

ABBREVIATIONS

AD	ACCESS DOOR	GPM	GALLONS PER MINUTE
AFG	ABOVE FINISHED GRADE	GV	GRAVITY VENTILATOR
AFF	ABOVE FINISHED FLOOR	GC	GENERAL CONTRACTOR
ACHP	AIR COOLED HEAT PUMP	HVAC	HEATING, VENTILATING & AIR CONDITIONING CONTRACTOR
AP	ACCESS PANEL	LAT	LEAVING AIR TEMP. DEGREES F.
ATC	TEMPERATURE CONTROL CONTRACTOR	LWT	LEAVING WATER TEMP. DEGREES F.
BDD	BACK DRAFT DAMPER	MAX	MAXIMUM
CFM	CUBIC FEET PER MINUTE	MIN	MINIMUM
CO	CLEAN OUT	OA	OUTSIDE AIR
CP	CONDENSATE PUMP	P	PUMP
DB	DRY BULB TEMP. DEGREES F.	PC	PLUMBING CONTRACTOR
DFC	DUCTLESS SPLIT-TYPE AIR CONDITIONER	OB	OPPOSED BLADE DAMPER
E	EXHAUST AIR DEVICE	PC	PLUMBING CONTRACTOR
EAT	ENTERING AIR TEMP. DEGREES F.	PD	PRESSURE DROP (FEET OF WATER)
EC	ELECTRICAL CONTRACTOR	R	RETURN AIR DEVICE
ECUH	ELECTRIC CABINET UNIT HEATER	RF	RETURN FAN
EF	EXHAUST FAN	RH	REHEAT COIL
ERV	ENERGY RECOVERY VENTILATOR	S	SUPPLY AIR DEVICE
EUH	ELECTRIC UNIT HEATER	SA	SOUND ATTENUATOR
FCU	FANCOIL UNIT	TB	TERMINAL BOX
FT	FINITUBE (RADIATION)	VFD	VARIABLE FREQUENCY DRIVE
		WB	WET BULB TEMP. DEGREES F.
		WMS	WIRE MESH SCREEN

PIPING

	HWS	HOT WATER SUPPLY
	HWR	HOT WATER RETURN
	DRAIN	
		PITCH DOWN IN DIRECTION OF ARROW
		DIRECTION OF FLOW
	RL	REFRIGERANT LIQUID
	RS	REFRIGERANT SUCTION

SHEETMETAL

	DOUBLE LINE	
	SUPPLY AIR DUCT TURN TOWARD	
	SUPPLY AIR DUCT TURN AWAY	
	RETURN / EXH. AIR DUCT TURN TOWARD	
	RETURN / EXH. AIR DUCT TURN AWAY	
	VOLUME DAMPER	
	AUTOMATIC CONTROL DAMPER	
	FIRE DAMPER	
	SMOKE DAMPER	
	MOTORIZED DAMPER	
	BRANCH TAKE OFF	
	DUCT W/ 1" ACOUSTICAL LINER	
	DUCT ELBOW W/ TURNING VANES	
	FLEXIBLE DUCT	
	GRAPHIC BREAK &/OR CONTINUATION OF DUCT OR PIPING	
	SUPPLY DIFFUSER OR GRILLE	
	RETURN/EXHAUST REGISTER OR GRILLE	
	VARIABLE AIR VOLUME TERMINAL BOX WITH HOT WATER REHEAT COIL	
	DUCT MOUNTED SMOKE DETECTOR FURNISHED AND WIRED BY ELEC. CONTR. INSTALLED BY MECHANICAL CONTRACTOR	

VALVES

	GATE VALVE
	GATE VALVE W/ HOSE BIBB END
	BALANCING VALVE
	BUTTERFLY VALVE
	2-WAY CONTROL VALVE
	"Y" STRAINER
	"Y" STRAINER W/ BLOW DOWN, H.W. SYSTEMS
	PIPE ANCHOR
	PIPE GUIDE
	FLOW MEASURING DEVICE
	AUTOMATIC AIR ELIMINATOR
	MANUAL AIR ELIMINATOR
	BALL VALVE
	PIPE TURN AWAY
	PIPE TURN TOWARDS
	UNION
	CONCENTRIC REDUCER
	ECCENTRIC REDUCER
	CAPPED PIPE
	SIDE CONNECTION
	BOTTOM CONNECTION 45 OR 90 DEGREES
	TOP CONNECTION 45 OR 90 DEGREES
	COMBINATION BALANCING SHUT-OFF
	EXPANSION COMPENSATOR

GENERAL

	EQUIPMENT DESIGNATION
	SECTION NO.
	DWG. NO.
	THERMOSTAT/CO2 - MOUNT 48" A.F.F.
	SENSOR THERMOSTAT - MOUNT 48" A.F.F.
	REMOTE SET POINT SPACE TEMPERATURE CONTROLLER
	STATIC PRESSURE SENSOR
	REVERSE ACTING THERMOSTAT
	UNDERCUT DOOR
	B.O.D. BOTTOM OF DUCT
	T.O.D. TOP OF DUCT
	XUX RECTANGULAR DUCTWORK SIZE
	XO ROUND DUCTWORK SIZE
	XIX OVAL DUCTWORK SIZE

GENERAL MECHANICAL NOTES

APPLICABLE TO ALL DRAWINGS

- THE HVAC SUBCONTRACTOR SHALL REFER TO THE ARCHITECTURAL DRAWINGS FOR THE CEILING HEIGHTS WHICH SHALL BE MAINTAINED.
- THE HVAC SUBCONTRACTOR SHALL INVESTIGATE AVAILABLE SPACE FOR ALL EQUIPMENT IN CEILINGS BEFORE SUBMISSION OF SHOP DRAWINGS.
- HVAC SUBCONTRACTOR SHALL COORDINATE ALL DIFFUSER, REGISTER AND GRILLE LOCATIONS WITH REFLECTED CEILING PLANS, AND ANY RELOCATIONS DUE TO FIELD CONDITIONS SHALL BE APPROVED BY THE ARCHITECT AND/OR ENGINEER.
- ALL FIRE DAMPER RATINGS SHALL CORRESPOND TO THE FIRE RATINGS OF THE WALL IN WHICH THEY ARE LOCATED.
- ADEQUATE SITE ACCESS PANELS SHALL BE FURNISHED AND INSTALLED FOR ALL EQUIPMENT REQUIRING SERVICE, MAINTENANCE AND REPLACEMENT FOR THE BALANCING OF VALVES AND FOR THE OPERATION OF HVAC SYSTEMS IN COORDINATION WITH THE GENERAL CONTRACTOR, AS PER THE SPECIFICATIONS.
- ALL EQUIPMENT DRAIN POINTS SHALL BE PIPED TO THE NEAREST FLOOR DRAIN.
- ALL PIPING RUNOUTS SHALL BE 3/4 INCH MINIMUM UNLESS OTHERWISE NOTED.
- DUCT SIZES INDICATED ON THE DRAWINGS ARE TO BE NET FREE AREA. ALL DUCTWORK SHALL BE CONSTRUCTED, INSTALLED AND SEALED (CLASS A), PER THE LATEST SMACNA REQUIREMENTS.
- ALL SQUARE ELBOWS AND BULLHEAD TEES SHALL HAVE TURNING VANES.
- GENERAL CONTRACTOR SHALL PROVIDE CURBS AROUND ALL DUCTWORK PENETRATIONS THROUGH THE ROOF.
- HVAC SUBCONTRACTOR SHALL SEAL THE DUCTWORK AND/OR PIPING PENETRATIONS THROUGH FIRE AND/OR SMOKE RATED WALLS WITH APPROVED FIRE STOP MATERIAL.
- PARTICULAR ATTENTION SHOULD BE PAID TO ADDITIONAL NOTES SHOWN ON THE INDIVIDUAL DRAWINGS.
- THE DUCTWORK AND PIPING SYSTEMS SHOWN ON THE DRAWINGS ARE SHOWN DIAGRAMMATICALLY WITHOUT EVERY OFFSET AND TRANSITION REQUIRED TO INSTALL THE WORK. OBVIOUS OFFSETS AND TRANSITIONS AS RELATED TO HVAC, ARE SHOWN WHERE POSSIBLE WITHOUT AFFECTING THE CLARITY OF THE DRAWINGS.
- ALL PIPING AND DUCTWORK SHALL BE RUN ABOVE THE CEILINGS UNLESS NOTED OTHERWISE.
- ALL THERMOSTATS TO BE MOUNTED ABOVE LIGHT SWITCHES ON SAME CENTERLINE, 4" ABOVE FINISHED FLOOR WHERE APPLICABLE, OR OTHERWISE NOTED. REFER TO ARCHITECTURAL DRAWINGS FOR EXACT LOCATION.
- THE FIRST FOUR (4'-0") FEET OF DUCTWORK BEHIND ANY DIFFUSER, GRILLE OR REGISTER SHALL BE PAINTED FLAT BLACK.
- ALL MATERIALS INSTALLED IN THIS WORK SHALL BE NEW UNLESS SPECIFICALLY NOTED FOR RE-USE.
- ALL WORK PERFORMED SHALL BE GUARANTEED FREE FROM DEFECTS IN WORKMANSHIP AND MATERIALS FOR A PERIOD OF ONE (1) YEAR FROM DATE OF FINAL ACCEPTANCE BY THE OWNER, UNLESS SUCH DEFECTS ARE CLEARLY THE RESULT OF MISUSE OF EQUIPMENT BY PERSONS NOT UNDER THE CONTROL OF THE SUBCONTRACTOR.
- THE HVAC SUBCONTRACTOR SHALL OBTAIN INSTALLATION INSTRUCTIONS ON EACH PIECE OF EQUIPMENT TO BE FURNISHED WHICH THE HVAC SUBCONTRACTOR IS REQUIRED TO INSTALL OR TO WHICH FINAL CONNECTIONS ARE TO BE MADE UNDER THE HVAC CONTRACT. THE HVAC SUBCONTRACTOR SHALL INSTALL AND MAKE FINAL CONNECTIONS PER THE MANUFACTURER'S INSTRUCTIONS AND RECOMMENDATIONS. THE CONTRACTOR SHALL DEMONSTRATE TO THE OWNER THAT THE INSTALLED EQUIPMENT OPERATES AS DESIGNED.
- ALL WORK UNDER THIS SECTION SHALL BE COORDINATED WITH ALL OTHER TRADES BEFORE INSTALLATION IS MADE.
- COORDINATE ALL MOTORS, STARTERS, DISCONNECT AND SMOKE DETECTOR REQUIREMENTS WITH ELECTRICAL SUBCONTRACTOR FOR ALL EQUIPMENT REQUIRING SAME.
- ALL EQUIPMENT TO BE INSTALLED EXPOSED IN FINISHED AREAS (REGISTERS, GRILLES, DIFFUSERS, ETC.) SHALL BE LOCATED AS INDICATED ON THE ARCHITECTURAL DRAWINGS. FINAL LOCATIONS SHALL BE AS SELECTED BY THE ARCHITECT UNLESS OTHERWISE NOTED.
- ALL EQUIPMENT TO BE INSTALLED EXPOSED IN FINISHED AREAS (REGISTERS, GRILLES, DIFFUSERS, ETC.) SHALL HAVE COLORS SELECTED BY THE ARCHITECT UNLESS OTHERWISE NOTED.
- ALL HVAC EQUIPMENT SHALL BE INSTALLED, COORDINATED WITH ALL TRADES, IN SUCH A WAY SO THAT LIGHTS, CONDUITS, SPRINKLERS, SUPPLY AND/OR DRAIN PIPING DO NOT BLOCK ACCESS TO UNITS AND RELATED ACCESSORIES.
- FOR LOCATION OF OPENINGS IN ROOF, SEE ARCHITECTURAL DRAWINGS. FINAL OPENING SIZES SHALL SUIT APPROVED SHOP DRAWINGS.
- THE HVAC CONTRACTOR SHALL FURNISH ALL SUPPORT STEEL REQUIRED FOR THE INSTALLATION OF HVAC EQUIPMENT, UNLESS OTHERWISE INDICATED.
- THE HVAC CONTRACTOR SHALL FIELD MEASURE ALL DUCT RUNS PRIOR TO FABRICATING DUCTWORK. FURNISH AND INSTALL ALL DUCT TRANSITIONS, ELBOWS, FITTINGS AND OFFSETS REQUIRED TO ACCOMMODATE FIELD CONDITIONS.
- ALL PIPING ENCLOSED WITHIN WALLS, CEILINGS OR FLOORS SHALL BE LEAK TESTED PRIOR TO BEING CONCEALED.
- THE HVAC CONTRACTOR SHALL BE RESPONSIBLE FOR ALL RIGGING AND STAGING REQUIRED FOR THE INSTALLATION OF THE HVAC SYSTEMS.
- UNDERCUT DOORS AND DOOR LOUVERS ARE BY THE GENERAL CONTRACTOR.
- ALL CEILING-MOUNTED EQUIPMENT SHALL BE INSTALLED IN SUCH A WAY THAT LIGHTS, PIPING AND DUCTWORK DO NOT BLOCK ACCESS TO UNITS AND RELATED ACCESSORIES.
- HVAC CONTRACTOR SHALL BE RESPONSIBLE FOR ALL SHEETMETAL TRANSITIONS AT AIR TERMINAL UNITS, FANS, COILS AND OTHER SIMILAR HVAC EQUIPMENT.
- THE HVAC CONTRACTOR SHALL PROVIDE REMOTE THERMOSTATS FOR EACH ELECTRIC UNIT HEATERS. ALL THERMOSTATS INSTALLED IN PUBLIC AREAS SUCH AS CORRIDORS, TOILET ROOMS, STAIRWELLS AND ASSEMBLY SPACES SHALL BE PROTECTED BY A TAMPERPROOF GUARD.
- FURNISH AND INSTALL FIRE DAMPERS AT ALL DUCT FLOOR PENETRATIONS.
- FURNISH AND INSTALL FIRE DAMPERS AT ALL 2 HR FIRE RATED WALLS.
- ALL ROOF O.A. INTAKES FOR HORIZONTAL UNIT VENTILATORS SHALL BE PROVIDED WITH A "LOW LEAK" AUTOMATIC CONTROL DAMPER MOUNTED IN THE DUCTWORK IMMEDIATELY BELOW THE ROOF.
- HVAC EQUIPMENT WITH FANS TO BE PROVIDED WITH FLEXIBLE CONNECTIONS ON INLET AND DISCHARGE OF FAN TO DUCTWORK.
- REFRIGERANT PIPE SIZES PER UNIT MANUFACTURERS RECOMMENDATIONS.
- PROVIDE ACCESS PANELS AT ALL FIRE DAMPER LOCATIONS.
- DUCT SIZES INDICATED ON DRAWINGS ARE TO BE NET FREE AREA.
- PITCH ALL HORIZONTAL CONDENSATE DRAIN LINES 1/8" PER FOOT OF RUN.
- ALL SQUARE ELBOWS AND BULL HEAD TEES TO HAVE TURNING VANES.
- DROP CONDENSATE DRAIN PIPES DOWN IN WALL ON WARM SIDE OF INSULATION.
- DUCT DIMENSIONS SHOWN ON ACOUSTICALLY LINED DUCTWORK ARE FOR CLEAR INSIDE DIMENSION AFTER APPLICATION OF LINER.
- ALL DIFFUSERS AND REGISTERS IN WET AREAS, (LOCKER ROOMS, TOILETS, SHOWERS, JAN, CLOSETS, ETC.) SHALL BE OF ALUMINUM CONSTRUCTION.

KEYNOTE LEGEND:

100% CONSTRUCTION DOCUMENTS

KEY PLAN NORTH ARROW

KEYPLAN

DRAWING NAME:

**MECHANICAL
LEGEND
GENERAL NOTES
ABBREVIATIONS**

DRAWN BY: AP

REVIEWED BY: DAH

SCALE: N/A | DRAWING NUMBER:

JOB NO.: 2202.00

DATE: OCTOBER 13, 2023

MO.01

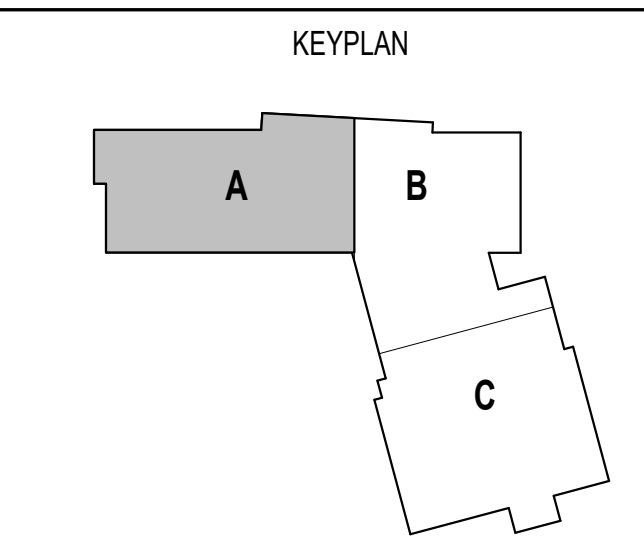
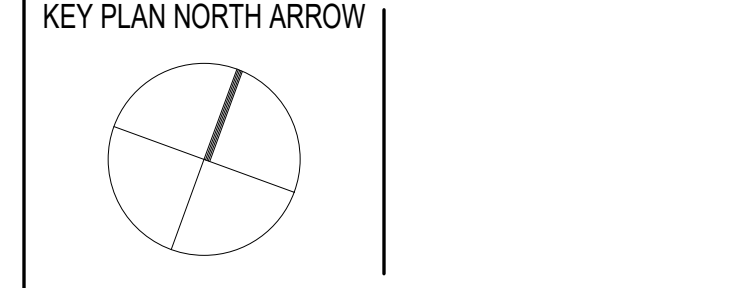


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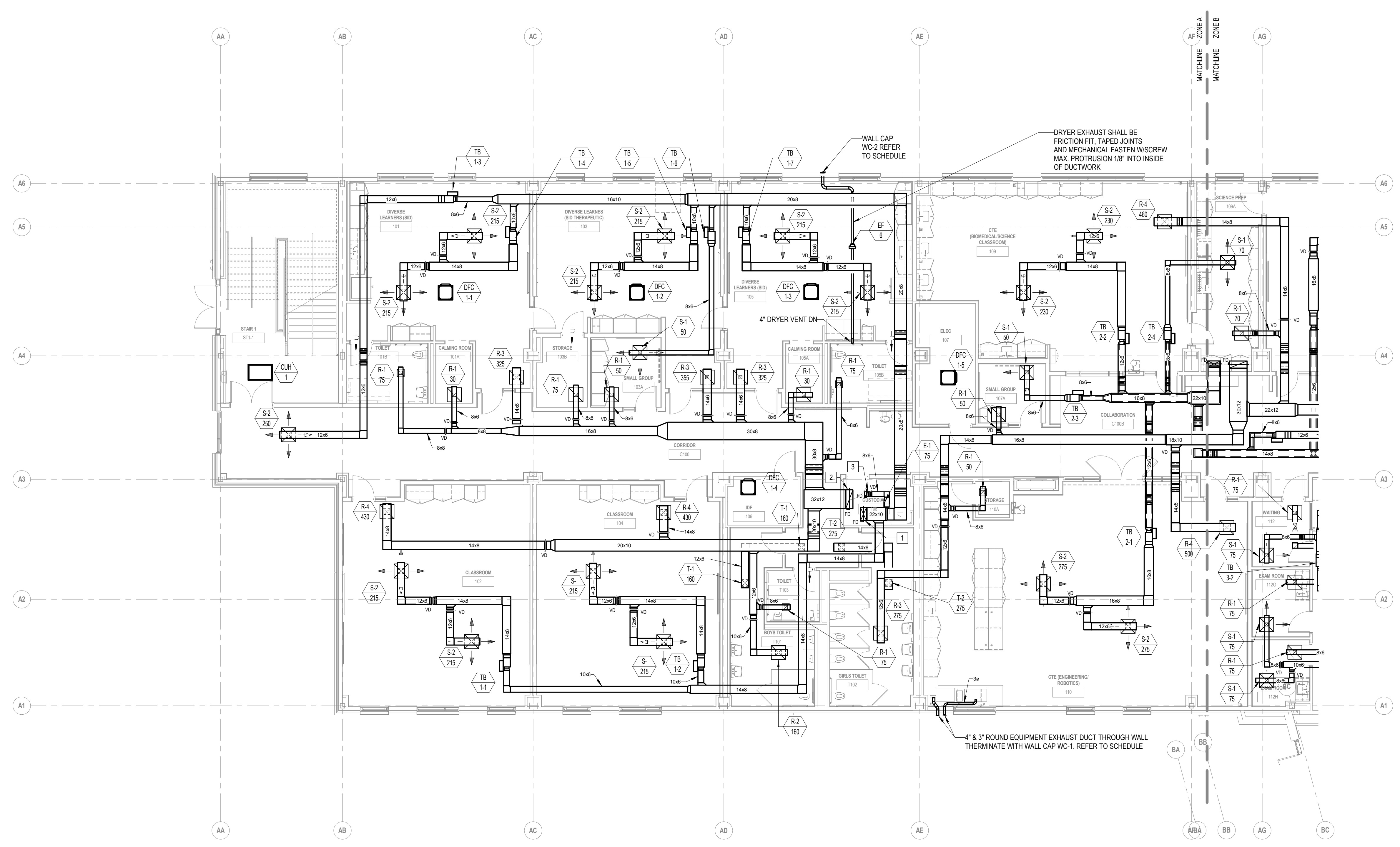
- KEYNOTE LEGEND:**
- 1 22x10 SUPPLY DUCT UP @ 2450 CFM
 - 2 32x12 RETURN DUCT UP @ 2435 CFM
 - 3 8x6 EXHAUST DUCT UP @ 75 CFM

- GENERAL NOTES**
1. ALL SUPPLY DUCTWORK DOWNSTREAM OF TERMINAL BOXES SHALL BE LINED WITH 1" THICK ACoustICAL INSULATION. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

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DRAWING NAME:	
MECHANICAL FIRST FLOOR DUCTWORK PLAN - ZONE A	
DRAWN BY:	AP
REVIEWED BY:	DAH
SCALE:	AS NOTED DRAWING NUMBER:
JOB NO.:	2202.02
DATE:	OCTOBER 13, 2023
M1.11A	



1 FIRST FLOOR DUCTWORK PLAN - ZONE A
1/8" = 1'-0"

KEYNOTE LEGEND:

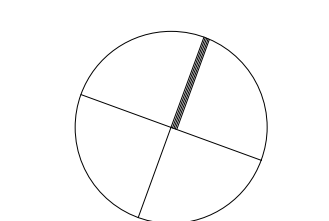
- 1 22x10 SUPPLY DUCT UP @ 2,380 CFM
- 2 30x12 RETURN DUCT UP @ 2,385 CFM
- 3 22x10 SUPPLY DUCT UP @ 2,120 CFM
- 4 28x12 RETURN DUCT UP @ 2,120 CFM

GENERAL NOTES

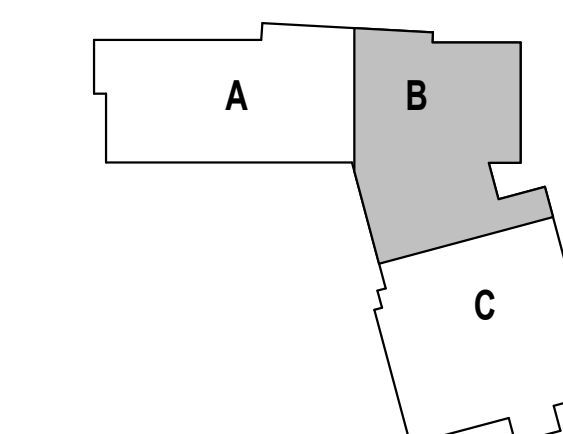
- ALL SUPPLY DUCTWORK DOWNSTREAM OF TERMINAL BOXES SHALL BE LINED WITH 1" THICK ACOUSTICAL INSULATION. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

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KEY PLAN NORTH ARROW



KEYPLAN



DRAWING NAME:

**MECHANICAL
FIRST FLOOR
DUCTWORK PLAN
- ZONE B**

DRAWN BY: AP

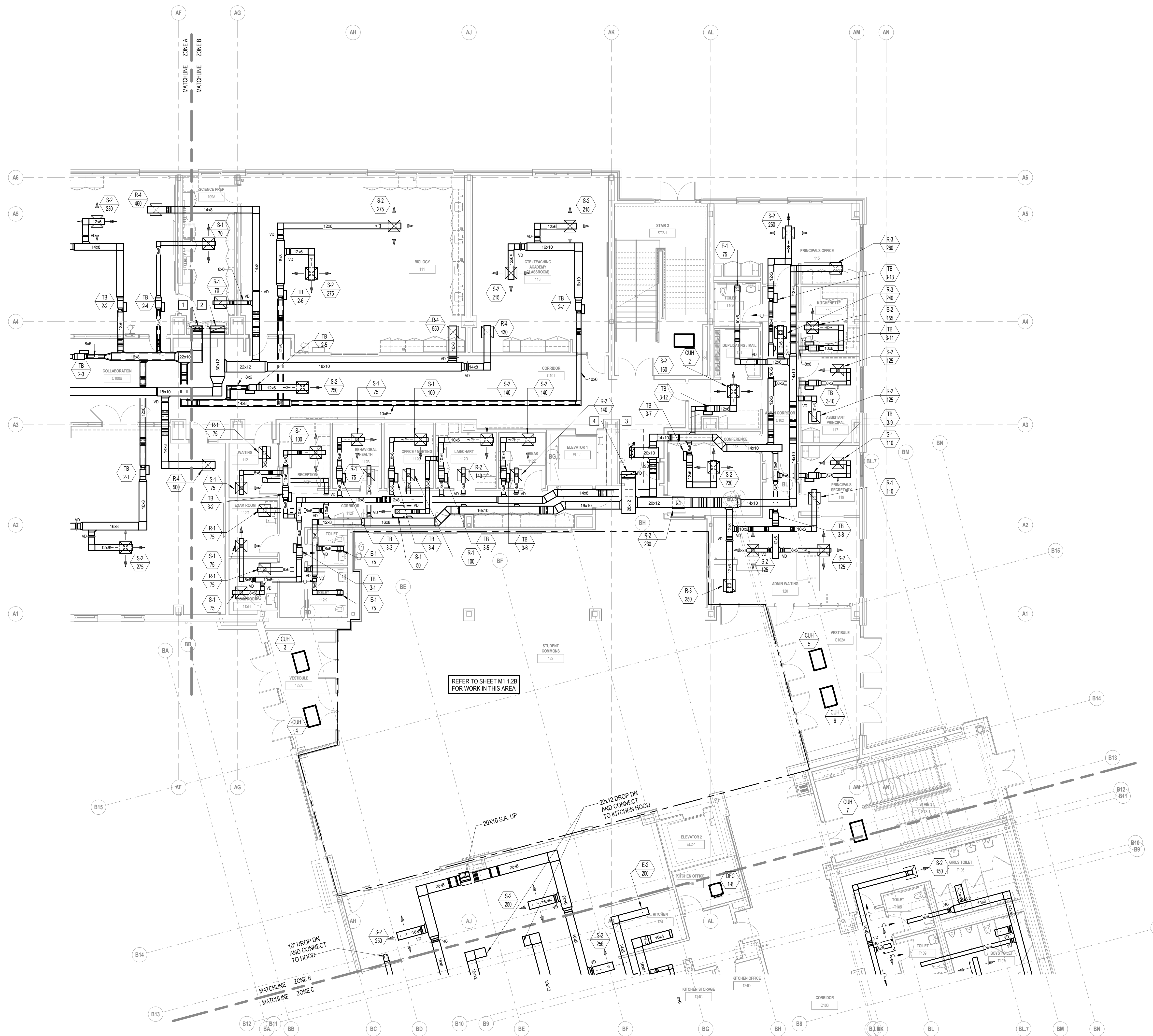
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M1.11B



1 FIRST FLOOR DUCTWORK PLAN - ZONE B
1/8" = 1'-0"



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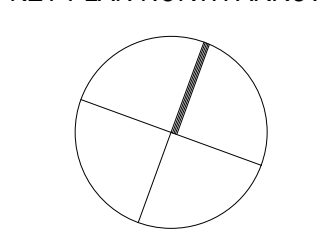
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GENERAL NOTES

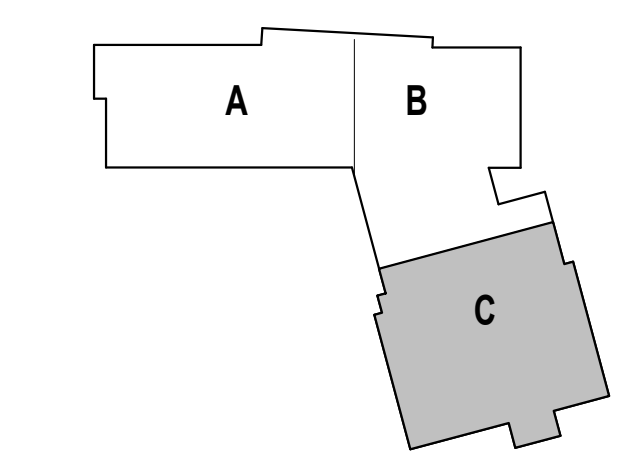
- ALL SUPPLY DUCTWORK DOWNSTREAM OF TERMINAL BOXES SHALL BE LINED WITH 1" THICK ACoustICAL INSULATION. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

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KEY PLAN NORTH ARROW



KEYPLAN



DRAWING NAME:

**MECHANICAL
FIRST FLOOR
DUCTWORK PLAN
- ZONE C**

DRAWN BY: AP

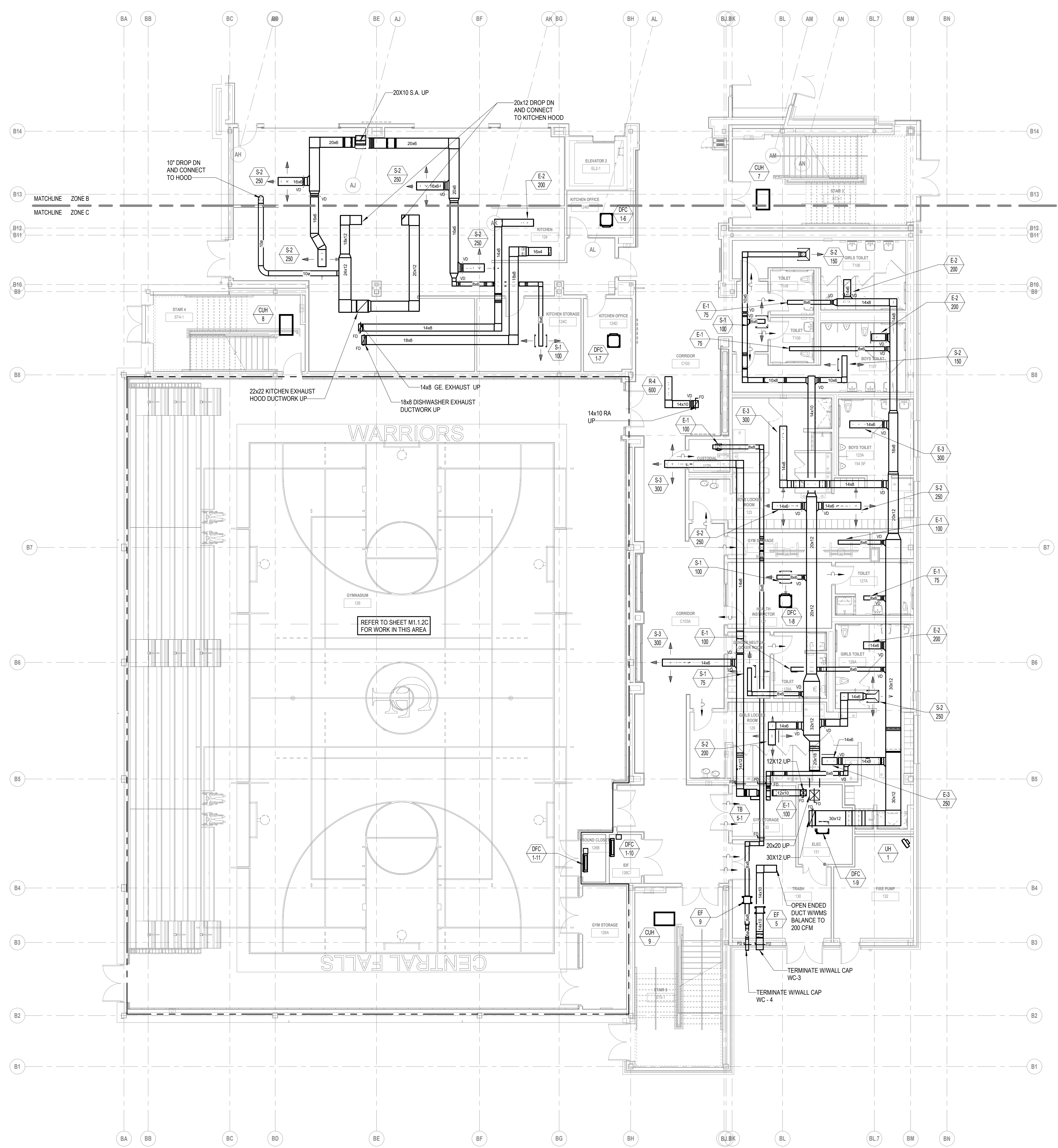
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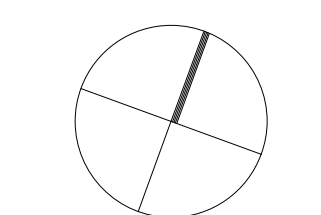
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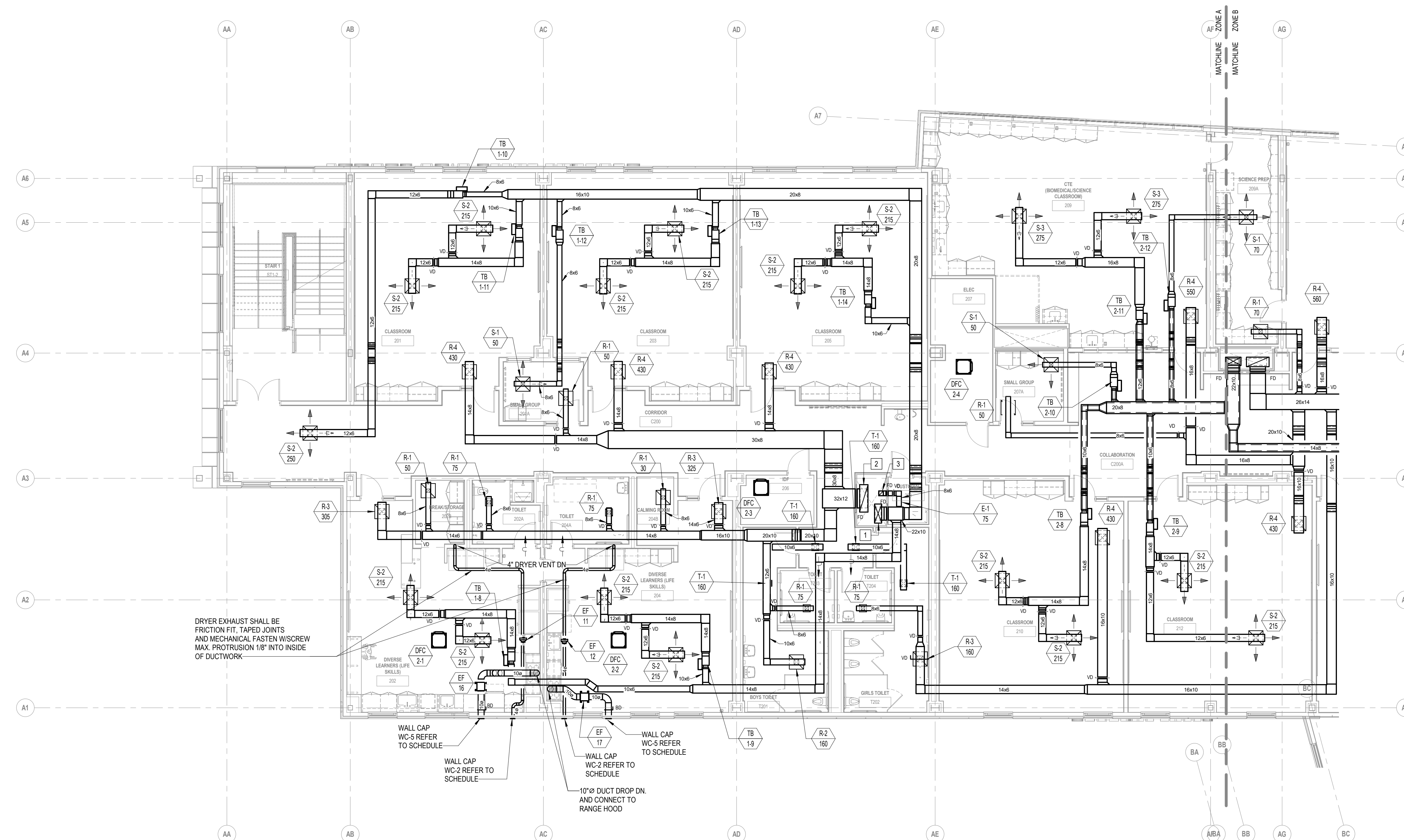
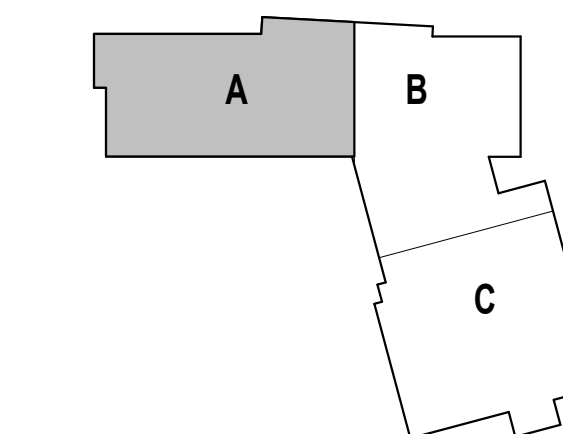
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M1.11C





KEYPLAN



DRYER EXHAUST SHALL BE FRICTION FIT, TAPED JOINTS AND MECHANICAL FASTEN WISCREW MAX. PROTRUSION 1/8" INTO INSIDE OF DUCTWORK

WALL CAP WC-3 REFER TO SCHEDULE

WALL CAP WC-2 REFER TO SCHEDULE

WALL CAP WC-1 REFER TO SCHEDULE

10" Ø DUCT DROP DN AND CONNECT TO RANGE HOOD

1 SECOND FLOOR DUCTWORK PLAN - ZONE A
1/8" = 1'-0"



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KEYNOTE LEGEND:

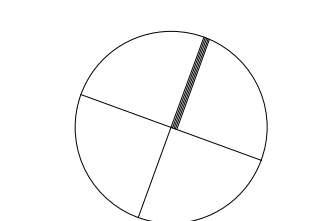
- 1 26x14 SUPPLY DUCT UP @ 4.910 CFM & 22x10 SUPPLY DUCT DN @ 2.360 CFM
- 2 36x16 RETURN DUCT UP @ 4.823 CFM & 36x12 RETURN DUCT DN @ 2.383 CFM
- 3 30x12 SUPPLY DUCT UP @ 4.540 CFM & 22x10 SUPPLY DUCT DN @ 2.129 CFM
- 4 36x16 RETURN DUCT UP @ 4.540 CFM & 28x12 RETURN DUCT DN @ 2.129 CFM

GENERAL NOTES

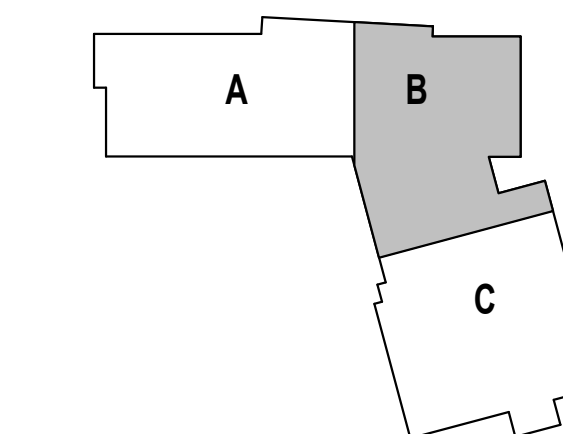
- 1 ALL SUPPLY DUCTWORK DOWNSTREAM OF TERMINAL BOXES SHALL BE LINED WITH 1" THICK ACOUSTICAL INSULATION. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

100% CONSTRUCTION DOCUMENTS

KEY PLAN NORTH ARROW



KEYPLAN



DRAWING NAME:

**MECHANICAL
SECOND FLOOR
DUCTWORK PLAN
- ZONE B**

DRAWN BY: AP

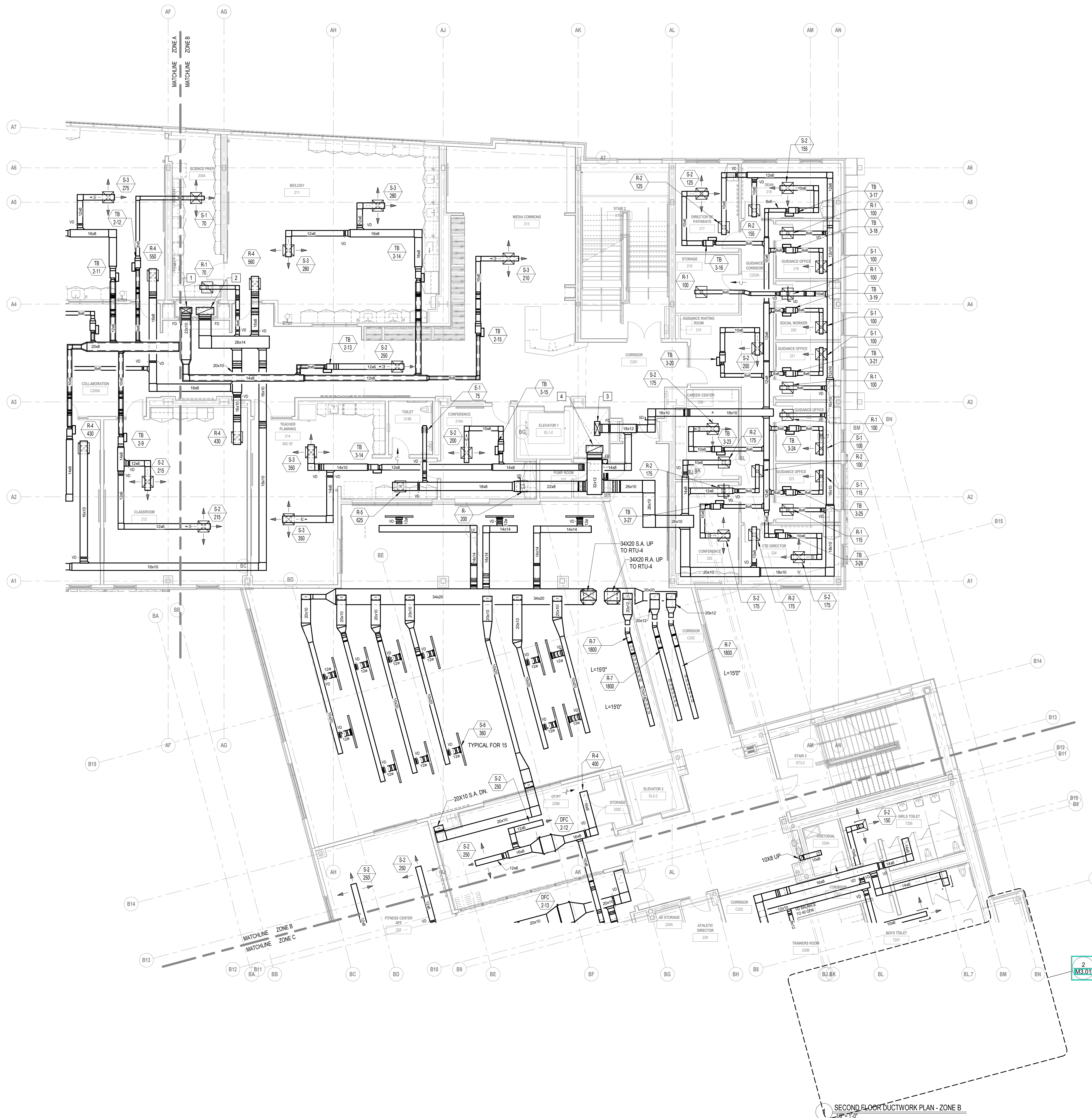
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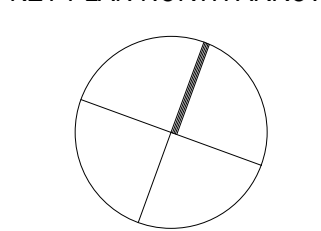
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GENERAL NOTES

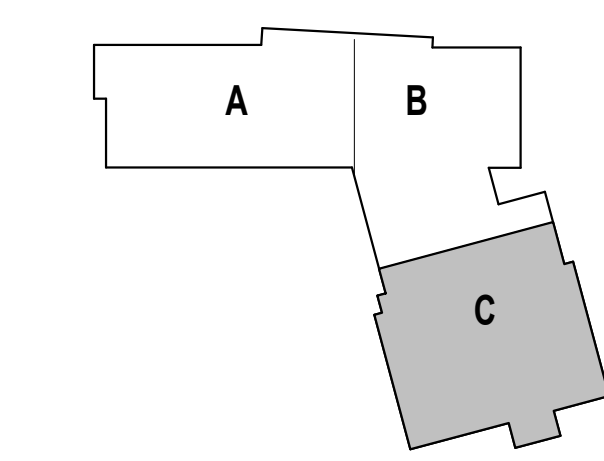
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KEY PLAN NORTH ARROW



KEYPLAN



DRAWING NAME:

**MECHANICAL
SECOND FLOOR
DUCTWORK PLAN
- ZONE C**

DRAWN BY: AP

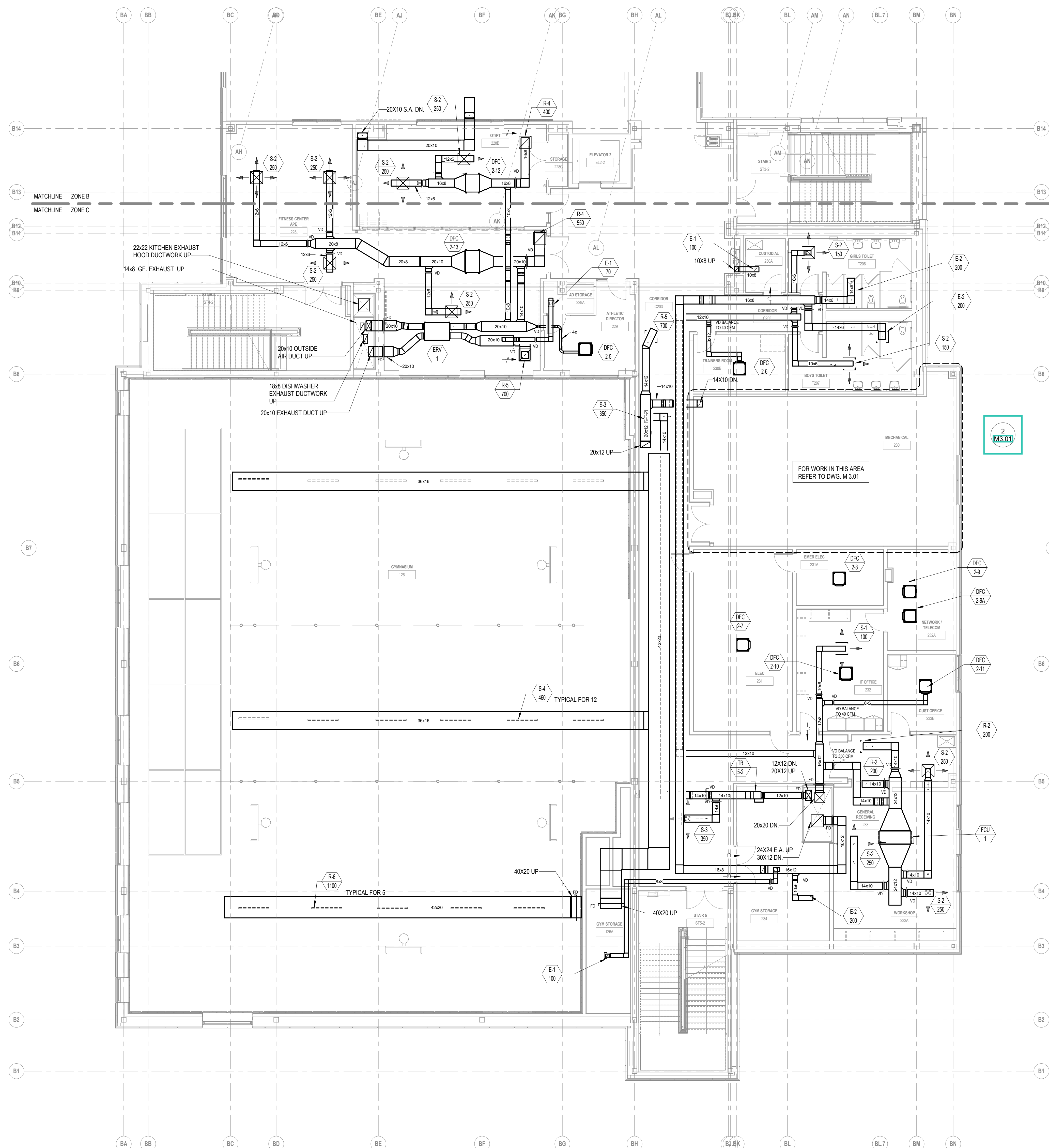
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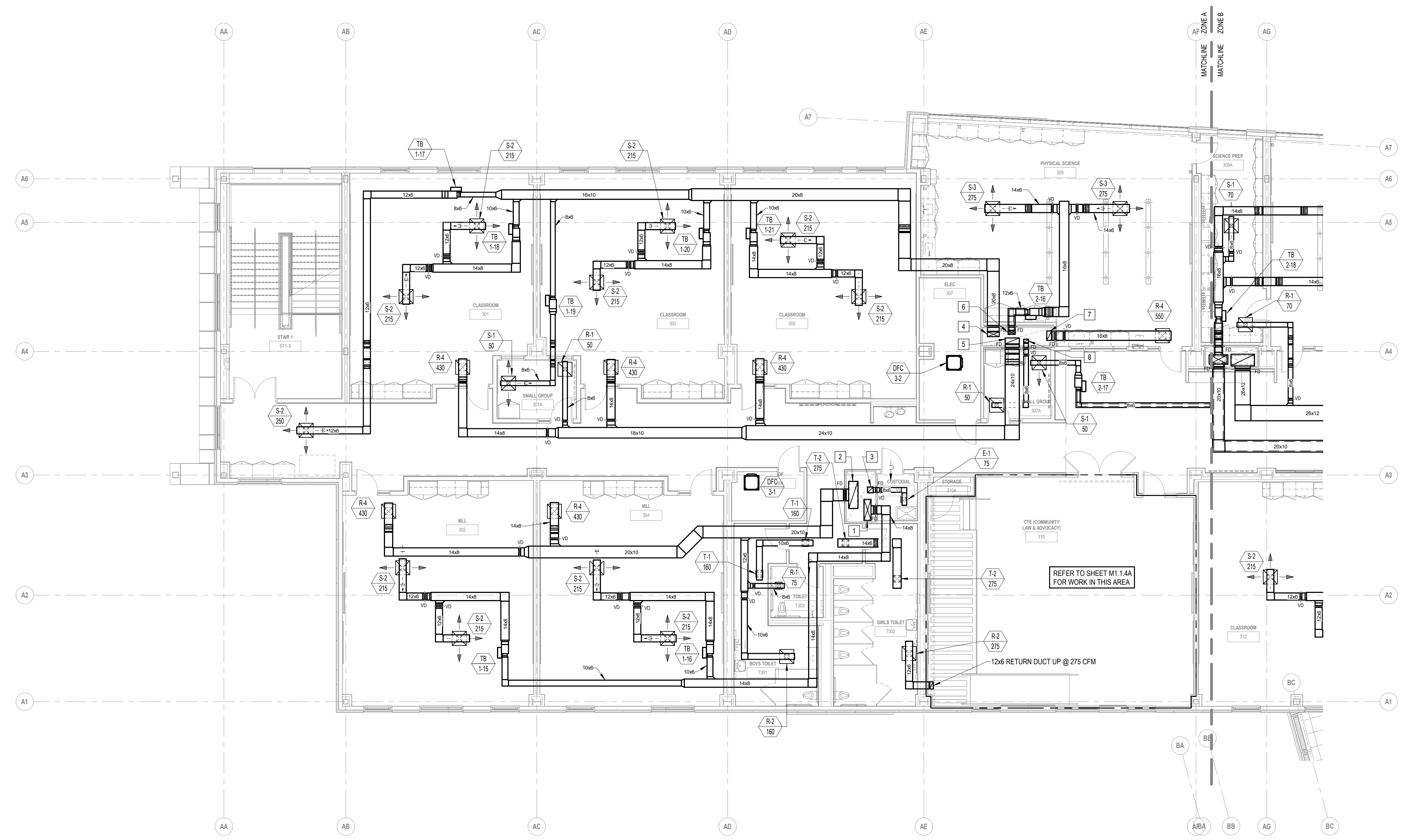
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1 SECOND FLOOR DUCTWORK PLAN - ZONE C
1/8" = 1'-0"

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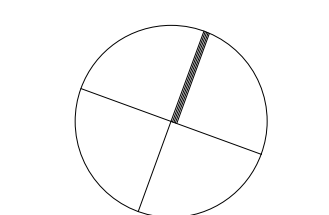
- 1 36x12 SUPPLY DUCT UP @ 5,760 CFM & 32x12 SUPPLY DUCT DN @ 4,900 CFM
- 2 46x16 RETURN DUCT UP @ 5,965 CFM & 46x14 RETURN DUCT DN @ 4,910 CFM
- 3 10x10 EXHAUST DUCT UP @ 225 CFM & 6x6 EXHAUST DUCT DN @ 150 CFM
- 4 20x8 SUPPLY DUCT UP @ 1,590 CFM
- 5 24x10 RETURN DUCT UP @ 1,340 CFM
- 6 12x6 SUPPLY DUCT UP @ 550 CFM
- 7 16x8 RETURN DUCT UP @ 550 CFM
- 8 8x6 RETURN DUCT UP @ 50 CFM

GENERAL NOTES

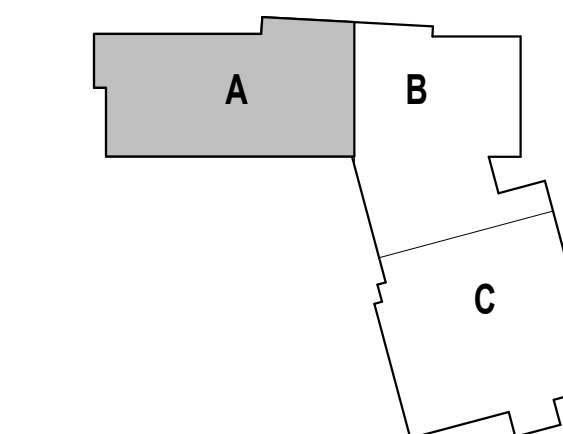
1. ALL SUPPLY DUCTWORK DOWNSTREAM OF TERMINAL BOXES SHALL BE LINED WITH 1" THICK ACOUSTICAL INSULATION. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

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KEY PLAN NORTH ARROW



KEYPLAN



DRAWING NAME:

**MECHANICAL
THIRD FLOOR
DUCTWORK PLAN
- ZONE A**

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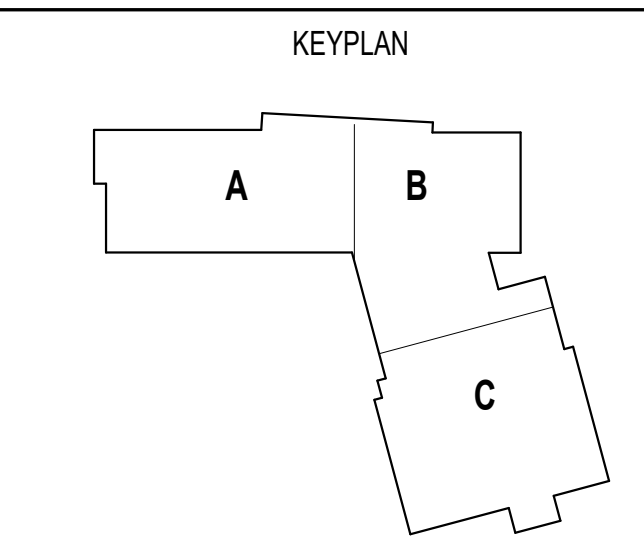
- 1 32x16 SUPPLY DUCT UP @ 2,570 CFM & 28x14 SUPPLY DUCT DN @ 4,910 CFM
- 2 40x20 RETURN DUCT UP @ 6,975 CFM & 38x16 RETURN DUCT DN @ 4,825 CFM
- 3 30x14 SUPPLY DUCT UP @ 5,550 CFM & 30x12 SUPPLY DUCT DN @ 4,540 CFM
- 4 44x18 RETURN DUCT UP @ 5,580 CFM & 36x16 RETURN DUCT DN @ 4,540 CFM

GENERAL NOTES

1. ALL SUPPLY DUCTWORK DOWNSTREAM OF TERMINAL BOXES SHALL BE LINED WITH 1" THICK ACOUSTICAL INSULATION. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

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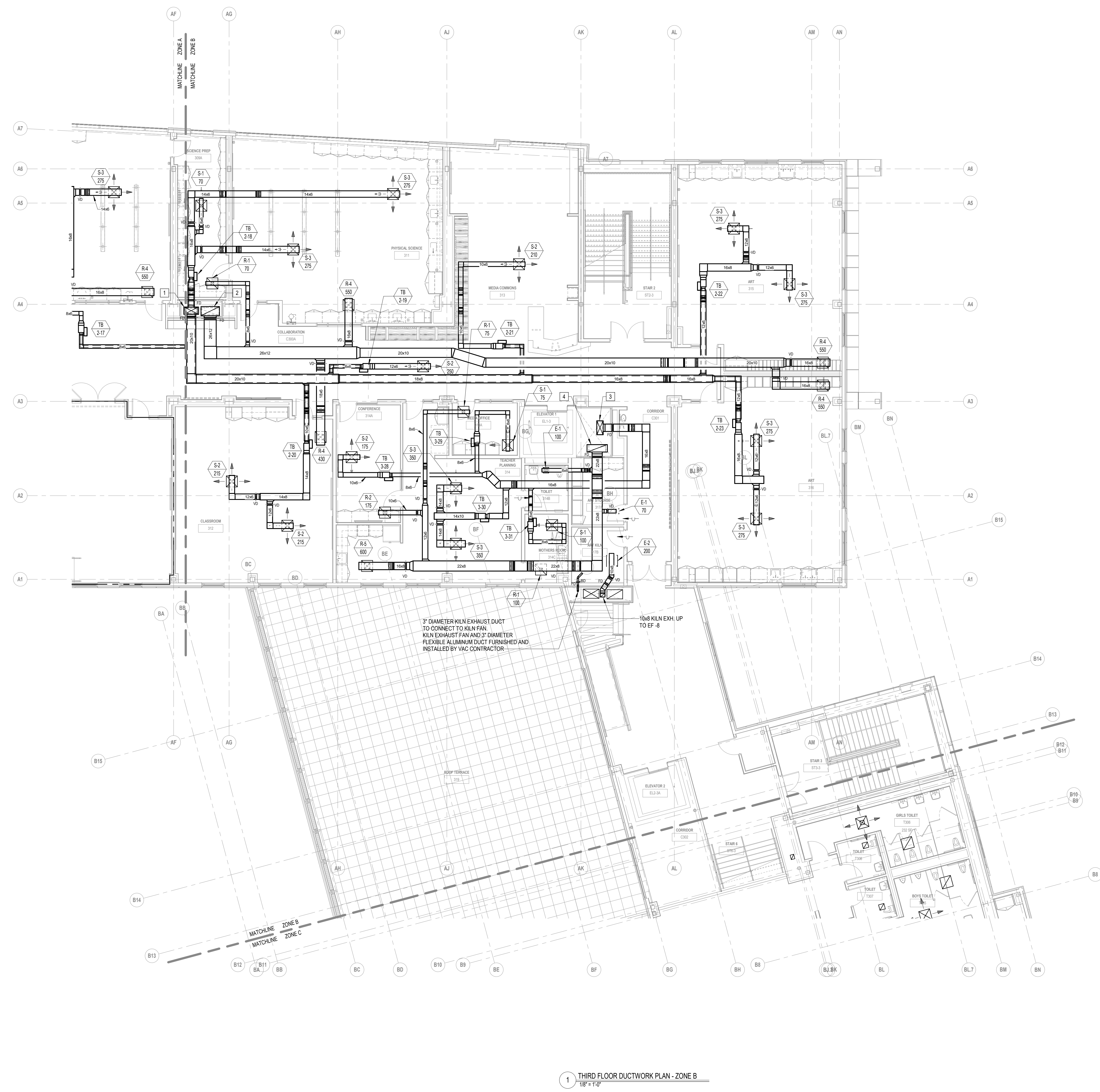
KEY PLAN NORTH ARROW



DRAWING NAME:
**MECHANICAL
THIRD FLOOR
DUCTWORK PLAN
- ZONE B**

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1 THIRD FLOOR DUCTWORK PLAN - ZONE B
1/8" = 1'-0"



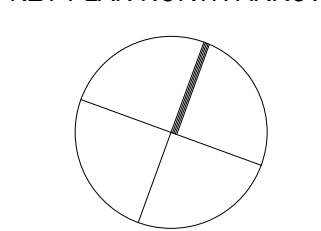
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GENERAL NOTES

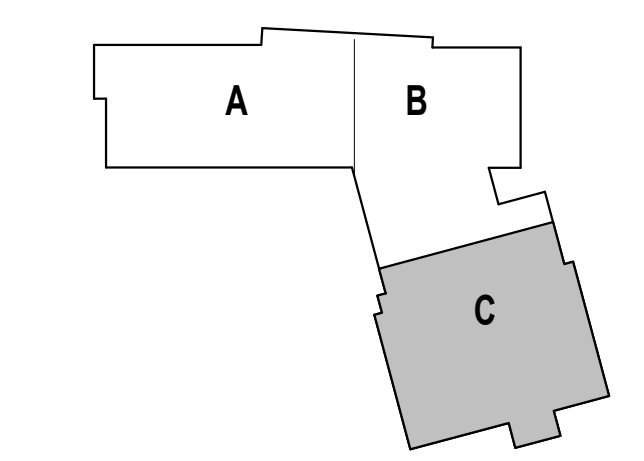
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100% CONSTRUCTION DOCUMENTS

KEY PLAN NORTH ARROW



KEYPLAN



DRAWING NAME:

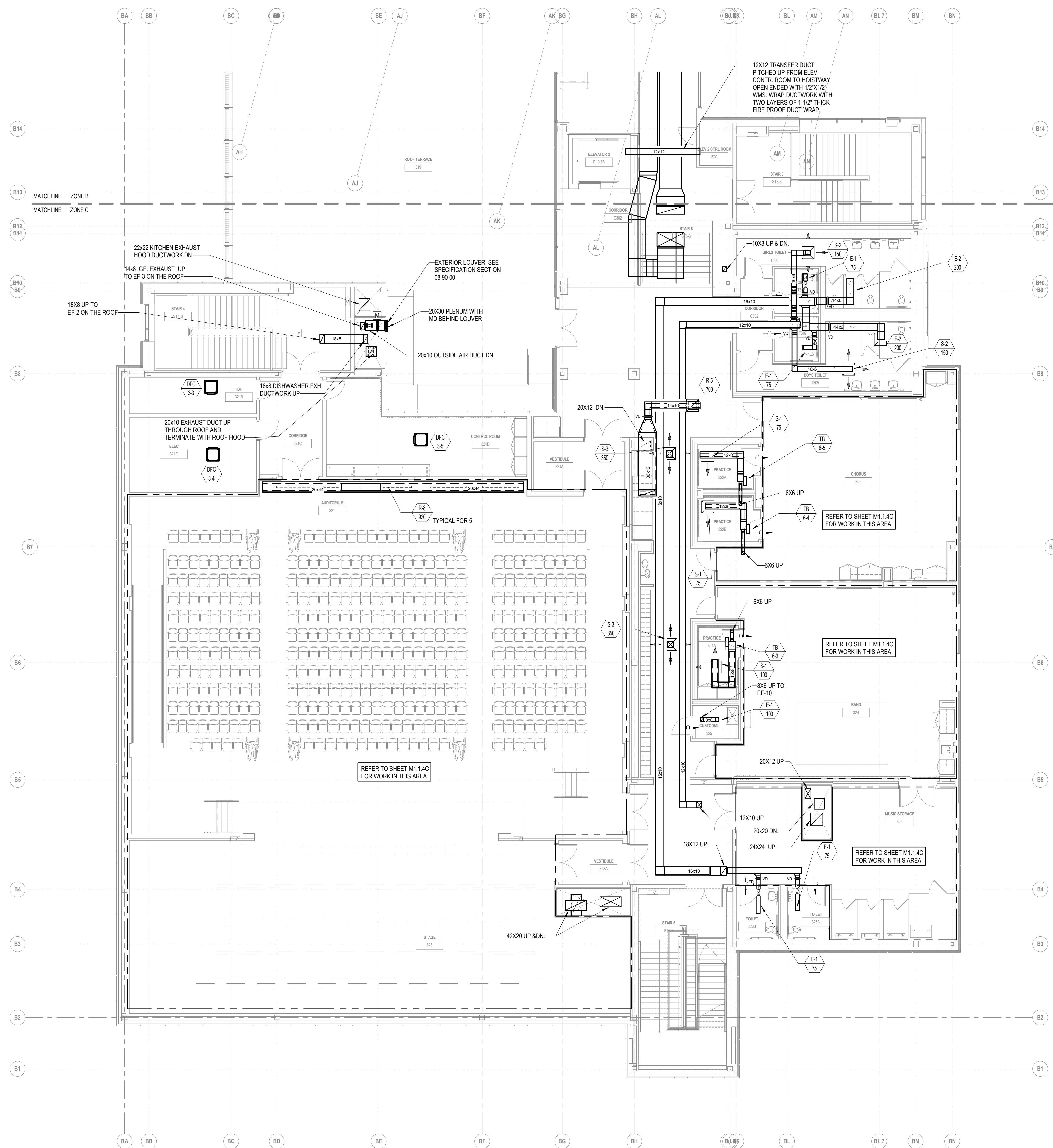
**MECHANICAL
THIRD FLOOR
DUCTWORK PLAN
- ZONE C**

DRAWN BY: AP

REVIEWED BY: DAH

SCALE: AS NOTED | DRAWING NUMBER:
JOB NO.: 2202.02
DATE: OCTOBER 13, 2023

M1.13C



KEYNOTE LEGEND:

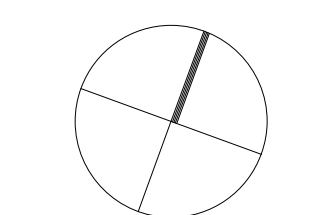
- 1 36x12 SUPPLY DUCT DN @ 5,760 CFM
- 2 46x16 RETURN DUCT DN @ 5,965 CFM
- 3 10x10 EXHAUST DUCT UP TO EF-4 @ 300 CFM & 10x10 EXHAUST DUCT DN @ 225 CFM
- 4 20x8 SUPPLY DUCT DN @ 1,590 CFM
- 5 24x10 RETURN DUCT DN @ 1,340 CFM
- 6 12x6 SUPPLY DUCT DN @ 550 CFM
- 7 16x8 RETURN DUCT DN @ 550 CFM
- 8 8x6 RETURN DUCT DN @ 50 CFM

GENERAL NOTES

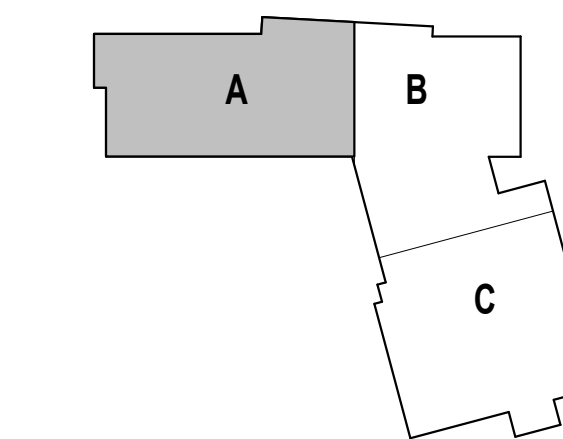
1. ALL SUPPLY DUCTWORK DOWNSTREAM OF TERMINAL BOXES SHALL BE LINED WITH 1" THICK ACOUSTICAL INSULATION. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

100% CONSTRUCTION DOCUMENTS

KEY PLAN NORTH ARROW



KEYPLAN



DRAWING NAME:

**MECHANICAL
FOURTH FLOOR
DUCTWORK PLAN
- ZONE A**

DRAWN BY: AP

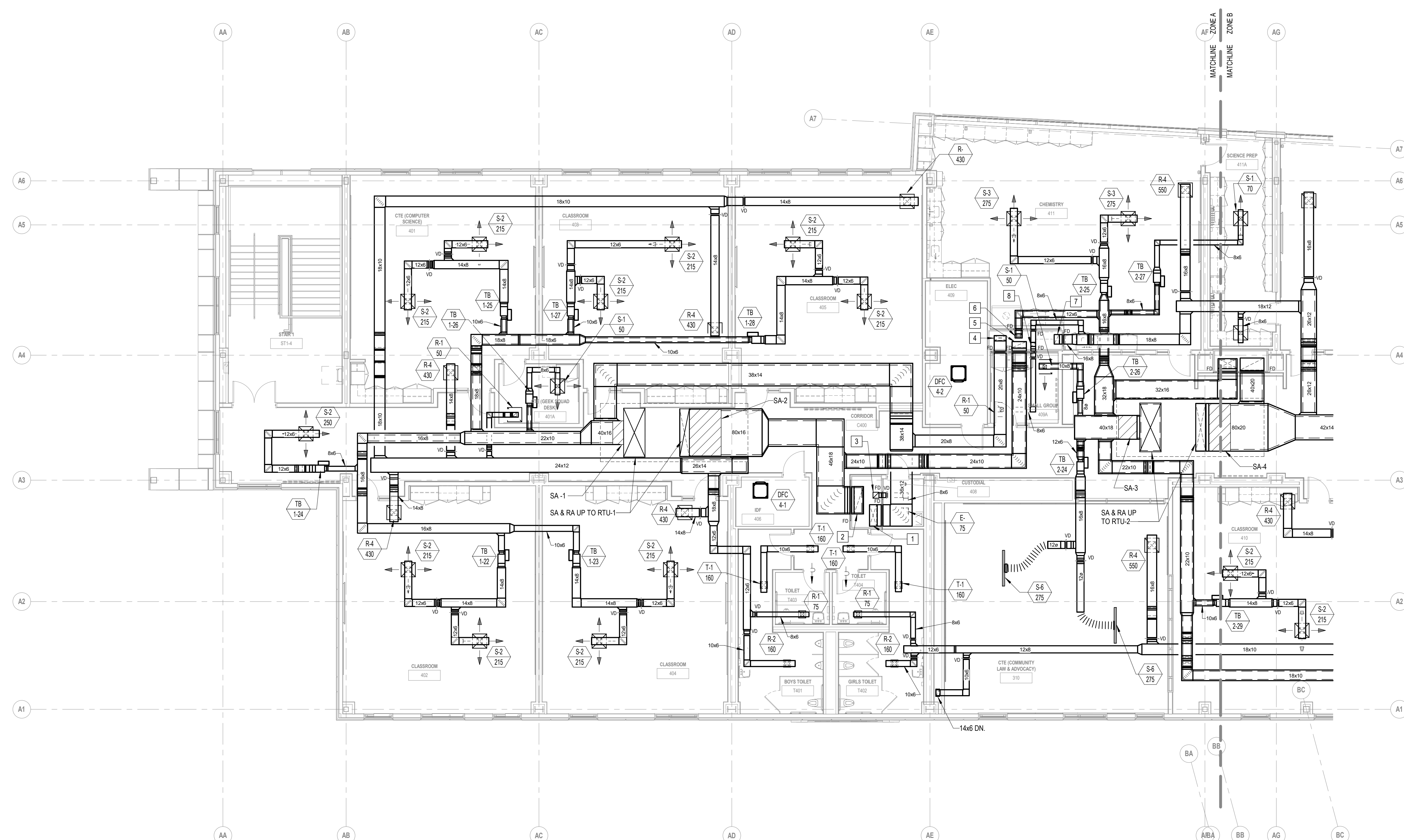
REVIEWED BY: DAH

SCALE: AS NOTED | DRAWING NUMBER:

JOB NO.: 2202.02

DATE: OCTOBER 13, 2023

M1.14A



1 FOURTH FLOOR DUCTWORK PLAN - ZONE A
1/8" = 1'-0"

KEYNOTE LEGEND:

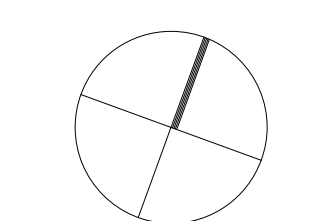
- 1 32x16 SUPPLY DUCT DN @ 7,570 CFM
- 2 40x20 RETURN DUCT DN @ 6,975 CFM
- 3 30x14 SUPPLY DUCT DN @ 5,590 CFM
- 4 44x18 RETURN DUCT DN @ 5,590 CFM

GENERAL NOTES

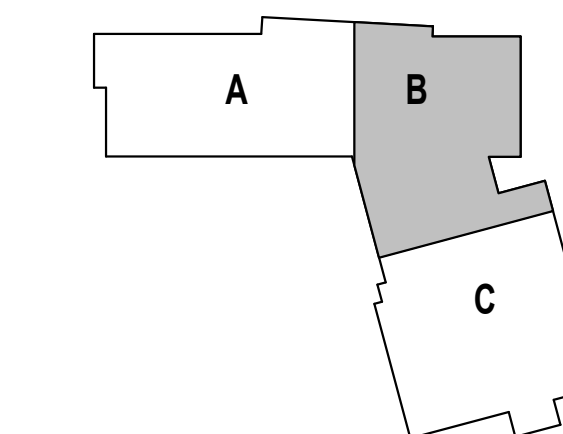
1. ALL SUPPLY DUCTWORK DOWNSTREAM OF TERMINAL BOXES SHALL BE LINED WITH 1" THICK ACOUSTICAL INSULATION. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

100% CONSTRUCTION DOCUMENTS

KEY PLAN NORTH ARROW



KEYPLAN



DRAWING NAME:

**MECHANICAL
FOURTH FLOOR
DUCTWORK PLAN
- ZONE B**

DRAWN BY: AP

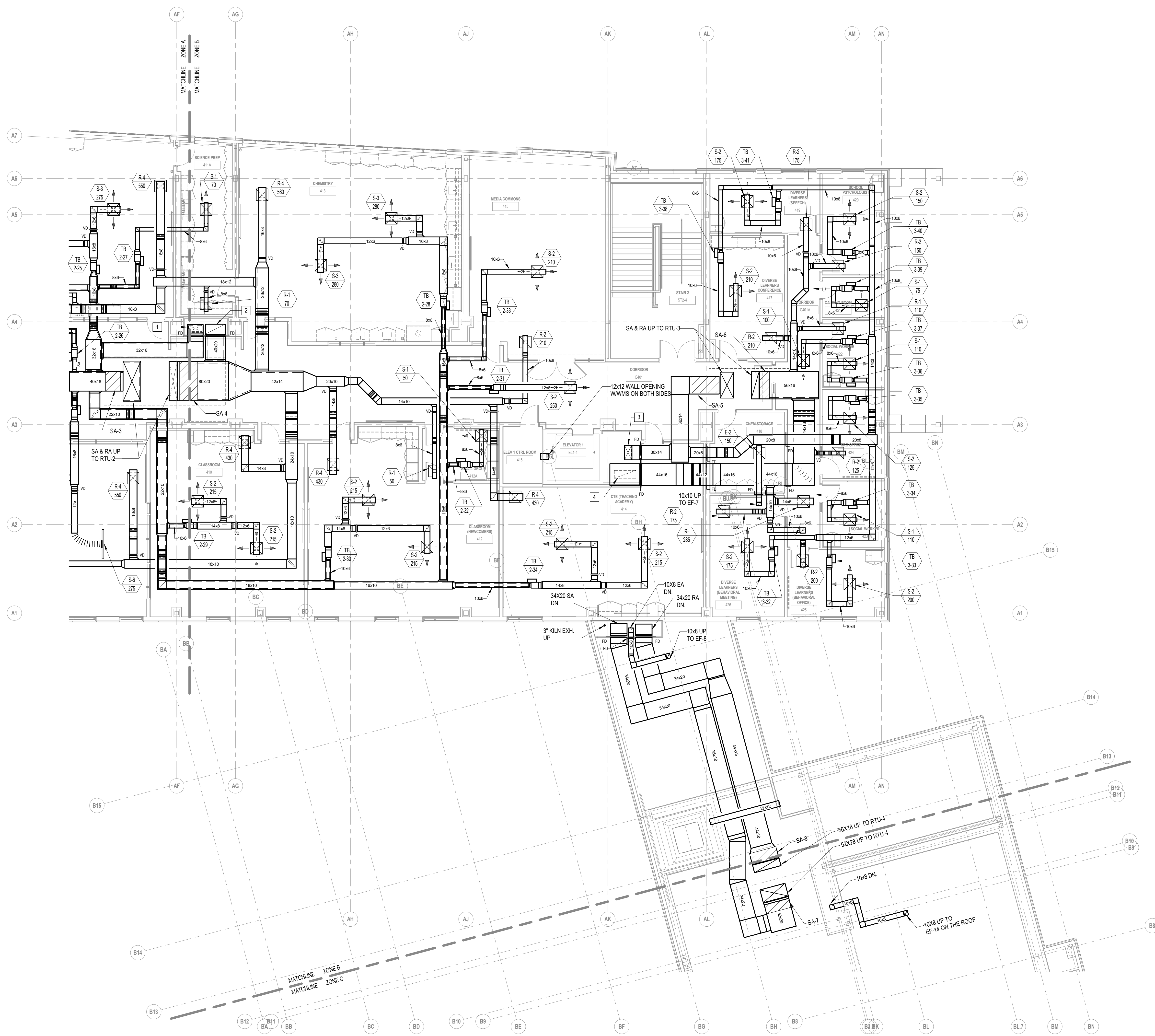
REVIEWED BY: DAH

SCALE: AS NOTED | DRAWING NUMBER:

JOB NO.: 2202.02

DATE: OCTOBER 13, 2023

M1.14B



1 FOURTH FLOOR DUCTWORK PLAN - ZONE B
1/8" = 1'-0"



CENTRAL FALLS HIGH SCHOOL
10 HIGGINSON AVE, CENTRAL FALLS, RI

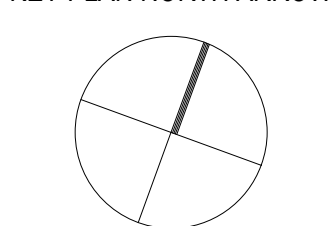
KEYNOTE LEGEND:

GENERAL NOTES

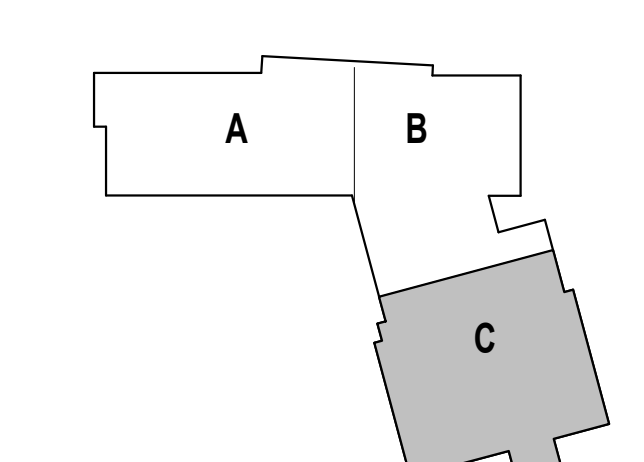
- ALL SUPPLY DUCTWORK DOWNSTREAM OF TERMINAL BOXES SHALL BE LINED WITH 1" THICK ACUSTICAL INSULATION. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

100% CONSTRUCTION DOCUMENTS

KEY PLAN NORTH ARROW



KEYPLAN



DRAWING NAME:

**MECHANICAL
FOURTH FLOOR
DUCTWORK PLAN
- ZONE C**

DRAWN BY: AP

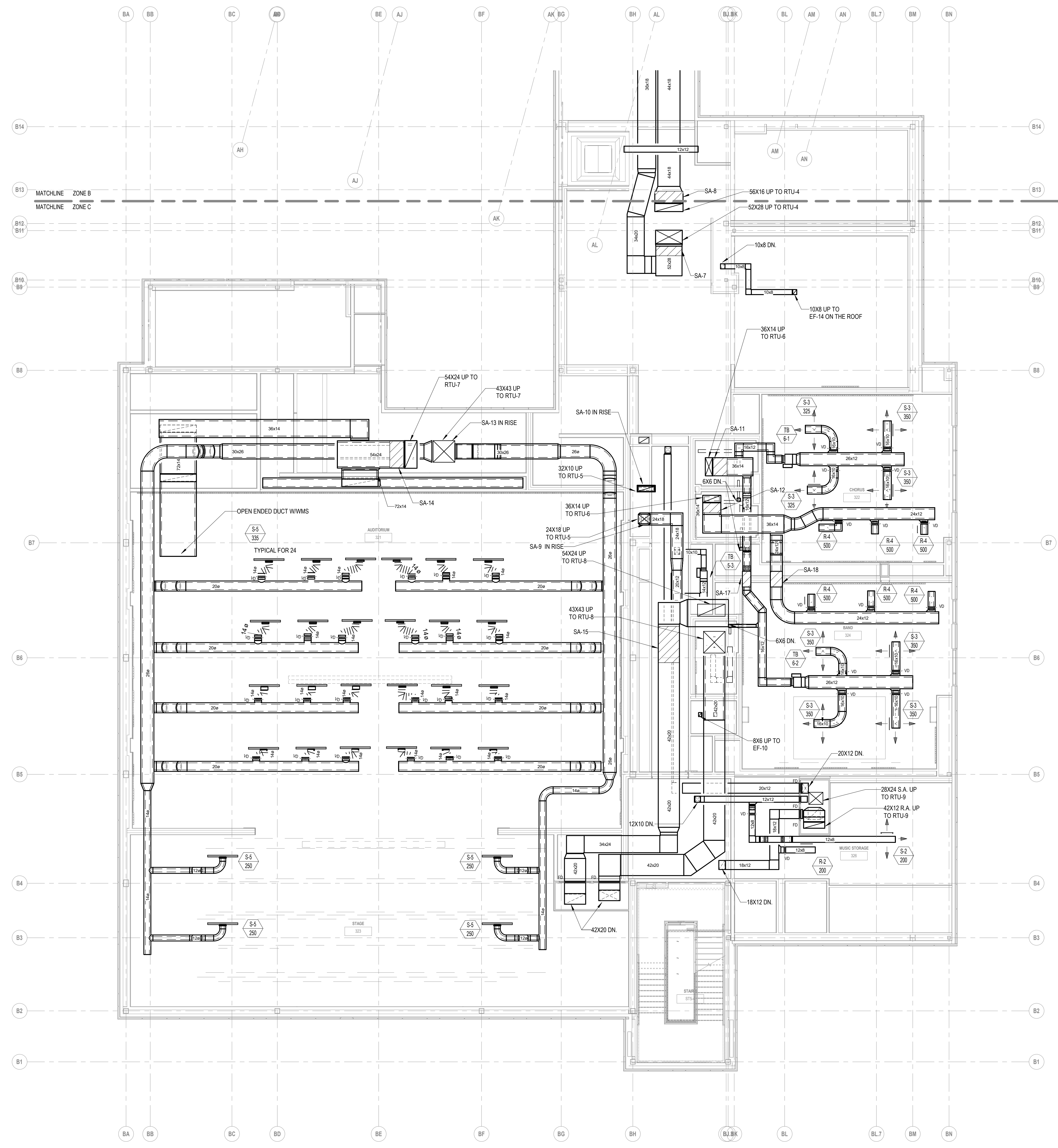
REVIEWED BY: DAH

SCALE: AS NOTED | DRAWING NUMBER:

JOB NO.: 2202.02

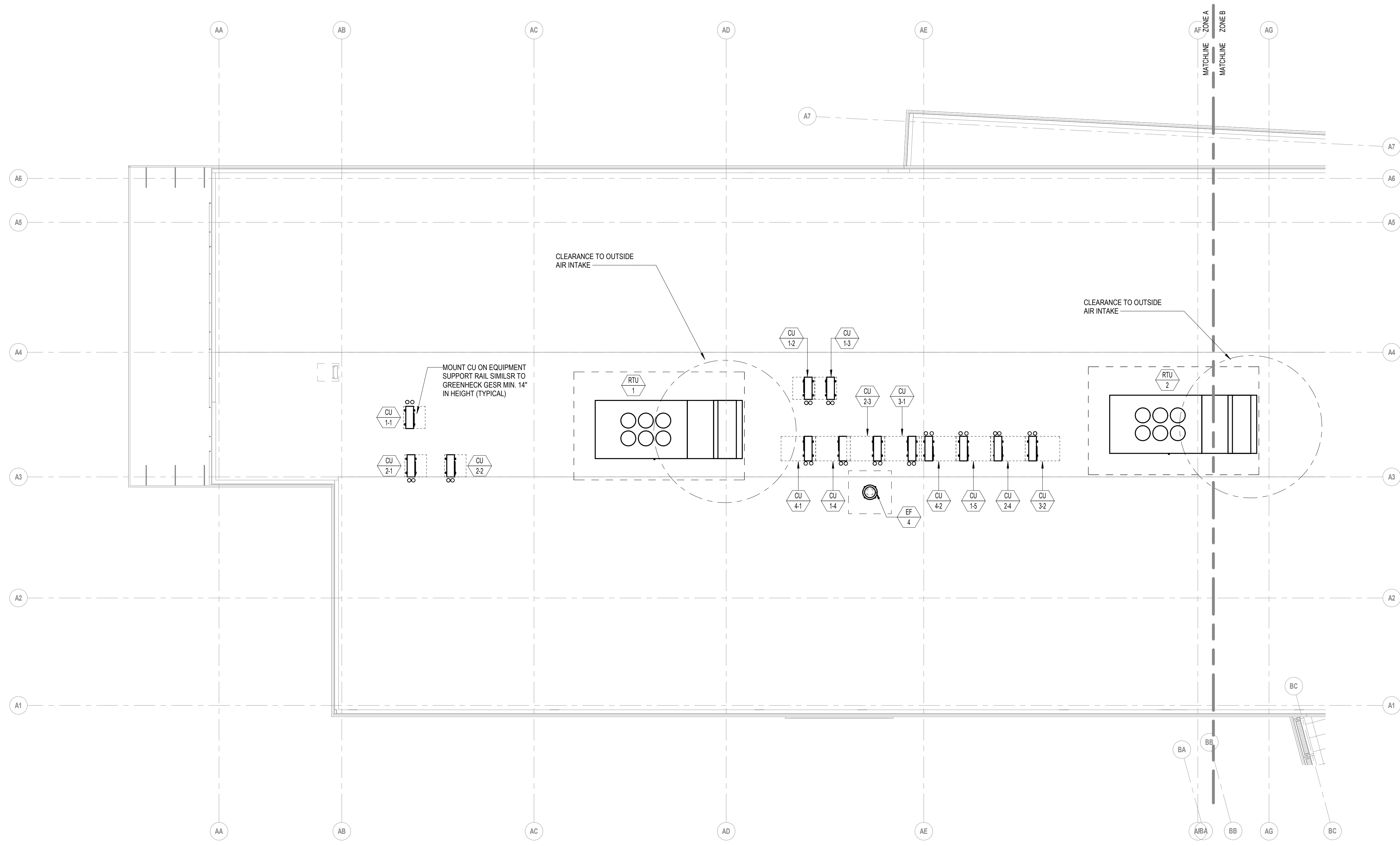
DATE: OCTOBER 13, 2023

M1.14C



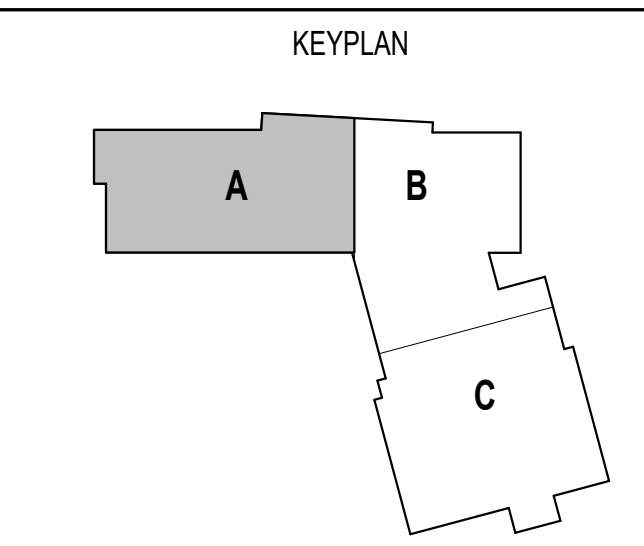
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KEYNOTE LEGEND:



1 MECHANICAL ROOF PLAN - ZONE A
1/8" = 1'-0"

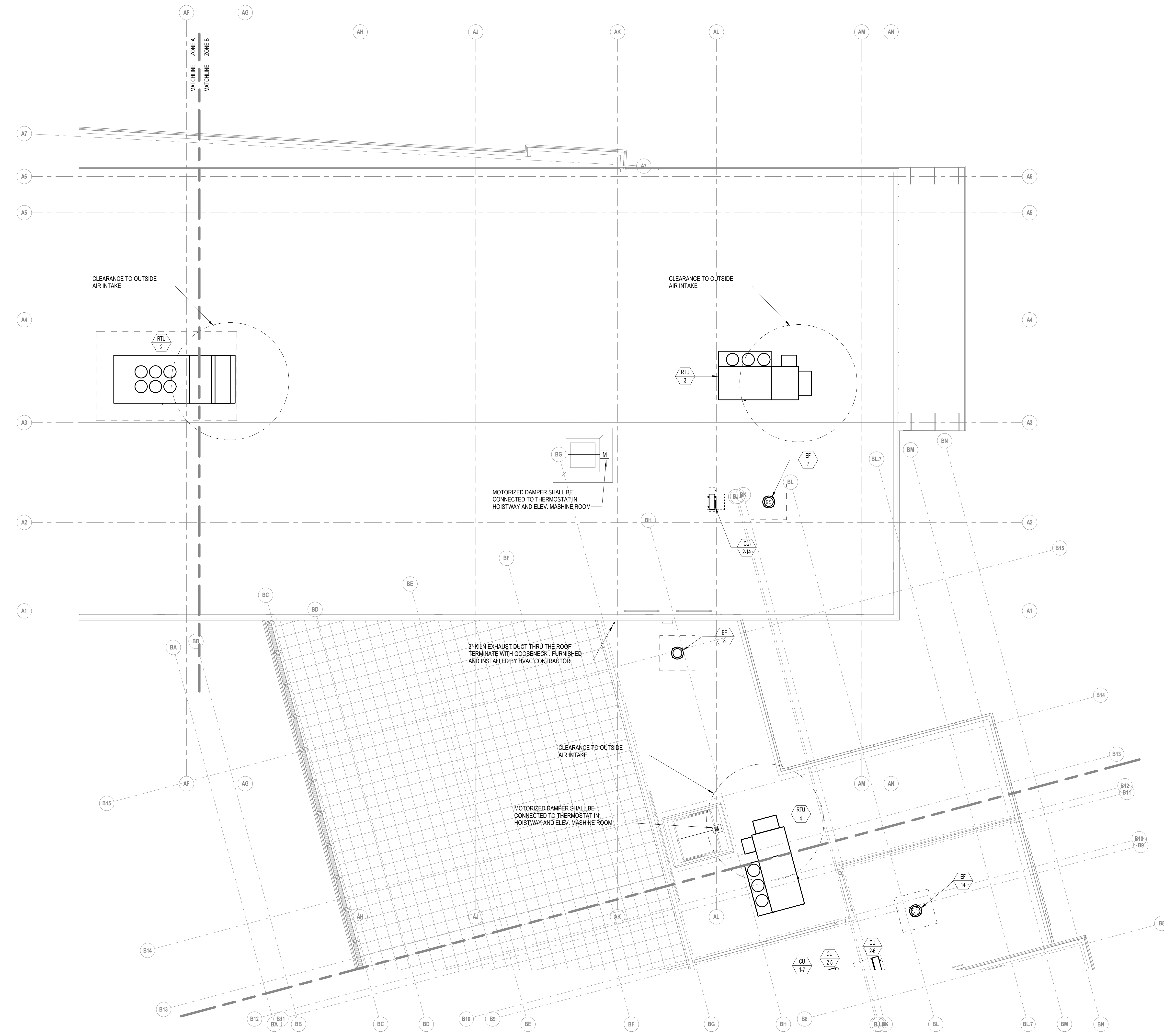
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KEY PLAN NORTH ARROW



DRAWING NAME:
MECHANICAL ROOF PLAN - ZONE A

DRAWN BY: AP
REVIEWED BY: DAH

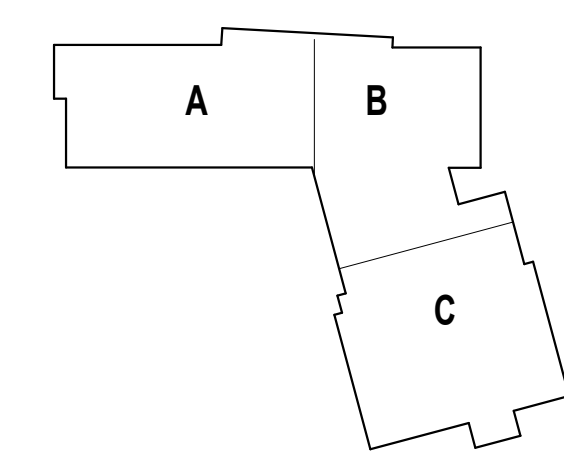
SCALE: AS NOTED | DRAWING NUMBER:
JOB NO.: 2202.02
DATE: OCTOBER 13, 2023 **M1.15A**



1 MECHANICAL ROOF PLAN - ZONE B
1/8" = 1'-0"

100% CONSTRUCTION DOCUMENTS
KEY PLAN NORTH ARROW

KEYPLAN



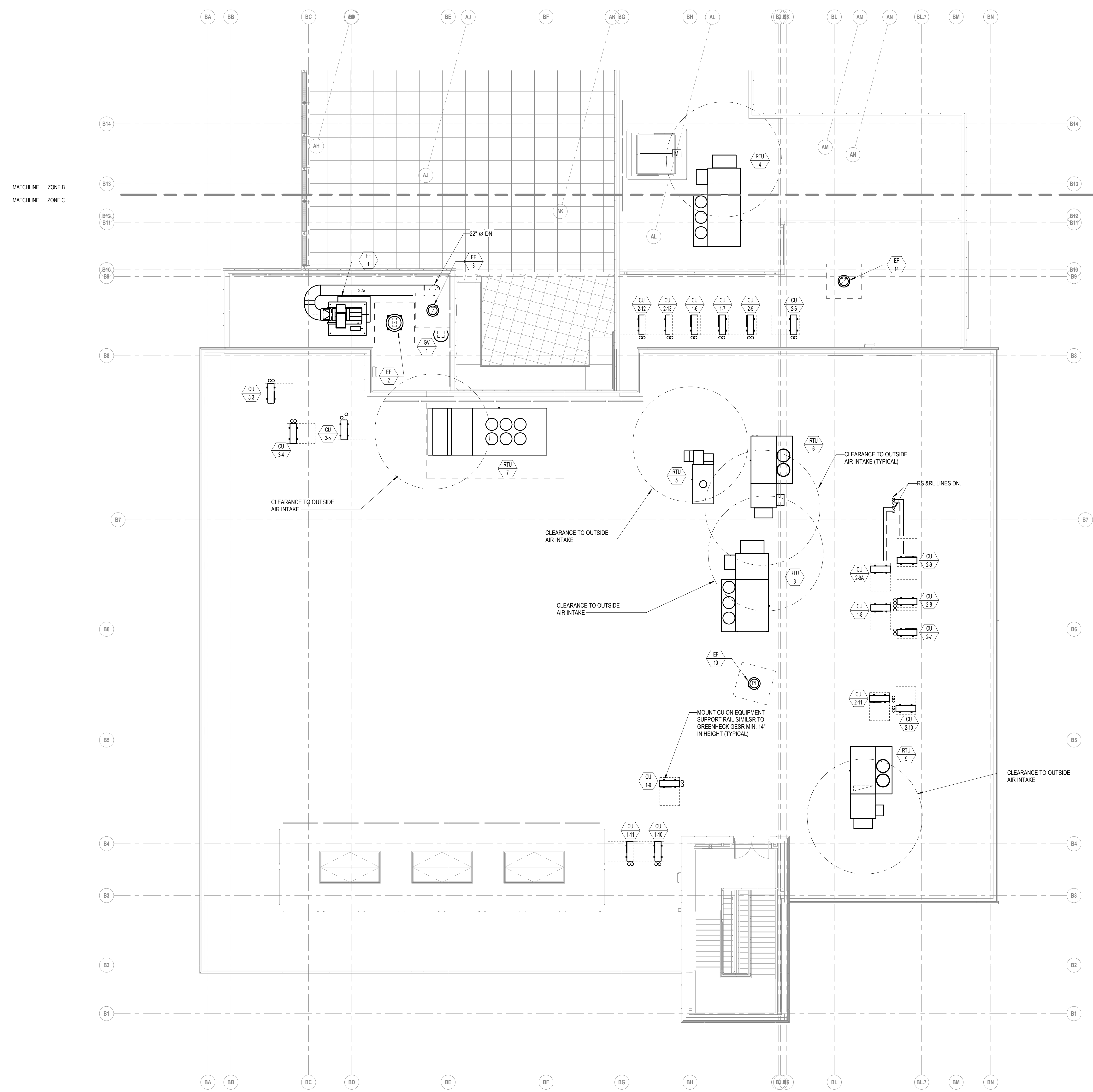
DRAWING NAME:
MECHANICAL ROOF PLAN - ZONE B

DRAWN BY: AP
REVIEWED BY: DAH

SCALE: AS NOTED | DRAWING NUMBER:
JOB NO.: 2202.02
DATE: OCTOBER 13, 2023 **M1.15B**

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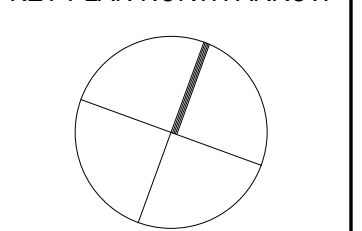


MATCHLINE ZONE B
MATCHLINE ZONE C

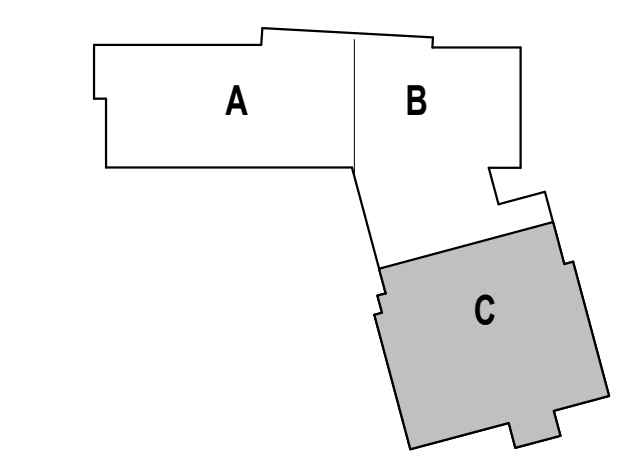
KEYNOTE LEGEND:

100% CONSTRUCTION DOCUMENTS

KEY PLAN NORTH ARROW



KEYPLAN



DRAWING NAME:

MECHANICAL ROOF PLAN - ZONE C

DRAWN BY: AP

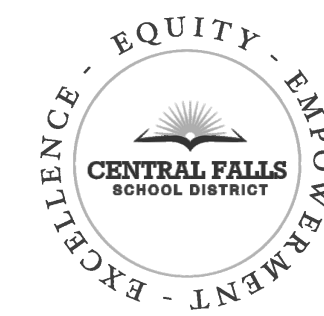
REVIEWED BY: DAH

SCALE: AS NOTED | DRAWING NUMBER:

JOB NO.: 2202.02

DATE: OCTOBER 13, 2023

M1.15C

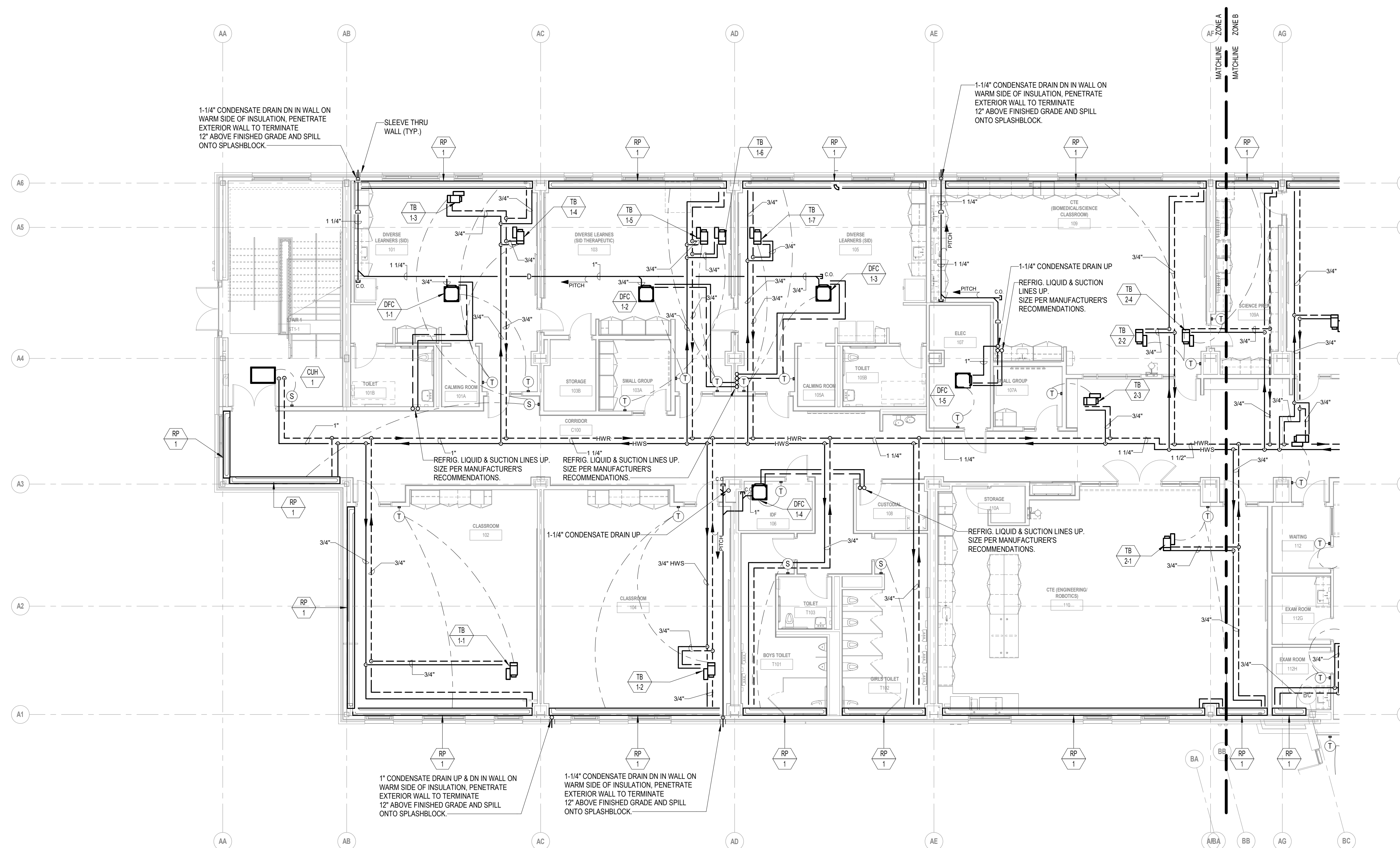


CENTRAL FALLS HIGH SCHOOL
10 HIGGINSON AVE, CENTRAL FALLS, RI

KEYNOTE LEGEND:

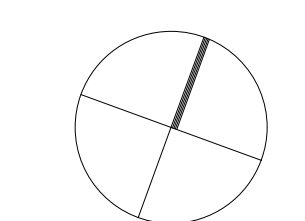
GENERAL NOTES

1. ALL PIPING RUNOUTS TO BE 3/4" UNLESS NOTED OTHERWISE.

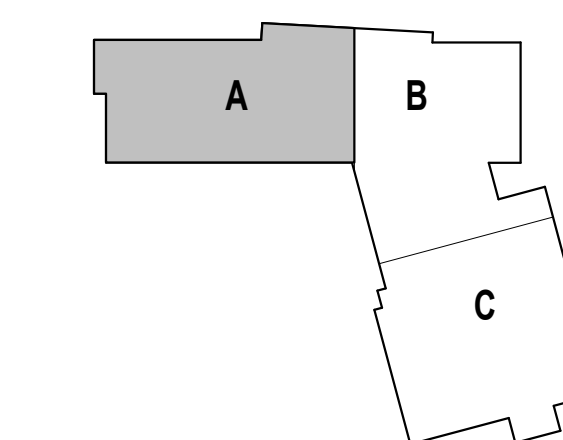


100% CONSTRUCTION DOCUMENTS

KEY PLAN NORTH ARROW



KEYPLAN



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

DRAWING NAME:

**MECHANICAL
FIRST FLOOR
PIPING PLAN -
ZONE A**

DRAWN BY: AP

REVIEWED BY: DAH

SCALE: AS NOTED | DRAWING NUMBER:

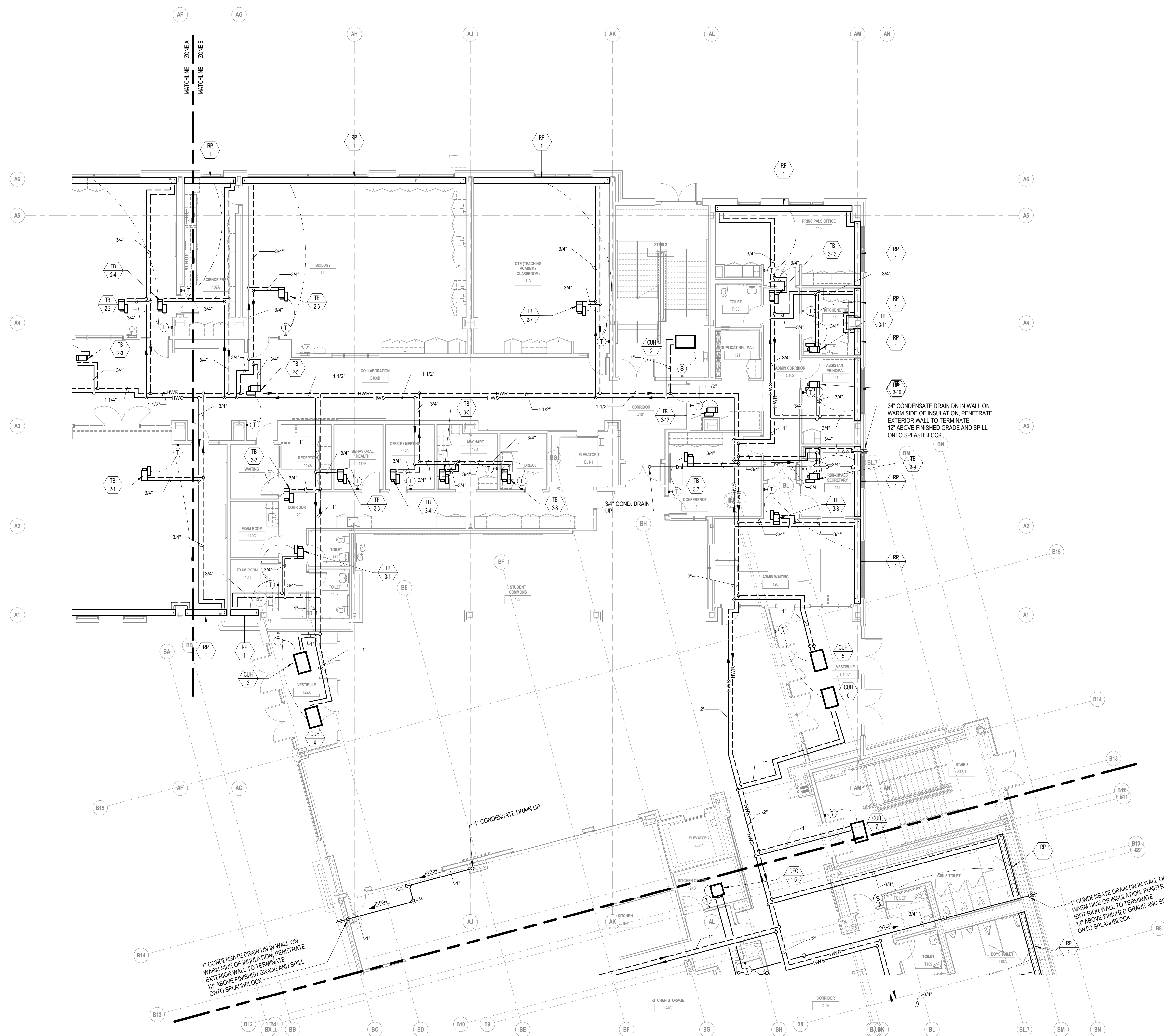
JOB NO.: 2202.02

DATE: OCTOBER 13, 2023

M2.11A

GENERAL NOTES

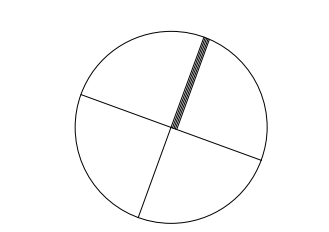
1. ALL PIPING ROUNDOUTS TO BE 3/4" UNLESS NOTED OTHERWISE.



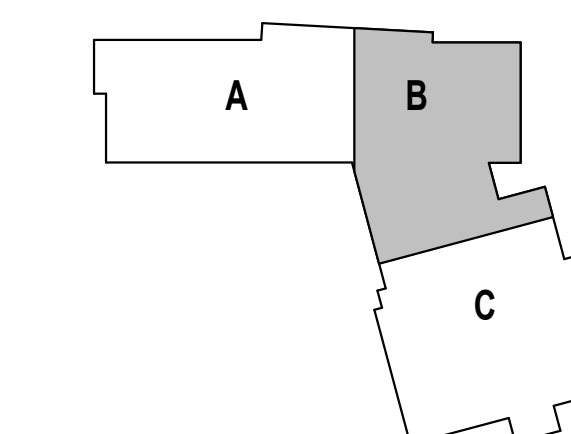
1 FIRST FLOOR PIPING PLAN - ZONE B
1/8" = 1'-0"

100% CONSTRUCTION DOCUMENTS

KEY PLAN NORTH ARROW



KEYPLAN



DRAWING NAME:

**MECHANICAL
FIRST FLOOR
PIPING PLAN -
ZONE B**

DRAWN BY: AP

REVIEWED BY: DAH

SCALE: AS NOTED | DRAWING NUMBER:

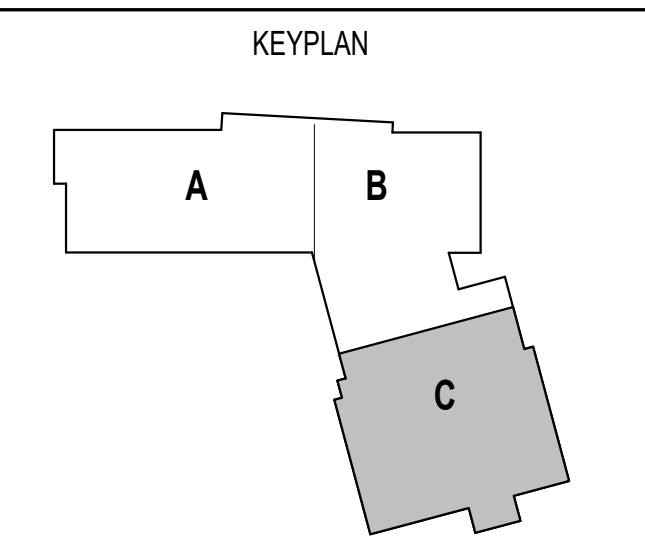
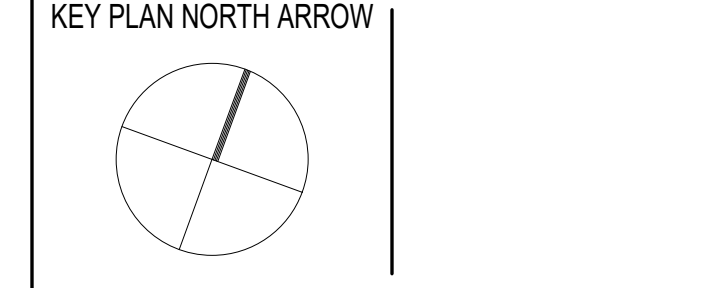
JOB NO.: 2202.02

DATE: OCTOBER 13, 2023

M2.11B

- ALL PIPING RUNOUTS TO BE 3/4" UNLESS NOTED OTHERWISE.

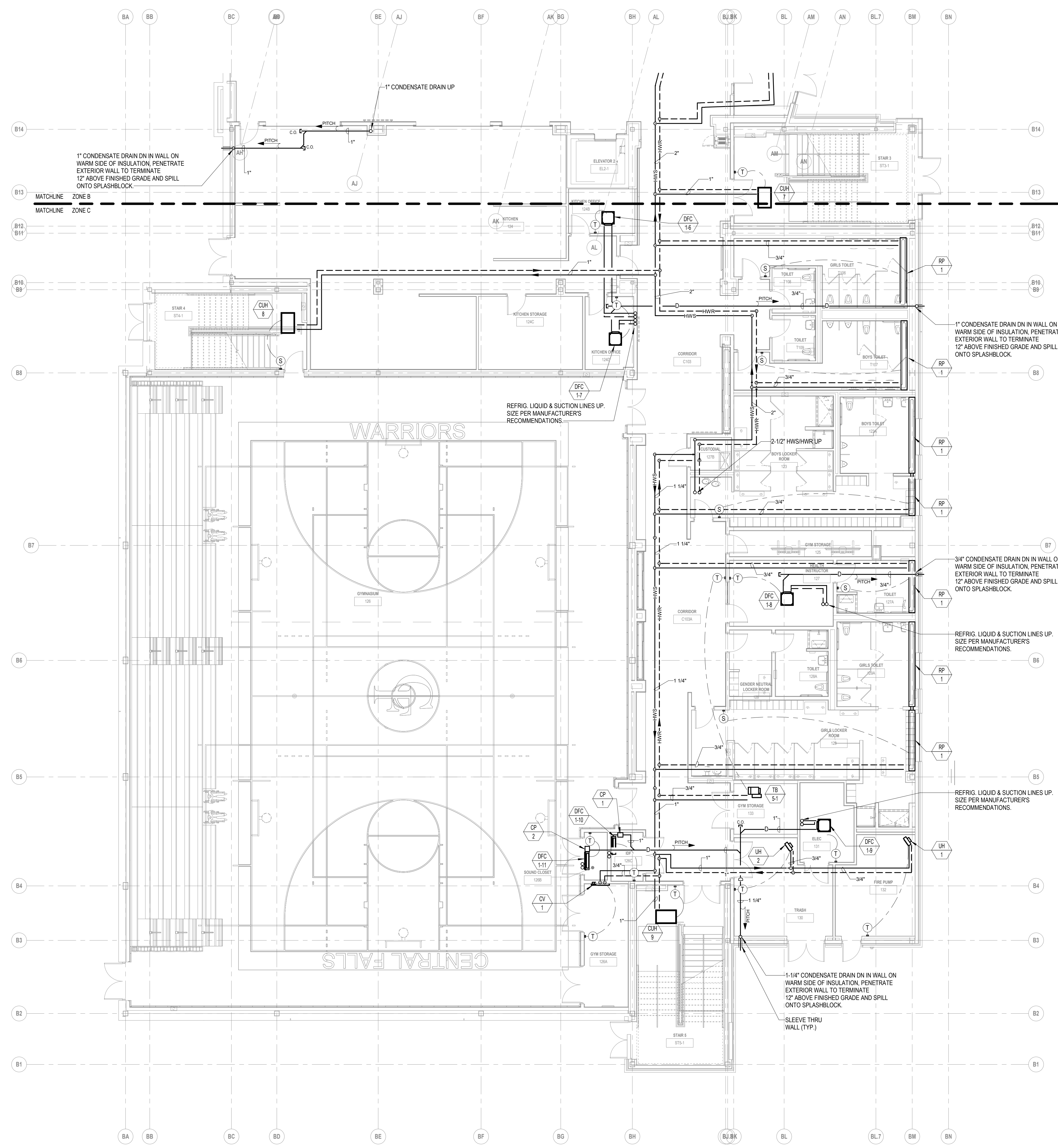
100% CONSTRUCTION DOCUMENTS



DRAWING NAME:
MECHANICAL FIRST FLOOR PIPING PLAN - ZONE C

DRAWN BY: AP
REVIEWED BY: DAH

SCALE: AS NOTED | DRAWING NUMBER:
JOB NO.: 2202.02
DATE: OCTOBER 13, 2023 **M2.11C**



1 FIRST FLOOR PIPING PLAN - ZONE C
18" x 14"

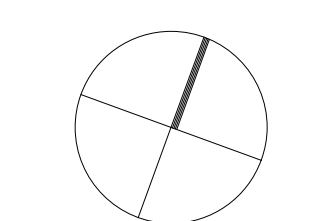
KEYNOTE LEGEND:

GENERAL NOTES

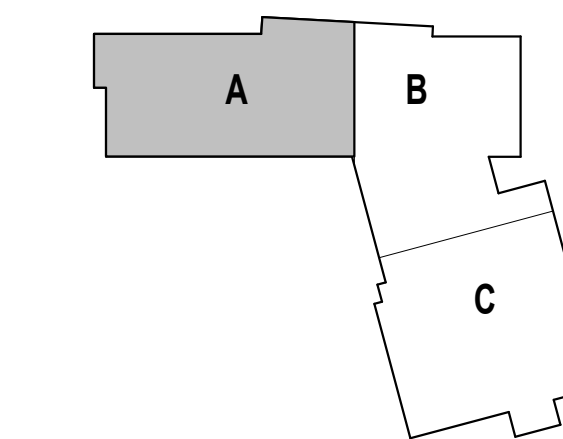
1. ALL PIPING RINGOUTS TO BE 3/4" UNLESS NOTED OTHERWISE.

100% CONSTRUCTION DOCUMENTS

KEY PLAN NORTH ARROW



KEYPLAN



DRAWING NAME:

**MECHANICAL
SECOND FLOOR
PIPING PLAN -
ZONE A**

DRAWN BY: _____ Author

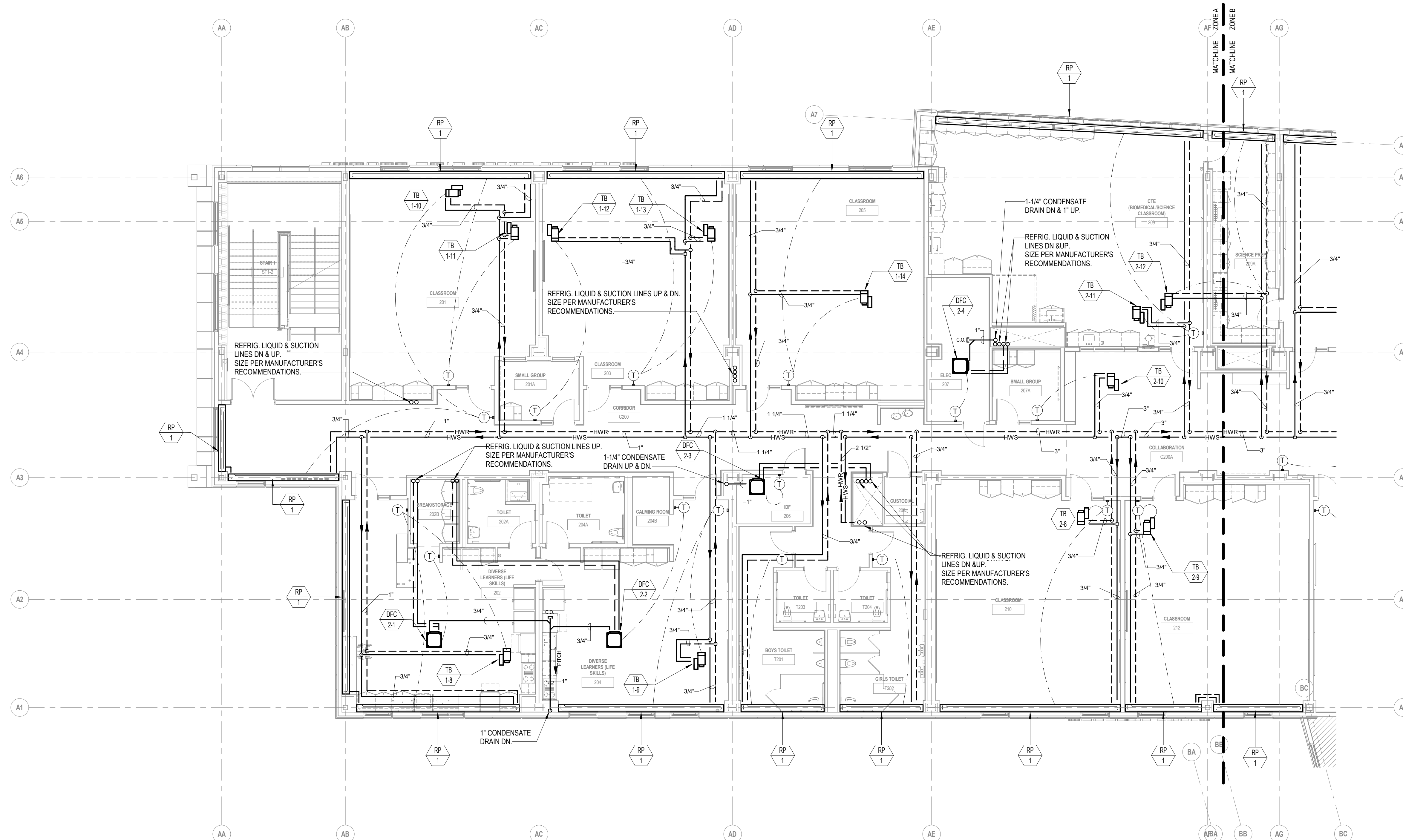
REVIEWED BY: _____ Checker

SCALE: AS NOTED | DRAWING NUMBER:

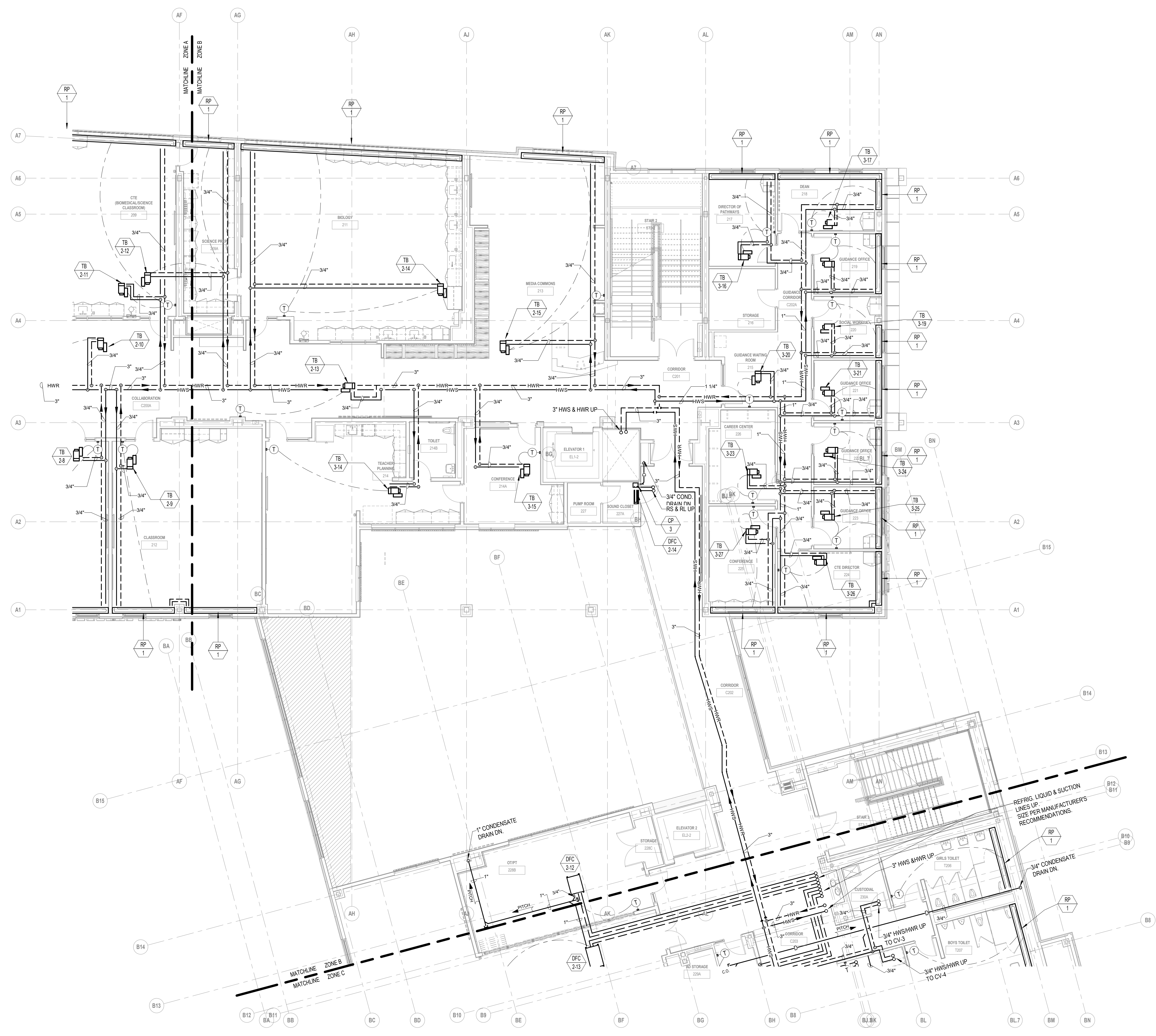
JOB NO.: 2202.02

DATE: OCTOBER 13, 2023

M2.12A



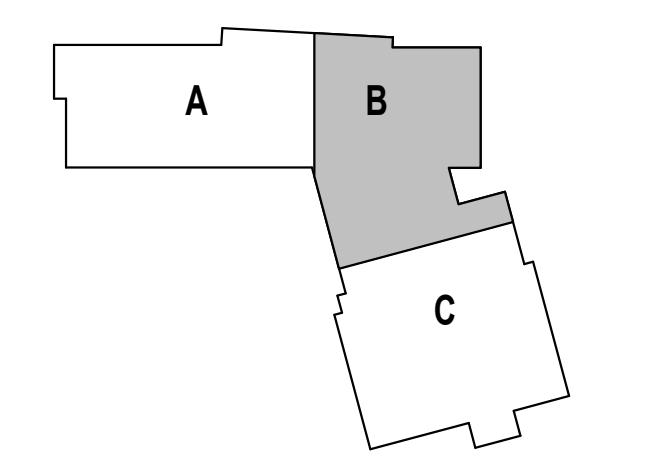
1 SECOND FLOOR PIPING PLAN - ZONE A
1/8" = 1'-0"



1 SECOND FLOOR PIPING PLAN - ZONE B
1/8" = 1'-0"

100% CONSTRUCTION DOCUMENTS

KEY PLAN NORTH ARROW



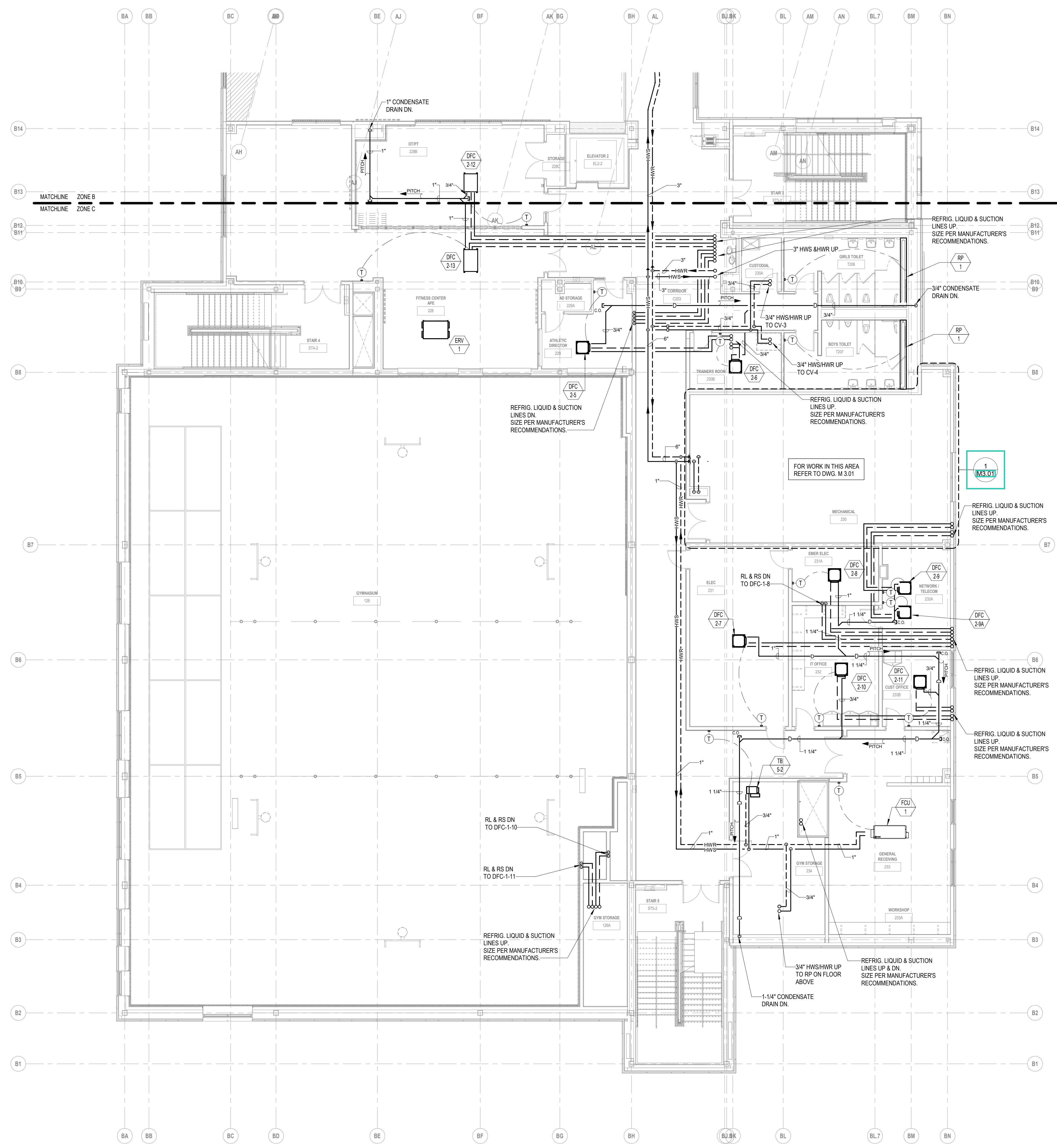
DRAWING NAME:
**MECHANICAL
SECOND FLOOR
PIPING PLAN -
ZONE B**

DRAWN BY: _____ Author
REVIEWED BY: _____ Checker

SCALE: AS NOTED | DRAWING NUMBER:
JOB NO.: 2202.02
DATE: OCTOBER 13, 2023 **M2.12B**

GENERAL NOTES

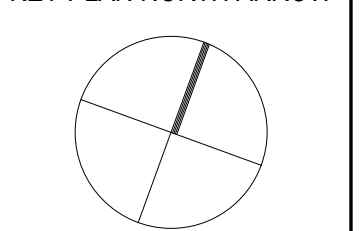
- ALL PIPING ROUNDOUTS TO BE 3/4" UNLESS NOTED OTHERWISE.



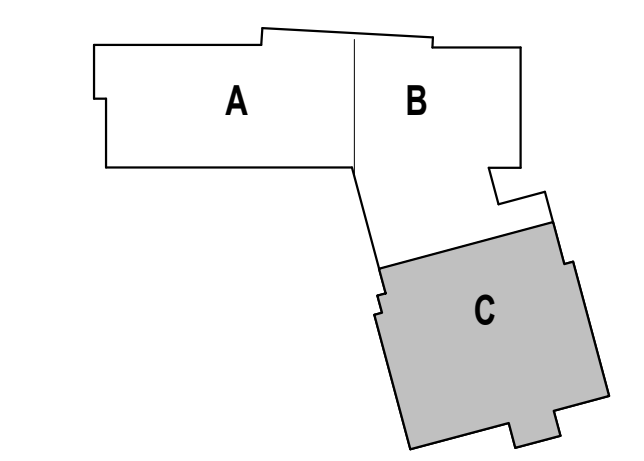
1 SECOND FLOOR PIPING PLAN - ZONE C
1/8" = 1'-0"

100% CONSTRUCTION DOCUMENTS

KEY PLAN NORTH ARROW



KEYPLAN



DRAWING NAME:

**MECHANICAL
SECOND FLOOR
PIPING PLAN -
ZONE C**

DRAWN BY: _____ Author

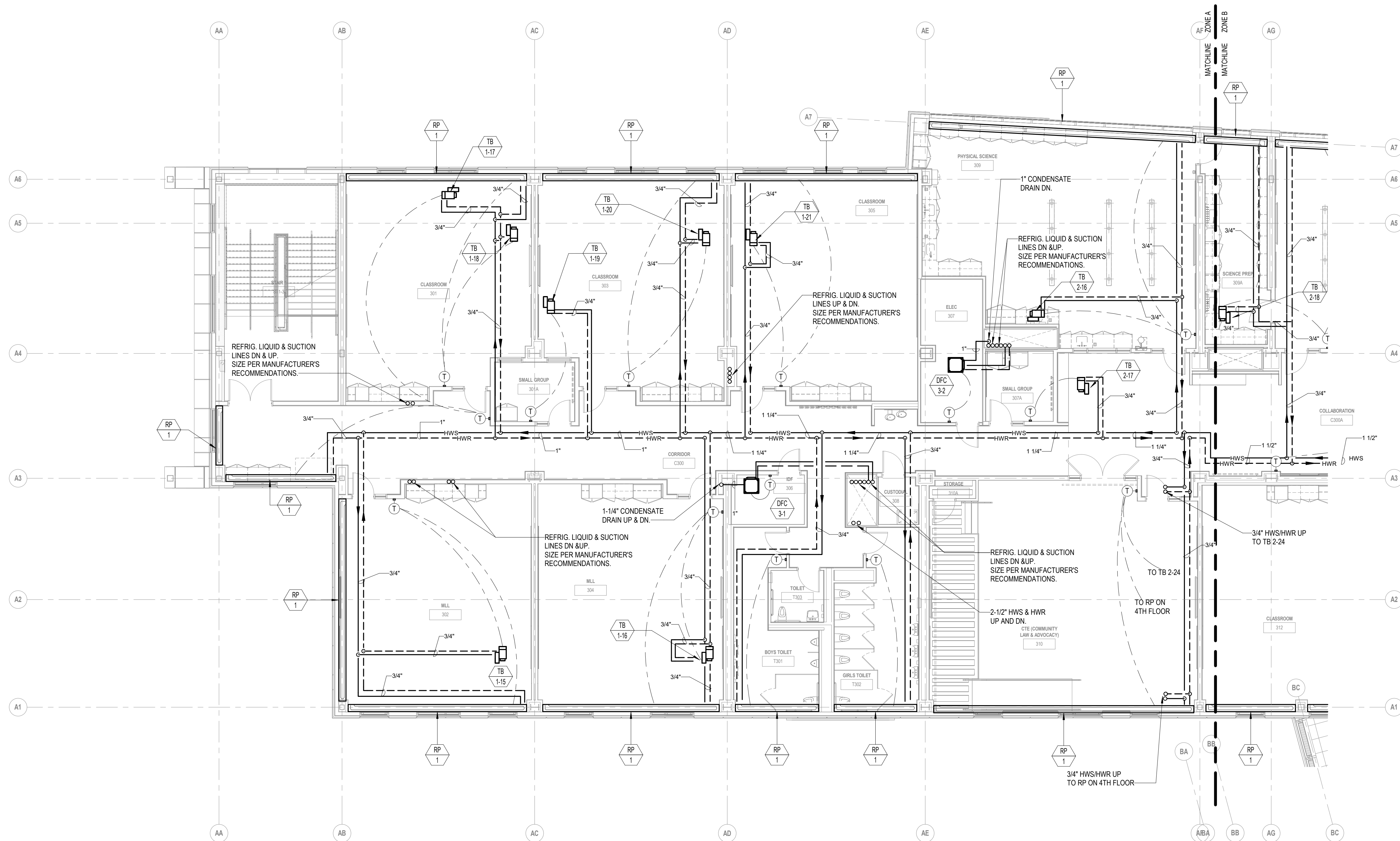
REVIEWED BY: _____ Checker

SCALE: AS NOTED | DRAWING NUMBER:
JOB NO.: 2202.02
DATE: OCTOBER 13, 2023 **M2.12C**

KEYNOTE LEGEND:

GENERAL NOTES

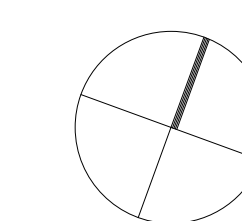
1. ALL PIPING RUNOUTS TO BE 3/4" UNLESS NOTED OTHERWISE.



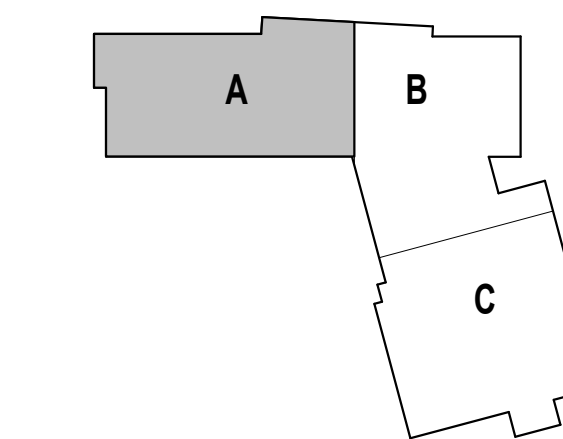
1 THIRD FLOOR PIPING PLAN - ZONE A
1/8" = 1'-0"

100% CONSTRUCTION DOCUMENTS

KEY PLAN NORTH ARROW



KEYPLAN



DRAWING NAME:

**MECHANICAL
THIRD FLOOR
PIPING PLAN -
ZONE A**

DRAWN BY: _____ Author

REVIEWED BY: _____ Checker

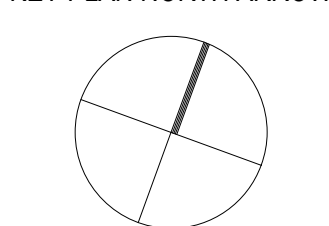
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JOB NO.: 2202.02
DATE: OCTOBER 13, 2023 **M2.13A**

GENERAL NOTES

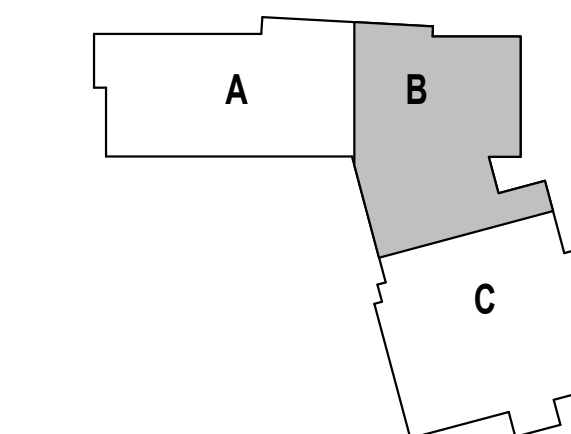
- ALL PIPING RINGOUTS TO BE 3/4" UNLESS NOTED OTHERWISE.

100% CONSTRUCTION DOCUMENTS

KEY PLAN NORTH ARROW



KEYPLAN



DRAWING NAME:

**MECHANICAL
THIRD FLOOR
PIPING PLAN -
ZONE B**

DRAWN BY: _____ Author

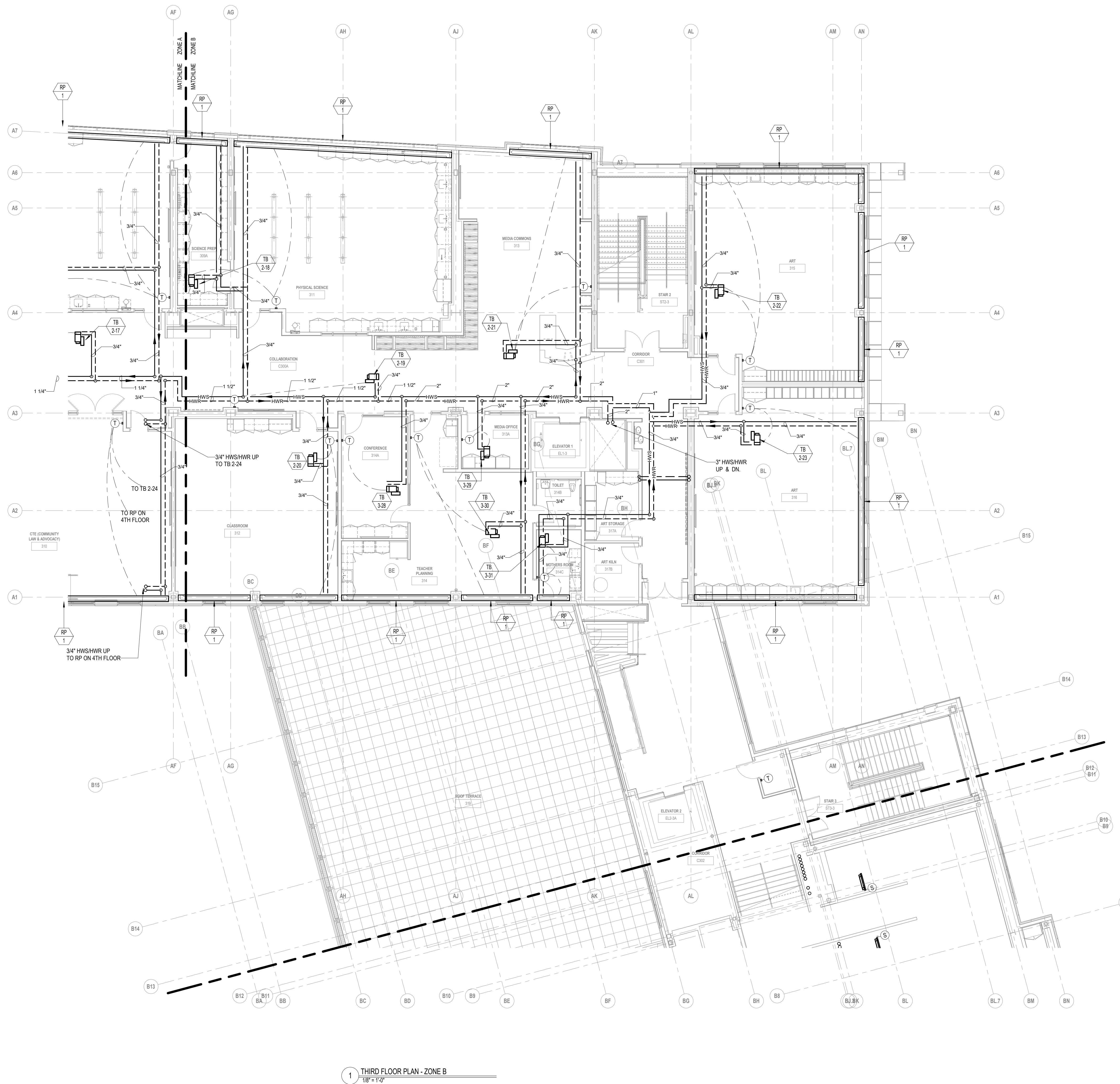
REVIEWED BY: _____ Checker

SCALE: AS NOTED | DRAWING NUMBER:

JOB NO.: 2202.02

DATE: OCTOBER 13, 2023

M2.13B



1 THIRD FLOOR PLAN - ZONE B
1/8" = 1'-0"

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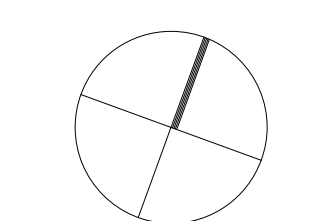
KEYNOTE LEGEND:

GENERAL NOTES

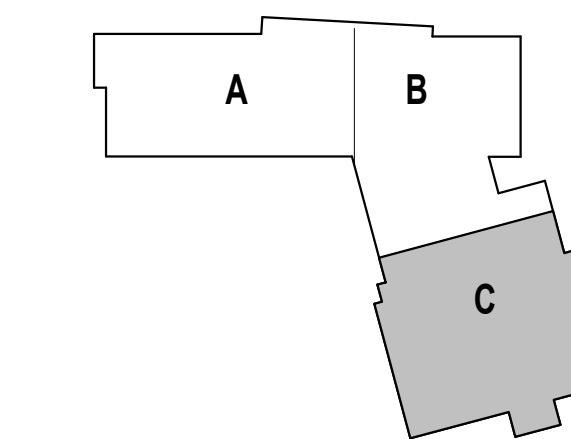
1. ALL PIPING RINGOUTS TO BE 3/4" UNLESS NOTED OTHERWISE.

100% CONSTRUCTION DOCUMENTS

KEY PLAN NORTH ARROW



KEYPLAN



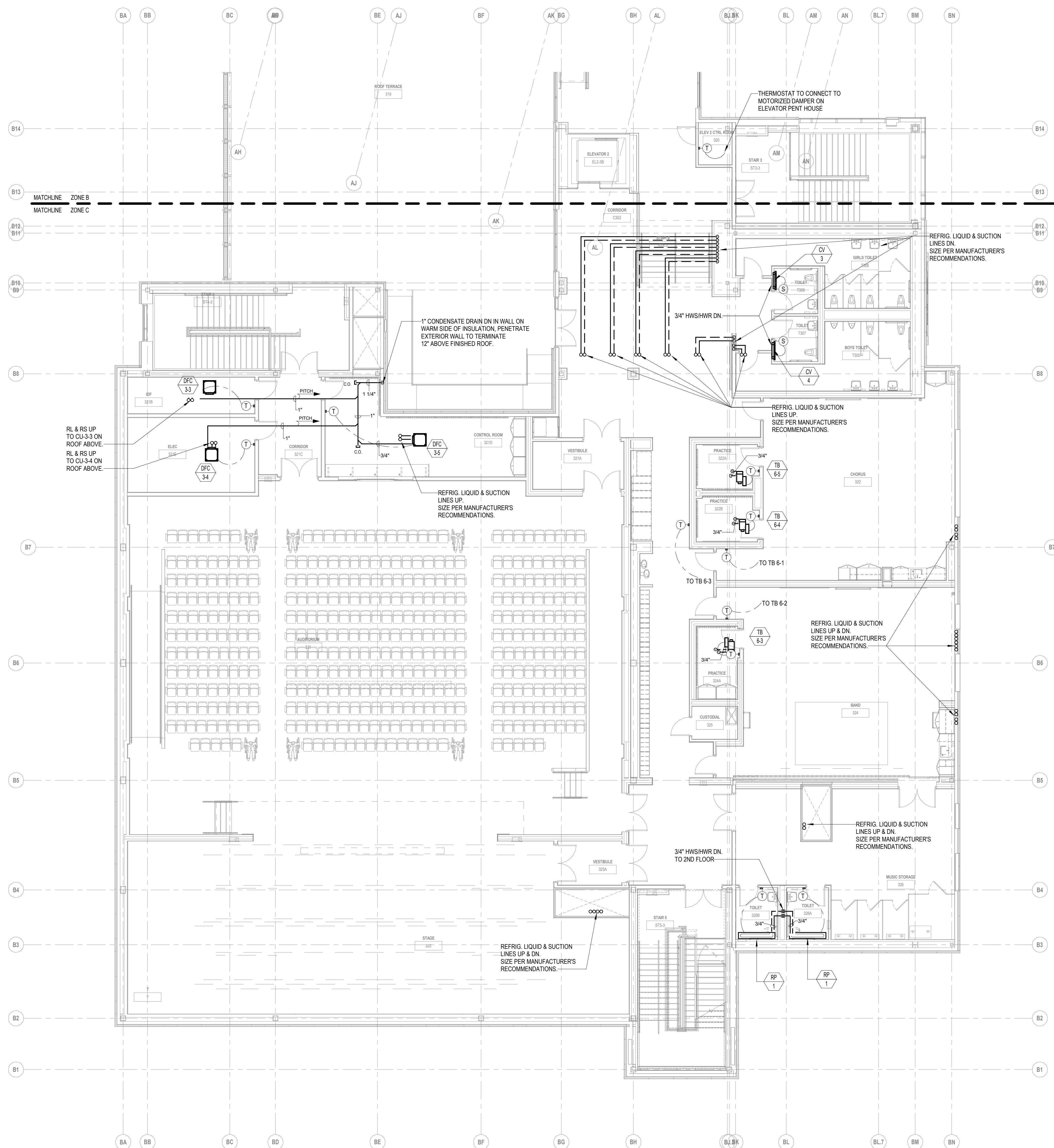
DRAWING NAME:

**MECHANICAL
THIRD FLOOR
PIPING PLAN -
ZONE C**

DRAWN BY: _____ Author

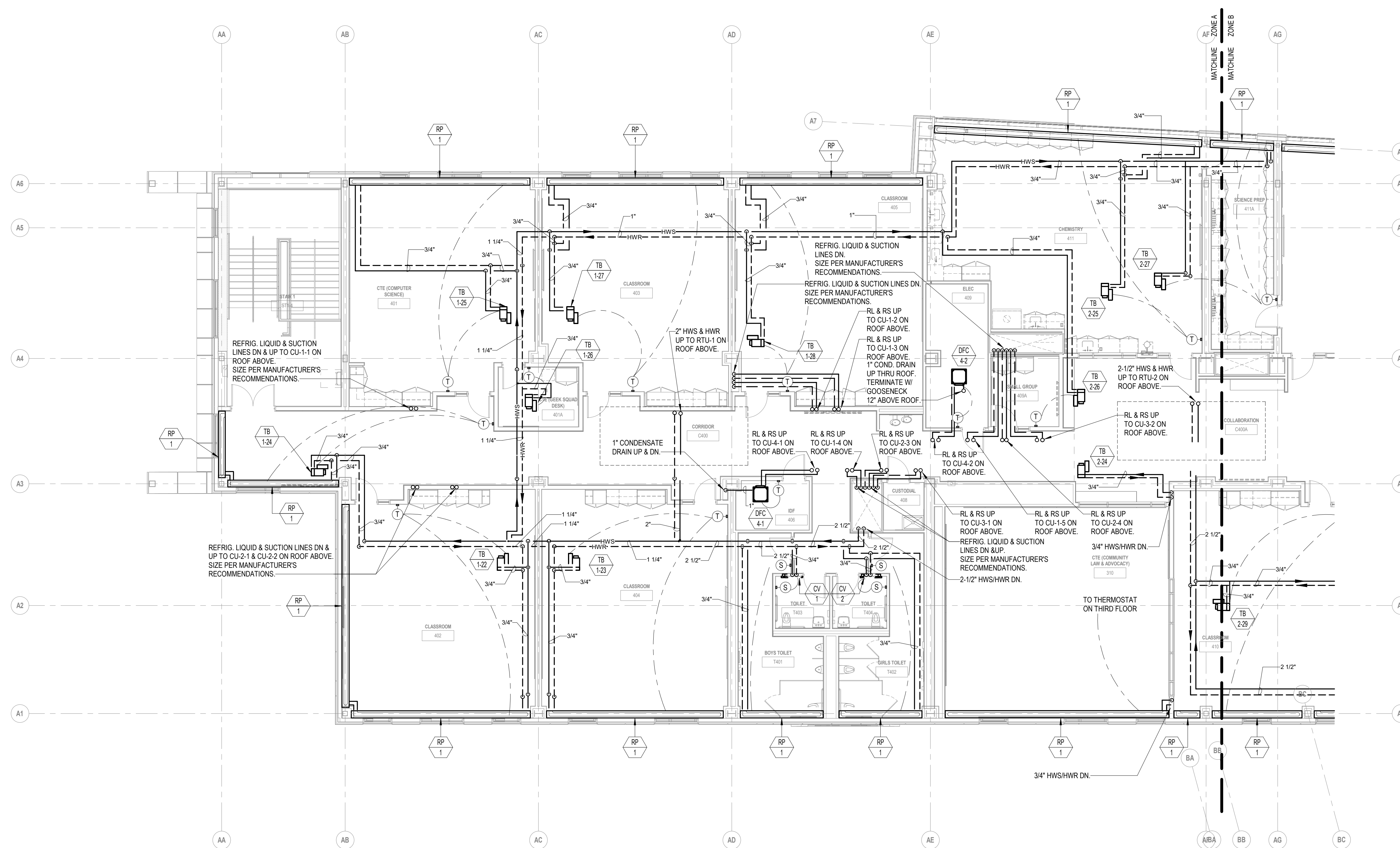
REVIEWED BY: _____ Checker

SCALE: AS NOTED | DRAWING NUMBER:
JOB NO.: 2202.02
DATE: OCTOBER 13, 2023 **M2.13C**



GENERAL NOTES

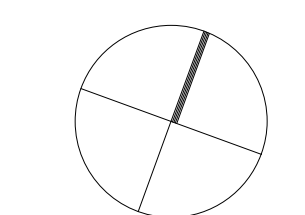
1. ALL PIPING RUNOUTS TO BE 3/4" UNLESS NOTED OTHERWISE.



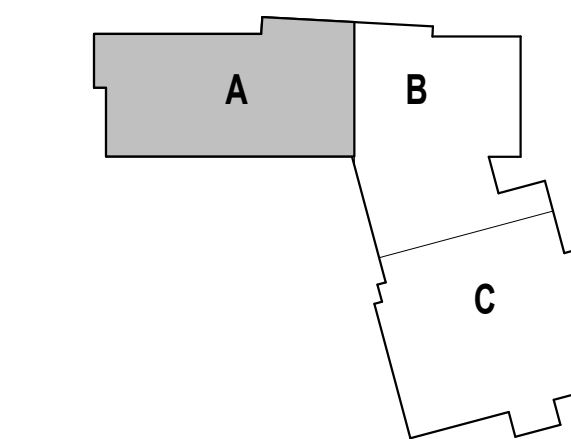
1 FOURTH FLOOR PIPING PLAN - ZONE A
1/8" = 1'-0"

100% CONSTRUCTION DOCUMENTS

KEY PLAN NORTH ARROW



KEYPLAN



DRAWING NAME:

**MECHANICAL
FOURTH FLOOR
PIPING PLAN -
ZONE A**

DRAWN BY: Author

REVIEWED BY: Checker

SCALE: AS NOTED | DRAWING NUMBER:
JOB NO.: 2202.02
DATE: OCTOBER 13, 2023

M2.14A

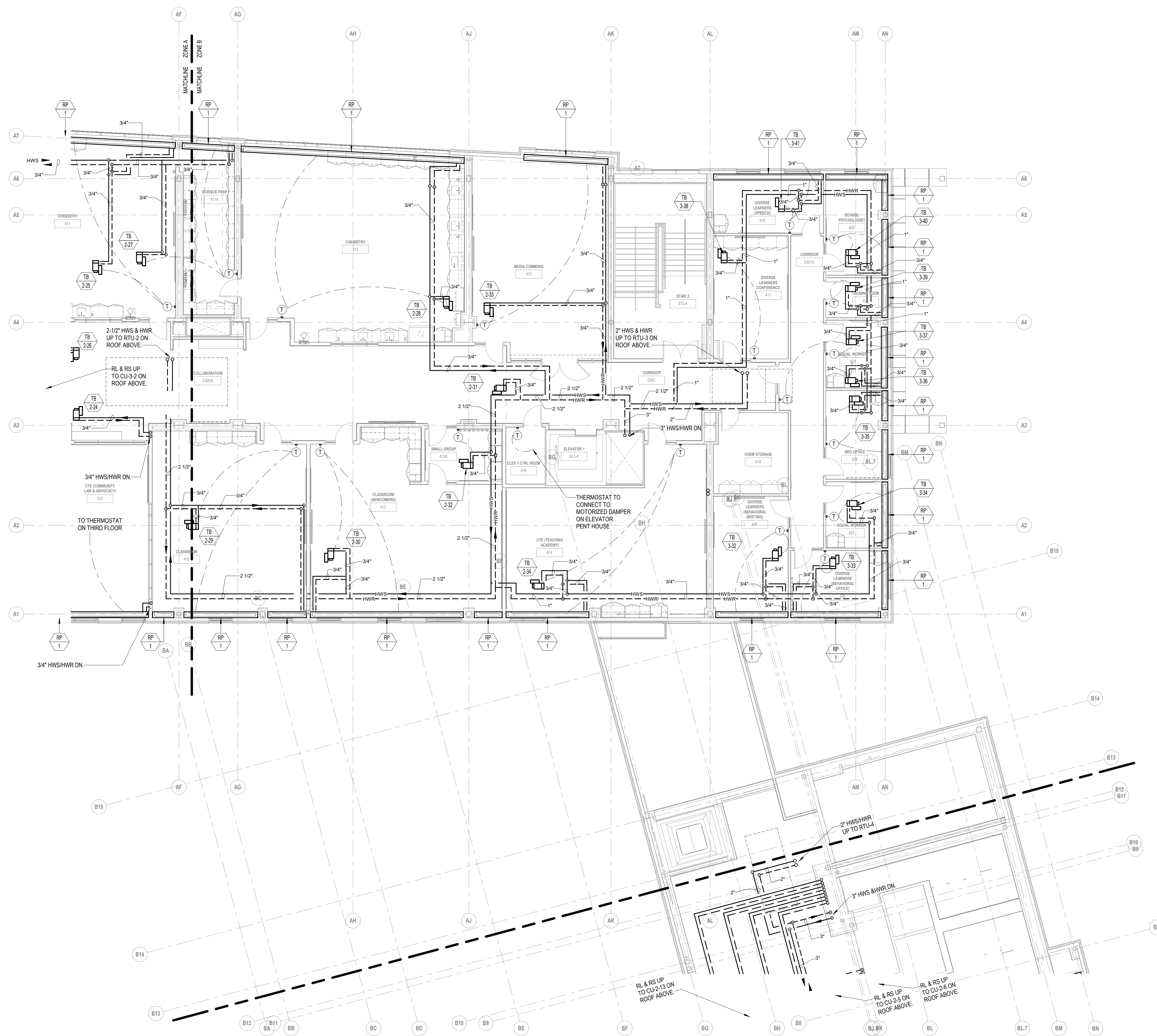


CENTRAL FALLS HIGH SCHOOL
10 HIGGINSON AVE, CENTRAL FALLS, RI

KEYNOTE LEGEND:

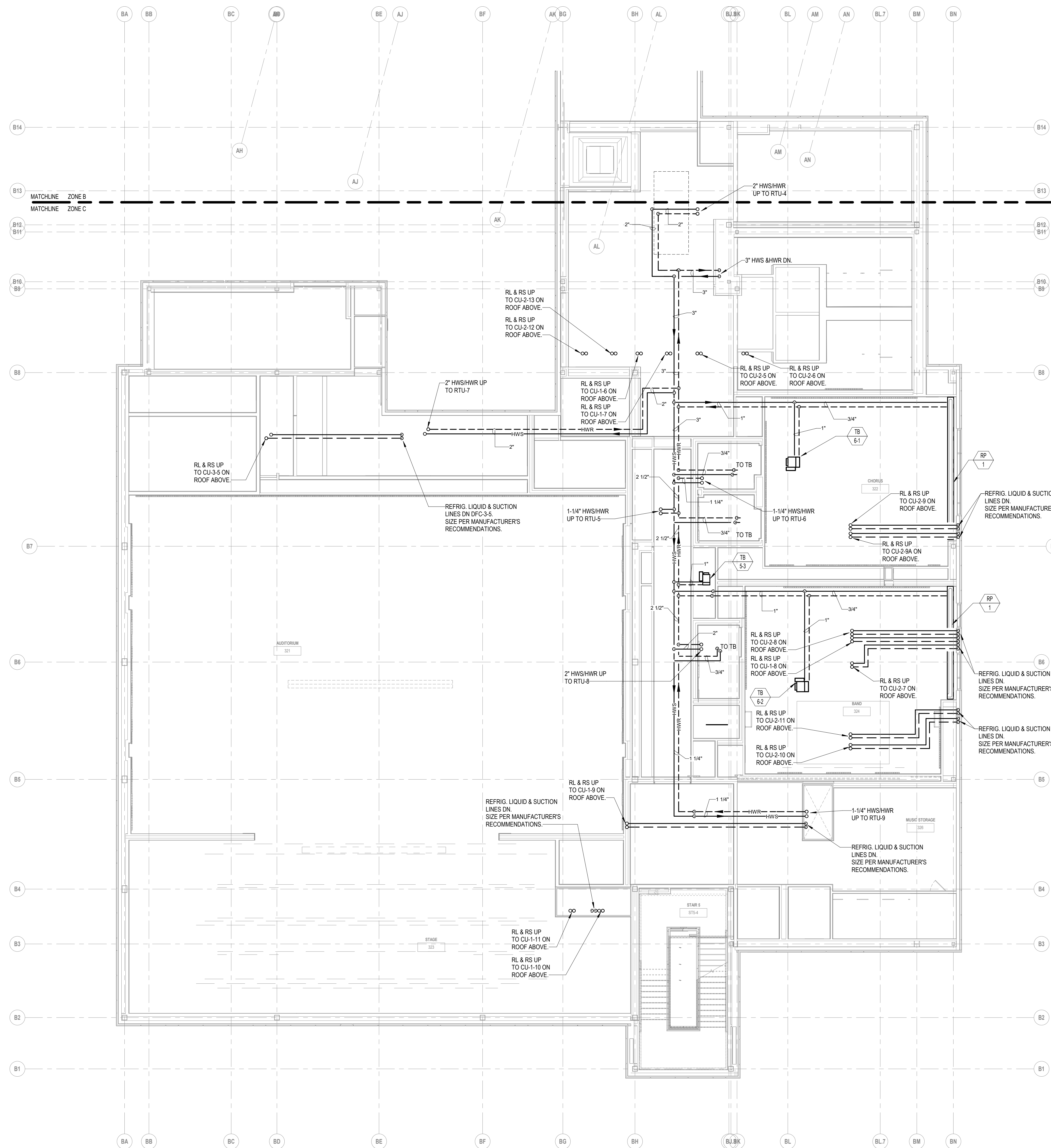
GENERAL NOTES

- ALL PIPING RUNOUTS TO BE 3/4" UNLESS NOTED OTHERWISE.



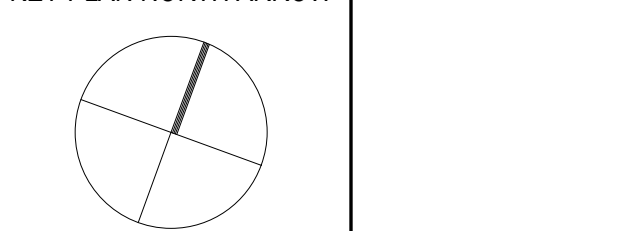
GENERAL NOTES

- ALL PIPING RINGOUTS TO BE 3/4" UNLESS NOTED OTHERWISE.

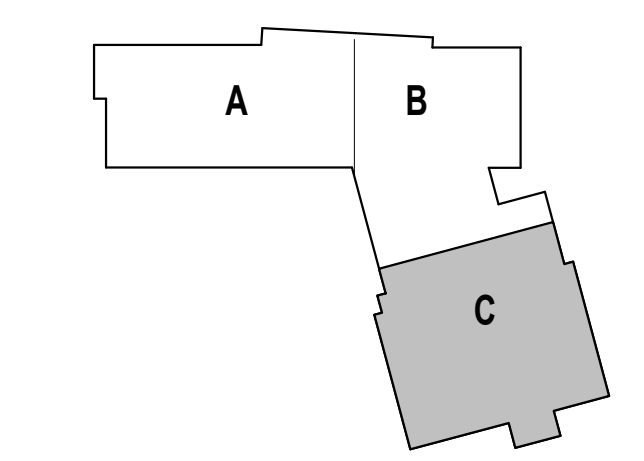


100% CONSTRUCTION DOCUMENTS

KEY PLAN NORTH ARROW



KEYPLAN



DRAWING NAME:

**MECHANICAL
FOURTH FLOOR
PIPING PLAN -
ZONE C**

DRAWN BY: _____ Author

REVIEWED BY: _____ Checker

SCALE: AS NOTED | DRAWING NUMBER:

JOB NO.: 2202.02

DATE: OCTOBER 13, 2023

M2.14C

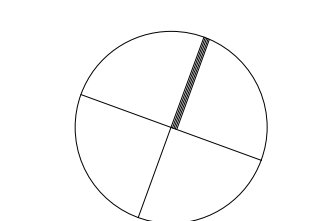


CENTRAL FALLS HIGH SCHOOL
10 HIGGINSON AVE, CENTRAL FALLS, RI

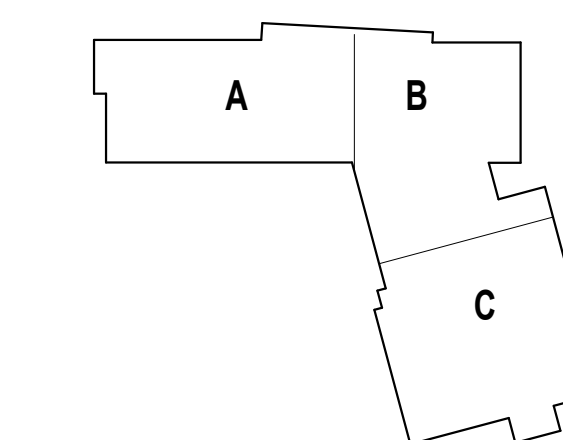
KEYNOTE LEGEND:

100% CONSTRUCTION DOCUMENTS

KEY PLAN NORTH ARROW



KEYPLAN



DRAWING NAME:

MECHANICAL ROOM PART PLANS

DRAWN BY: AP

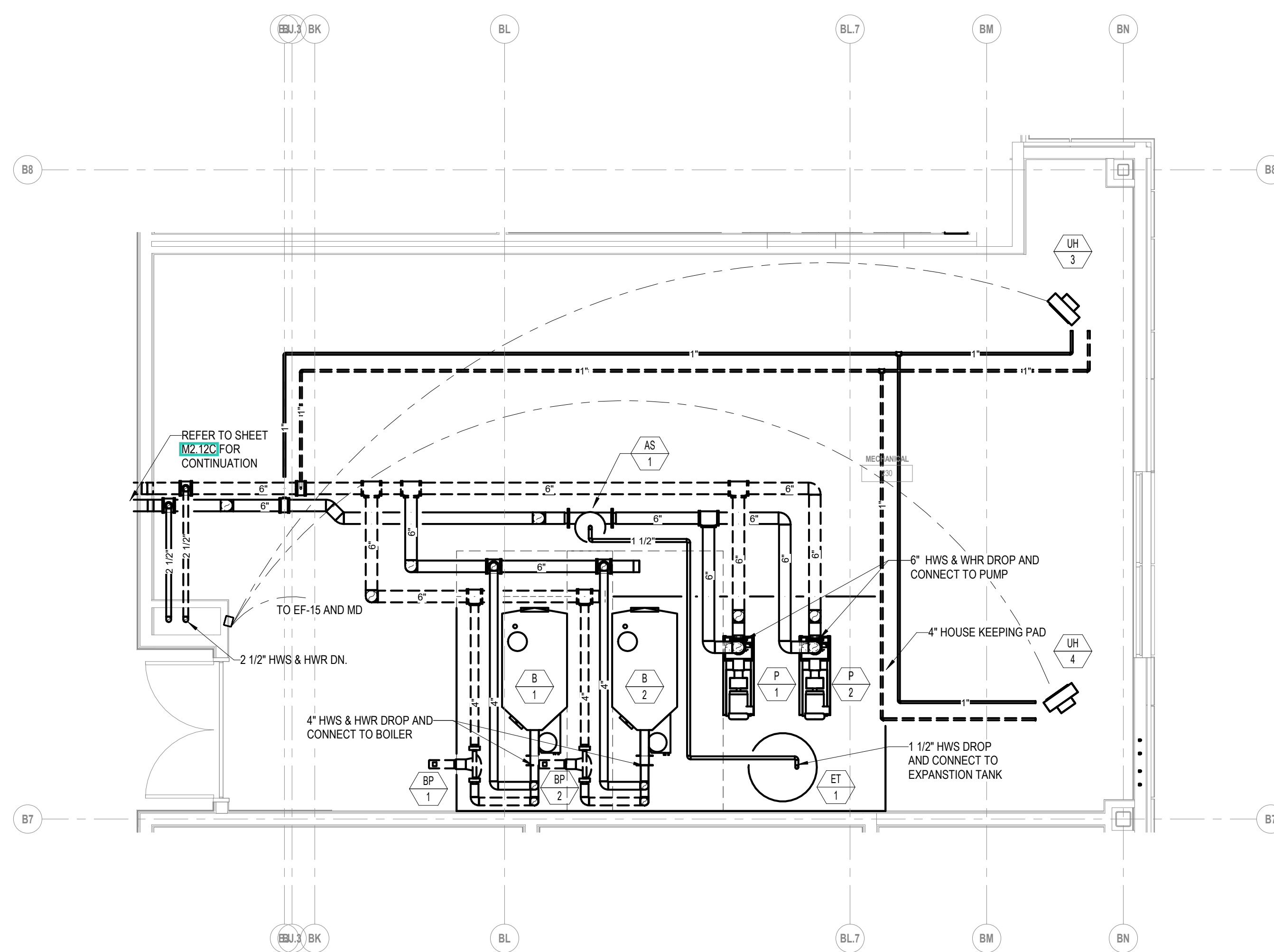
REVIEWED BY: DAH

SCALE: AS NOTED | DRAWING NUMBER:

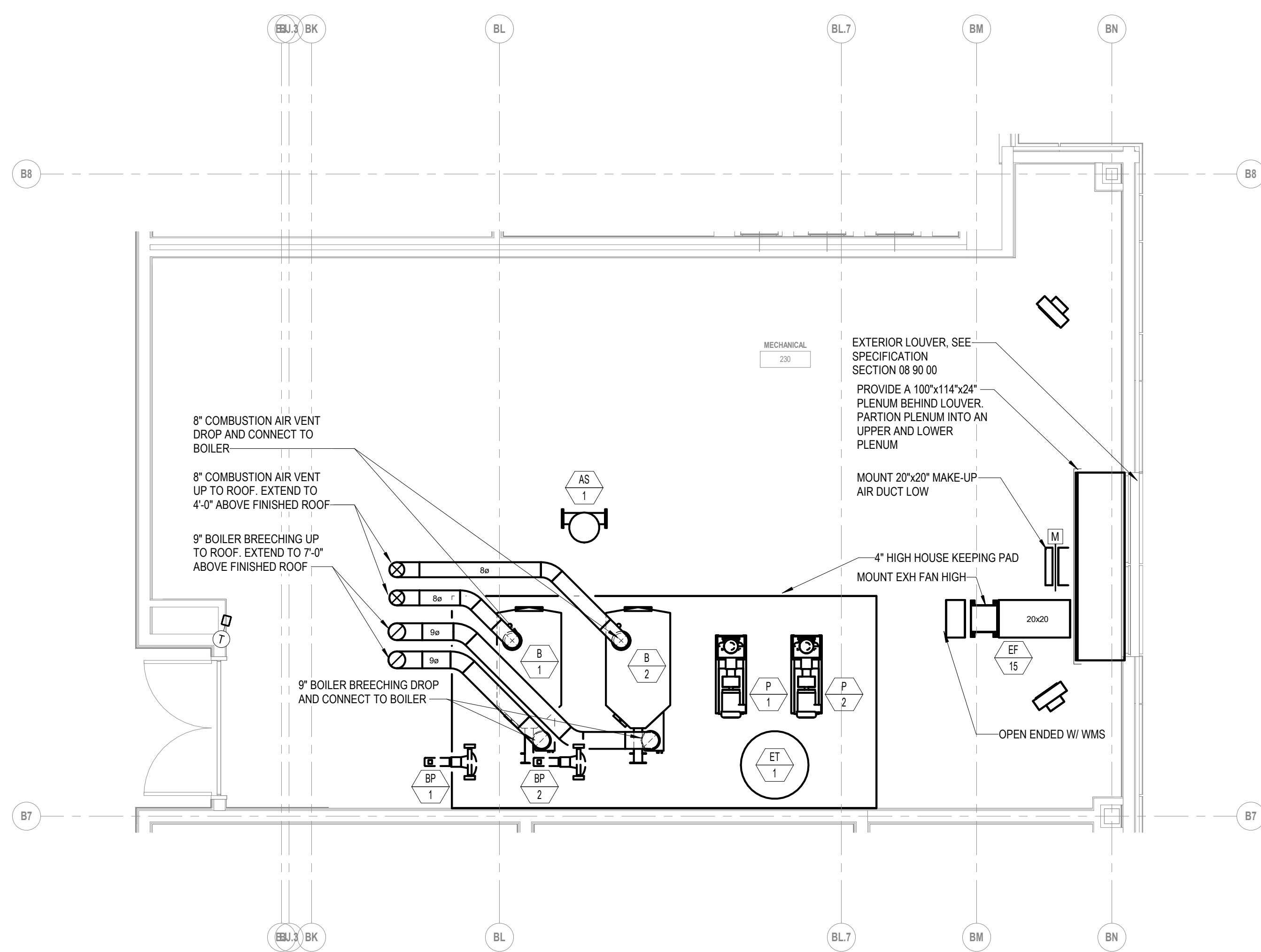
JOB NO.: 2202.02

DATE: OCTOBER 13, 2023

M3.01



1 MECHANICAL ROOM PIPING PART PLAN
1/4" = 1'-0"



2 MECHANICAL ROOM DUCTWORK PART PLAN
1/4" = 1'-0"

ROOFTOP UNIT SCHEDULE

TAG	Estimated Weight (lbs)	Model	Electrical		Efficiency		Supply Fan					Exhaust Fan					Filtration	Energy Recovery				Cooling				Hot Water Heating												
			Voltage	MCA	MOP	EER	IEER / ISMRE	Supply Airflow (CFM)	Outside Airflow (CFM)	ESP (inH ₂ O)	TSP (inH ₂ O)	Motor Size (qty @ HP)	BHP	Airflow (CFM)	ESP (inH ₂ O)	TSP (inH ₂ O)		Motor Size (qty @ HP)	BHP	Wheel LAT		Recovered Capacity	EAT		LAT		Total Capacity (MBH)	Sensible Capacity (MBH)	Modulating Hot Gas Reheat LDB (°F)	EDB (°F)	LDB (°F)	Flow (GPM)	Fluid PD (ft wg)					
																				Cooling	Heating		EDB (°F)	EWB (°F)	LDB (°F)	LWB (°F)												
			Outside Air (CFM)	Exhaust Air (CFM)	LDB (°F)	LWB (°F)	LDB (°F)	LWB (°F)	Total Cooling (Btu/hr)	Sensible Heating (Btu/hr)	EDB (°F)	EWB (°F)	LDB (°F)	LWB (°F)																								
RTU-1 (Classroom)	7,267	VXE-312-30	460V/3ph	105.4	125.0	N/A	7	9,980	9,980	2.00	4.15	2 @ 7-1/2	4.65	9,980	1.00	2.25	2 @ 5	3.43	MERV 8 & MERV 13	9,980	9,980	78.7	65.8	52.8	43.9	273,951	515,208	78.7	65.8	52.8	52.8	388.4	279.1	77.1	52.8	83.3	34.6	11.1
RTU-2 (Classroom)	8,026	VXE-312-40	460V/3ph	119.2	125.0	N/A	6.1	12,390	12,390	2.00	4.96	2 @ 7-1/2	6.90	12,390	1.00	2.18	2 @ 7-1/2	4.99	MERV 8 & MERV 13	12,390	12,390	79.9	66.7	46.5	39.6	295,502	565,319	79.9	66.7	52.2	52.1	544.4	371.3	77.8	46.5	75.8	41.2	15.4
RTU-3 (Admin)	3,980	VX-212-20	460V/3ph	59.7	70.0	10.6	16.5	7,260	2,100	1.85	4.24	1 @ 10	7.63	7,260	1.00	1.13	1 @ 5	3.81	MERV 8 & MERV 13	3,420	3,420	78.6	65.9	53.2	43.8	92,340	178,031	78.9	64.3	46.1	46.0	330.7	219.5	80.9	62.1	106.8	32.3	2.3
RTU-4 (Cafeteria)	4,525	VXE-212-15	460V/3ph	89.2	110.0	9.8	18.2	6,500	3,420	2.00	4.24	1 @ 7-1/2	6.70	6,500	1.00	1.82	1 @ 5	3.97	MERV 8 & MERV 13	3,420	3,420	78.6	65.9	53.2	43.8	92,340	178,031	89.0	73.0	55.3	55.1	369.8	241.2	90.0	5.0	79.3	54.9	6.5
RTU-5 (Cocoon)	1,198	VX-12-2	460V/3ph	18.5	25.0	11.2	18.1	2,100	675	2.00	4.83	1 @ 3	2.50	2,100	1.00	1.11	1 @ 1-1/2	0.96	MERV 8 & MERV 13									79.5	66.2	54.9	54.9	72.7	55.8	73.7	50.5	94.9	10.6	8.0
RTU-6 (Music)	3,077	VXE-112-10	460V/3ph	35.1	50.0	11.1	17.8	3,250	1,885	2.00	3.75	1 @ 5	2.97	3,250	1.00	1.82	1 @ 3	1.87	MERV 8 & MERV 13	1,885	1,885	78.7	65.7	51.9	43.3	51,743	95,479	77.1	64.4	52.0	51.6	121.1	89.6	76.3	60.3	92.8	12.0	0.6
RTU-7 (Aud)	7,135	VXE-312-25	460V/3ph	74.8	90.0	9.8	11.4	9,225	6,100	1.50	3.18	2 @ 5	3.30	9,225	1.00	1.78	2 @ 5	2.58	MERV 8 & MERV 13	6,100	6,100	78.0	65.2	56.1	46.1	178,425	336,847	77.0	64.3	53.3	53.3	299.9	235.9	74.6	61.5	90.3	30.2	8.7
RTU-8 (Gym)	4,175	VXE-212-15	460V/3ph	60.8	90.0	11.3	20.7	5,500	3,800	1.50	3.34	1 @ 7-1/2	4.45	5,500	1.00	1.82	1 @ 5	2.84	MERV 8 & MERV 13	3,800	3,800	78.8	66.1	51.9	42.8	99,180	192,478	77.7	65.0	52.4	52.2	208.8	152.2	82.8	58.1	91.5	20.9	0.8
RTU-9 (Lock-Gym-Sup)	3,077	VXE-112-10	460V/3ph	31.9	45.0	N/A	8	2,500	2,500	2.00	3.52	1 @ 3	2.21	2,500	1.00	1.97	1 @ 2	1.40	MERV 8 & MERV 13	2,500	2,500	79.5	66.4	48.0	40.4	63,000	116,100	79.5	66.4	50.2	50.0	120.9	80.4	77.6	48.0	90.5	12.1	0.6

- Schedule Notes:
 1) Design Summer Conditions: OA 89F/73F, RA 75F/50%
 2) Design Winter Conditions: OA 5F, RA 72F/35%
 3) All units to have factory furnished SF and EF airflow measuring stations. Non 100% OA units to have factory installed OA airflow measuring station.
 4) All units to have inverter lead compressor
 5) All energy recovery wheels to have factory furnished VFD
 6) All units to be single point power
 7) All coils to be epoxy coated
 8) All units to have stainless steel drain pan
 9) All units to have factory powered GFI
 10) Exhaust fans sized for 100% economizer mode
 11) Hot water coils sized based on 160-140, 30% PG

- ① ACCEPTABLE ALT. MANUFACTURERS: HAKKON, SEASONS FOUR OR APPROVED EQUAL.
 ② COIL PERFORMANCE BASED ON 30% PROPYLENE GLYCOL.

ENERGY RECOVERY VENTILATOR SCHEDULE

ITEM	MFG'R	MODEL	SERVICE	CFM		MAIN ELECTRICAL DATA				SUPPLY FAN DATA		EXHAUST/RETURN FAN DATA		ENTHALPY CORE SUMMER CONDITIONS			ENTHALPY CORE WINTER CONDITIONS			FILTER DATA		REMARKS		
				SUP.	RET/EXH	O.A.	VOLTS	PH	HZ.	MCA	MOP	E.S.P.	WATTS	E.S.P.	WATTS	E.A.T.	LAT	EFF %	E.A.T.	L.A.T.	EFF %		TYPE	SIZE
ERV-1	RENEWARE	HE10INH	FITNES ROOM & PT/OT	700	700	700	480	3	60	2.7	15	0.5"	860	0.5"	860	85	78.5	65	0	48.7	65	MERV 13	2"	

FAN COIL UNIT SCHEDULE

ITEM	MFG'R	MODEL	ARRANGEMENT	SERVICE	CFM	O.A. CFM	EXT. S.P.	HP	HEATING COIL DATA ②				ELECTRICAL				FILTER DATA		REMARKS				
									EDB	LDB	MBH	E.W.T. °F	L.W.T. °F	GPM	WPD	NO. ROWS	V.	PH.		HZ.	TYPE	SIZE	MFG'R
FCU-1	DAIKIN	FCH208	HORIZONTAL	WORKSHOP 233A	750	350	0.375"	1/4	57	95	38.5	160	130	2.4	1.48	2	115	1	60	MERV 8	2"	FARR	

- ① ACCEPTABLE ALT. MANUFACTURERS: NAILOR, CARRIER, AIRTHERM OR APPROVED EQUAL.
 ② BASED ON 30% PROPYLENE GLYCOL.

UNIT HEATER SCHEDULE

ITEM	MFG'R ①	MODEL	CFM	MBH	EWT °F	LWT °F	GPM	PD. FT.	MOTOR		ELECTRICAL			REMARKS
									WG	HP	RPM	V	PH	
UH-1	ZEHNDER-RITTLING	RH-24	450	10.2	160°F	140°F	1.0	0.3	1/30	0.7	120	1	60	
UH-2	ZEHNDER-RITTLING	RH-24	450	10.2	160°F	140°F	1.0	0.3	1/30	0.7	120	1	60	
UH-3	ZEHNDER-RITTLING	RH-24	450	10.2	160°F	140°F	1.0	0.3	1/30	0.7	120	1	60	
UH-4	ZEHNDER-RITTLING	RH-24	450	10.2	160°F	140°F	1.0	0.3	1/30	0.7	120	1	60	

- ① ACCEPTABLE ALT. MANUFACTURERS: VULCAN, RITTLING, ROSEMEX OR APPROVED EQUAL.
 ② COIL PERFORMANCE BASED ON 30% PROPYLENE GLYCOL.

RADIANT PANEL SCHEDULE

ITEM	MFG'R ①	MODEL	PANEL DIMENSIONS		EWT	LWT	GPM/LF	BTU/LIN. FT	REMARKS
			WIDTH	LENGTH					
RP-1	AREOTECH	LPD	12"	SEE PLANS	160°F	140°F	0.02	161	

- ① ACCEPTABLE ALT. MANUFACTURERS: STERLING, ZEHNDER-RITTLING OR APPROVED EQUAL.
 ② COIL PERFORMANCE BASED ON 30% PROPYLENE GLYCOL.

AIR SEPARATOR SCHEDULE

ITEM	MFG'R ①	MODEL	GPM	SIZE	LOCATION	SERVICE	REMARKS
AS-1	TACO	ACT05F	396	5"	BOILER ROOM	HOT WATER	

- ① ACCEPTABLE ALT. MANUFACTURERS: BELL & GOSSETT, SPIROTHERM OR APPROVED EQUAL.

EXPANSION TANK SCHEDULE

ITEM	MFG'R ①	MODEL	GAL. CAP.	TANK DIA.	TANK HEIGHT	SYS. TEMP. (°F)		PRE CHARGE	REMARKS
						MIN.	MAX		
ET-1	TACO	CA900-125	238	30"	73"	55°F	160°F	18 psi	

- ① ACCEPTABLE ALT. MANUFACTURERS: BELL & GOSSETT, WESSELS OR APPROVED EQUAL.

ELECTRIC UNIT HEATER & CABINET UNIT HEATER SCHEDULE

ITEM	MFG'R ①	MODEL	CFM	ELEC. HEAT DATA			FAN DATA			BTU/HR	REMARKS
				KW	VOLT	PHASE	HP	VOLT	PHASE		
EUH-1	QMARK	CDF-558	250	5.0	208	3	-	-	-	17100	
EUH-2	QMARK	CDF-558	250	5.0	208	3	-	-	-	17100	
EUH-3	QMARK	CDF-558	250	5.0	208	3	-	-	-	17100	
EUH-4	QMARK	CDF-558	250	5.0	208	3	-	-	-	17100	
EUH-1	QMARK	MUH-05	350	5.0	208	3	1/100	208	3	17000	

- ① ACCEPTABLE ALT. MANUFACTURERS: BERKO, MODINE OR APPROVED EQUAL.

CONDENSATE PUMP SCHEDULE

ITEM	MFG'R.	MODEL	SIZE	PSI	HEAD FEET	MOTOR DATA				SERVICE	REMARKS	
						HP	V	Ø	WATTS			AMPS
CP-1	LITTLE GIANT	VCCA-20P	12"x5"x5.09"	7.4	5'	1/30	115	1	60	1.5	DFC	
CP-2	LITTLE GIANT	VCCA-20P	12"x5"x5.09"	7.4	5'	1/30	115	1	60	1.5	DFC	

BOILER SCHEDULE

ITEM	MFG'R.	MODEL	FUEL INPUT NAT. GAS (MBH)	OUTPUT MBH	BOILER HP	MIN GAS PRESS	ELEC. DATA			REMARKS	
							V	Ø	AMPS		MCA
B-1	LOCHINVAR	FB 2501	2,500	2,400	75	4" WC	208	3	4.5	5.6	
B-2	LOCHINVAR	FB 2501	2,500	2,400	75	4" WC	208	3	4.5	5.6	

- ① BASED ON 30% PROPYLENE GLYCOL.

PUMP SCHEDULE

ITEM	MFG'R. ①	MODEL	SERIES	SIZE	GPM	HEAD FEET	MOTOR DATA			SERVICE	REMARKS	
							HP	V	Ø			RPM
P-1	TACO	F3009D	FI	4x3	393	75	10	480	3	1750	HOT WATER	-
P-2	TACO	F3009D	FI	4x3	393	75	10	480	3	1750	HOT WATER	-
BP-1	TACO	1941	1900	2x2	200	25	3	480	3	1750	BOILER B-1	PROVIDE PUMP MOUNTED VFD
BP-2	TACO	1941	1900	2x2	200	25	3	480	3	1750	BOILER B-2	PROVIDE PUMP MOUNTED VFD

- ① ACCEPTABLE ALT. MANUFACTURERS: BELL & GOSSETT, ARMSTRONG OR APPROVED EQUAL.
 ② BASED ON 30% PROPYLENE GLYCOL.

VARIABLE FREQUENCY DRIVE SCHEDULE

ITEM	MFG'R. ①	MODEL	SERVICE	MOTOR DATA			MAX. OUTPUT CURRENT	MOUNT	CONTROL INPUT	BY-PASS	REMARKS
				HP	VOLTS	Ø					
VFD-1	ABB	ACH550	P-1	10	480	3	23	WALL	4-20mA	YES	
VFD-2	ABB	ACH550	P-2	10	480	3	23	WALL	4-20mA	YES	

EXHAUST FAN SCHEDULE														
ITEM	MFG'R. ⑤	MODEL	DRIVE	SERVICE	INTERLOCK	CFM	SP IN. WC.	HP	FAN RPM	ELECTRICAL DATA			SONES	REMARKS
										V	PH	HZ		
EF-1	GREENHECK	22 USF-200/300	BELT	KITCHEN HOOD EXH.	⑦	5907	2.0"	3.0	1253	208	3	60	-	
EF-2	GREENHECK	GB-120	BELT	DISHWASER ROOM	BMS	600	0.625"	1/4	1189	120	1	60	-	
EF-3	GREENHECK	G-090	DIRECT	GEN. KITCHEN EXH.	BMS	200	0.5"	1/4	1206	120	1	60	-	
EF-4	GREENHECK	G-090	DIRECT	CUSTODIAL	BMS	300	0.5"	1/4	1206	120	1	60	-	
EF-5	GREENHECK	SQ-70-VG	DIRECT	TRASH ROOM EXH.	BMS	200	0.25"	1/15	1439	120	1	60	3.7	
EF-6	FANTECH	DBF110	DIRECT	DRYER EXH. BOOSTER	PROOF SWITCH	167	-	80 WATTS	-	120	1	60	-	
EF-7	GREENHECK	SQ-70-VG	DIRECT	CHEM. STORAGE 418	BMS	150	0.25"	1/15	1439	120	1	60	3.7	
EF-8	GREENHECK	G-090-VG	DIRECT	KILN ROOM 317B	BMS	200	0.25"	1/6	1304	120	1	60	5.6	
EF-9	GREENHECK	SQ-70-VG	DIRECT	JAN. CLOSET 127B	BMS	100	0.25"	1/15	1439	120	1	60	3.7	
EF-10	GREENHECK	G-080-VG	DIRECT	JAN. CLOSET 325	BMS	100	0.25"	1/10	1201	115	1	60	5.3	
EF-11	FANTECH	DBF110	DIRECT	DRYER EXH. BOOSTER	PROOF SWITCH	167	-	80 WATTS	-	120	1	60	-	
EF-12	FANTECH	DBF110	DIRECT	DRYER EXH. BOOSTER	PROOF SWITCH	167	-	80 WATTS	-	120	1	60	-	
EF-13	GREENHECK	GB-140	BELT	CONCESSIONS STAND	TIME CLOCK ⑧	800	0.35"	1/4	1004	120	1	60	5.1	
EF-14	GREENHECK	G-080-VG	DIRECT	JAN. CLOSET 230A	BMS	100	0.25"	1/10	1201	120	1	60	5.3	
EF-15	GREENHECK	SQ-100-VG	DIRECT	MECHANICAL 230	BMS	500	0.35"	1/4	1026	120	1	60	-	
EF-16	GREENHECK	SQ-90	DIRECT	DIVERSE LEAR. 202	INTERLOCK WITH HOOD CONTROL	300	0.5"	1/10	1550	120	1	60	6.7	
EF-17	GREENHECK	SQ-90	DIRECT	DIVERSE LEAR. 204	INTERLOCK WITH HOOD CONTROL	300	0.5"	1/10	1550	120	1	60	6.7	

- ① FAN TO BE FURNISHED WITH FACTORY MOUNTED AND WIRED DISCONNECT SWITCH, GREASE TRAP, VENTED CURB EXTENSION & HINGING KIT TO MEET NFPA96. FAN SHALL HAVE U.L. 762 LISTING.
- ② PROVIDE WITH ROOF CURB, BIRDSCREEN, MOTORIZED DAMPER & DISCONNECT SWITCH (FACTORY MOUNTED AND WIRED).
- ③ PROVIDE WITH ROOF CURB, BIRDSCREEN, MOTORIZED DAMPER AND FACTORY MOUNTED AND WIRED SOLID STATE SPEED CONTROL MOUNTED AS A DISCONNECT SWITCH.
- ④ PROVIDE WITH PITCH ROOF CURB, BIRDSCREEN, MOTORIZED DAMPER & DISCONNECT SWITCH (FACTORY MOUNTED AND WIRED).
- ⑤ ACCEPTABLE ALT. MANUFACTURERS: PENN VENTILATOR CORP., COOK OR APPROVED EQUAL.
- ⑥ FAN TO BE FURNISHED WITH GREASE TRAP, VENTED CURB EXTENSION & HINGING KIT TO MEET NFPA96. FAN SHALL HAVE U.L. 762 LISTING.
- ⑦ FAN SHALL BE INTERLOCKED WITH KITCHEN HOOD CONTROL SYSTEM FURNISHED BY OTHERS.
- ⑧ TIME CLOCK FURNISHED BY DIV 23 00 00, INSTALLED BY 26 00 00.

DUCTLESS SPLIT-TYPE AIR CONDITIONER SCHEDULE																				
ITEM	MFG'R	INDOOR UNIT MODEL	OUTDOOR UNIT MODEL	COOLING CAP. TOTAL MBH	HEATING CAP. TOTAL MBH	INDOOR FAN DATA MAX CFM	INDOOR ELEC. DATA			OUTDOOR COMP. DATA		OUTDOOR FAN DATA			OUTDOOR ELEC. DATA			SEER	ROOM SERVED	REMARKS
							VOLTS	Ø	Hz	MCOEP	MCA	FLA	VOLTS	Ø	Hz					
DFC-1-1/CU-1-1	MITSUBISHI	PLA-A24EA7	PUY-A24NH7	24.0	N/A	810	POWERED BY OUTDOOR	26	19	0.5 + 0.5	208	1	60	24.2	DIVERSE LEARNERS 101	①②③				
DFC-1-2/CU-1-2	MITSUBISHI	PLA-A24EA7	PUY-A24NH7	24.0	N/A	810	POWERED BY OUTDOOR	26	19	0.5 + 0.5	208	1	60	24.2	DIVERSE LEARNERS 103	①②③				
DFC-1-3/CU-1-3	MITSUBISHI	PLA-A24EA7	PUY-A24NH7	24.0	N/A	810	POWERED BY OUTDOOR	26	19	0.5 + 0.5	208	1	60	24.2	DIVERSE LEARNERS 105	①②③				
DFC-1-4/CU-1-4	MITSUBISHI	PLA-A36EA7	PUY-A36NK7	36.0	N/A	1200	POWERED BY OUTDOOR	30	25	0.5 + 0.5	208	1	60	21.8	IDF 106	①②③				
DFC-1-5/CU-1-5	MITSUBISHI	PLA-A36EA7	PUY-A36NK7	36.0	N/A	1200	POWERED BY OUTDOOR	30	25	0.5 + 0.5	208	1	60	21.8	ELEC. 107	①②③				
DFC-1-6/CU-1-6	MITSUBISHI	PLA-A12EA7	PUY-A12NK7	12.0	N/A	530	POWERED BY OUTDOOR	28	15	0.5 + 0.5	208	1	60	27	KITCH OFF. 124B	①②③				
DFC-1-7/CU-1-7	MITSUBISHI	PLA-A12EA7	PUY-A12NK7	12.0	N/A	530	POWERED BY OUTDOOR	28	15	0.5 + 0.5	208	1	60	27	KITCH OFF. 124D	①②③				
DFC-1-8/CU-1-8	MITSUBISHI	PLA-A12EA7	PUY-A12NK7	12.0	N/A	530	POWERED BY OUTDOOR	28	15	0.5 + 0.5	208	1	60	27	HEALTH INST. 127	①②③				
DFC-1-9/CU-1-9	MITSUBISHI	PLA-A36EA7	PUY-A36NK7	36.0	N/A	1200	POWERED BY OUTDOOR	30	25	0.5 + 0.5	208	1	60	21.8	ELEC. 131	①②③				
DFC-1-10/CU-1-10	MITSUBISHI	PKA-A36KA8	PUY-A36NK7	36.0	N/A	920	POWERED BY OUTDOOR	31	25	0.5 + 0.5	208	1	60	19.4	IDF 126C	①②③				
DFC-1-11/CU-1-11	MITSUBISHI	PKA-A12LA1	PUY-A12NK7	12.0	N/A	385	POWERED BY OUTDOOR	28	11	0.5	208	1	60	21.3	SOUND CLOSET 126B	①②③				
DFC-2-1/CU-2-1	MITSUBISHI	PLA-A24EA7	PUY-A24NH7	24.0	N/A	810	POWERED BY OUTDOOR	26	19	0.5 + 0.5	208	1	60	24.2	DIVERSE LEARNERS 202	①②③				
DFC-2-2/CU-2-2	MITSUBISHI	PLA-A24EA7	PUY-A24NH7	24.0	N/A	810	POWERED BY OUTDOOR	26	19	0.5 + 0.5	208	1	60	24.2	DIVERSE LEARNERS 204	①②③				
DFC-2-3/CU-2-3	MITSUBISHI	PLA-A36EA7	PUY-A36NK7	36.0	N/A	1200	POWERED BY OUTDOOR	30	25	0.5 + 0.5	208	1	60	21.8	IDF 206	①②③				
DFC-2-4/CU-2-4	MITSUBISHI	PLA-A36EA7	PUY-A36NK7	36.0	N/A	1200	POWERED BY OUTDOOR	30	25	0.5 + 0.5	208	1	60	21.8	ELEC. 207	①②③				
DFC-2-5/CU-2-5	MITSUBISHI	PLA-A12EA7	PUY-A12NK7	12.0	N/A	530	POWERED BY OUTDOOR	28	15	0.5 + 0.5	208	1	60	27	ATH. DIR. 229	①②③				
DFC-2-6/CU-2-6	MITSUBISHI	PLA-A12EA7	PUY-A12NK7	12.0	N/A	530	POWERED BY OUTDOOR	28	15	0.5 + 0.5	208	1	60	27	TRAINER ROOM 230B	①②③				
DFC-2-7/CU-2-7	MITSUBISHI	PLA-A36EA7	PUY-A36NK7	36.0	N/A	1200	POWERED BY OUTDOOR	30	25	0.5 + 0.5	208	1	60	21.8	ELEC. 231	①②③				
DFC-2-8/CU-2-8	MITSUBISHI	PLA-A24EA7	PUY-A24NH7	24.0	N/A	810	POWERED BY OUTDOOR	26	19	0.5 + 0.5	208	1	60	24.2	EM. EL. ROOM 231A	①②③				
DFC-2-9/CU-2-9	MITSUBISHI	PLA-A42EA7	PUY-A42NK7	42.0	N/A	880	POWERED BY OUTDOOR	31	25	0.4	208	1	60	21.0	NETWORK ROOM 232A	①②③				
DFC-2-9A/CU-2-9A	MITSUBISHI	PLA-A42EA7	PUY-A42NH7	42.0	N/A	880	POWERED BY OUTDOOR	31	25	0.4	208	1	60	21.0	NETWORK ROOM 232A	①②③				
DFC-2-10/CU-2-10	MITSUBISHI	PLA-A12EA7	PUY-A12NK7	12.0	N/A	530	POWERED BY OUTDOOR	28	15	0.5 + 0.5	208	1	60	27	IT OFFICE 232	①②③				
DFC-2-11/CU-2-11	MITSUBISHI	PLA-A12EA7	PUY-A12NK7	12.0	N/A	530	POWERED BY OUTDOOR	28	15	0.5 + 0.5	208	1	60	27	CUST. OFFICE 233B	①②③				
DFC-2-12/CU-2-12	MITSUBISHI	PEAD-A24A7	PYZ-HA24NH1	24.0	28.0	570	POWERED BY OUTDOOR	27	17	0.5 + 0.5	208	1	60	16.6	OT/PT 228B	①②③				
DFC-2-13/CU-2-13	MITSUBISHI	PEAD-A36A7	PYZ-HA36NK1	36.0	40.0	1024	POWERED BY OUTDOOR	40.0	24	0.5 + 0.5	208	1	60	17.1	FITNESS CENTER 228	①②③				
DFC-2-14/CU-2-14	MITSUBISHI	PKA-A12LA1	PUY-A12NK7	12.0	N/A	385	POWERED BY OUTDOOR	28	11	0.5	208	1	60	21.3	SOUND CLOSET 227A	①②③				
DFC-3-1/CU-3-1	MITSUBISHI	PLA-A36EA7	PUY-A36NK7	36.0	N/A	1200	POWERED BY OUTDOOR	30	25	0.5 + 0.5	208	1	60	21.8	IDF 306	①②③				
DFC-3-2/CU-3-2	MITSUBISHI	PLA-A36EA7	PUY-A36NK7	36.0	N/A	1200	POWERED BY OUTDOOR	30	25	0.5 + 0.5	208	1	60	21.8	ELEC. 307	①②③				
DFC-3-3/CU-3-3	MITSUBISHI	PLA-A36EA7	PUY-A36NK7	36.0	N/A	1200	POWERED BY OUTDOOR	30	25	0.5 + 0.5	208	1	60	21.8	IDF 321B	①②③				
DFC-3-4/CU-3-4	MITSUBISHI	PLA-A36EA7	PUY-A36NK7	36.0	N/A	1200	POWERED BY OUTDOOR	30	25	0.5 + 0.5	208	1	60	21.8	ELEC. 321E	①②③				
DFC-3-5/CU-3-5	MITSUBISHI	PLA-A12EA7	PUY-A12NK7	12.0	N/A	530	POWERED BY OUTDOOR	28	15	0.5 + 0.5	208	1	60	27	CONTROL ROOM 321D	①②③				
DFC-4-1/CU-4-1	MITSUBISHI	PLA-A36EA7	PUY-A36NK7	36.0	N/A	1200	POWERED BY OUTDOOR	30	25	0.5 + 0.5	208	1	60	21.8	IDF 406	①②③				
DFC-4-2/CU-4-2	MITSUBISHI	PLA-A36EA7	PUY-A36NK7	36.0	N/A	1200	POWERED BY OUTDOOR	30	25	0.5 + 0.5	208	1	60	21.8	ELEC. 409	①②③				

- ① UNITS TO BE FURNISHED WITH CONDENSATE DRAIN PUMP.
- ② UNITS TO BE FURNISHED WITH LOW AMBIENT OPERATION CAPABILITY.
- ③ ACCEPTABLE ALT. MANUFACTURERS: DAIKIN, SANYO OR APPROVED EQUAL.

SOUND ATTENUATOR SCHEDULE																					
ITEM	MFG'R	RTU	MODEL	CFM	TOTAL LENGTH IN.	INLET DIMENSIONS W X H	OUTLET DIMENSIONS W X H	VELOCITY FPM	SILENCER P.D. IN. W.G.	HORIZ. CENTERLINE LENGTH	VERT. CENTERLINE LENGTH	SHAPE	DYNAMIC INSERTION LOSS Hz								REMARKS
													63	125	250	500	1K	2K	4K	8K	
SA-1	COMMERCIAL ACOUSTICS	RTU-1 SUPPLY	12E60LR	9980	60	82x36	40x16	1330	0.19	3'-0"	2'-0"	ELBOW	2	4	7	31	44	33	19	14	
SA-2	COMMERCIAL ACOUSTICS	RTU-1 RETURN	SMP	-9980	60	80x16	80x16	-978	0.05	3'-0"	2'-0"	ELBOW	4	8	15	22	29	25	16	10	
SA-3	COMMERCIAL ACOUSTICS	RTU-2 SUPPLY	12E60LR	12390	60	82X36	40x16	1547	0.26	3'-0"	2'-0"	ELBOW	9	18	28	29	42	34	20	15	
SA-4	COMMERCIAL ACOUSTICS	RTU-2 RETURN	SMP	-12390	60	80x16	80x20	-976	0.07	3'-0"	2'-0"	ELBOW	5	12	21	33	46	35	18	12	
SA-5	COMMERCIAL ACOUSTICS	RTU-3 SUPPLY	XLP	7260	60	36X14	36X14	2070	0.25	5'-0"	0'-0"	STRAIGHT	5	11	20	21	31	38	20	12	
SA-6	COMMERCIAL ACOUSTICS	RTU-3 RETURN	XLP	-7260	60	56X16	56X16	-1429	0.12	3'-0"	2'-0"	ELBOW	5	11	17	23	36	35	18	12	
SA-7	COMMERCIAL ACOUSTICS	RTU-4 SUPPLY	SP-18	6500	60	56X16	56X16	860	0.08	3'-0"	2'-0"	ELBOW	8	9	20	31	44	33	19	14	
SA-8	COMMERCIAL ACOUSTICS	RTU-4 RETURN	SP-1F	-6500	60	52x28	52x28	-1000	0.21	3'-0"	2'-0"	ELBOW	11	14	27	30	29	17	15	12	
SA-9	COMMERCIAL ACOUSTICS	RTU-5 SUPPLY	HPA	2100	60	24x18	24x18	1013	0.44	5'-0"	0'-0"	STRAIGHT	9	17	25	39	46	45	40	25	
SA-10	COMMERCIAL ACOUSTICS	RTU-5 RETURN	12E60LR	-2100	60	36X12	36x12	-675	0.10	5'-0"	0'-0"	STRAIGHT	11	13	19	28	39	41	38	30	
SA-11	COMMERCIAL ACOUSTICS	RTU-6 SUPPLY	18E60LR	3250	60	36x14	36x14	1120	0.15	3'-0"	2'-0"	ELBOW	8	10	13	22	31	28	27	26	
SA-12	COMMERCIAL ACOUSTICS	RTU-6 RETURN	SP-1F	-3250	60	36x14	36x14	-1120	0.26	3'-0"	2'-0"	ELBOW	11	14	27	30	29	17	15	12	
SA-13	COMMERCIAL ACOUSTICS	RTU-7 SUPPLY	24E60SR	9225	60	43X43	43X43	440	0.06	3'-0"	2'-0"	ELBOW	8	11	15	24	33	30	31	28	
SA-14	COMMERCIAL ACOUSTICS	RTU-7 RETURN	SP-18	-9225	60	54X24	54X24	-574	0.04	3'-0"	2'-0"	ELBOW	8	8	23	34	46	32	16	10	
SA-15	COMMERCIAL ACOUSTICS	RTU-8 SUPPLY	14E60LR	5500	60	42x20	42x20	1171	0.18	5'-0"	0'-0"	STRAIGHT	8	10	15	24	35	33	30	28	
SA-16	COMMERCIAL ACOUSTICS	RTU-8 RETURN	SP-18	-5500	60	42x20	42x20	-1054	0.12	3'-0"	2'-0"	ELBOW	8	8	23	34	46	32	16	10	
SA-17	COMMERCIAL ACOUSTICS		RD-MV-F7X36	1500	24	16X12	16X12	550	0.1	2'-0"	0'-0"	STRAIGHT	6	8	19	29	42	34	20	15	
SA-18	COMMERCIAL ACOUSTICS		RD-MV-F7X36	-1500	24	24X12	24X12	550	0.1	2'-0"	0'-0"	STRAIGHT	6	8	19	29	42	34	20	15	

System name and number	RTU-5
Condition analyzed (Impacts Ez, Vdz, Vpz and Vps)	Heating
All zones are included in the VPR calculation	Yes

Zone Name and Number	Occupancy Category	Zone Floor Area Az (sq ft)	Are you using default value for zone population?	Zone Population Pz (people)	Zone Air Distribution Effectiveness Ez	Zone Outdoor Airflow Voz (cfm)	Zone Discharge Airflow Vdz (cfm)	Zone Primary Airflow Vpz (cfm)	Zone Secondary Recirculation Fraction Er	Zone Primary Air Fraction Ep	Zone Outdoor Airflow Provided Voz/Vdz (measured or design)
C103 Corridor	Corridors	1,694	No	0.00	0.80		600	225	0.75	0.30	Vpz/Vdz
C203 Corridor	Corridors	1,823	No	0.00	0.80		750	225	0.75	0.30	
C302 Corridor	Corridors	2,703	No	0.00	0.80		202.73	750	225	0.75	0.30

System name and number	RTU-6
Condition analyzed (Impacts Ez, Vdz, Vpz and Vps)	Heating
All zones are included in the VPR calculation	Yes

Zone Name and Number	Occupancy Category	Zone Floor Area Az (sq ft)	Are you using default value for zone population?	Zone Population Pz (people)	Zone Air Distribution Effectiveness Ez	Zone Outdoor Airflow Voz (cfm)	Zone Discharge Airflow Vdz (cfm)	Zone Primary Airflow Vpz (cfm)	Zone Secondary Recirculation Fraction Er	Zone Primary Air Fraction Ep	Zone Outdoor Airflow Provided Voz/Vdz (measured or design)
322 Chorus	Music / theater/ dance	837	No	61.00	0.80	825.28	1,400	910	0.75	0.65	Vpz/Vdz
322 A Practices	Music / theater/ dance	31	No	2.00	0.80	27.33	75	30	0.75	0.40	
322 B Practice	Music / theater/ dance	31	No	2.00	0.80	27.33	75	30	0.75	0.40	
324 Band	Music / theater/ dance	799	No	57.00	0.80	772.43	1,400	850	0.75	0.61	
324 A Practice	Music / theater/ dance	34	No	2.00	0.80	27.55	100	30	0.75	0.30	
326 Music Storage	Music / theater/ dance	86	No	2.00	0.80	31.45	200	35	0.75	0.18	
						0.00	3,250	1,885		0.58	

System name and number	RTU-7
Condition analyzed (Impacts Ez, Vdz, Vpz and Vps)	Heating
All zones are included in the VPR calculation	Yes

Zone Name and Number	Occupancy Category	Zone Floor Area Az (sq ft)	Are you using default value for zone population?	Zone Population Pz (people)	Zone Air Distribution Effectiveness Ez	Zone Outdoor Airflow Voz (cfm)	Zone Discharge Airflow Vdz (cfm)	Zone Primary Airflow Vpz (cfm)	Zone Secondary Recirculation Fraction Er	Zone Primary Air Fraction Ep	Zone Outdoor Airflow Provided Voz/Vdz (measured or design)
321 Auditorium	Auditorium seating area	4,335	No	407.00	0.80	2688.88	8,040	5,415	0.75	0.67	Vpz/Vdz
321D Control Room	Office space	305	No	4.00	0.80	47.88	130	75	0.75	0.58	
321C Cor	Corridors	211	No	1.00	0.80	15.83	55	30	0.75	0.55	
323 Stage	Stages, studios	2,408	No	24.00	0.80	480.80	1,000	490	0.75	0.49	
						0.00	9			0.00	

System Name and Number	Condition Analyzed (Impacts Ez)	Occupancy Category	Zone Floor Area Az (sq ft)	Are you using default value for zone population?	Zone Population Pz (people)	People Outdoor Air Rate Rp (cfm per person)	Area Outdoor Air Rate Ra (cfm per sq ft)	Breathing Zone Outdoor Airflow Vbz (cfm)	Zone Air Distribution Effectiveness Ez	Zone Outdoor Airflow Voz (cfm)	Zone Discharge Airflow Vdz (cfm)	Zone Primary Airflow Vpz (cfm)	Zone Secondary Recirculation Fraction Er	Zone Primary Air Fraction Ep	Outdoor air intake flow provided (measured or design) (cfm)
RTU-8	Heating	Multi-use assembly	8,306	No	300.00	7.50	0.06	2748.36	0.80	3,435				3,800	

System name and number	RTU-9
Condition analyzed (Impacts Ez)	Heating

Zone Name and Number	Occupancy Category	Zone Floor Area Az (sq ft)	Are you using default value for zone population?	Zone Population Pz (people)	Zone Air Distribution Effectiveness Ez	Zone Outdoor Airflow Voz (cfm)	Zone Discharge Airflow Vdz (cfm)	Zone Primary Airflow Vpz (cfm)	Zone Secondary Recirculation Fraction Er	Zone Primary Air Fraction Ep	Zone Outdoor Airflow Provided Voz/Vdz (measured or design)
129 Girls Locker	Health club / weight	507	No	12.00	0.80	338.02					450
127 Health Instr	Office space	190	No	4.00	0.80	39.25					100
123 Boys Locker	Health club / weight	518	No	20.00	0.80	538.85					550

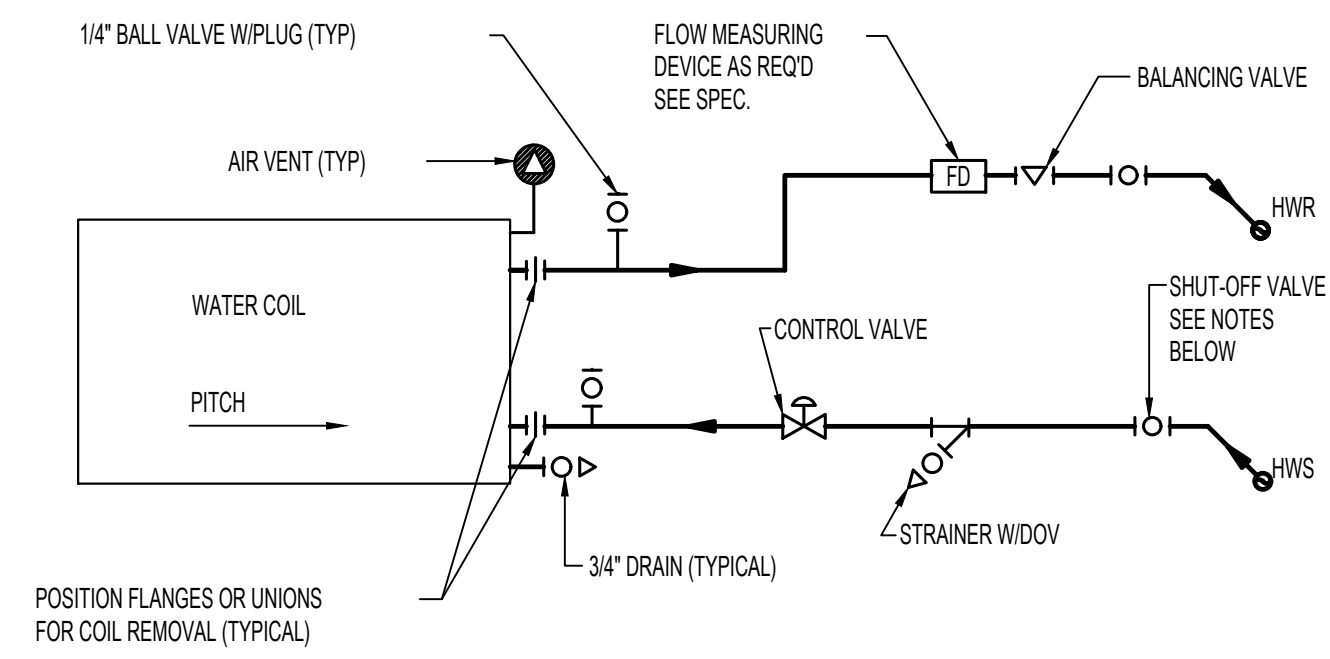
System name and number	RTU-1
Condition analyzed (Impacts Ez)	Heating

Zone Name and Number	Occupancy Category	Zone Floor Area Az (sq ft)	Are you using default value for zone population?	Zone Population Pz (people)	Zone Air Distribution Effectiveness Ez	Zone Outdoor Airflow Voz (cfm)	Zone Discharge Airflow Vdz (cfm)	Zone Primary Airflow Vpz (cfm)	Zone Secondary Recirculation Fraction Er	Zone Primary Air Fraction Ep	Zone Outdoor Airflow Provided Voz/Vdz (measured or design)
101 SAD CL	Classrooms (age 9 plus)	622	No	22.00	1.00	294.64					430
101 A Calming	Classrooms (age 9 plus)	43	No	1.00	1.00	15.16					30
102 Classroom	Classrooms (age 9 plus)	809	No	29.00	1.00	387.08					430
103 A small Group	Classrooms (age 9 plus)	98	No	3.00	1.00	41.76					50
103 SAD Therapeutic	Classrooms (age 9 plus)	614	No	5.00	1.00	123.68					430
104 Classroom	Classrooms (age 9 plus)	809	No	29.00	1.00	387.08					430
105 A Calming	Classrooms (age 9 plus)	43	No	1.00	1.00	15.16					50
105 SAD CL	Classrooms (age 9 plus)	622	No	22.00	1.00	294.64					430
201 Classroom	Classrooms (age 9 plus)	771	No	29.00	1.00	382.52					430
201A Small Group	Classrooms (age 9 plus)	82	No	2.00	1.00	31.04					50
202 Diverse Learners	Classrooms (age 9 plus)	668	No	18.00	1.00	260.16					430
202 B Small Group	Classrooms (age 9 plus)	60	No	2.00	1.00	27.20					50
203 Classroom	Classrooms (age 9 plus)	771	No	29.00	1.00	382.52					430
204 Diverse Learners	Classrooms (age 9 plus)	640	No	1.00	1.00	86.80					430
204B Calming	Classrooms (age 9 plus)	45	No	1.00	1.00	15.40					50
205 Classroom	Classrooms (age 9 plus)	771	No	29.00	1.00	382.52					430
301 Classroom	Classrooms (age 9 plus)	771	No	29.00	1.00	382.52					430
301A Small Group	Classrooms (age 9 plus)	92	No	2.00	1.00	31.04					50
302 MLL	Classrooms (age 9 plus)	838	No	29.00	1.00	390.56					430
303 Classroom	Classrooms (age 9 plus)	771	No	29.00	1.00	382.52					430
304 MLL	Classrooms (age 9 plus)	807	No	29.00	1.00	386.84					430
305 Classroom	Classrooms (age 9 plus)	771	No	29.00	1.00	382.52					430
401 Computer Science	Classrooms (age 9 plus)	770	No	29.00	1.00	382.40					430
401A Geek Squad	Classrooms (age 9 plus)	82	No	2.00	1.00	31.04					50
402 Classroom	Classrooms (age 9 plus)	838	No	29.00	1.00	390.56					430
403 Classroom	Classrooms (age 9 plus)	773	No	29.00	1.00	382.76					430
404 Classroom	Classrooms (age 9 plus)	807	No	29.00	1.00	386.84					430
405 Classroom	Classrooms (age 9 plus)	813	No	29.00	1.00	387.56					430
C100 Corridor	Corridors	1,193	No	1.00	1.00	71.58					250
C200 Corridor	Corridors	1,249	No	1.00	1.00	74.94					250
C300 Corridor	Corridors	1,282	No	1.00	1.00	75.72					250
C400 Corridor	Corridors	1,282	No	1.00	1.00	75.72					250
						0.00					9,980

System name and number	RTU-2
Condition analyzed (Impacts Ez)	Heating

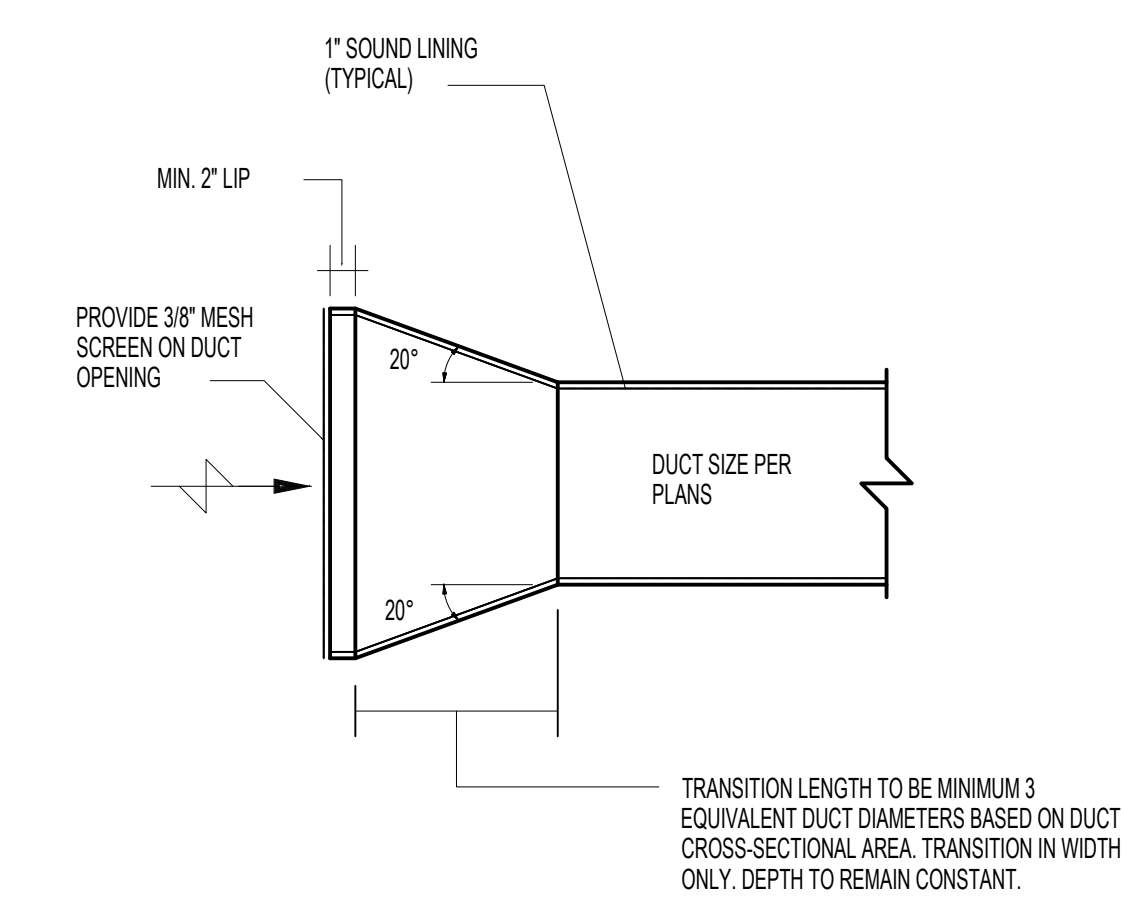
Zone Name and Number	Occupancy Category	Zone Floor Area Az (sq ft)	Are you using default value for zone population?	Zone Population Pz (people)	Zone Air Distribution Effectiveness Ez	Zone Outdoor Airflow Voz (cfm)	Zone Discharge Airflow Vdz (cfm)	Zone Primary Airflow Vpz (cfm)	Zone Secondary Recirculation Fraction Er	Zone Primary Air Fraction Ep	Zone Outdoor Airflow Provided Voz/Vdz (measured or design)
107A Small Group	Classrooms (age 9 plus)	78	No	2.00	1.00	29.36					50
109A Science prep	Classrooms (age 9 plus)	232	No	2.00	1.00	47.84					70
109 Biomed Science Cl	Classrooms (age 9 plus)	918	No	25.00	1.00	360.16					460
110 Robotics	Classrooms (age 9 plus)	1,373	No	33.00	1.00	494.76					550
111 BioMed Science Cl	Classrooms (age 9 plus)	1,106	No	29.00	1.00	422.72					550
113 CTE	Classrooms (age 9 plus)	686	No	29.00	1.00	372.32					430
207A Small Group	Classrooms (age 9 plus)	92	No	2.00	1.00	31.04					50
209 Biomed Classroom	Classrooms (age 9 plus)	1,077	No	1.00	1.00	419.24					550
209A Science Prep	Classrooms (age 9 plus)	243	No	2.00	1.00	49.16					70
210 Classroom	Classrooms (age 9 plus)	698	No	29.00	1.00	362.72					430
211 Biology	Classrooms (age 9 plus)	1,195	No	29.00	1.00	433.40					560
212 Classroom	Classrooms (age 9 plus)	606	No	29.00	1.00	362.72					430
213 Media Commons	Libraries	1,245	No	15.00	1.00	224.40					250
309 Physical Science	Classrooms (age 9 plus)	1,065	No	29.00	1.00	417.80					550
309A Science Prep	Classrooms (age 9 plus)	243	No	2.00	1.00	49.16					70
310 CTE	Classrooms (age 9 plus)	1,170	No	31.00	1.00	450.40					550
311 Physical Science	Classrooms (age 9 plus)	1,195	No	29.00	1.00	433.40					560
312 Classroom	Classrooms (age 9 plus)	876	No	29.00	1.00	395.12					430
313 Media Commons	Libraries	1,245	No	15.00	1.00	224.40					250
315 Art	Art classroom	1,056	No	29.00	1.00	480.08					550
316 Art	Art classroom	1,056	No	29.00	1.00	480.08					550
317B Art Kiln	Art classroom	95	No	1.00	1.00	27.10					200
409A Small Group	Classrooms (age 9 plus)	82	No	2.00	1.00	31.04					510
410 Che	Classrooms (age 9 plus)	690	No	31.00	1.00	392.80					430
411 Chemistry	Classrooms (age 9 plus)	1,061	No	29.00	1.00	417.32					550
411A science prep	Classrooms (age 9 plus)	196	No	2.00	1.00	38.72					70
412 Newcomers	Classrooms (age 9 plus)	891	No	29.00	1.00	398.92					430
412A small Group	Classrooms (age 9 plus)	115	No	2.00	1.00	33.80					50
413 Chemistry	Classrooms (age 9 plus)	1,195	No	29.00	1.00	433.40					560
414 Teaching Academy	Classrooms (age 9 plus)	831	No	29.00	1.00	389.72					430
415 Media Commons	Libraries	775	No	15.00	1.00	168.00					210
C100B Collab	Corridors	912	No	0.00	1.00	54.72					150
C101 Cor	Corridors	400	No	0.00	1.00	24.00					100
C200A Coll	Corridors	506	No	0.00	1.00	55.56					150
C201 Cor	Corridors	207	No	0.00	1.00	12.42					100
C300A Coll	Corridors	926	No	0.00	1.00	55.56					150
C301 Cor	Corridors	474	No	0.00	1.00	28.44					100
C400A Coll	Corridors	1,203	No	0.00	1.00	72.18					150
C401 Cor	Corridors	478	No	0.00	1.00	28.68					100
						0.00					12,990

System name and number	RTU-3
Condition analyzed (Impacts Ez, Vdz, Vpz and Vps)</	

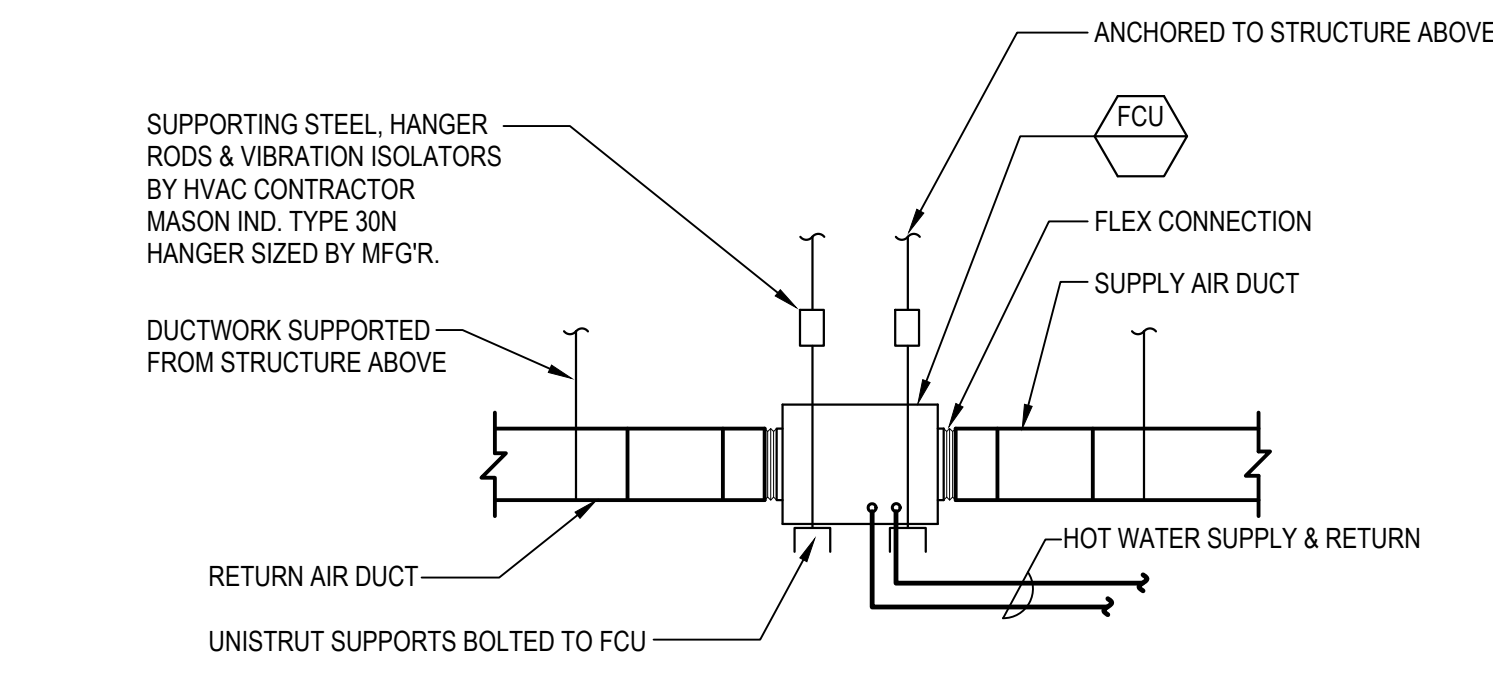


- NOTES:
1. COIL TO BE PIPED COUNTER FLOW TO AIR FLOW
 2. VALVES UP TO 2\"/>

TYPICAL ONE SECTION HIGH WATER HEATING OR REHEAT COIL PIPING DETAIL W/ TWO - WAY VALVE
N.T.S.

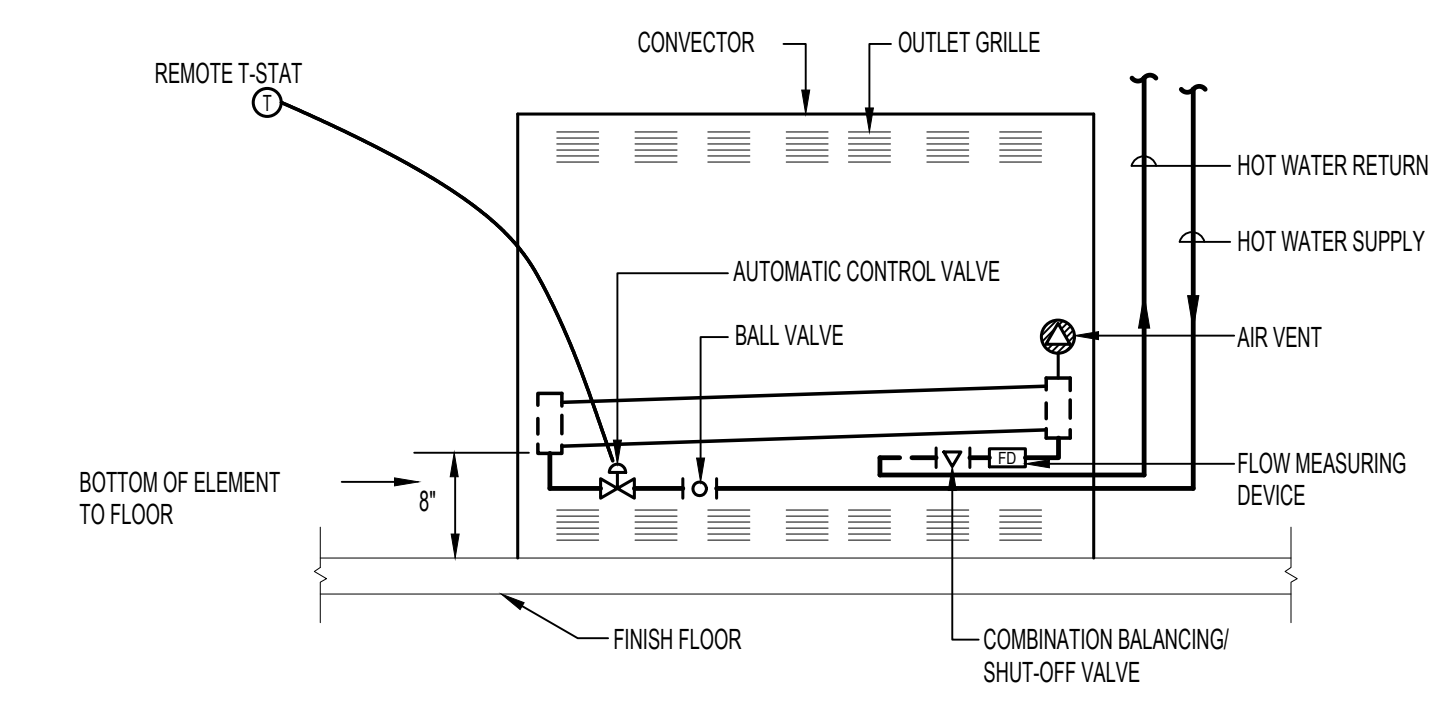


RETURN AIR BELLMOUTH DETAIL
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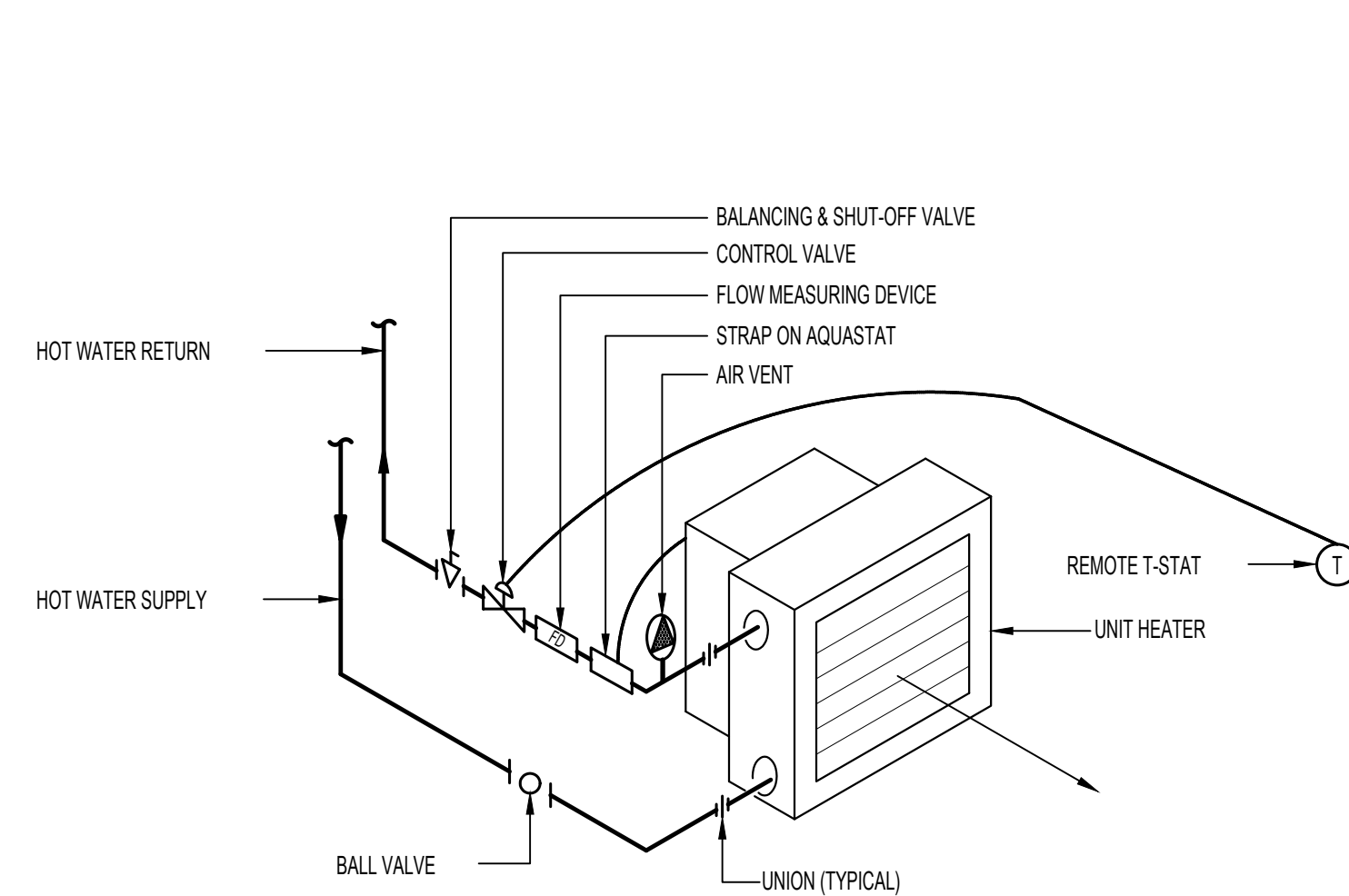


NOTE:
REFER TO MECHANICAL DRAWINGS FOR PIPING & DUCTWORK SIZES.

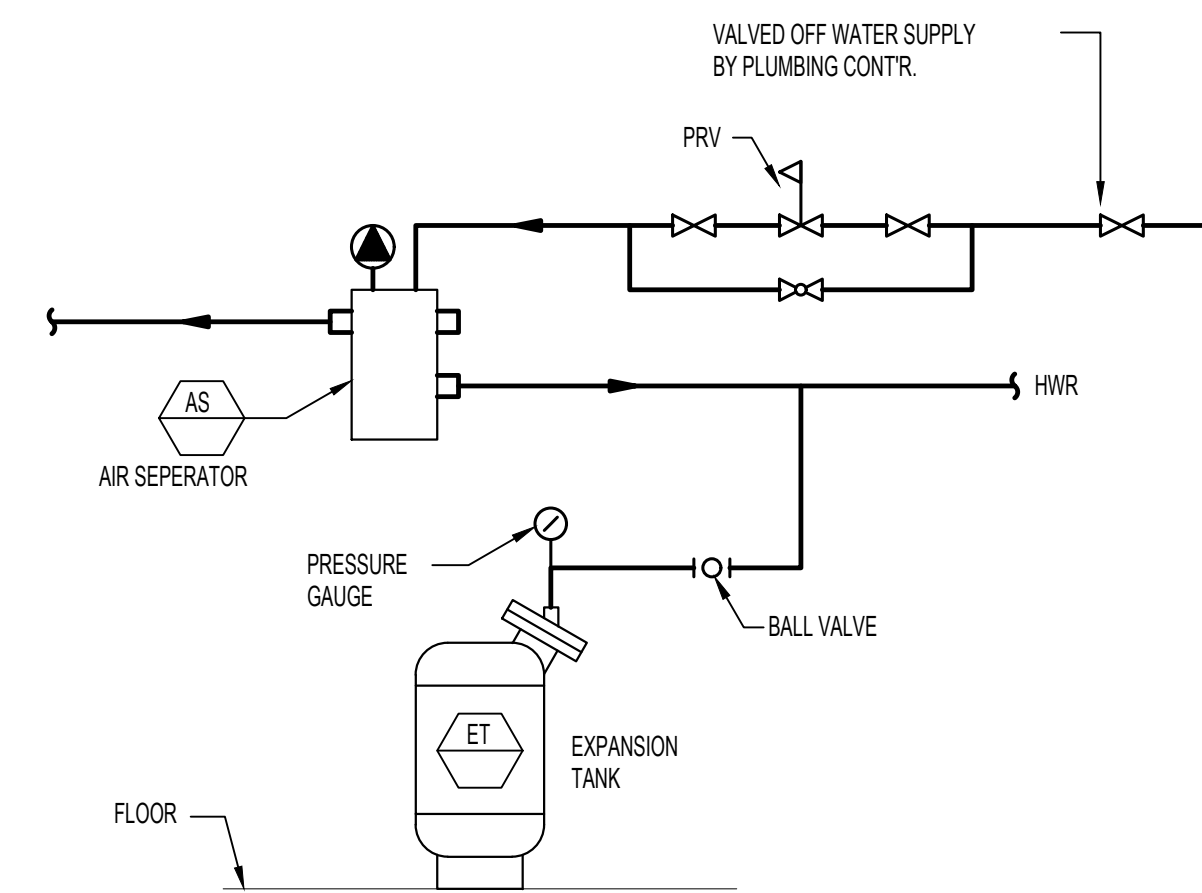
FAN COIL UNIT DETAIL
N.T.S.



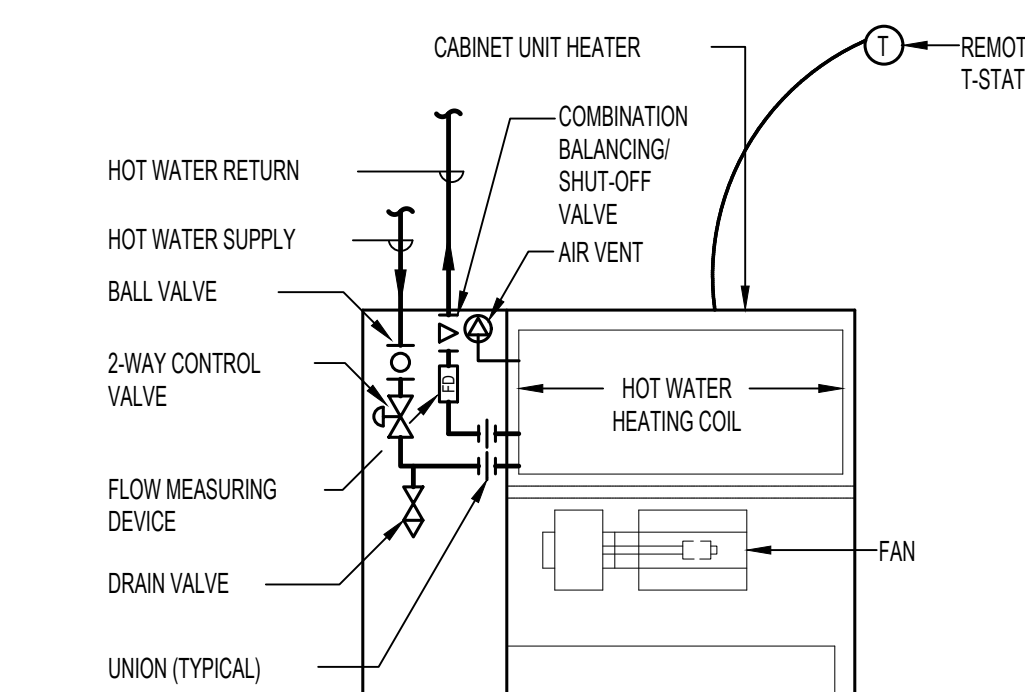
HOT WATER CONVECTOR PIPING DETAIL
N.T.S.



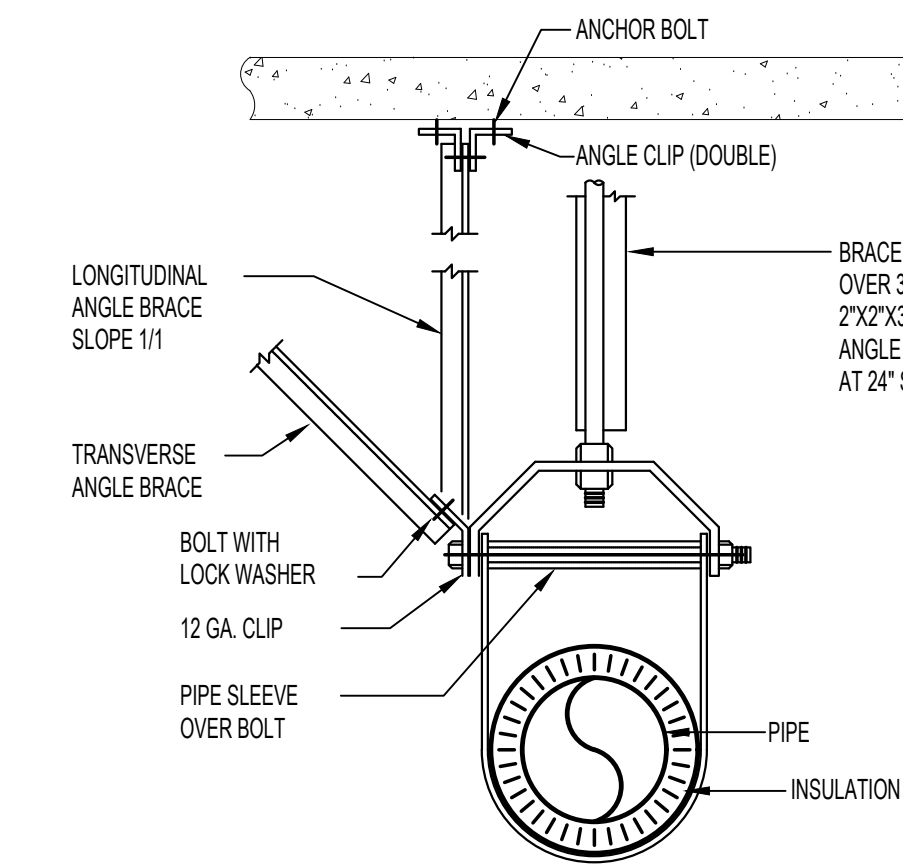
HORIZONTAL UNIT HEATER PIPING DETAIL
N.T.S.



EXPANSION TANK PIPING DETAIL
N.T.S.



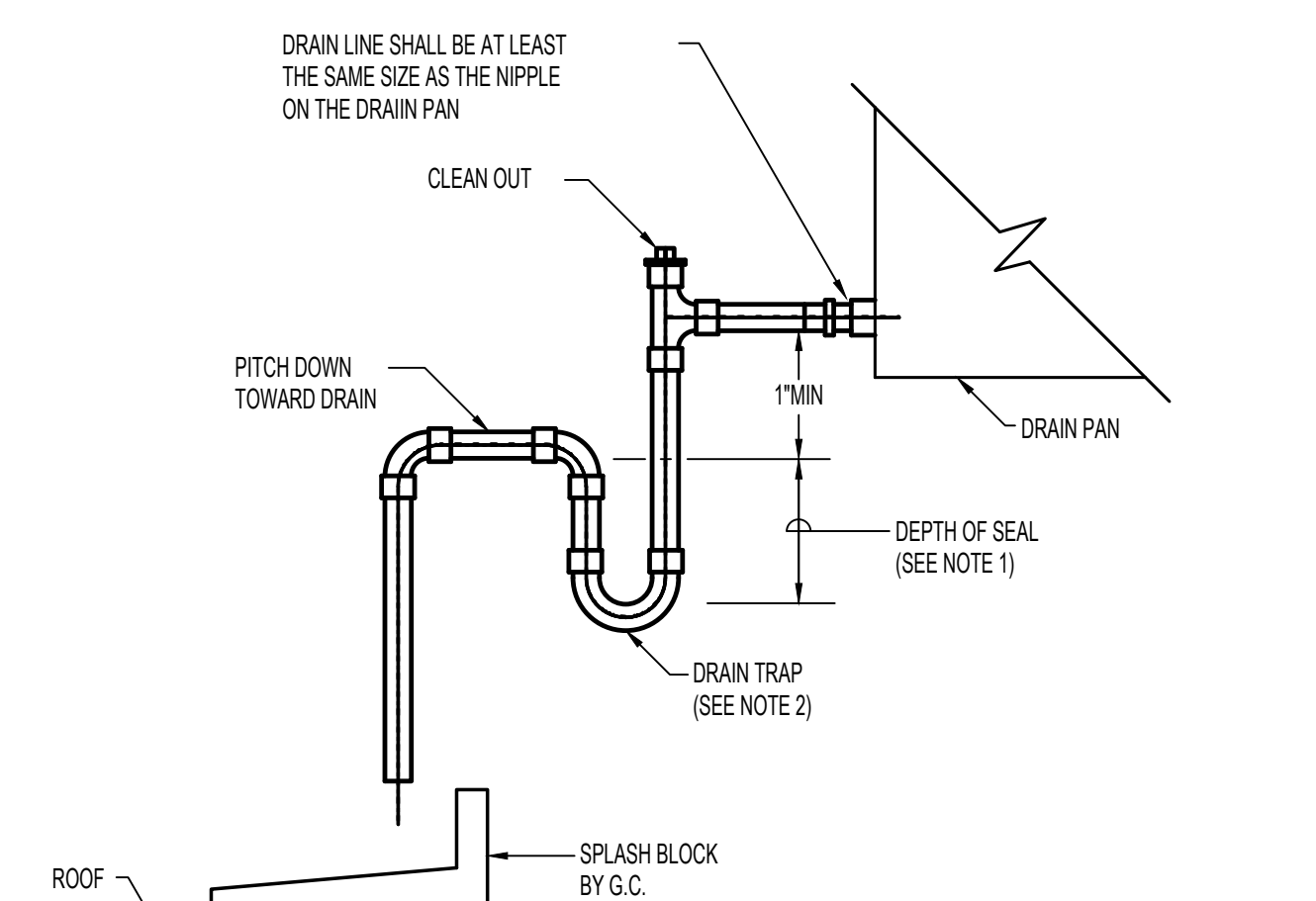
PIPING TO CABINET UNIT HEATER DETAIL
N.T.S.



PIPE SIZE	1\"/>
2 1/2\"/>	
3\"/>	
4\"/>	
6\"/>	
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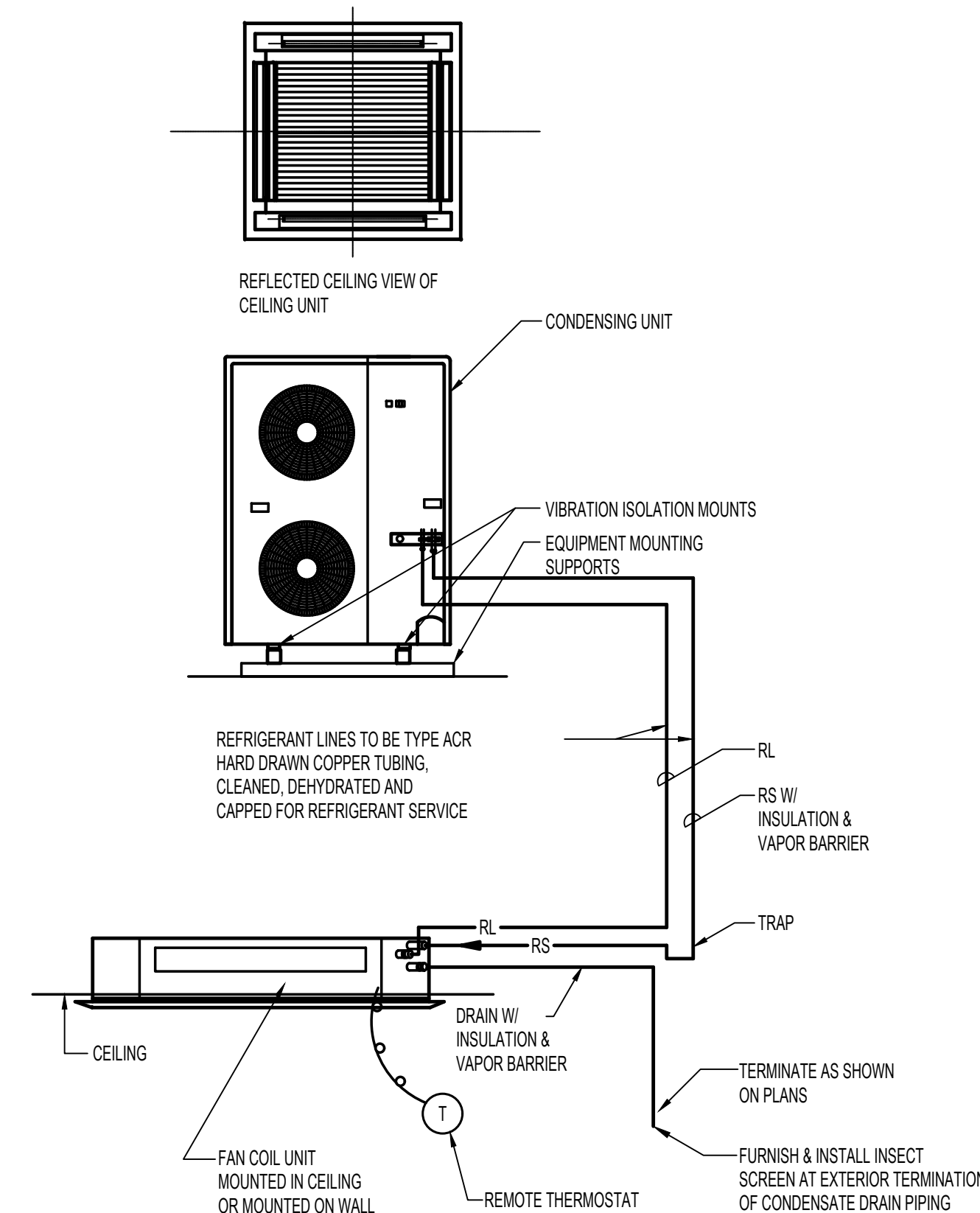
* 1 5/8 X 1 5/8 X 1/2 GAGE CHANNEL MAY BE USED.

TYPICAL SEISMIC BRACING FOR PIPE DETAIL
N.T.S.

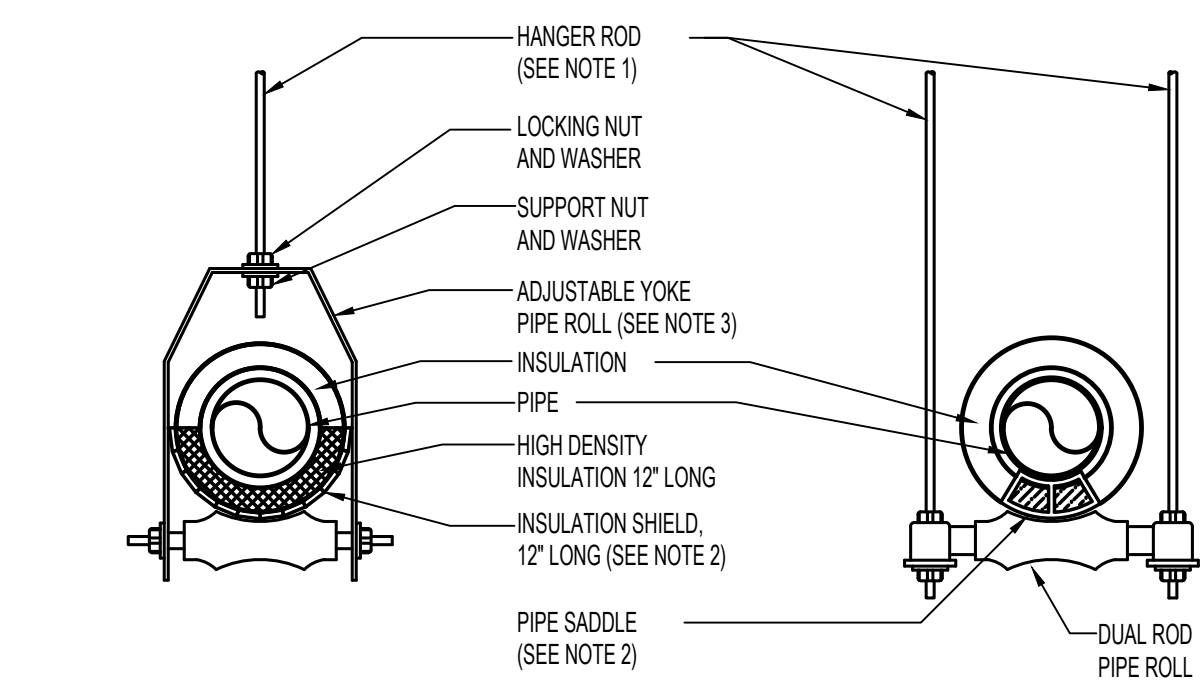


- NOTE:
1. THE DEPTH OF THE SEAL SHALL BE A MINIMUM OF THE ROOFTOP AIR HANDLING UNIT'S TOTAL STATIC PRESSURE IN INCHES OF WATER PLUS 3\"/>

ROOFTOP AIR HANDLING UNIT COOLING COIL DRAIN TRAP DETAIL
N.T.S.



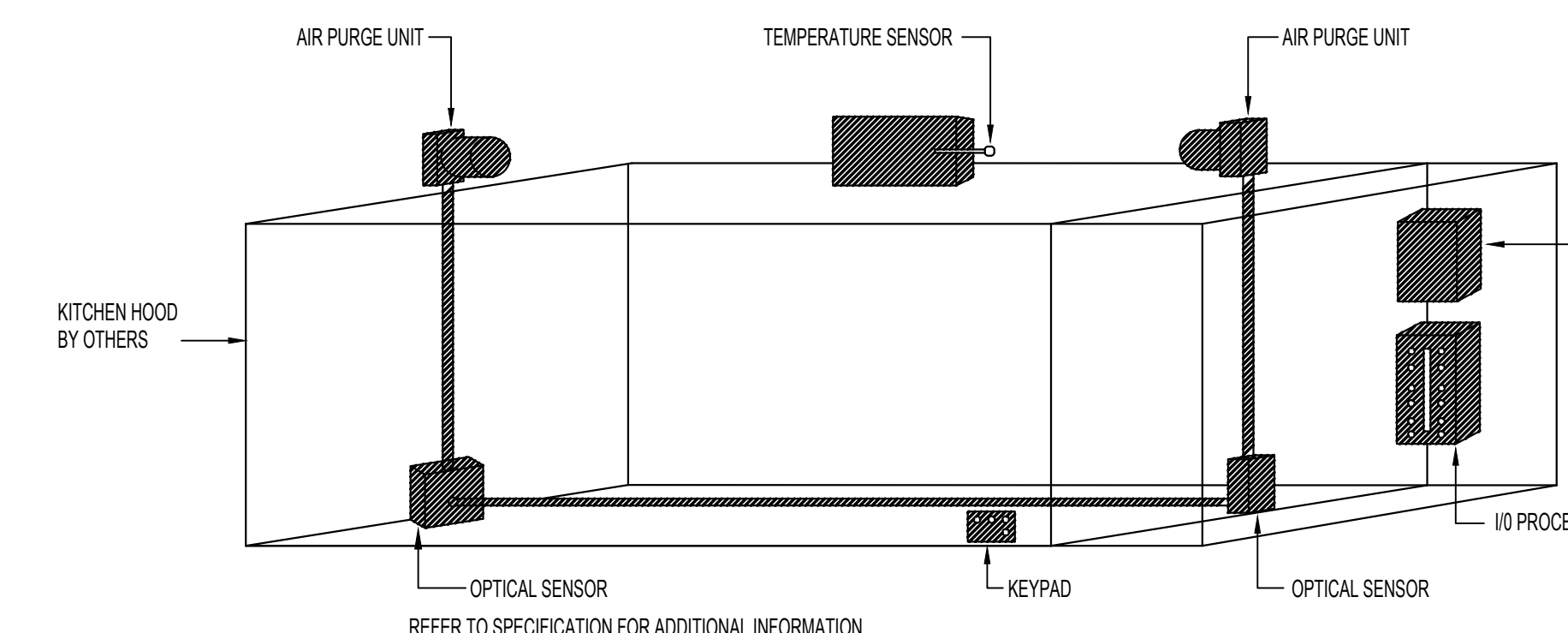
DUCTLESS FAN COIL AIR CONDITIONING UNIT & PIPING DETAIL
N.T.S.



HANGER ROD SCHEDULE		HANGER ROD SPACING	
PIPE SIZE	ROD SIZE	PIPE SIZE	MAX. ALLOWABLE SPACING
4\"/>			
5\"/>			
6\"/>			
8\"/>			
10\"/>			
12\"/>			

- NOTE:
1. REFER TO "TYPICAL METHOD OF SECURING HANGER RODS DETAIL" FOR ATTACHING HANGERS TO THE STRUCTURE.
 2. PROVIDE INSULATION SHIELD OR PIPE SADDLE BASED ON THE PIPING SYSTEM AND PIPE SIZE AS INDICATED IN THE SPECIFICATIONS.
 3. ADJUSTABLE YOKE PIPE ROLL SHALL BE USED ON 4\"/>

PIPE ROLL TYPE PIPE HANGER INSTALLATION DETAIL
N.T.S.



KITCHEN HOOD EXHAUST CONTROL DETAIL
N.T.S.

KEYNOTE LEGEND:

100% CONSTRUCTION DOCUMENTS

KEY PLAN NORTH ARROW

KEYPLAN

DRAWING NAME:

MECHANICAL DETAILS

DRAWN BY: AP

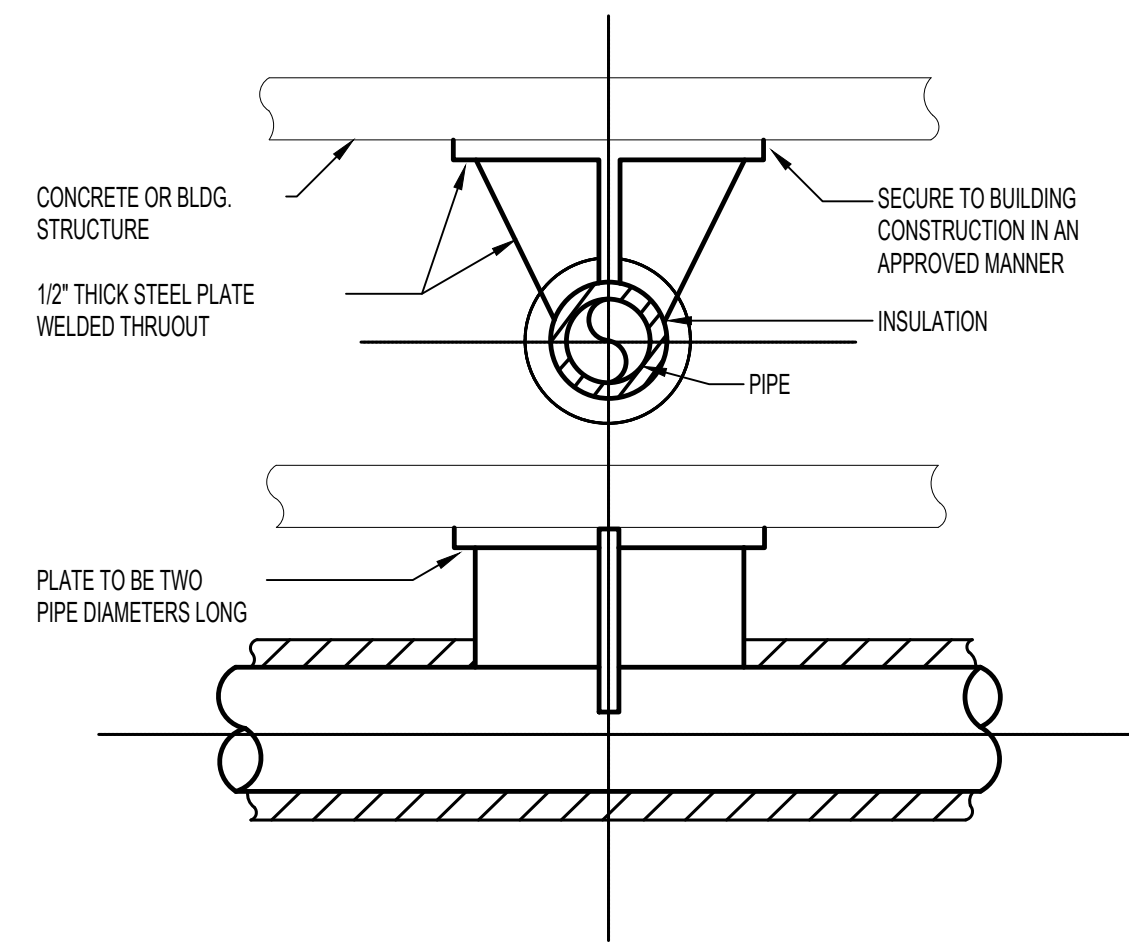
REVIEWED BY: DAH

SCALE: NTS DRAWING NUMBER:

JOB NO.: 2202.00

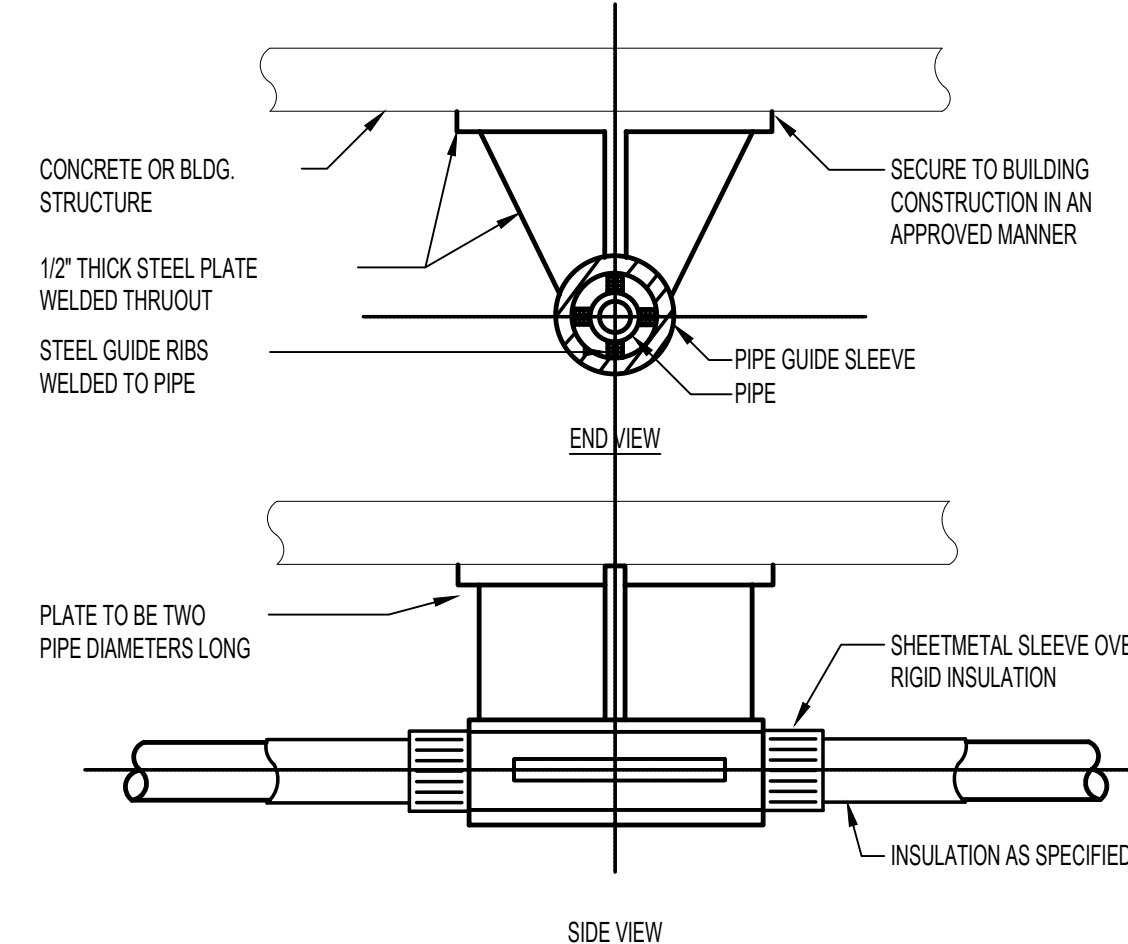
DATE: OCTOBER 13, 2023

M6.01



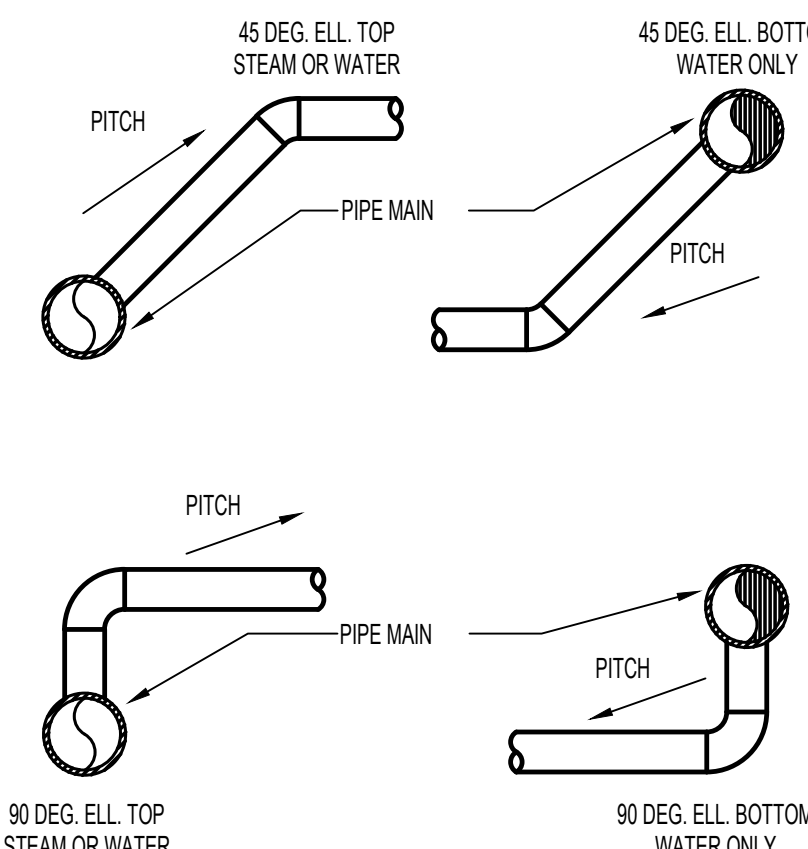
- NOTES:
1. CONCRETE ATTACHMENTS SHALL BE HLT OR APPROVED EQUAL.
 2. STEEL ATTACHMENTS SHALL BE WELDED OR BOLTED.
 3. FOR PIPES W/ CENTERLINE LESS THAN 18\"/>

PIPE ANCHOR DETAIL
N.T.S.

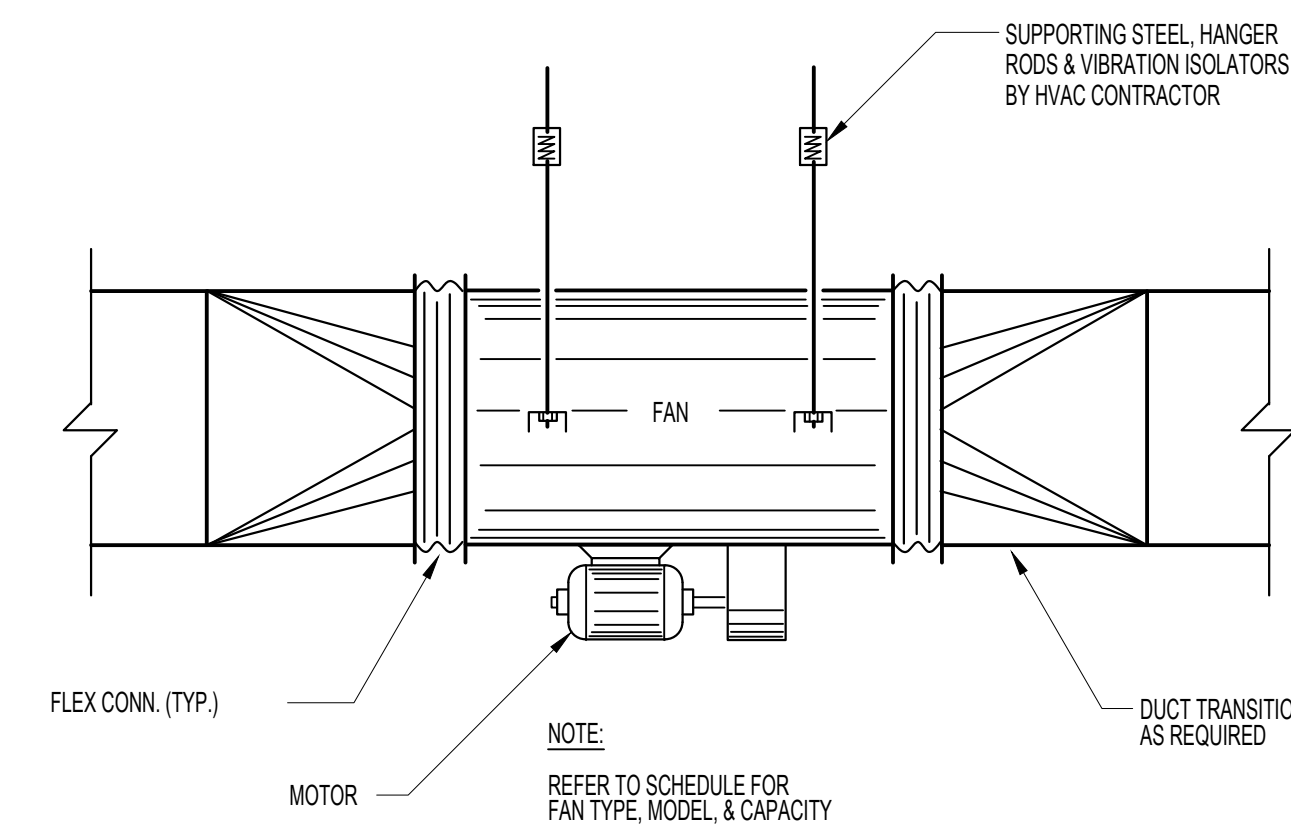


- NOTES:
1. CONCRETE ATTACHMENTS SHALL BE HLT OR APPROVED EQUAL.
 2. STEEL ATTACHMENTS SHALL BE WELDED OR BOLTED.
 3. FOR PIPES W/ CENTERLINE LESS THAN 18\"/>

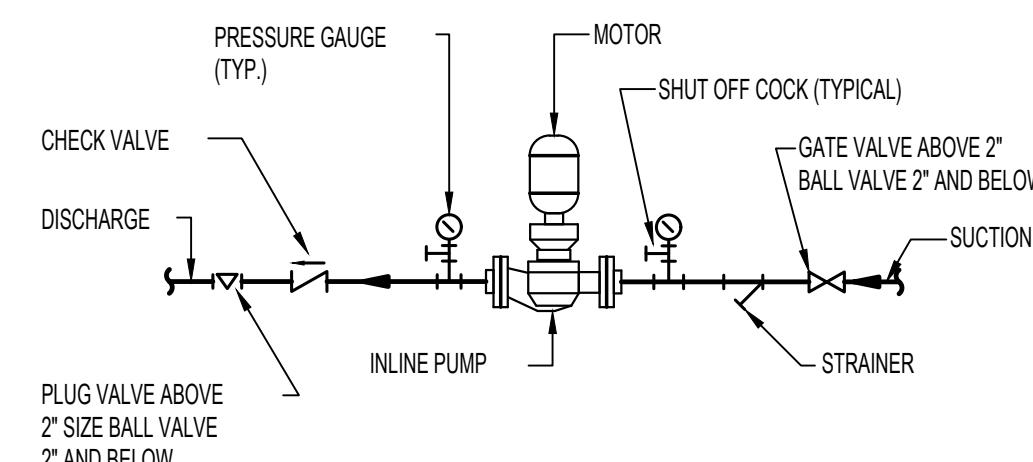
PIPE GUIDE DETAIL
N.T.S.



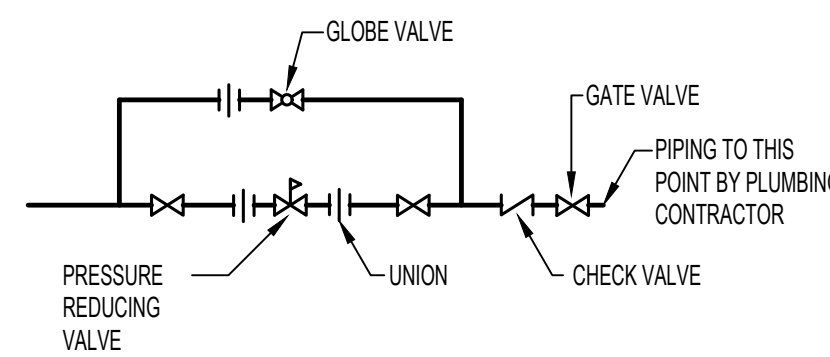
TYPICAL FOR ALL WATER PIPING SYSTEMS
TYPICAL BRANCH PIPE TAKE-OFF DETAIL
N.T.S.



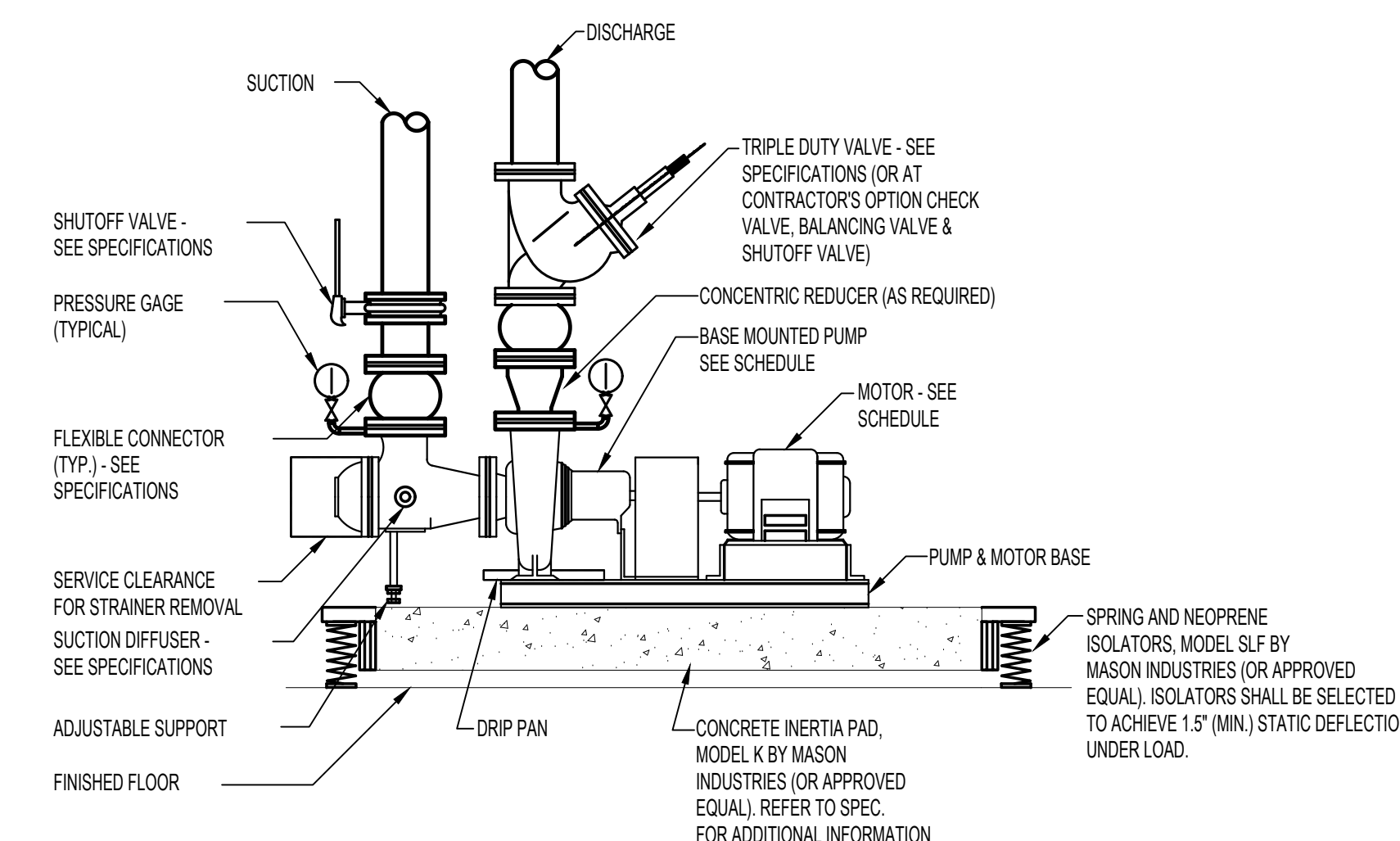
INLINE FAN DETAIL
N.T.S.



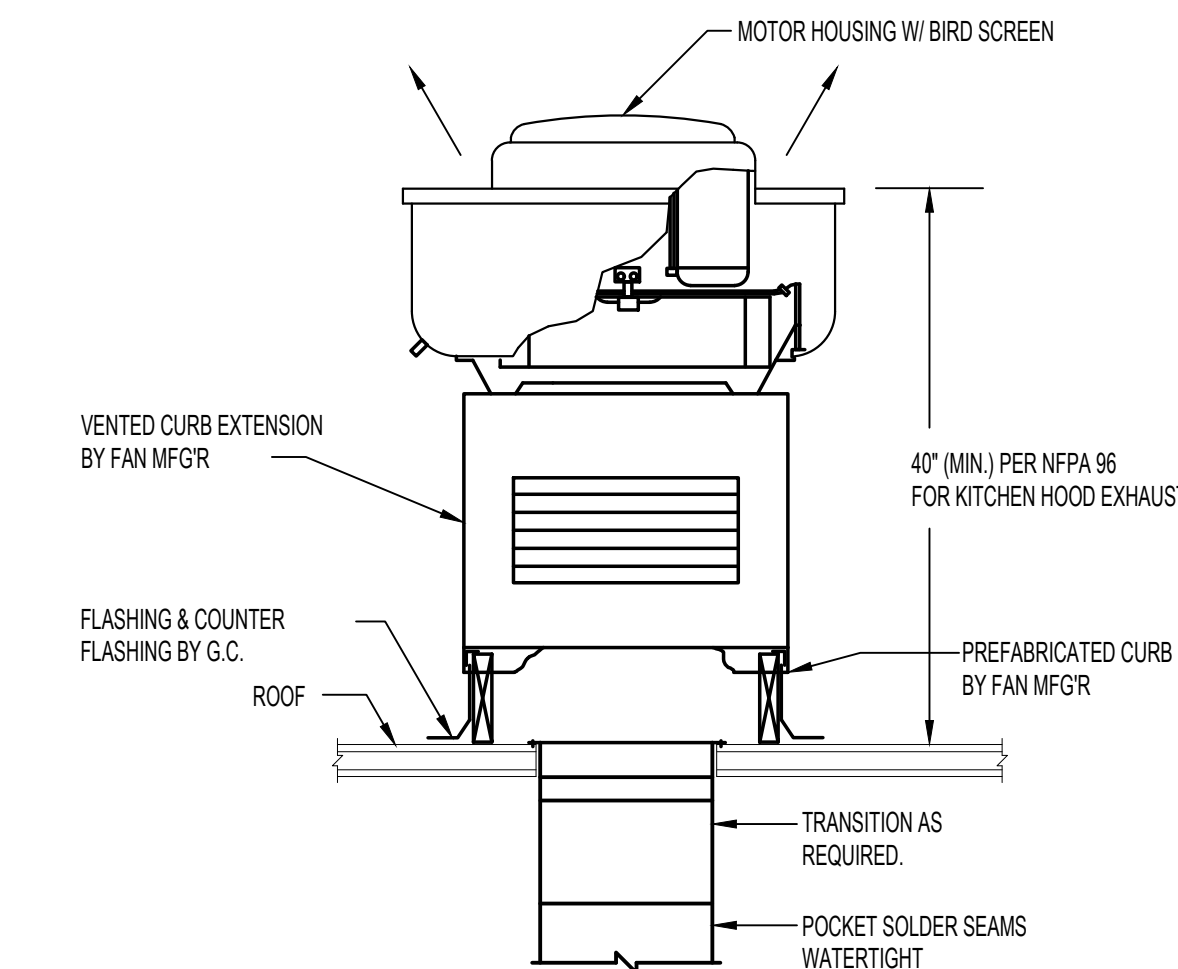
IN-LINE PUMP DETAIL
N.T.S.



COLD WATER MAKE UP STATION
N.T.S.

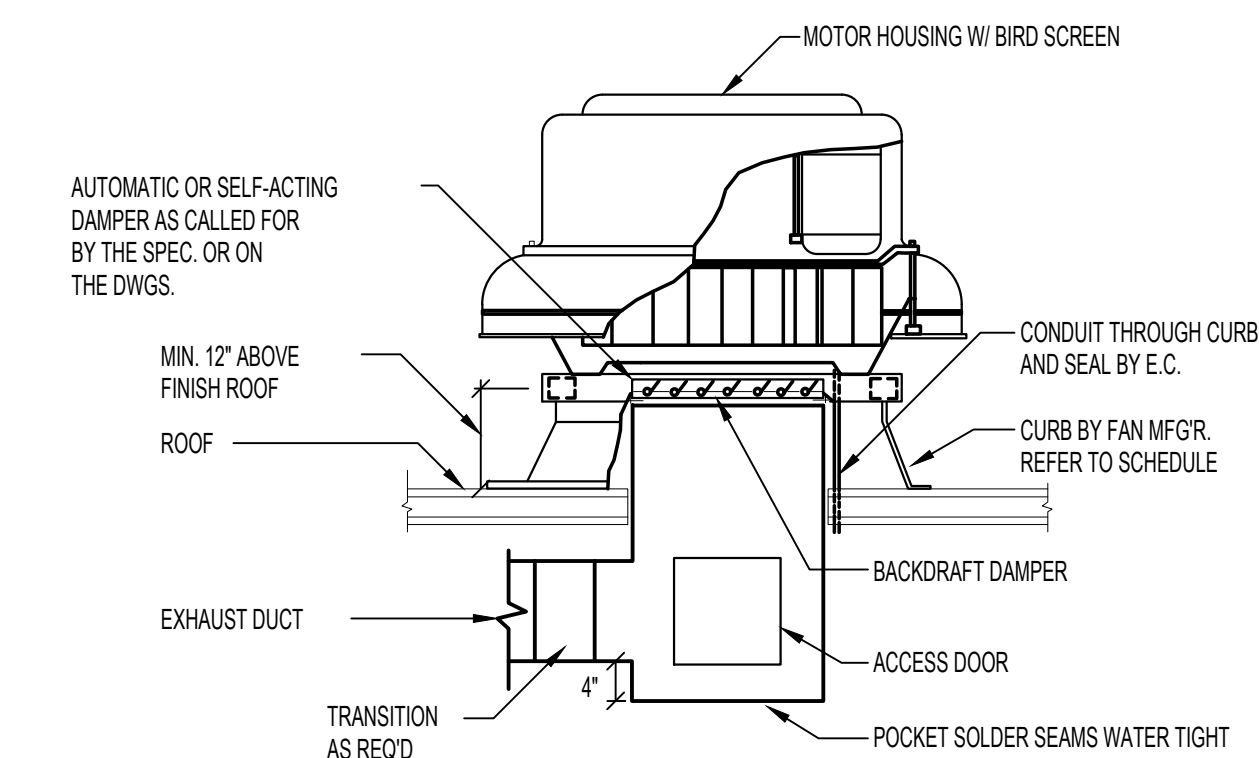


END SUCTION PUMP DETAIL
N.T.S.

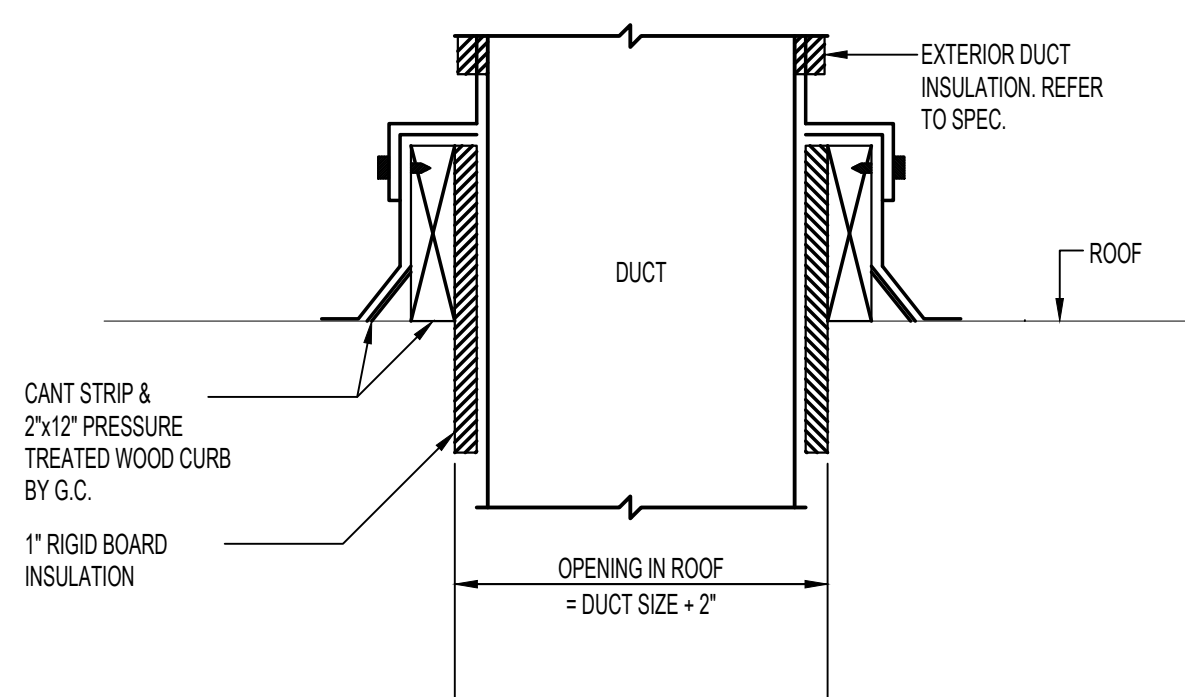


NOTE: KITCHEN HOOD EXHAUST FANS SHALL BE PROVIDED WITH VENTED CURB EXTENSION AS REQUIRED BY NFPA 96.

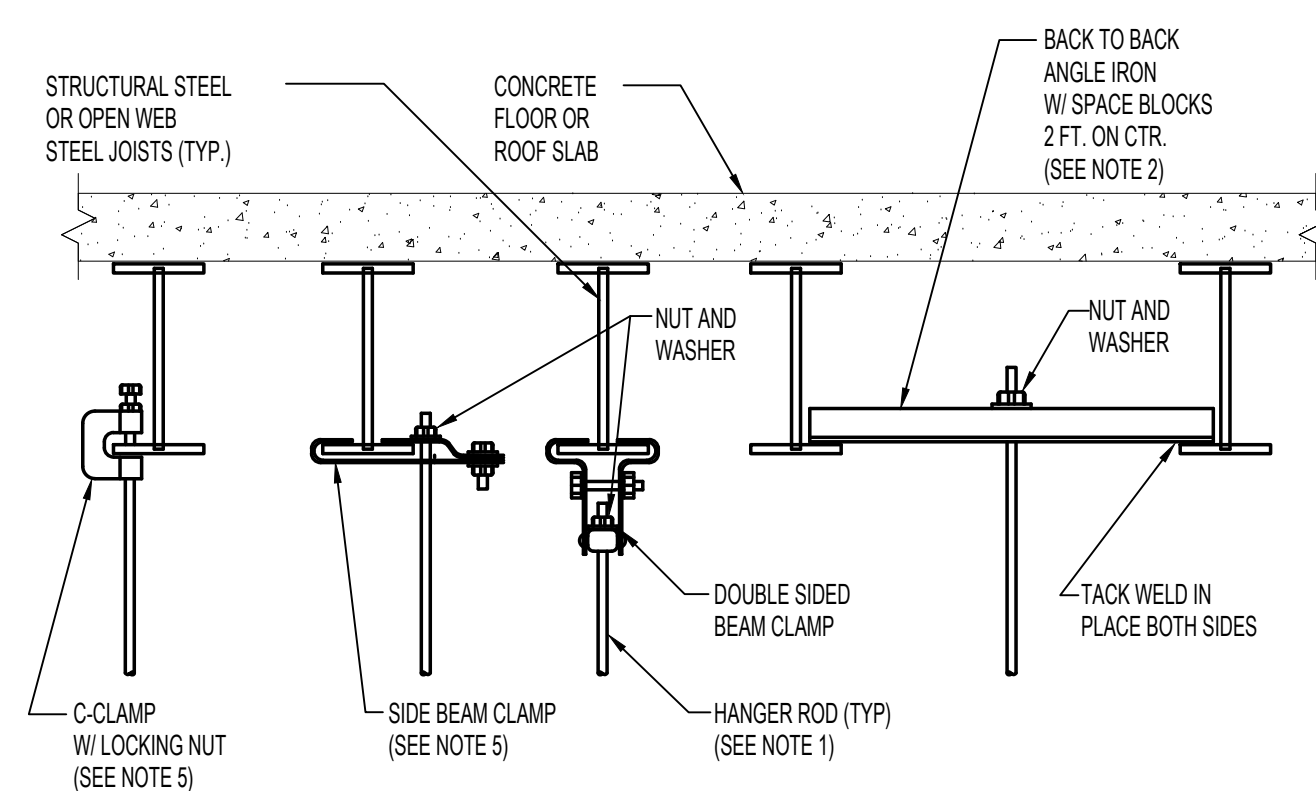
TOP DISCHARGE CENTRIFUGAL ROOF EXHAUSTER DETAIL
N.T.S.



CENTRIFUGAL ROOF EXHAUSTER DETAIL WITH PREFABRICATED CURB
N.T.S.

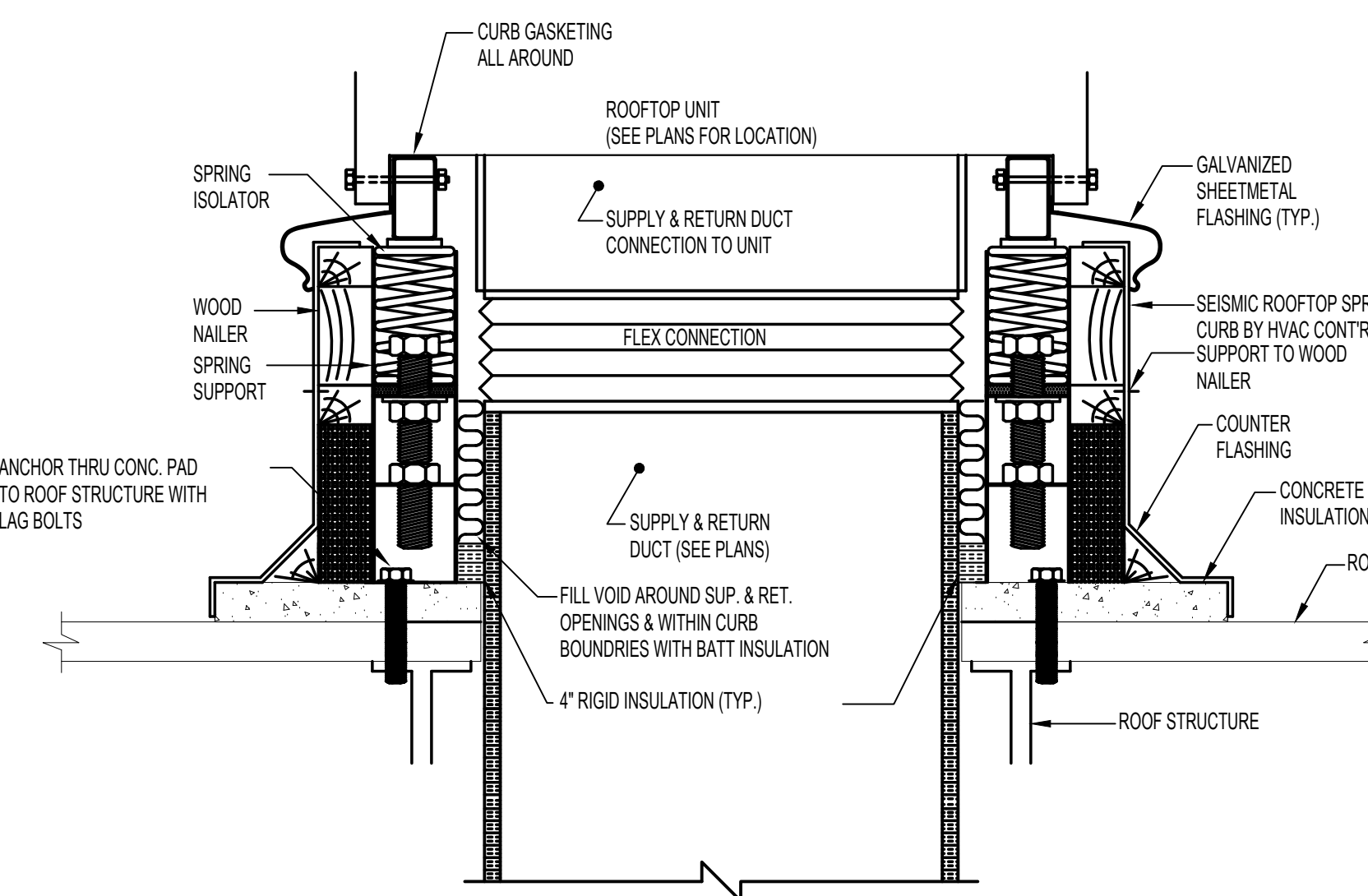


DUCTWORK ROOF PENETRATION DETAIL
N.T.S.

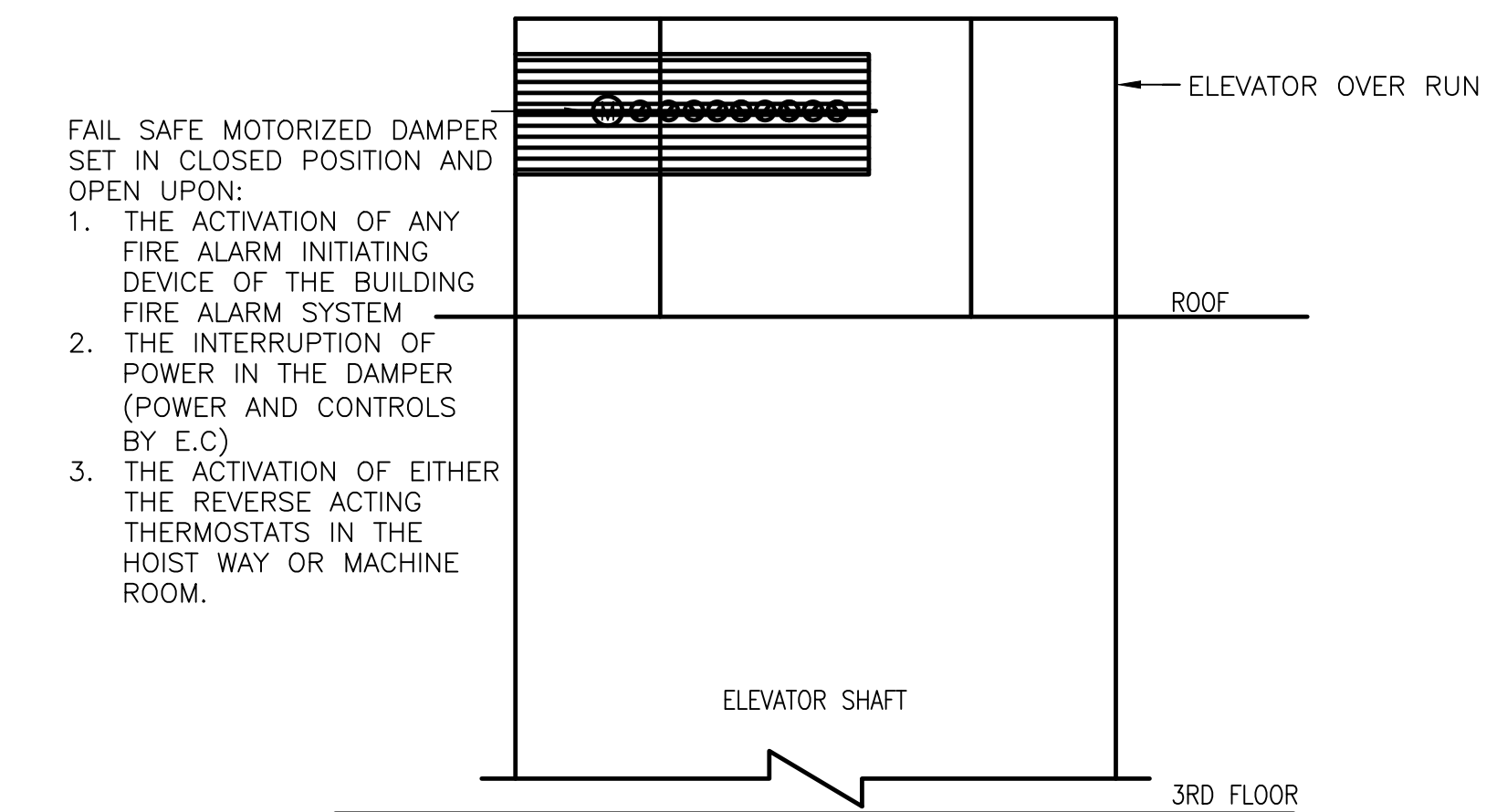


1. REFER TO PIPE HANGER DETAIL FOR HANGER ROD SIZE. FOR CEILING SUSPENDED EQUIPMENT PROVIDE MIN. 3/8\"/>
2. FOR PIPES UNDER 2\"/>
3. REFER TO "TYPICAL METHOD OF SECURING HANGER RODS TO CONCRETE DECK DETAIL" FOR ATTACHING HANGER RODS TO CONCRETE DECK.
4. REPAIR OF FIREPROOFING IN ORDER TO FACILITATE THE INSTALLATION OF HANGER RODS IN EXISTING CONSTRUCTION SHALL BE BY THE G.C.
5. USE OF C-CLAMPS AND SIDE BEAM CLAMPS IS LIMITED TO PIPING 2-1/2\"/>

TYPICAL METHODS OF SECURING HANGER RODS TO STRUCTURAL STEEL DETAIL
N.T.S.

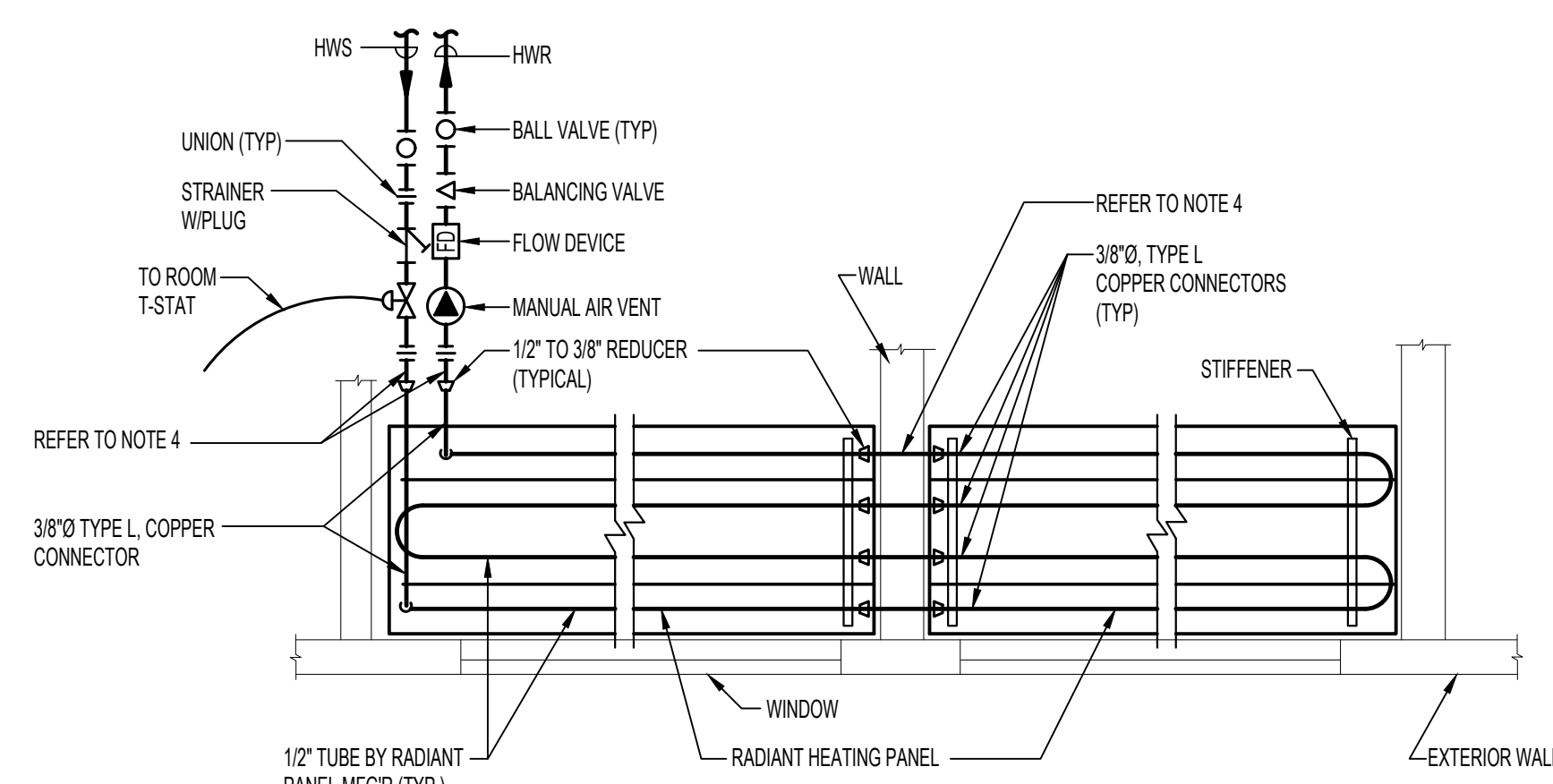


ROOFTOP UNIT CURB DETAIL
N.T.S.



ELEVATOR VENT DETAIL
N.T.S.

- FAIL SAFE MOTORIZED DAMPER SET IN CLOSED POSITION AND OPEN UPON:
1. THE ACTIVATION OF ANY FIRE ALARM INITIATING DEVICE OF THE BUILDING FIRE ALARM SYSTEM.
 2. THE INTERRUPTION OF POWER IN THE DAMPER (POWER AND CONTROLS BY E.C).
 3. THE ACTIVATION OF EITHER THE REVERSE ACTING THERMOSTATS IN THE HOIST WAY OR MACHINE ROOM.



- NOTES:
- INSTALL 1-1/2" THICK GLASS FIBER PAD (DENSITY 0.75 LB/SQ. FT) ABOVE RADIANT PANELS.
 - PROVIDE HANGERS AND SUPPORTS PER MFG'S RECOMMENDATIONS.
 - PROVIDE PLASTER FRAME AS REQUIRED FOR SETTING IN GWB OR PLASTER CEILINGS.
 - 3 FOOT LONG, 1/2" FLEXIBLE HOSES, WITH SYNTHETIC POLYMER CORE, WITH AN OUTER RATED COVERING OF GALVANIZED STEEL, WITH STEEL FITTINGS, WPT CONNECTIONS AND DIELECTRIC COUPLINGS. FIRE RATED ASSEMBLY MEETS UL 94 AND ASTM M4.

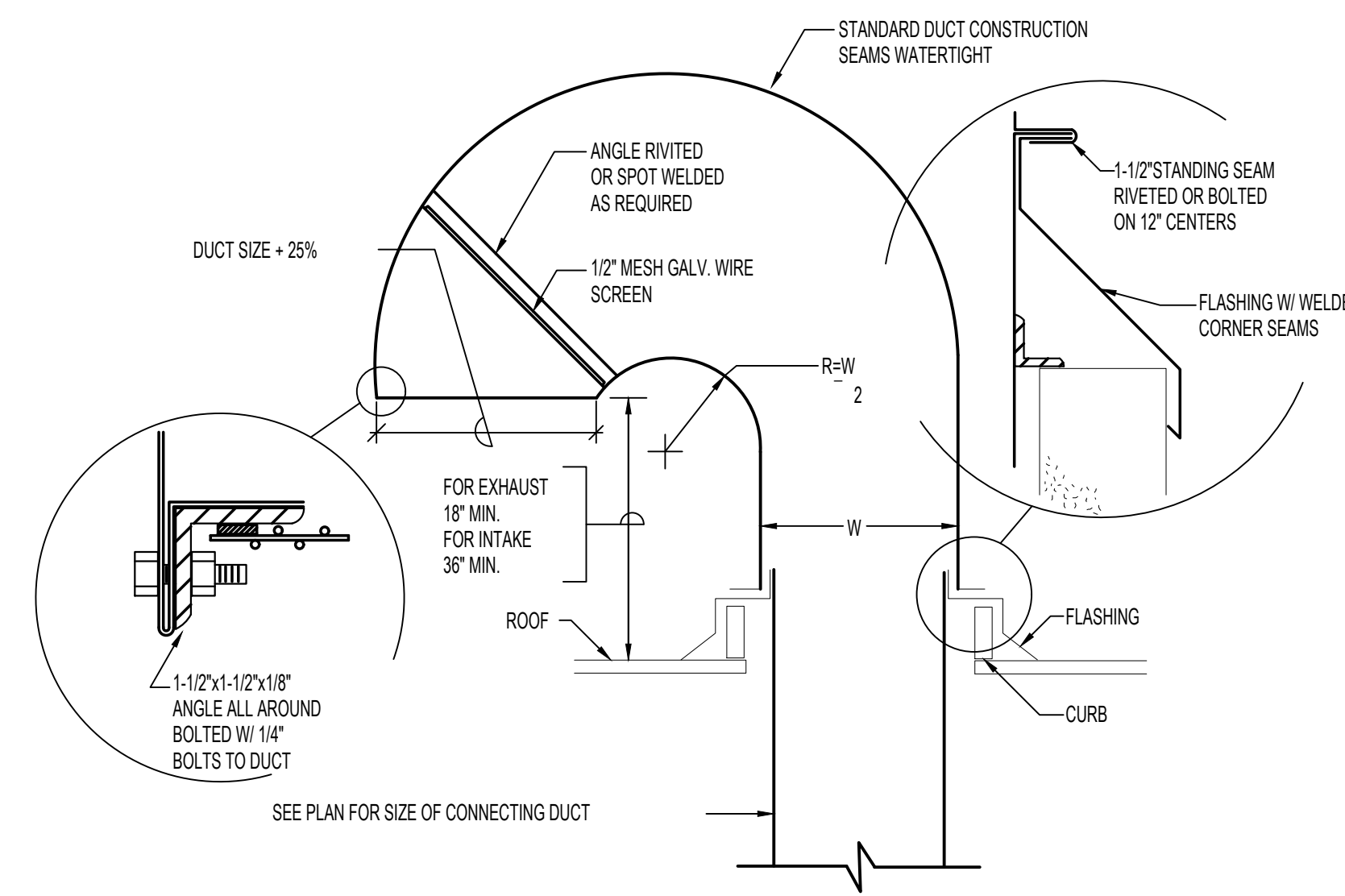
TYPICAL RADIANT HEATING PANEL PIPING DETAIL

N.T.S.

PIPE SIZE	DIM H	DIM W
1"	4'	2'
1-1/4"	5'	2'
1-1/2"	5'	2-1/2'
2"	6'	3'
2-1/2"	6'	3'
3"	8'	4'
4"	8'	4'
5"	10'	5'
6"	10'	5'
8"	12'	6'

EXPANSION LOOP

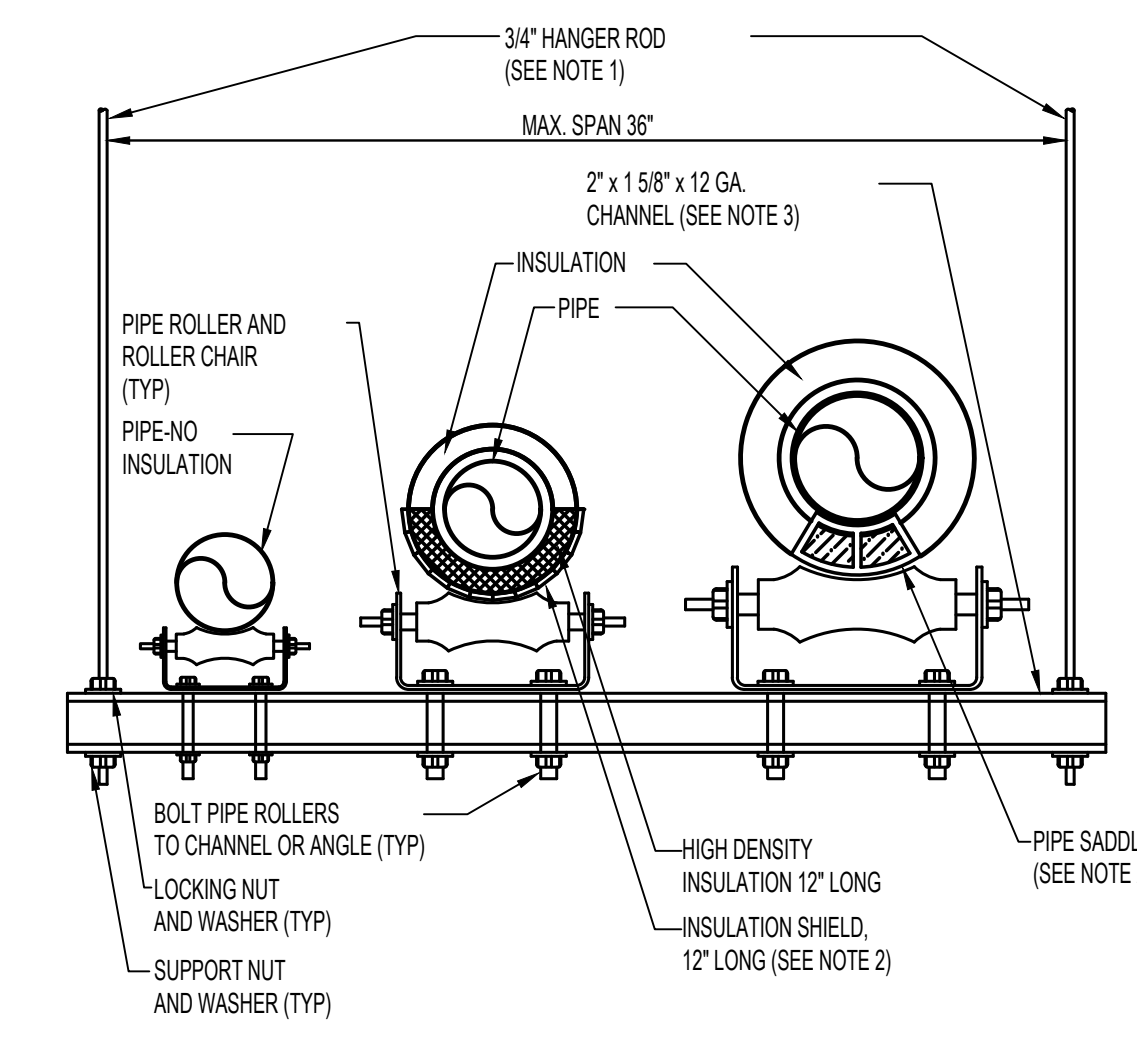
N.T.S.



- NOTES:
- SEE ARCHITECTURAL DRAWINGS &/OR SPECIFICATIONS FOR CURB, FLASHING & ROOFING.
 - WHEN WOOD PLATE IS PROVIDED AROUND TOP OF CURB, SECURE FLASHING & GOOSENECK TO WOOD PLATE WITH 3/8" CADMIUM PLATED LAG BOLTS NOT OVER 12" ON CENTERS.
 - WHEN PREFAB METAL CURB IS USED, SECURE FLASHING & GOOSENECK WITH SHEET METAL SCREWS AS REQUIRED FOR TIGHT JOINTS & RIGID INSULATION.

RECTANGULAR GOOSENECK DETAIL

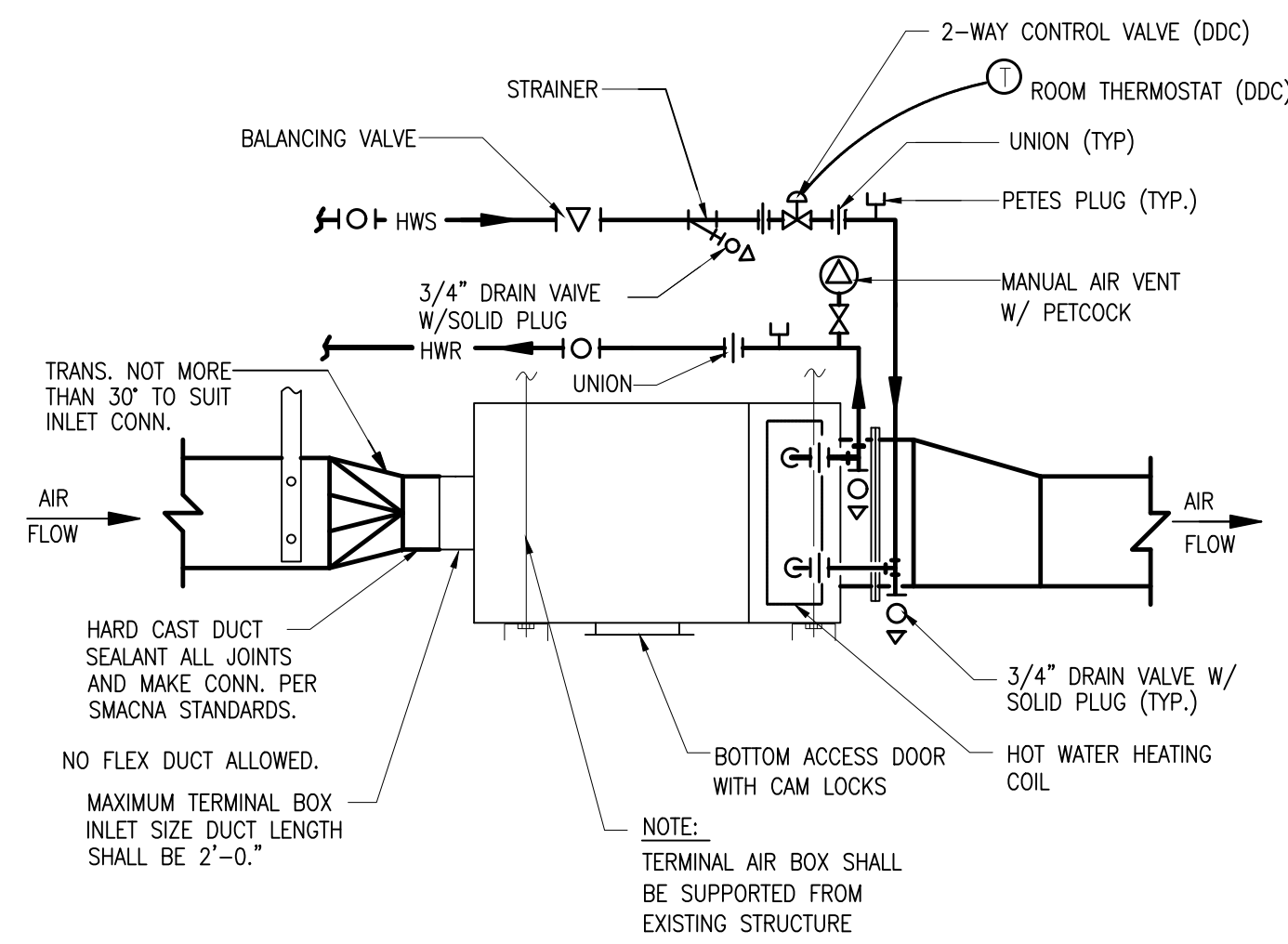
N.T.S.



- NOTES:
- REFER TO TYPICAL METHOD OF SECURING HANGER RODS DETAIL FOR ATTACHING HANGERS TO THE STRUCTURE.
 - PROVIDE INSULATION SHIELD OR PIPE SADDLE BASED ON THE PIPING SYSTEM AND PIPE SIZE AS INDICATED IN THE SPECIFICATIONS.
 - TRAPEZE TYPE HANGER SHALL BE USED FOR A MAXIMUM 1000 LB. UNIFORM LOAD.

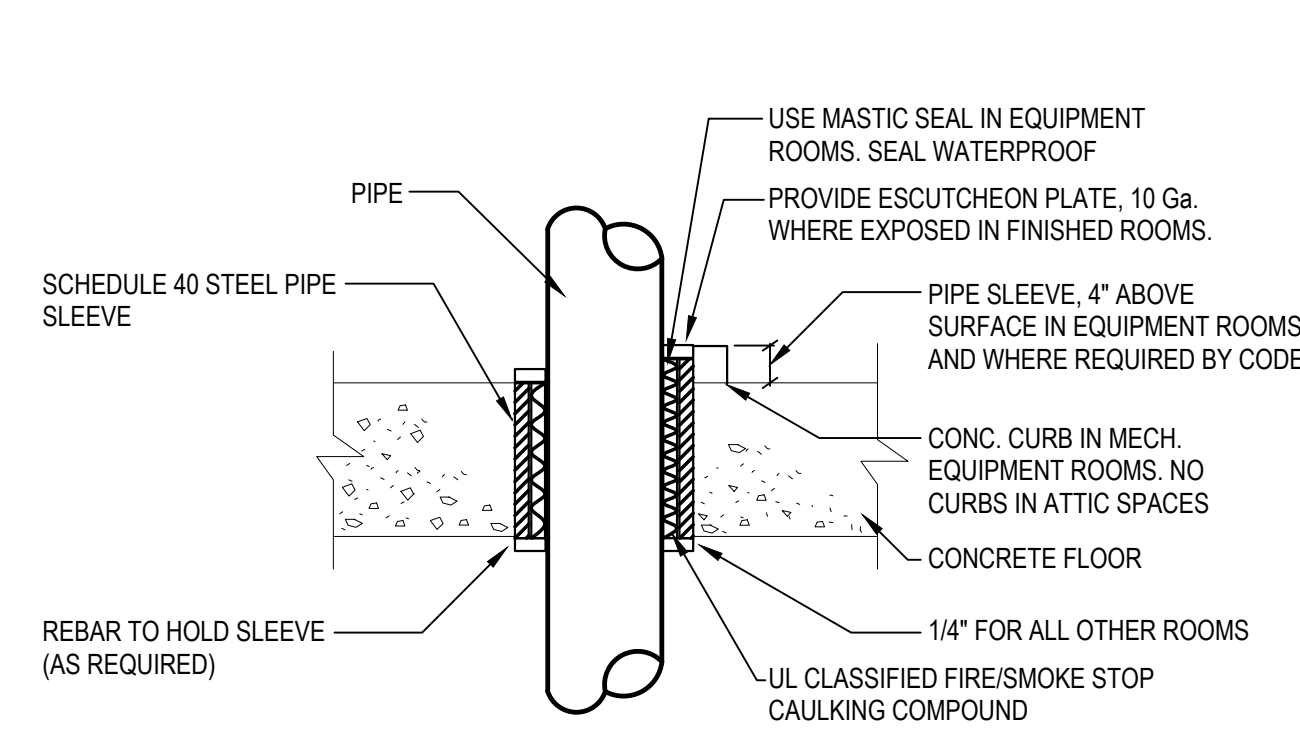
TRAPEZE TYPE PIPE HANGER INSTALLATION DETAIL

N.T.S.



VARIABLE & CONSTANT VOLUME TERMINAL BOX DETAIL

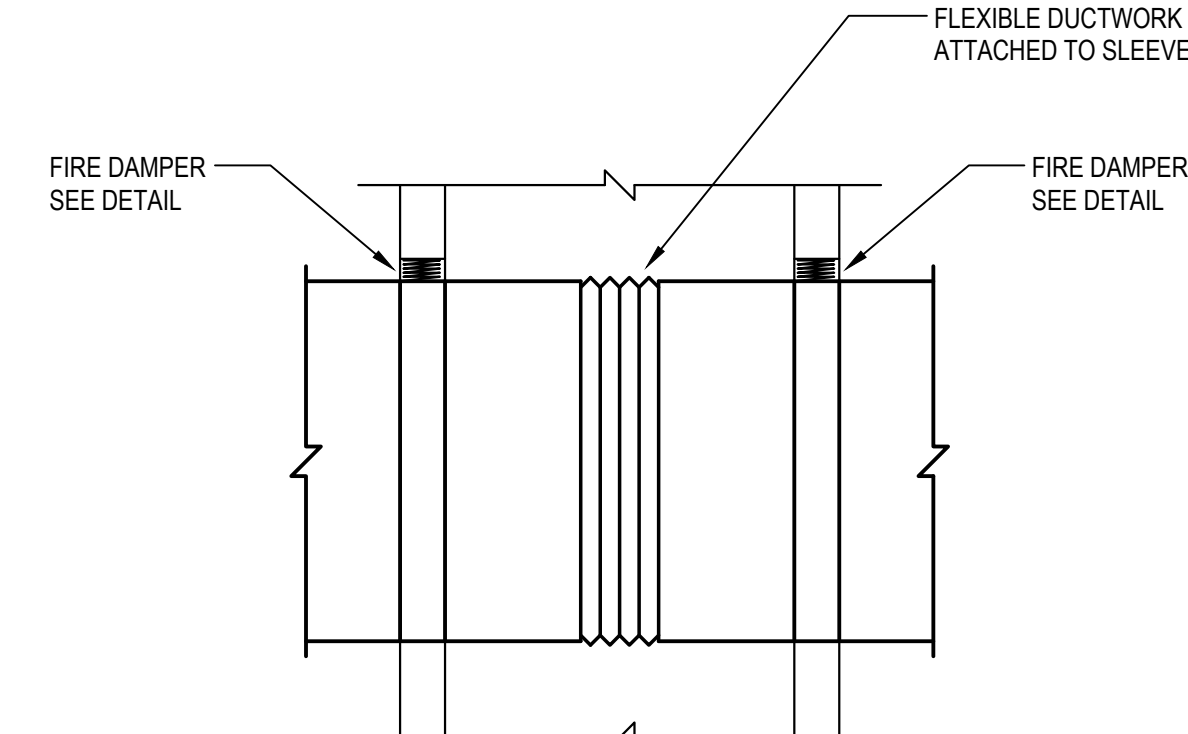
N.T.S.



SLEEVES & SLEEVE LOCATIONS BY MECH. CONTR.

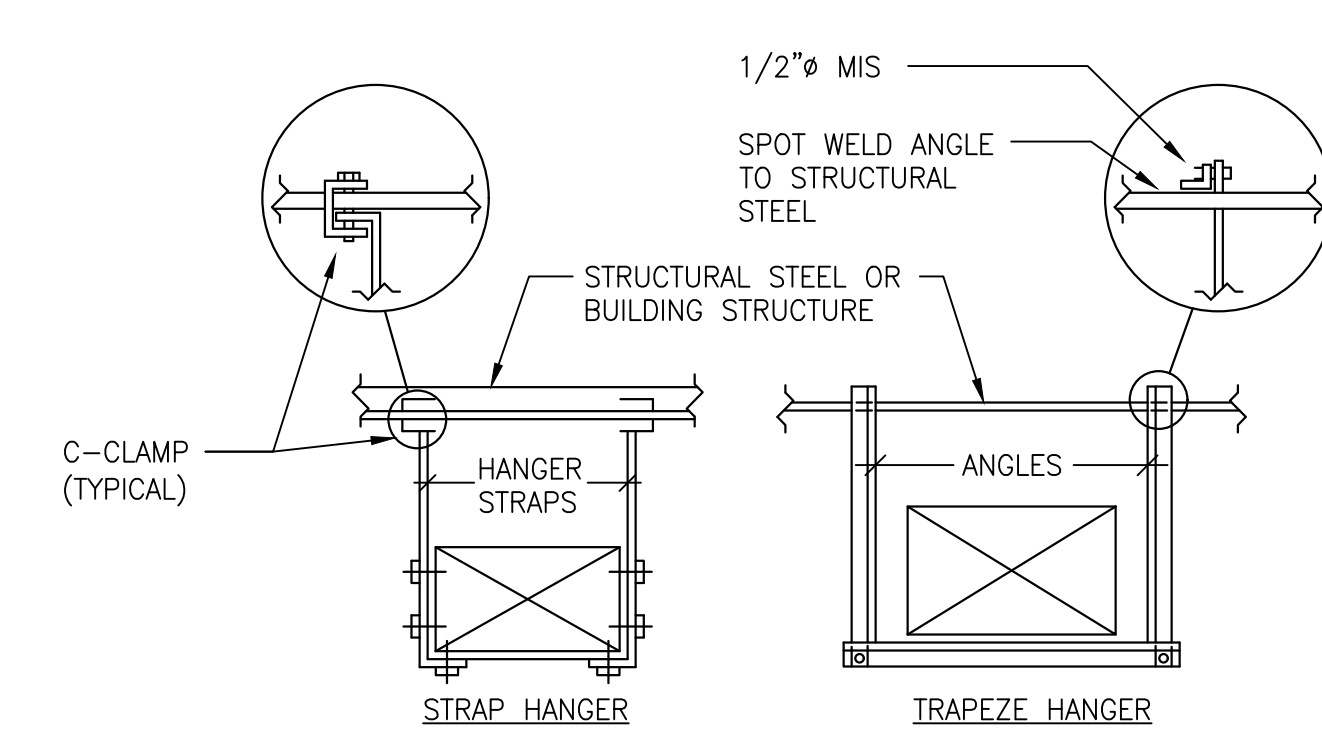
TYPICAL FLOOR PIPING SLEEVE DETAIL

N.T.S.



FIRE DAMPERS AT EXPANSION JOINT

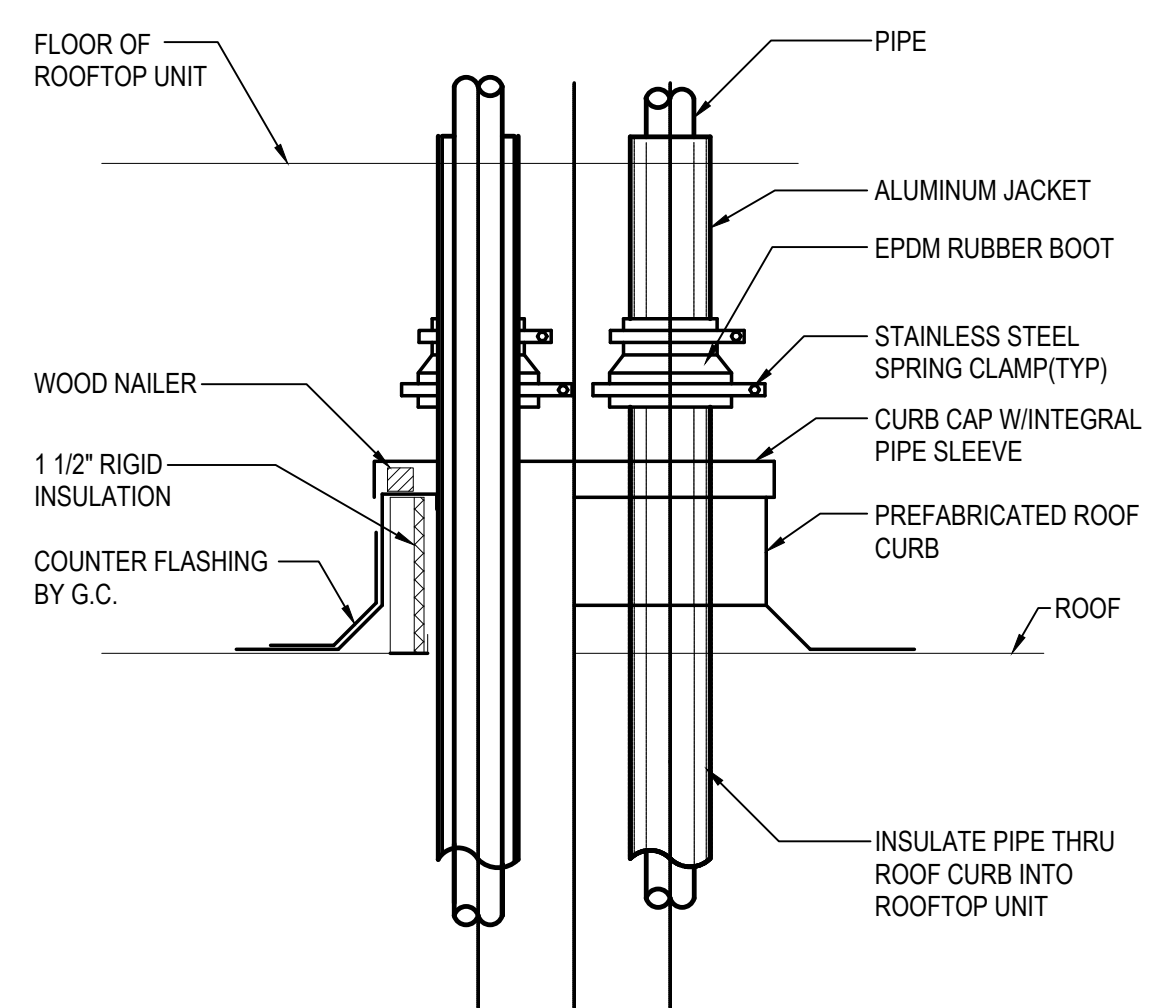
N.T.S.



- NOTES:
- FOR STRAP AND TRAPEZE HANGER SIZE, REFER TO SMACNA DUCT STANDARDS. NO POP RIVETS ALLOWED; USE SELF-TAPPING SHEET METAL SCREWS ONLY. COORDINATE WITH STRUCTURAL. REVIEW SEISMIC SECTION OF SPE FOR ATTACHMENT.

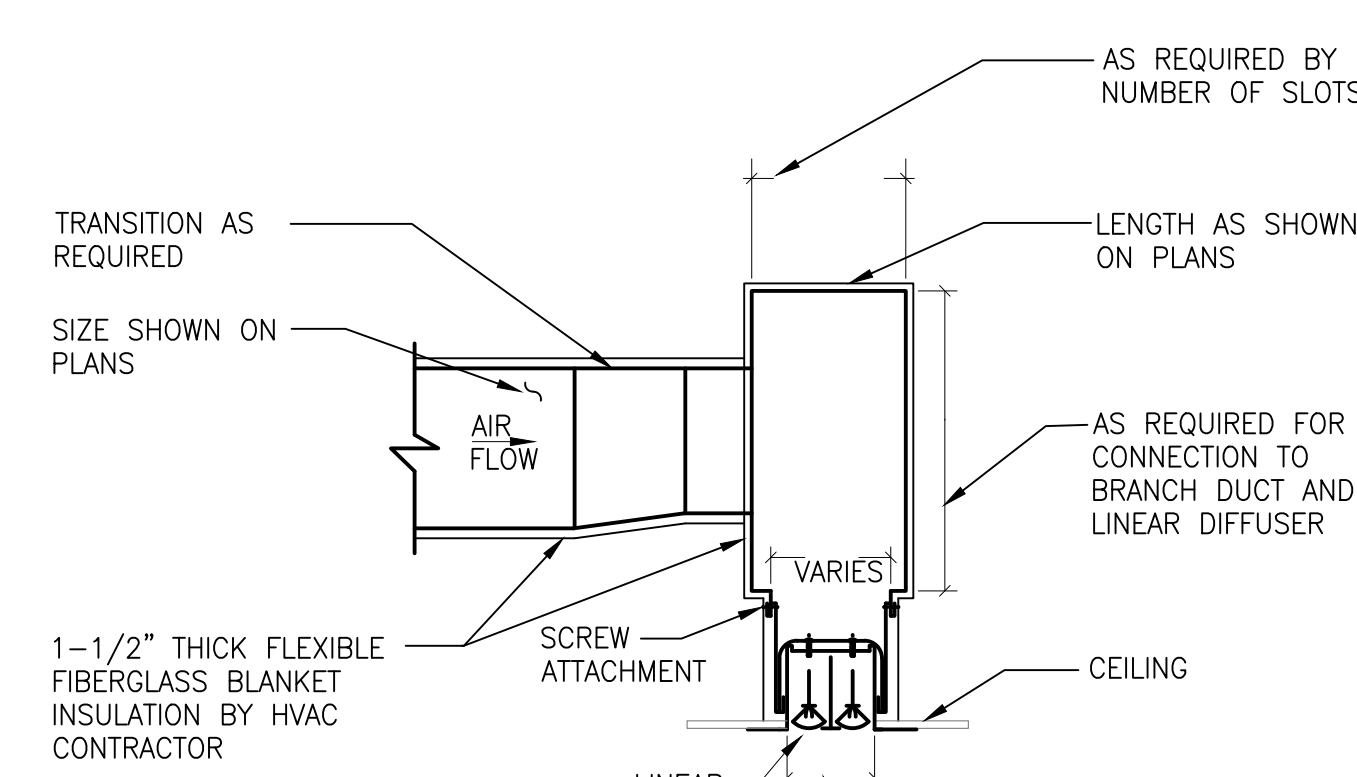
LOW VELOCITY DUCT HANGER DETAIL

N.T.S.



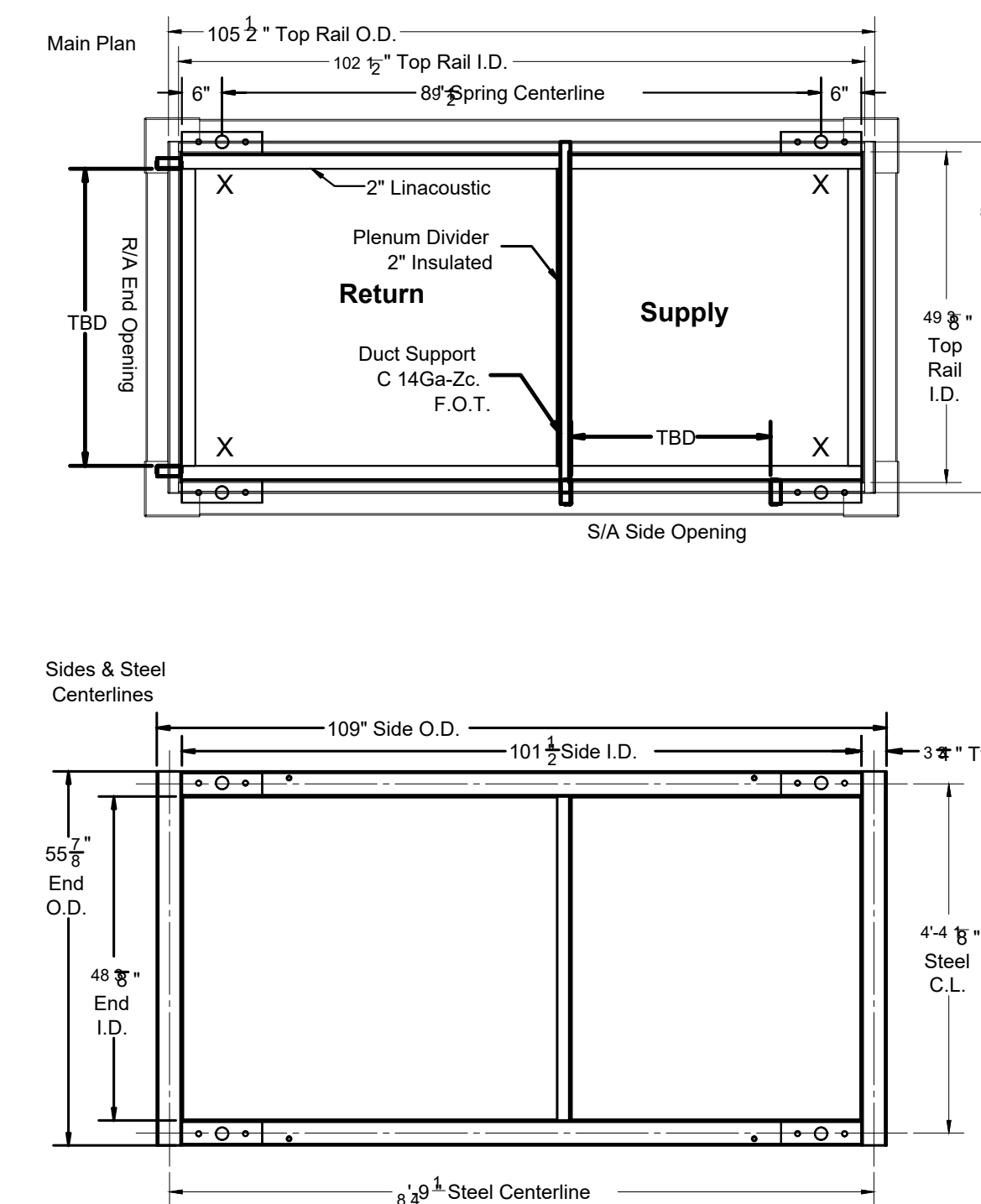
PIPING ROOF PENETRATION

N.T.S.



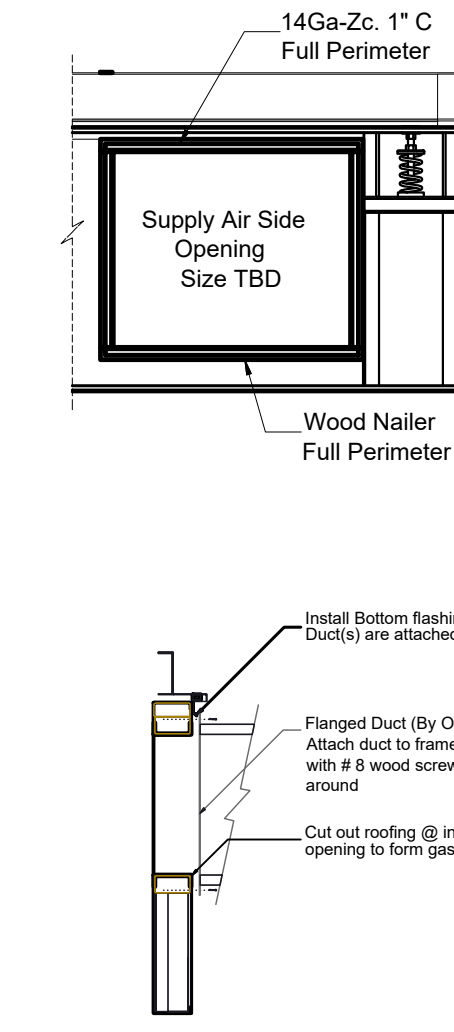
TYPICAL LINEAR DIFFUSER PLENUM DETAIL

N.T.S.

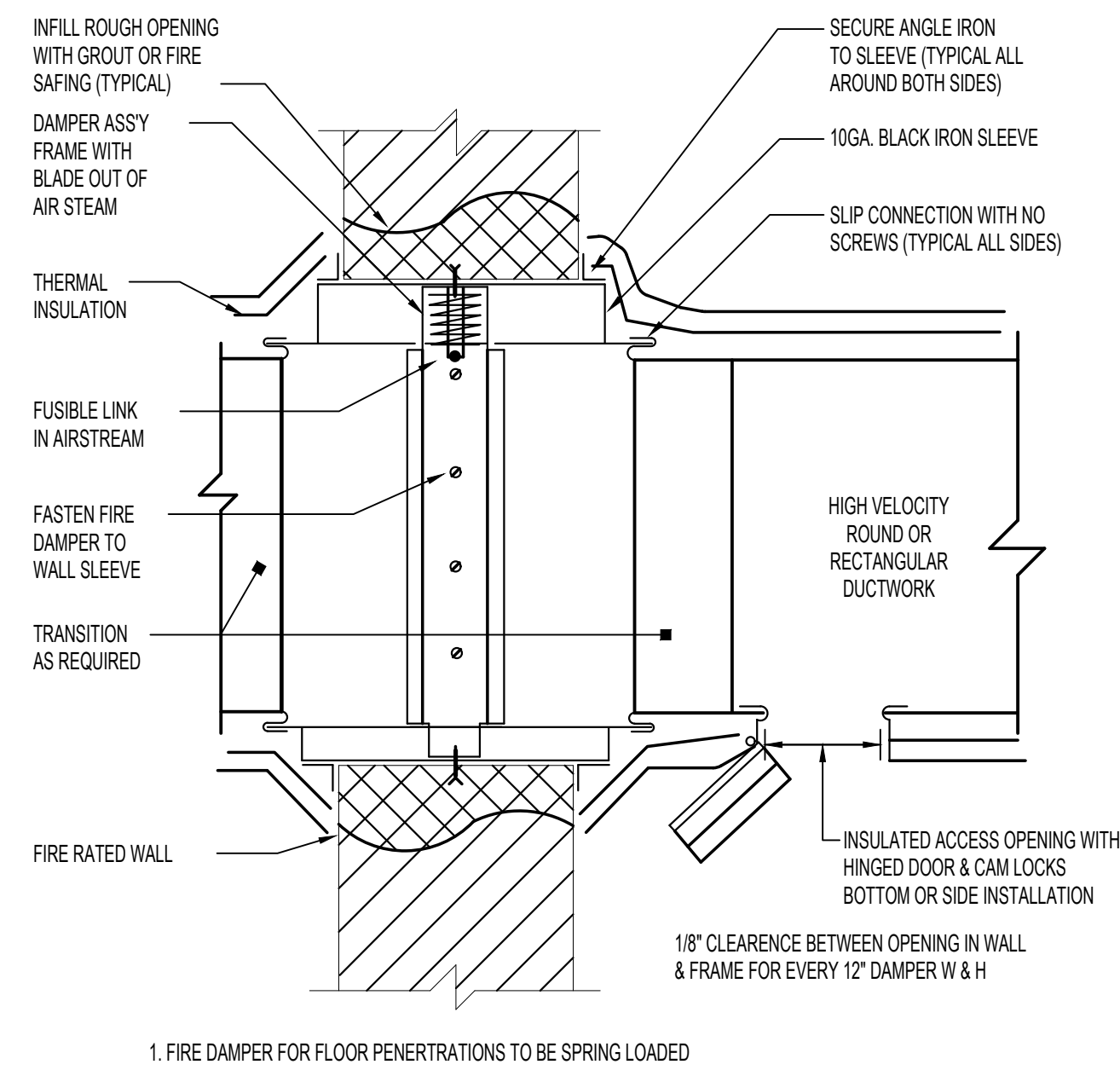


CURB EXTENSION DETAIL

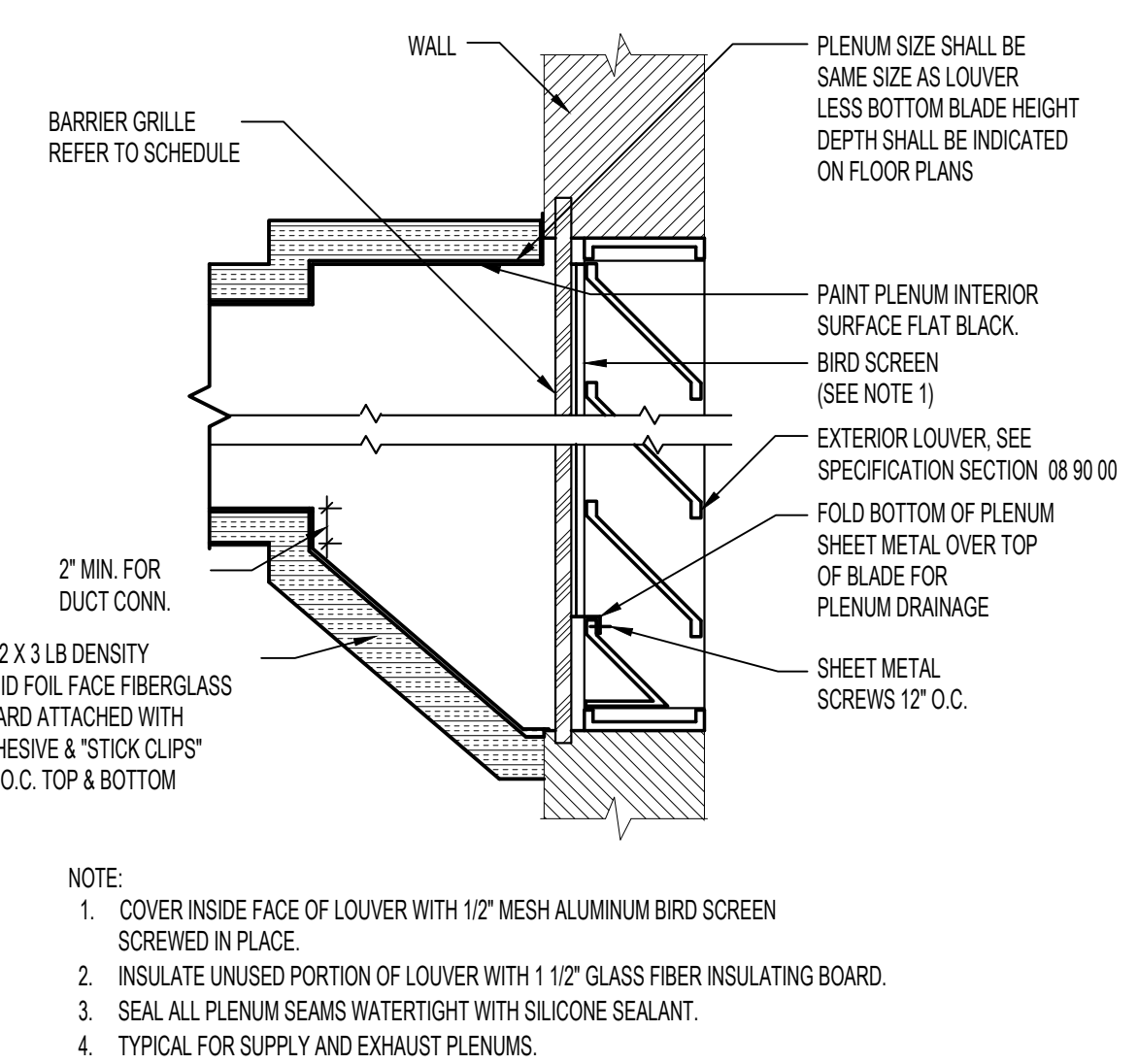
N.T.S.



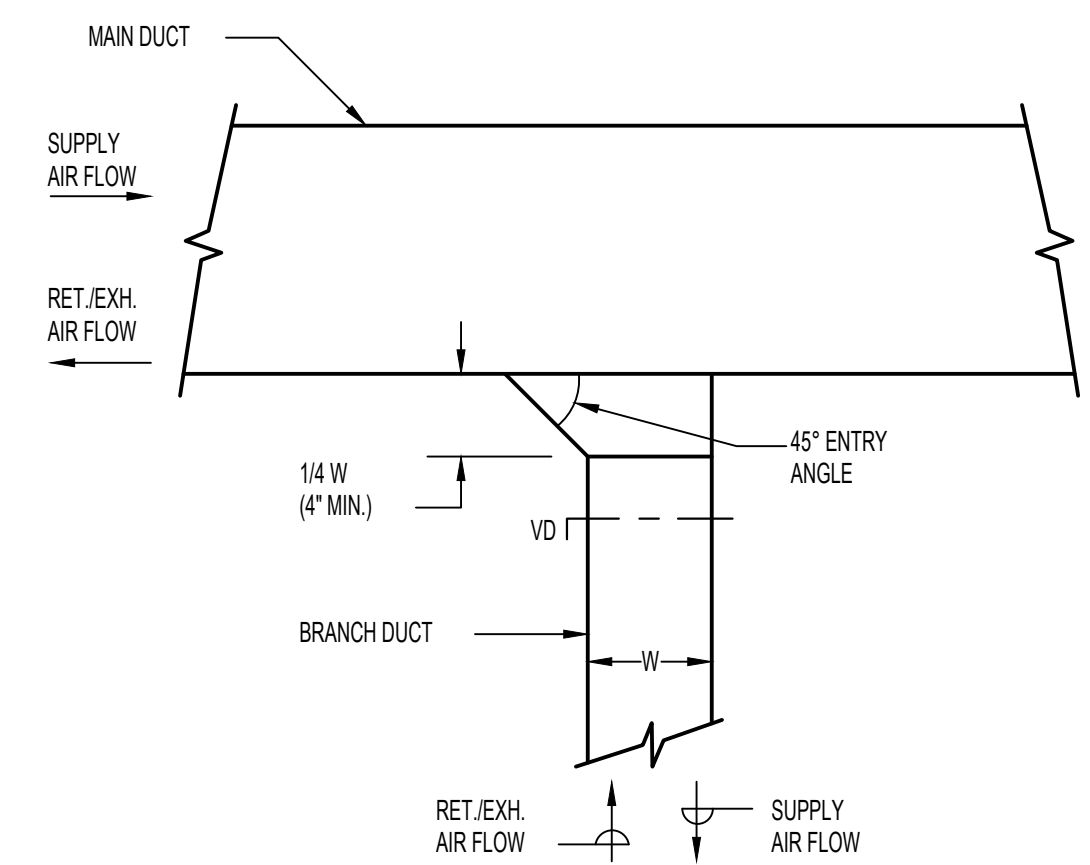
Note: All dimensions are approximate pending confirmation with final approved units



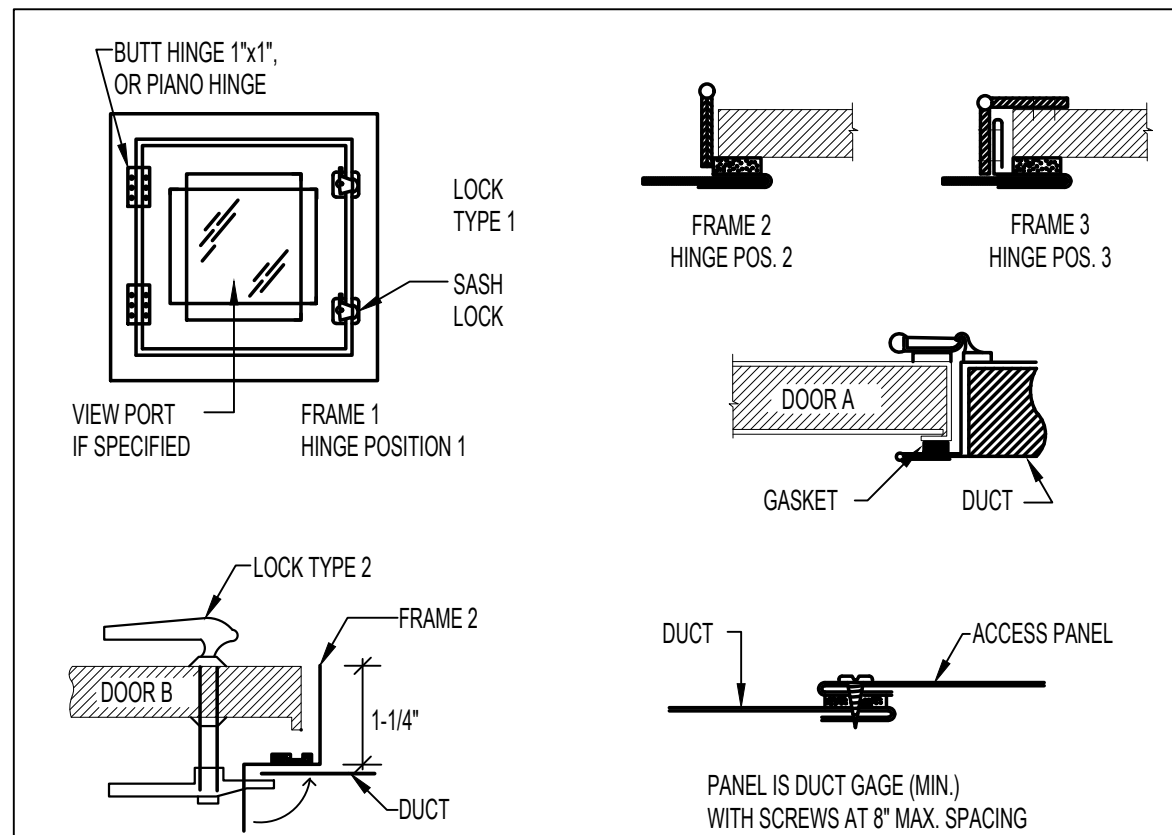
FIRE DAMPER DETAIL
N.T.S.



INTAKE AND EXHAUST LOUVER INSTALLATION DETAIL
N.T.S.



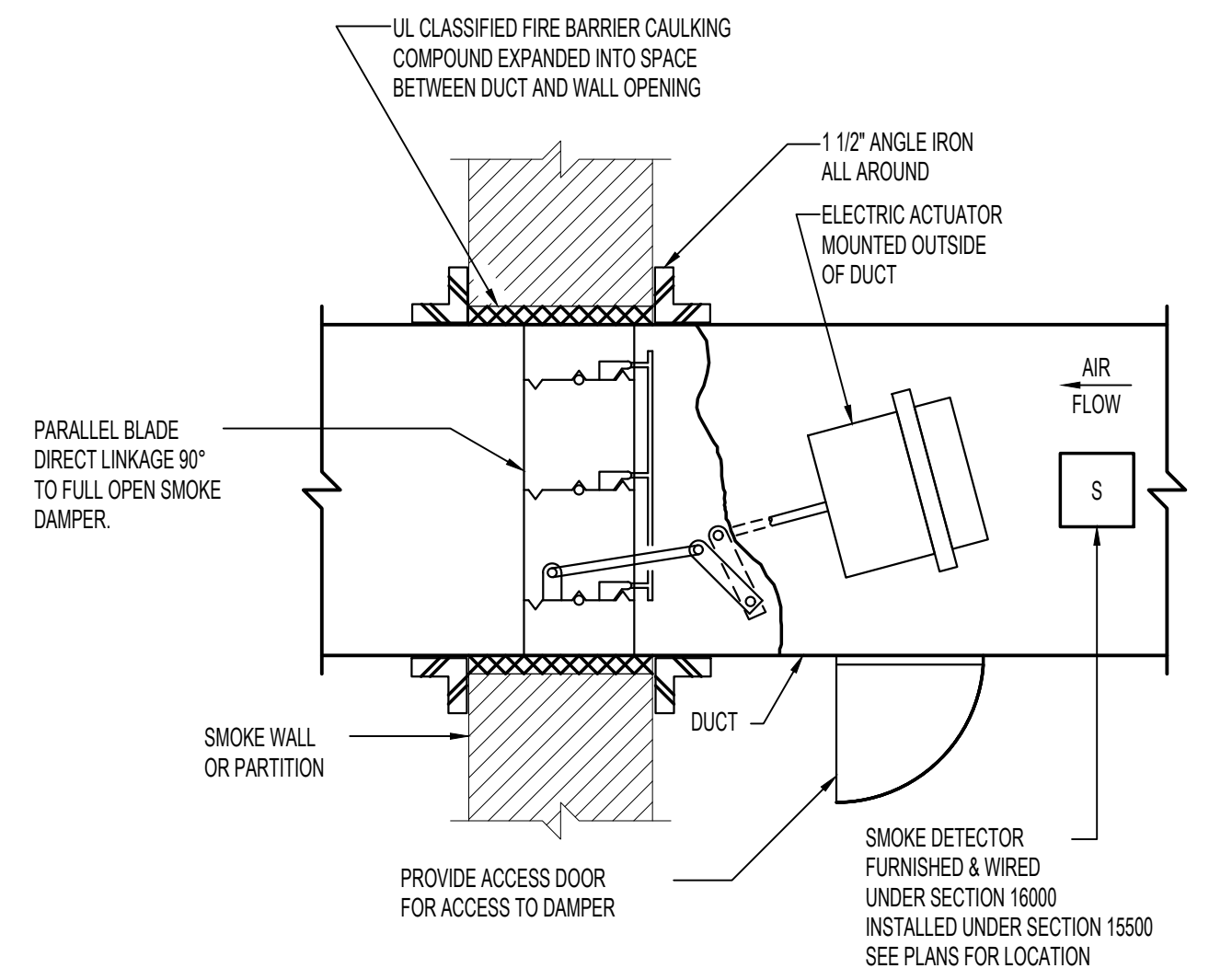
DETAIL OF BRANCH DUCT TAKE-OFF
N.T.S.



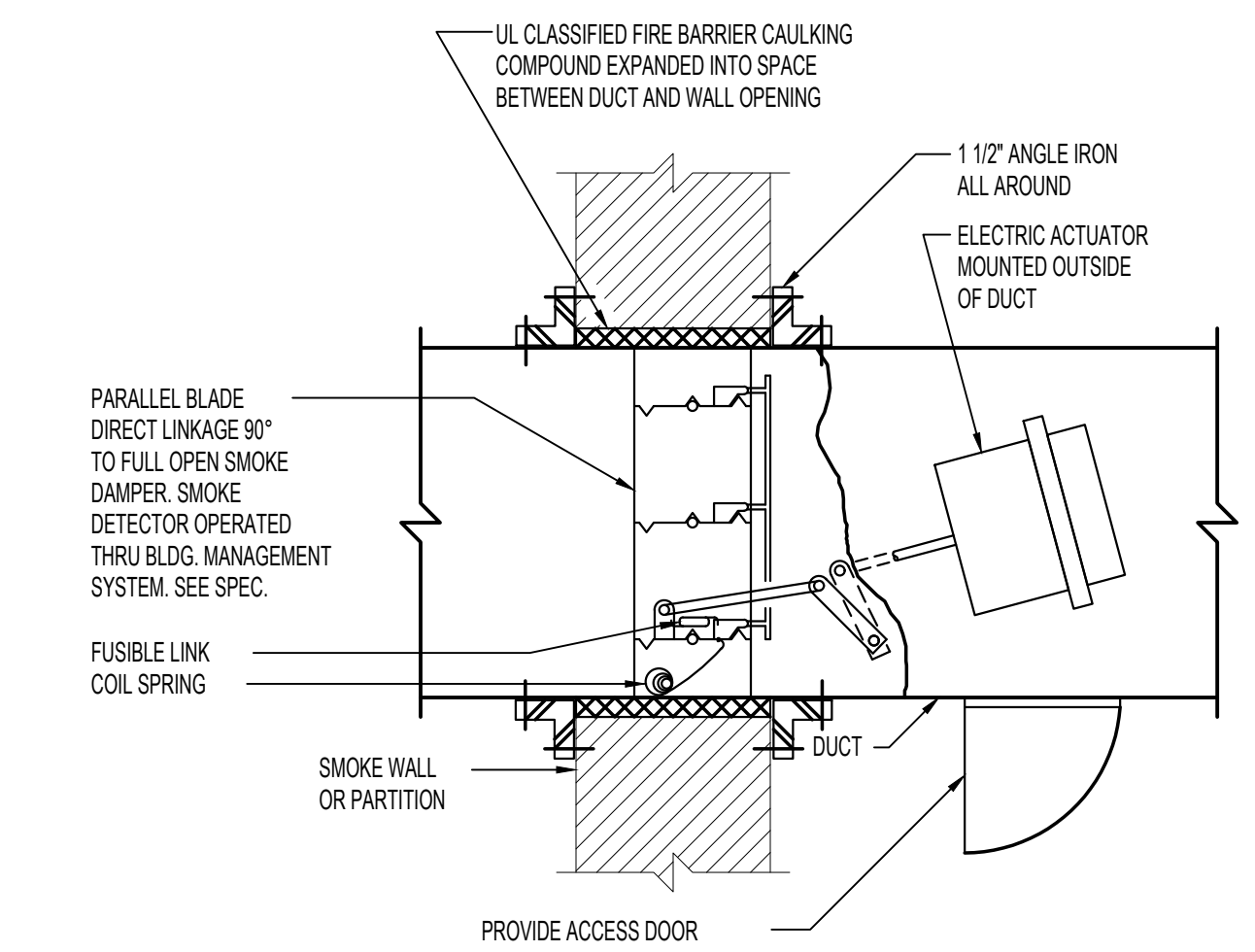
NOTE: CONSTRUCTION AND AIRTIGHTNESS MUST BE SUITABLE FOR THE DUCT PRESSURE CLASS USED.

DOOR SIZE	No. HINGES	No. LOCKS	METAL GAGE		
			FRAME	DOOR	BACK
2\"/>					

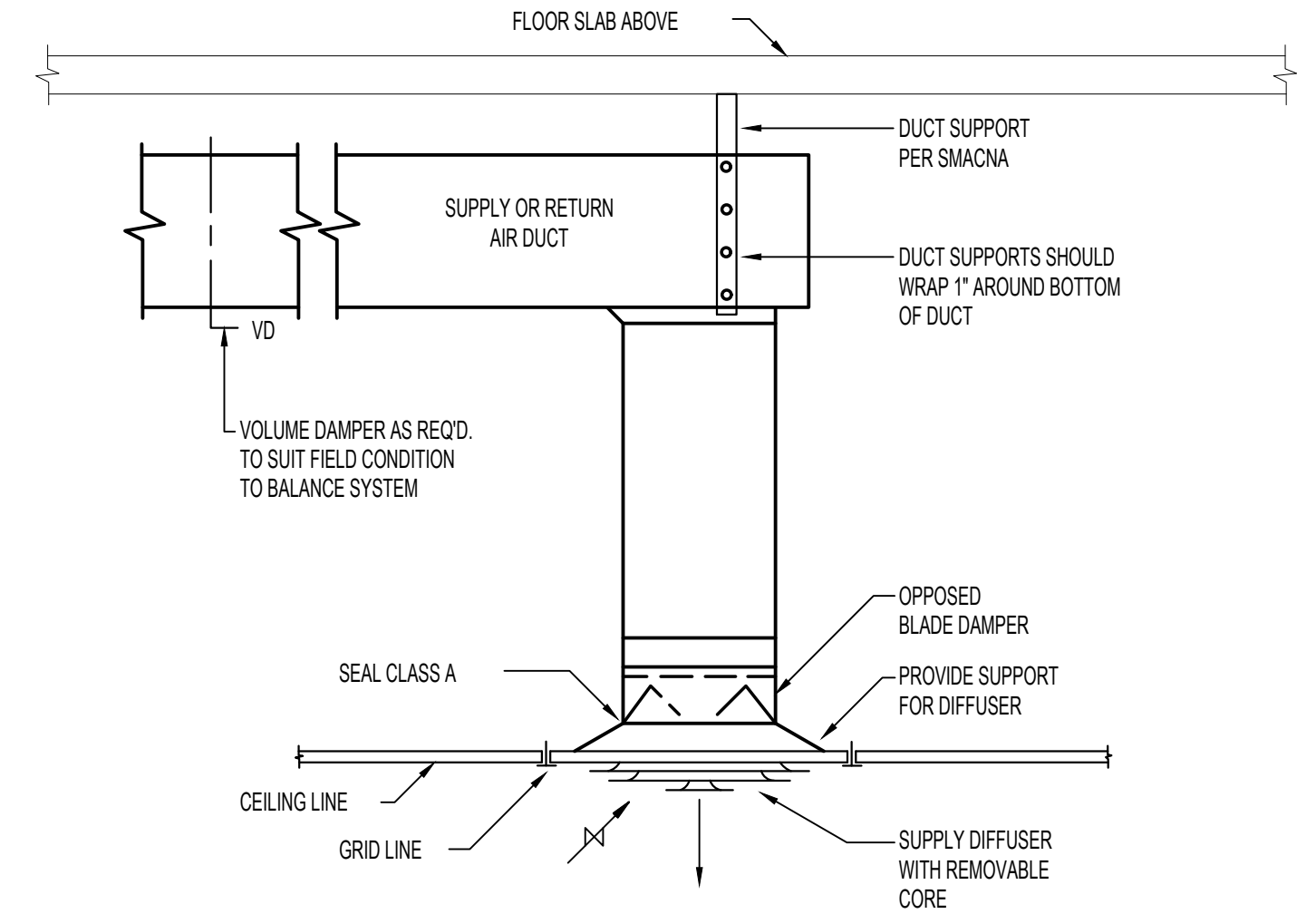
DUCT ACCESS DOORS
N.T.S.



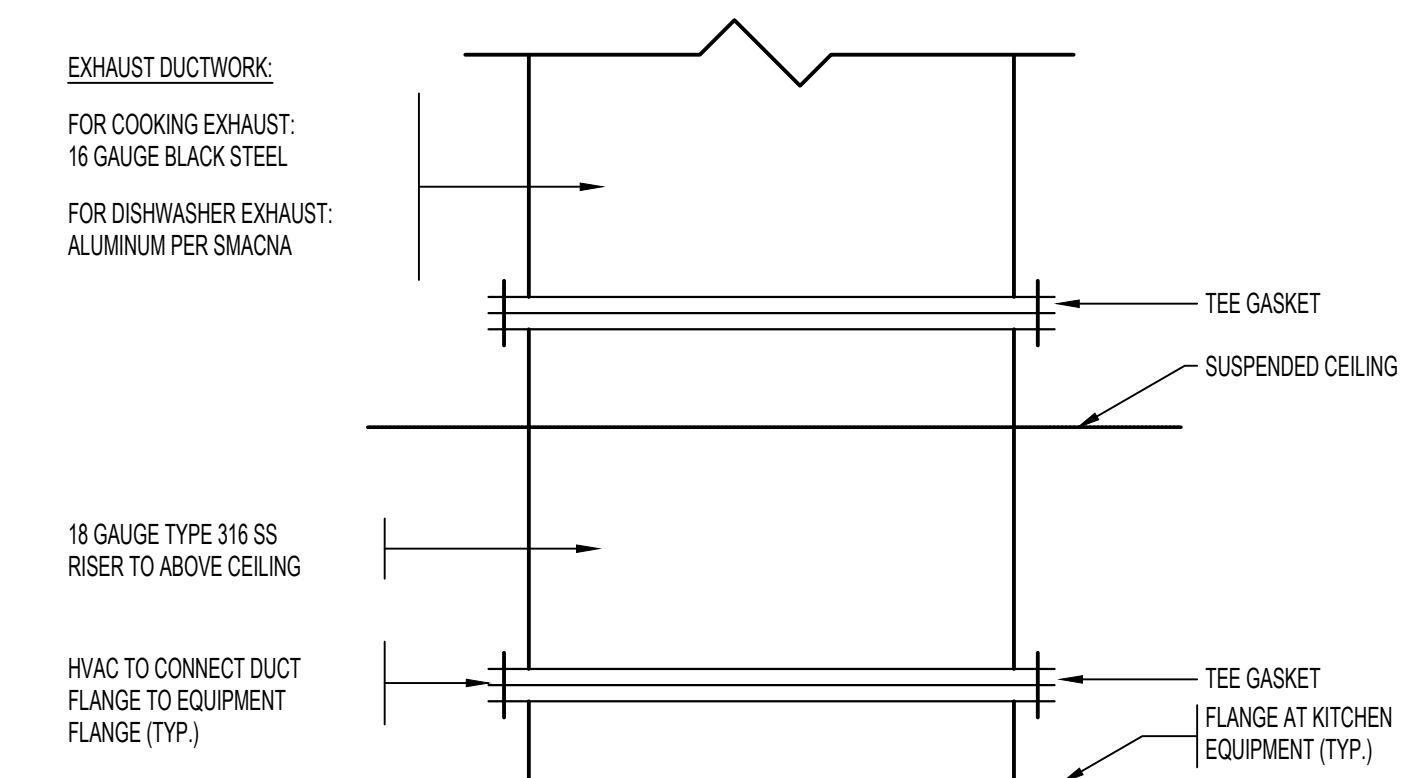
SMOKE DAMPER DETAIL
N.T.S.



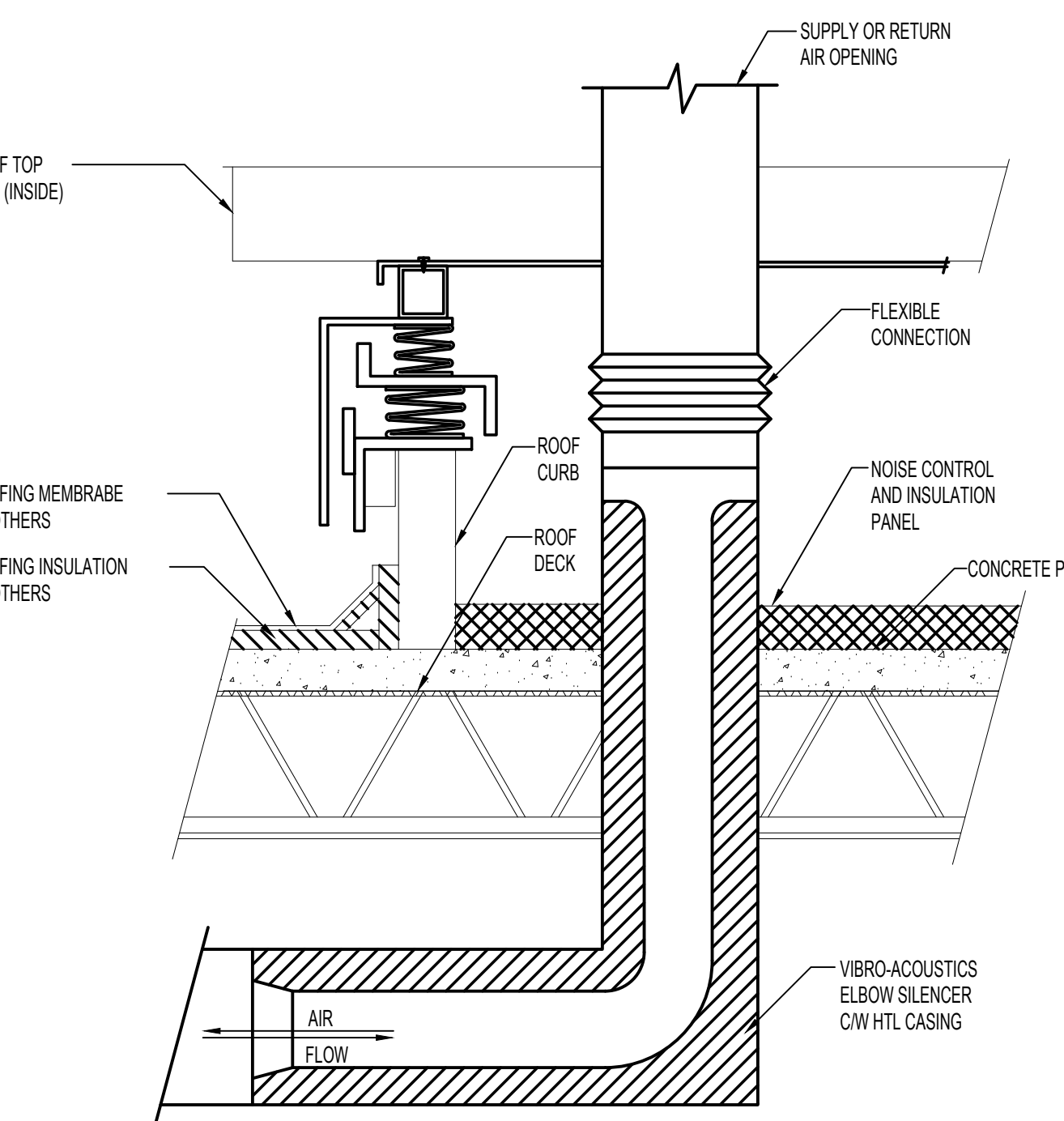
SMOKE AND FIRE DAMPER DETAIL
N.T.S.



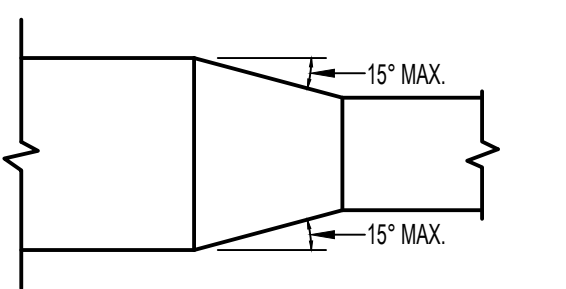
TYPICAL SUPPLY DIFFUSER OR RETURN REGISTER DETAIL
N.T.S.



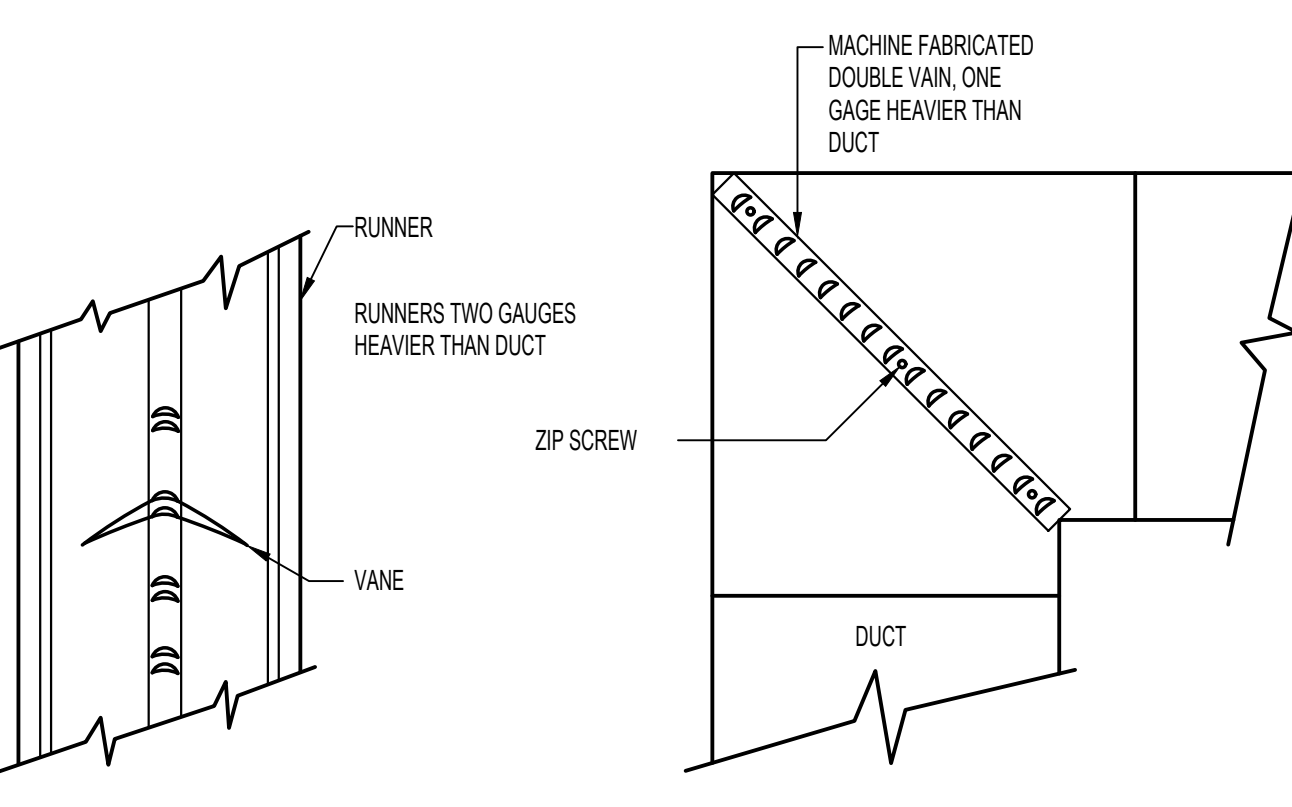
DUCTWORK CONNECTIONS AT KITCHEN EQUIPMENT
N.T.S.



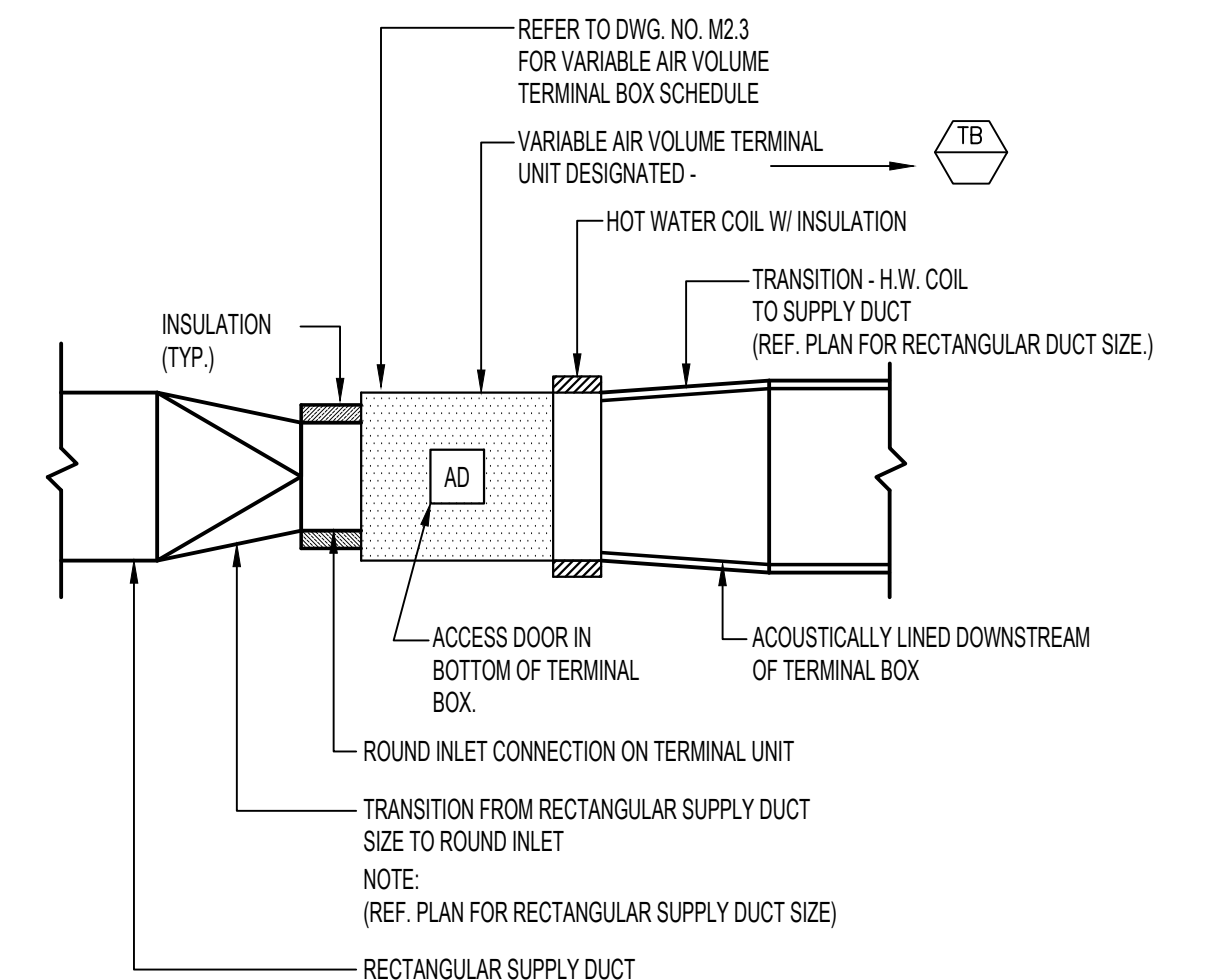
ELBOW SILENCER DETAIL
N.T.S.



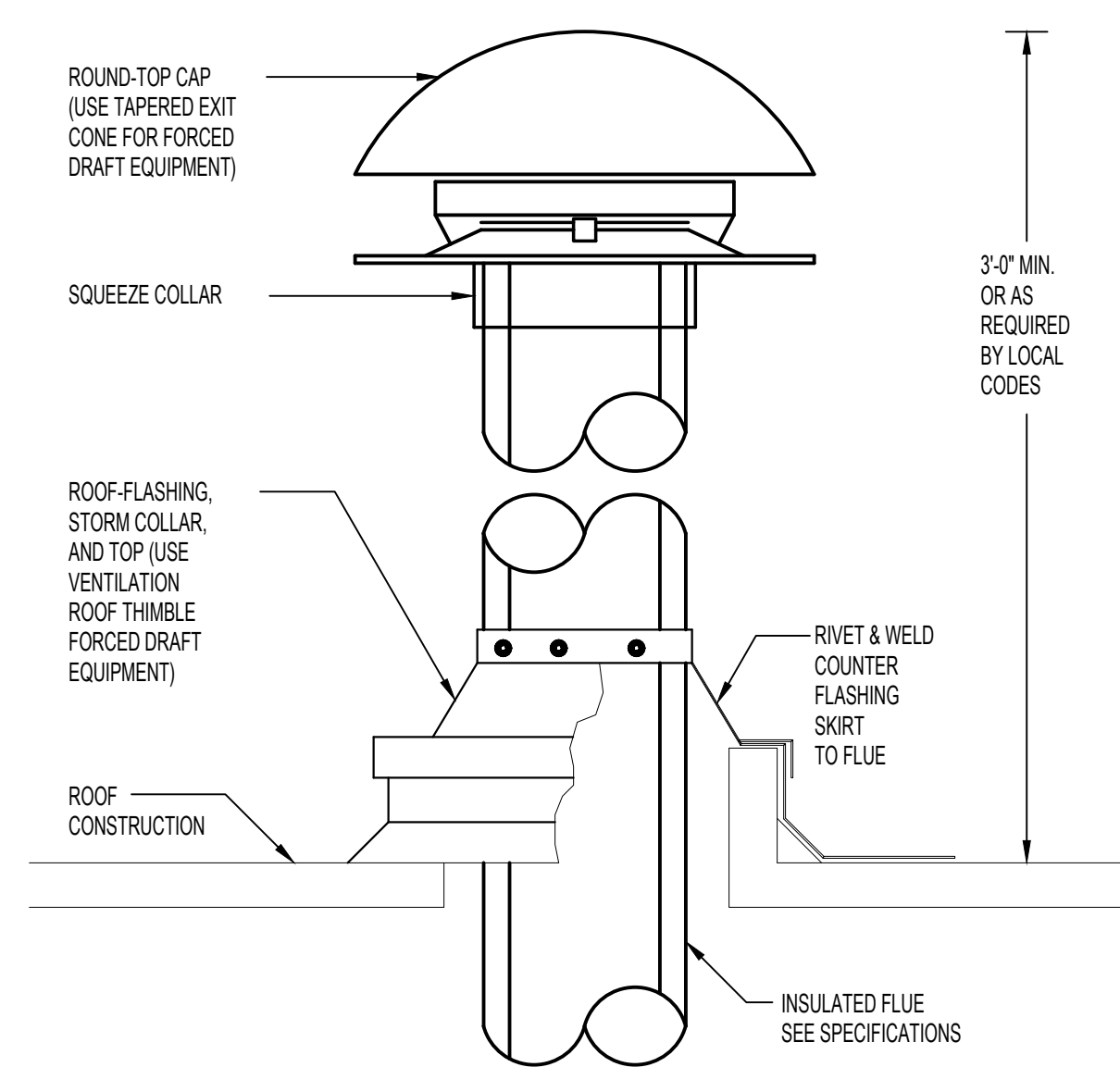
DUCT TRANSITION DETAIL
N.T.S.



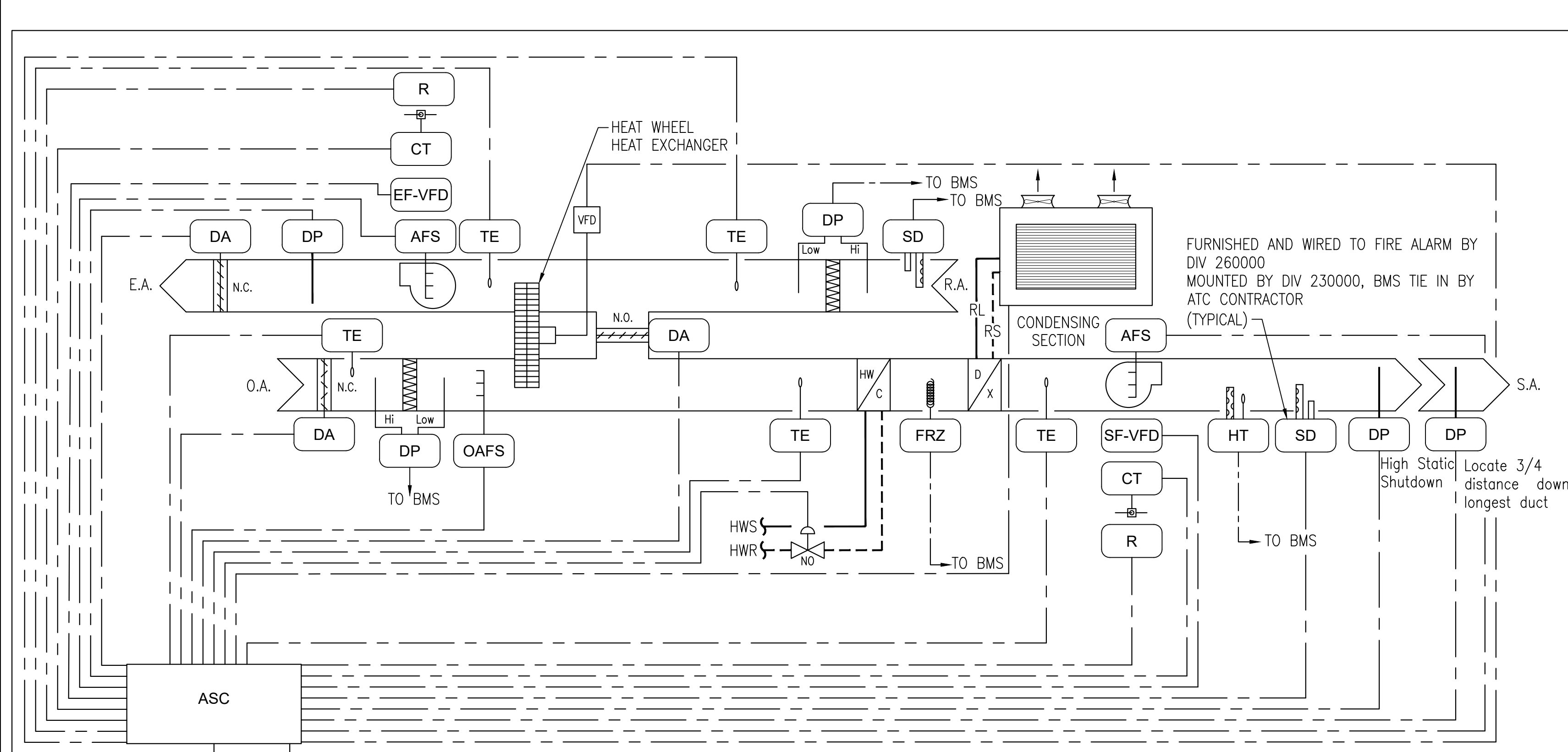
VANES FOR SQUARE ELBOWS DETAIL
N.T.S.



VARIABLE AIR VOLUME TERMINAL BOX DUCT CONN. DETAIL
N.T.S.



GAS FLUE PIPING ROOF PENETRATION DETAIL
N.T.S.



SEQUENCE OF OPERATION

Install NFPA approved smoke detectors, provided under Specifications Section 26 00 00, in each supply air and return air duct to each HVAC unit. The smoke detectors shall de-energize their respective units through direct hard wired relays and activate all audio/visual indicating devices on sensing smoke in the air stream.

Provide smoke dampers in the supply air and return air ductwork to all HVAC systems conveying 15,000 CFM or more. These dampers shall close on receiving a signal from the duct mounted smoke detectors and shall simultaneously de-energize the equipment.

Interlock with the integral return/exhaust fan serving the relevant space(s) such that the appropriate return/exhaust fan(s) enter the necessary operational cycle concurrently with their interlocked supply air fan(s).

Provide a static pressure controller two-thirds (2/3) of the distance downstream in the effectively longest duct run. The pressure sensor shall provide the error offset signal to its corresponding adjustable frequency AC drive P.I.D. controller. The controller shall adjust the drive output signal, varying the supply fan speed to maintain the proper system pressure.

The return/exhaust fan shall be modulated to track airflow as sensed by fan inlet air flow measuring stations (supply and return). The DDC system shall monitor supply CFM and calculate a return airflow set point by subtracting a fixed offset, which is difference between supply and return CFM (refer to equipment schedule). The calculated return air set point shall be maintained by modulating the speed of the return/exhaust air fan via its variable frequency drive, increasing fan speed on a drop in airflow as sensed by the air sensor.

Provide high static and low static pressure controllers at the supply fan and at the return/exhaust fan to stop the system and signal an alarm if limit conditions are exceeded.

Unit controls shall be compatible with BMS through BACnet, LON, or N2 connection as required to suit the automatic temperature control system.

Occupied/Unoccupied modes will be as scheduled through the operator's workstation.

Morning Warm-up:

- Morning warm-up shall be initiated by an optimum start algorithm based on outside air temperature. The optimum start algorithm shall be based on a straight line ramp function such that morning warm-up occurs 2 hour (adj.) prior to the occupied mode when outdoor air temp. is 0°F and 1/2 hour (adj.) prior to occupied mode when outdoor air temp is 60°F. Optimum start can be overridden at the OWS by manually scheduling the morning warm-up if preferred by facilities personnel.

- The supply fan shall run continuously, the exhaust fan shall be de-energized, the energy recover wheel shall be de-energized, the outside air damper and exhaust air damper shall be closed, and the recirculation damper shall be open.

The hot water control valve shall modulate open as directed by the duct mounted temperature sensor until the return air temperature reaches the occupied space temperature set point.

Heating Cycle - "Occupied":

- The supply and exhaust fan shall run continuously. The fresh air damper and exhaust air damper shall open. The recirculation damper shall close.
- The hot water control valve shall modulate as directed by the remote duct mounted temperature sensor to maintain a discharge air temperature of 60°F (adj.).

Heating Cycle - "Unoccupied":

- The supply fan shall run only upon demand from the setback set point controller, the exhaust fan and the energy recovery wheel shall remain de-energized. The fresh air damper and exhaust air damper shall remain closed and the recirculation damper shall remain open.
- The hot water control valve shall modulate as directed by the remote duct mounted temperature sensor to maintain a discharge air temperature of 60°F (adj.).
- Hot water control valve shall remain 30% open whenever unit is off and outdoor ambient temperature is below 38°F.

Freeze Protection cycle:

- Provide an automatic reset type freeze-stat at the discharge of the heating coil.
- On sensing a discharge air temperature of 35°F (adjustable) or below, the supply air fan and the return air fan shall be de-energized. The fresh air dampers and the exhaust air dampers shall close 100%, the return air dampers shall open 100% and all audio/visual alarm devices shall initiate.
- The heating coil shall receive full respective water flow until the air temperature sensed by the freeze-stat rises above the low limit temperature sensor set point. The automatic reset freeze-stat shall reset and the unit shall initialize to the appropriate sequence.
- The BMS shall limit the automatic reset function to a total of two "trips" and resets. Upon a third trip, the reset must be executed through the BMS.

Cooling Cycle - "Morning Cool-down":

- The energy recovery unit shall operate in the recirculation mode. The supply fan shall run continuously, the exhaust fan shall remain de-energized. The outside air damper and exhaust air damper shall be closed and the recirculation damper shall be open.
- Economizer control shall use outside air for cooling requirements on sensing that the ambient enthalpy meets the unit discharge demands (comparative). While in economizer mode, the heat wheel shall stop and the heat wheel bypass dampers (if equipped) shall open.
- On sensing that ambient air is not appropriate to meet the "cool-down" requirements, the remote duct mounted proportional signal temperature sensor shall initiate the condensing unit and stage the compressors as required to maintain a discharge air temperature of 55°F.

Cooling Cycle - "Occupied":

- The supply and exhaust fan shall run continuously. The fresh air damper and exhaust air damper shall open. The recirculation damper shall close.
- Economizer control shall use outside air for cooling requirements on sensing that the ambient enthalpy meets the unit discharge demands (comparative). While in economizer mode, the heat wheel shall stop and the heat wheel bypass dampers shall open.
- On sensing that ambient air is not appropriate to meet the "cooling" requirements, the remote duct mounted proportional signal temperature sensor shall initiate the condensing unit and stage the compressors as required to maintain a discharge air temperature of 55°F.

Cooling Cycle - "Unoccupied"

- The system shall remain de-energized. The fresh air damper and exhaust air damper shall remain 100% closed.

Heat Recovery Wheel - Variable Speed:

- The controller shall modulate the heat recovery wheel for energy recovery as follows.

Cooling Recovery Mode:

The controller shall measure the heat wheel discharge air temperature and modulate the heat wheel speed to maintain a setpoint 2°F (adj.) less than the unit supply air temperature setpoint. The heat wheel shall run for cool recovery whenever:

The unit return air temperature is 5°F (adj.) or more below the outside air temperature.
AND the unit is in a cooling mode.
AND the economizer (if present) is off.
AND the supply fan is on.

Heating Recovery Mode:

The controller shall measure the heat wheel discharge air temperature and modulate the heat wheel speed to maintain a setpoint 2°F (adj.) greater than the unit supply air temperature setpoint. The heat wheel shall run for heat recovery whenever:

The unit return air temperature is 5°F (adj.) or more above the outside air temperature.
AND the unit is in a heating mode.
AND the economizer (if present) is off.
AND the supply fan is on.

Periodic Self-Cleaning:

- The heat wheel shall run at 5% speed (adj.) for 10sec (adj.) every 4hr (adj.) the unit runs.

Frost Protection:

- The heat wheel shall run at 5% speed (adj.) whenever:
Outside air temperature drops below 15°F (adj.)
OR the exhaust air temperature drops below 20°F (adj.).
- Frost control is initiated when O.A. temperature drops below the set point and pressure drop across the wheel increases, which indicates frosting.
- When frosting is indicated, the factory mounted and wired pre-heater shall be energized to heat O.A. to energy wheel frost threshold.

Discharge Air Temperature Reset Control (Cooling Cycle, Occupied Mode):

- The ATC contractor shall furnish and install sensors and controls to enable space temperature based reset of discharge air temperature (adj.) to prevent sub-cooling of spaces.
- The Building Management System sense return air temperature and shall reset the supply air temperature set point according to the straight line ramp function defined herein:

Return Air Temp.	Supply Air Temp. Set Point
75F	55F (adj.)
70F	60F (adj.)

Static Pressure Reset Control:

- ATC contractor shall provide static pressure reset control which shall reset the discharge static pressure set point when facility is in unoccupied mode and terminal box dampers are closed. During unoccupied mode, unit supply static pressure set point shall be reset from maximum setting established during balancing (typically 2.0" max. adj.) down to 0.5" (adj.).

Emergency Power Operation:

- Exhaust fan and DX cooling lockout on emergency power: Upon switch over to emergency power, the exhaust fan and DX cooling shall be de-energized, the return air damper shall open 100%, the exhaust damper and outside air dampers shall close 100%.

Static Safeties:

- High static pressure safety will stop supply and return fans, close outdoor/exhaust dampers and open heating coil valve if during the pressure rises above set point. The set point is adjustable at the device. A manual reset is required at the device to restart the unit.
- Low static pressure safety will stop supply and return fans, close outdoor/exhaust dampers and open heating coil valve 100% when pressure drops below set point. The set point is adjustable at the device. A manual reset is required at the device to restart the unit.

Alarms: The following alarms will announce at the workstation:

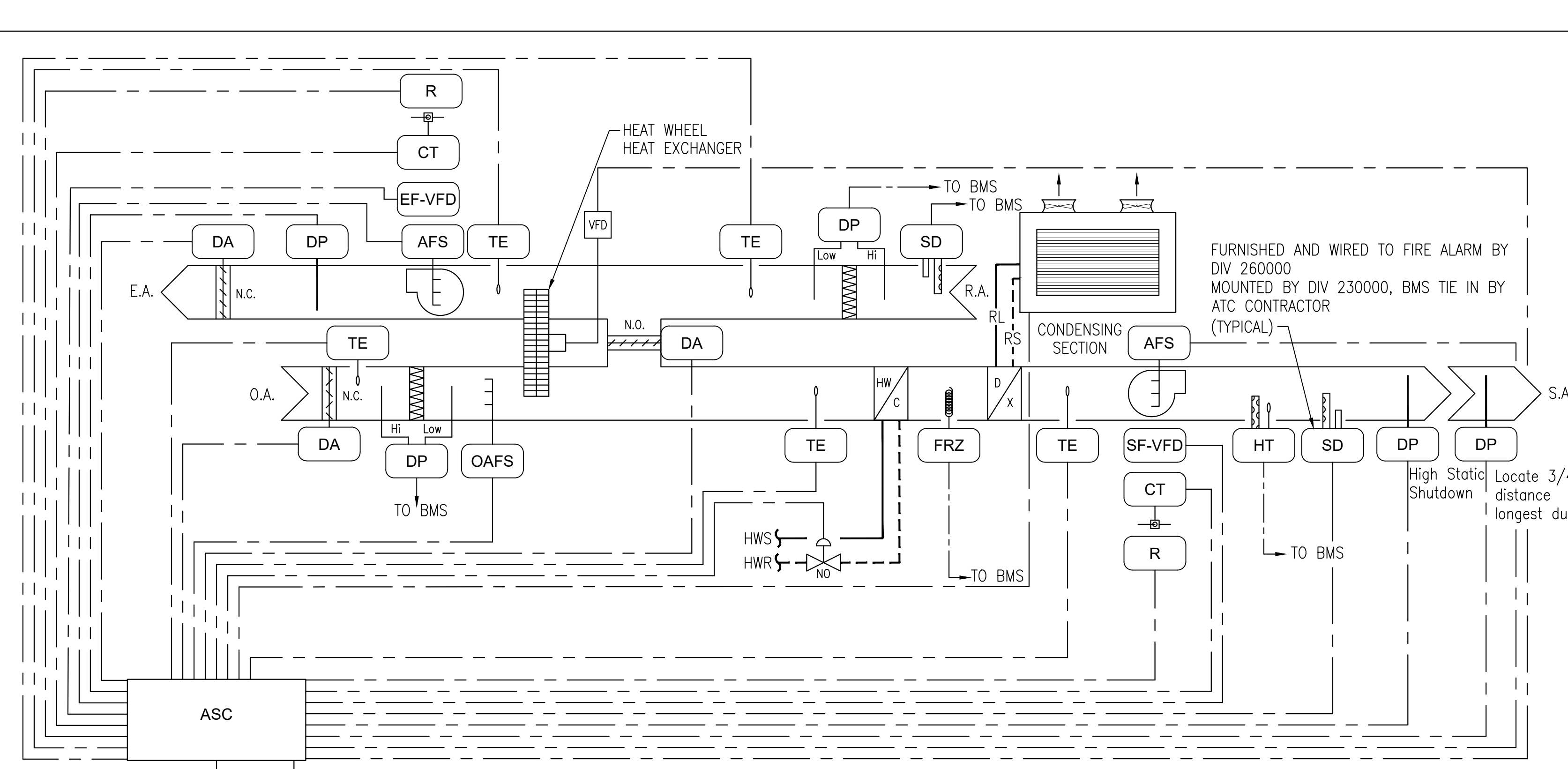
- If the supply or exhaust fan status is not indicated within 30sec of start command, a fan failure alarm is generated.
- If filter differential pressure exceeds the normal pressure setting for the rooftop unit's filters, a dirty filter alarm is generated.
- Low temperature detector below 35°F.
- Low static pressure safeties. If the supply air static pressure is 25% (adj.) less than setpoint.
- High static pressure safeties. If the supply air static pressure is 25% (adj.) greater than setpoint.
- Discharge air temperature is +/- 5°F form set point during occupied mode.
- High Zone Carbon Dioxide Concentration: If the highest zone CO2 concentration is greater than 1000 ppm (adj.).

Unoccupied Override:

- If during the unoccupied mode of the facility, an override button on a thermostat(s) associated with this rooftop unit is activated, the unit shall temporarily return to the occupied mode for the pre-programmed amount of time, typically 2 hours (adj.).

Demanded load shedding:

- Upon activation one lag compressor shall be locked out reducing the potential power consumption of the unit.
- Once reactivated unit shall return to normal operation.



SEQUENCE OF OPERATION

Install NFPA approved smoke detectors, provided under Specifications Section 26 00 00, in each supply air and return air duct to each HVAC unit. The smoke detectors shall de-energize their respective units through direct hard wired relays and activate all audio/visual indicating devices on sensing smoke in the air stream.

Provide smoke dampers in the supply air and return air ductwork to all HVAC systems conveying 15,000 CFM or more. These dampers shall close on receiving a signal from the duct mounted smoke detectors and shall simultaneously de-energize the equipment.

Interlock with the integral return/exhaust fan serving the relevant space(s) such that the appropriate return/exhaust fan(s) enter the necessary operational cycle concurrently with their interlocked supply air fan(s).

Provide a static pressure controller two-thirds (2/3) of the distance downstream in the effectively longest duct run. The pressure sensor shall provide the error offset signal to its corresponding adjustable frequency AC drive P.I.D. controller. The controller shall adjust the drive output signal, varying the supply fan speed to maintain the proper system pressure.

The return/exhaust fan shall be modulated to track airflow as sensed by fan inlet air flow measuring stations (supply and return). The DDC system shall monitor supply CFM and calculate a return airflow set point by subtracting a fixed offset, which is difference between supply and return CFM (refer to equipment schedule). The calculated return air set point shall be maintained by modulating the speed of the return/exhaust air fan via its variable frequency drive, increasing fan speed on a drop in airflow as sensed by the air sensor.

Provide high static and low static pressure controllers at the supply fan and at the return/exhaust fan to stop the system and signal an alarm if limit conditions are exceeded.

Unit controls shall be compatible with BMS through BACnet, LON, or N2 connection as required to suit the automatic temperature control system.

Occupied/Unoccupied modes will be as scheduled through the operator's workstation.

Morning Warm-up:

- Morning warm-up shall be initiated by an optimum start algorithm based on outside air temperature. The optimum start algorithm shall be based on a straight line ramp function such that morning warm-up occurs 2 hour (adj.) prior to the occupied mode when outdoor air temp. is 0°F and 1/2 hour (adj.) prior to occupied mode when outdoor air temp is 60°F. Optimum start can be overridden at the OWS by manually scheduling the morning warm-up if preferred by facilities personnel.

- The supply fan shall run continuously, the exhaust fan shall be de-energized, the energy recover wheel shall be de-energized, the outside air damper and exhaust air damper shall be closed, and the recirculation damper shall be open.

The hot water control valve shall modulate open as directed by the remote space mounted temperature sensor until the return air temperature reaches the "occupied" space temperature set point.

Heating Cycle - "Occupied":

- The supply and exhaust fan shall run continuously. The fresh air damper and exhaust air damper shall modulate open to min position. The recirculation damper shall modulate close to match exhaust and fresh air position.
- The hot water control valve shall modulate as directed by the remote duct mounted temperature sensor to maintain a discharge air temperature of 60°F (adj.).

Heating Cycle - "Unoccupied":

- The supply fan shall run only upon demand from the setback set point controller, the exhaust fan and the energy recovery wheel shall remain de-energized. The fresh air damper and exhaust air damper shall remain closed and the recirculation damper shall remain open.
- The hot water control valve shall modulate as directed by the remote duct mounted temperature sensor to maintain a discharge air temperature of 60°F (adj.).
- Hot water control valve shall remain 30% open whenever unit is off and outdoor ambient temperature is below 38°F.

Freeze Protection cycle:

- Provide an automatic reset type freeze-stat at the discharge of the heating coil.
- On sensing a discharge air temperature of 35°F (adjustable) or below, the supply air fan and the return air fan shall be de-energized. The fresh air dampers and the exhaust air dampers shall close 100%, the return air dampers shall open 100% and all audio/visual alarm devices shall initiate.
- The heating coil shall receive full respective water flow until the air temperature sensed by the freeze-stat rises above the low limit temperature sensor set point. The automatic reset freeze-stat shall reset and the unit shall initialize to the appropriate sequence.
- The BMS shall limit the automatic reset function to a total of two "trips" and resets. Upon a third trip, the reset must be executed through the BMS.

Cooling Cycle - "Morning Cool-down":

- The energy recovery unit shall operate in the recirculation mode. The supply fan shall run continuously, the exhaust fan shall remain de-energized. The outside air damper and exhaust air damper shall be closed and the recirculation damper shall be open.
- Economizer control shall use outside air for cooling requirements on sensing that the ambient enthalpy meets the unit discharge demands (comparative). While in economizer mode, the heat wheel shall stop and the heat wheel bypass dampers shall open.
- On sensing that ambient air is not appropriate to meet the "cool-down" requirements, the remote duct mounted proportional signal temperature sensor shall initiate the condensing unit and stage the compressors as required to maintain a discharge air temperature of 55°F.

Cooling Cycle - "Occupied":

- The supply and exhaust fan shall run continuously. The fresh air damper and exhaust air damper shall modulate open to min position. The recirculation damper shall modulate close to match exhaust and fresh air position.
- Economizer control shall use outside air for cooling requirements on sensing that the ambient enthalpy meets the unit discharge demands (comparative). While in economizer mode, the heat wheel shall stop and the heat wheel bypass dampers shall open.
- On sensing that ambient air is not appropriate to meet the "cooling" requirements, the remote duct mounted proportional signal temperature sensor shall initiate the condensing unit and stage the compressors as required to maintain a discharge air temperature of 55°F.

Cooling Cycle - "Unoccupied"

- The system shall remain de-energized. The fresh air damper and exhaust air damper shall remain 100% closed.

Heat Recovery Wheel - Variable Speed:

- The controller shall modulate the heat recovery wheel for energy recovery as follows.

Cooling Recovery Mode:

The controller shall measure the heat wheel discharge air temperature and modulate the heat wheel speed to maintain a setpoint 2°F (adj.) less than the unit supply air temperature setpoint. The heat wheel shall run for cool recovery whenever:

The unit return air temperature is 5°F (adj.) or more below the outside air temperature.
AND the unit is in a cooling mode.
AND the economizer (if present) is off.
AND the supply fan is on.

Heating Recovery Mode:

The controller shall measure the heat wheel discharge air temperature and modulate the heat wheel speed to maintain a setpoint 2°F (adj.) greater than the unit supply air temperature setpoint. The heat wheel shall run for heat recovery whenever:

The unit return air temperature is 5°F (adj.) or more above the outside air temperature.
AND the unit is in a heating mode.
AND the economizer (if present) is off.
AND the supply fan is on.

Periodic Self-Cleaning:

- The heat wheel shall run at 5% speed (adj.) for 10sec (adj.) every 4hr (adj.) the unit runs.

Frost Protection:

- The heat wheel shall run at 5% speed (adj.) whenever:
Outside air temperature drops below 15°F (adj.)
OR the exhaust air temperature drops below 20°F (adj.).
- Frost control is initiated when O.A. temperature drops below the set point and pressure drop across the wheel increases, which indicates frosting.
- When frosting is indicated, the factory mounted and wired pre-heater shall be energized to heat O.A. to energy wheel frost threshold.

Discharge Air Temperature Reset Control (Cooling Cycle, Occupied Mode):

- The ATC contractor shall furnish and install sensors and controls to enable space temperature based reset of discharge air temperature (adj.) to prevent sub-cooling of spaces.
- The Building Management System sense return air temperature and shall reset the supply air temperature set point according to the straight line ramp function defined herein:

Return Air Temp.	Supply Air Temp. Set Point
75F	55F (adj.)
70F	60F (adj.)

Static Pressure Reset Control:

- ATC contractor shall provide static pressure reset control which shall reset the discharge static pressure set point when facility is in unoccupied mode and terminal box dampers are closed. During unoccupied mode, unit supply static pressure set point shall be reset from maximum setting established during balancing (typically 2.0" max. adj.) down to 0.5" (adj.).

Frost Control:

- Frost control is initiated when O.A. temperature drops below the set point and pressure drop across the wheel increases, which indicates frosting.
- When frosting is indicated, the factory mounted and wired pre-heater shall be energized to heat O.A. to energy wheel frost threshold.

Emergency Power Operation:

- Return fan lockout on emergency power: Upon switch over to emergency power, the return fan shall be de-energized, the return air damper shall open 100%, the exhaust damper and outside air dampers shall close 100%.

Static Safeties:

- High static pressure safety will stop supply and return fans, close outdoor/exhaust dampers and open heating coil valve 100% when pressure rises above set point. The set point is adjustable at the device. A manual reset is required at the device to restart the unit.
- Low static pressure safety will stop supply and return fans, close outdoor/exhaust dampers and open heating coil valve 100% when pressure drops below set point. The set point is adjustable at the device. A manual reset is required at the device to restart the unit.

Alarms: The following alarms will announce at the workstation:

- If the supply or exhaust fan status is not indicated within 30sec of start command, a fan failure alarm is generated.
- If filter differential pressure exceeds the normal pressure setting for the rooftop unit's filters, a dirty filter alarm is generated.
- Low temperature detector below 35°F.
- Low static pressure safeties. If the supply air static pressure is 25% (adj.) less than setpoint.
- High static pressure safeties. If the supply air static pressure is 25% (adj.) greater than setpoint.
- Discharge air temperature is +/- 5°F form set point during occupied mode.
- High Zone Carbon Dioxide Concentration: If the highest zone CO2 concentration is greater than 1000 ppm (adj.).

Unoccupied Override:

- Upon activation one lag compressor shall be locked out reducing the potential power consumption of the unit.
- Once reactivated unit shall return to normal operation.



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KEYNOTE LEGEND:

100% CONSTRUCTION DOCUMENTS

KEY PLAN NORTH ARROW

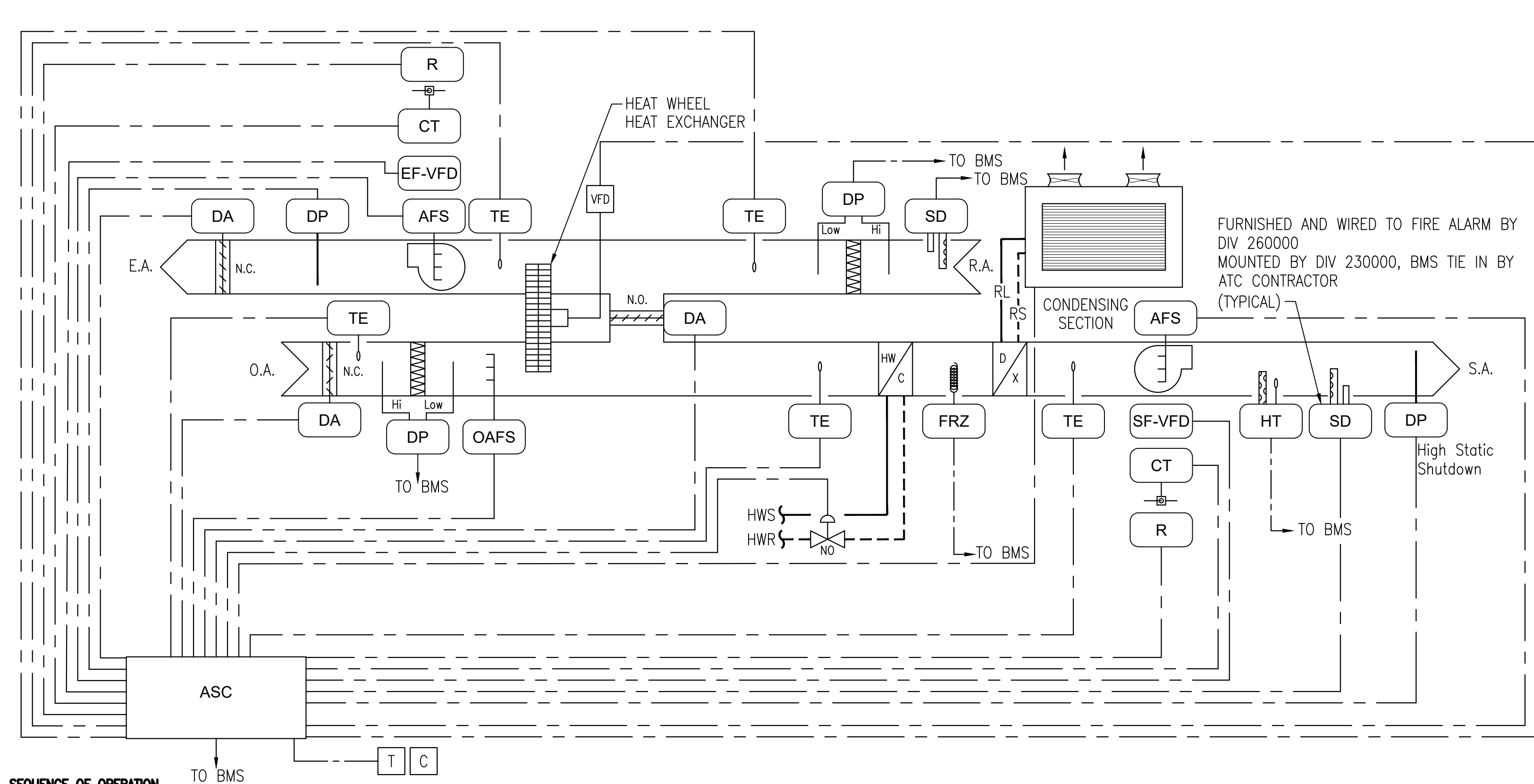
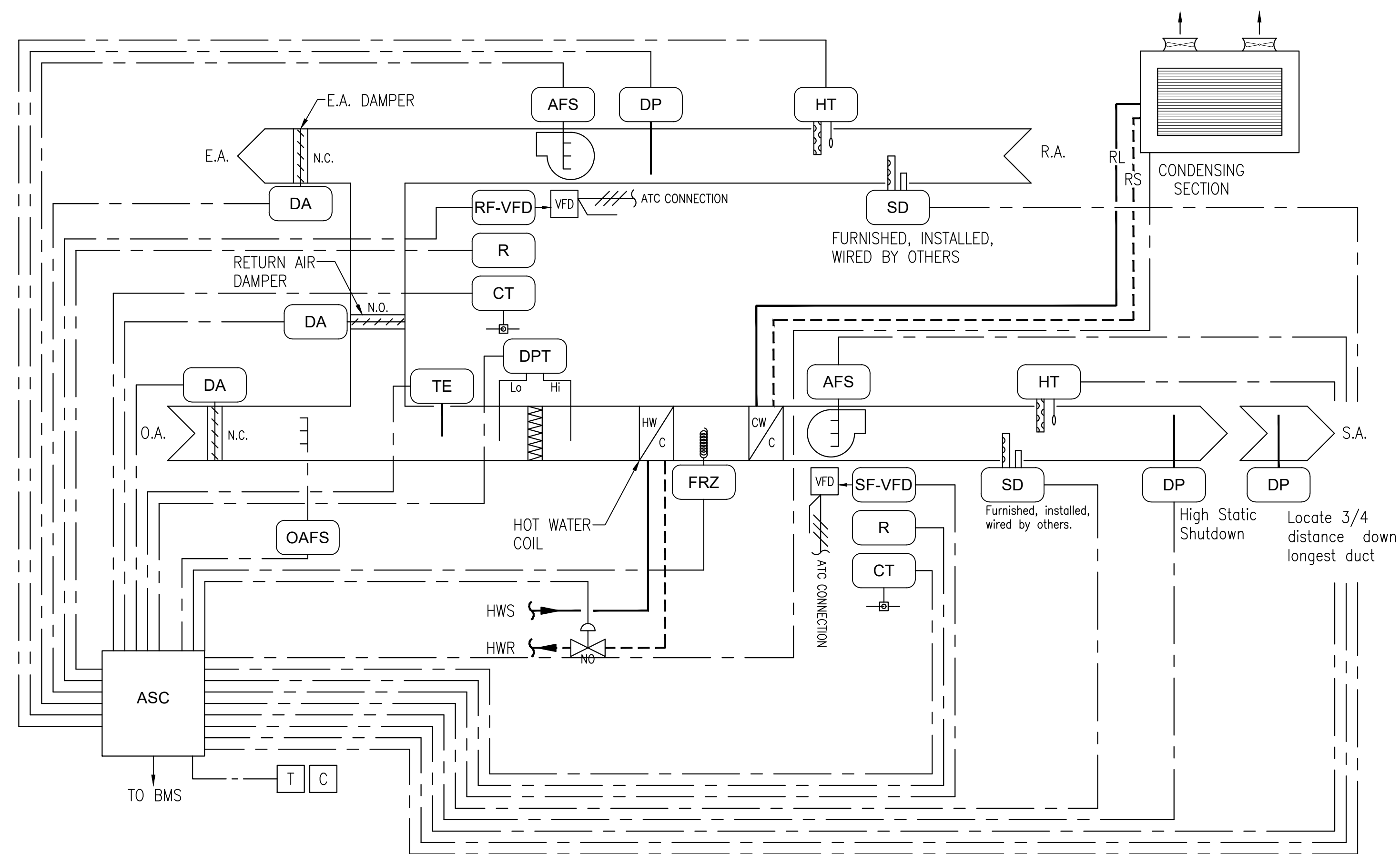
KEYPLAN

DRAWING NAME:
MECHANICAL CONTROL SEQUENCES

DRAWN BY: AP
REVIEWED BY: DAH
SCALE: NONE | DRAWING NUMBER:
JOB NO.: 2202.00
DATE: OCTOBER 13, 2023 | **M7.01**

**100% OA VAV ROOFTOP UNIT W/ENERGY RECOVERY
HOT WATER HEATING & DX COOLING (RTU-1 AND 2)**

**MIXED AIR VAV ROOFTOP UNIT W/ENERGY RECOVERY
HOT WATER HEATING & DX COOLING (RTU-4,6 AND 9)**



SEQUENCE OF OPERATION

Install NFPA approved smoke detectors, provided under Specifications Section 26 00 00, in each supply air and return air duct to each HVAC unit. The smoke detectors shall de-energize their respective units through direct hard wired relays and activate all audio/visual indicating devices on sensing smoke in the air stream.

Provide smoke dampers in the supply air and return air ductwork to all HVAC systems conveying 15,000 CFM or more. These dampers shall close on receiving a signal from the duct mounted smoke detectors and shall simultaneously de-energize the equipment.

Interlock with the integral return/exhaust fan serving the relevant space(s) such that the appropriate return/exhaust fan(s) enter the necessary operational cycle concurrently with their interlocked supply air fan(s).

Provide a static pressure controller two-thirds (2/3) of the distance downstream in the effectively longest duct run. The pressure sensor shall provide the error offset signal to its corresponding adjustable frequency AC drive P.I.D. controller. The controller shall adjust the drive output signal, varying the supply fan speed to maintain the proper system pressure.

The return fan shall be modulated to track airflow as sensed by fan inlet air flow measuring stations (supply and return). The DDC system shall monitor supply CFM and calculate a return airflow set point by subtracting a fixed offset, which is difference between supply and return CFM (refer to equipment schedule). The calculated return air set point shall be maintained by modulating the speed of the return air fan via its variable frequency drive, increasing fan speed on a drop in airflow as sensed by the air sensor.

Provide high static and low static pressure controllers at the supply fan and at the return/exhaust fan to stop the system and signal an alarm if limit conditions are exceeded.

Occupied/Unoccupied modes will be as scheduled through the operator's workstation.

Morning Warm-up:

- Morning warm-up shall be initiated by an optimum start algorithm based on outside air temperature. The optimum start algorithm shall be based on a straight line ramp function such that morning warm-up occurs 2 hour (adj.) prior to the occupied mode when outdoor air temp. is 0°F and ½ hour (adj.) prior to occupied mode when outdoor air temp is 60°F. Optimum start can be overridden at the OWS by manually scheduling the morning warm-up if preferred by facilities personnel.
- The supply fan shall run continuously, the exhaust fan shall be de-energized, the outside air damper and exhaust air damper shall be closed, and the recirculation damper shall be open.
- The hot water control valve shall modulate open as directed by the remote space mounted temperature sensor until the return air temperature reaches the occupied space temperature set point.

Heating Cycle - "Occupied":

- The supply and exhaust fan shall run continuously. The fresh air damper and exhaust air damper shall modulate open to min position. The recirculation damper shall modulate close to match exhaust and fresh air position.
- The hot water control valve shall modulate as directed by the remote duct mounted temperature sensor to maintain a discharge air temperature of 85°F (adj.).

Heating Cycle - "Unoccupied":

- The supply fan shall run only upon demand from the setback set point controller, the exhaust fan and the energy recovery wheel shall remain de-energized. The fresh air damper and exhaust air damper shall remain closed and the recirculation damper shall remain open.
- The hot water control valve shall modulate as directed by the remote duct mounted temperature sensor to maintain a discharge air temperature of 60°F (adj.).
- Hot water control valve shall remain 30% open whenever unit is off and outdoor ambient temperature is below 38°F.

Freeze Protection Cycle:

- Provide an automatic reset type freeze-stat at the discharge of the heating coil.
- On sensing a discharge air temperature of 35°F (adjustable) or below, the supply air fan and the return air fan shall be de-energized. The fresh air dampers and the exhaust air dampers shall close 100%, the return air dampers shall open 100% and all audio/visual alarm devices shall initiate.
- The heating coil shall receive full respective water flow until the air temperature sensed by the freeze-stat rises above the low limit temperature sensor set point. The automatic reset freeze-stat shall reset and the unit shall initialize to the appropriate sequence.
- The BMS shall limit the automatic reset function to a total of two "trips" and resets. Upon a third trip, the reset must be executed through the BMS.

Cooling Cycle - "Morning Cool-down":

- The unit shall operate in the recirculation mode. The supply fan shall run continuously, the exhaust fan shall remain de-energized. The outside air damper and exhaust air damper shall be closed and the recirculation damper shall be open.
- Economizer control shall use outside air for cooling requirements on sensing that the ambient enthalpy meets the unit discharge demands (comparative). While in economizer mode, the heat wheel shall stop and the heat wheel bypass dampers shall open.
- On sensing that ambient air is not appropriate to meet the "cool-down" requirements, the remote duct mounted proportional signal temperature sensor shall initiate the condensing unit and stage the compressors as required to maintain a discharge air temperature of 55°F.

Cooling Cycle - "Occupied":

- The supply and exhaust fan shall run continuously. The fresh air damper and exhaust air damper shall modulate open to min position. The recirculation damper shall modulate close to match exhaust and fresh air position.
- Economizer control shall use outside air for cooling requirements on sensing that the ambient enthalpy meets the unit discharge demands (comparative). While in economizer mode, the heat wheel shall stop and the heat wheel bypass dampers shall open.
- On sensing that ambient air is not appropriate to meet the "cooling" requirements, the remote duct mounted proportional signal temperature sensor shall initiate the condensing unit and stage the compressors as required to maintain a discharge air temperature of 55°F.

Freeze Protection Cycle:

- Provide an automatic reset type freeze-stat at the discharge of the heating coil.
- On sensing a discharge air temperature of 35°F (adjustable) or below, the supply air fan and the return air fan shall be de-energized. The fresh air dampers and the exhaust air dampers shall close 100%, the return air dampers shall open 100% and all audio/visual alarm devices shall initiate.
- The heating coil(s) shall receive full hot water flow until the air temperature sensed by the freeze-stat rises above the low limit temperature sensor set point. The automatic reset freeze-stat shall reset and the unit shall initialize to the appropriate sequence.
- The BMS shall limit the automatic reset function to a total of two "trips" and resets. Upon a third trip, the reset must be executed through the BMS.

Discharge Air Temperature Reset Control (Cooling Cycle, Occupied Mode):

- The ATC contractor shall furnish and install sensors and controls to enable space temperature based reset of discharge air temperature (adj.) to prevent sub-cooling of spaces.
- The Building Management System sense return air temperature and shall reset the supply air temperature set point according to the straight line ramp function defined herein:

Return Air Temp.	Supply Air Temp. Set Point
75°F	55°F (adj.)
70°F	60°F (adj.)

Static Pressure Reset Control:

- ATC contractor shall provide static pressure reset control which shall reset the discharge static pressure set point when facility is in unoccupied mode and terminal box dampers are closed. During unoccupied mode, unit supply static pressure set point shall be reset from maximum setting established during balancing (typically 2.0" max. adj.) down to 0.5" (adj.).

Frost Control:

- Frost control is initiated when O.A. temperature drops below the set point and pressure drop across the wheel increases, which indicates frosting.
- When frosting is indicated, the factory mounted and wired pre-heater shall be energized to heat O.A. to energy wheel frost threshold.

Demand Controlled Ventilation:

- Furnish and install a CO2 sensor in the return air duct which shall, through the DDC system modulate the outdoor air, return air and exhaust air dampers in response to the CO2 level in the space.
- RTU-6 outside air damper position shall be overridden upon activation of kitchen hood. Damper position shall modulate to main make up air. MAX cfm 3700. EF/RF shall modulate based on kitchen exhaust fan speed.

Emergency Power Operation:

- Return fan lockout on emergency power: Upon switch over to emergency power, the return fan shall be de-energized, the return air damper shall open 100%, the exhaust damper and outside air dampers shall close 100%.

Static Safeties: Return duct low static pressure safety will stop supply and return fans, close outdoor/exhaust dampers and open heating coil valve 100% when pressure drops below set point. The set point is adjustable at the device. A manual reset is required at the device to restart the unit.

Alarms: The following alarms will annunciate at the workstation:

- If the supply or return fan status is not indicated within 30sec of start command, a fan failure alarm is generated.
- If filter differential pressure exceeds the normal pressure setting for the rooftop unit's filters, a dirty filter alarm is generated.
- Low temperature detector below 35°F.
- Low static pressure safeties.
- High static pressure safeties.
- Discharge air temperature is +/- 5°F form set point during occupied mode.

Unoccupied Override:

- If during the unoccupied mode of the facility, an override button on a thermostat(s) associated with this rooftop unit is activated, the unit shall temporarily return to the occupied mode for the pre-programmed amount of time, typically 2 hours (adj.).

Demand load shedding:

- Upon activation one lag compressor shall be locked out, reducing the potential power consumption of the unit.
- Once reactivated unit shall return to normal operation.

SEQUENCE OF OPERATION

Install NFPA approved smoke detectors, provided under Specifications Section 26 00 00, in each supply air and return air duct to each HVAC unit. The smoke detectors shall de-energize their respective units through direct hard wired relays and activate all audio/visual indicating devices on sensing smoke in the air stream.

Provide smoke dampers in the supply air and return air ductwork to all HVAC systems conveying 15,000 CFM or more. These dampers shall close on receiving a signal from the duct mounted smoke detectors and shall simultaneously de-energize the equipment.

Interlock with the integral return/exhaust fan serving the relevant space(s) such that the appropriate return/exhaust fan(s) enter the necessary operational cycle concurrently with their interlocked supply air fan(s).

The return/exhaust fan shall be modulated to track airflow as sensed by fan inlet air flow measuring stations (supply and return). The DDC system shall monitor supply CFM and calculate a return airflow set point by subtracting a fixed offset, which is difference between supply and return CFM (refer to equipment schedule). The calculated return air set point shall be maintained by modulating the speed of the return/exhaust air fan via its variable frequency drive, increasing fan speed on a drop in airflow as sensed by the air sensor.

Provide high static and low static pressure controllers at the supply fan and at the return/exhaust fan to stop the system and signal an alarm if limit conditions are exceeded.

Unit controls shall be compatible with BMS through BACnet, LON, or N2 connection as required to suit the automatic temperature control system.

Occupied/Unoccupied modes will be as scheduled through the operator's workstation.

Morning Warm-up:

- Morning warm-up shall be initiated by an optimum start algorithm based on outside air temperature. The optimum start algorithm shall be based on a straight line ramp function such that morning warm-up occurs 2 hour (adj.) prior to the occupied mode when outdoor air temp. is 0°F and ½ hour (adj.) prior to occupied mode when outdoor air temp is 60°F. Optimum start can be overridden at the OWS by manually scheduling the morning warm-up if preferred by facilities personnel.
- The supply fan shall run continuously, the exhaust fan shall be de-energized, the energy recover wheel shall be de-energized, the outside air damper and exhaust air damper shall be closed, and the recirculation damper shall be open.
- The hot water control valve shall modulate open as directed by the remote space mounted temperature sensor until the return air temperature reaches the "occupied" space temperature set point.

Heating Cycle - "Occupied":

- The supply and exhaust fan shall run continuously. The fresh air damper and exhaust air damper shall modulate open to min position. The recirculation damper shall modulate close to match exhaust and fresh air position.
- The hot water control valve shall modulate as directed by the remote duct mounted temperature sensor to maintain a discharge air temperature of 85°F (adj.).

Heating Cycle - "Unoccupied":

- The supply fan shall run only upon demand from the setback set point controller, the exhaust fan and the energy recovery wheel shall remain de-energized. The fresh air damper and exhaust air damper shall remain closed and the recirculation damper shall remain open.
- The hot water control valve shall modulate as directed by the remote duct mounted temperature sensor to maintain a discharge air temperature of 60°F (adj.).
- Hot water control valve shall remain 30% open whenever unit is off and outdoor ambient temperature is below 38°F (adj.).

Freeze Protection Cycle:

- Provide an automatic reset type freeze-stat at the discharge of the heating coil.
- On sensing a discharge air temperature of 35°F (adjustable) or below, the supply air fan and the return air fan shall be de-energized. The fresh air dampers and the exhaust air dampers shall close 100%, the return air dampers shall open 100% and all audio/visual alarm devices shall initiate.
- The heating coil shall receive full respective water flow until the air temperature sensed by the freeze-stat rises above the low limit temperature sensor set point. The automatic reset freeze-stat shall reset and the unit shall initialize to the appropriate sequence.
- The BMS shall limit the automatic reset function to a total of two "trips" and resets. Upon a third trip, the reset must be executed through the BMS.

Cooling Cycle - "Morning Cool-down":

- The energy recovery unit shall operate in the recirculation mode. The supply fan shall run continuously, the exhaust fan shall remain de-energized. The outside air damper and exhaust air damper shall be closed and the recirculation damper shall be open.
- Economizer control shall use outside air for cooling requirements on sensing that the ambient enthalpy meets the unit discharge demands (comparative). While in economizer mode, the heat wheel shall stop and the heat wheel bypass dampers shall open.
- On sensing that ambient air is not appropriate to meet the "cool-down" requirements, the remote duct mounted proportional signal temperature sensor shall initiate the condensing unit and stage the compressors as required to maintain a discharge air temperature of 55°F.

Cooling Cycle - "Occupied":

- The supply and exhaust fan shall run continuously. The fresh air damper and exhaust air damper shall modulate open to min position. The recirculation damper shall modulate close to match exhaust and fresh air position.
- Economizer control shall use outside air for cooling requirements on sensing that the ambient enthalpy meets the unit discharge demands (comparative). While in economizer mode, the heat wheel shall stop and the heat wheel bypass dampers shall open.
- On sensing that ambient air is not appropriate to meet the "cooling" requirements, the remote duct mounted proportional signal temperature sensor shall initiate the condensing unit and stage the compressors as required to maintain a discharge air temperature of 55°F.

Cooling Cycle - "Unoccupied"

- The system shall remain de-energized. The fresh air damper and exhaust air damper shall remain 100% closed.

Heat Recovery Wheel - Variable Speed:

- The controller shall modulate the heat recovery wheel for energy recovery as follows.

Cooling Recovery Mode:

The controller shall measure the heat wheel discharge air temperature and modulate the heat wheel speed to maintain a setpoint 2°F (adj.) less than the unit supply air temperature setpoint. The heat wheel shall run for cool recovery whenever:

- The unit return air temperature is 5°F (adj.) or more below the outside air temperature. AND the unit is in a cooling mode. AND the economizer (if present) is off. AND the supply fan is on.

Heating Recovery Mode:

The controller shall measure the heat wheel discharge air temperature and modulate the heat wheel speed to maintain a setpoint 2°F (adj.) greater than the unit supply air temperature setpoint. The heat wheel shall run for heat recovery whenever:

- The unit return air temperature is 5°F (adj.) or more above the outside air temperature. AND the unit is in a heating mode. AND the economizer (if present) is off. AND the supply fan is on.

Periodic Self-Cleaning:

- The heat wheel shall run at 5% speed (adj.) for 10sec (adj.) every 4hr (adj.) the unit runs.

Frost Protection:

- The heat wheel shall run at 5% speed (adj.) whenever:
 - Outside air temperature drops below 15°F (adj.)
 - OR the exhaust air temperature drops below 20°F (adj.).

Minimum Outside Air Ventilation - Carbon Dioxide (CO2) Control:

- When in the occupied mode, the controller shall monitor zone CO2 levels served by this air handling unit. The controller shall take the highest zone CO2 level and modulate the outside air dampers open on rising CO2 concentrations, overriding normal damper operation to maintain a CO2 setpoint of 800 ppm (adj.).
- Kitchen Exhaust Make-up Air Control: RTU-6 outside air damper position shall be overridden upon activation of kitchen hood. Damper position shall modulate to main make up air. MAX cfm 3700. EF/RF shall modulate based on kitchen exhaust fan speed.

Discharge Air Temperature Reset Control (Cooling Cycle, Occupied Mode):

- The ATC contractor shall furnish and install sensors and controls to enable space temperature based reset of discharge air temperature (adj.) to prevent sub-cooling of spaces.
- The Building Management System sense return air temperature and shall reset the supply air temperature set point according to the straight line ramp function defined herein:

Return Air Temp.	Supply Air Temp. Set Point
75°F	55°F (adj.)
70°F	60°F (adj.)

Static Pressure Reset Control:

- ATC contractor shall provide static pressure reset control which shall reset the discharge static pressure set point when facility is in unoccupied mode and terminal box dampers are closed. During unoccupied mode, unit supply static pressure set point shall be reset from maximum setting established during balancing (typically 2.0" max. adj.) down to 0.5" (adj.).

Frost Control:

- Frost control is initiated when O.A. temperature drops below the set point and pressure drop across the wheel increases, which indicates frosting.
- When frosting is indicated, the factory mounted and wired pre-heater shall be energized to heat O.A. to energy wheel frost threshold.

Emergency Power Operation:

- Return fan lockout on emergency power: Upon switch over to emergency power, the return fan shall be de-energized, the return air damper shall open 100%, the exhaust damper and outside air dampers shall close 100%.

Static Safeties:

- High static pressure safety will stop supply and return fans, close outdoor/exhaust dampers and open heating coil valve 100% when pressure rises above set point. The set point is adjustable at the device. A manual reset is required at the device to restart the unit.
- Low static pressure safety will stop supply and return fans, close outdoor/exhaust dampers and open heating coil valve 100% when pressure drops below set point. The set point is adjustable at the device. A manual reset is required at the device to restart the unit.

Alarms: The following alarms will annunciate at the workstation:

- If the supply or exhaust fan status is not indicated within 30sec of start command, a fan failure alarm is generated.
- If filter differential pressure exceeds the normal pressure setting for the rooftop unit's filters, a dirty filter alarm is generated.
- Low temperature detector below 35°F.
- Low static pressure safeties. If the supply air static pressure is 25% (adj.) less than setpoint.
- High static pressure safeties. If the supply air static pressure is 25% (adj.) greater than setpoint.
- Discharge air temperature is +/- 5°F form set point during occupied mode.
- High Zone Carbon Dioxide Concentration: If the highest zone CO2 concentration is greater than 1000 ppm (adj.).

Unoccupied Override:

- If during the unoccupied mode of the facility, an override button on a thermostat(s) associated with this rooftop unit is activated, the unit shall temporarily return to the occupied mode for the pre-programmed amount of time, typically 2 hours (adj.).

Demand load shedding:

- Upon activation one lag compressor shall be locked out reducing the potential power consumption of the unit.
- Once reactivated unit shall return to normal operation.

VAV ROOFTOP UNIT W/HOT WATER HEAT AND DX COOLING (RTU-3 AND 5)

ROOFTOP UNIT W/ENERGY RECOVERY HOT WATER HEATING & DX COOLING (RTU-7 AND 8)



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KEYNOTE LEGEND:

100% CONSTRUCTION DOCUMENTS

KEY PLAN NORTH ARROW

KEYPLAN

DRAWING NAME:

MECHANICAL CONTROL SEQUENCES

DRAWN BY: AP
REVIEWED BY: DAH
SCALE: NONE | DRAWING NUMBER:
JOB NO.: 2202.00
DATE: OCTOBER 13, 2023 | **M7.02**



CENTRAL FALLS HIGH SCHOOL
10 HIGGINSON AVE, CENTRAL FALLS, RI

KEYNOTE LEGEND:

100% CONSTRUCTION DOCUMENTS

KEY PLAN NORTH ARROW

KEYPLAN

DRAWING NAME:

**MECHANICAL
CONTROL
SEQUENCES**

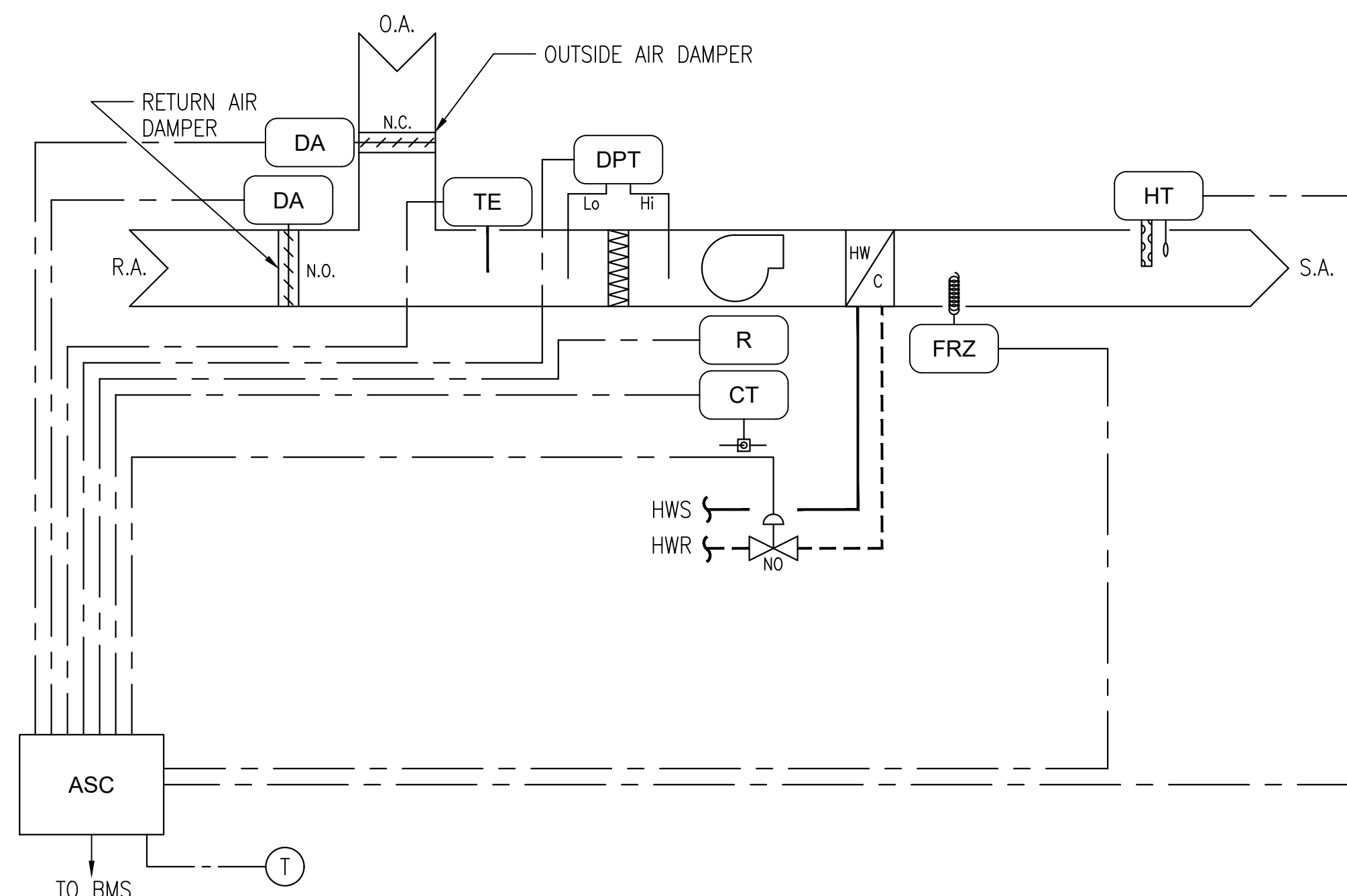
DRAWN BY: AP

REVIEWED BY: DAH

SCALE: NONE DRAWING NUMBER:

JOB NO.: 2202.00

DATE: OCTOBER 13, 2023 **M7.03**



SEQUENCE OF OPERATION

Warmup: Morning warm-up shall be initiated by an optimum start algorithm based on outside air temperature. The optimum start algorithm shall be based on a straight line ramp function such that morning warm-up occurs 2 hour (adj.) prior to the occupied mode when outdoor air temp. is 0°F and ½ hour (adj.) prior to occupied mode when outdoor air temp is 60°F. Optimum start can be overridden at the OWS by manually scheduling the morning warm-up if preferred by facilities personnel. Supply fan runs continuously. Unit operates for return air temperature set point of 72°F. On a call for heating, unit operates on 100% return air. Heating coil valve shall modulate to maintain return air temperature set point.

Occupied: Supply fan runs continuously. Outdoor air damper shall open to introduce schedule minimum air quantity to maintain minimum fresh air CFM set point. Unit operates to maintain room temperature set point of 68°F, with a discharge temperature low limit of 55°F.

On a call for heating: The heating coil valve modulates to maintain room temperature set point. 68°F (adj.)

Unoccupied: Fancoil unit shall be "off". When the room temperature sensors in the area served by the associated fancoil unit drop below 60°F, the supply fan shall start. The outdoor damper shall be closed, with the unit operating on full return air.

The heating coil valve modulates to maintain unoccupied heating discharge temperature set point.

When room temperature rises above 64°F, the supply fans are off.

Freeze Protection:

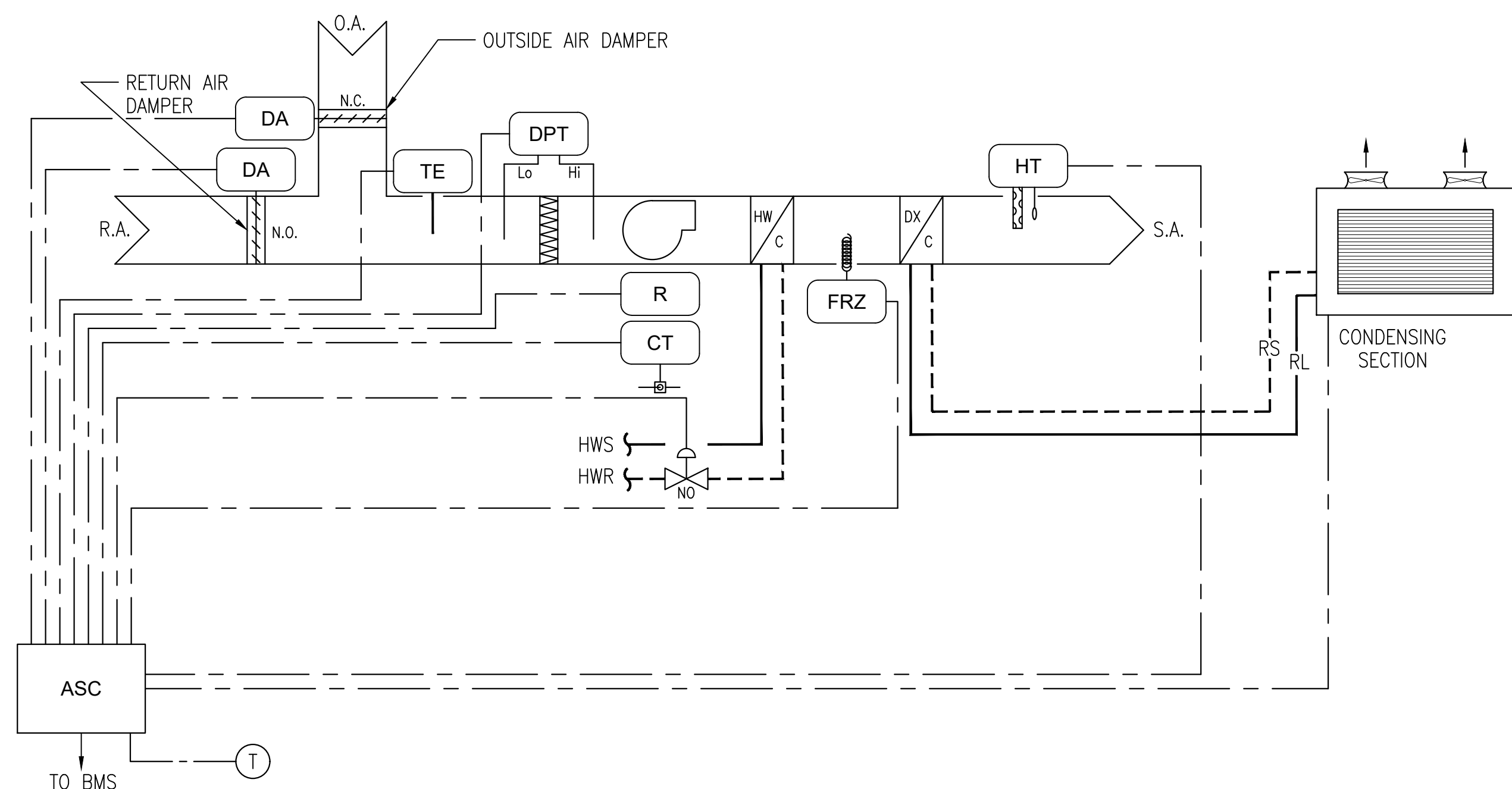
1. Provide an automatic reset type freeze-stat at the discharge of the heating coil.
2. On sensing a discharge air temperature of 35°F (adjustable) or below, the supply air fan shall be de-energized. The fresh air damper shall close 100%, the return air dampers shall open 100% and all audio/visual alarm devices shall initiate.
3. The heating coil(s) shall receive full hot water flow until the air temperature sensed by the freeze-stat rises above the low limit temperature sensor set point. The automatic reset freeze-stat shall reset and the unit shall initialize to the appropriate sequence.
4. The BMS shall limit the automatic reset function to a total of two "trips" and resets. Upon a third trip, the reset must be executed through the BMS.

Alarms: The following alarms will annunciate at the workstation:

1. If the supply fan status is not indicated within 30sec of start command, a fan failure alarm is generated.
2. If filter differential pressure exceeds the normal pressure setting for the rooftop unit's filters, a dirty filter alarm is generated.
3. Low temperature detector below 35°F.
4. Discharge air temperature is +/- 5°F form set point during occupied mode.
5. Dirty Filter.

Unoccupied Mode Override: When push-button on room thermostat is pressed, unit switches to the occupied mode for 2 hours (adjustable).

FANCOIL UNIT



SEQUENCE OF OPERATION

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Occupied: Supply fan runs continuously. Outdoor air damper shall open to introduce schedule minimum air quantity to maintain minimum fresh air CFM set point. Unit operates to maintain room temperature set point of 68°F, with a discharge temperature low limit of 55°F.

On a call for heating: The heating coil valve modulates to maintain room temperature set point. 68°F (adj.)

On a call for cooling: The DX system shall engage as required to maintain room temperature set point. 75°F (adj.)

Unoccupied: Fancoil unit shall be "off". When the room temperature sensors in the area served by the associated fancoil unit drop below 60°F, the supply fan shall start. The outdoor damper shall be closed, with the unit operating on full return air.

The heating coil valve modulates to maintain unoccupied heating discharge temperature set point.

When room temperature rises above 64°F, the supply fans are off.

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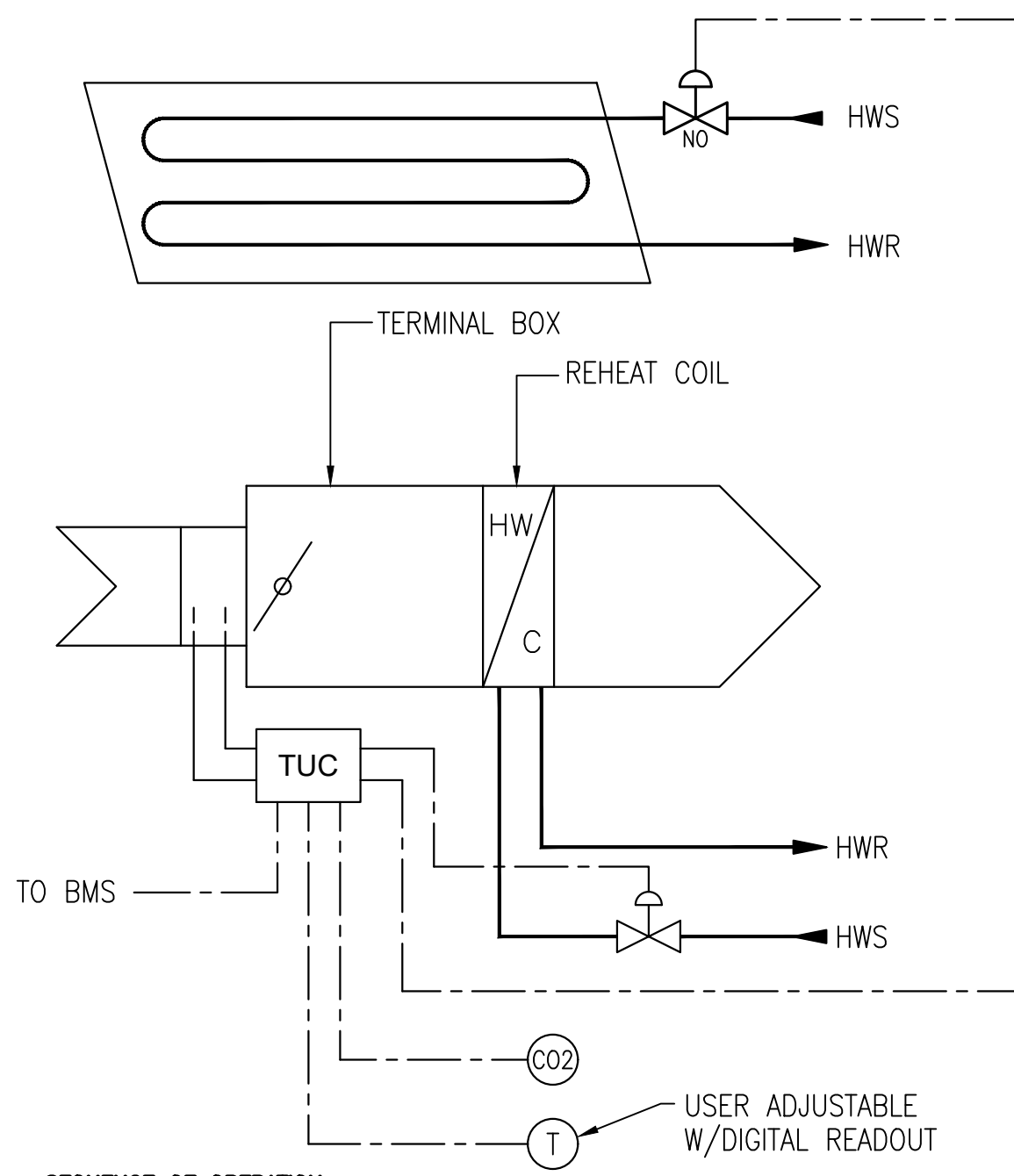
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3. The heating coil(s) shall receive full hot water flow until the air temperature sensed by the freeze-stat rises above the low limit temperature sensor set point. The automatic reset freeze-stat shall reset and the unit shall initialize to the appropriate sequence.
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5. Dirty Filter.

Unoccupied Mode Override: When push-button on room thermostat is pressed, unit switches to the occupied mode for 2 hours (adjustable).

FANCOIL UNIT



SEQUENCE OF OPERATION

Typical VAV Cooling Reheat:
Pressure independent VAV box operates on a "occupied/unoccupied" schedule.

During Occupied Mode: VAV damper modulates from minimum to maximum CFM setpoints to maintain room temperature set point. On a call for cooling, damper modulates towards the maximum CFM setting. On a call for heating, damper modulates towards the minimum CFM setting and the radiant panel hot water control valve shall modulate open to maintain space heating temperature set point. Upon a further drop in space temperature, the reheat coil hot water control valve shall modulate open to maintain space heating temperature set point.

Unoccupied: VAV box damper remains minimum setpoint. If room temperature drops below the night temperature set point, the radiant panel hot water control valve shall modulate open to maintain space heating temperature set point. When pushbutton on room temperature sensor is pressed, VAV box switches to occupied mode for 2 hours (ADJ).

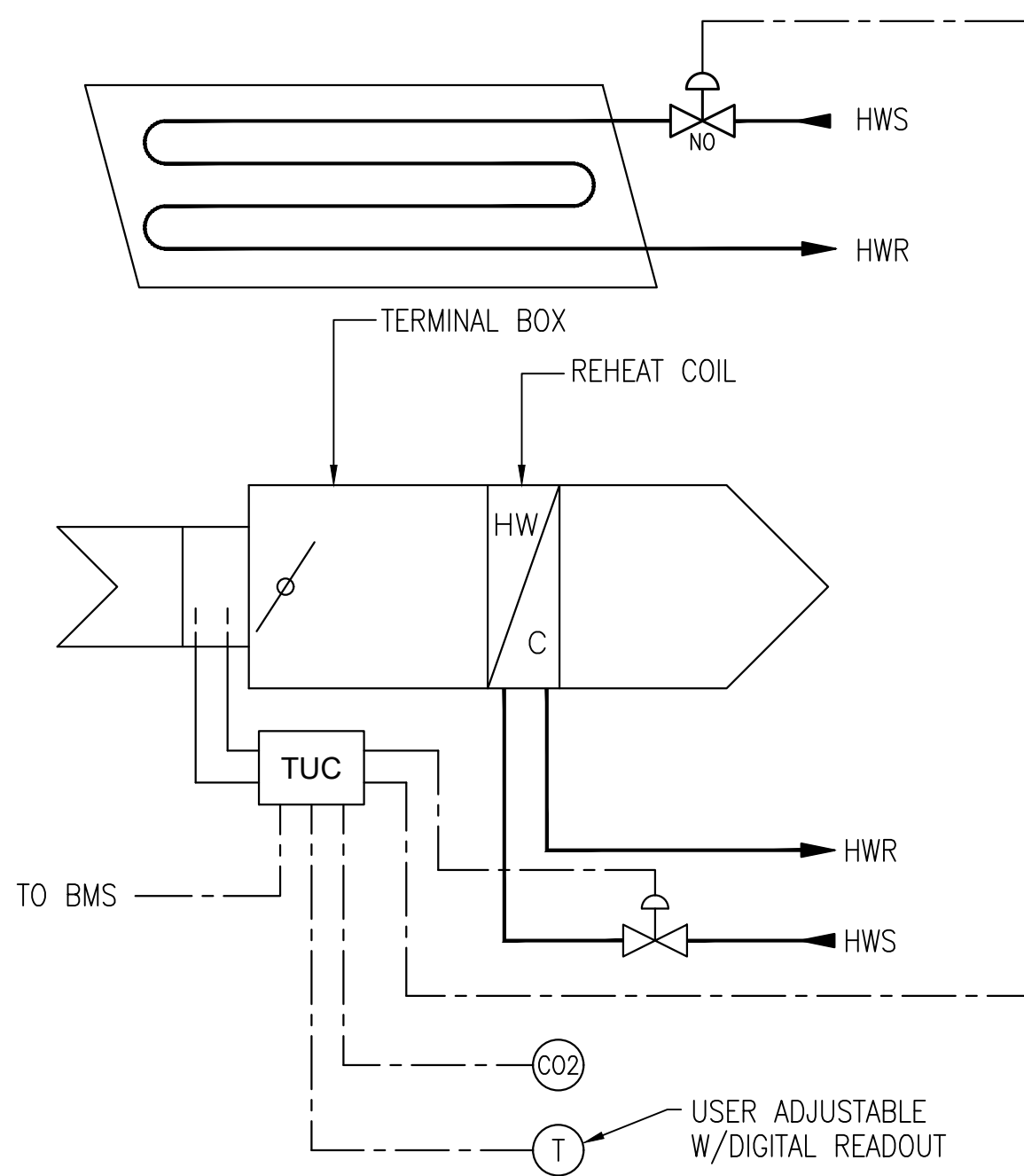
Morning Warm-up: VAV box damper shall open to minimum position during morning warm-up mode.

Room Thermostat: Occupied set point is adjustable at the room thermostat with a +/- 2 degf warmer / cooler adjustment. Thermostats for classrooms, offices and similar spaces shall be provided with an override function to allow use of space outside of the normal occupied schedule.

Room Occupancy Sensor: The VAV terminal boxes shall be interlocked with the room occupancy sensor (furnished and installed by the electrical contractor) via automatic temperature controls. Upon sensing an absence of movement for 10 minutes (adj.), the occupancy sensor shall reset the terminal box to the unoccupied mode and the damper shall modulate min position. Damper and control valve shall modulate to maintain space temperature set back condition. Should this occur during the occupied mode of the school, the space temperature setpoint shall be reset +5F during the cooling season and -5F during the heating season. When occupancy is again sensed, VAV terminal box shall return to occupied mode.

CO2 Sensor: Each shall be furnished with a CO2 sensor which shall be interlocked with its associated terminal box. Upon sensing a CO2 level of 800 ppm the terminal box damper shall modulate open. The reheat coil hot water control valve shall modulate open to maintain space heating temperature set point if required. Once CO2 levels have reduced below set point terminal box shall return to normal operation set by schedule.

100% OA VAV TERMINAL BOXES WITH REHEAT & RADIANT PANELS



SEQUENCE OF OPERATION

Typical VAV Cooling Reheat:
Pressure independent VAV box operates on a "occupied/unoccupied" schedule.

During Occupied Mode: VAV damper modulates from minimum to maximum CFM setpoints to maintain room temperature set point. On a call for cooling, damper modulates towards the maximum CFM setting. On a call for heating, damper modulates towards the minimum CFM setting and the radiant panel hot water control valve shall modulate open to maintain space heating temperature set point. Upon a further drop in space temperature, the reheat coil hot water control valve shall modulate open to maintain space heating temperature set point.

Unoccupied: VAV box damper remains closed. If room temperature drops below the night temperature set point, damper modulates to minimum CFM setting and reheat coil hot water control valve shall modulate open to satisfy night set point. When pushbutton on room temperature sensor is pressed, VAV box switches to occupied mode for 2 hours (ADJ).

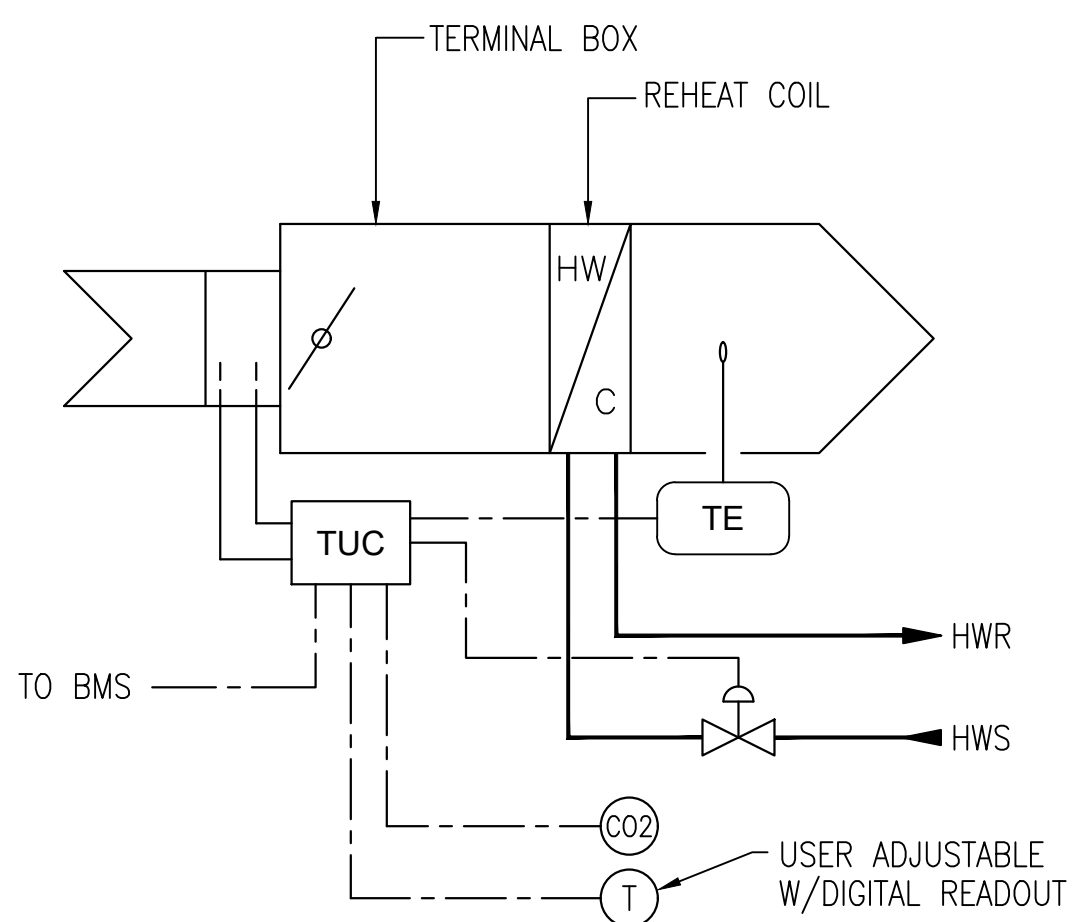
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CO2 Sensor: Each room shall be furnished with a CO2 sensor. Upon sensing a CO2 level of 800 ppm for longer than 10 min (adj) the BMS shall be notified.

VAV TERMINAL BOXES WITH REHEAT & RADIANT PANELS



SEQUENCE OF OPERATION

Typical VAV Cooling Reheat:
Pressure independent VAV box operates on a "occupied/unoccupied" schedule.

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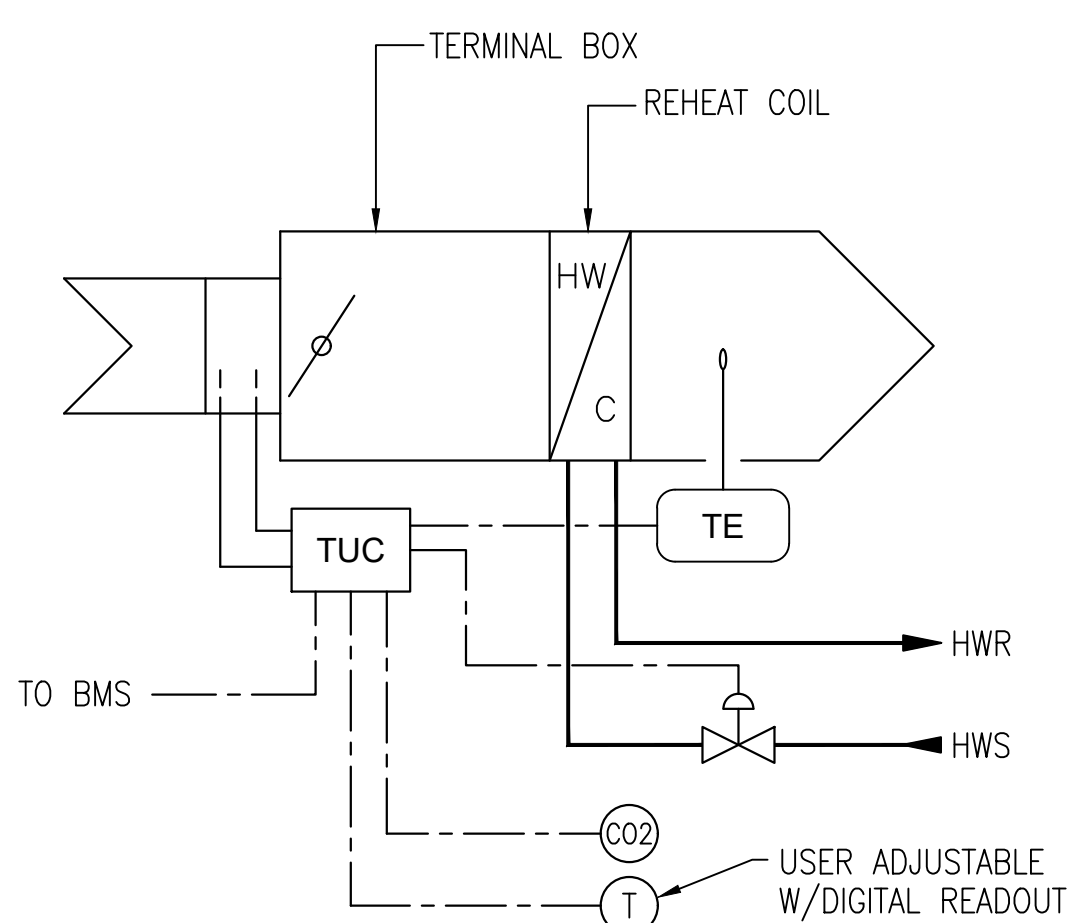
Unoccupied: VAV box damper modulate min position. If room temperature drops below the night temperature set point, the reheat coil hot water control valve shall modulate open to satisfy night set point. When pushbutton on room temperature sensor is pressed, VAV box switches to occupied mode for 2 hours (ADJ).

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100% OA VAV TERMINAL BOXES WITH REHEAT



SEQUENCE OF OPERATION

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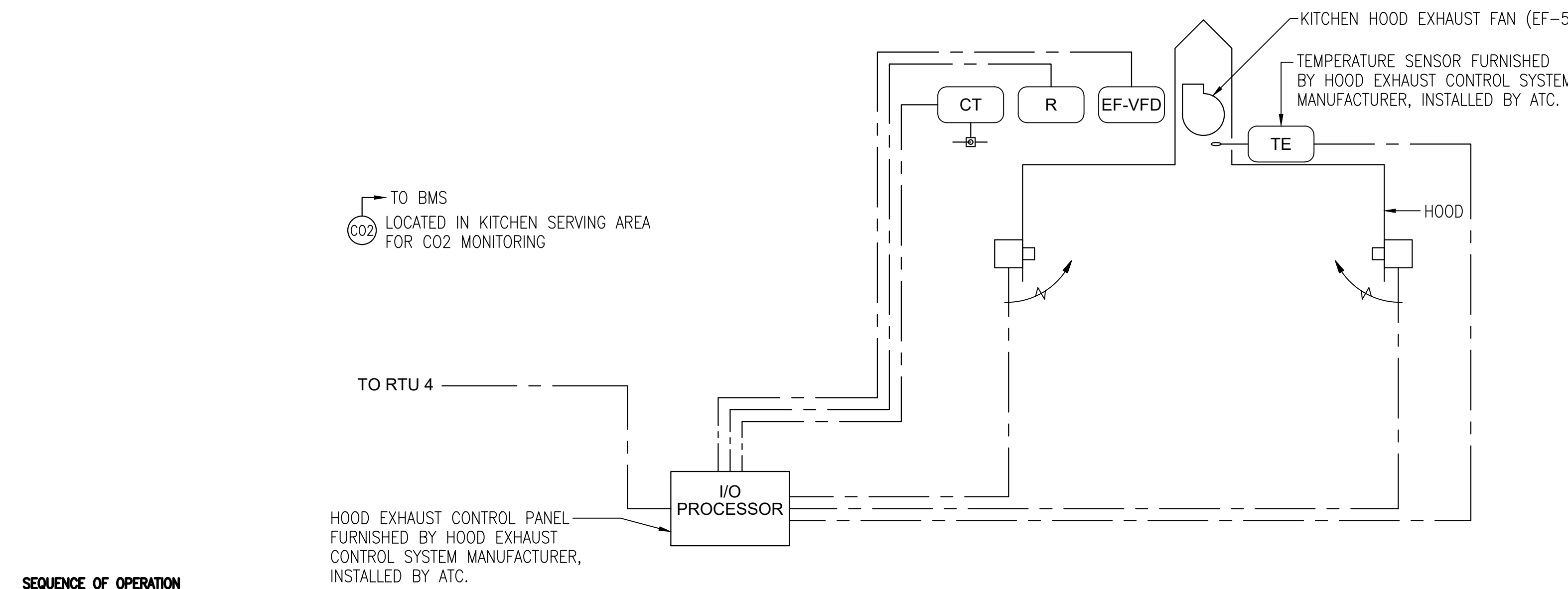
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VAV TERMINAL BOXES WITH REHEAT



SEQUENCE OF OPERATION

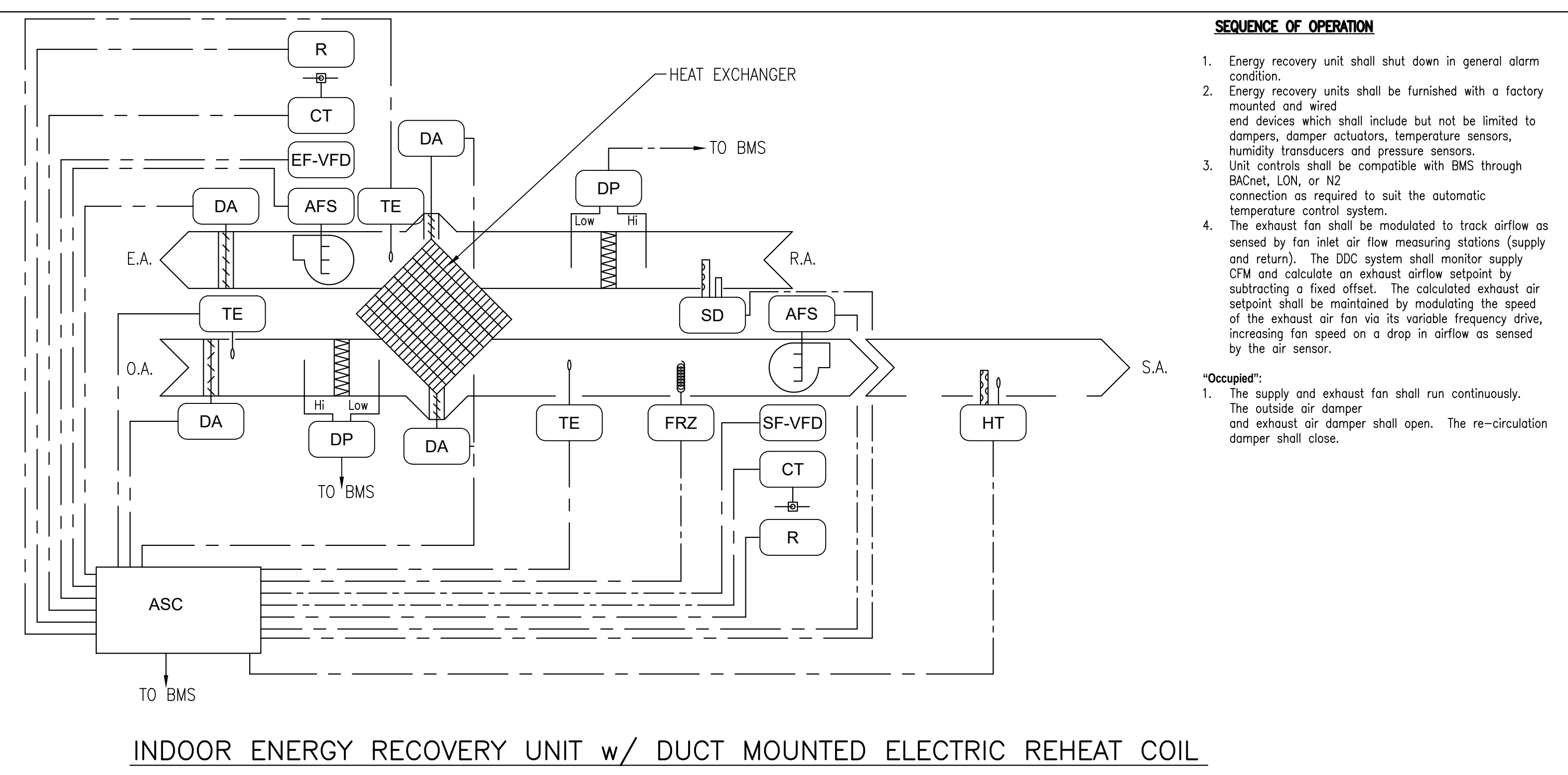
Kitchen Make-Up Air Unit (RTU-4)

- Sheet Metal Contractor shall install NFPA approved smoke detector, provided under Specification Section 260000, in the supply air duct from all HVAC units conveying 2,000 CFM or more. The ATC Contractor shall interlock the smoke detector to de-energize its respective unit and activate all BMS audio/visual indicating devices on sensing smoke in the air stream. Fire alarm interconnections from the smoke detectors shall remain the responsibility of Division 16.
- Provide high static and low static pressure controllers at the supply fan to stop the system and signal all BMS and audio/visual alarms if limit conditions are exceeded.
- Interlock the kitchen make-up air unit and kitchen hood exhaust fan such that de-energizing the make-up air unit will indicate on the control panel, located at the kitchen exhaust hood. The kitchen hood exhaust fan shall remain energized until manually de-energized.
- Provide a duct mounted discharge air temperature sensor in the supply air ductwork for all HVAC systems conveying 3,000 CFM or more. This discharge air temperature sensor shall act as a heating and/or cooling anticipator to prevent room temperature overshoot.
- Heating cycle - Morning Warm-Up:
 - Refer to Air handling sequence of operations.
- Heating cycle - Occupied No Cooking:
 - Refer to Air handling sequence of operations.
- Heating cycle - Occupied with Cooking:
 - The air handling unit exhaust fan shall track the kitchen hood exhaust fan. As the kitchen hood exhaust fan VFD adjust speed the air handling units exhaust fan VFD shall adjust speed in the inverse.

Kitchen Hood Exhaust Fan:

- The ATC Contractor shall install the kitchen hood exhaust control system as manufactured by Melink (Intellihood) or approved equal. Refer to detail on drawings for required components.
- The kitchen hood exhaust fan shall be enabled/disabled through the ATC system.
- Interlock the exhaust fan with RTU-4 and with the power saving the cooking equipment, such that all power is interrupted in the event of a failure of the exhaust fan.
- The kitchen hood exhaust fan shall remain energized during any fire emergency during which the kitchen hood fire suppression system discharges. The air handling unit shall be de-energized and the power stopped.
- The kitchen hood exhaust fan speed shall vary in response to a signal from the optic sensor located in the hood and/or temperature sensor located in the exhaust duct connection. The exhaust fan speed shall be controlled by a variable frequency drive furnished by kitchen hood exhaust control system manufacturer.
 - Upon detection of any smoke/vapors inside the hood, optic sensors shall send a signal to the I/O processor to ramp the fans up to full speed until all effluent is removed from the airstream.
 - Upon detection of excessive heat in the exhaust air stream, the temperature sensor shall send a signal to the I/O processor to ramp the fans up to full speed until temperature drops to the default temperature (75F - 90F).
- The air handling unit's exhaust fan speed, outside air damper and return air damper shall modulate in response to the exhaust fan speed in order to maintain proper kitchen pressurization.

KITCHEN VENTILATION & EXHAUST

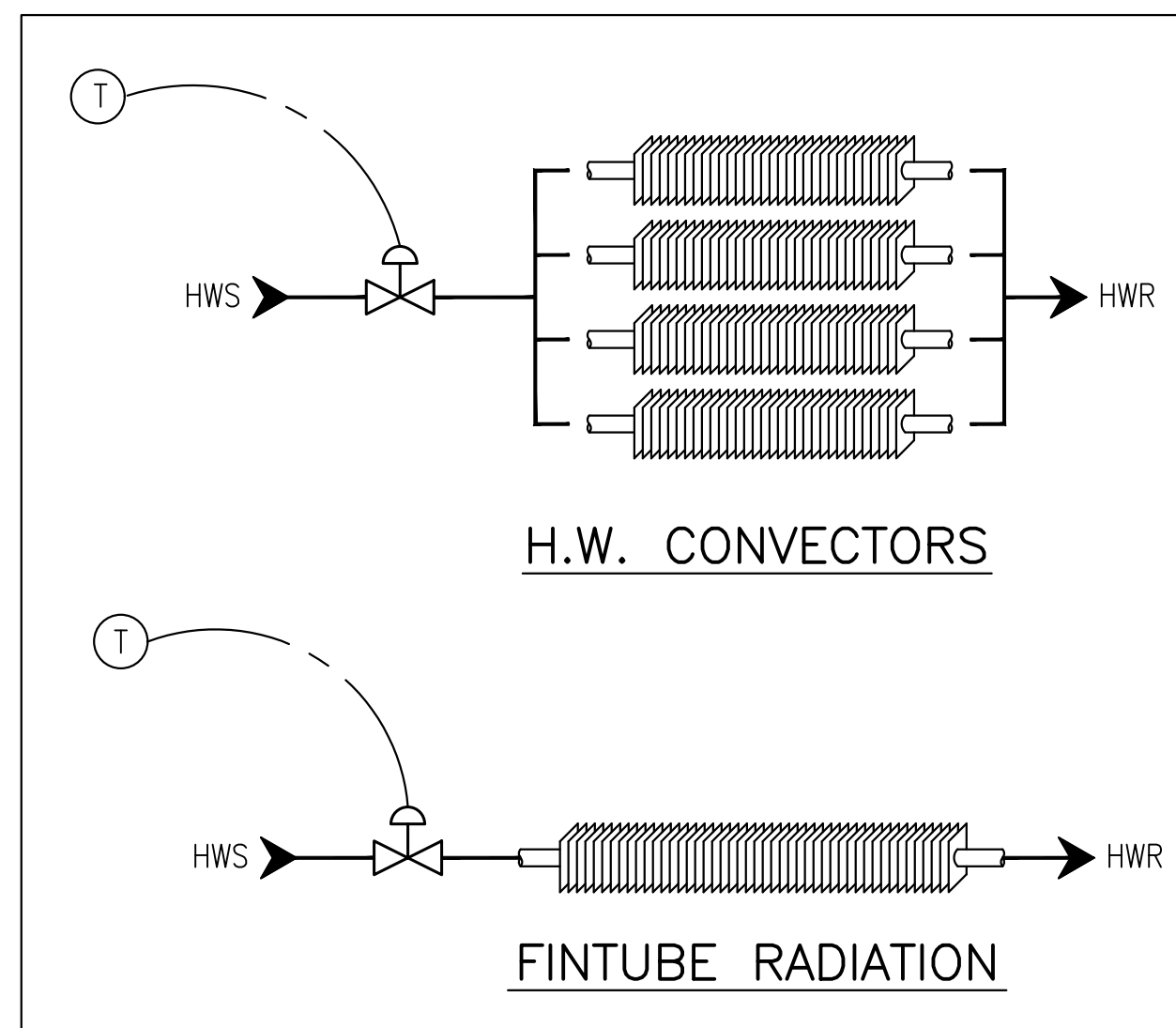


SEQUENCE OF OPERATION

- Energy recovery unit shall shut down in general alarm condition.
- Energy recovery units shall be furnished with a factory mounted and wired and devices which shall include but not be limited to dampers, damper actuators, temperature sensors, humidity transducers and pressure sensors.
- Unit controls shall be compatible with BMS through BACnet, LON, or N2 connection as required to suit the automatic temperature control system.
- The exhaust fan shall be modulated to track airflow as sensed by fan inlet air flow measuring stations (supply and return). The DDC system shall monitor supply CFM and calculate an exhaust airflow setpoint by subtracting a fixed offset. The calculated exhaust air setpoint shall be maintained by modulating the speed of the exhaust air fan via its variable frequency drive, increasing fan speed on a drop in airflow as sensed by the air sensor.

Occupied:

- The supply and exhaust fan shall run continuously. The outside air damper and exhaust air damper shall open. The re-circulation damper shall close.



SEQUENCE OF OPERATION

H.W. CONVECTORS & FIN-TUBE RADIATION:

Occupied:
On a drop in space temperature, below the "Occupied" temperature set point, the 2-position control valve will open. On a rise in space temperature the valve will close to maintain the "Occupied" space temperature set point.

Unoccupied:
The "Unoccupied" mode will be determined by the B.M.S. On a drop in space temperature, below the "Unoccupied" temperature set point, the 2-position control valve will open. On a rise in space temperature the valve will close to maintain the set back "Unoccupied" space temperature set point.

Any time that power is lost to hot water control valve the valve will fall in the open position through spring action.

KEYNOTE LEGEND:

100% CONSTRUCTION DOCUMENTS

KEY PLAN NORTH ARROW

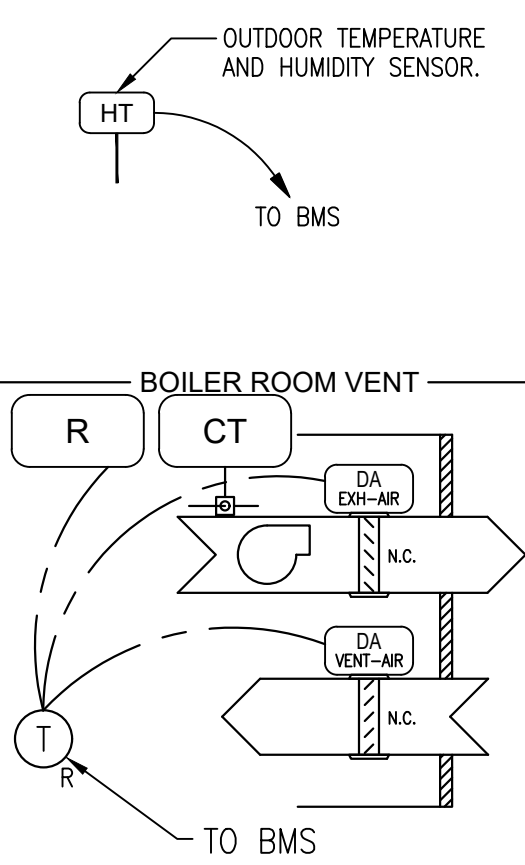
GLYCOL MAKE-UP FILL TANK SCHEDULE & SEQUENCE OF OPERATIONS

TANK NO.	LOCATION	MODEL#	MAKE-UP CAPACITY (GPM @ PSI)	PRESSURE RANGE (PSI)	SOLUTION CONTAINER (GAL)	DIMENSION (IN INCHES)		ELECTRIC DATA			APPROX. WEIGHT (LBS)	REMARKS	
						A	B	HP	VOLT	Ø			Hz
TK-1	BOILER ROOM	GMP-13050	1.8 @ 50	10 - 50	50	42	28	1.5	460	3	60	150	GMP SERIES OR EQUAL

GLYCOL MAKE-UP PACKAGE
 FULLY AUTOMATED AND AUTONOMOUS. COMPLETE WITH: LOW LEVEL CUT-OFF AND ALARM ARRANGEMENT, INCLUDING A 110V SIGNAL FOR REMOTE ALARM, ISOLATION VALVES, STRAINER, PRESSURE TANK WITH PRESSURE CONTROL, PRESSURE REDUCING VALVE AND GAUGE, TRANSLUCENT POLYETHYLENE SOLUTION CONTAINER WITH UID DESIGNED TO ACCOMMODATE RELIEF VALVE PIPING, MAGNETIC STARTER, 110V/60 HZ MOTOR AND CONTROLS. ALL MOUNTED ON A STURDY STEEL FRAME WITH 1/2" SYSTEM CONNECTION AND FACTORY PRESET 12 PSIG (FIELD ADJUSTABLE) DISCHARGE.

SEQUENCE OF OPERATION FOR GLYCOL PACKAGE SYSTEM

- WHEN THE PRESSURE IN THE GLYCOL SYSTEM DECREASES TO THE MINIMUM ALLOWABLE PRESSURE (OR FILL PRESSURE +/-); THE "PRV" SYSTEM REDUCING VALVE OPENS.
- THE GLYCOL STORED IN THE PRESSURE TANK WILL FLOW INTO THE SYSTEM. THE PRESSURE WILL CONTINUE TO DECREASE ON THE SUPPLY SIDE OF THE PRV, UNTIL THE PUMP CUT-IN PRESSURE IS REACHED. THE PRESSURE SWITCH WILL SEND A SIGNAL TO THE PUMP TO START AND MAINTAIN GLYCOL IN THE SYSTEM AND PRESSURE TANK SO THAT THE PRV IS NOT DEPRIVED.
- THE PUMP WILL RUN UNTIL ALL THE FOLLOWING CONDITIONS WILL BE ATTAINED.
 - THE PRESSURE IN THE GLYCOL SYSTEM REACHES AND STAYS AT OR ABOVE THE PRV SETTING.
 - THE VOLUME OF THE GLYCOL SOLUTION IN THE PRESSURE TANK INCREASES UNTIL THE PUMP CUT-OUT PRESSURE IS DETECTED BY THE PRESSURE SWITCH. IF THE PRESSURE IN THE COOLING GLYCOL SYSTEM DECREASES AGAIN, STEP 1, STEP 2, AND STEP 3 WILL BE FOLLOWED AGAIN.
 - SHOULD THE PACKAGE RUN OUT OF GLYCOL SOLUTION, THE "LOW LEVEL CONTROL ALARM" WILL CUT OFF THE PUMP AND ACTIVATE AN AUDIBLE - VISUAL ALARM (INCLUDING THE REMOTE ALARM IF CONNECTED).



SEQUENCE OF OPERATION

Boilers and Trim:

- Provide an outside air sensor (adjustable) to act as a heat starter.
- Upon sensing an outdoor ambient temperature of 65°F (adjustable) or below, the boiler sequencing panel shall initialize to the Winter cycle.
 - The heater starter shall energize the hydronic system pumps and the boilers sequencing control panel, upon sensing an outdoor ambient temperature of 65°F or below. Boilers shall be staged and cycled as required to maintain the temperature setpoint. Automatic rotation of the boilers' firing shall be orchestrated by the sequencing panel to assure equal run time of module.
 - The boiler sequencing panel shall provide an "Enable" signal to the appropriate boiler's burner and to the boiler combustion air isolation.
 - The panel shall energize the Lead boiler on sensing a system temperature below the system temperature set point. The boiler sequencing panel shall stage the boilers' firing as required to meet the demand. Upon sensing a system temperature satisfying the system temperature set point, the panel shall sequentially de-energize the boilers and reset for the next cycle.
 - As each boiler is initiated by the boiler sequencing panel its associated boiler pump shall engage. Upon proof of engaging, boiler combustion sequence shall commence.
 - The sequencing panel shall sense outdoor ambient conditions and shall reset the supply water temperature according to the straight line ramp function defined herein:

Ambient	Setpoint
0°F	160°F
65°F	90°F

3. Upon sensing an outdoor ambient temperature of 65°F or above, the boiler sequencing panel shall initialize to the Summer cycle.

4. The panel shall de-energize the boilers.

5. Each manual reset low water cutoff control shall de-energize its appropriate boiler should the water level drop below the controller's set point. Control must be physically reset to restart the boiler after a shutdown instituted by this control.

Boiler Room Ventilation Air:

- Upon a rise in room temperature (75F adj) the exhaust fan shall turn on and the make-up air damper shall open. Once the room thermostat is satisfied the exhaust fan shall disengage and the make-up air damper shall close.

Hot Water Pumps Differential Pressure Control:

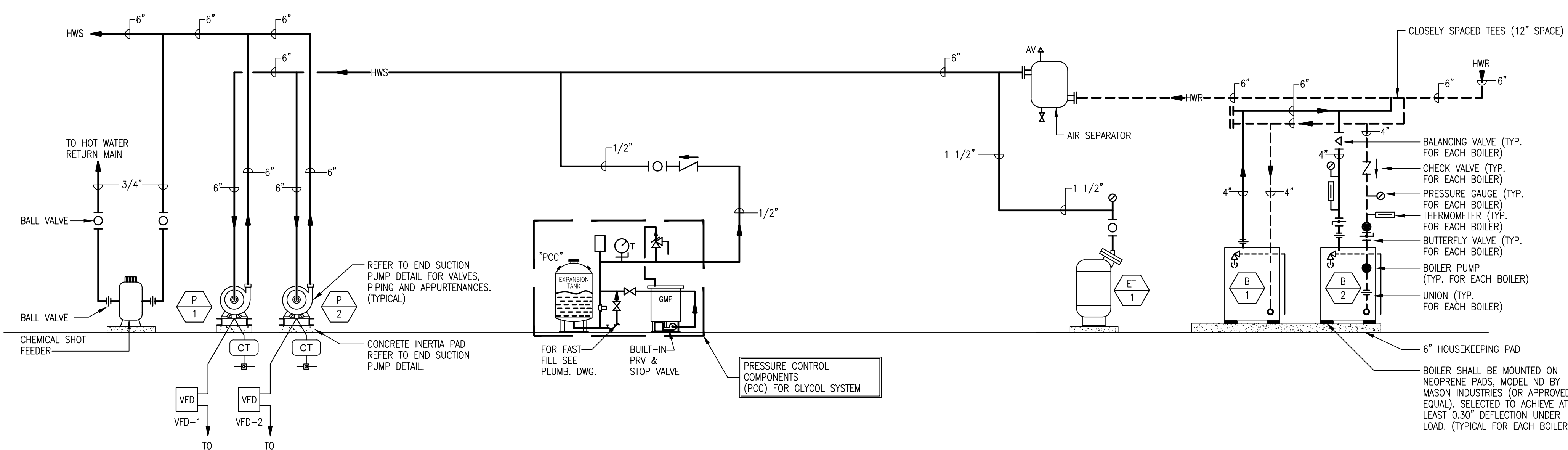
- Hot water pumps shall operate continuously on a primary/standby basis. If the primary pump does not provide flow on demand, the standby pump shall automatically start and all Building Management System and audio-visual alarms shall be initiated.
- Provide a differential pressure sensor for each hot water pump. The pressure sensor shall provide a "Proof-of-Flow" signal to the Building Management System to confirm proper operation.
- Provide a differential pressure controller for the hot water system. The pressure controller shall signal the pump variable frequency drive to maintain the proper system pressure. Differential pressure controller shall be field located near end of run.
- Provide high pressure and low pressure controllers at the pumps to stop the system if preset conditions are exceeded.

Differential Pressure By-Pass Valve:

- Differential pressure by-pass valve shall modulate as required to maintain minimum system flow.
- Minimum system flow shall be determined by pump curve of pumps P-1/P-2.
- Upon building heating load being satisfied and when pumps reach minimum speed, valve shall modulate open to meet minimum flow.

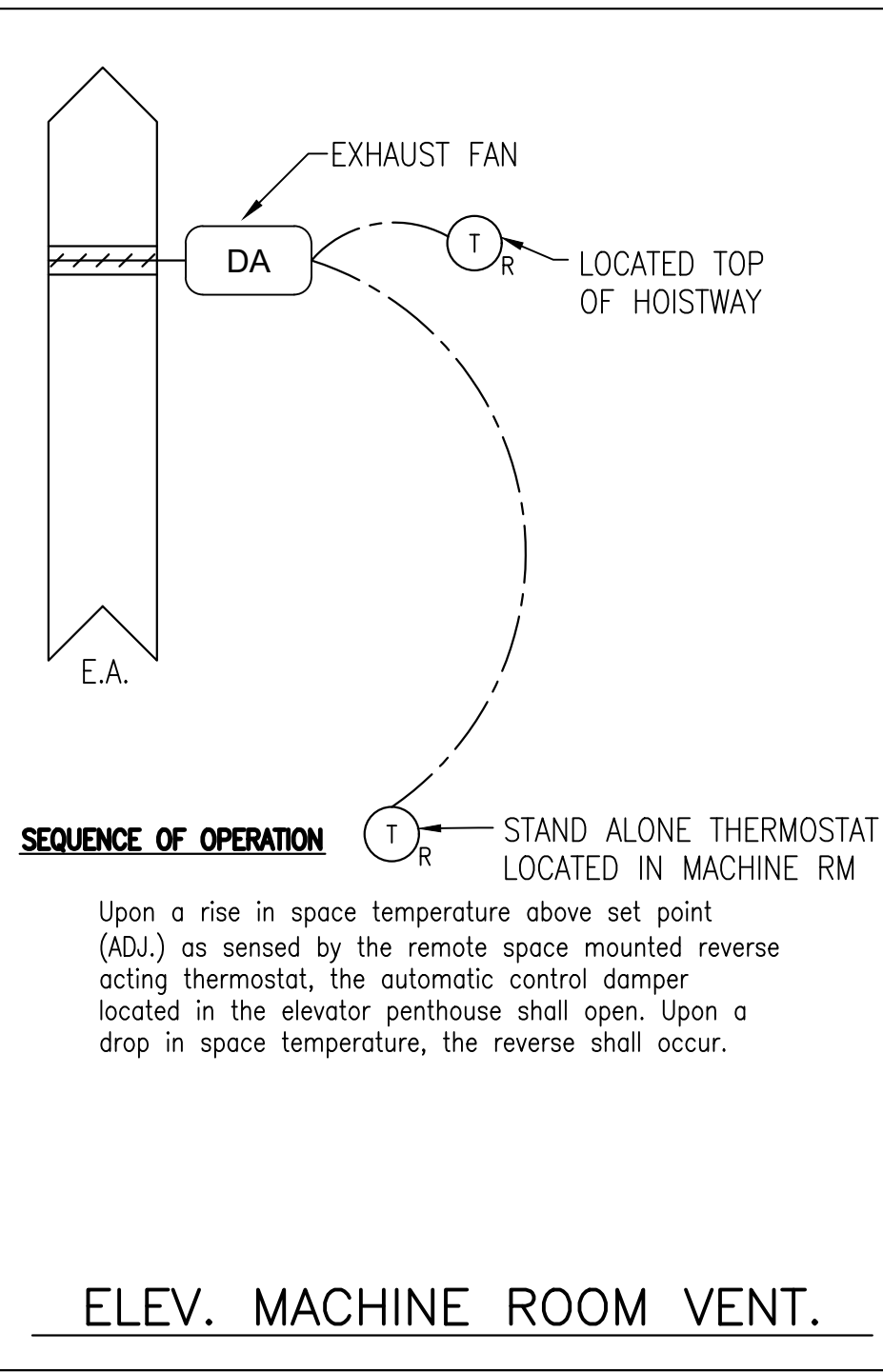
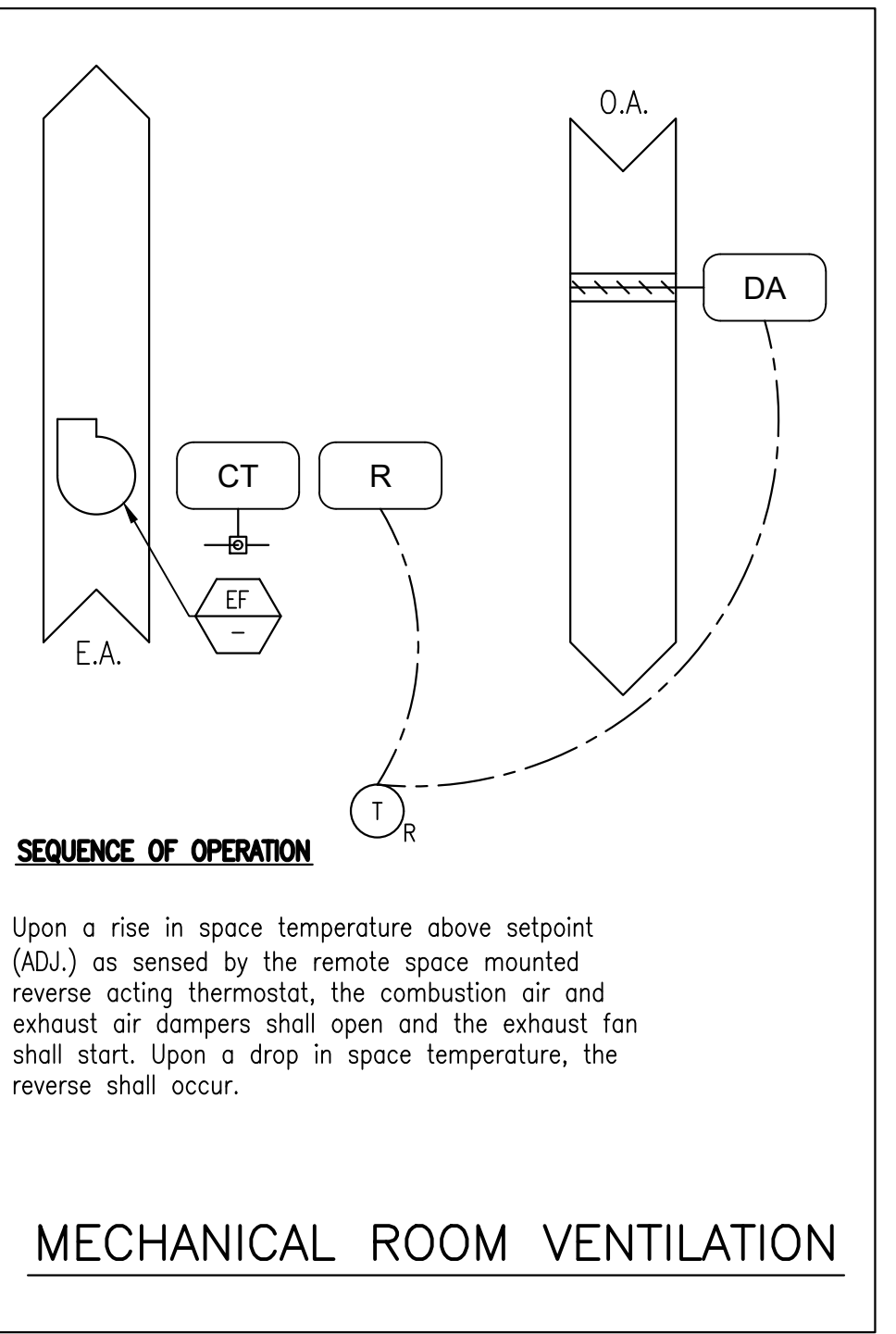
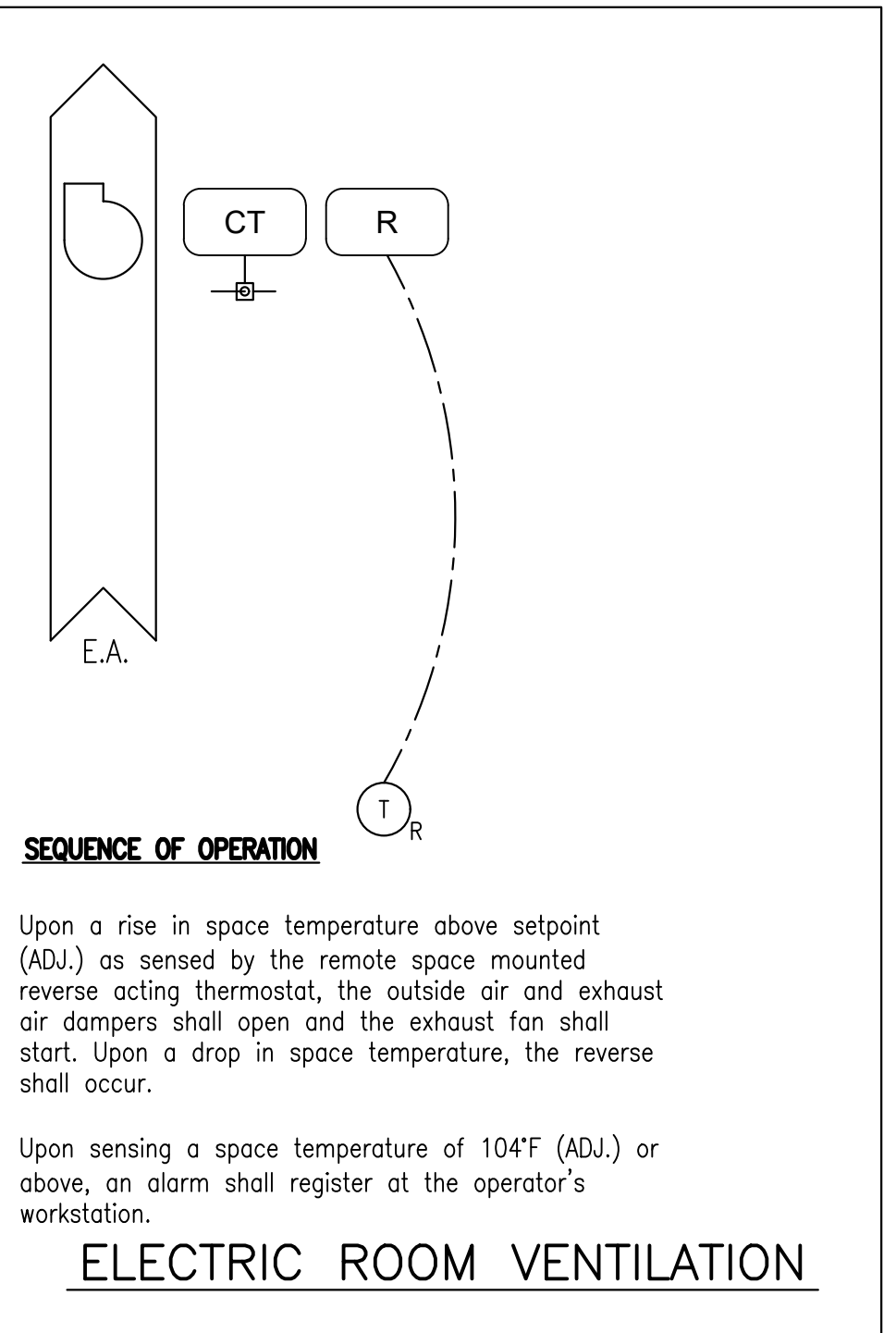
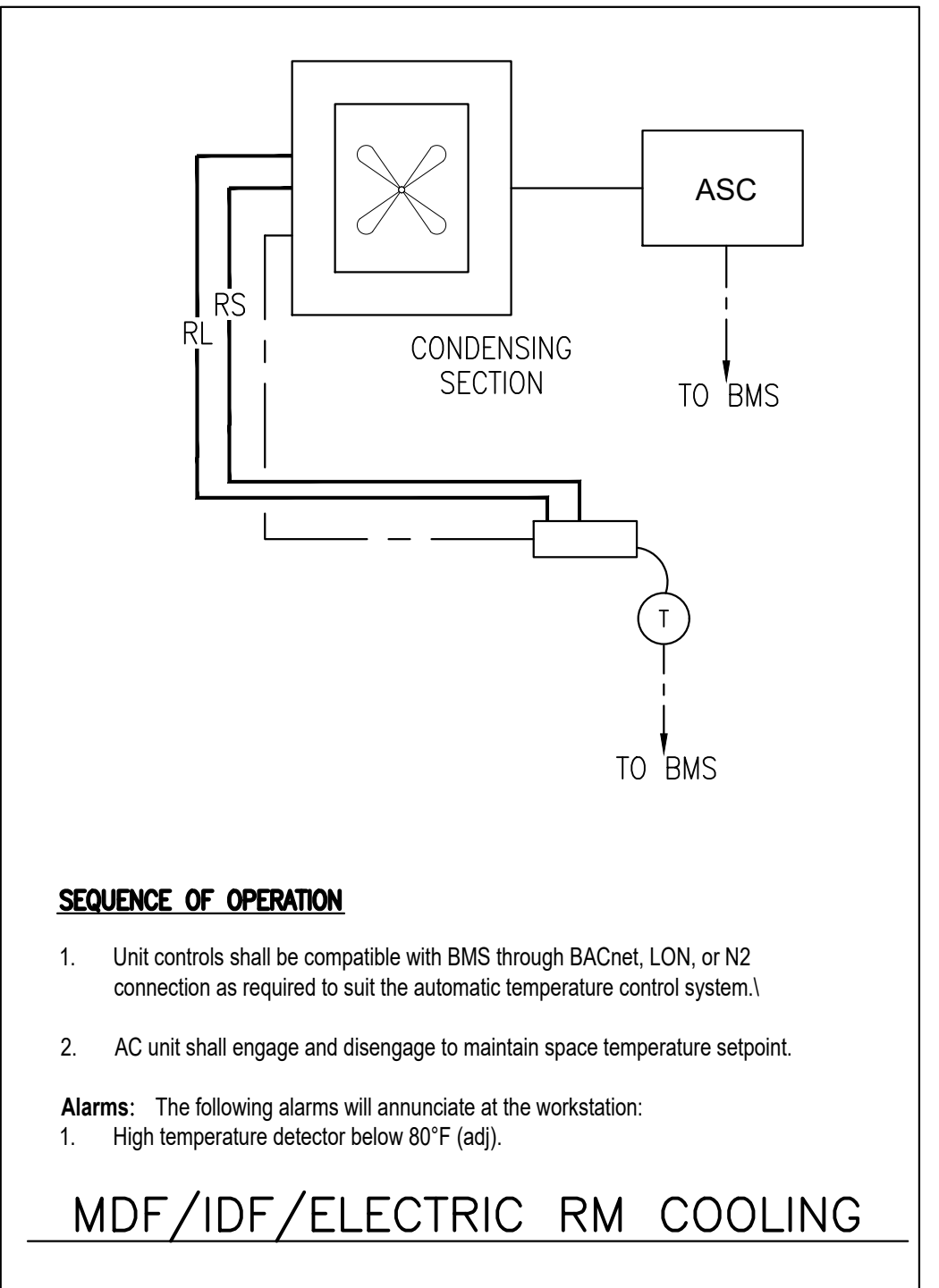
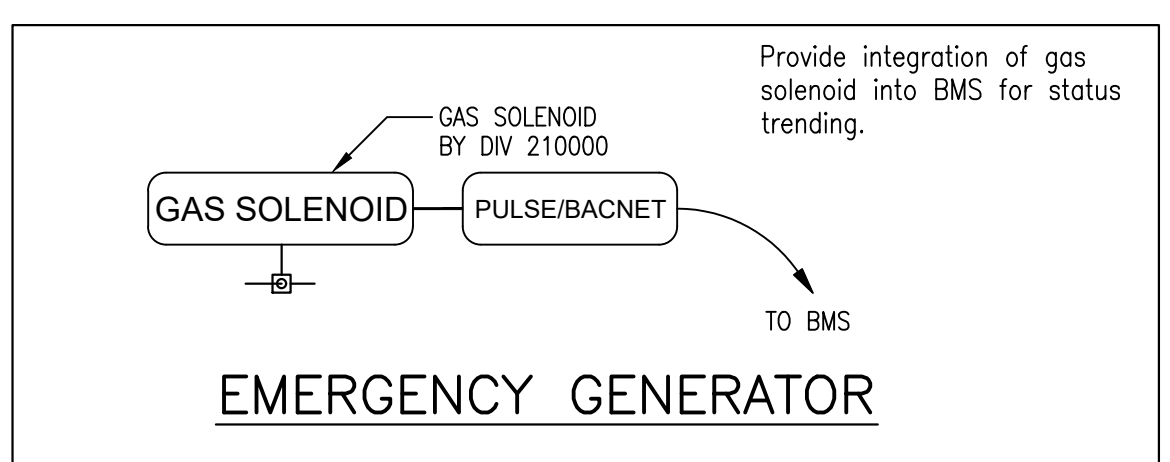
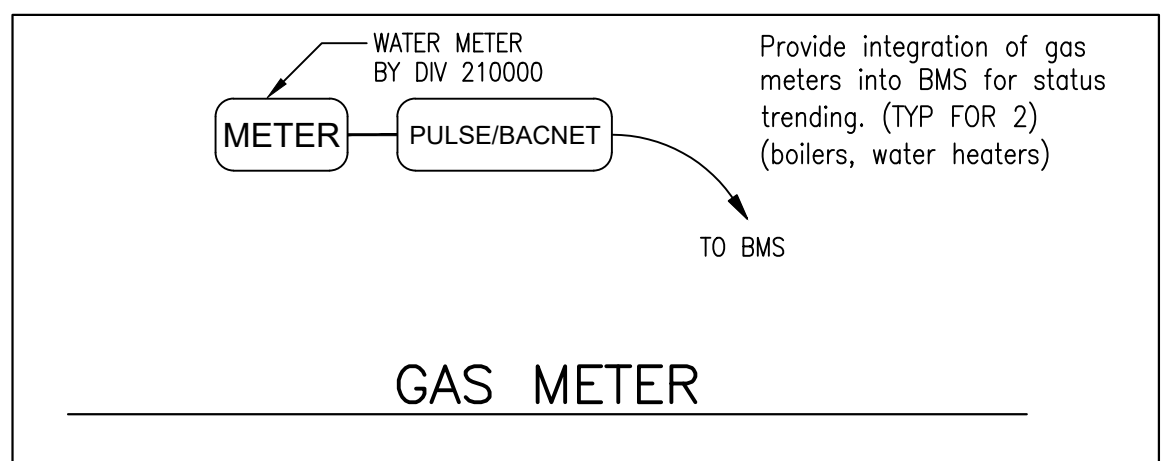
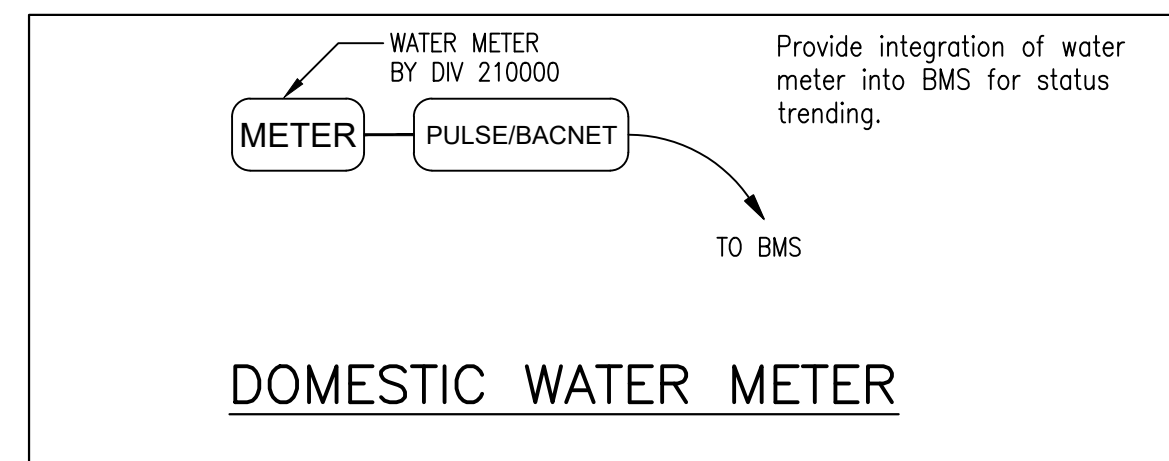
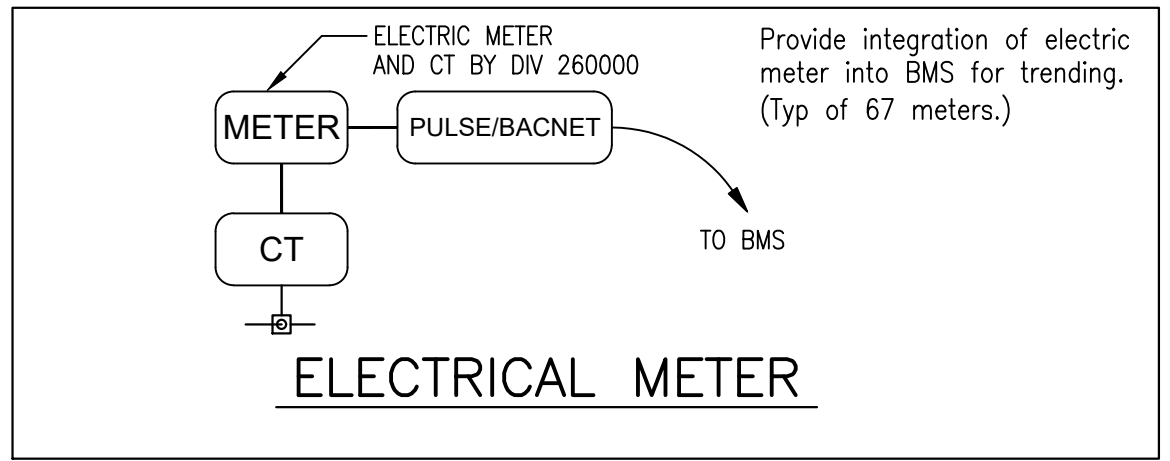
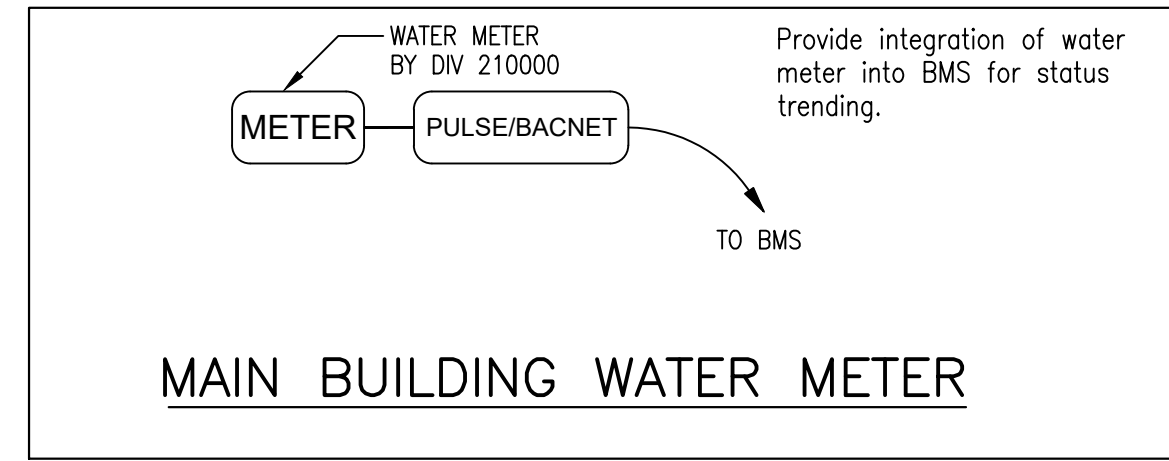
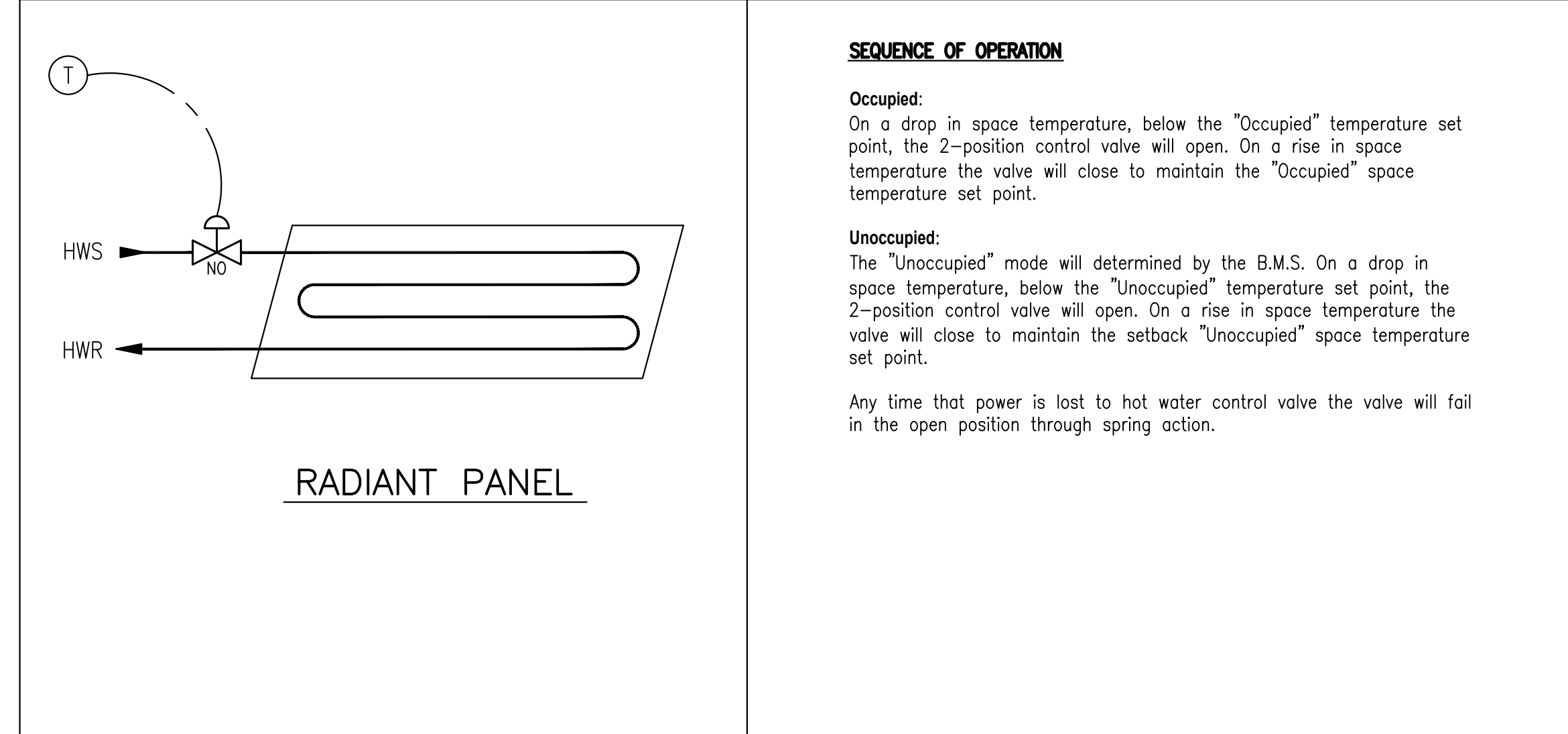
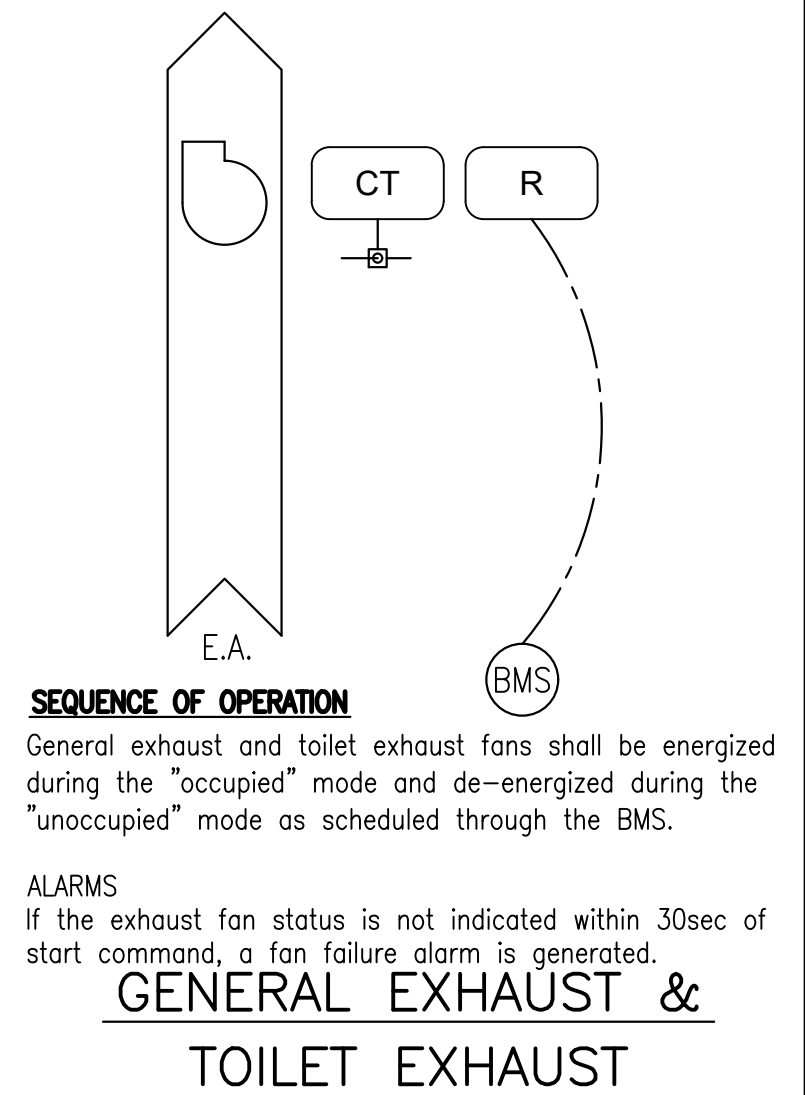
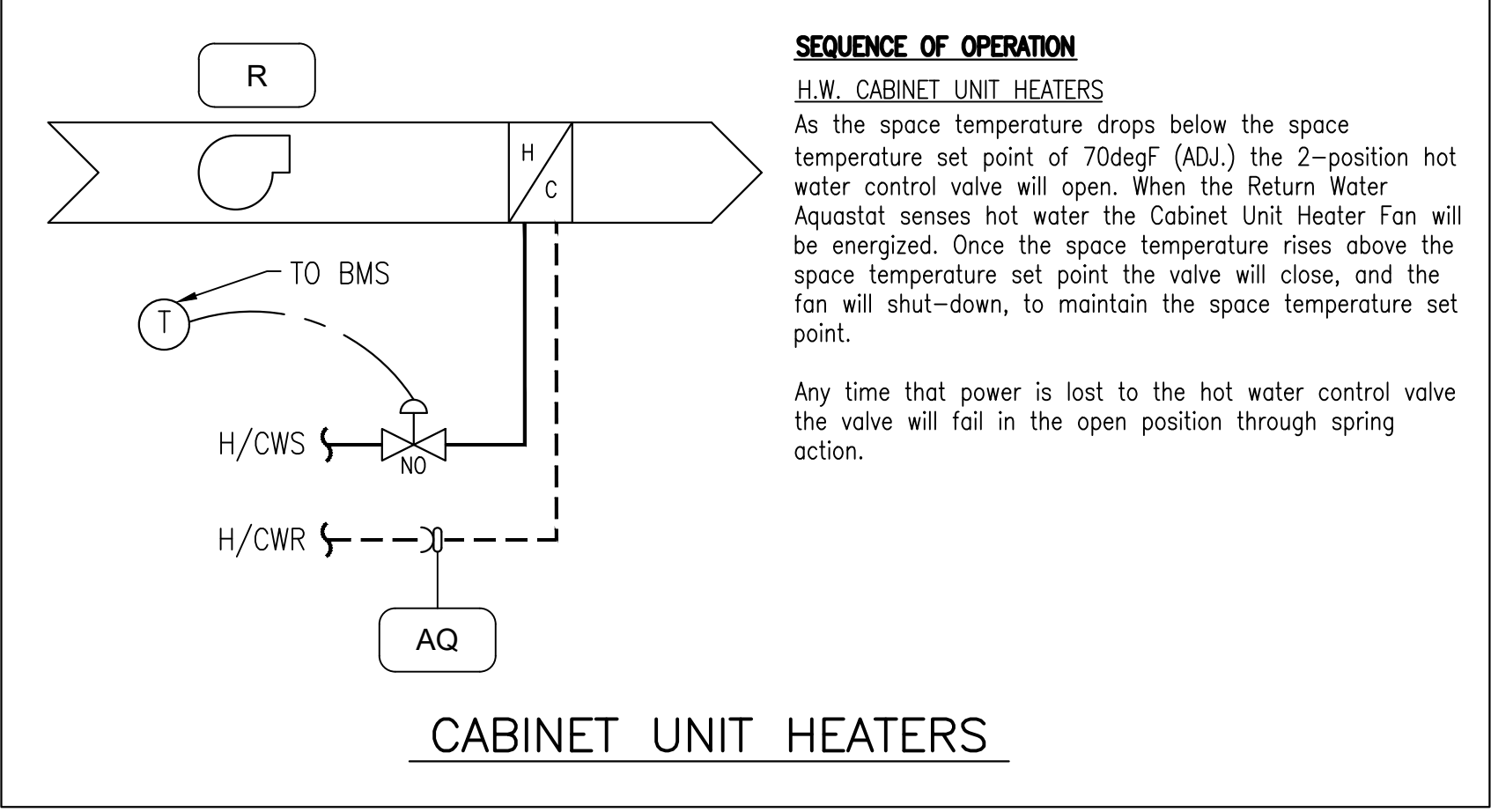
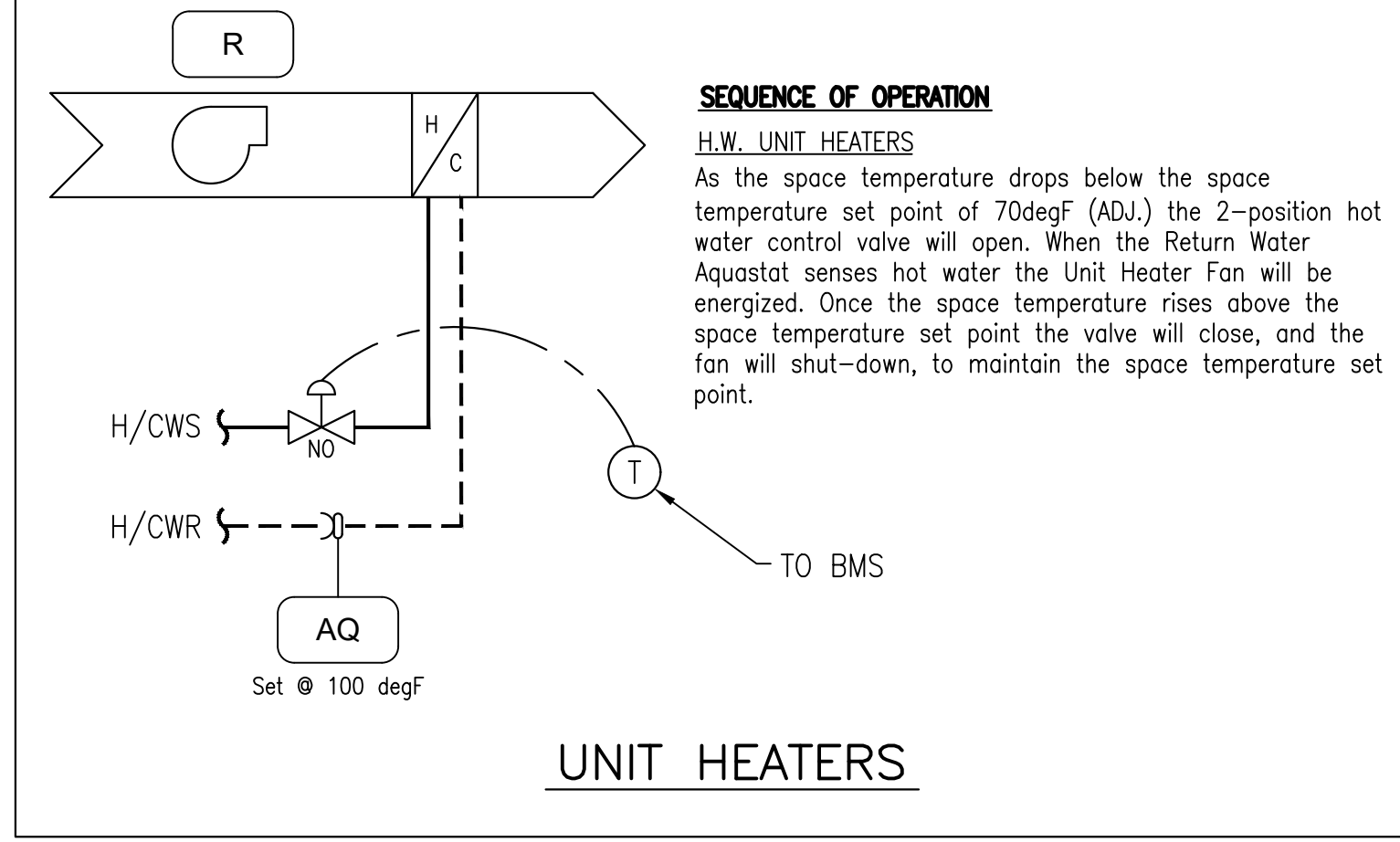
GENERAL NOTES:

- The boilers factory control system shall be capable to run independently in the even of loss of communication between the boilers and the BMS

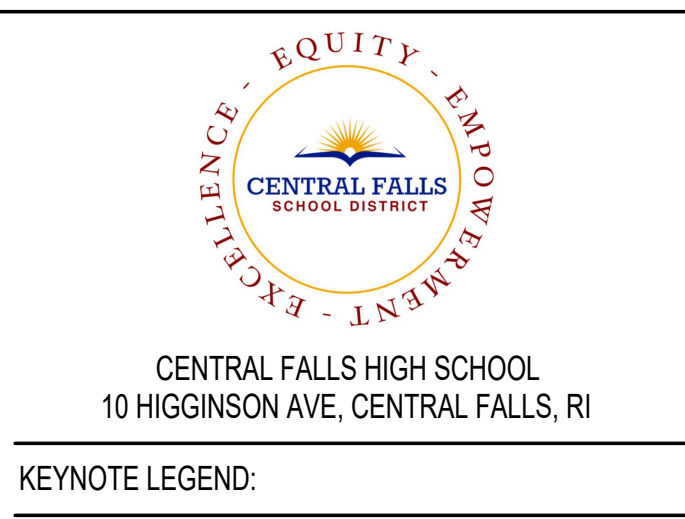


HOT WATER FLOW DIAGRAM AND SEQUENCES OF OPERATION

N.T.S.



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KEYNOTE LEGEND:

100% CONSTRUCTION DOCUMENTS

KEY PLAN NORTH ARROW

DRAWING NAME:
MECHANICAL CONTROL SEQUENCES

DRAWN BY: AP
 REVIEWED BY: DAH
 SCALE: NONE
 JOB NO.: 2202.00
 DATE: OCTOBER 13, 2023
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