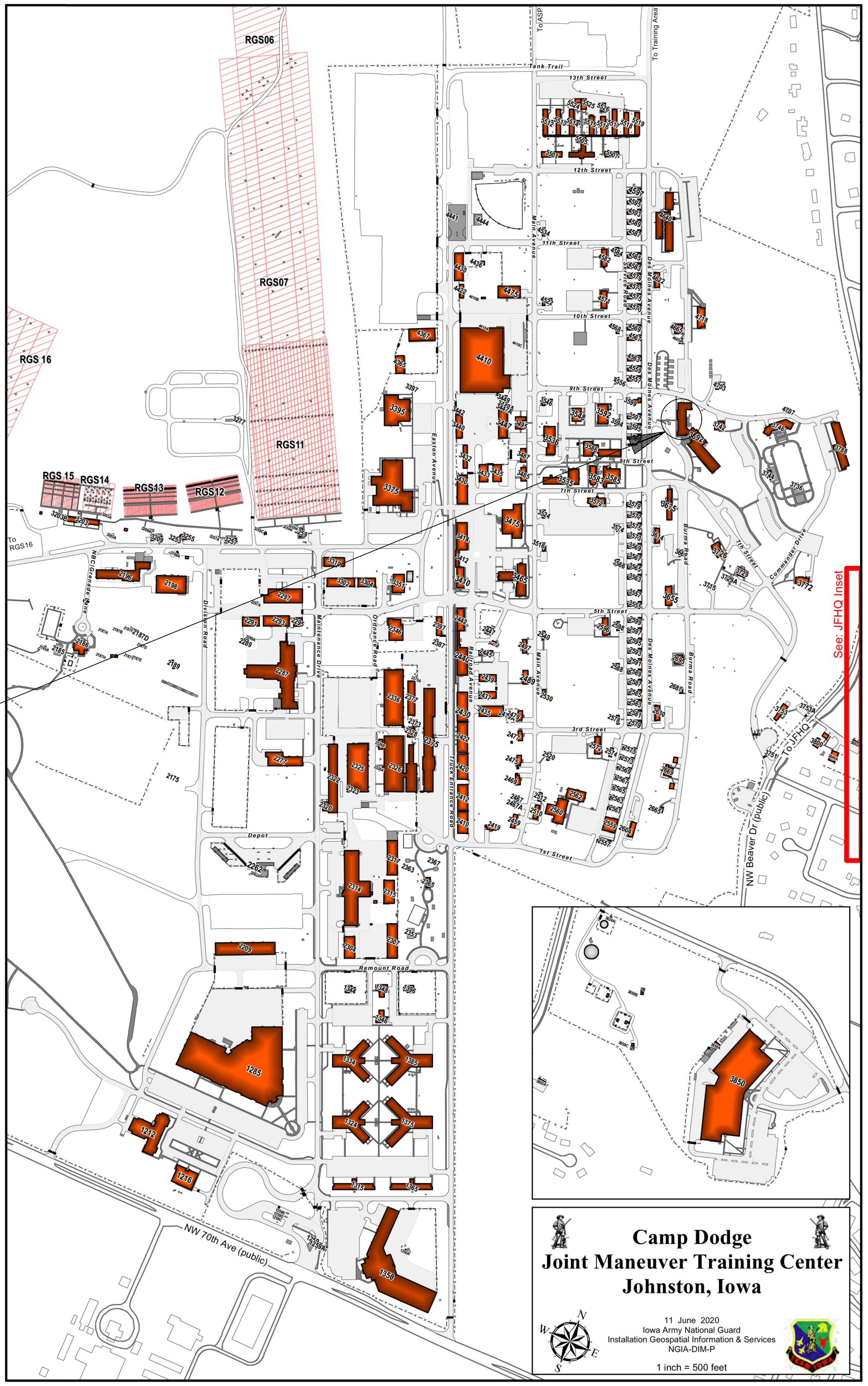
IOWA ARMY NATIONAL GUARD

CAMP DODGE, JOHNSTON, IA

BUILDING A9
HVAC IMPROVEMENTS

PROJECT NO. 19083677
CONTRACT NO. 142A9044

BUILDING A9



Camp Dodge
Joint Maneuver Training Center
Johnston, Iowa

11 June 2020
Iowa Army National Guard
Installation Geospatial Information & Services
NGIA-DIM-P
1 inch = 500 feet

mgc Engineering P.C.

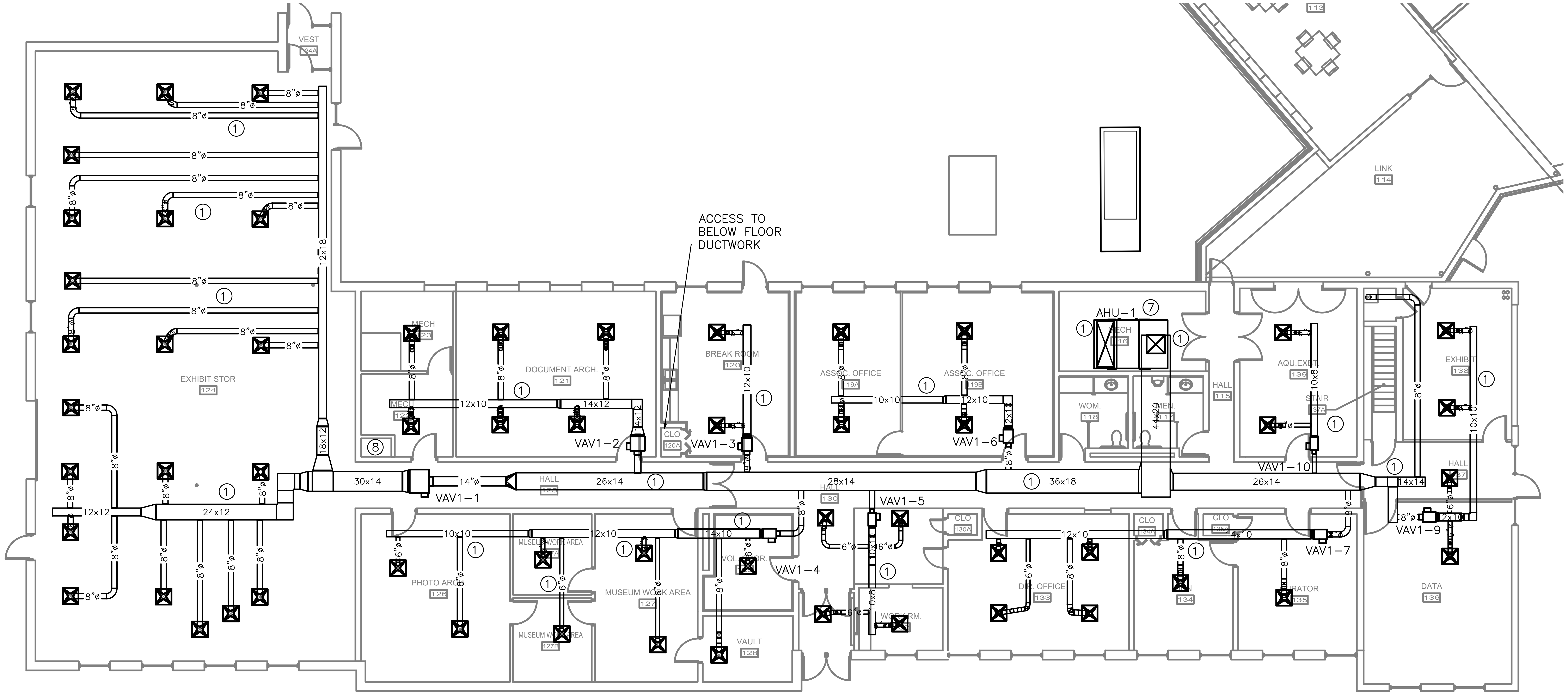
IOWA ARMY NATIONAL GUARD
CAMP DODGE - BUILDING A9
HVAC IMPROVEMENTS

90% CD REVIEW	05/19/2024
100% CD	08/12/2024

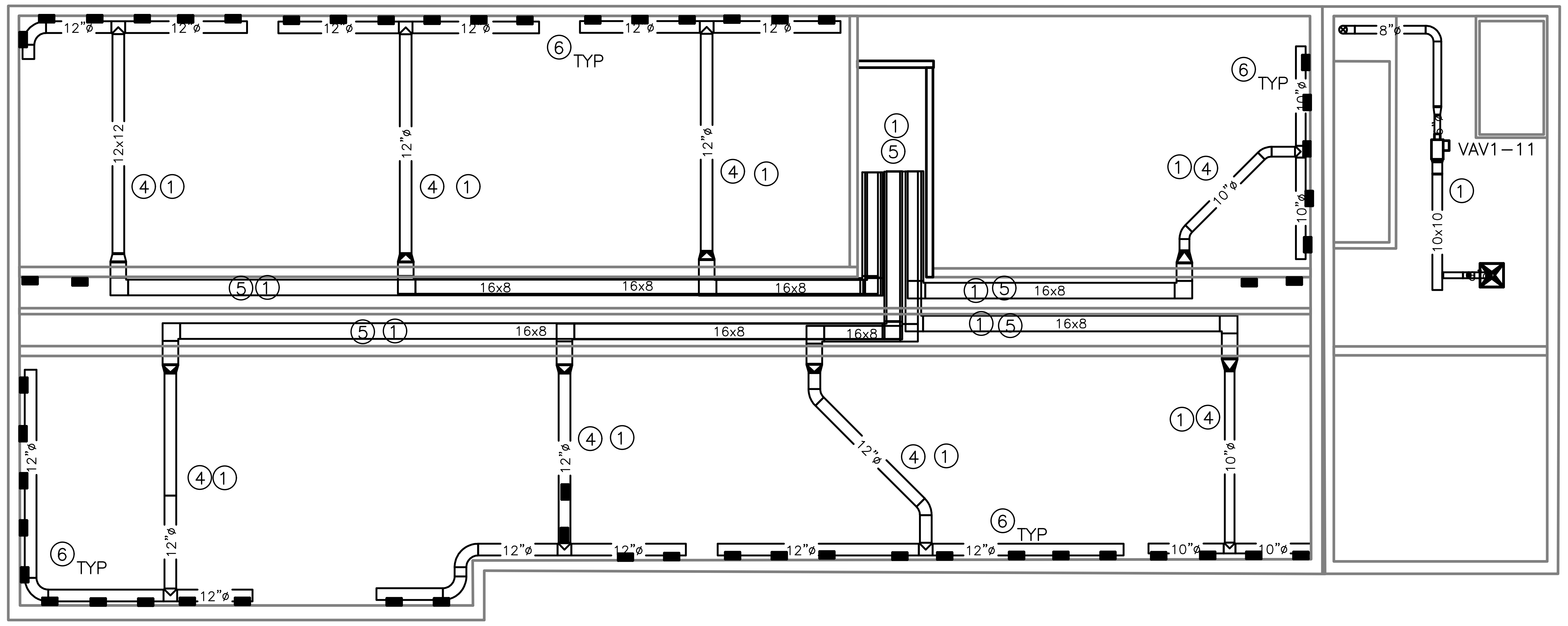
COVER SHEET

M001

NOTES (DUCT CLEANING):
1. CLEAN EXISTING DUCTWORK, DIFFUSERS AND GRILLES.
2. PROVIDE ALL NECESSARY ACCESS DOORS FOR COMPLETE CLEANING.
3. COORDINATE ANY DOWN TIME WITH THE OWNER.
4. BURIED DUCTWORK.
5. DUCTWORK IN TUNNEL.
6. DUCT UP TO GRILLE.
7. CLEAN ALL INTERNAL AHU COMPONENTS.
8. RELIEF HOOD.



2 MECHANICAL FLOOR PLAN – DUCT CLEANING
1/8" = 1'-0"



1 MECHANICAL LOWER LEVEL FLOOR PLAN – DUCT CLEANING
1/8" = 1'-0"

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IOWA ARMY NATIONAL GUARD
CAMP DODGE - BUILDING A9
CHILLER REPLACEMENT

90% CD REVIEW	05/19/2024
100% CD	08/12/2024

MECHANICAL FLOOR PLAN - DUCT CLEANING

M101

CHILLER SCHEDULE

TAG	MANUFACTURER	MODEL NO	NOM. TONS	MBH OUTPUT	AMB TEMP	COOLING				ELECTRICAL			NOTES
						GPM	EWT/LWT	FLUID	PRES DROP	MCA	MOCP	VOLT/PH	
CH-1	TRANE	CGAM030A2	30	1	95	56	45 / 35	30% PG	15 FT	136	175	208/ 3	1, 2

NOTES:
1. CHILLER TO BE SELECTED TO SERVE EXISTING COIL IN AHU – SEE CHILLED WATER SCHEDULE
2. PROVIDE CHILLER WITH BACNET INTERFACE (BASE BID). COORDINATE REQUIREMENTS WITH CONTROLS CONTRACTOR

WATER COIL SCHEDULE – EXISTING COIL INFORMATION

TAG	MANUFACTURER	MODEL NO	MBH TOTAL/SENS	FLUID				AIR				NOTES
				GPM	EWT/LWT	FLUID	PRES DROP	CFM	EAT	LAT	APD	
CC-1	TRANE	PRIMA-FLO H (W)	271 / 266	60	35 / 45	30% PG	8 FT	9500	75.8 / 59.2	50.0 / 48.5	0.65 INCH	1.
HC-1	TRANE	PRIMA-FLO H (WC)	231.5	15.4	180 / 150	WATER	1 FT	9500	50	72	0.2 INCH	1.

NOTES:
1. EXISTING COILS TO REMAIN.

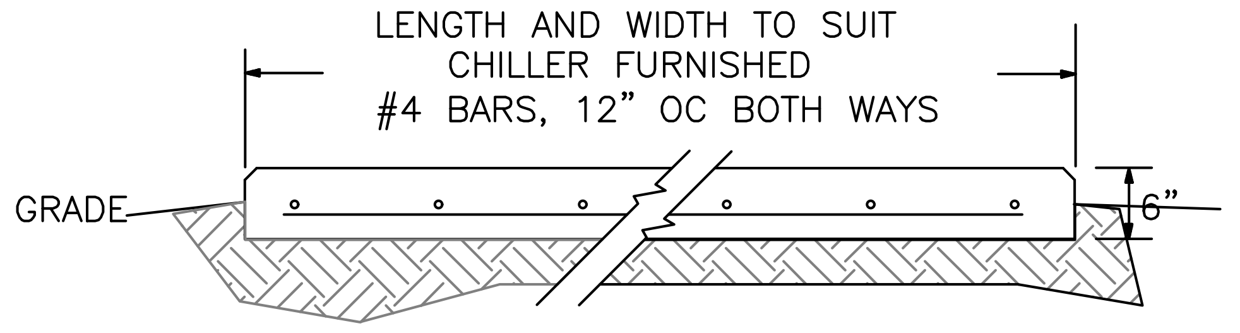
CHILLED WATER PUMP SCHEDULE

TAG	MANUFACTURER	MODEL NO	GPM	HEAD (FT)	IMPELLER	EFFICIENCY	MOTOR RPM	ELECTRICAL			NOTES
								HP	BHP	VOLT/PH	
PCH-1	BELL & GOSSETT	e80 2.5X2.5X2X7B	60	30	5.75	0.54	1750	1.5	0.89	208/ 3	1, 2,
PCH-2	BELL & GOSSETT	e80 2.5X2.5X2X7B	60	30	5.75	0.54	1750	1.5	0.89	208/ 3	1, 2,

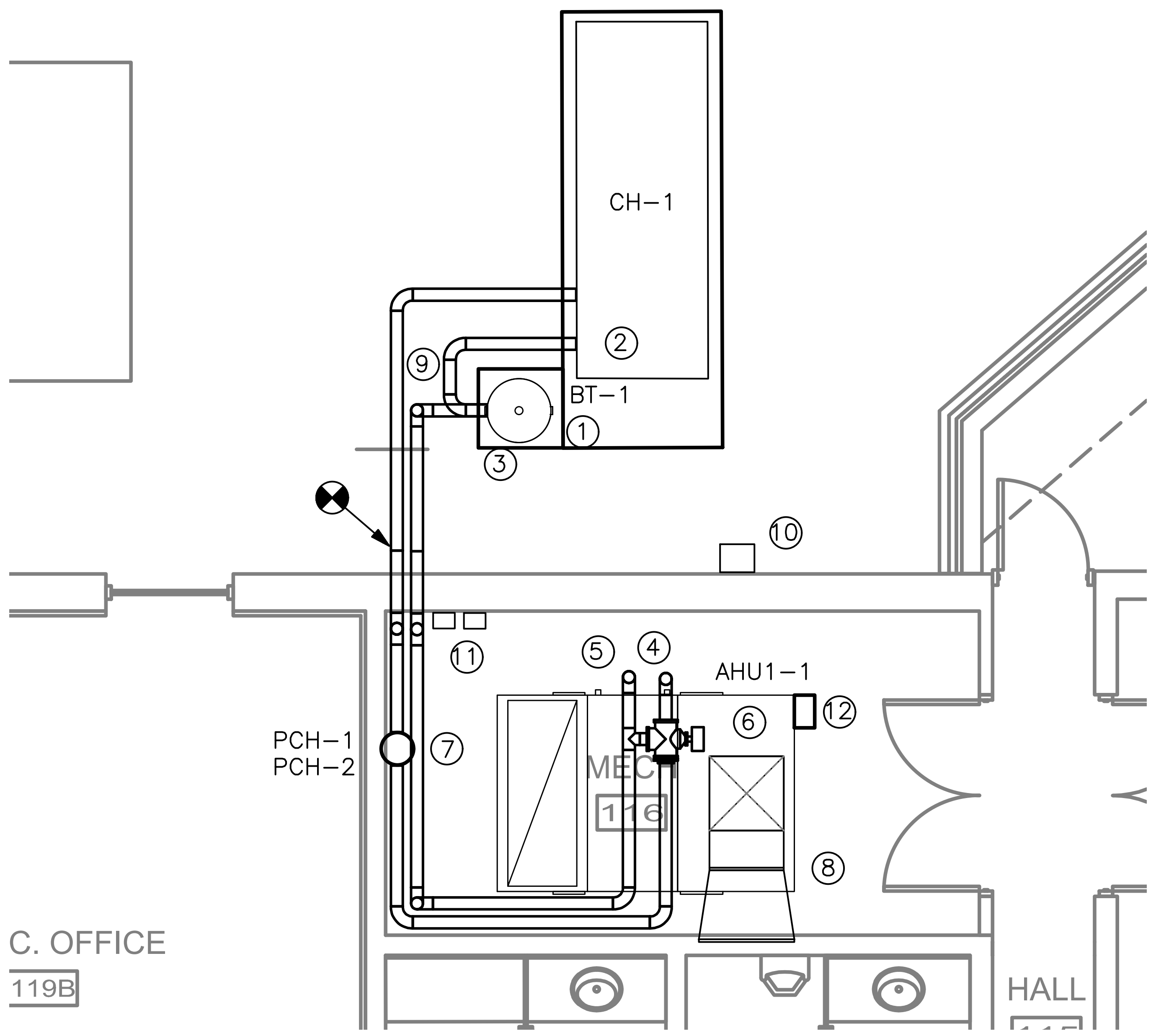
NOTES:
1. CLEAN STRAINER BEFORE OPERATION OF NEW PUMP.
2. MODIFY PIPING AS REQUIRED FOR NEW PUMP.

NOTES (NEW CONSTRUCTION):
1. PROVIDE NEW 6" CONCRETE PAD. PAD TO BE A MINIMUM OF 6" LARGER THAN CHILLER AND INCORPORATE NEW BUFFER TANK. RAISE GRADE AS REQUIRED. VERIFY LOCATION OF UTILITIES AND PROTECT.
2. PROVIDE NEW CHILLER
3. PROVIDE NEW BUFFER TANK (150 GALLON)
4. PROVIDE NEW THREE WAY CHILLED WATER COIL CONTROL VALVE AND ACTUATOR
5. PROVIDE NEW THREE-WAY HOT WATER COIL CONTROL VALVE AND ACTUATOR
6. PROVIDE NEW AHU MOTOR AND SHEAVES
7. PROVIDE NEW CHILLED WATER PUMPS (TWO PUMPS)
8. REUSE EXISTING CONTROL COMPONENTS AND CONFIRM EXISTING CONTROL SEQUENCE. ALTERNATE #1 – UPDATE CONTROL SYSTEM. SEE SHEET M104
9. PROVIDE NEW CHILLED WATER PIPING TO CHILLER AND BUFFER TANK
10. PROVIDE NEW ELECTRICAL SERVICE TO CHILLER – CONFIRM BREAKER SIZE
11. PROVIDE NEW STARTER AND RECONNECT CHILLED WATER PUMPS.
12. PROVIDE NEW VARIABLE FREQUENCY DRIVE FOR AHU FAN MOTOR. (10 HP, 208V/3PH). VFD SHALL HAVE BACNET COMMUNICATION TO THE BAS).
13. FLUSH SYSTEM AND PROVIDE NEW 30% PG IN CHILLED WATER SYSTEM.

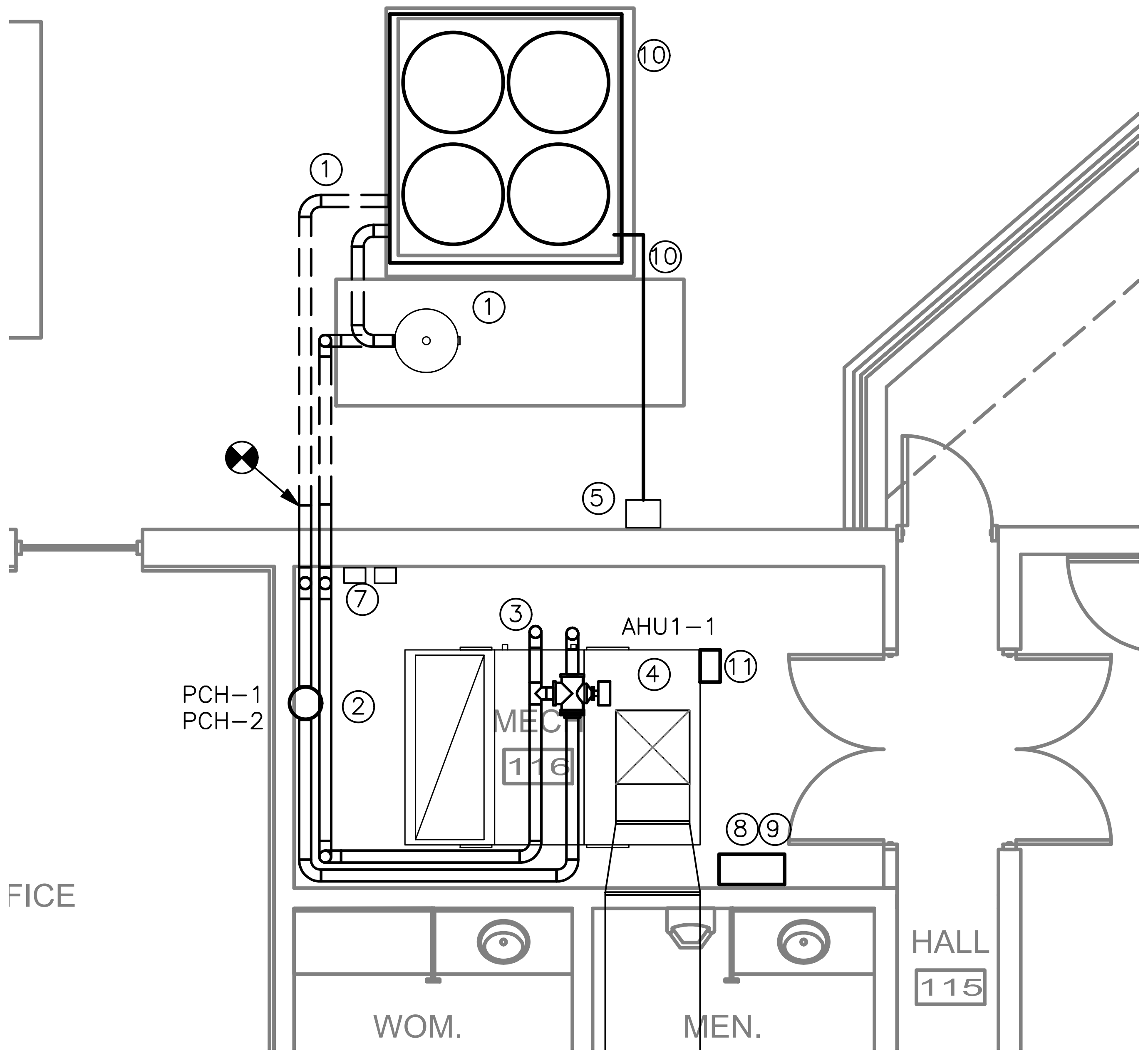
NOTES (DEMO):
1. DISCONNECT CHILLED WATER SUPPLY AND RETURN PIPING, REMOVE EXISTING CHILLER AND BUFFER TANK. DRAIN AND DISPOSE OF GLYCOL IN SYSTEM.
2. REMOVE CHILLED WATER PUMPS. (TWO PUMPS)
3. REMOVE CHILLED WATER COIL & HOT WATER COIL CONTROL VALVES AND ACTUATORS.
4. REMOVE SUPPLY FAN MOTOR AND SHEAVES
5. DISCONNECT ELECTRICAL SERVICE TO CHILLER AND REMOVE CONDUIT AND CONDUCTORS BACK TO DISCONNECT
6. REUSE ALL EXISTING CONTROLLERS, CONTROLLERS AND SENSORS. CALIBRATE SENSORS.
7. DISCONNECT ELECTRICAL SERVICE TO STARTERS, SERVING PUMPS. REMOVE STARTERS AND PREPARE CONDUIT AND CONDUCTORS FOR REUSE.
8. REMOVE HUMIDIFIER, INSERTION TUBE AND CAP DOMESTIC WATER SERVICE AND CAP AND SEAL DUCT OPENING.
9. DISCONNECT ELECTRICAL SERVICE TO HUMIDIFER. REMOVE CONDUIT AND CONDUCTORS BACK TO PANEL – RE-LABEL PANEL
10. REMOVE CHILLER CONCRETE PAD AND BUFFER TANK CONCRETE PAD.
11. DISCONNECT AND REMOVE VARIABLE FREQUENCY DRIVE OF AHU FAN MOTOR. PREPARE CONDUIT AND CONDUCTOR FOR REUSE.



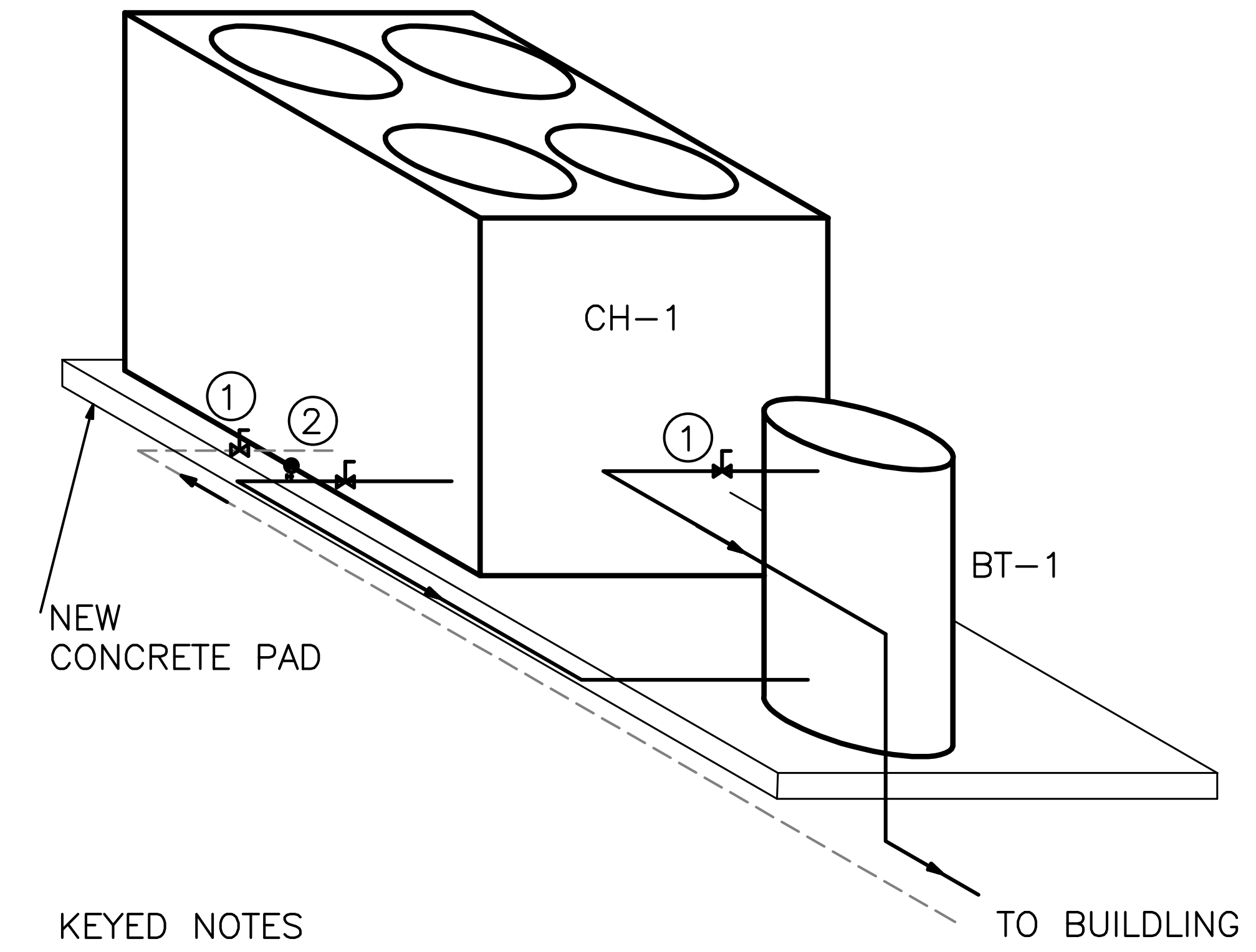
4 CHILLER BASE DETAIL
NTS



2 MECHANICAL PARTIAL FLOOR PLAN – HVAC NEW CONSTRUCTION
1/4" = 1'-0"



1 MECHANICAL PARTIAL FLOOR PLAN – HVAC DEMO
1/4" = 1'-0"



KEYED NOTES
1. ISOLATION VALVE (TYP)
2. THERMOMETER

3 NEW CHILLER PIPING DETAIL
NTS

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CHILLER REPLACEMENT

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MECHANICAL
FLOOR PLAN
- MAIN LEVEL

M102

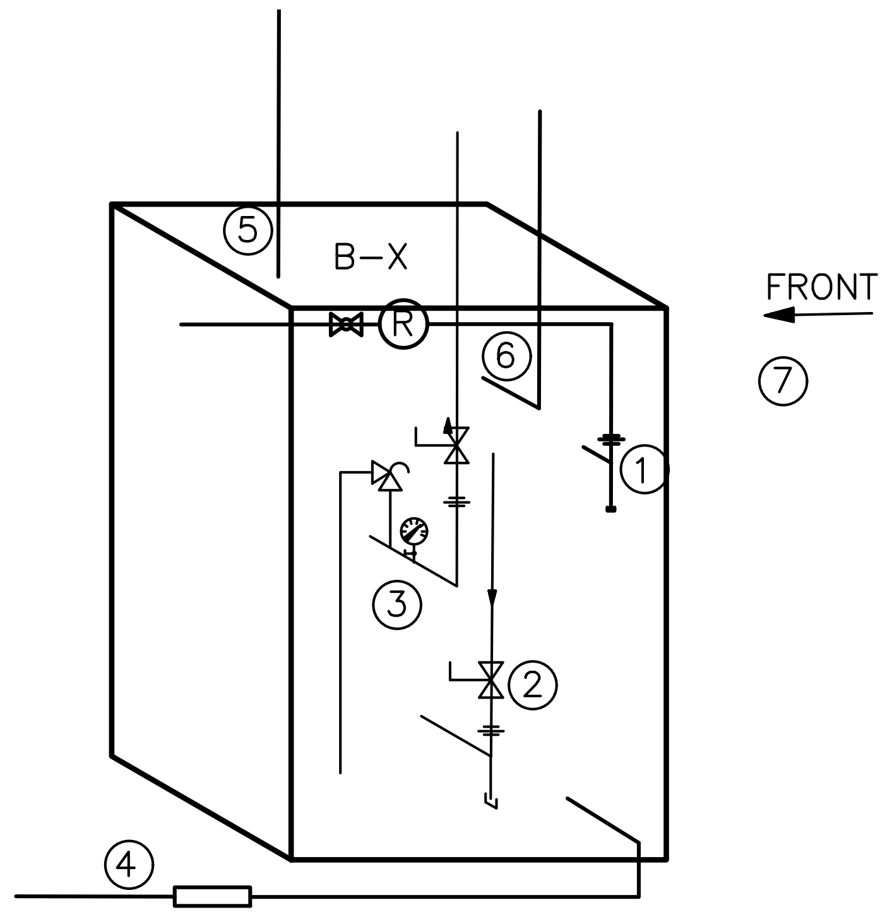
BOILER SCHEDULE														
TAG	MANUFACTURER	MODEL NO	MBH INPUT	MBH OUTPUT	EFFICIENCY	FUEL	CONNECTIONS				ELECTRICAL			NOTES
							HWS/HWR (INCH)	FLUE (INCH)	COMB (INCH)	NG (INCH)	MCA	MOCP	VOLT/PH	
B-1	LOCHINVAR	KHB285N	285	264	95	NG	1-1/4	3	3	1/2	5	15	120/1	1, 2
B-2	LOCHINVAR	KHB285N	285	264	95	NG	1-1/4	3	3	1/2	5	15	120/1	1, 2

NOTES:
1. PROVIDE BACNET INTERFACE (BASE BID)
2. CONNECT TO EXISTING FLUE/COMBUSTION AIR ROUTED TO ROOF

ALTERNATE #1:
1. COORDINATE WITH TEMPERATURE CONTROLS CONTRACTOR.
    1.1. REMOVE AND REPLACE VAV BOX HW CONTROL VALVES. RECONFIGURE PIPING AS NECESSARY FOR NEW VALVES. SEE SHEET M101 FOR VAV BOX LOCATIONS.
    1.2. INSTALL BOILER ISOLATION CONTROL VALVES.
    1.3. INSTALL AHU-1 OUTDOOR AIR FLOW SENSOR.

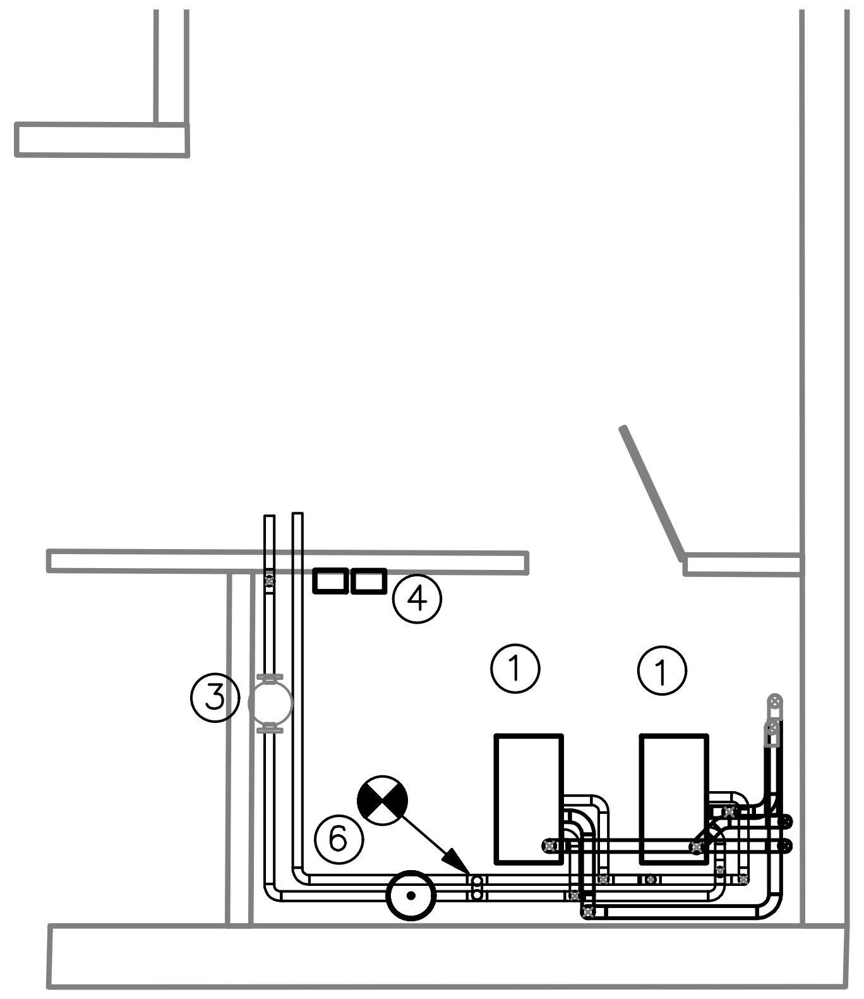
HOT WATER PUMP SCHEDULE											
TAG	MANUFACTURER	MODEL NO	GPM	HEAD (FT)	IMPELLER	EFFICIENCY	MOTOR RPM	ELECTRICAL			NOTES
								HP	BHP	VOLT/PH	
PHW-1	BELL & GOSSETT	e80 1.5X1.5X2X7c	50	30	5.875	0.56	1750	1.0	0.69	208/ 3	1, 2
PHW-2	BELL & GOSSETT	e80 2.5X2.5X2X7B	50	30	5.875	0.56	1750	1.0	0.69	208/ 3	1, 2

NOTES:
1. CLEAN EXISTING STRAINER BEFORE PUMP OPERATION.
2. MODIFY PIPING AS REQUIRED FOR NEW PUMP



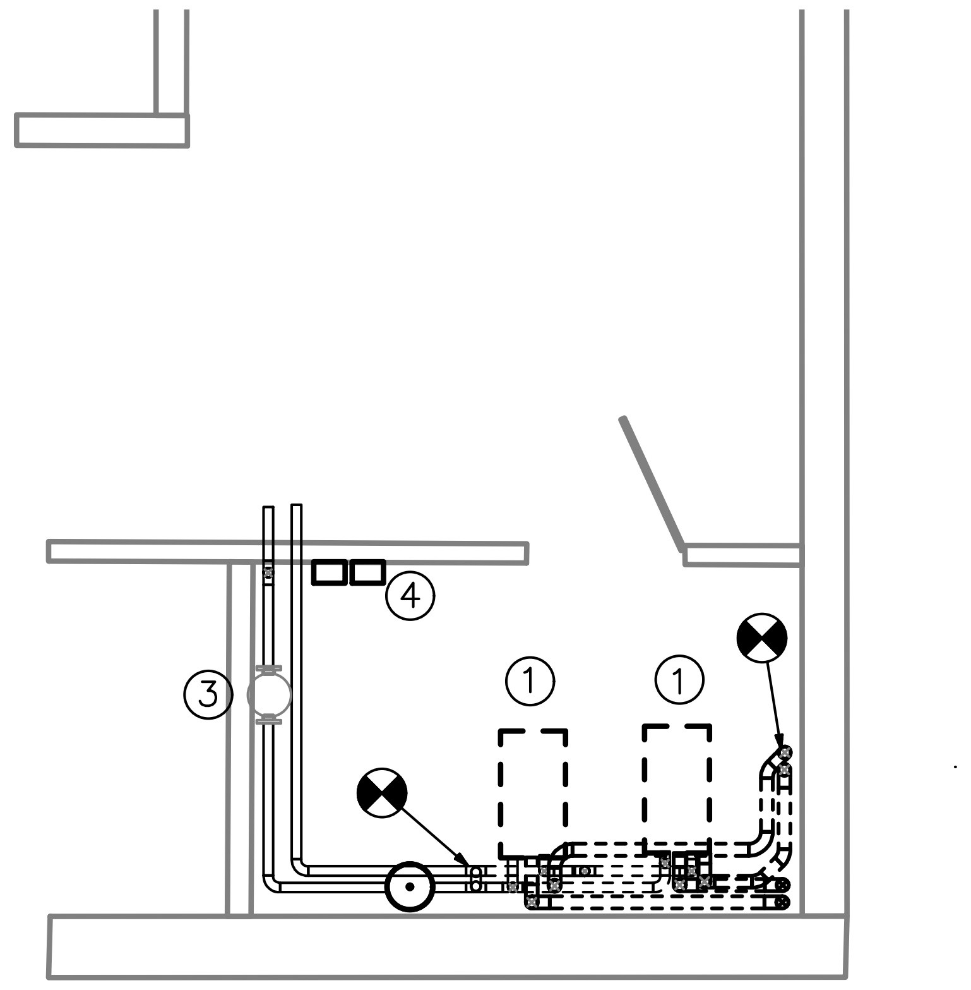
6 BOILER CONNECTION DIAGRAM
NTS

NOTES:
1. CONNECT 1" NG SERVICE, ISOLATION VALVE AND REGULATOR WITH DRIP LEG
2. CONNECT 1-1/4" HWS TO BOILER WITH ISOLATION VALVE AND DRAIN.
3. CONNECT 1-1/4" HWR TO BOILER WITH ISOLATION VALVE, TEMPERATURE/PRESSURE GAUGE AND PRESSURE RELIEF VALVE. PIPE RELIEF VALVE TO FLOOR DRAIN.
4. PROVIDE NEUTRALIZATION DEVICE FOR EACH BOILER AND PIPE DRAIN TO FLOOR DRAIN.
5. PROVIDE NEW 3" FLUE TO MATCH EXISTING
6. COMBUSTION AIR INLET
7. MAINTAIN SERVICE CLEARANCE AS RECOMMENDED BY THE MANUFACTURER



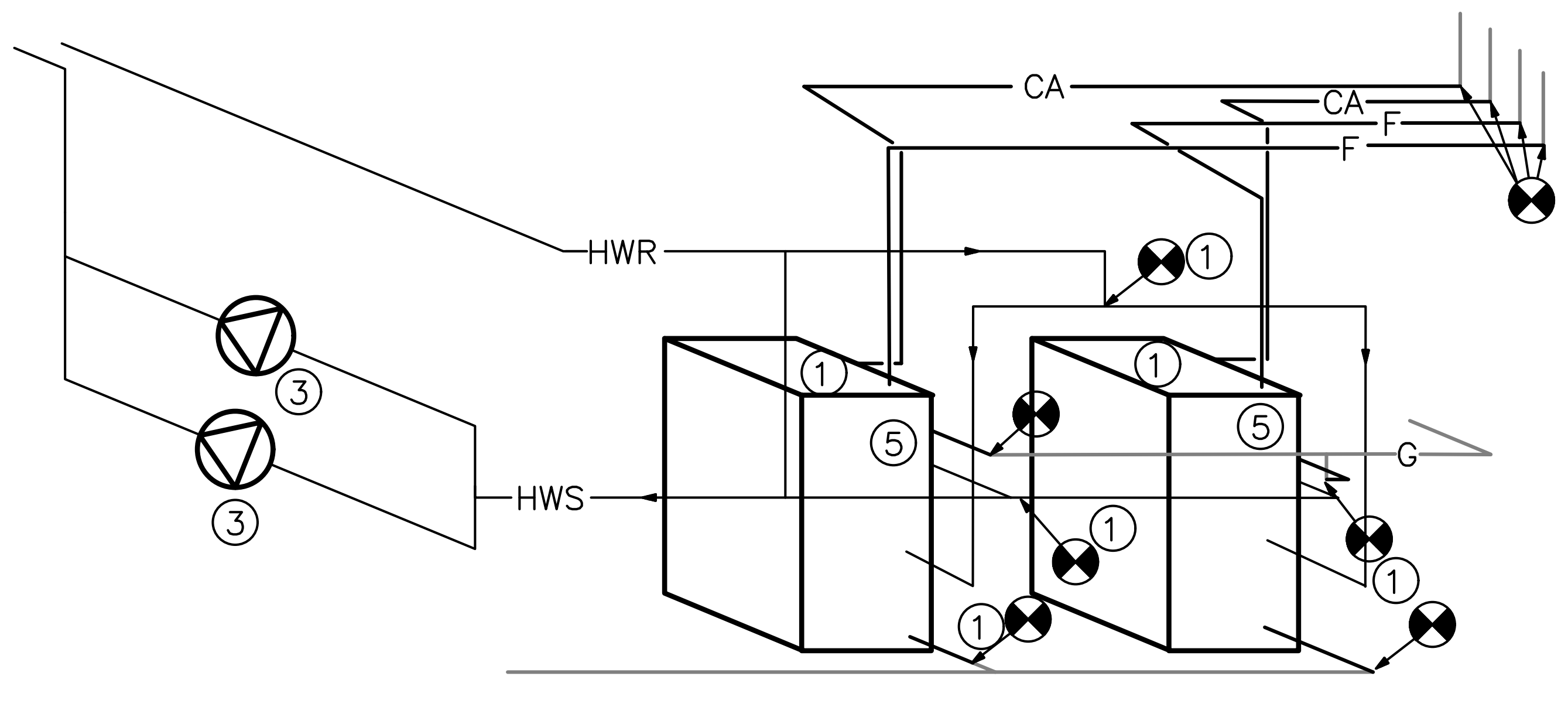
4 MECHANICAL LOWER LEVEL FLOOR PLAN – HVAC NEW
1/4" = 1'-0"

NOTES (NEW):
1. INSTALL NEW BOILER AND CONNECT HWS, HWR AND NG PIPING, CONDENSATE DRAIN, FLUE, COMBUSTION AIR DUCT, ELECTRICAL CONNECTION, AND TEMPERATURE CONTROLS. COORDINATE WITH BOILER DOCUMENTS FOR CONNECTION LOCATIONS.
2. INSTALL NG REGULATOR TO EACH BOILER
3. INSTALL NEW PUMPS (TWO PUMPS). RECONNECT ELECTRICAL CONNECTIONS.
4. INSTALL NEW PUMP STARTERS. RECONNECT ELECTRICAL CONNECTIONS.
5. SEE BOILER PIPING DETAIL 5/M103
6. USE EXISTING AIR SEPARATOR, EXPANSION TANK AND POT FEEDER.

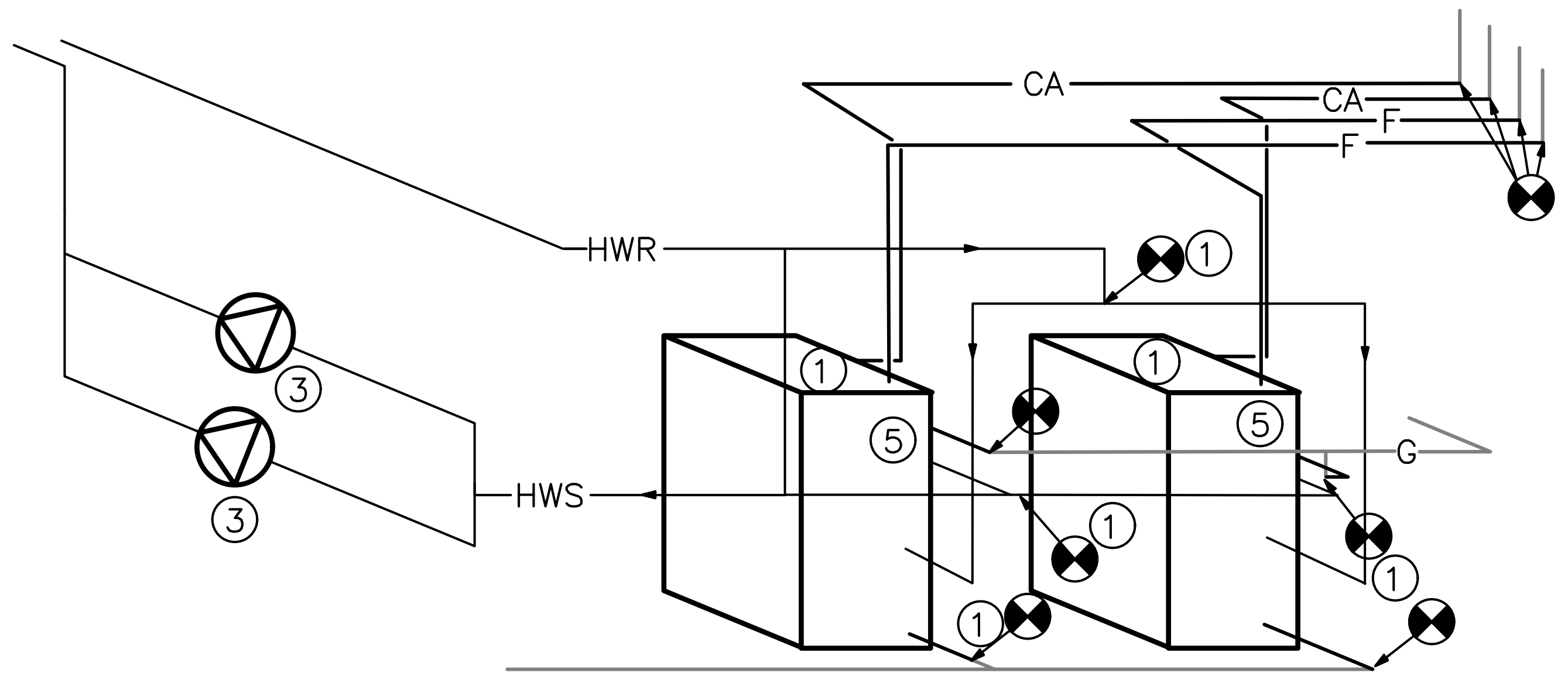


2 MECHANICAL LOWER LEVEL FLOOR PLAN – HVAC DEMO
1/4" = 1'-0"

NOTES (DEMO):
1. DISCONNECT HWS, HWR AND NG PIPING, CONDENSATE DRAIN, NG REGULATOR, COMBUSTION AIR DUCTWORK, FLUE, ELECTRICAL CONNECTION, TEMPERATURE CONTROLS AND REMOVE BOILER. PREPARE FOR NEW CONNECTIONS
2. SALVAGE NG REGULATOR.
3. DISCONNECT ELECTRICAL CONNECTION TO PUMP AND REMOVE PUMP. PREPARE FOR RECONNECTION.
4. REMOVE PUMP STARTER



3 MECHANICAL FLOOR PLAN – HVAC (NEW)
NTS



1 MECHANICAL FLOOR PLAN – HVAC DEMO
NTS

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CAMP DODGE - BUILDING A9
CHILLER REPLACEMENT**

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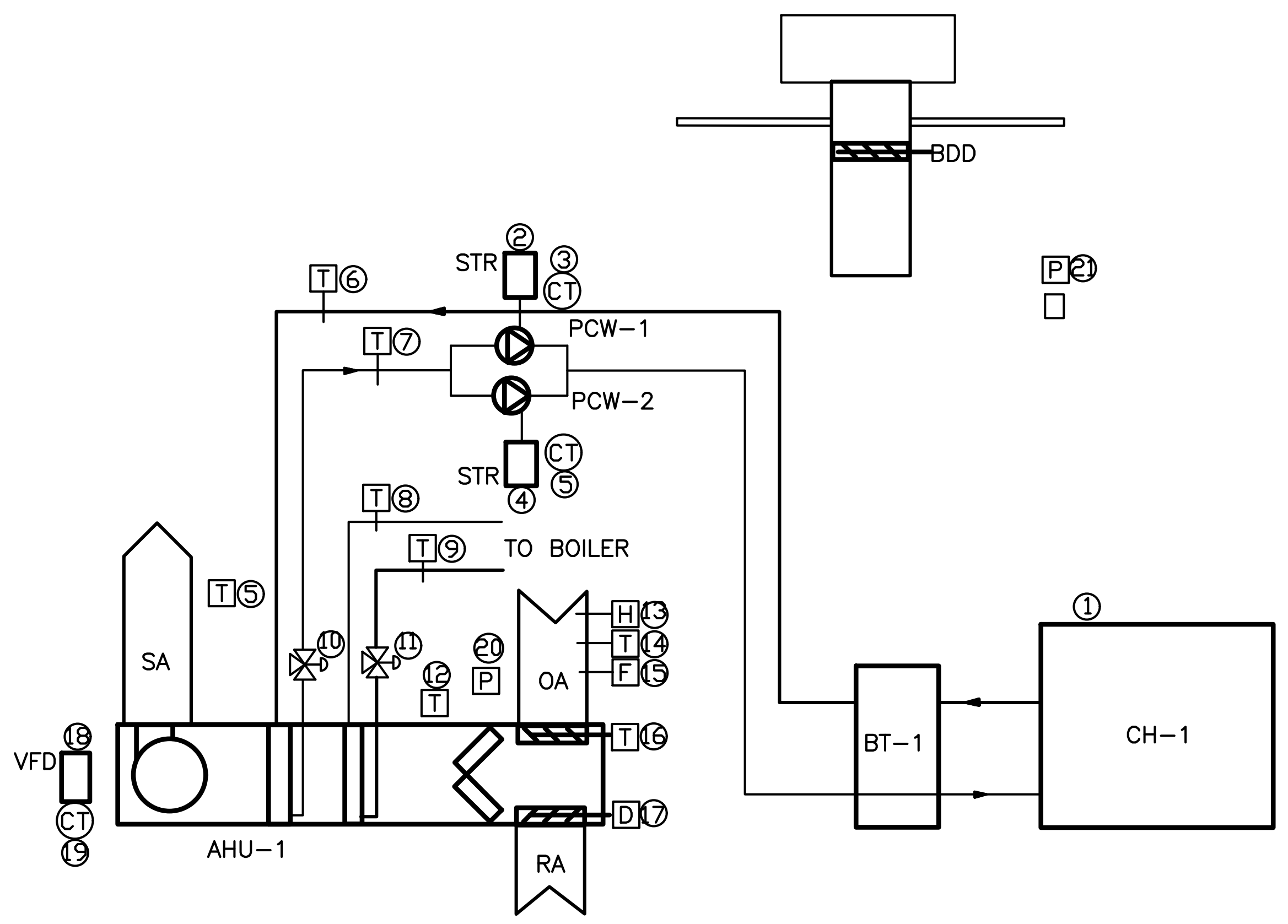
**MECHANICAL
FLOOR PLAN -
LOWER LEVEL**

M103

CH-1/AHU-1 SYSTEM CONTROL POINTS
1. B-1 BACNET CONNECTION TO CHILLER
    A. ENABLE/DISABLE (DO)
    B. EWT (AI)
    C. LWT (AI)
    D. COOLING STAGES (DI)
    E. RUN TIME (AI)
2. PCH-1 STARTER
    A. PCH-1 START/STOP (DO)
    B. RUN TIME (CALCULATED)
3. PCH-1 STATUS (DI)
4. PCH-2 STARTER
    A. PCH-2 START/STOP (DO)
    B. RUN TIME (CALCULATED)
5. PCH-2 STATUS (DI)
6. CHS TEMP (AI)
7. CHR TEMP (AI)
8. HWS TEMP (AI)
9. HWR TEMP (AI)
10. CH CONTROL VALVE (AO)
11. HW CONTROL VALVE (AO)
12. AHU-1 MIXED AIR TEMP - MAT (AI)
13. AHU-1 OA HUMIDITY (AI)
14. AHU-1 OA TEMP (AI)
15. AHU-1 OA AIRFLOW (AI)
16. AHU-1 OA DAMPER (AO)
17. AHU-1 RA DAMPER (AO)
18. BACNET CONNECTION TO AHU-1 VFD
    A. AHU-1 SF-1 START/STOP (DO)
    B. AHU-1 SF-1 VFD SPEED (AO)
    C. AHU-1 SF-1 STATUS (DI)
    D. AHU-1 SF-1 VFD FAULT (DI)
19. AHU-1 SF-1 STATUS (DI)
20. AHU-1 FILTER PRESSURE DROP (AI)
21. BUILDING PRESSURE (AI)



⑥ AHU-1 / CH-1 CONTROL DIAGRAM
NTS

CHILLER SEQUENCE

SYSTEM CONSISTS OF A CHILLER, A CONSTANT VOLUME LEAD/STANDBY PUMPS AND A CHILLED WATER COIL CONTROL VALVE.

BAS SHALL ENABLE THE CHILLER BASED ON AHU LEAVING AIR TEMPERATURE.
WHEN AHU-1 DISCHARGE AIR TEMPERATURE IS GREATER THAN DAT SETPOINT (50 F - ADJUSTABLE) OR WHEN A SPACE HUMIDITY SENSOR CALLS FOR DEHUMIDIFICATION, CHILLER SHALL BE ENABLED.
WHEN CHILLER IS ENABLED, LEAD CHILLED WATER PUMP SHALL BE ENABLED AND ONCE FLOW IS PROVEN, CHILLER WILL BE ENABLED.
BAS SHALL RESET LEAVING CHILLED WATER TEMPERATURE BASED ON SYSTEM DEMAND.
BAS SHALL MONITOR CHILLED WATER VALVE POSITION AND RESET TO KEEP FLOW THROUGH THE COIL AS HIGH AS POSSIBLE.

CHILLED WATER PUMPS SHALL OPERATE IN A LEAD/STANDBY CONFIGURATION. IF LEAD PUMP FAILS TO OPERATE AS COMMANDED, BAS SHALL GENERATE AN ALARM AND STANDBY PUMP SHALL BE ENERGIZED.

BAS SHALL GENERATE AN ALARM WHEN CHILLER SIGNALS A GENERAL ALARM FAILURE.
BAS SHALL GENERATE AN ALARM IF THE CHILLER LWT IS GREATER THAN 3 DEGREES OFF SETPOINT FOR MORE THAN 5 MINUTES.

AHU-1 SEQUENCE

SYSTEM CONSISTS OF A VARIABLE SPEED AIR HANDLING WITH OUTDOOR AIR DAMPER AND RETURN AIR DAMPER, CHILLED WATER COIL AND HEATING WATER COIL. SYSTEM ALSO HAS A REMOTE RELIEF HOOD WITH A MOTORIZED DAMPER.

AHU SHALL BE ENABLED/DISABLED BY THE BAS. UNIT SHALL OPERATE 24/7 AND SHALL OPERATE IN OCCUPIED AND UNOCCUPIED MODE BASED ON TIME OF DAY.

OCCUPIED MODE
WHEN ENABLED, OA & RA DAMPER SHALL MODULATE TO MINIMUM OUTDOOR AIR POSITION (2375 CFM) AS SENSED BY DUCT MOUNTED FLOW SENSOR AND VARIABLE SPEED SUPPLY FAN SHALL MODULATE FROM FULL SPEED TO MINIMUM SPEED TO MAINTAIN DUCT STATIC PRESSURE SENSOR SETPOINT (AS DETERMINED BY THE BALANCER) TO MAINTAIN VAV BOX AIRFLOW. RELIEF DAMPER SHALL MODULATE TO MAINTAIN BUILDING STATIC PRESSURE SETPOINT (0.2" WC -ADJUSTABLE) WITH REFERENCE THE OUTDOORS.

IN COOLING MODE, THREE WAY CHILLED WATER CONTROL VALVE SHALL MODULATE TO MAINTAIN DAT SETPOINT (50 DEGREES F - ADJUSTABLE). WHEN THE OA ENTHALPY IS LOWER THAN THE RA ENTHALPY, OA SHALL BE USED BEFORE THE RA. RA AND OA DAMPER SHALL MODULATE FOR THE LOWEST ENTHALPY AIRSTREAM AND MECHANICAL COOLING WILL REMAIN AVAILABLE.

IN COOLING MODE, RESET DAT - ALLOW DAT TO RESET UP (60 DEGREES F - ADJUSTABLE) BASED ON AIRFLOW THROUGH VAV BOX TO ENSURE ALL BOXES ARE FLOWING 90% OF FULL BOX AIRFLOW AND ALL SPACE RELATIVE HUMIDITY SETPOINTS ARE SATISFIED.

IN HEATING MODE, THREE WAY HOT WATER VALVE SHALL MODULATE TO MAINTAIN DAT SETPOINT (60 DEGREES F - ADJUSTABLE)

IN HEATING MODE PROVIDE MINIMUM OA AIRFLOW AND ALLOW DAT TO RESET DOWN TO 50 DEGREES F IF ANY VAV BOX ZONE REQUIRES COOLING

UNOCCUPIED MODE
AHU SHALL OPERATE AS IDENTIFIED IN OCCUPIED MODE.

BAS SHALL MONITOR PRESSURE DROP ACROSS THE FILTER AND GENERATE AN ALARM WHEN DROP RAISES ABOVE SETPOINT (ADJUSTABLE)
BAS SHALL GENERATE AN ALARM IF SUPPLY FAN FAILS TO OPERATE AS COMMANDED.
BAS SHALL GENERATE AN ALARM IF DAT IS OFF SETPOINT BY MORE THAN 3 DEGREES FOR 5 MINUES.

TEMPERATURE CONTROLS
BASE BID
1. USE EXISTING CONTROLLER, SENSORS, DEVICES AND VAV CONTROL VALVES. CONNECT EXISTING CONTROLLER TO NEW EQUIPMENT
2. CALIBRATE TEMPERATURE SENSORS.
3. PROVIDE NEW AHU HOT WATER COIL AND CHILLED WATER COIL CONTROL VALVES AND ACTUATORS.

ALTERNATE BID (ADD TO BASE BID WORK)
1. PROVIDE NEW CONTROLLERS, SENSOR, SPACE SENSORS, DEVICES, NEW VAV BOX CONTROL VALVES AND ACTUATORS.
2. PROVIDE VAV BOX DISCHARGE AIR TEMPERATURE SENSORS.
3. PROVIDE BOILER ISOLATION VALVES.
4. PROVIDE AHU-1 OA FLOW SENSOR.
5. SEE UPDATED CONTROL SEQUENCES ON THIS SHEET.

VAV BOX SCHEDULE

TAG	HTG. CFM	MIN UOCC CFM	MIN CLG. CFM	MAX CLG. CFM
VAV1-1	2100	600	600	2415
VAV1-2	650	225	225	850
VAV1-3	350	100	100	400
VAV1-4	550	175	175	750
VAV1-5	800	200	200	800
VAV1-6	350	350	175	680
VAV1-7	800	400	40	1600
VAV1-8	NOT USED			
VAV1-9	1150	350	350	1100
VAV1-10	100	50	50	200
VAV1-11	125	75	75	250

SEE SHEET M101 FOR VAV BOX LOCATIONS

VAV BOX CONTROL POINTS
1. DAMPER POSITION (AO)
2. VAV BOX AIRFLOW (AI)
3. VAV BOX DISCHARGE AIR TEMP (AI)
4. VAV BOX REHEAT COIL VALVE (AO)
5. SPACE TEMP (AI)
6. SPACE RELATIVE HUMIDITY (AI)

VAV BOX CONTROL SEQUENCE

SYSTEM CONSISTS OF A VAV BOX WITH REHEAT COIL. PROVIDE A DISCHARGE AIR TEMPERATURE SENSOR FOR MONITORING. SPACE TEMPERATURE SENSOR AND SPACE HUMIDITY SENSOR WILL BE USED FOR SPACE CONTROL.

WHEN SPACE TEMPERATURE SENSOR IS ABOVE SPACE TEMPERATURE SETPOINT, VAV BOX DAMPER SHALL MODULATE FROM MAXIMUM AIRFLOW TO MINIMUM AIRFLOW TO MAINTAIN SPACE TEMPERATURE SETPOINT.

WHEN SPACE TEMPERATURE IS SATISFIED AND SPACE RELATIVE HUMIDITY IS ABOVE SETPOINT, INCREMENTALLY (PERCENT) MODULATE DAMPER OPEN AND MODULATE HEATING COIL VALVE FROM FULL CLOSED POSITION TO FULL OPEN POSITION TO MAINTAIN ROOM SPACE TEMPERATURE AND RELATIVE HUMIDITY SETPOINTS.

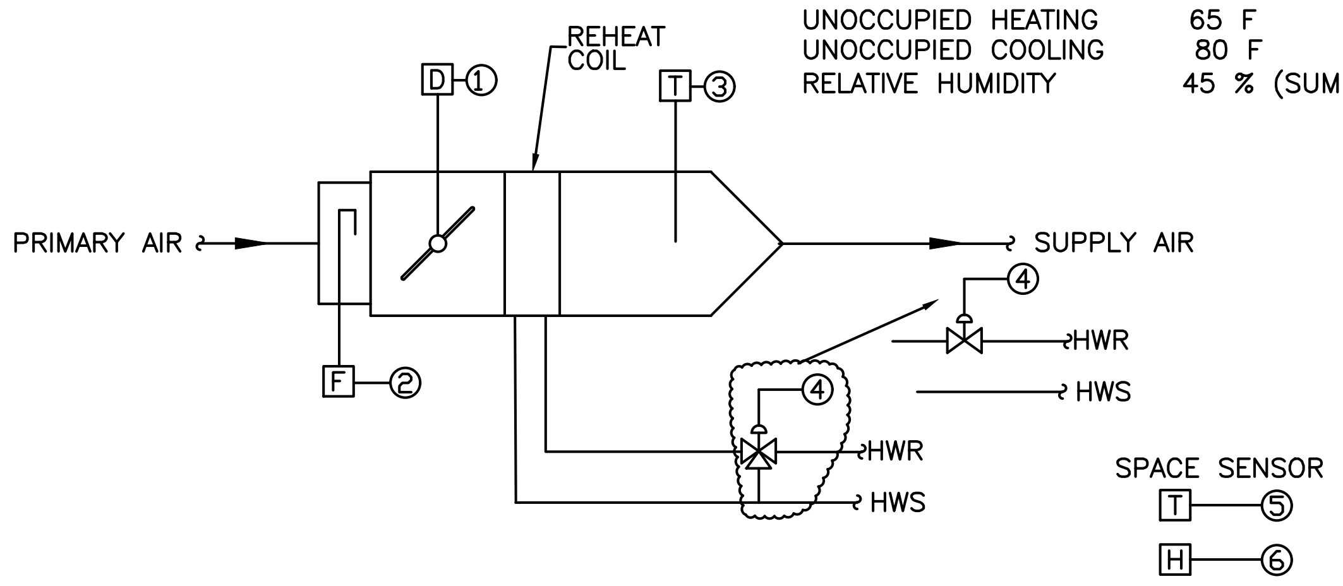
WHEN DAMPER IS AT THE MINIMUM AIRFLOW AND SPACE TEMPERATURE IS BELOW SPACE TEMPERATURE SETPOINT, MODULATE HEATING COIL VALVE FROM FULL CLOSED POSITION TO FULL OPEN POSITION TO MAINTAIN SPACE TEMPERATURE SETPOINT.

ON THE USER INPUT SCREEN SHALL BE ABLE TO ADJUST THE FOLLOWING BOX PARAMETERS
1. OCCUPIED SPACE TEMPERATURE SETPOINT
2. UNOCCUPIED SPACE TEMPERATURE SETPOINT
3. OCCUPIED SPACE RELATIVE HUMIDITY SETPOINT
4. UNOCCUPIED SPACE RELATIVE HUMIDITY SETPOINT
5. (INCREMENTAL (PERCENT) MOVEMENT OF DAMPER IN HUMIDIFICATION MODE.

BAS SHALL GENERATE AN ALARM IF SPACE TEMPERATURE IS MORE THAN 4 DEGREES ABOVE OR BELOW SETPOINT FOR MORE THAN 5 MINUTES
BAS SHALL GENERATE AN ALARM IF THE SPACE RELATIVE HUMIDITY IS MORE THATN 5 % ABOVE SPACE RELATIVE HUMIDITY SETPOINT FOR MORE THAN 5 MINUTES

SPACE TEMPERATURE / RELATIVE HUMIDITY SETPOINTS

OCCUPIED HEATING	70 F
OCCUPIED COOLLING	74 F
UNOCCUPIED HEATING	65 F
UNOCCUPIED COOLING	80 F
RELATIVE HUMIDITY	45 % (SUMMER)



NOTE:
1. THREE-WAY VALVE SHALL BE PROVIDED ON VAV-9.
2. SPACE TEMPERATURE SENSOR AND SPACE HUMIDITY SENSOR SHALL BE PROVIDED IN EACH ROOM.

④ VAV BOX CONTROL DIAGRAM
NTS

BOILER SYSTEM SEQUENCE

SYSTEM CONSISTS OF TWO CONDENSING BOILERS AND LEAD LOOP PUMP AND A STANDBY LOOP PUMP.

BOILERS SHALL BE ENABLED/DISABLE BY THE BAS. BOILER WILL OPERATE WHEN ANY ZONE REQUIRES REHEAT FOR SPACE HUMIDITY CONTROL OR SPACE HEATING.

WHEN SYSTEM IS ENABLED, LEAD BOILER ISOLATION VALVE SHALL OPEN, LEAD PUMP SHALL BE ENABLED AND LEAD BOILER SHALL BE ENABLED. LEAD BOILER SHALL MODULATE FIRING RATE TO MAINTAIN LEAVING WATER TEMPERATURE SETPOINT.
WHEN LEAVING WATER TEMPERATURE IS 5 DEGREES BELOW TEMPERATURE SETPOINT FOR MORE THAN 5 MINUTES (ADJUSTABLE), BAS SHALL ENABLE SECOND BOILER.

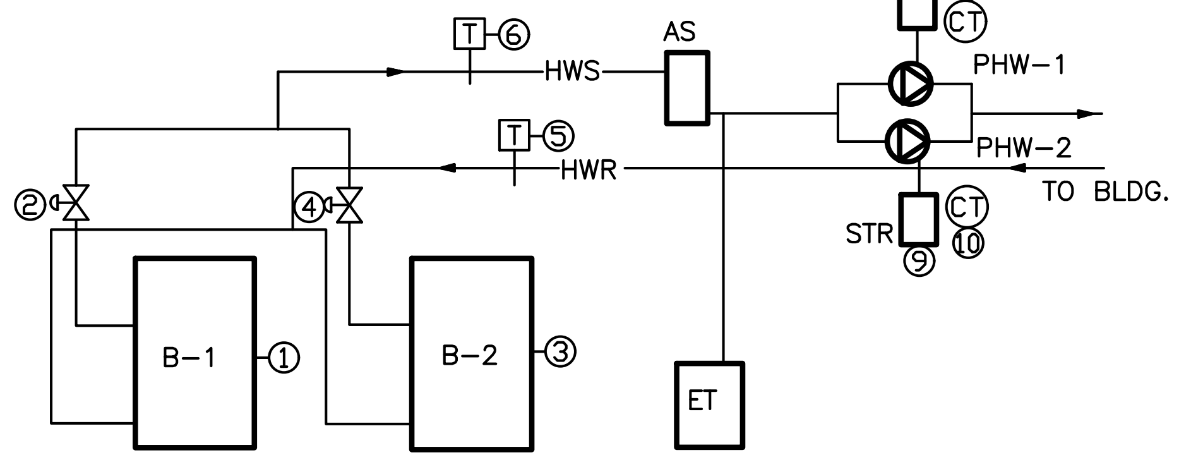
WHEN LAG BOILER IS CALLED TO START, LAG BOILER ISOLATION VALVE SHALL OPEN AND THEN BOILER WILL BE ENABLED.
WHEN THE FIRING RATE OF BOTH BOILER IS LESS THAN 30% MODULATION FOR MORE THAN 5 MINUTES (ADJUSTABLE), LAG BOILER SHALL BE DISABLED AND LAG ISOLATION VALVE SHALL CLOSE.

WHEN LEAD BOILER FAILS TO OPERATE AS COMMANDED, BAS SHALL GENERATE AN ALARM AND LAG BOILER SHALL BE ENABLED.
BAS SHALL SELECT LEAD BOILER BASED ON BOILER RUNTIME.

WHEN LEAD PUMP FAILS TO OPERATE AS COMMANDED, BAS SHALL GENERATE AN ALARM AND STANDBY PUMP SHALL BE ENABLED
BAS SHALL SELECT LEAD PUMP BASED ON PUMP RUNTIME

BAS SHALL GENERATE AN ALARM WHEN BOILER IS IN ALARM

B-1 SYSTEM CONTROL POINTS
1. B-1 BACNET CONNECTION TO BOILER
    A. ENABLE/DISABLE (DO)
    B. EWT (AI)
    C. LWT (AI)
    D. FIRING RATE (AI)
    E. RUN TIME (AI)
2. B-1 ISOLATION VALVE
3. B-2 BACNET CONNECTION TO BOILER
    A. ENABLE/DISABLE (DO)
    B. EWT (AI)
    C. LWT (AI)
    D. FIRING RATE (AI)
    E. RUN TIME (AI)
4. B-2 ISOLATION VALVE
5. HWR TEMP (AI)
6. HWS TEMP (AI)
7. PUMP STARTER PHW-1
    A. PHW-1 START/STOP (DO)
    B. PWH-1 RUN TIME (CALCULATED)
8. PHW-1 STATUS (DI)
9. PUMP STARTER TO PHW-2
    A. PHW-2 START/STOP (DO)
    B. PWH-2 RUN TIME (CACLULATED)
10. PHW-2 STATUS (DI)



① BOILER SYSTEM CONTROL DIAGRAM
NTS

mgc Engineering P.C.

IOWA ARMY NATIONAL GUARD
CAMP DODGE - BUILDING A9
CHILLER REPLACEMENT

90% CD REVIEW	05/19/2024
100% CD	08/12/2024

TEMPERATURE CONTROL DIAGRAMS

M104