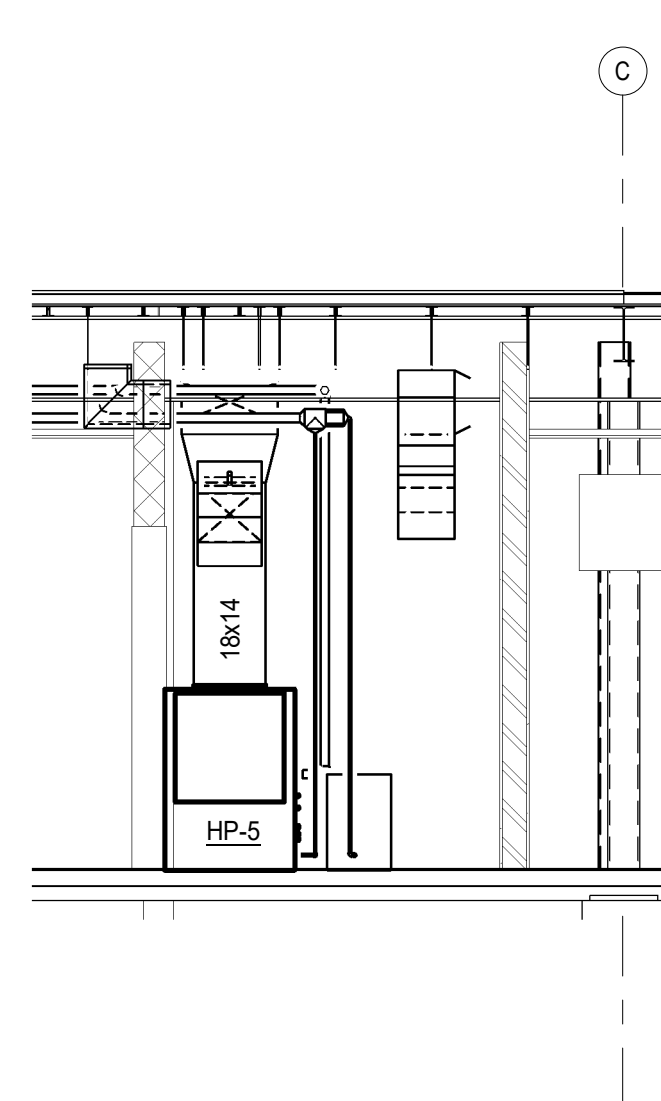
DATE	03/22/2024
PROJECT	23125-01
DESIGNED	DWR
DRAWN	DWR
CHECKED	i

RRMM
ARCHITECTS, PC
28 Church Ave SW
Roanoke, Virginia 24011
(540)344-1212

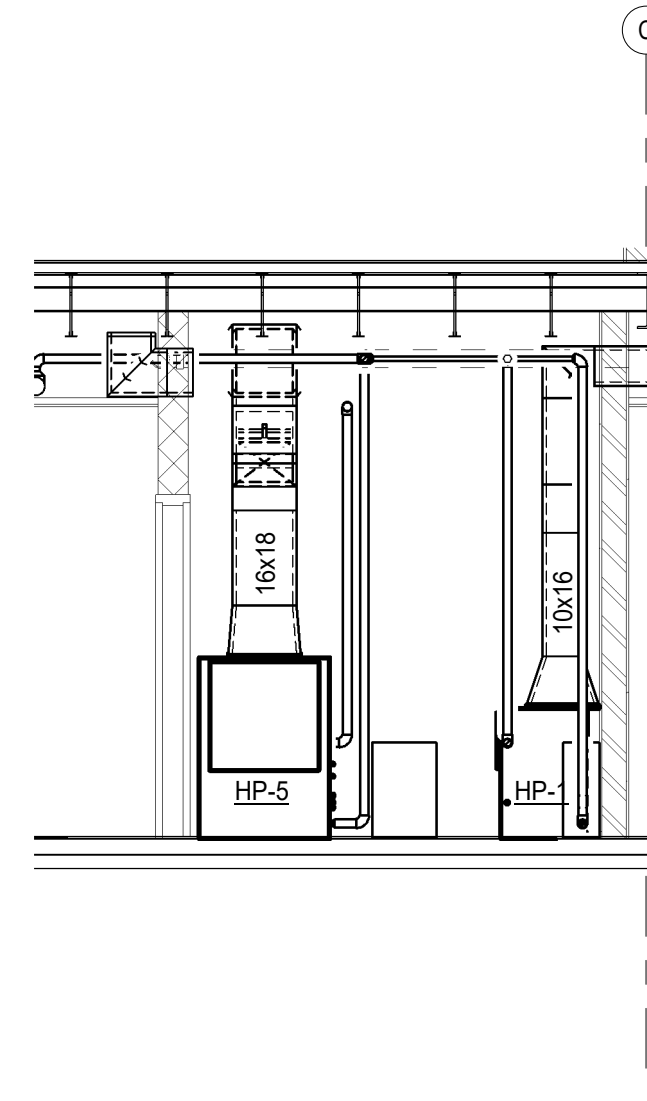


PROJECT **W.E. CUNDIFF ELEMENTARY SCHOOL ADDITIONS AND RENOVATIONS**
ROANOKE COUNTY PUBLIC SCHOOLS
1200 HARDY RD
VINTON, VA
DRAWING **MECHANICAL CONTROLS AND SEQUENCES**

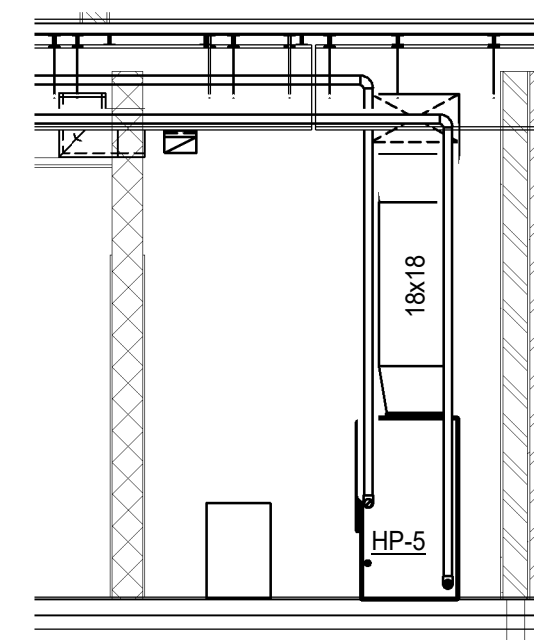
SHEET
M-302



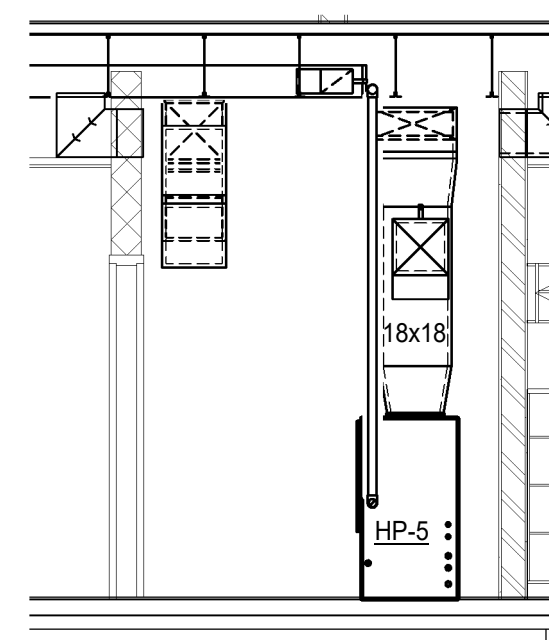
MECH A132 SECTION



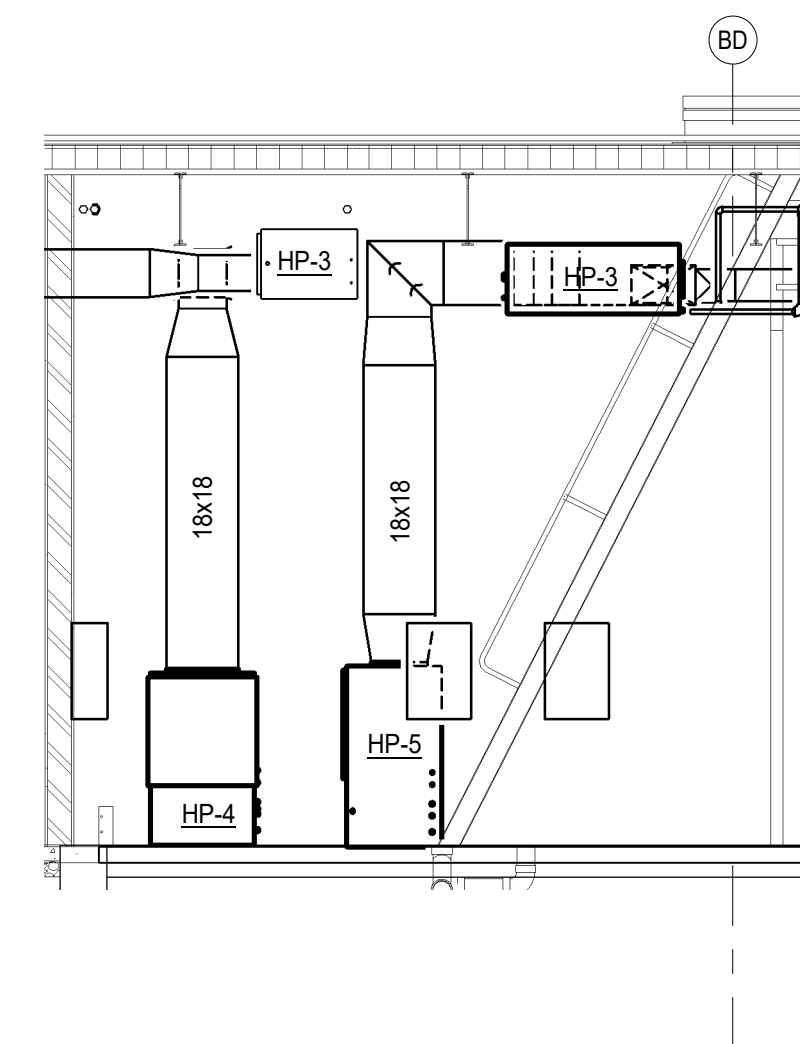
3 MECH A123 SECTION
M-401 SCALE: 1/4" = 1'-0"



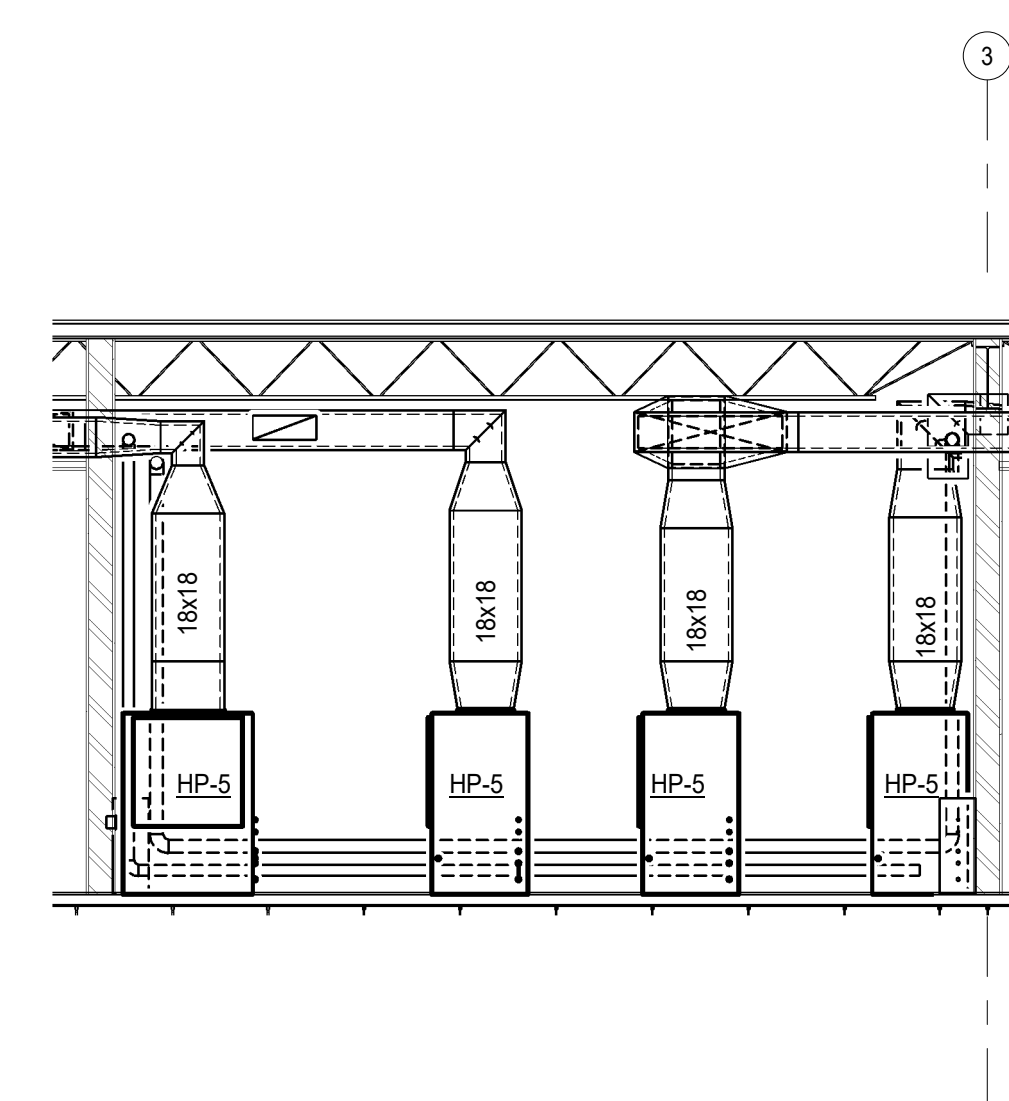
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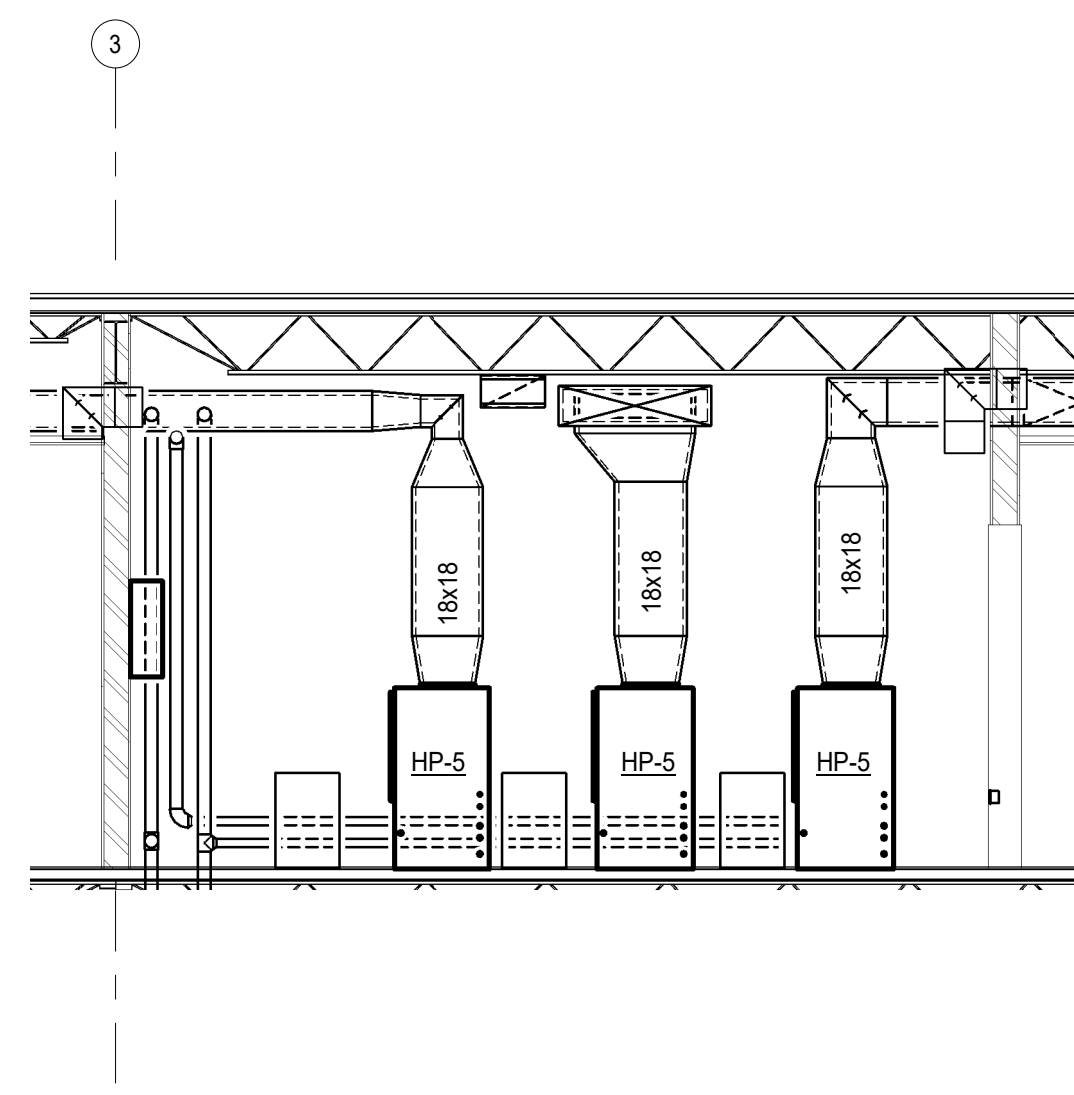
5 MECH A106 SECTION
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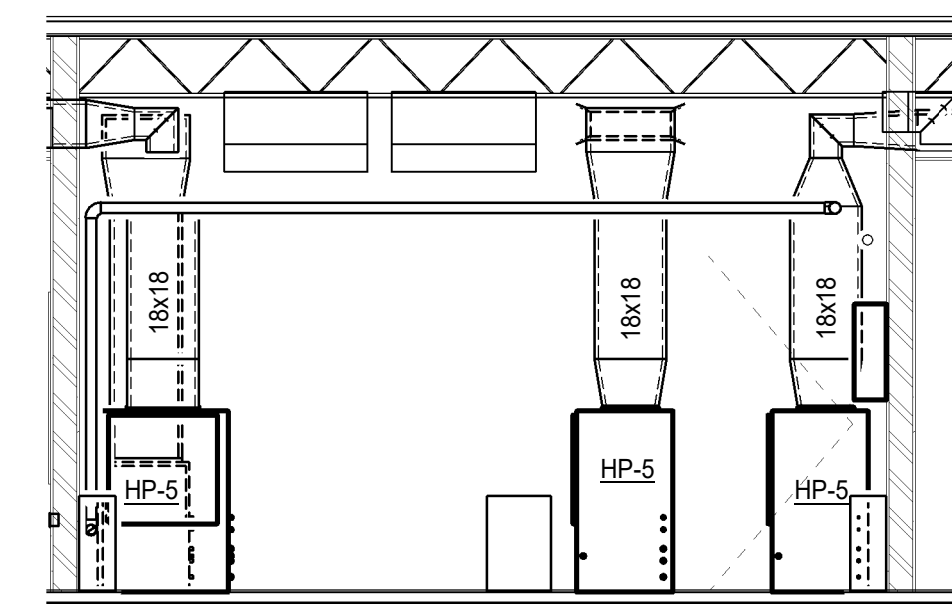
6 MECH B123 SECTION
M-401 SCALE: 1/4" = 1'-0"



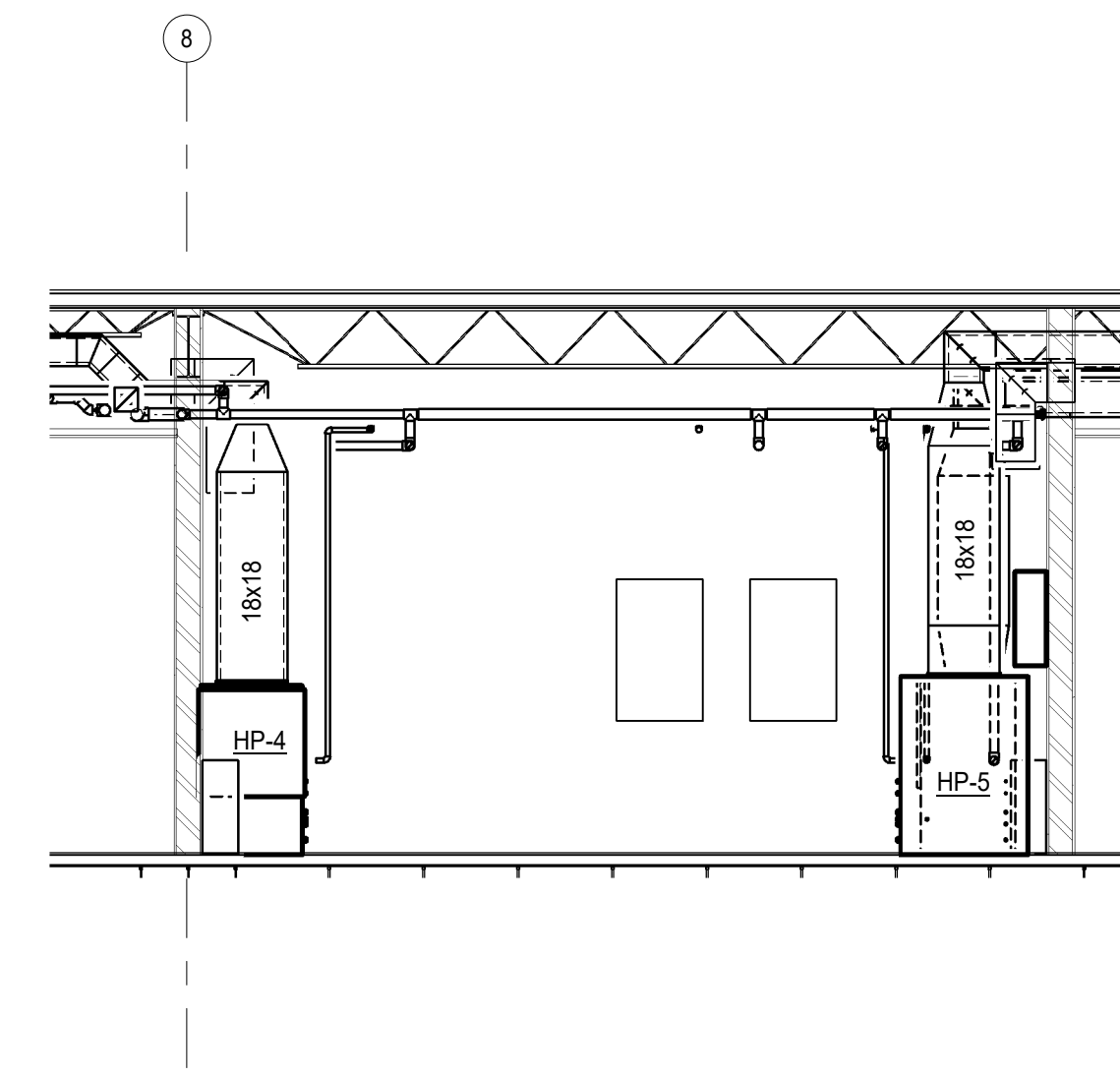
7 MECH A233 SECTION
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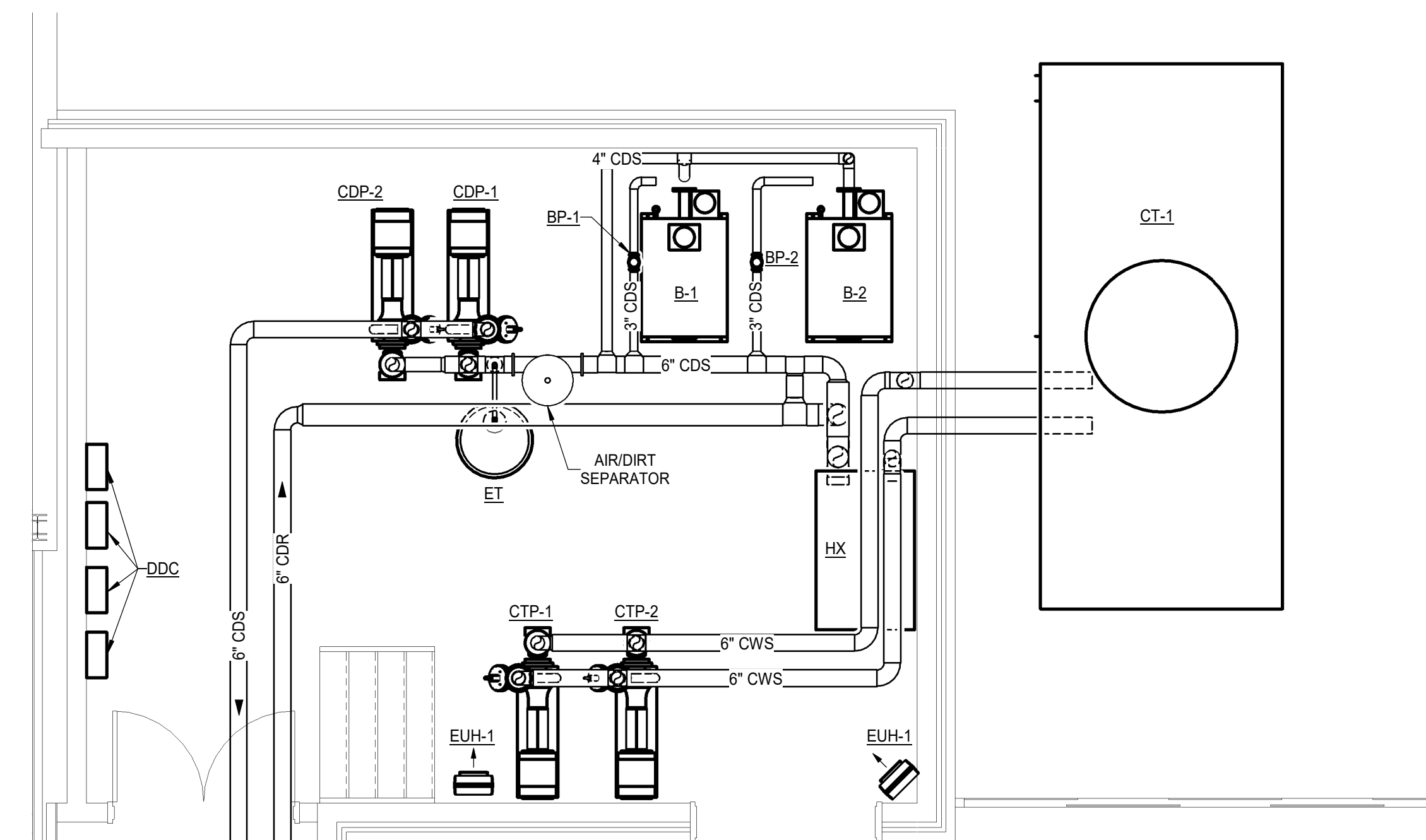
8 MECH A229 SECTION
M-401 SCALE: 1/4" = 1'-0"



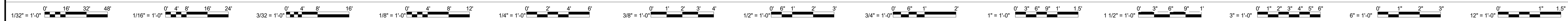
9 MECH A215 SECTION
M-401 SCALE: 1/4" = 1'-0"



MECH A260 SECTION



MECHANICAL ROOM



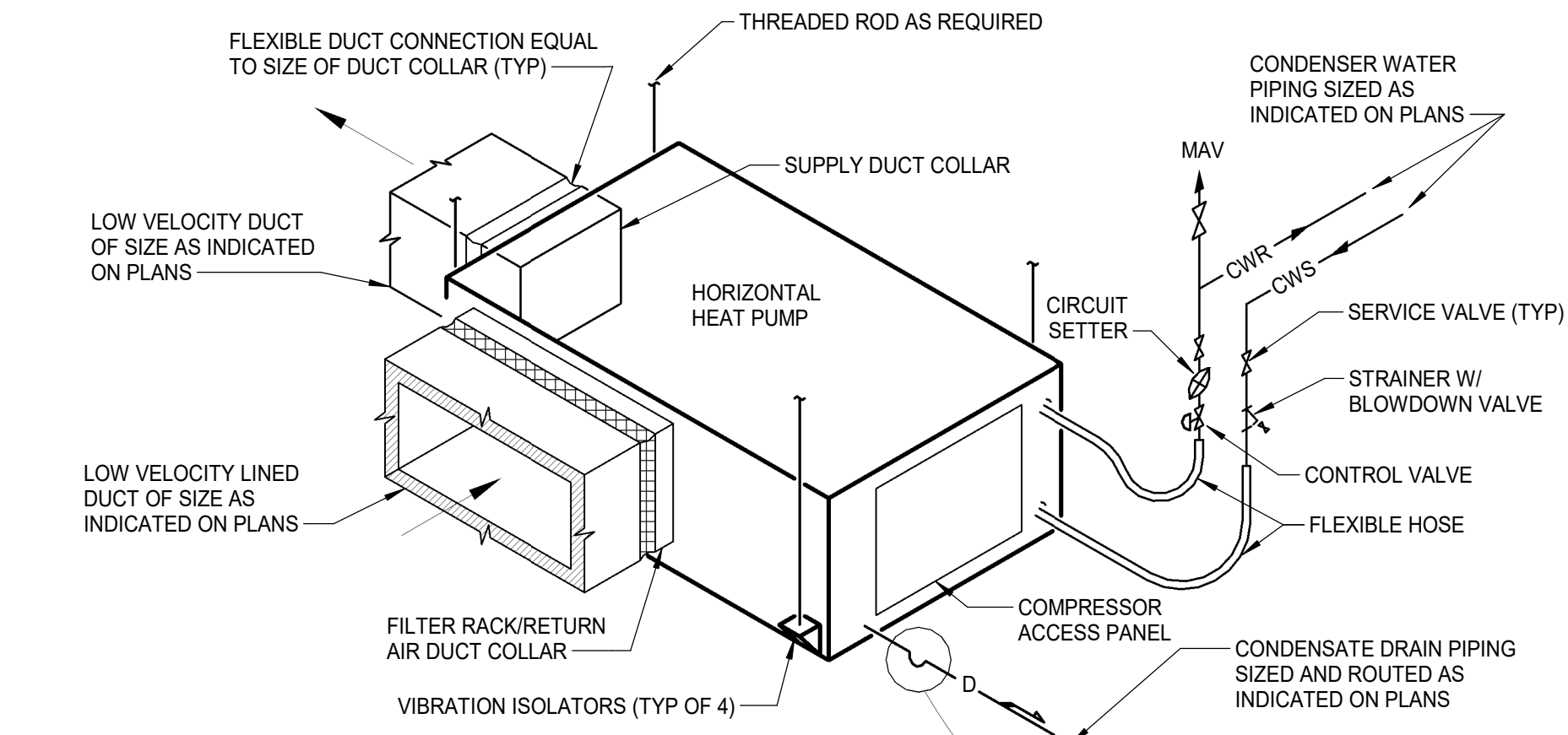
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B

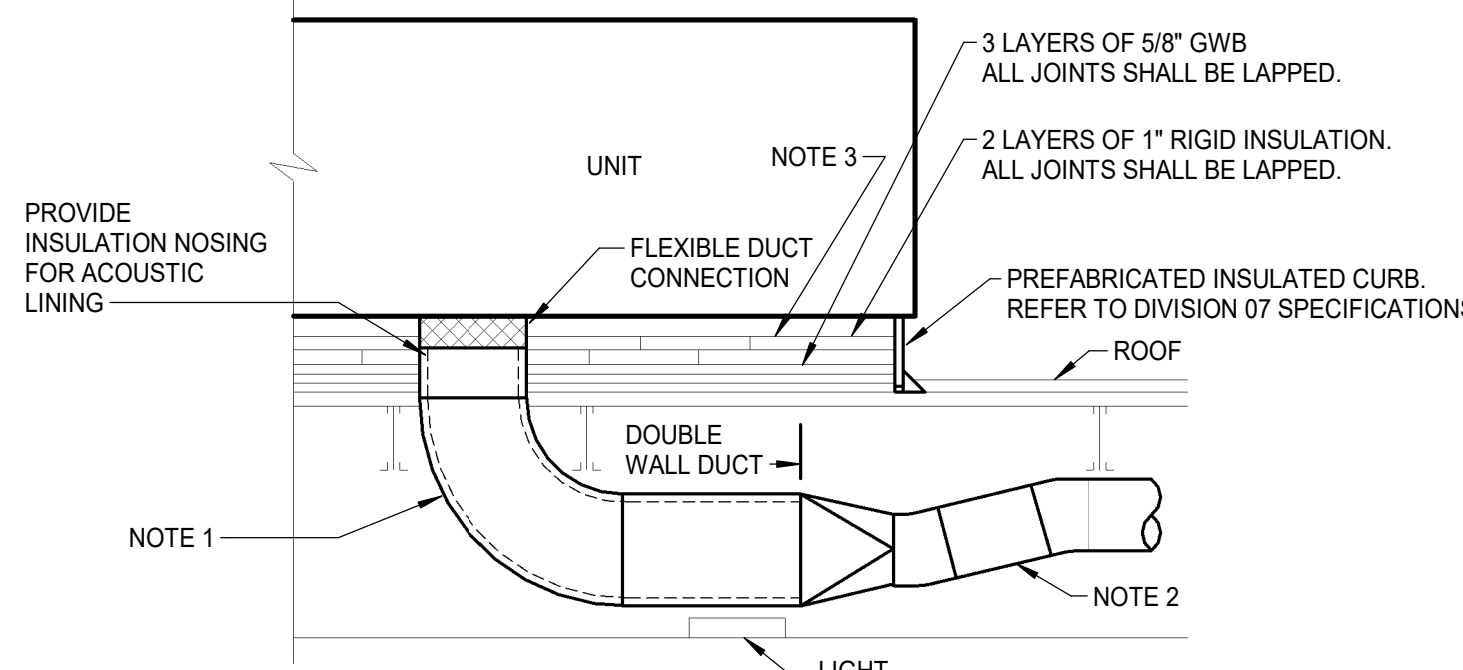
A



- NOTES:
1. ALL HEAT PUMP UNITS SHALL HAVE ALL MANUFACTURER RECOMMENDED SERVICE CLEARANCES MAINTAINED. COORDINATE LOCATION OF PIPING, DUCTWORK, POWER CONNECTIONS, CONTROL WIRE CONNECTIONS, ETC. AS TO NOT RESTRICT ACCESS TO THE HEAT PUMP IN ANY WAY.
 2. COORDINATE MOUNTING LOCATION OF HEAT PUMP AS TO AVOID OTHER TRADES BUILDING SYSTEMS SUCH AS SPRINKLER PIPE, CABLE TRAY, DOMESTIC WATER PIPING, ETC. THAT COULD PREVENT ACCESS TO HEAT PUMP.
 3. WHERE HEAT PUMP IS INSTALLED ABOVE ACOUSTIC CEILING, ALL EFFORT SHALL BE MADE TO POSITION HEAT PUMP WHERE RETURN AIR FILTER ACCESS AND MAINTENANCE ACCESS CAN BE ACHIEVED THROUGH REMOVABLE CEILING TILE WITHOUT INTERFERENCE FROM LIGHTING FIXTURES.
 4. SCHEMATIC SHOWN IS LEFT HAND RETURN WITH END DISCHARGE. REFER TO PLANS FOR CORRECT RETURN AND DISCHARGE LOCATIONS.
 5. HEAT PUMPS MOUNTED ABOVE CEILINGS SHALL HAVE AUXILIARY DRAIN PANS. REFER TO AUXILIARY DRAIN PAN DETAIL.

HORIZONTAL WATER SOURCE HEAT PUMP CONNECTIONS

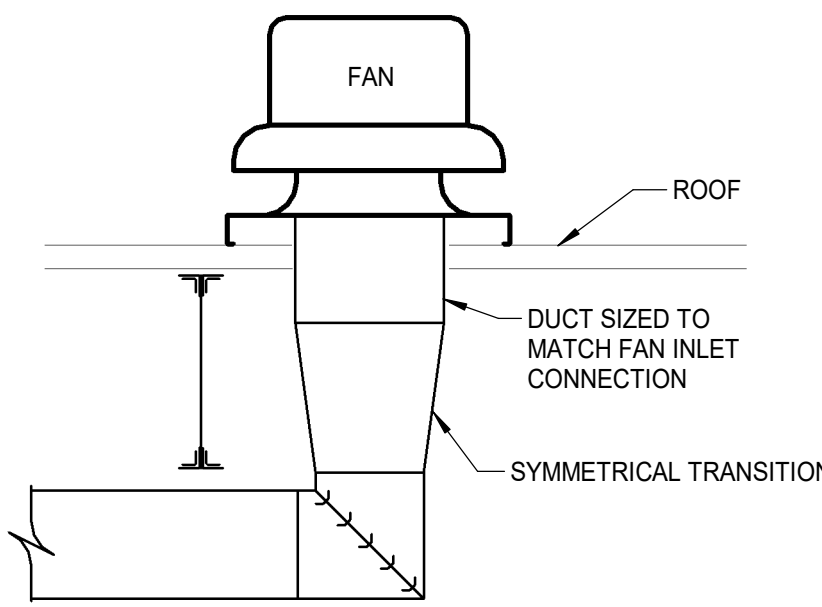
SCHEMATIC



ROOFTOP AIR HANDLING & AIR CONDITIONING UNIT DETAIL

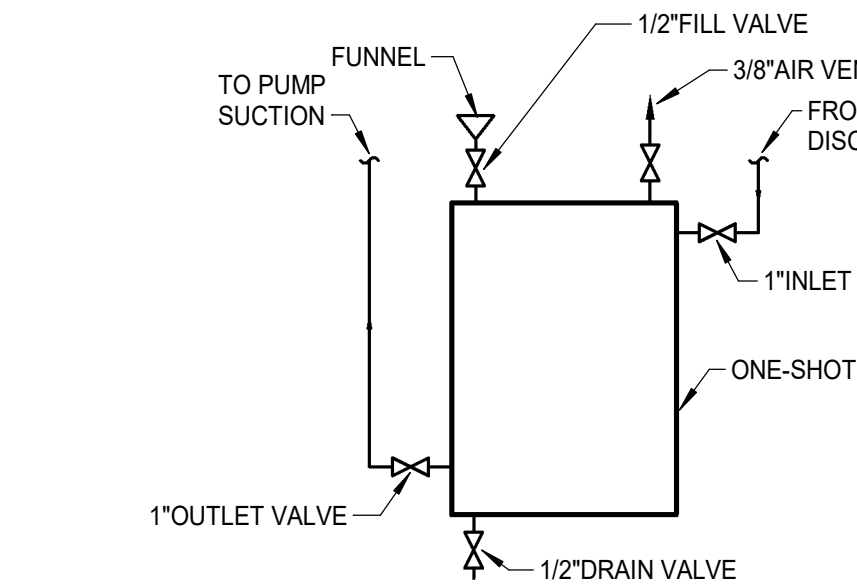
SCHEMATIC

- NOTES:
1. RADIUS ELBOW WITH 1.5D RADIUS. PROVIDE MITERED ELBOW WITH TURNING VANES WHERE REQUIRED FOR LIMITED CEILING SPACE. REFER TO PLANS FOR FULL EXTENT OF ACOUSTIC LINING AND DOUBLE WALL DUCTWORK.



FAN CONNECTION DETAILS

NO SCALE



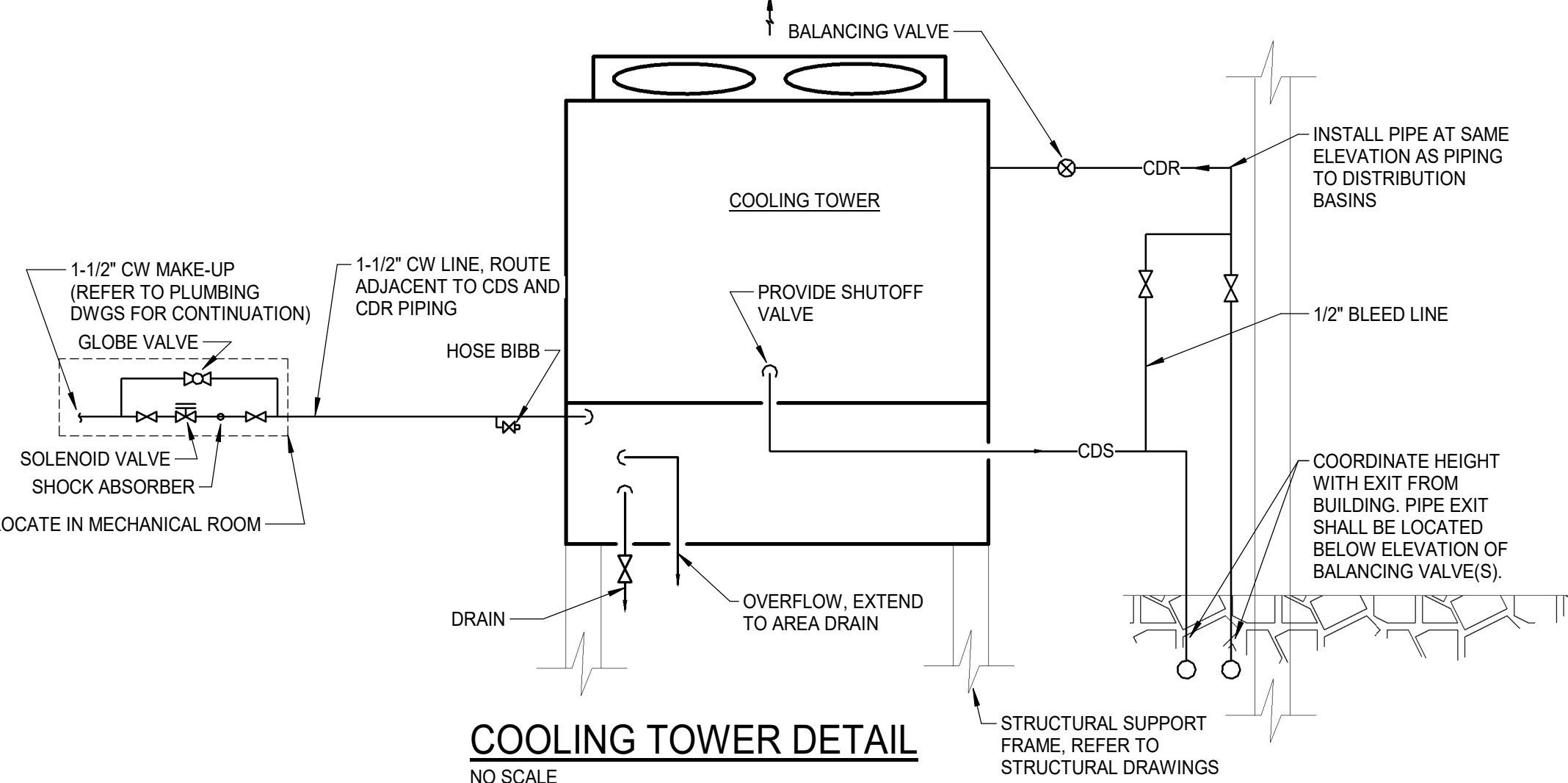
CHEMICAL FEEDER DETAIL

SCHEMATIC

- NOTES:
1. ALL HEAT PUMP UNITS SHALL HAVE PRIMARY MANUFACTURER RECOMMENDED SERVICE CLEARANCES MAINTAINED. COORDINATE LOCATION OF PIPING, DUCTWORK, POWER CONNECTIONS, CONTROL WIRE CONNECTIONS, ETC. AS TO NOT RESTRICT ACCESS TO THE HEAT PUMP IN ANY WAY.
 2. COORDINATE MOUNTING LOCATION OF HEAT PUMP AS TO AVOID OTHER TRADES BUILDING SYSTEMS SUCH AS SPRINKLER PIPE, CABLE TRAY, DOMESTIC WATER PIPING, ETC. THAT COULD PREVENT ACCESS TO HEAT PUMP.
 3. REFER TO PLANS FOR CORRECT RETURN AND DISCHARGE LOCATIONS.
 4. PROVIDE EXTERNALLY TRAPPED CONDENSATE DRAIN IF NOT INTERNALLY TRAPPED.

VERTICAL WATER SOURCE HEAT PUMP CONNECTIONS

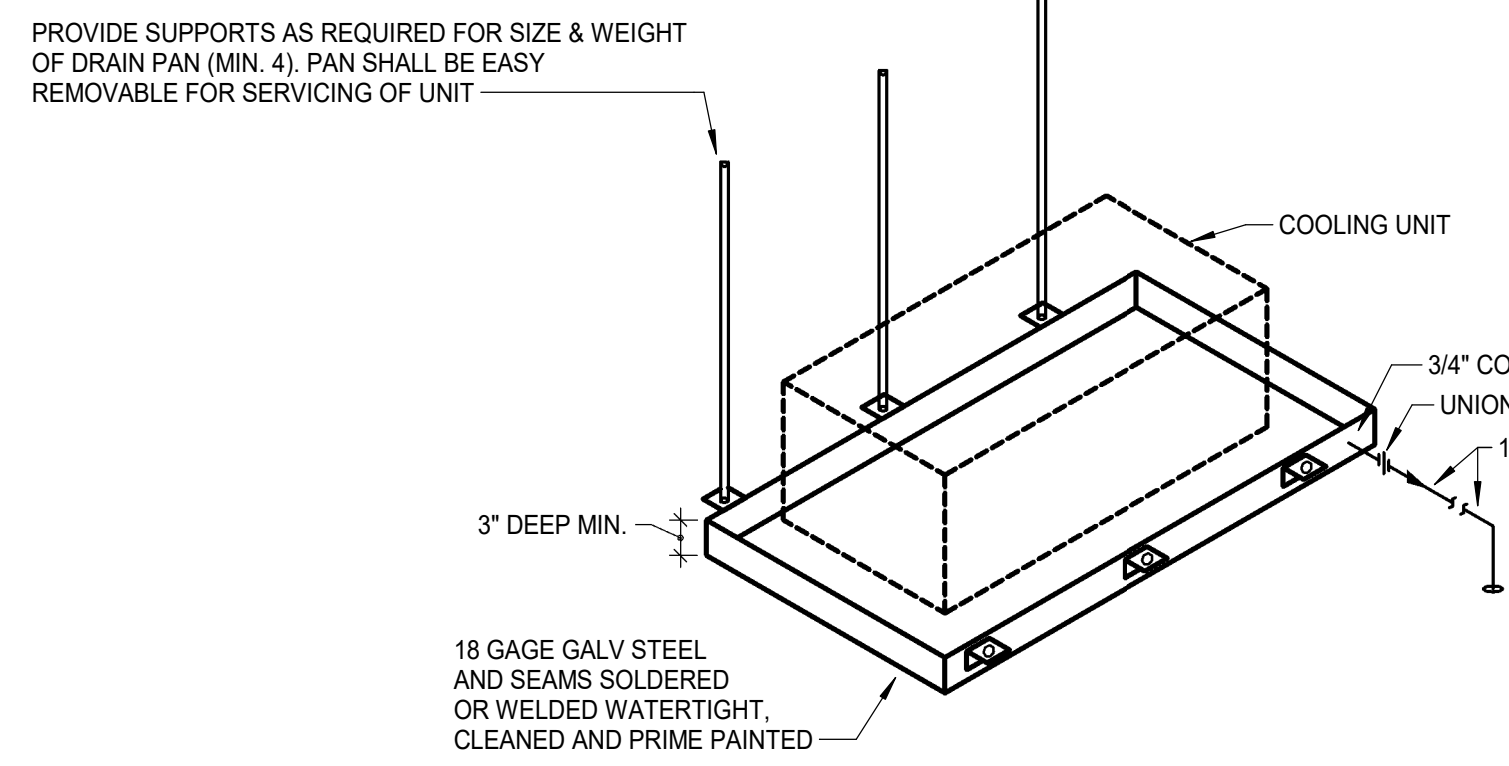
SCHEMATIC



COOLING TOWER DETAIL

NO SCALE

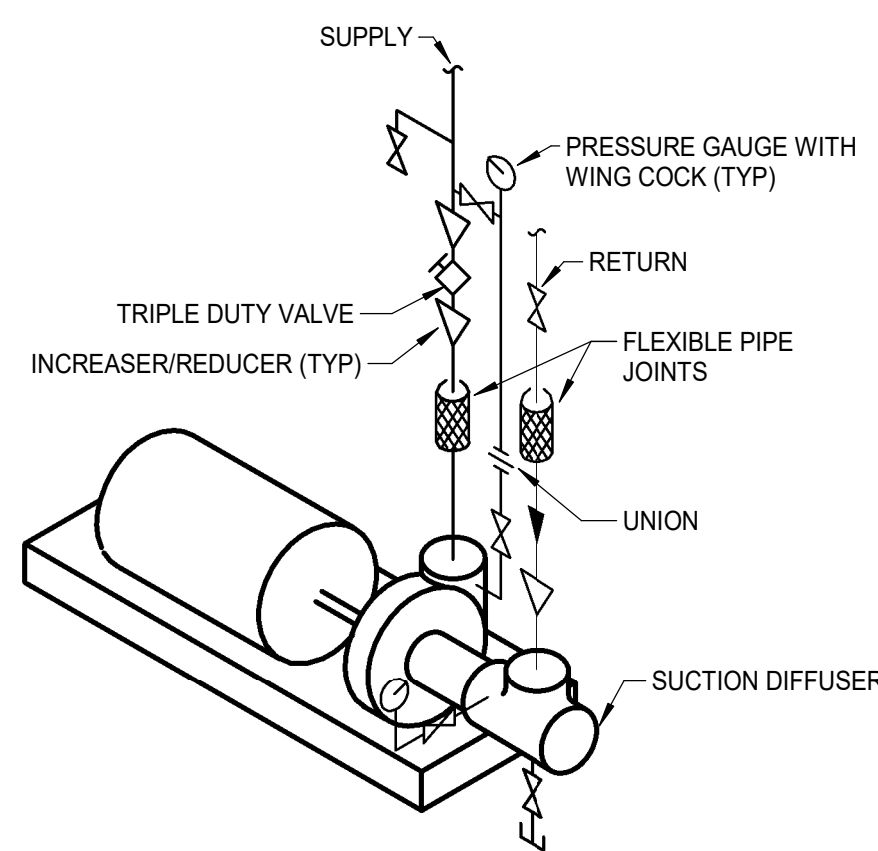
- NOTE:
1. VERIFY AIR GAP BETWEEN CW MAKE-UP OUTLET AND TOP OF BASIN OVERFLOW.
 2. DRAIN & OVERFLOW PIPING SHALL BE FULL SIZE OF UNIT CONNECTION.
 3. INSTALL CDR PIPING TO ALLOW CLEAR SERVICE AREA FOR FANS & MOTOR.
 4. PROVIDE HEAT-TRACE FOR ALL OUTDOOR CDS, CDR, AND CW PIPING. COORDINATE REQUIRED POWER CONNECTION POINTS WITH ELECTRICAL.



AUXILIARY DRAIN PAN

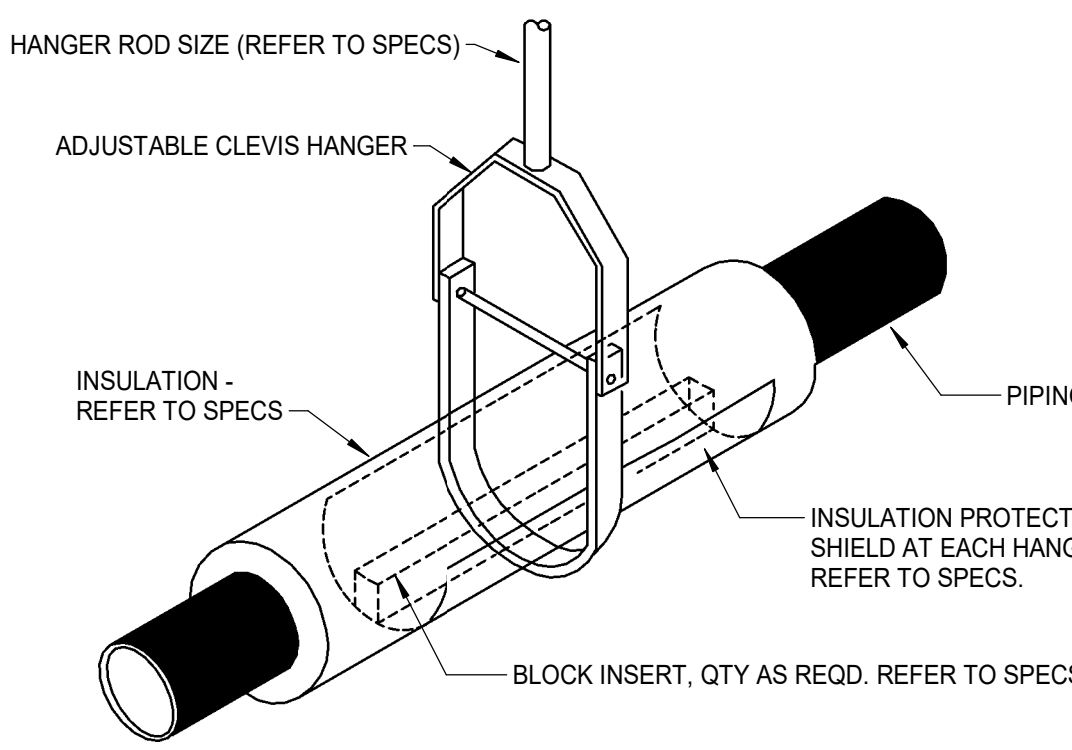
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- NOTES:
1. ALL FAN COIL & BLOWER COIL UNITS CONCEALED ABOVE CEILING SHALL HAVE AUXILIARY DRAIN PAN UNDER ENTIRE UNIT EXCEPT WHEN PROVIDED WITH "SECONDARY OVERFLOW" DRAIN CONNECTION AND FACTORY AUXILIARY PAN UNDER CHILLED WATER VALVE. "SECONDARY OVERFLOW" DRAIN PANS SHALL BE EXTENDED DOWN THRU CEILING AS INDICATED ABOVE.
 2. DRAIN PAN SHALL BE REINFORCED WITH GALVANIZED STEEL ANGLES TO PREVENT SAGGING OR FLEXING WHEN FULL OF WATER.
 3. PAN SHALL EXTEND A MINIMUM 3" BEYOND SIDES OF COOLING UNIT & CHILLED WATER VALVES.



PUMP CONNECTIONS

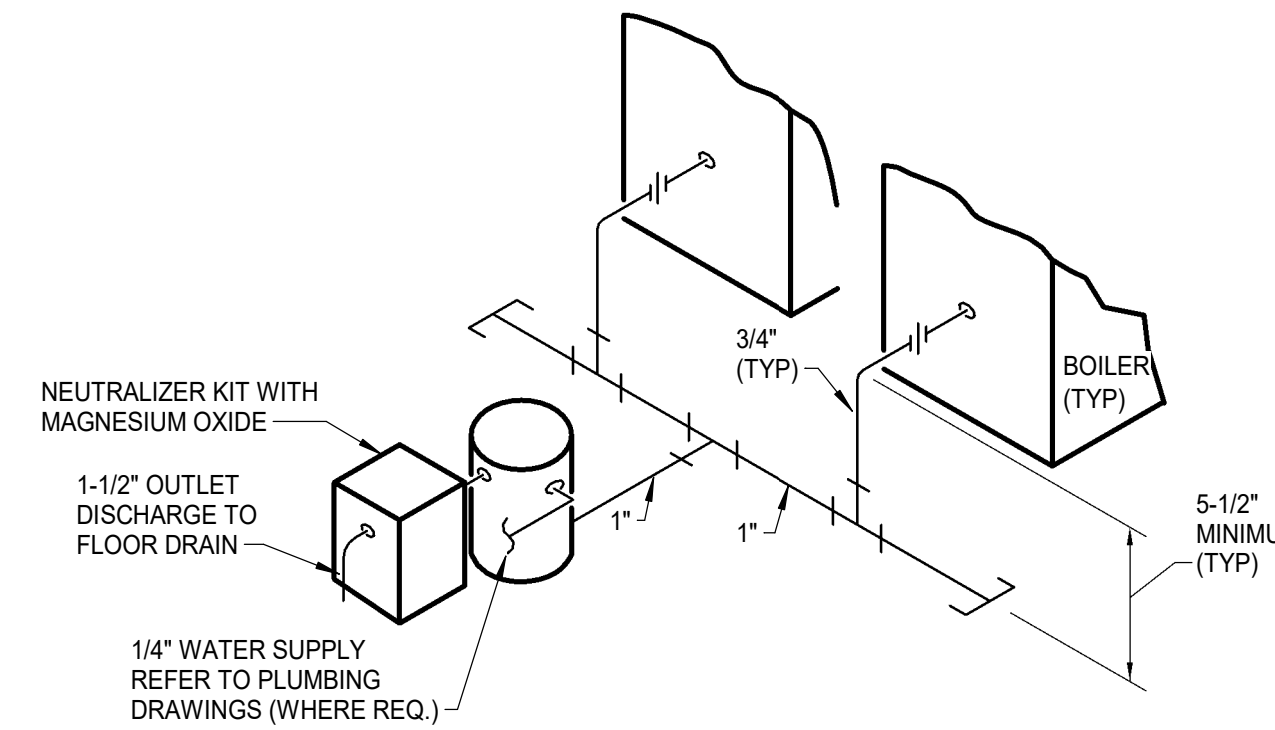
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- NOTE:
1. SEE STRUCTURAL DRAWINGS FOR HANGER ROD CONNECTION STRUCTURE.

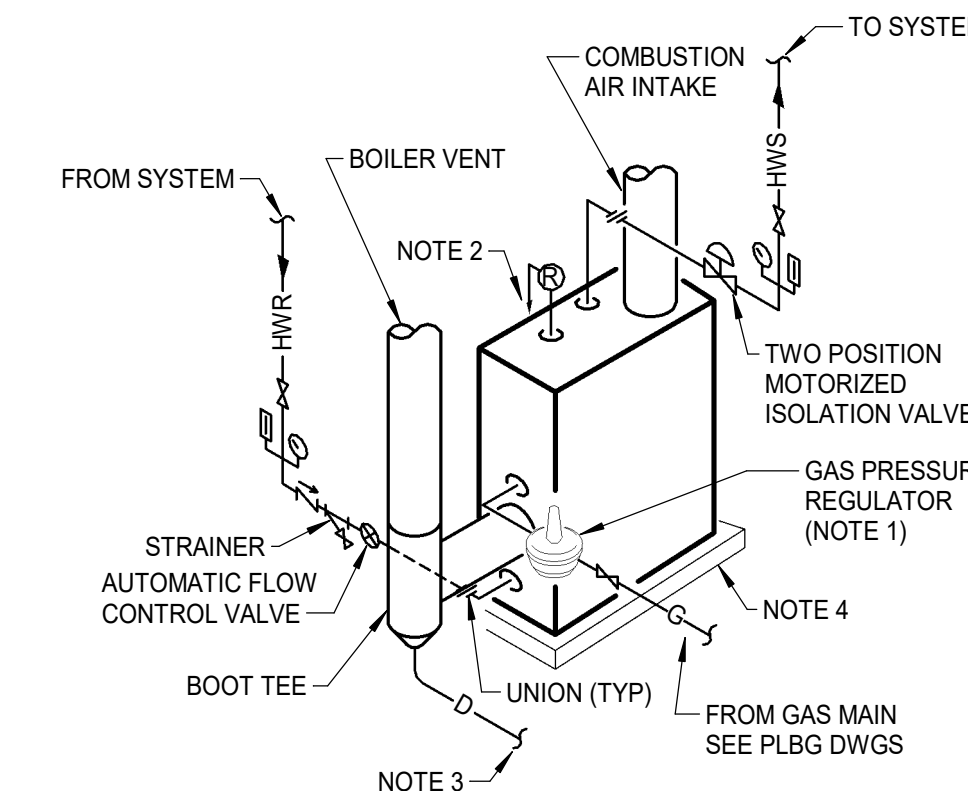
PIPE HANGER AND INSULATION DETAIL

NO SCALE



BOILER CONDENSATE PIPING DETAIL

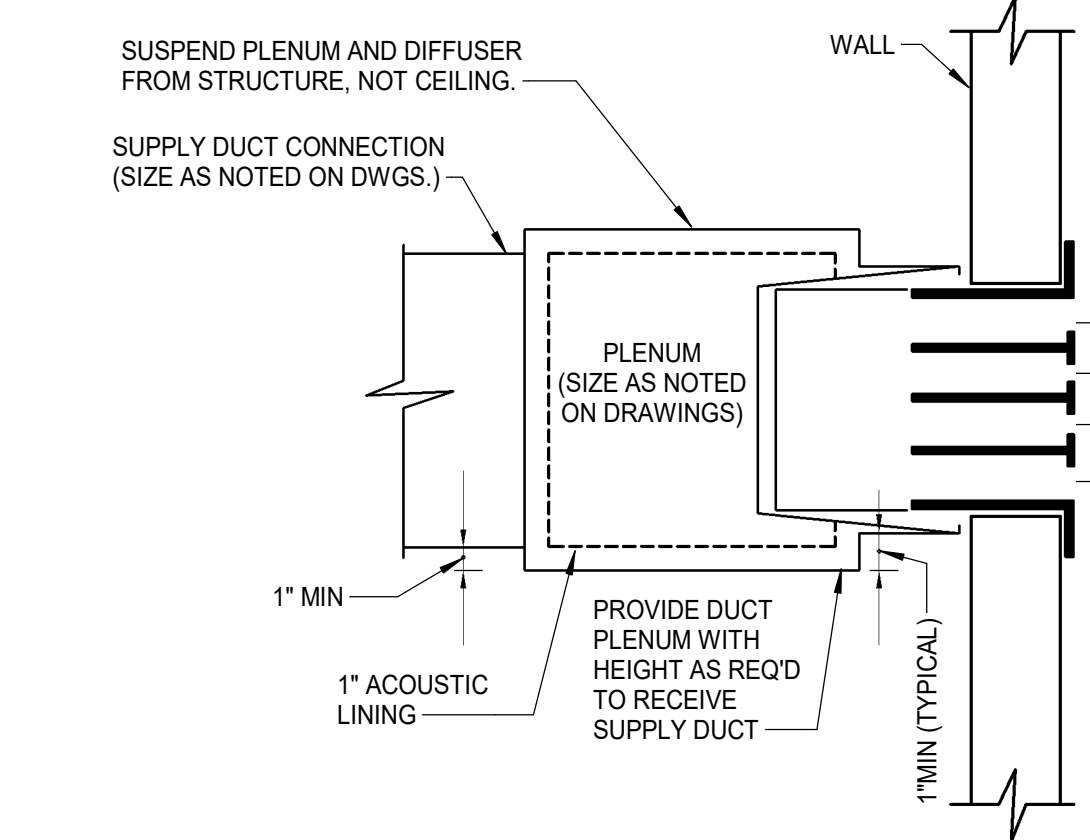
SCHEMATIC



- NOTES:
1. GAS TRAIN PROVIDED BY BOILER MANUFACTURER AND INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.
 2. EXTEND RELIEF VALVE DISCHARGE TO FLOOR.
 3. CONDENSATE DRAIN LINE IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS. EXTEND TO NEUTRALIZER KIT PROVIDED WITH BOILER, THEN TO FLOOR DRAIN.
 4. BOILER MUST BE SET ON MINIMUM 6" HIGH HOUSEKEEPING PAD TO ALLOW FOR SUFFICIENT CONDENSATE DRAIN CONNECTION HEIGHT. COORDINATE EXACT HEIGHT WITH NEUTRALIZING KIT PROVIDED.

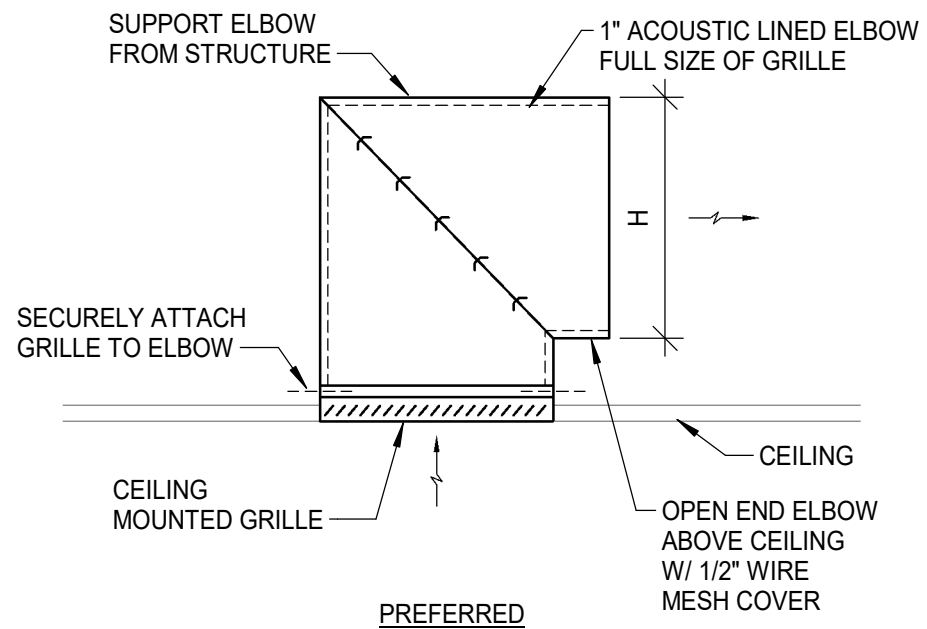
BOILER CONNECTIONS

SCHEMATIC



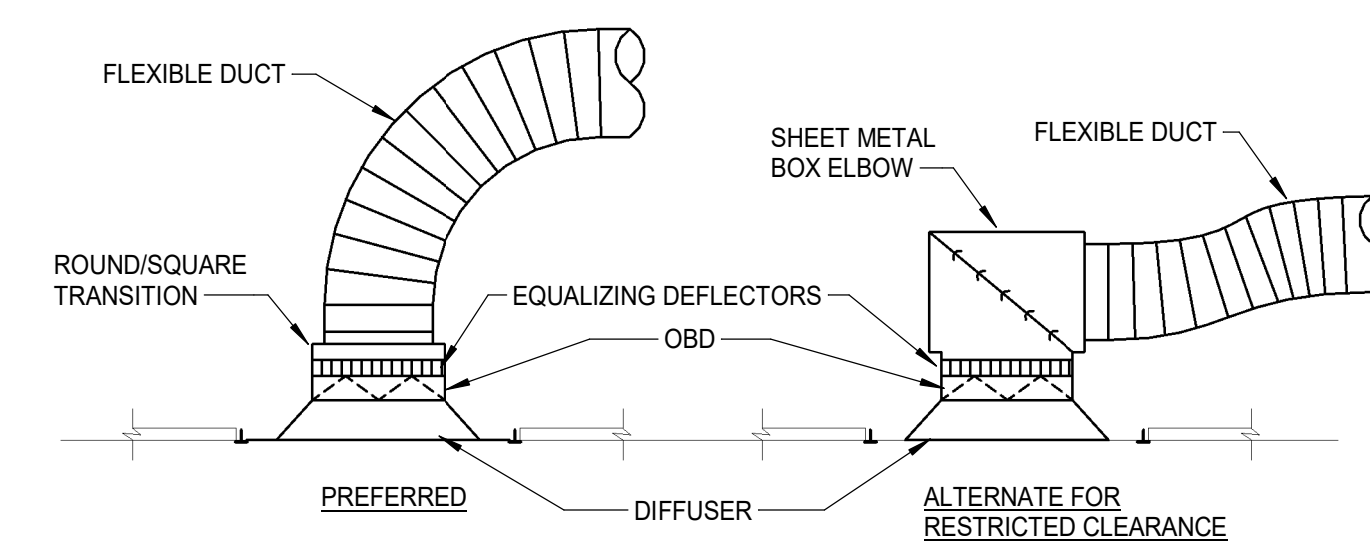
MOUNTING DETAIL FOR LINEAR DIFFUSERS

NO SCALE



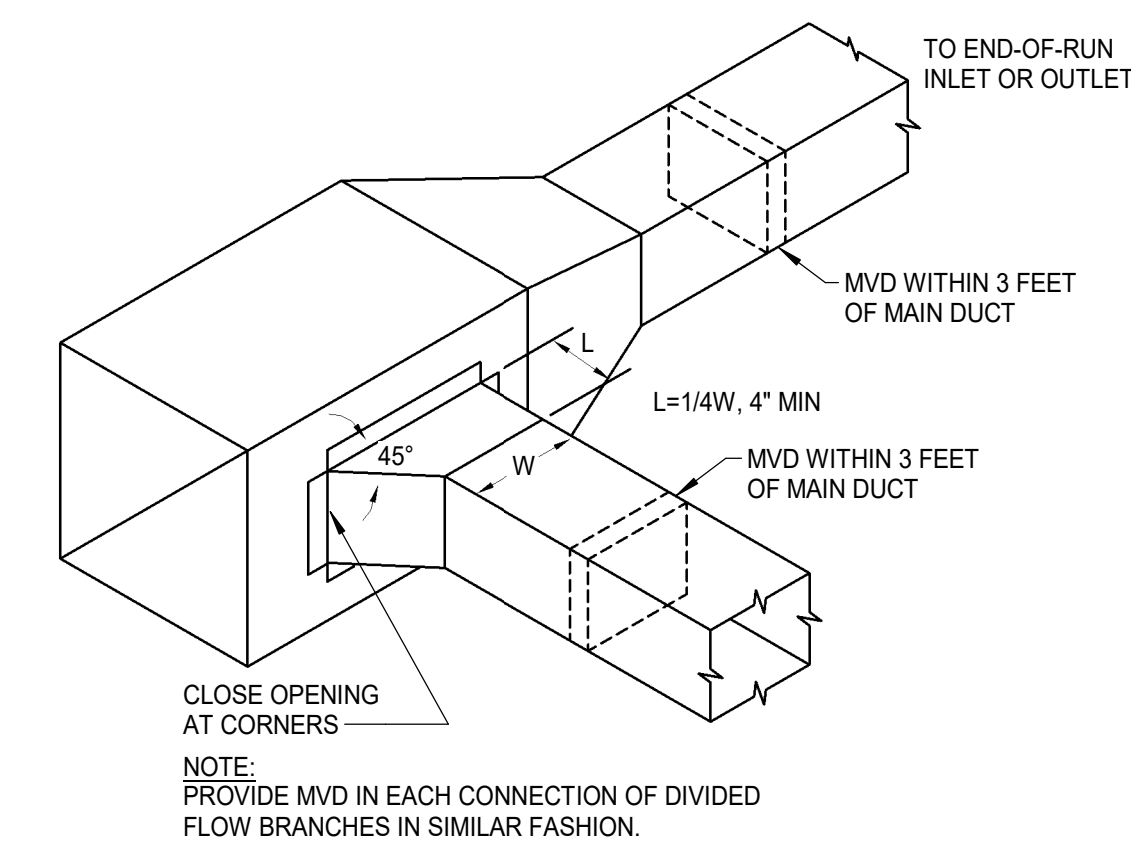
PLENUM RETURN GRILLE DETAIL

NO SCALE



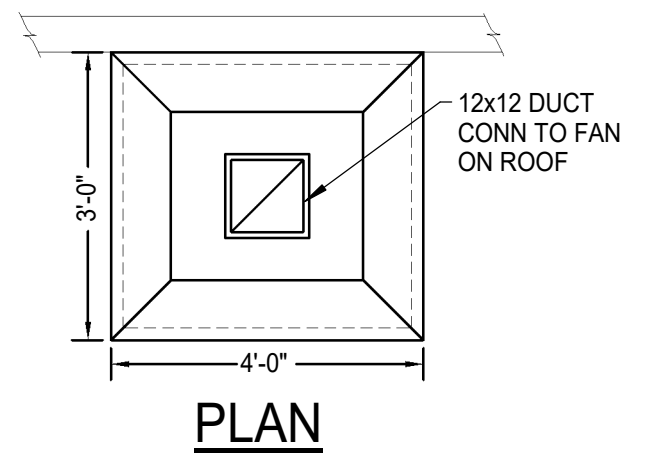
DIFFUSER CONNECTION DETAIL

NO SCALE



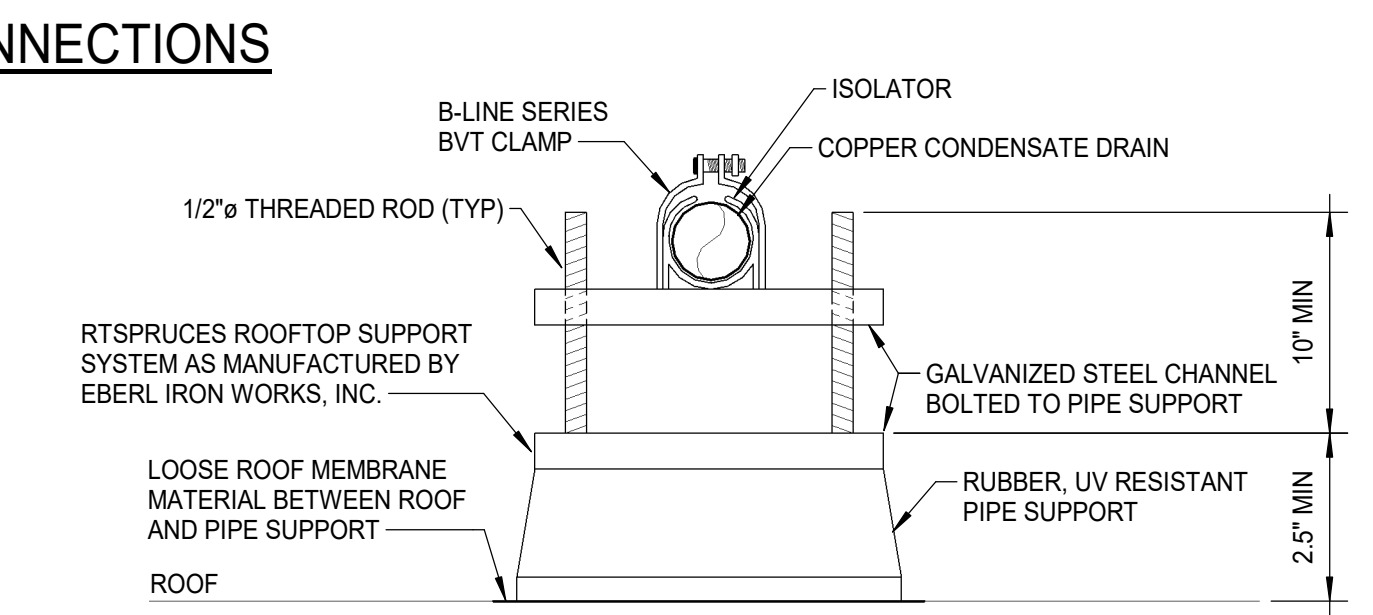
BRANCH CONNECTIONS DETAIL FOR SUPPLY, RETURN & EXHAUST DUCT (TYP)

SCHEMATIC



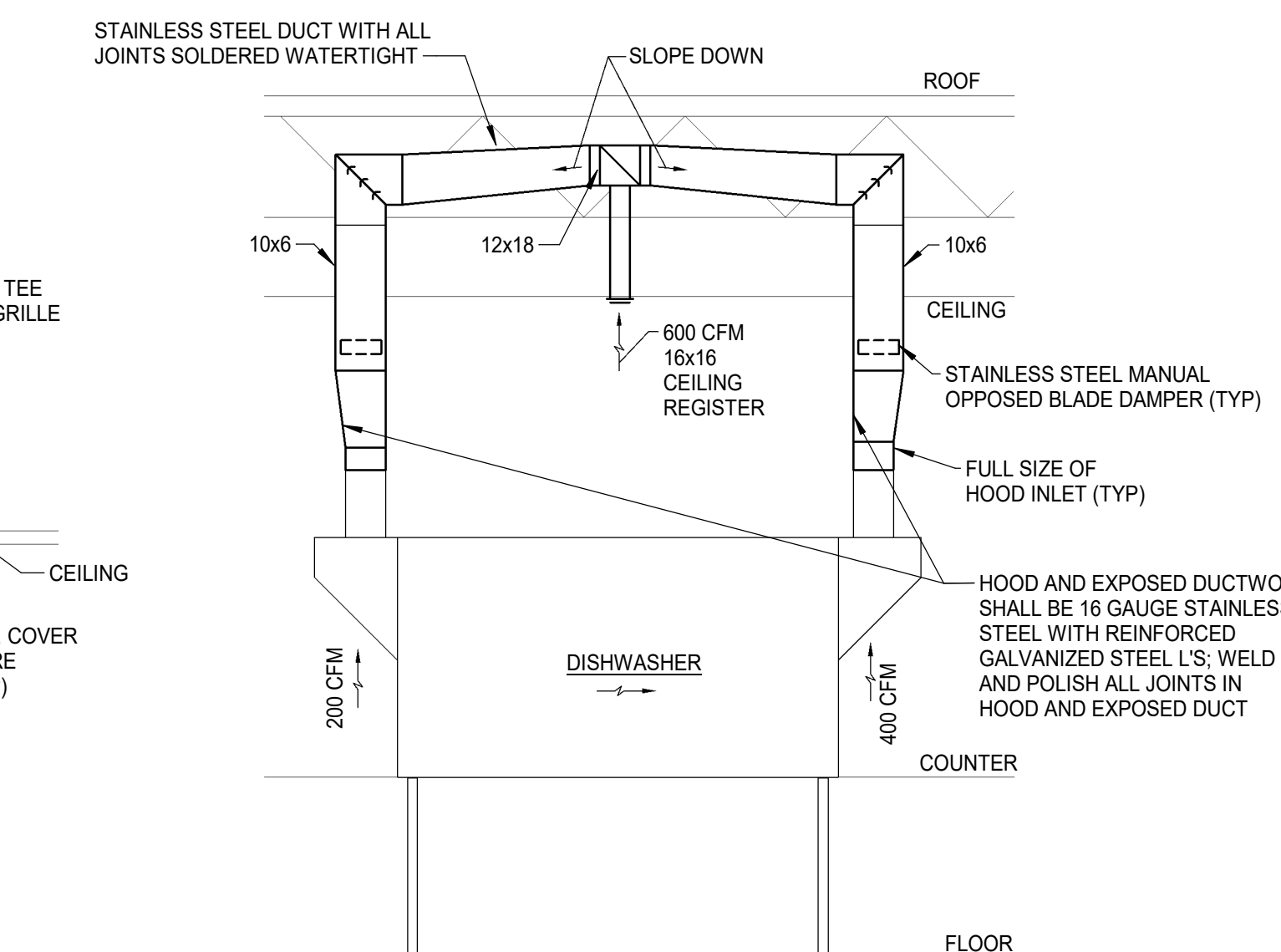
KILN EXHAUST HOOD DETAIL

NO SCALE



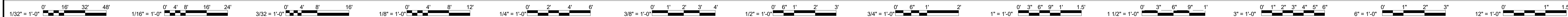
ROOFTOP CONDENSATE PIPE SUPPORT FOR EXISTING ROOFS

NO SCALE



DISHWASHER HOOD DETAIL

NO SCALE



DESCRIPTION
BY
MARK
DATE
REVISIONS

ASCENT
ENGINEERING GROUP
5228 VALLEYVIEW DRIVE, SUITE 4
ROANOKE, VIRGINIA 24019
(540) 265-4444
D:\DWR 23900 C: ---

DATE	PROJECT	DESIGNED	DRAWN	CHECKED
03/22/2024	23125-01	DWR	DWR	

RRMM
ARCHITECTS, PC
28 Church Ave SW
Roanoke, Virginia 24011
(540) 344-1212

NOT FOR CONSTRUCTION

PROJECT
W.E. CUNDIFF ELEMENTARY SCHOOL ADDITIONS AND RENOVATIONS
ROANOKE COUNTY PUBLIC SCHOOLS
1200 HARDY RD
VINTON, VA
DRAWING
MECHANICAL DETAILS

SHEET

M-501