

UNITED STATES
POSTAL SERVICE™

HVAC UPGRADES

TACOMA P&DC

4001 SOUTH PINE STREET
TACOMA, WA 98413

USPS PROJECT NO. K72311
BRW PROJECT NO. 222109.00
DATE: MARCH 28, 2024

OWNER

UNITED STATES POSTAL SERVICE FACILITIES R&A

200 E. KENTUCKY AVENUE
DENVER, CO 80209-9950
PHONE: (303) 264-0426

ARCHITECT

BROWN REYNOLDS WATFORD ARCHITECTS, INC.

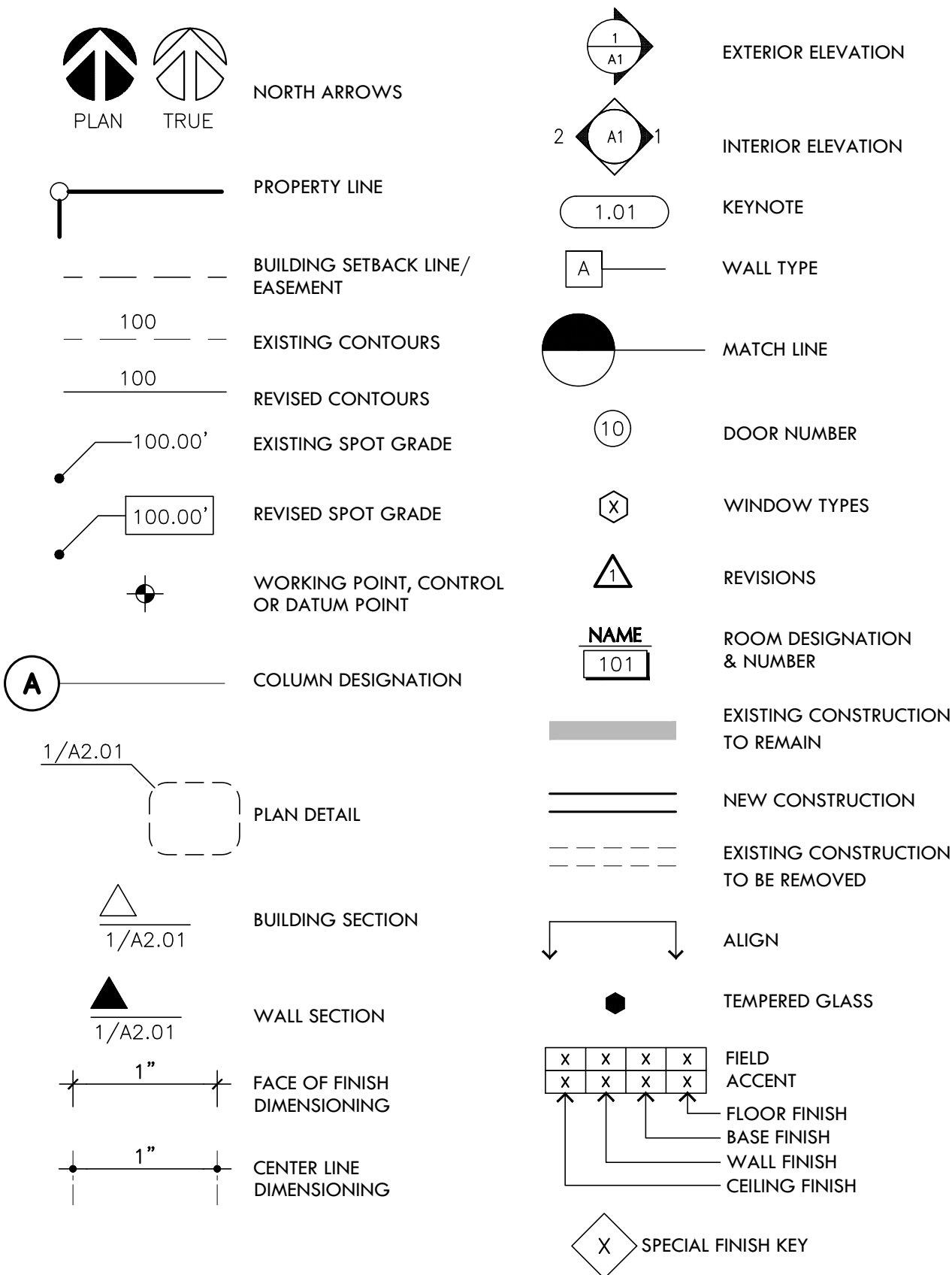
1620 MONTGOMERY STREET, SUITE 320
SAN FRANCISCO, CA 94111
PHONE: (415) 749-2670

MECHANICAL ENGINEER

GRANT REID CLAUSSEN, P.E.

13101 PRESTON ROAD, SUITE 601
DALLAS, TEXAS 75240
PHONE: (214) 659-9000

SYMBOL LEGEND



GENERAL NOTES

1. ALL WORK SHALL BE DONE IN A NEAT AND WORKMANLIKE MANNER AND IN ACCORDANCE WITH ALL APPLICABLE NATIONAL, STATE AND LOCAL CODES.
2. CONTRACTOR'S SUBMITTAL OF A BID REPRESENTS THAT HE HAS VISITED THE SITE AND IS FAMILIAR WITH EXISTING CONDITIONS THAT MAY AFFECT ANY PORTION OF THE WORK.
3. THE PLANS AND SPECIFICATIONS CONTAINED HEREIN REPRESENT THE SCOPE OF WORK TO BE PROVIDED. CONTRACTOR SHALL PROVIDE ALL WORK SHOWN ON THESE DOCUMENTS AND ALL WORK THAT CAN BE REASONABLY INFERRED TO BE INCLUDED. CONTRACT OFFICER SHALL BE THE SOLE INTERPRETER OF THE INTENT OF THE PLANS AND SPECIFICATIONS. CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND CONDITIONS AND SHALL NOTIFY THE CONTRACT OFFICER OF ANY DISCREPANCIES BEFORE PROCEEDING WITH THAT PORTION OF THE WORK.
4. IN ALL CASES, CARE SHALL BE TAKEN TO CREATE AS LITTLE NUISANCE AS POSSIBLE. CORRIDORS SHALL BE KEPT FREE OF HAZARDOUS EXTENSION CORDS, EQUIPMENT, TRASH, AND OTHER SITUATIONS THAT COULD RESULT IN INJURY TO VISITORS OR EMPLOYEES OF THE CONTRACTOR.
5. PRIOR TO SUBMITTING A PROPOSAL, THE CONTRACTOR SHALL CHECK ON THE AVAILABILITY OF ALL MATERIALS SPECIFIED, AND QUALIFY IN WRITING THE TIME OF PROPOSAL IF ANY MATERIALS SHOULD REQUIRE A LONG LEAD TIME OR ARE NOT AVAILABLE WITHIN A REASONABLE TIME FRAME.
6. UPON SELECTION OF THE CONTRACTOR, HE SHALL SUBMIT A SCHEDULE OF WORK LISTING THE AREAS TO RECEIVE NEW WORK, THE STARTING DATES OF EACH PHASE OF WORK IN EACH AREA, THE LENGTH OF TIME TO COMPLETION, WORK TO BE PERFORMED AFTER HOURS, AND A SCHEDULE OF VALUES FOR EACH PHASE OF WORK.
7. CONTRACTOR SHALL ACQUIRE AND PAY FOR ANY AND ALL PERMITS OR FEES THAT MAY BE REQUIRED FOR THIS PROJECT.
8. CONTRACTOR SHALL INCLUDE ALL HAULING OF DEMOLISHED MATERIALS OR TRASH GENERATED BY THIS PROJECT. TRASH SHALL BE REMOVED DAILY FROM THE AREAS BEING IMPROVED AND SHALL NOT BE ALLOWED TO ACCUMULATE.
9. UPON COMPLETION OF WORK, CONTRACTOR SHALL THOROUGHLY CLEAN ALL AREAS WHERE WORK OCCURRED, AS WELL AS ANY "PATHS" THAT MAY HAVE BEEN ESTABLISHED DURING CONSTRUCTION. AREAS DESIGNATED BY USPS FOR STORAGE OF THE CONTRACTORS EQUIPMENT AND MATERIALS SHALL ALSO BE LEFT CLEAN, FREE OF DEBRIS OR EXCESS MATERIALS.
10. CONTRACTOR SHALL THOROUGHLY PROTECT ALL EXISTING SURFACES DURING DEMOLITION AND CONSTRUCTION. ANY MATERIAL OR SURFACE THAT IS DAMAGED SHALL BE REPAIRED OR REPLACED AT THE CONTRACTORS EXPENSE.
11. THE CONTRACTOR REMAINS RESPONSIBLE FOR DETAILS AND ACCURACY OF HIS WORK, CONFIRMING QUANTITIES, FOR SELECTING FABRICATION AND CONSTRUCTION PROCESSES, FOR TECHNIQUES OF ASSEMBLY, FOR PERFORMING HIS WORK IN A SAFE MANNER AND FOR ADHERING TO ALL APPLICABLE CODES.
12. EXISTING AREAS TO RECEIVE NEW PAINT SHALL HAVE OLD PAINT REMOVED AND ANY REPAIRS MADE TO THE SUBSTRATE THAT MAY BE REQUIRED TO PROVIDE PROPER INSTALLATION OF PAINT MATERIALS. ADJACENT METAL, BRICK AND GLASS SURFACES ARE TO BE PROTECTED AS REQUIRED FROM APPLICATION OVER SPRAY OR OTHER DAMAGE.
13. TO MINIMIZE DISRUPTION OF POSTAL OPERATIONS, ADDITIONAL PHASING OF WORK, EVENING OR WEEKEND SCHEDULES OR OTHER MEASURES MAY BE REQUIRED TO COMPLETE PORTIONS OF THE PROJECT.
14. CONTACT: MANUEL SABLAN MAINTENANCE MANAGER, (253) 471-6040 FOR COORDINATION OF SITE VISIT, PHASING AND PRE-PROPOSAL MEETING SCHEDULE.
15. CONTRACTOR SHALL VERIFY EXISTING CONDITIONS, AT THE PROJECT SITE, AGAINST LISTED SCOPE OF WORK BEFORE SUBMITTING OFFERS TO USPS. NUMBERS GIVEN FOR FIXTURES AND EQUIPMENT QUANTITIES IN THE STATEMENT OF WORK ARE APPROXIMATE AND SHOULD BE VERIFIED BY THE CONTRACTOR.

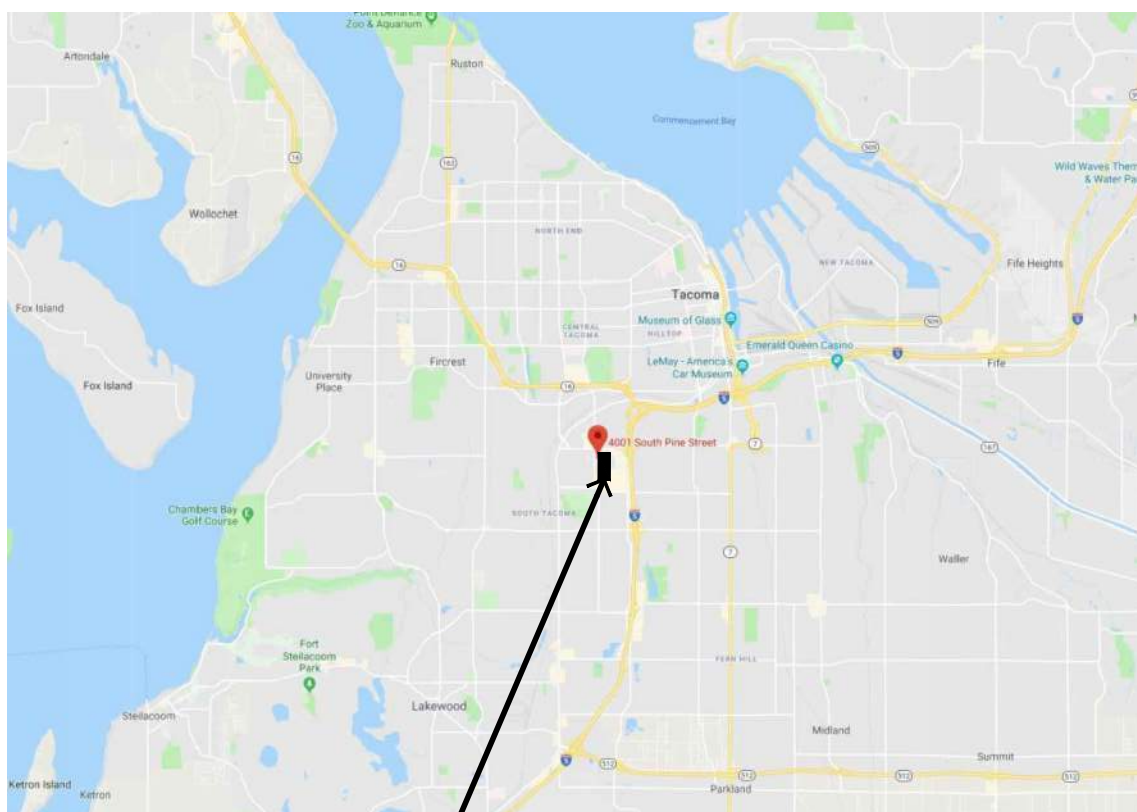
CODE INFORMATION

BUILDING:	2018 INTERNATIONAL EXISTING BUILDING CODE WITH CITY OF TACOMA AMENDMENTS
ELECTRICAL:	2020 WAC 296-468
ENERGY:	2018 WASHINGTON STATE ENERGY CODE (WAC 51-11C)
PLUMBING:	2018 UNIFORM PLUMBING CODE WITH CITY OF TACOMA AMENDMENTS
MECHANICAL:	2018 INTERNATIONAL MECHANICAL CODE WITH CITY OF TACOMA AMENDMENTS
FIRE:	2018 INTERNATIONAL FIRE CODE WITH CITY OF TACOMA AMENDMENTS
ACCESSIBILITY:	RE-4 STANDARDS FOR ACCESSIBILITY
SECURITY:	RE-5 USPS STANDARDS FOR SECURITY
USPS:	2023-1 STANDARD DESIGN CRITERIA

PROJECT DESCRIPTION

REPLACE EXISTING PROPRIETARY SIEMENS EMS WITH NEW BAS TO MONITOR ALL AHU, VAV BOXES, RTU, AND PTAC UNITS BASED ON CURRENT USPS CRITERIA. CONNECT BAS TO USPS NETWORK EMS. PROVIDE NEW CONTROLS AT EACH UNIT AND NEW TEMPERATURE SENSORS THROUGHOUT. REPLACE APPROXIMATELY (82) POWERED TERMINAL & VAV BOXES.

VICINITY MAP



TACOMA P&DC
4001 SOUTH PINE STREET
TACOMA, WA 98413

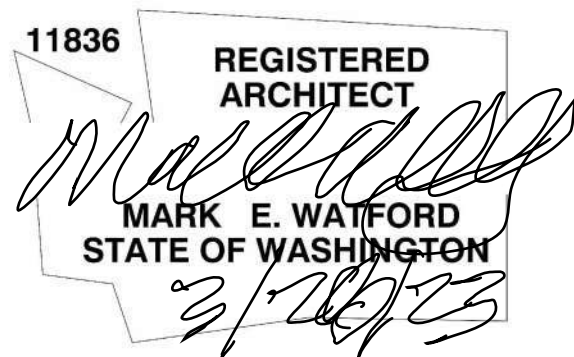


INDEX OF DRAWINGS

T1.1	TITLE SHEET AND DRAWING INDEX
A1.1	OVERALL FLOOR PLAN / PHASING PLAN
A1.2	HVAC CONTROLS SCREEN IMAGES / INFORMATION
M2.0	OVERALL FLOOR / ROOF PLAN - HVAC
M2.1	FLOOR PLAN - AREA A - HVAC CONTROLS
M2.2	FLOOR PLAN - AREA B - HVAC CONTROLS
M2.3	FLOOR PLAN - AREA C - HVAC CONTROLS
M2.4	FLOOR PLAN - AREA E - HVAC CONTROLS
M2.5	FLOOR PLAN - AREA F - HVAC CONTROLS
M4.0	CONTROL SEQUENCES / DETAILS
M4.1	CONTROL DIAGRAMS
M4.2	CONTROL DIAGRAMS - AIR HANDLING UNITS

ARCHITECTURAL ABBREVIATIONS

A.F.F.	ABOVE FINISH FLOOR	MNTD.	MOUNTED
B.O.	BOTTOM OF	NOM.	NOMINAL
C.J.	CONTROL JOINT	N.I.C.	NOT IN CONTRACT
CLR	CLEAR	O.C.(E.W.)	ON CENTER (EACH WAY)
DIA.	DIAMETER	O.H.	OPPOSITE HAND
DN	DOWN	RE	REFERENCE
E.J.	EXPANSION JOINT	REQ./REQD	REQUIRED
EQ.	EQUAL	R.O.	ROUGH OPENING
F.F.	FINISH FLOOR	SIM.	SIMILAR
F.V.	FIELD VERIFY	T.O.	TOP OF
GA.	GAUGE	TYP.	TYPICAL
M.O.	MASONRY OPENING	V.I.F.	VERIFY IN FIELD
MAX.	MAXIMUM	W.B.	WIND BRACING
MIN.	MINIMUM	W/	WITH

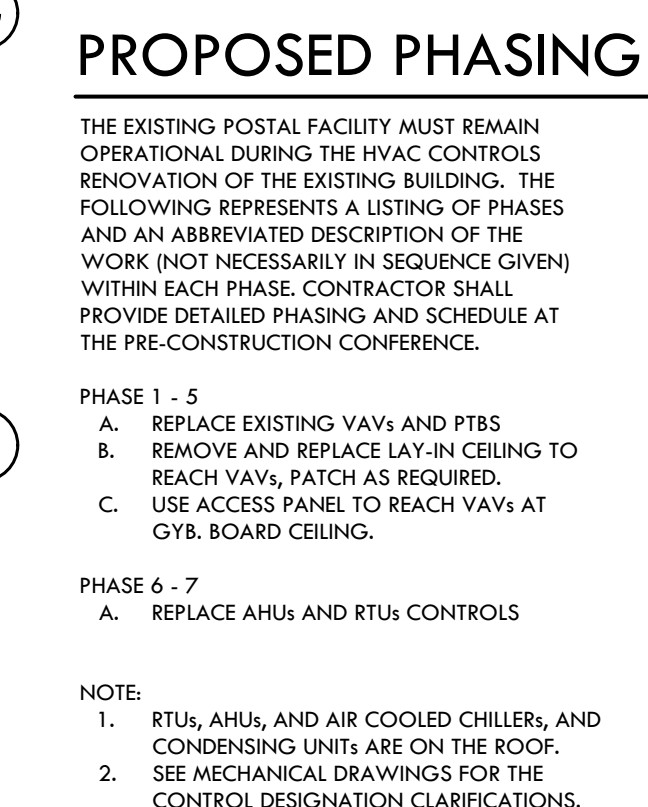


TO THE BEST OF MY KNOWLEDGE AND PROFESSIONAL JUDGMENT THE DRAWINGS AND SPECIFICATIONS FOR SECURITY UPGRADES AT TACOMA P&DC, WASHINGTON HAVE BEEN PREPARED IN ACCORDANCE WITH THE CITY OF TACOMA CODES, WASHINGTON ACCESSIBILITY STANDARDS, THE OCCUPATIONAL SAFETY AND HEALTH ACT (OSHA), AND USPS HANDBOOK RE-4 FOR THOSE FEATURES THAT MUST BE HANDICAP ACCESSIBLE AS PART OF THE PROPOSED PROJECT.


MARK E. WATFORD, FAIA
STATE OF WASHINGTON REGISTRATION #11836
COPYRIGHT © 2024 BROWN REYNOLDS WATFORD ARCHITECTS, INC.

T1.1

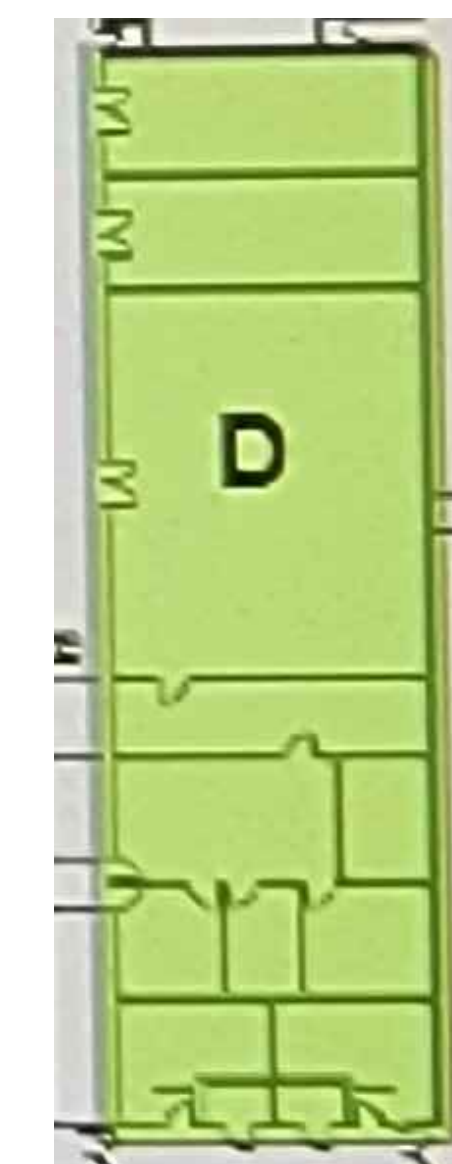
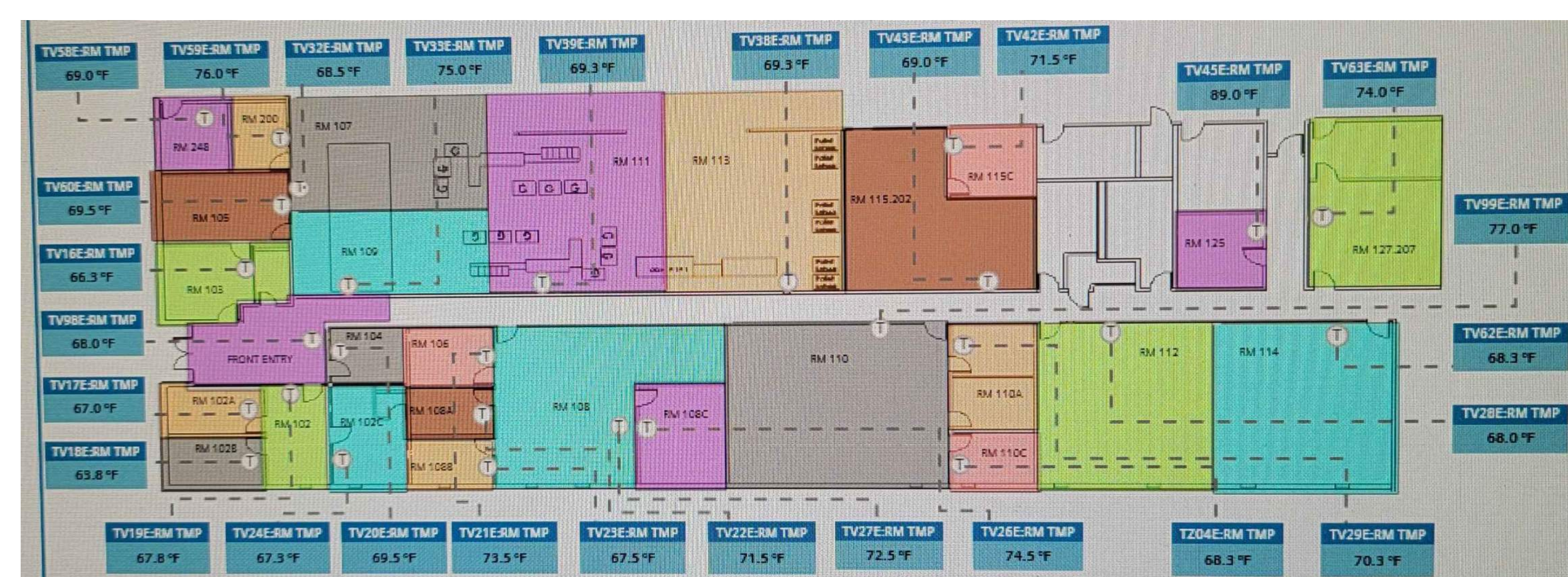
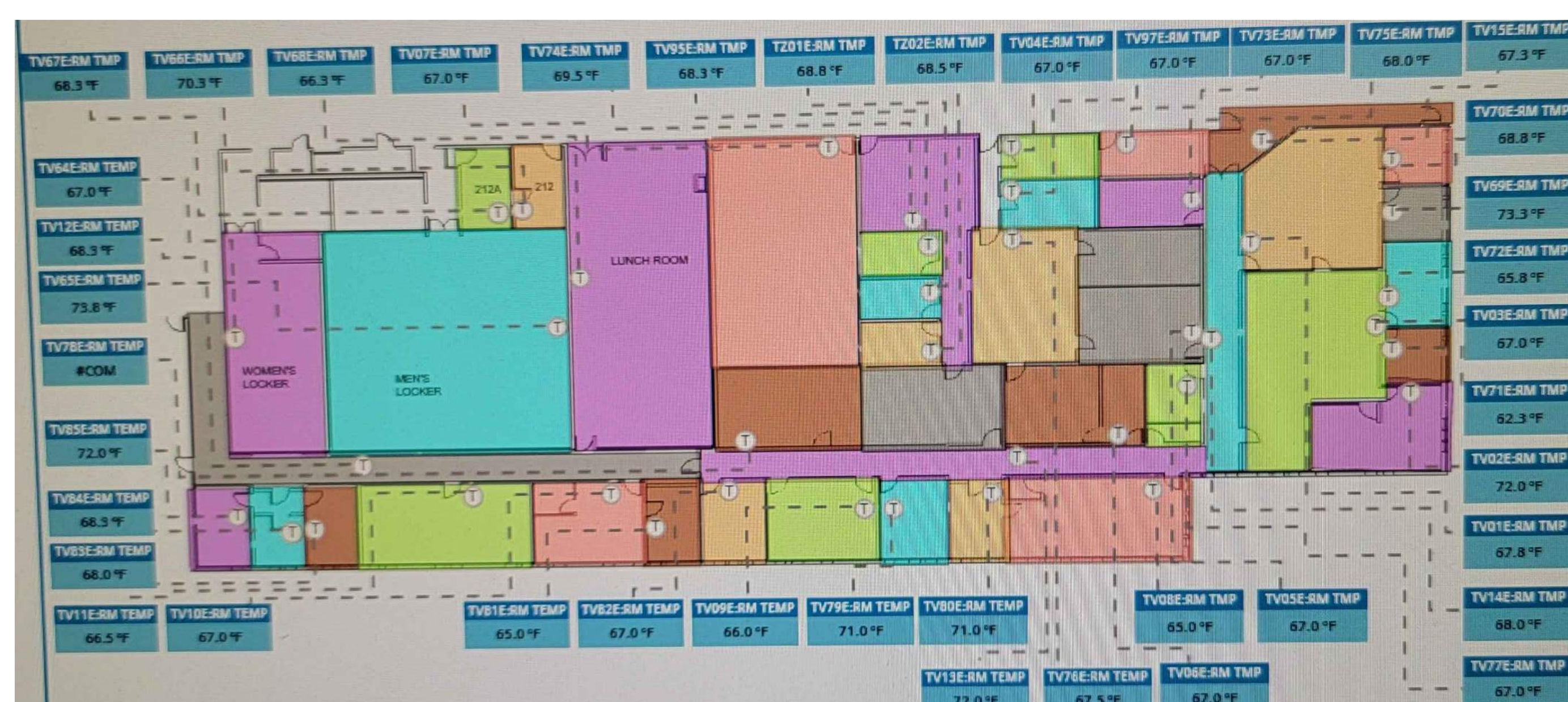
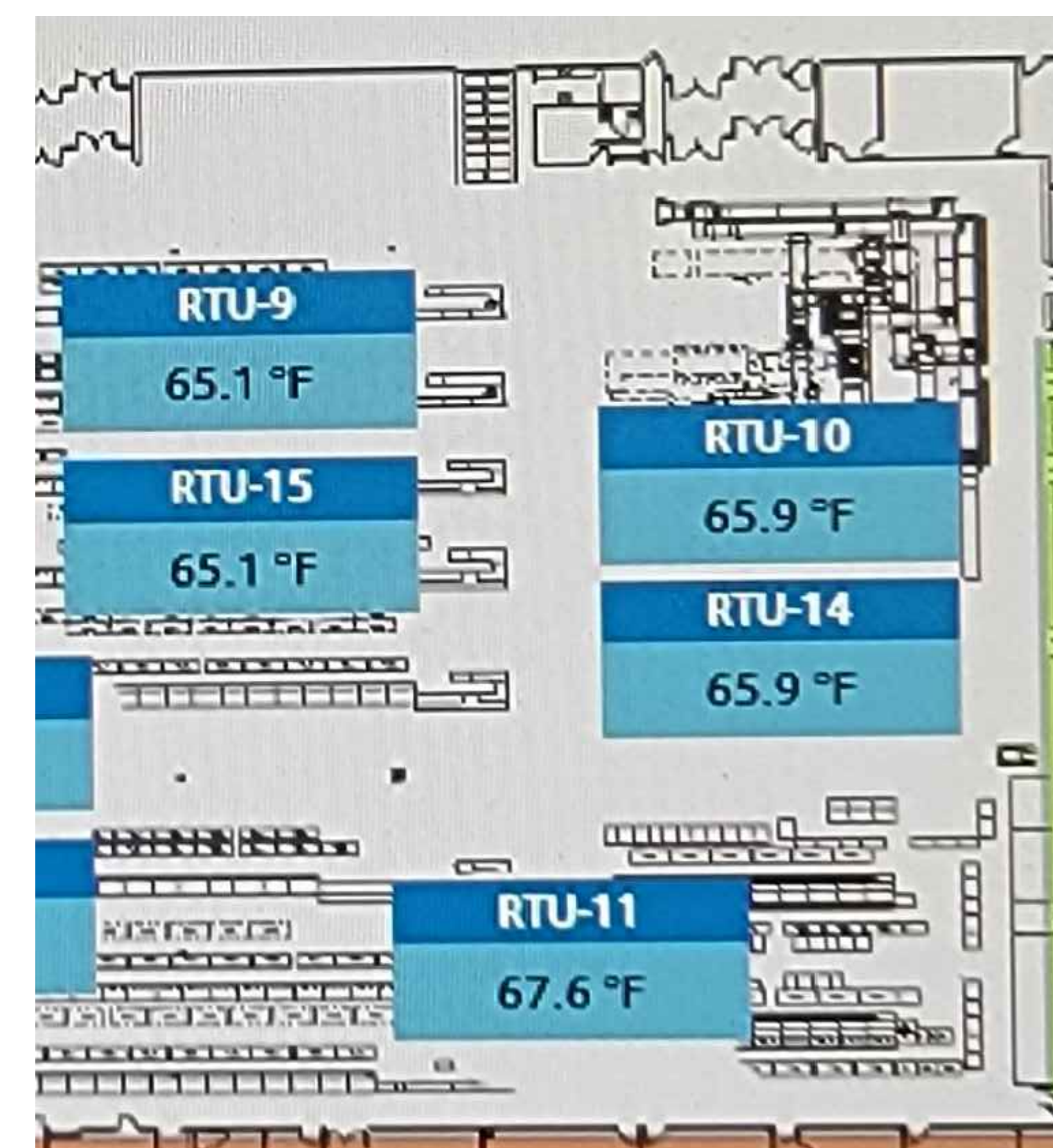
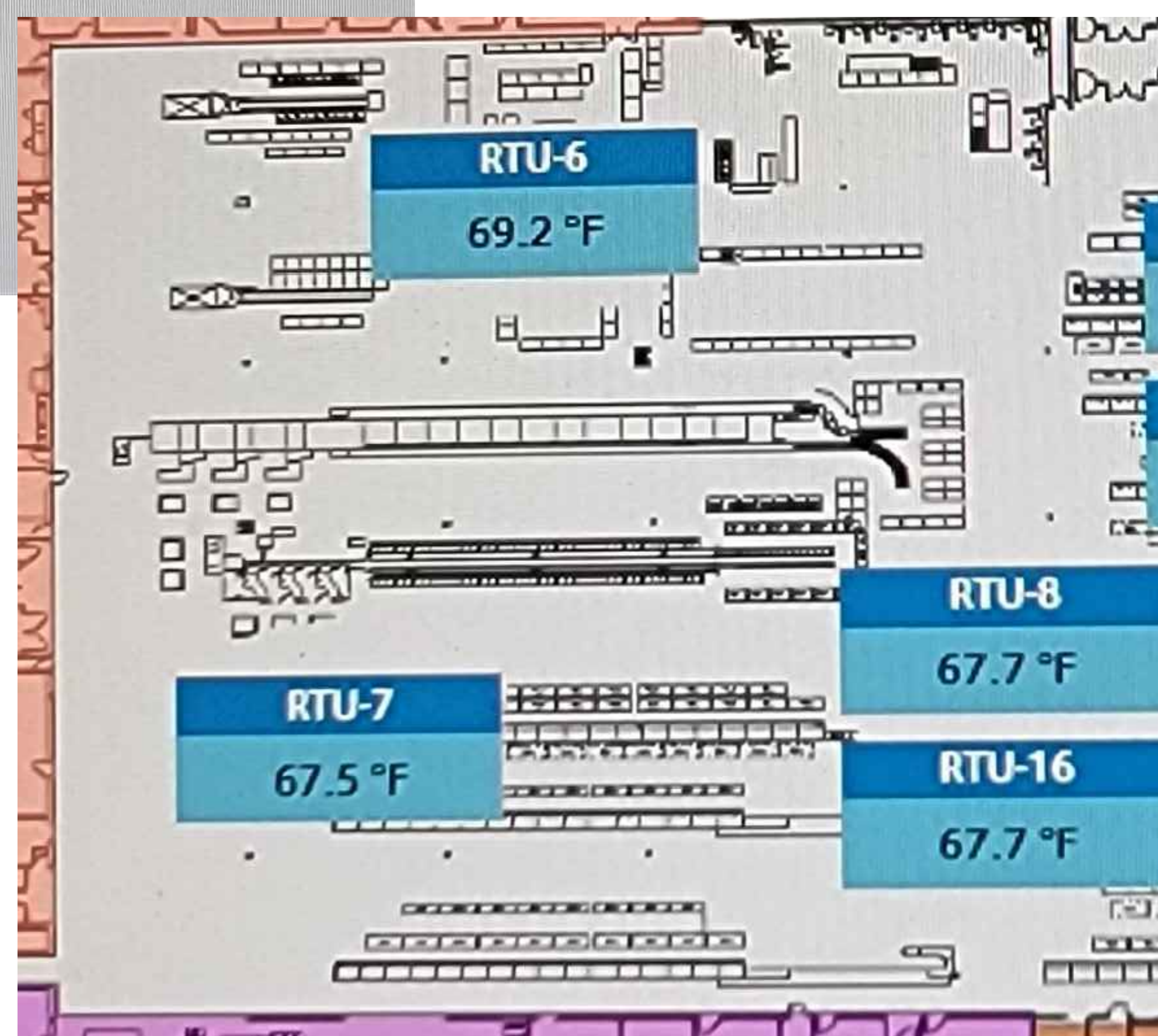
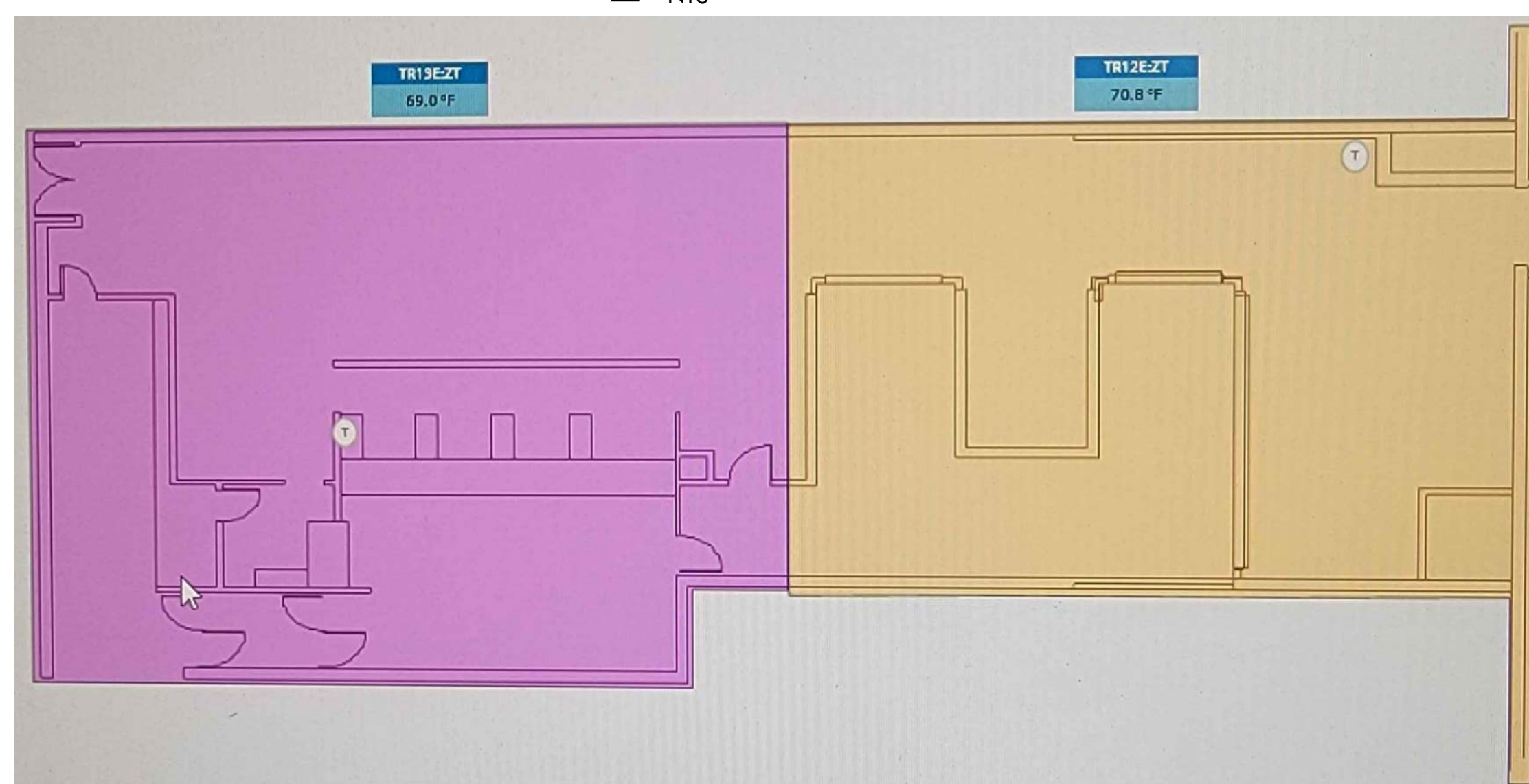
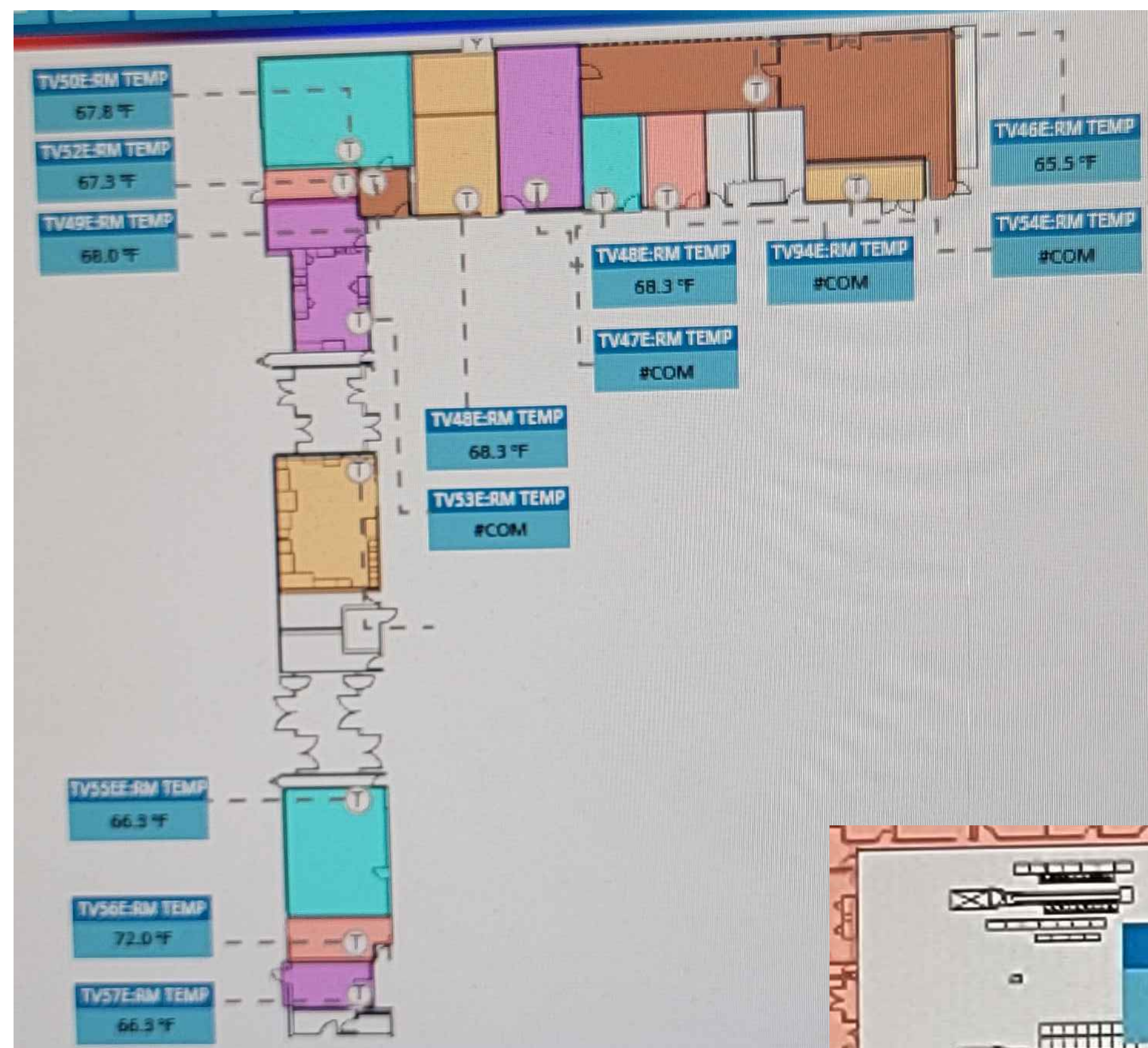
TITLE SHEET



SP001



TRUE
NORTH



INFORMATION PROVIDED FROM EXISTING HVAC CONTROL SYSTEM INDICATING ZONING, DEVICE LOCATION / AREA, CONTROL LOCATIONS, ETC. INFORMATION TO BE CONFIRMED IN FIELD AND COORDINATED WITH MECHANICAL DESIGN DOCUMENTS AND SPECIFICATIONS.

PROPOSED PHASING

THE EXISTING POSTAL FACILITY MUST REMAIN OPERATIONAL DURING THE HVAC CONTROLS RENOVATION OF THE EXISTING BUILDING. THE FOLLOWING REPRESENTS A LISTING OF PHASES AND AN ABBREVIATED DESCRIPTION OF THE WORK (NOT NECESSARILY IN SEQUENCE GIVEN WITHIN EACH PHASE. CONTRACTOR SHALL PROVIDE DETAILED PHASING AND SCHEDULE AT THE PRE-CONSTRUCTION CONFERENCE.

PHASE 1 - 5

- A. REPLACE EXISTING VAVs AND PTBS
- B. REMOVE AND REPLACE LAY-IN CEILING TO REACH VAVs, PATCH AS REQUIRED.
- C. USE ACCESS PANEL TO REACH VAVs AT GYB. BOARD CEILING.

PHASE 6 - 7

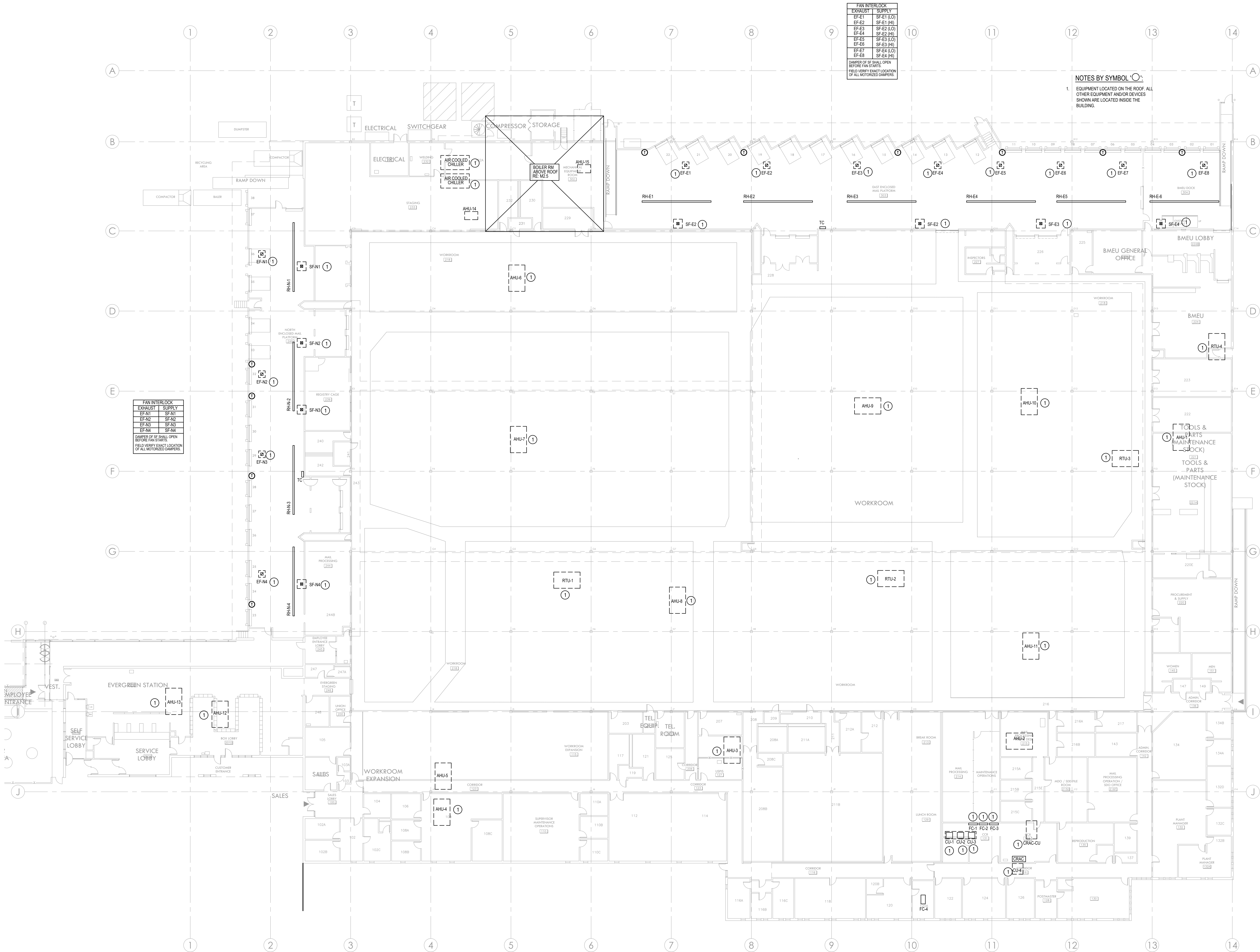
- A. REPLACE AHUk AND RTUk CONTROLS.

NOTE:

1. RTUs, AHUs, AND AIR COOLED CHILLERS, AND CONDENSING UNITS ARE ON THE ROOF.
2. SEE MECHANICAL DRAWINGS FOR THE CONTROL DESIGNATION CLARIFICATIONS.



1 OVERALL FLOOR/ROOF PLAN - HVAC
1/16" = 1'-0"



FAN INTERLOCK	
EXHAUST	SUPPLY
EF-E1	SF-E1 (LO)
EF-E2	SF-E1 (HI)
EF-E3	SF-E2 (LO)
EF-E4	SF-E2 (HI)
EF-E5	SF-E3 (LO)
EF-E6	SF-E3 (HI)
EF-E7	SF-E4 (LO)
EF-E8	SF-E4 (HI)

DAMPER OF SF SHALL OPEN BEFORE FAN STARTS.
FIELD VERIFY EXACT LOCATION OF ALL MOTORIZED DAMPERS.

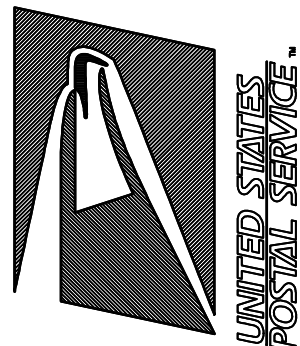
NOTES BY SYMBOL: 1. EQUIPMENT LOCATED ON THE ROOF. ALL OTHER EQUIPMENT AND/OR DEVICES SHOWN ARE LOCATED INSIDE THE BUILDING.

COPYRIGHT © 2024 BROWN REYNOLDS WATFORD ARCHITECTS, INC.

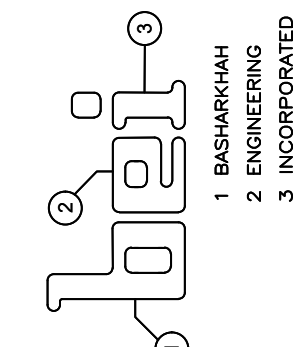
DATE: MARCH 27, 2024
DRAWN BY: HS
CHECKED BY: HS, TB
BRV PROJECT NO.: 222109.00
USPS PROJECT NO.: K72311

M2.0

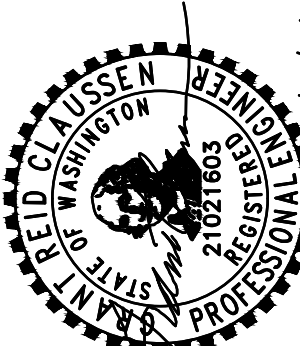
OVERALL FLOOR/ROOF
PLAN - HVAC CONTROLS



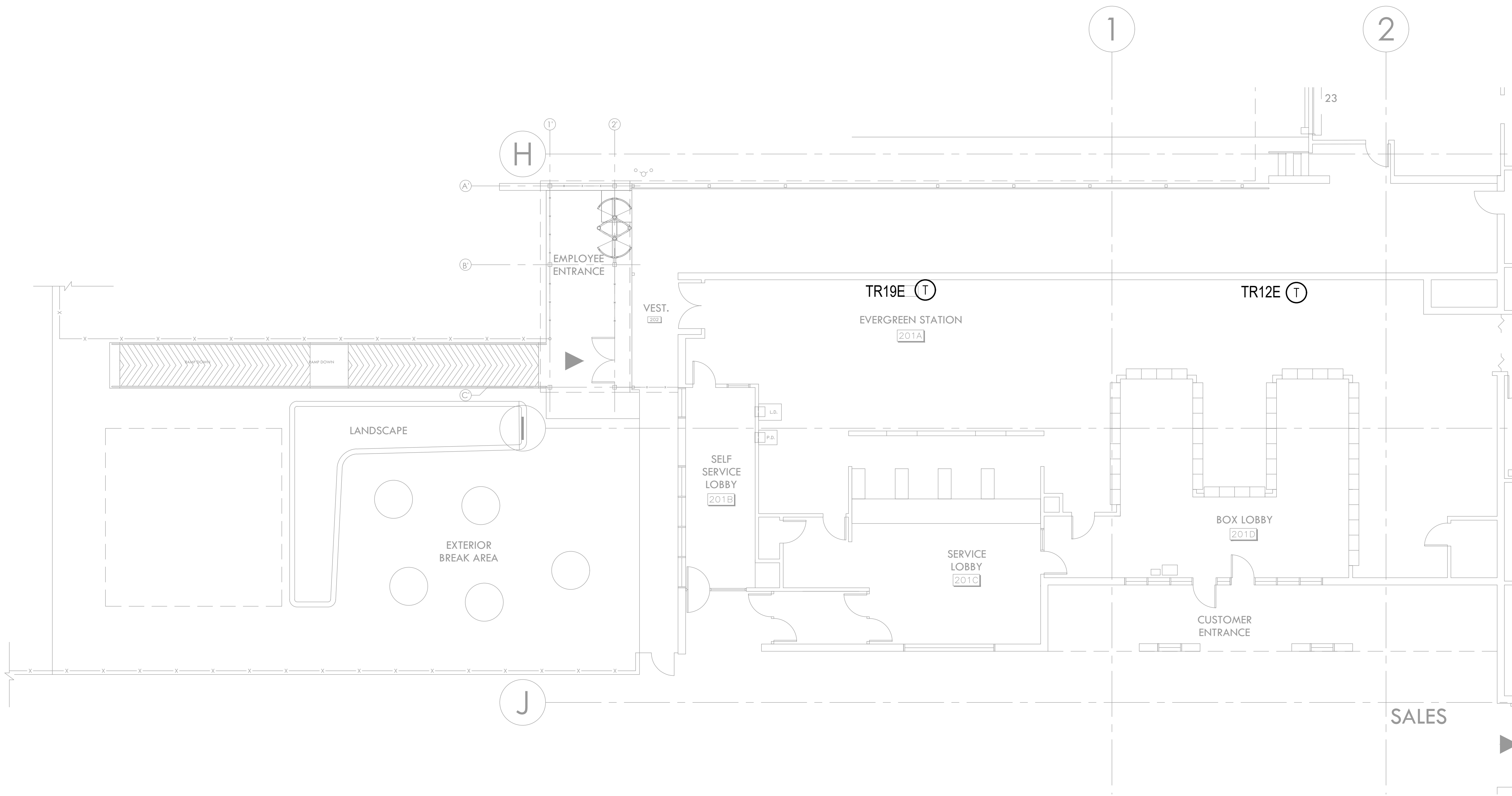
TACOMA P&DC
HVAC UPGRADES
4001 SOUTH PINE STREET
TACOMA, WA 98413



GRANT CLAUSEN
WASHINGTON REG. #21021603
13101 Preston Road
Dallas, Texas 75240
(214) 689-8000
Job #22099



BROWN REYNOLDS WATFORD
ARCHITECTS
1620 MONTGOMERY
SAN FRANCISCO, CA 94111
415.749.2870
WWW.BRWARCH.COM

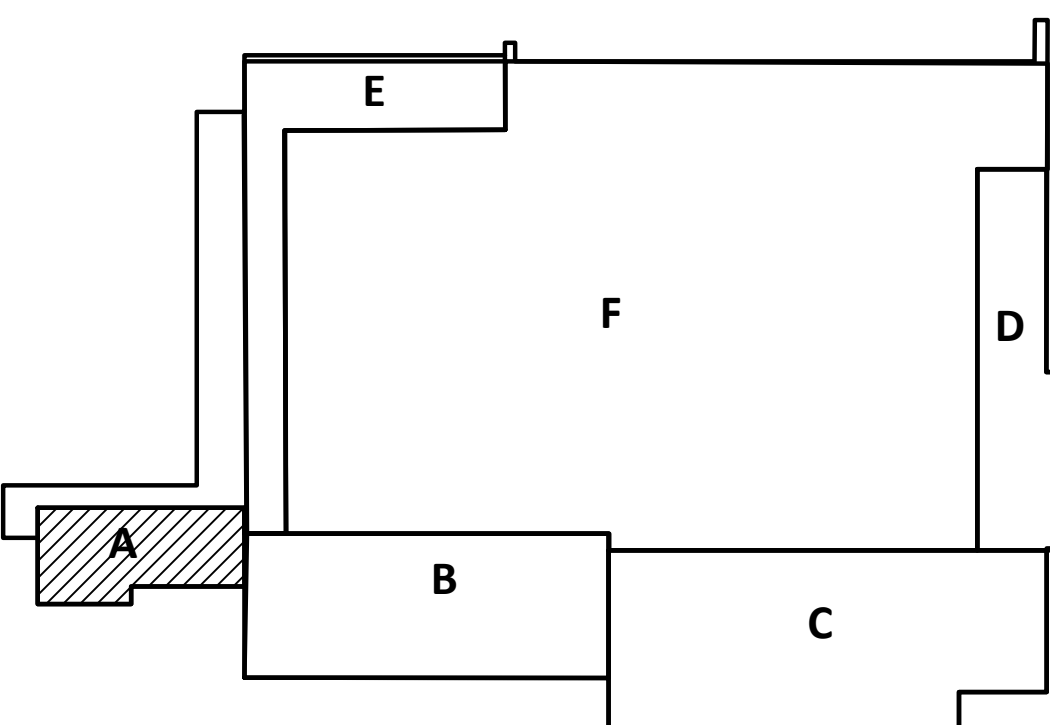


1 FLOOR PLAN - AREA A - HVAC CONTROLS
1/8" = 1'-0"

GENERAL NOTES:

- A. THE SCHEMATIC LAYOUT OF THE INSTRUMENTATION SHOWN ON THIS DRAWING HAS BEEN EXTRACTED FROM THE GRAPHIC DISPLAY OF THE EXISTING BAS. THE POINT LIST NAMING MAY BE DIFFERENT FROM THE USPS POINT LIST STANDARD THAT HAS TO BE FOLLOWED. THE CONTRACTOR SHALL SEE TO IT THAT THE APPROPRIATE POINT LIST BE USED IN THE NEW BAS BASED ON THE LATEST USPS STANDARD, THERMOSTAT DESIGNATION & CORRESPONDING UNIT:
- | | |
|--------|---------|
| PREFIX | UNIT |
| TR | ROOFTOP |
| TV | VAV |
| TZ | ZONE |
- B. REFER TO DWG. M2.0 FOR EQUIPMENT ON THE ROOF AND OTHER EQUIPMENT INSIDE THE BUILDING.

KEY PLAN



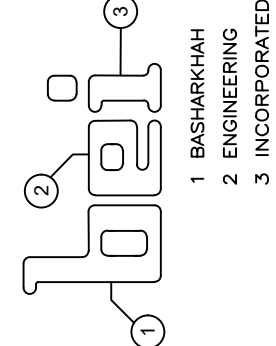
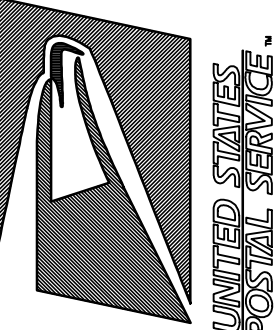
COPYRIGHT © 2024 BROWN REYNOLDS WATFORD ARCHITECTS, INC.

DATE: MARCH 27, 2024
DRAWN BY: HS
CHECKED BY: HS, TB
BRV PROJECT NO.: 222109.00
USPS PROJECT NO.: K72311

M2.1

HVAC CONTROLS -
AREA A

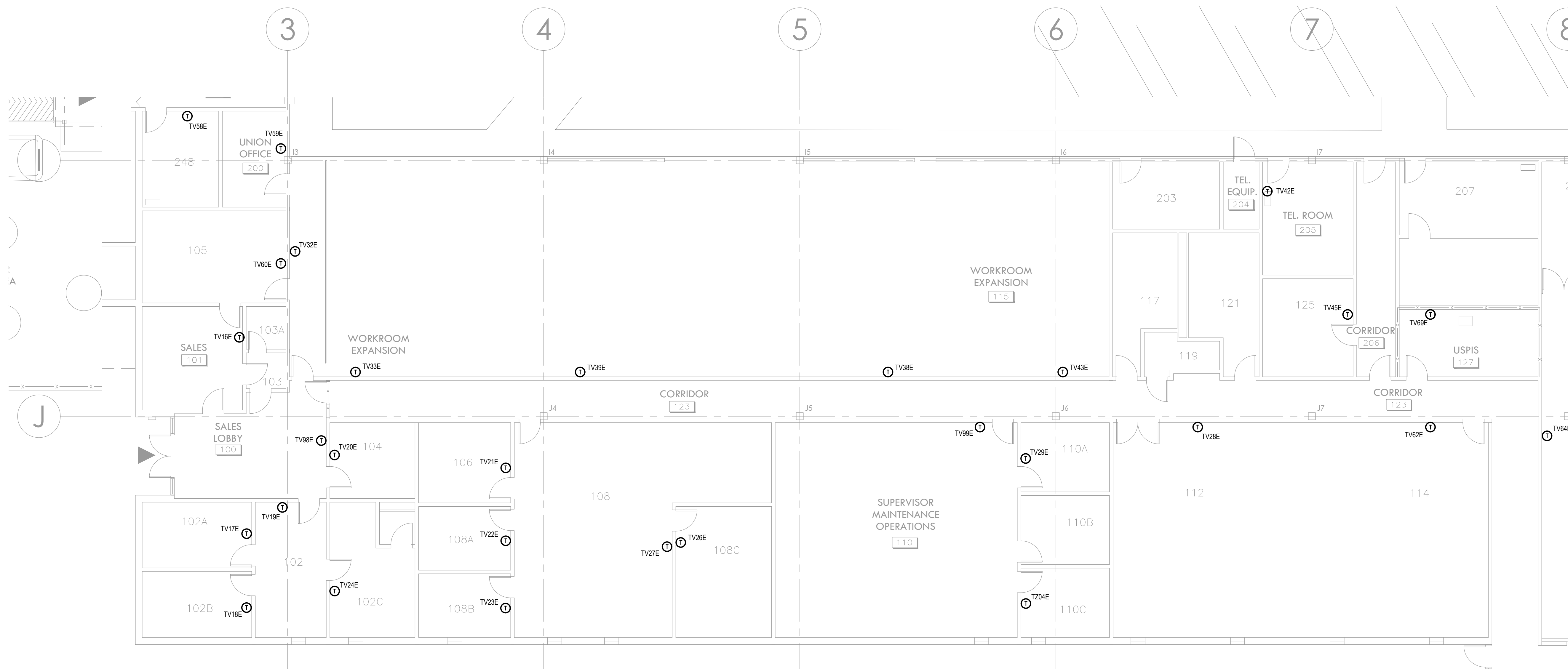
TACOMA P&DC
HVAC UPGRADES
4001 SOUTH PINE STREET
TACOMA, WA 98413



GRANT CLAUSSEN
WASHINGTON REG. #21021603
13101 Preston Road
Dallas, Texas 75240
(214) 659-8000
Job #22099



BROWN REYNOLDS WATFORD
ARCHITECTS
1620 MONTGOMERY
SAN FRANCISCO, CA 94111
415.749.2870
WWW.BRWARCH.COM

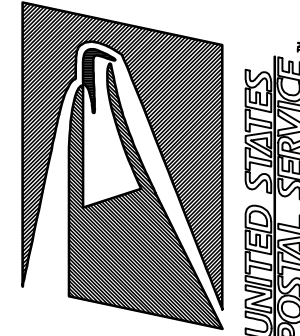
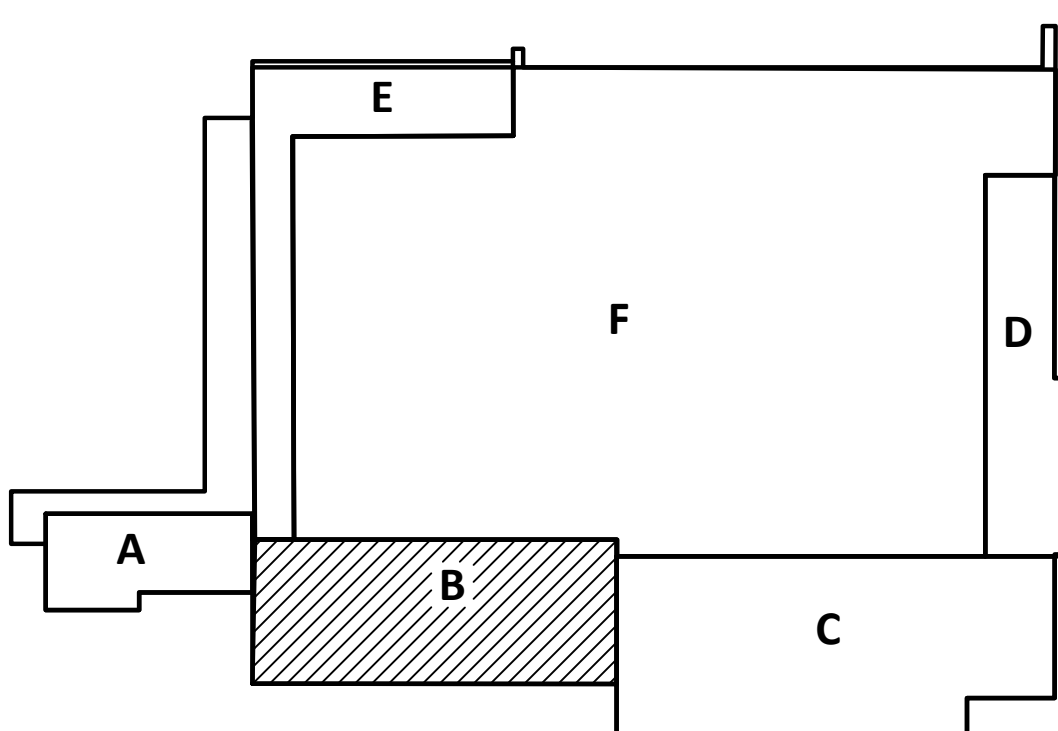


1 FLOOR PLAN - AREA B - HVAC CONTROLS
1/8" = 1'-0"

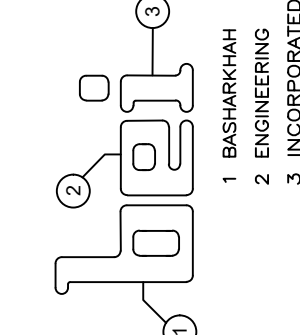
GENERAL NOTES:

- A. THE SCHEMATIC LAYOUT OF THE INSTRUMENTATION SHOWN ON THIS DRAWING HAS BEEN EXTRACTED FROM THE GRAPHIC DISPLAY OF THE EXISTING BAS. THE POINT LIST NAMING MAY BE DIFFERENT FROM THE USPS POINT LIST STANDARD THAT HAS TO BE FOLLOWED. THE CONTRACTOR SHALL SEE TO IT THAT THE APPROPRIATE POINT LIST BE USED IN THE NEW BAS BASED ON THE LATEST USPS STANDARD. THERMOSTAT DESIGNATION & CORRESPONDING UNIT:
- | PREFIX | UNIT |
|--------|---------|
| TR | ROOFTOP |
| TV | VAV |
| TZ | ZONE |
- B. REFER TO DWG. M2.0 FOR EQUIPMENT ON THE ROOF AND OTHER EQUIPMENT INSIDE THE BUILDING.

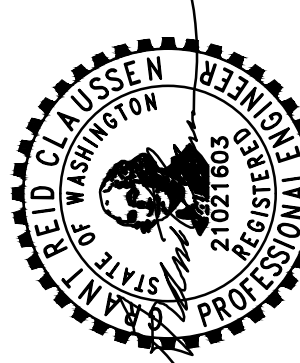
KEY PLAN



TACOMA P&DC
HVAC UPGRADES
4001 SOUTH PINE STREET
TACOMA, WA 98413



GRANT CLAUSEN
WASHINGTON REG. #21021603
13101 Preston Road
Dallas, Texas 75240
(214) 699-8000
Job #22099

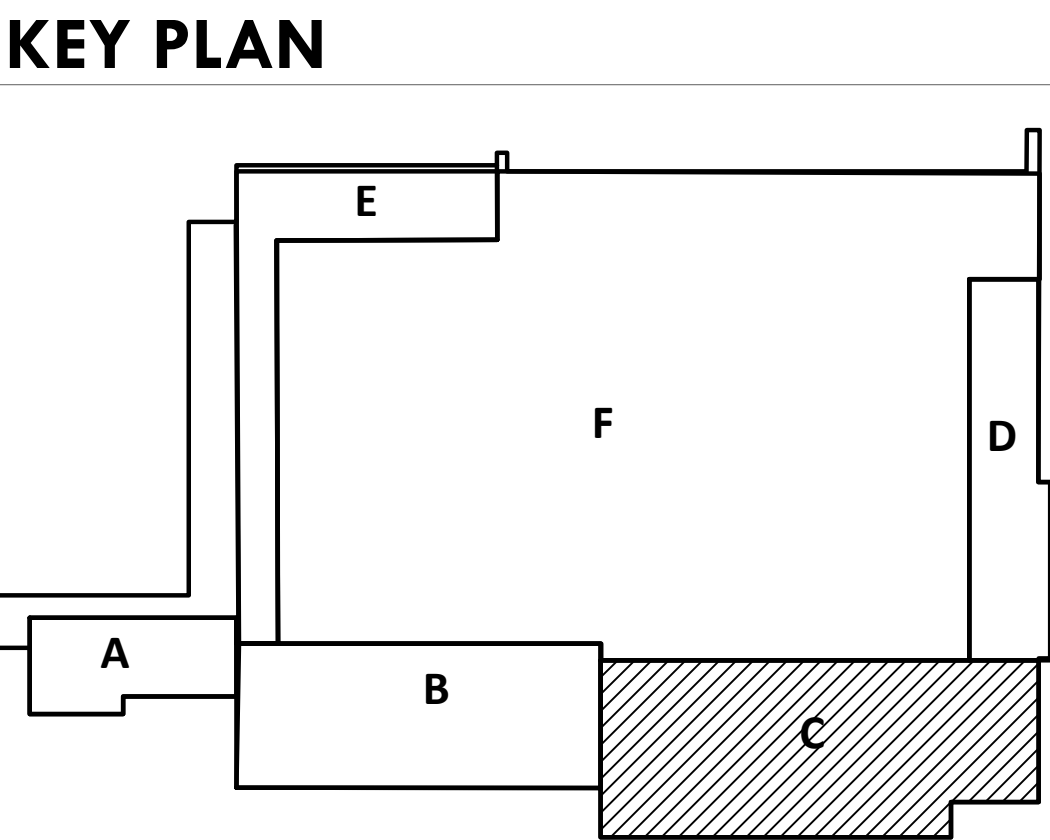


BROWN REYNOLDS WATFORD
ARCHITECTS
1620 MONTGOMERY
AVENUE
SAN FRANCISCO, CA 94111
415.749.2870
WWW.BRWARCH.COM

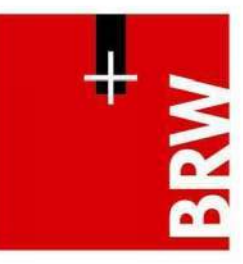


1 FLOOR PLAN - AREA C - HVAC CONTROLS
1/8" = 1'-0"

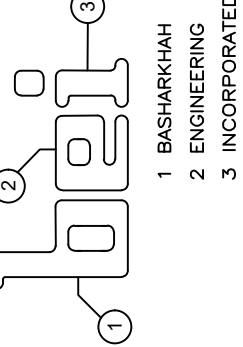
- GENERAL NOTES:**
- A. THE SCHEMATIC LAYOUT OF THE INSTRUMENTATION SHOWN ON THIS DRAWING HAS BEEN EXTRACTED FROM THE GRAPHIC DISPLAY OF THE EXISTING BAS. THE POINT LIST NAMING MAY BE DIFFERENT FROM THE USPS POINT LIST STANDARD THAT HAS TO BE FOLLOWED. THE CONTRACTOR SHALL SEE TO IT THAT THE APPROPRIATE POINT LIST BE USED IN THE NEW BAS BASED ON THE LATEST USPS STANDARD. THERMOSTAT DESIGNATION & CORRESPONDING UNIT:
- | PREFIX | UNIT |
|--------|---------|
| TR | ROOFTOP |
| TV | VAV |
| TZ | ZONE |
- B. REFER TO DWG. M2.0 FOR EQUIPMENT ON THE ROOF AND OTHER EQUIPMENT INSIDE THE BUILDING.



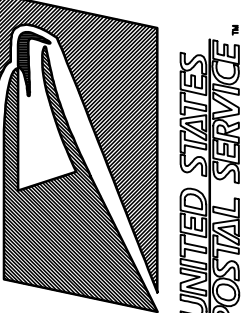
BROWN REYNOLDS WATFORD ARCHITECTS
1620 MONTGOMERY
SAN FRANCISCO, CA 94111
415.769.2870
WWW.BRWARCH.COM



GRANT CLAUSEN
WASHINGTON REG. #21021603
13101 Preston Road
Dallas, Texas 75240
(214) 689-8000
Job #22099



**TACOMA P&DC
HVAC UPGRADES
4001 SOUTH PINE STREET
TACOMA, WA 98413**

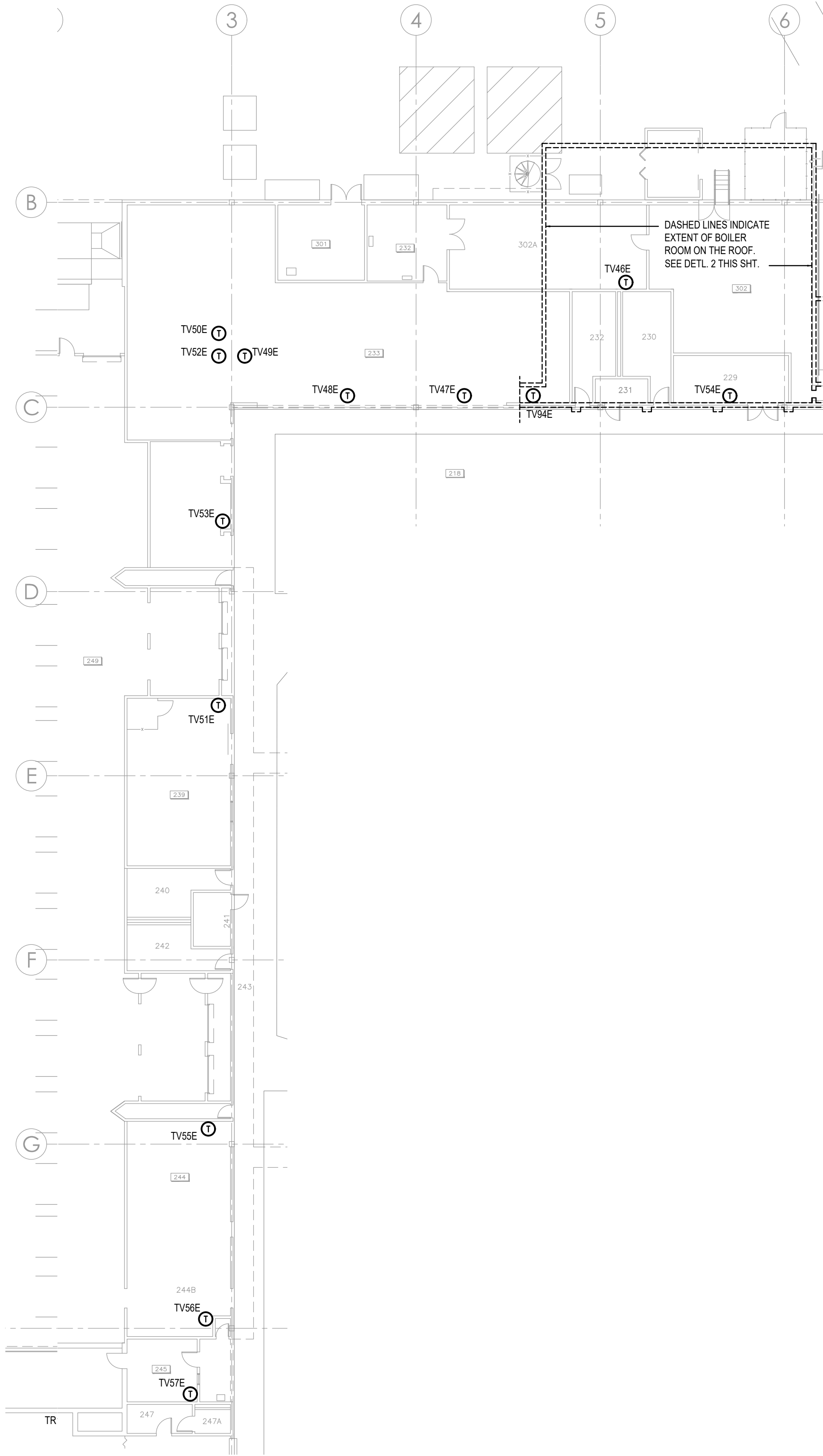


COPYRIGHT © 2024 BROWN REYNOLDS WATFORD ARCHITECTS, INC.

DATE:	MARCH 27, 2024
DRAWN BY:	HS
CHECKED BY:	HS, TB
BRW PROJECT NO.	222109.00
USPS PROJECT NO.	K72311

M2.3

HVAC CONTROL - AREA C

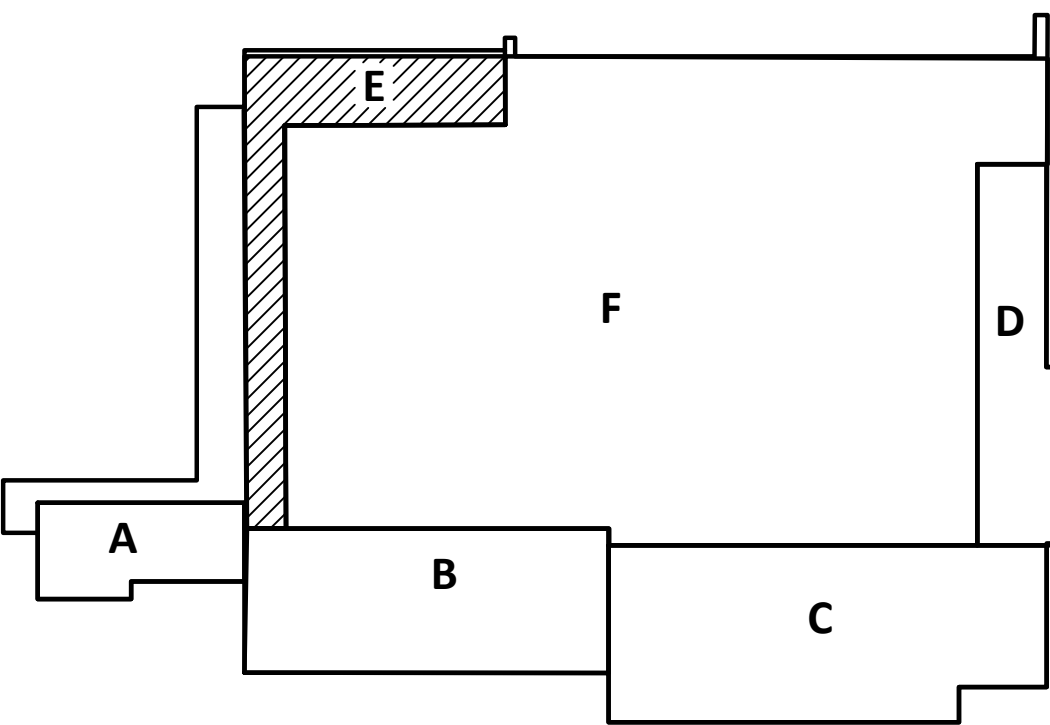


1 FLOOR PLAN - AREA E - HVAC CONTROLS
1/16" = 1'-0"

GENERAL NOTES:

- A. THE SCHEMATIC LAYOUT OF THE INSTRUMENTATION SHOWN ON THIS DRAWING HAS BEEN EXTRACTED FROM THE GRAPHIC DISPLAY OF THE EXISTING BAS. THE POINT LIST NAMING MAY BE DIFFERENT FROM THE USPS POINT LIST STANDARD THAT HAS TO BE FOLLOWED. THE CONTRACTOR SHALL SEE TO IT THAT THE APPROPRIATE POINT LIST BE USED IN THE NEW BAS BASED ON THE LATEST USPS STANDARD. THERMOSTAT DESIGNATION & CORRESPONDING UNIT:
- | PREFIX | UNIT |
|--------|---------|
| TR | ROOFTOP |
| TV | VAV |
| TZ | ZONE |
- B. REFER TO DWG. M2.0 FOR EQUIPMENT ON THE ROOF AND OTHER EQUIPMENT INSIDE THE BUILDING.

KEY PLAN



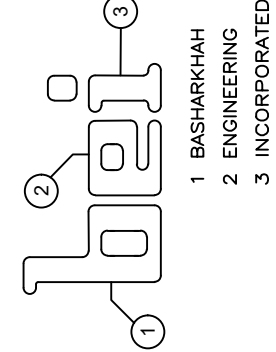
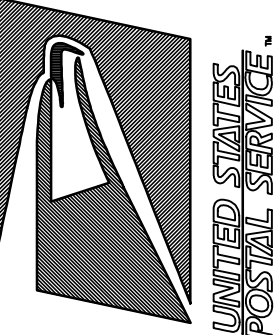
COPYRIGHT © 2024 BROWN REYNOLDS WATFORD ARCHITECTS, INC.

DATE: MARCH 27, 2024
DRAWN BY: HS
CHECKED BY: HS, TB
BRW PROJECT NO.: 222109.00
USPS PROJECT NO.: K72311

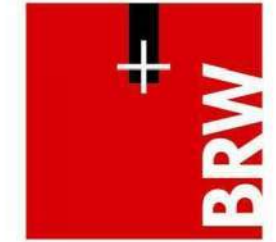
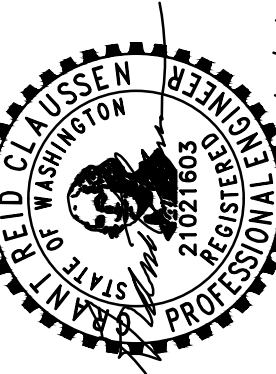
M2.4

HVAC CONTROL -
AREA E

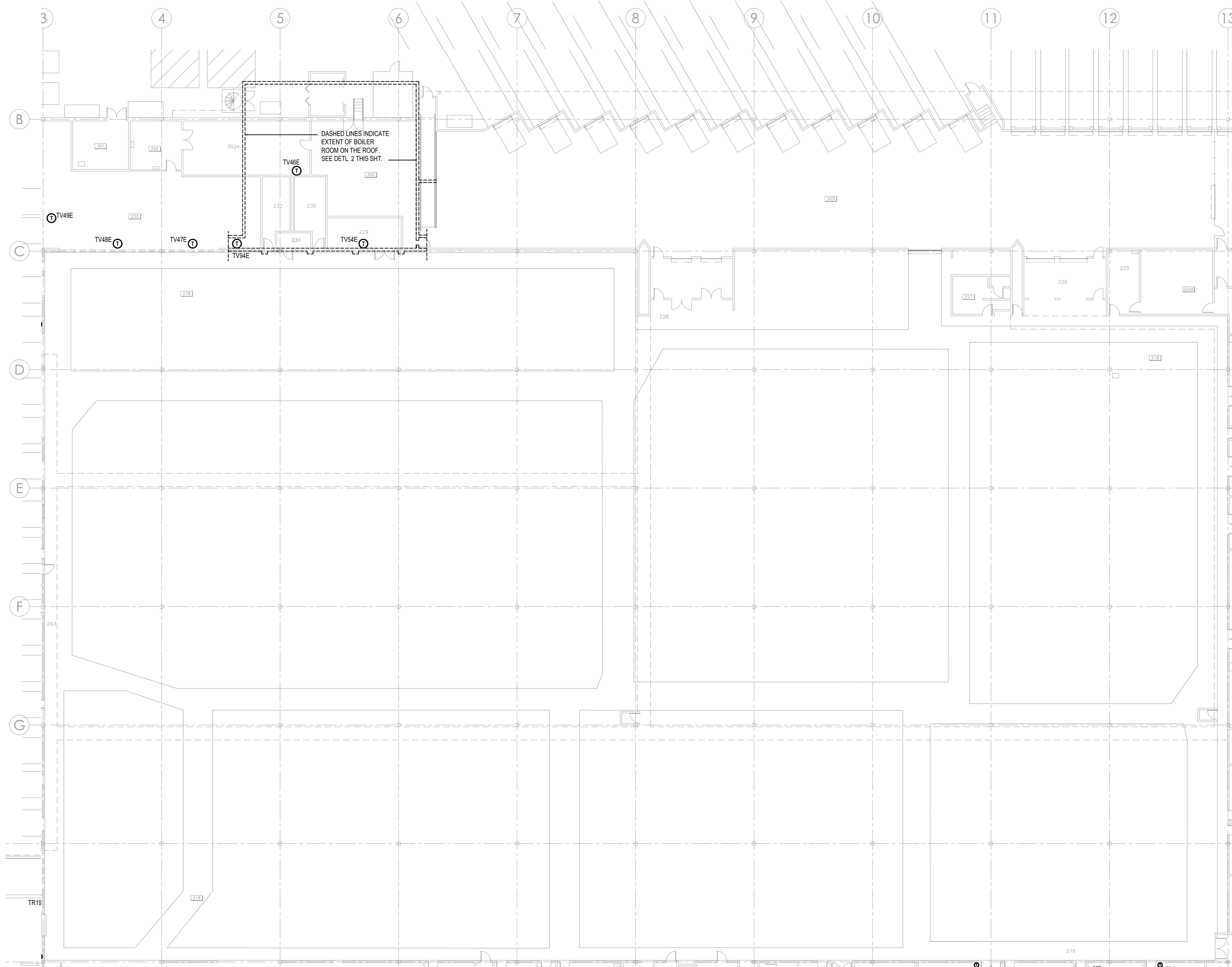
TACOMA P&DC
HVAC UPGRADES
4001 SOUTH PINE STREET
TACOMA, WA 98413



GRANT CLAUSSEN
WASHINGTON REG. #21021603
13101 Preston Road
Dallas, Texas 75240
(214) 699-8000
Job #22099



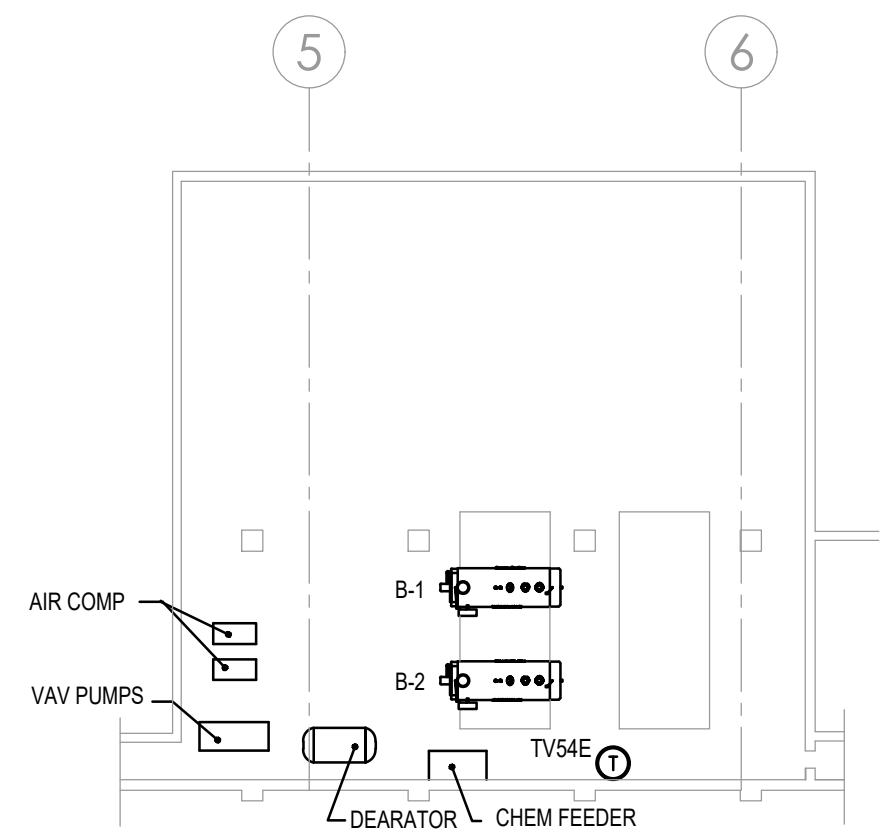
BROWN REYNOLDS WATFORD
ARCHITECTS
1620 MONTGOMERY
AVENUE
SAN FRANCISCO, CA 94111
415.749.2870
WWW.BRWARCH.COM



1 FLOOR PLAN - AREA F - HVAC CONTROLS
1/16" = 1'-0"

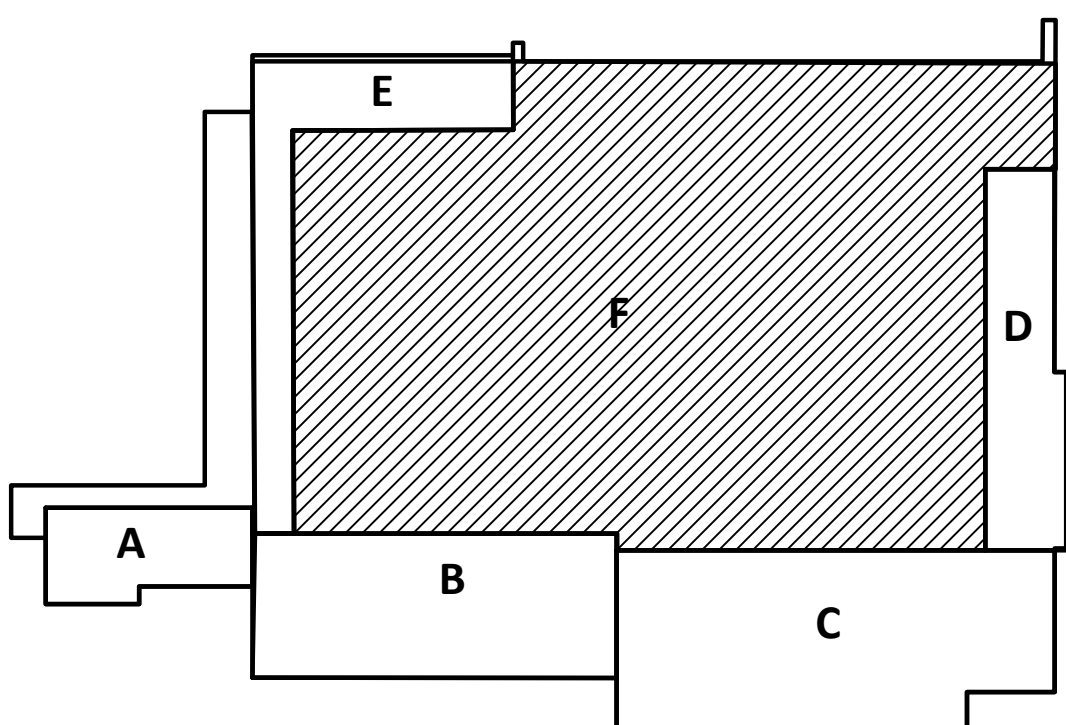
GENERAL NOTES:

- A. THE SCHEMATIC LAYOUT OF THE INSTRUMENTATION SHOWN ON THIS DRAWING HAS BEEN EXTRACTED FROM THE GRAPHIC DISPLAY OF THE EXISTING BAS. THE POINT LIST NAMING MAY BE DIFFERENT FROM THE USPS POINT LIST STANDARD THAT HAS TO BE FOLLOWED. THE CONTRACTOR SHALL SEE TO IT THAT THE APPROPRIATE POINT LIST BE USED IN THE NEW BAS BASED ON THE LATEST USPS STANDARD. THERMOSTAT DESIGNATION & CORRESPONDING UNIT:
- | PREFIX | UNIT |
|--------|---------|
| TR | ROOFTOP |
| TV | VAV |
| TZ | ZONE |
- B. REFER TO DWG. M2.0 FOR EQUIPMENT ON THE ROOF AND OTHER EQUIPMENT INSIDE THE BUILDING.
- C. FIELD VERIFY EXACT LOCATION OF THE BOILER ROOM AND ALL EQUIPMENT AND/OR DEVICES THAT NEED TO BE CONTROLLED.



2 PARTIAL ROOF PLAN AT BOILER ROOM
NOT TO SCALE

KEY PLAN



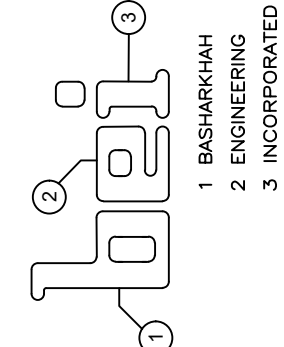
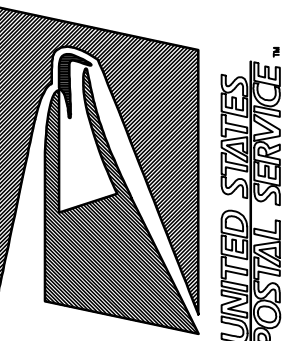
COPYRIGHT © 2024 BROWN REYNOLDS WATFORD ARCHITECTS, INC.

DATE: MARCH 27, 2024
DRAWN BY: HS
CHECKED BY: HS, TB
BRV PROJECT NO.: 222109.00
USPS PROJECT NO.: K72311

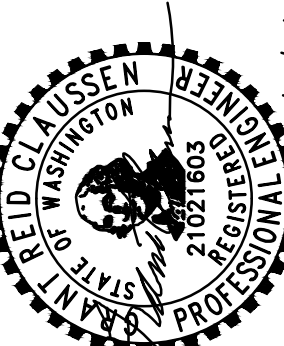
M2.5

OVERALL FLOOR PLAN
- CONTROLS

TACOMA P&DC
HVAC UPGRADES
4001 SOUTH PINE STREET
TACOMA, WA 98413



GRANT CLAUSSEN
WASHINGTON REG. #21021603
13101 Preston Road
Dallas, Texas 75240
(214) 689-8000
Job #22099



BROWN REYNOLDS WATFORD
ARCHITECTS
1620 MONTGOMERY
SAN FRANCISCO, CA 94111
415.749.2870
WWW.BRWARCH.COM

1.0 CONTROL SEQUENCES

THE SEQUENCE OF OPERATION PROVIDED IS GENERIC AND TO BE USED AS A GUIDE ONLY. CONTROLS CONTRACTOR SHALL MODIFY/EDIT VERBAGE ACCORDINGLY TO MATCH EXISTING SYSTEM. ALSO, CONTROL CONTRACTOR SHALL MEET WITH THE LOCAL BUILDING MAINTENANCE DEPARTMENT TO REVIEW ALL EXISTING PROGRAMS AND EQUIPMENT SEQUENCE OF OPERATION PRIOR TO PROGRAMMING.

1.01 OUTDOOR AIR CONDITION MONITORING

- A. THE CONTROLLER WILL READ THE OUTSIDE AIR TEMPERATURE AND HUMIDITY AND CALCULATE THE OUTSIDE AIR ENTHALPY, AND WILL MAKE THESE VALUES AVAILABLE TO THE SYSTEM. IF THE OUTSIDE AIR TEMPERATURE SENSOR IS OUT OF THE NORMAL SET POINT PARAMETER AFTER A TIME DELAY (ADJ.), CONTROLLER WILL GENERATE A SENSOR FAILURE.

1.02 OPTIMAL START PROGRAM (OSP)

- A. THE BUILDING AUTOMATION SYSTEM (BAS) OR ENERGY MANAGEMENT SYSTEM (EMS) SHALL CONTROL THE VARIOUS DAY/NIGHT ZONES BASED UPON AN OPERATOR INTERACTIVE TIME-OF-DAY (TOD) PROGRAM.
- B. THE TOD PROGRAM SHALL INTERACT WITH AN OPTIMAL START PROGRAM (OSP) SUCH THAT START TIMES SHALL BE ASSIGNED BY THE OSP TO ACHIEVE THE TARGET OCCUPANCY SPACE TEMPERATURE 72° F WINTER, 75° F SUMMER AT THE PRECISE TIME OF BUILDING OCCUPANCY.
- C. REFER TO THE VARIOUS SEQUENCES OF OPERATION TO DETERMINE THE AMOUNT OF DAY/NIGHT ZONES REQUIRED.
- D. DURING MORNING WARM-UP, ALL OUTSIDE AIR DAMPERS SHALL BE FULL CLOSED.

1.03 DAY/NIGHT ZONE CONTROL

- A. THE FACILITY SHALL BE DIVIDED INTO DAY/NIGHT ZONES PER USPS STANDARD. THE UNOCCUPIED HEATING TEMPERATURE SETPOINT FOR ALL ZONES IS 55° F. THE UNOCCUPIED COOLING SETPOINT IS INDICATED IN THE TABLE.
- B. THE BASES/MS SHALL CONTROL THE BUILDING ZONES PER FACILITY SCHEDULE FOR WEEKDAYS, SATURDAY AND SUNDAY. :

AREA	UNOCCUPIED COOLING
WORKROOM	88°F
LOCKER	88°F
ADMINISTRATION	88°F
DATA CENTERS	88°F
CAFETERIA	88°F
LOBBIES	88°F

1.04 GENERAL MOTOR STARTING REQUIREMENTS

- A. MOTORS SHALL BE STARTED WITH A MINIMUM DELAY OF 5 SECONDS (ADJ.) BETWEEN MOTORS EXCEPT WHEN SIMULTANEOUS OPERATION SEQUENCE IS REQUIRED.
- B. MOTORS EQUIPPED WITH VFD'S SHALL INITIALLY START AT 30% SPEED (ADJ.) AND THEN RAMP UP TO THE REQUIRED OPERATING SPEED.
- C. RELIEF FAN MOTORS SHALL NOT BE ALLOWED TO START UNTIL THE ASSOCIATED DAMPER END SWITCH IS PROVEN OPEN.
- D. AHU AND RETURN/RELIEF FAN MOTORS SHALL NOT BE ALLOWED TO START UNTIL THE ASSOCIATED RETURN DAMPER END SWITCH IS PROVEN OPEN.

1.05 ELECTRIC MAIN UTILITY METERING

- A. PROVIDE A SMART METER FOR EACH MAIN INCOMING ELECTRICAL FEED. PROVIDE THE METER POINTS AND TRENDS AS INDICATED IN THE POINT LIST.
- B. PROVIDE THE METER POINTS AND TRENDS AS INDICATED IN THE ATTACHED POINTS LIST.
- C. PHASE MONITORING
1. THE BAS SHALL MONITOR THE INCOMING POWER, IF THERE IS A PHASE VOLTAGE LOSS OR PHASE VOLTAGE UNBALANCE, THE BAS SHALL SHUT OFF ALL MOTORIZED EQUIPMENT AND THE CHILLER, AND ISSUE AN ALARM. THE BAS STATION SHALL HAVE AN ICON TO MANUALLY RESTART ALL EQUIPMENT PREVIOUSLY SHUT OFF.
2. THE SYSTEM UNDER VOLTAGE TRIP POINT ON THE VOLTAGE MONITOR SHALL BE SET TO 420 VOLTS (87.5% OF NOMINAL 480 VOLTS).

1.06 ELECTRICAL LOAD MANAGEMENT

- A. BAS SHALL PROVIDE LOAD MANAGEMENT CAPABILITY AS INDICATED BELOW FOR PEAK AVOIDANCE AND FOR PEAK ALARM CONDITION.
- B. THE BAS SHALL RESET SPACE TEMPERATURE BY 1 DEG. F. (INCREASE OR DECREASE BASED ON COOLING OR HEATING MODE OF OPERATION). FAN SPEED SHALL BE REDUCED, WHENEVER POSSIBLE, TO MAINTAIN SET POINT.
1. UPON PEAK POWER WARNING CONDITION INDICATION PROVIDED BY WARNING CONDITION FROM METERED SERVICES THE BAS SHALL INITIATE A 10% SHED REQUEST TO LIGHTING CONTROL SYSTEM.
- C. UPON PEAK POWER ALARM CONDITION INDICATION PROVIDED BY PREDICTED DEMAND CONDITION FROM METERED SERVICES
1. THE BAS SHALL RESET SPACE TEMPERATURE BY 2 DEG. F. (INCREASE OR DECREASE BASED ON COOLING OR HEATING MODE OF OPERATION). FAN SPEED SHALL BE REDUCED TO 70%.
2. THE FAN SPEED OF ALL UNITS CONTROLLED BY VFD'S SHALL BE REDUCED TO 70%.
3. DURING CHILLED WATER SYSTEM OPERATION THE CHILLED WATER SETPOINT SHALL BE INCREASED BY 3°F.
4. THE BAS SHALL INITIATE A 20% SHED REQUEST TO LIGHTING CONTROL SYSTEM.
- D. COORDINATE INPUT REQUIREMENTS TO BAS WITH DIVISION 26.
- E. ON "OFF PEAK" TIME PERIOD, CONTROLS SHALL RETURN TO COMFORT SET POINTS.

1.07 CHILLED WATER PUMPING CONTROL

- A. ENERGY MONITORING
1. PROVIDE FOR THE MAIN AND SECONDARY (IF PRESENT) CHILLED WATER SYSTEM A BTU MONITORING SYSTEM, WHEN AVAILABLE, TO MEASURE ENERGY DELIVERED TO THE FACILITY.
2. THROUGH THE BTU METER COMMUNICATION INTERFACE PROVIDE THE POINT AND TRENDS AS INDICATED IN THE POINTS LIST.
3. PROVIDE MONITORING OF ALL OTHER SYSTEM POINTS AS INDICATED ON THE POINT LIST AND OTHER SYSTEM PARAMETERS AS NEEDED FOR OPERATOR CONTROL.
- 1.08 HEATING HOT WATER SYSTEM CONTROL
- A. SYSTEM - HOT WATER SYSTEM
1. SYSTEM OFF - WHEN THE SYSTEM IS OFF:
- a. THE HOT WATER PUMPS SHALL BE OFF.
- b. THE BOILER UNITS SHALL BE DISABLED.
- c. ALL CONTROL LOOPS SHALL BE DISABLED.
2. INITIATION OF SYSTEM START-UP - THE SYSTEM SHALL BE STARTED:
- a. BY AN OPERATOR MANUALLY ENTERED COMMAND AT THE BAS.
- b. AUTOMATICALLY WHEN THERE IS A REQUIREMENT FOR THE HOT WATER AT THE ANY OF THE AHU AFTER AN OPERATOR DEFINED TIME DELAY.
3. SYSTEM OPERATION - WHEN SYSTEM START UP HAS BEEN INITIATED, THE FOLLOWING SEQUENCES SHALL BE IMPLEMENTED:
- a. THE LEAD AND LAG BOILERS SHALL BE SELECTED BY ONE OF THE FOLLOWING OPERATOR SELECTABLE METHODS:
1. OPERATOR SELECTION OF INDIVIDUAL EQUIPMENT.
2. RUN TIMES TO EQUALIZE EQUIPMENT OPERATIONS.
3. OPERATOR SELECTED STAGING SEQUENCE.
- b. THE BOILER AND ASSOCIATED PUMP SHALL BE ENABLED AND THE BOILER UNIT SHALL START UNDER CONTROL OF THE UNIT MOUNTED CONTROL PANEL.
- c. THE DIFFERENTIAL PRESSURE BYPASS VALVE SHALL BE MODULATED TO MAINTAIN THE HOT WATER DIFFERENTIAL PRESSURE SETPOINT.
- d. PROVIDE AN INTERFACE TO THE BOILER CONTROL PANELS AND PROVIDE A LINEAR SETPOINT RESET SCHEDULE BASED ON OUTSIDE AIR TEMPERATURE IN ACCORDANCE WITH THE FOLLOWINGS:

	50 DEG. F. OAT	70 DEG. F. OAT
HOT WATER SUPPLY TEMPERATURE SETPOINT	180 DEG. F.	100 DEG. F.

4. SETPOINTS - THE SETPOINTS FOR THE SYSTEM SHALL BE DETERMINED AS FOLLOWS:
- a. THE HOT WATER DIFFERENTIAL PRESSURE SETPOINT SHALL BE SET INITIALLY AT 8 PSIG.
- b. THE OPERATOR DEFINED PERIOD FOR SECONDARY PUMP STAGING SHALL BE 10 MINUTES.
- c. THE OPERATOR DEFINED PERIOD FOR BOILER AND PRIMARY PUMP STAGING SHALL BE 15 MINUTES.
- d. THE HOT WATER SUPPLY TEMPERATURE SETPOINT SHALL BE INITIALLY SET TO 180 DEG. F.
5. INITIATION OF SYSTEM SHUTDOWN - SYSTEM SHUTDOWN SHALL BE INITIATED:
- a. BY OPERATOR ENTERED MANUAL COMMAND.
- b. AUTOMATICALLY BY THE EMS BASED ON A TIME SCHEDULE BASIS.
6. ALARMS - THE EMS SHALL GENERATE AN ALARM:
- a. IF A BOILER IS OPERATING WITHOUT AN ASSOCIATED PUMP OPERATING AND VICE VERSA.
- b. IF THE HOT WATER DIFFERENTIAL PRESSURE IS OUTSIDE THE OPERATOR ESTABLISHED LOW AND HIGH ALARM LIMITS, WHICH SHALL BE INITIALLY SET AT +/- 3 PSIG AROUND THE CURRENT SETPOINT.
7. FAILURE POSITIONS - WHEN A EMS COMPONENT FAILURE OCCURS:
- a. PUMPS SHALL REMAIN AT THE LAST COMMANDED STATE.
- b. BOILERS SHALL REMAIN AT THE LAST COMMANDED STATE.

1.09 LIGHTING SYSTEMS MONITORING

- A. THE BAS SHALL MONITOR THE LIGHTING SYSTEM THROUGH THE BACNET INTERFACE.
- B. THE BAS CONTRACTOR SHALL PROVIDE PROGRAMMING TO TOTALIZE THE LIGHTING SYSTEM DEMAND KW RECEIVED THROUGH A BACNET OBJECT FROM THE LIGHTING CONTROL SYSTEM.
- C. THE BAS CONTRACTOR SHALL PROVIDE ALL PROGRAMMING REQUIRED TO ESTABLISH TRENDS OBJECTS FOR THE LIGHTING SYSTEM AS INDICATED ON THE POINTS LIST.
- D. ENERGY MONITORING
1. PROVIDE FOR THE MAIN AND SECONDARY WATER SYSTEM A BTU MONITORING SYSTEM TO MEASURE ENERGY DELIVERED TO THE FACILITY.
2. THROUGH THE HOT WATER PUMP VFD COMMUNICATION INTERFACE PROVIDE POINTS AND TRENDS AS INDICATED IN THE POINTS LIST.
3. PROVIDE MONITORING OF ALL OTHER SYSTEM POINTS AS INDICATED ON THE POINT LIST AND OTHER SYSTEM PARAMETERS AS NEEDED FOR OPERATOR CONTROL.

1.10 VAV/CAIR HANDLER SYSTEM CONTROL

- A. SYSTEM - VAV AIR HANDLING UNITS (WITH VFD), CV AIR HANDLING UNITS (WITHOUT VFD) AND OUTSIDE AIR ECONOMIZER (HEATING / COOLING)
- B. EACH AIR-HANDLING UNIT SHALL UTILIZE A STAND-ALONE DDC CONTROLLER DEDICATED ONLY FOR CONTROL OF ITS RESPECTIVE UNIT.
1. SYSTEM OFF - WHEN THE SYSTEM IS OFF:
- a. THE UNIT OUTSIDE AIR DAMPER SHALL BE CLOSED.
- b. THE SUPPLY AIR FAN SHALL BE OFF.
- c. THE COOLING COIL VALVE SHALL BE CLOSED.
- d. THE HEATING COIL VALVE SHALL BE CLOSED.
- e. THE RETURN AIR DAMPER SHALL BE OPEN.
- f. THE RELIEF AIR DAMPER SHALL BE CLOSED.
- g. ALL CONTROL LOOPS SHALL BE DISABLED.
2. INITIATION OF SYSTEM START-UP - SYSTEM START-UP SHALL BE INITIATED:
- a. BY AN OPERATOR MANUALLY ENTERED COMMAND AT THE BAS.
- b. AUTOMATICALLY BY THE BAS BASED ON OPTIMAL START, NIGHT SETUP, TIME SCHEDULE, RESTART FOLLOWING A FIRE ALARM, OR RESTART FOLLOWING A POWER FAILURE.
3. SYSTEM OPERATION - WHEN SYSTEM START-UP HAS BEEN INITIATED, THE FOLLOWING SEQUENCES SHALL BE IMPLEMENTED:
- a. THE SUPPLY AIR FANS SHALL BE CONTROLLED AS FOLLOWS:
- I. THE VARIABLE SPEED SUPPLY AIR FAN SHALL START AT ITS MINIMUM SPEED, FOLLOWING AN OPERATOR ASSIGNED TIME DELAY, THE SUPPLY FAN SPEED SHALL BE MODULATED TO MAINTAIN THE DUCT STATIC PRESSURE SETPOINT. THE SPEED OF THE FAN SHALL NOT BE ADJUSTED BY MORE THAN 10 PERCENT OF ITS MAXIMUM SPEED IN ANY ONE (1) MINUTE PERIOD. THE CONSTANT SPEED SUPPLY AIR FAN SHALL START AT ITS MINIMUM SPEED FOLLOWING AN OPERATOR ASSIGNED TIME DELAY UP TO THE WORKING SPEED.
- II. FOR VAV ONLY, THE STATIC PRESSURE SETPOINT SHALL BE RESET DOWNWARDS VIA A CONTROL ALGORITHM TO OPTIMIZE THE ENERGY USAGE. THE STATIC PRESSURE SETPOINT SHALL BE RESET DOWN IN OPERATOR DEFINED INCREMENTS AT OPERATOR DEFINED INTERVALS UNTIL, SUCH TIME AS THE PRIMARY AIR FLOWRATE TO ONE OF THE ASSOCIATED FAN POWERED TERMINAL UNITS HAS BEEN BELOW THE REQUIRED VALUE FOR MORE THAN AN OPERATOR ESTABLISHED PERIOD OF TIME WHICH SHALL BE SET INITIALLY AT 1 MINUTE. IF THE PRIMARY AIR FLOWRATE HAS BEEN BELOW THE REQUIRED VALUE FOR MORE THAN THE OPERATOR ESTABLISHED PERIOD OF TIME, THEN THE STATIC PRESSURE SETPOINT SHALL BE RESET UP IN OPERATOR DEFINED INCREMENTS AT OPERATOR DEFINED INTERVALS UNTIL, SUCH TIME AS THE REQUIRED PRIMARY AIR FLOWRATE TO ALL OF THE ASSOCIATED TERMINAL UNITS HAS BEEN ACHIEVED.
- b. THE OUTSIDE AIR DAMPER SHALL OPEN TO THE MINIMUM POSITION ONCE THE UNIT IS OPERATING DURING NORMAL OCCUPIED TIME PERIODS.
- c. THE HEATING AND COOLING COIL VALVES SHALL BE MODULATED IN SEQUENCE TO ATTAIN THE REQUIRED SUPPLY AIR TEMPERATURE HEATING/COOLING SETPOINTS, RESPECTIVELY.
- d. IF THE OUTSIDE AIR TEMPERATURE IS BETWEEN OPERATOR-DEFINED LIMITS, AND THE RETURN AIR ENTHALPY IS GREATER THAN THE OUTSIDE AIR ENTHALPY, THEN THE UNIT SHALL OPERATE IN ECONOMIZER MODE. THE OUTSIDE AIR DAMPERS SHALL BE MODULATED IN SEQUENCE TO MAINTAIN THE SUPPLY AIR TEMPERATURE SETPOINT. THE RELIEF DAMPERS SHALL MODULATE TO MAINTAIN THE SPACE PRESSURE SETPOINT. THE RETURN AIR DAMPERS SHALL MODULATE TO MAINTAIN THE MIXED PLENUM PRESSURE SETPOINT. IF THE OUTSIDE AIR DAMPERS ARE FULLY OPEN AND THE SUPPLY AIR TEMPERATURE CANNOT BE MAINTAINED, THEN THE CHILLED WATER VALVE SHALL BE MODULATED TO MAINTAIN THE SUPPLY AIR TEMPERATURE SETPOINT.
4. SETPOINTS - THE SETPOINTS FOR THE SYSTEM SHALL BE DETERMINED AS FOLLOWS:
- a. THE SUPPLY AIR TEMPERATURE SETPOINT SHALL BE SET MANUALLY BY THE OPERATOR AND SHALL BE SET INITIALLY AT 55 DEG. F. FOR COOLING AND 45 DEG. F. FOR HEATING.
- b. THE DUCT STATIC PRESSURE SETPOINT SHALL BE SET BY THE OPERATOR AND SHALL BE SET INITIALLY AT 0.75 INCHES W.G. AND SHALL HAVE RESET LIMITS OF 0.25 TO 1.0 INCHES W.G.
- c. THE TIME DELAY FOR VFD CONTROL SHALL BE SET INITIALLY AT TWO (2) MINUTES.
- d. THE SETPOINT FOR HIGH STATIC SHUTDOWN SHALL BE SET INITIALLY AT 2.0 INCHES W.G.
- e. THE TIME DELAY FOR STATIC PRESSURE RESET DOWN SHALL BE INITIALLY SET AT 10 MINUTES.
- f. THE TIME DELAY FOR STATIC PRESSURE RESET UP SHALL BE INITIALLY SET AT 5 MINUTES.
- g. THE STATIC PRESSURE RESET DOWN INTERVAL SHALL BE INITIALLY SET AT 0.05 INCHES W.G.
- h. THE STATIC PRESSURE RESET UP INTERVAL SHALL BE INITIALLY SET AT 0.1 INCHES W.G.
- i. FREEZE/STAT SETPOINT SHALL BE SET AT THE DEVICE FOR 35 DEG. F.
- j. THE LIMITS FOR ECONOMIZER OPERATIONS SHALL BE INITIALLY SET BETWEEN 58 DEG. F AND 18 DEG. F.
- k. THE SPACE PRESSURE SETPOINT SHALL BE INITIALLY SET AT 0.08 INCHES W.G.
- l. THE MIXED PLENUM PRESSURE SETPOINT SHALL BE SET AT -0.01 INCHES W.G.
5. INITIATION OF SYSTEM SHUTDOWN SYSTEM SHUTDOWN SHALL BE INITIATED:
- a. BY OPERATOR ENTERED MANUAL COMMAND.
- b. AUTOMATICALLY BY THE BAS WHEN THERE ARE NO TERMINAL UNITS REQUIRING PRIMARY AIR.
- c. HIGH STATIC PRESSURE SHUT DOWN.
- d. BY THE FIRE ALARM SYSTEM. THE BAS SHALL AUTOMATICALLY SET THE CONTROL RELAY TO THE OFF STATE.
6. ALARMS - THE BAS SHALL GENERATE AN ALARM:
- a. IF THE DUCT STATIC PRESSURE IS OUTSIDE THE OPERATOR ESTABLISHED LOW AND HIGH ALARM LIMITS, INITIALLY SET AT 0.1 AND 1.2 INCHES W.G.
- b. IF THE SUPPLY AIR TEMPERATURE IS OUTSIDE THE OPERATOR ESTABLISHED LOW AND HIGH LIMITS, WHICH SHALL BE SET AT +/- 0.4 DEG. F. AROUND THE CURRENT SETPOINT.
- c. ALL ALARMS SHALL BE INHIBITED WHEN THE SUPPLY FAN IS NOT OPERATING EXCEPT THE SPACE TEMPERATURE ALARMS. THE ALARMS, EXCEPT THE FAN FAILURE TO START AND FAILURE IN SERVICE ALARMS AND THE SPACE TEMPERATURE ALARMS, REMAIN INHIBITED FOLLOWING START UP OF THE UNIT FOR AN OPERATOR DETERMINED PERIOD OF TIME INITIALLY SET AT 2 MINUTES.
7. FAILURE POSITIONS - WHEN A BAS COMPONENT OR POWER FAILURE OCCURS:
- a. SUPPLY FAN SHALL REMAIN IN THE LAST COMMANDED STATE.
- b. THE COOLING COIL VALVE SHALL REMAIN IN THE LAST COMMANDED POSITION.
- c. THE OUTSIDE AIR, RETURN AIR AND RELIEF AIR DAMPERS SHALL REMAIN IN THE LAST COMMANDED POSITIONS.
8. DDC CONTROL SHALL MONITOR A PRESSURE DIFFERENTIAL SWITCH INSTALLED ACROSS EACH FILTER BANK.
9. THE DDC SYSTEM SHALL MONITOR AHU RUNTIME. WHEN THE AHU HAS OPERATED FOR AN OWNER DEFINED TIME PERIOD, THE HMI SHALL NOTIFY MAINTENANCE PERSONNEL THAT SERVICE/INSPECTION IS REQUIRED.
10. DURING UNOCCUPIED TIMES, THE DDC SYSTEM WILL DESIGNATED SETUP SETBACK TEMPERATURE SENSOR. WHEN THE DESIGNATED SETBACK TEMPERATURE IS BELOW 55°F (ADJ.), THE SYSTEM WILL BE ABLE TO MAINTAIN 55°F (ADJ.) WHEN THE DESIGNATED SETBACK TEMPERATURE IS ABOVE 90°F (ADJ.), THEN SYSTEM WILL BE ABLE TO MAINTAIN 90°F.
11. A MANUAL-RESET MIXED AIR LOW LIMIT CONTROLLER SHALL DEENERGIZE THE AHU IF THE MIXED AIR TEMPERATURE FALLS BELOW 35° F (ADJ.). WHEN THE MIXED AIR LOW LIMIT DE-ENERGIZES THE UNIT, A FREEZE PROTECTION SHUTDOWN ALARM SHALL BE DISPLAYED AT THE HMI.
12. A MANUAL-RESET RETURN AIR HIGH LIMIT CONTROLLER SHALL DEENERGIZE THE AHU IF THE RETURN AIR TEMPERATURE RISES ABOVE 125° F (ADJ.). WHEN THE RETURN AIR HIGH LIMIT DE-ENERGIZES THE UNIT, A HIGH LIMIT SHUTDOWN ALARM SHALL BE DISPLAYED AT THE HMI.
13. THE SUPPLY AIR OR RETURN AIR SMOKE DETECTORS SHALL DE-ENERGIZE THE AHU IF THE PRODUCTS OF COMBUSTION ARE DETECTED. WHEN THE SUPPLY AIR OR RETURN AIR SMOKE DETECTORS DEENERGIZES THE UNIT, A SMOKE DETECTOR SHUT DOWN ALARM SHALL BE DISPLAYED AT THE HMI.
14. IF THE SUPPLY AIR FAN FAILS TO START DURING OPERATION, THE AHU WILL BE DE-ENERGIZED. WHEN THE AHU IS DE-ENERGIZED FOR FAN FAILURE, A FAN FAILURE ALARM SHALL BE DISPLAYED AT THE HMI.

1.10 DX-RTU W/ GAS HEAT

- A. EACH UNIT SHALL BE PROVIDED WITH HEATING, COOLING AND FAN SECTIONS; CONVENTIONAL THERMOSTAT INTERFACE (CTI) BOARD; AND AN O/A/R SPRING RETURN DAMPER SECTION. COMPLETE WITH FACTORY INSTALLED MOTORIZED ACTUATORS. THE TEMPERATURE CONTROL SYSTEM CONTRACTOR SHALL PROVIDE A DEDICATED STAND-ALONE DDC CONTROLLER FOR EACH UNIT. THE UNOCCUPIED/UNOCCUPIED MODE OF OPERATION SHALL BE DEFINED BY THE EMS. OPTIMUM START/STOP SCHEDULE. MONITOR COMPRESSOR(S) STATUS, FAN STATUS, SUPPLY AND RETURN AIR TEMPERATURE AND O/A TEMPERATURE. THE DDC CONTROLLER SHALL BE INSTALLED INSIDE THE UNIT.
1. UNOCCUPIED MODE:
- A. IN THE UNOCCUPIED MODE OF OPERATION, THE UNIT OUTSIDE AIR DAMPER SHALL REMAIN CLOSED AND THE SUPPLY FAN SHALL CYCLE ON AND OFF WITH THE UNIT'S HEATING AND COOLING. THE DDC CONTROLLER SHALL ENERGIZE THE HEATING OR COOLING AS REQUIRED TO MAINTAIN THE UNOCCUPIED HEATING AND COOLING SETPOINTS (INITIALLY 55°F HEATING, 80°F COOLING) AS SENSED BY A SPACE TEMPERATURE SENSOR. ON A RISE IN SPACE TEMPERATURE ABOVE THE UNOCCUPIED COOLING SETPOINT, THE DDC CONTROLLER SHALL ENERGIZE THE MECHANICAL COOLING. ON A DROP IN SPACE TEMPERATURE BELOW THE UNOCCUPIED COOLING SETPOINT, THE REVERSE SHALL OCCUR. ON A FURTHER DROP IN SPACE TEMPERATURE BELOW THE UNOCCUPIED HEATING SETPOINT, THE DDC CONTROLLER SHALL ENERGIZE THE GAS HEATING. ON A RISE IN SPACE TEMPERATURE ABOVE THE UNOCCUPIED HEATING SETPOINT, THE REVERSE SHALL OCCUR.
2. OCCUPIED MODE:
- A. IN THE OCCUPIED MODE OF OPERATION, THE UNIT SUPPLY FAN SHALL CYCLE WITH A CALL FOR HEATING OR COOLING. THE DDC CONTROLLER SHALL ENERGIZE THE HEATING AND COOLING AS REQUIRED TO MAINTAIN THE OCCUPIED HEATING AND COOLING SETPOINTS (INITIALLY 68°F HEATING, 74°F COOLING) AS SENSED BY A SPACE TEMPERATURE SENSOR. SPACE SETPOINT SHALL BE USER ADJUSTABLE WITHIN +/- 2°F. ON A RISE IN SPACE TEMPERATURE ABOVE THE OCCUPIED COOLING SETPOINT, THE DDC CONTROLLER SHALL ENERGIZE THE MECHANICAL COOLING. ON A DROP IN SPACE TEMPERATURE BELOW THE OCCUPIED COOLING SETPOINT, THE REVERSE SHALL OCCUR. ON A FURTHER DROP IN SPACE TEMPERATURE BELOW THE OCCUPIED HEATING SETPOINT, THE DDC CONTROLLER SHALL ENERGIZE THE GAS HEATING. ON A RISE IN SPACE TEMPERATURE ABOVE OCCUPIED HEATING SETPOINT, THE REVERSE SHALL OCCUR.
3. TEMPERATURE CONTROL
- A. WARM-UP MODE: THE EMS SHALL DETERMINE THE REQUIRED WARM-UP PERIOD BASED ON THE OPTIMIZED START ALGORITHM. IN THIS MODE, THE OUTSIDE AIR DAMPER SHALL BE FULLY CLOSED AND THE EMS WILL CONTROL THE UNIT TO REACH THE GLOBAL WARM-UP SETPOINT OF 56°F (ADJ.).
- B. COOLDOWN MODE: THE EMS SHALL DETERMINE THE REQUIRED COOLDOWN PERIOD BASED ON THE OPTIMIZED START ALGORITHM. IN THIS MODE, THE OUTSIDE AIR DAMPER SHALL BE FULLY CLOSED AND THE EMS WILL CONTROL THE UNIT TO REACH THE GLOBAL COOLDOWN SETPOINT TEMPERATURE OF 78°F (ADJ.).
4. MONITORING:
- A. SUPPLY AIR TEMPERATURE SENSORS SHALL BE MOUNTED IN THE SUPPLY AIR DUCTWORK TO MONITOR THE SUPPLY AIR TEMPERATURE.
5. ECONOMIZER MODE (IF APPLICABLE)
- A. DURING THE OCCUPIED COOLING MODE THE ECONOMIZER AND MECHANICAL COOLING ARE USED TO CONTROL THE ZONE TEMPERATURE. IF THE ENTHALPY OF THE OUTSIDE AIR IS APPROPRIATE TO USE FREE COOLING, THE ECONOMIZER SHALL BE USED TO SATISFY THE ZONE TEMPERATURE SETPOINT. IF THE ECONOMIZER CANNOT SATISFY SPACE LOAD CONDITIONS, MECHANICAL COOLING SHALL BE STAGED ON AS NECESSARY. MINIMUM ON/OFF TIMING OF THE MECHANICAL COOLING SHALL PREVENT RAPID CYCLING. WHENEVER THE ECONOMIZER IS NOT UTILIZED MECHANICAL COOLING SHALL BE USED TO SATISFY COOLING REQUIREMENTS. AT OUTDOOR AIR CONDITIONS ABOVE THE ENTHALPY CONTROL SETTING, MECHANICAL COOLING SHALL BE USED AND THE FRESH AIR DAMPERS SHALL REMAIN AT MINIMUM POSITION.
6. CO2 CONTROL - DEMAND CONTROL VENTILATION (DCV), IF APPLICABLE
- A. PROVIDE SPACE CO2 SENSORS THAT SHALL CONTROL THE OUTSIDE AIR DAMPERS TO MAINTAIN CO2 SETPOINT. CO2 SENSOR SHALL BE INSTALLED IN HIGH OCCUPANCY AREAS SUCH AS AUDITORIUM AND CAFETERIA.
7. DEHUMIDIFICATION MODE
- A. 3-5 TON UNITS DEHUMIDIFICATION SHALL BE MITIGATED BY TWO-STEP SCROLL COMPRESSOR AND TWO-SPEED BLOWER MOTOR. 6 TON UNITS AND LARGER SHALL CONTROL HUMIDITY UTILIZING DUAL COMPRESSORS WITH DUAL REFRIGERANT CIRCUITS AND FAN SPEED CONTROL.

REPLACEMENT PARALLEL FAN POWERED TERMINAL UNIT SCHEDULE

DESIGNATION	FMB-*	FMB-*	FMB-*	FMB-*	FMB-*
VAV SECTION (NOTE 6)					
INLET SIZE, DIA.	6"	8"	10"	12"	14"
MAX. CFM	400	800	1400	1800	2500
MIN. CFM	60	140	210	270	375
FAN SECTION					
HP	1/6	1/4	1/2	3/4	1.0
MAX. CFM (NOTE 7)	280	560	980	1260	1750

GENERAL NOTES:

1. ABOVE SIZING SCHEDULE IS BASED ON ENVIROTEC MODEL VFL. CONTRACTOR SHALL VERIFY THE TYPE OF HEATING, WHETHER HYDRONIC OR ELECTRIC, AND SHALL USE THE SAME EXISTING UTILITIES AS THE EXISTING TO BE REPLACED.
2. CONTRACTOR SHALL MATCH AS FAR AS FEASIBLE THE EXISTING MANUFACTURER. IF NOT AVAILABLE, HE/SHE MAY SUBMIT OTHER APPROVED MANUFACTURERS. ONLY ONE MANUFACTURER SHALL BE USED FOR ALL REPLACEMENTS.
3. (*) USE THE SAME DESIGNATION OR ID AS THE EXISTING UNIT TO BE REPLACED.
- REMARKS:
1. PROVIDE 1" THK. THROW-AWAY FILTER.
2. FAN MOTOR: THREE SPEED CONTROL.
3. IF USED, ELECTRIC HEATERS SHALL HAVE A FUSED, DOOR INTERLOCKING DISCONNECT SWITCH. PROVIDE SCR CONTROL.
4. TERMINALS SHALL HAVE MULTI-POINT, CROSSFLOW INLET PROBE.
5. PROVIDE SINGLE POINT ELECTRICAL CONNECTION.
6. VAV TERMINAL UNIT SHALL BE PRESSURE INDEPENDENT AND SHALL BE ADJUSTED FOR A MINIMUM AIRFLOW OF 15% OF COOLING CAPACITY. MAX. PRESSURE DROP = 0.1" W.G. INLET PRESSURE = 0.5" W.G.
7. PARALLEL FAN POWERED CFM SHALL BE SIZED FOR 75% OF COOLING CFM.
8. 0.4" EXTERNAL STATIC PRESSURE.
9. PROVIDE A DIRECT DIGITAL CONTROL (DDC) SYSTEM FOR EACH TERMINAL WITH THE CAPABILITY TO INTERFACE TO THE FACILITY FMCS.

REPLACEMENT STRAIGHT VAV TERMINAL UNIT SCHEDULE

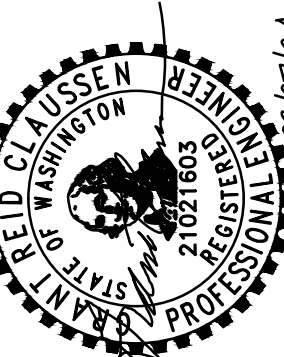
DESIGNATION	VAV-*	VAV-*	VAV-*	VAV-*	VAV-*
VAV SECTION (NOTE 6)					
INLET SIZE, DIA.	6"	8"	10"	12"	14"
MAX. CFM	400	800	1400	1800	2500
MIN. CFM	60	140	210	270	375

GENERAL NOTES:

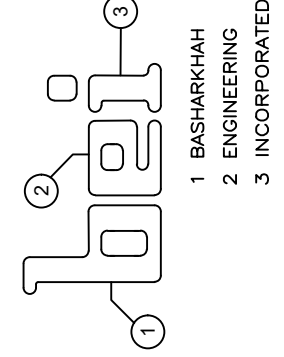
1. ABOVE SIZING SCHEDULE IS BASED ON ENVIROTEC MODEL VFL. CONTRACTOR SHALL VERIFY THE TYPE OF HEATING, WHETHER HYDRONIC OR ELECTRIC, AND SHALL USE THE SAME EXISTING UTILITIES AS THE EXISTING TO BE REPLACED.
2. CONTRACTOR SHALL MATCH AS FAR AS FEASIBLE THE EXISTING MANUFACTURER. IF NOT AVAILABLE, HE/SHE MAY SUBMIT OTHER APPROVED MANUFACTURERS. ONLY ONE MANUFACTURER SHALL BE USED FOR ALL REPLACEMENTS.
3. (*) USE THE SAME DESIGNATION OR ID AS THE EXISTING UNIT TO BE REPLACED.
- REMARKS:
1. TERMINALS SHALL HAVE MULTI-POINT, CROSSFLOW INLET PROBE.
2. VAV TERMINAL BOX SHALL BE PRESSURE INDEPENDENT AND SHALL BE ADJUSTED FOR A MINIMUM AIRFLOW OF 15% OF COOLING CAPACITY. MAX. PRESSURE DROP = 0.1" W.G. INLET PRESSURE = 0.5" W.G.
3. PROVIDE FACTORY STANDARD ATTENUATOR.
4. PROVIDE A DIRECT DIGITAL CONTROL (DDC) SYSTEM FOR EACH TERMINAL UNIT WITH THE CAPABILITY TO INTERFACE TO THE SCHOOL FMCS. HEATING/COOLING TESTS SHALL BE LOOKABLE.
5. VARIABLE AIR VOLUME TERMINAL SHALL BE SAME MANUFACTURE AS THE FAN POWERED TERMINAL UNIT. SEE SCHEDULE FOR FAN POWERED TERMINAL.
6. PROVIDE A DIRECT DIGITAL CONTROL (DDC) SYSTEM FOR EACH TERMINAL WITH THE CAPABILITY TO INTERFACE TO THE FACILITY FMCS.

EXISTING ENERGY MANGEMENT SYSTEM (EMS) UPGRADE			
REPLACE EXISTING AND PROVIDE NEW DIRECT DIGITAL CONTROL SYSTEM TO INCLUDE ALL AFFECTED EXISTING EQUIPMENT. REPLACE THE AFFECTED CONTROL DEVICES SUCH AS SHUT-OFF VALVES, CONTROL VALVES, DAMPERS, ETC., WHEN REQUIRED, INCLUDING INSTRUMENTATION USED FOR TEMPERATURE, PRESSURE, FLOW, ETC. MEASUREMENTS TO ACHIEVE THE MINIMUM CONTROL REQUIREMENTS AS DEFINED ON THESE DRAWINGS AND IN THE SPECIFICATIONS. THE EMS FRONT END WILL BE PLACED IN A DESIGNATED AREA FOR SYSTEM ACCESS, SCHEDULING, AND TROUBLESHOOTING. THIS IS NOT AN EXHAUSTIVE LIST OF THE EXISTING EQUIPMENT THAT MAY REQUIRE REPLACEMENT. THE CONTRACTOR SHALL HAVE A COMPLETE AND COMPREHENSIVE SITE SURVEY TO DETERMINE ALL AFFECTED EXISTING EQUIPMENT. MONITORING/CONTROL POINTS ARE MINIMUM REQUIRED AND SHALL BE VERIFIED WITH THE SPECIFICATIONS.			
ALL AFFECTED EQUIPMENT TO BE REUSED SHALL BE CHECKED FOR OPERABILITY, SHALL BE REFURBISHED, REPLACED OR REPAIRED AS NEEDED. APPROPRIATE ALLOWANCES SHALL BE PROVIDED IN THE BID PRICE PER DIVISION 1 SECTION 01200 - ALLOWANCES.			
BUILDING GLOBAL SIGNALS MISC MONITORING POINTS		OUTSIDE AIR TEMPERATURE OUTSIDE AIR HUMIDITY BUILDING PRESSURIZATION	
QUANTITY	MONITORING POINTS	CONTROL POINTS	REMARKS
2 AIR COOLED CHILLERS 4 PUMPS	CHILLERS & PUMPS	CHILLERS ARE TRANE MODEL RTAF 190F PROVIDED WITH TRACER ADAPTIVEVIEW CONTROL THAT CAN BE CONFIGURED FOR BACNET COMMUNICATIONS. INTERFACE ALL CONTROL POINTS TO THE NEW EMS.	CHILLERS ARE TRANE MODEL RTAF 190F PROVIDED WITH TRACER ADAPTIVEVIEW CONTROL THAT CAN BE CONFIGURED FOR BACNET COMMUNICATIONS. INTERFACE ALL CONTROL POINTS TO THE NEW EMS.
	BOILERS & PUMPS	BOILER STATUS HOT WATER SUPPLY TEMP HOT WATER RETURN TEMP HOT WATER PUMP STATUS	BOILER START/STOP HOT WATER PUMP START/STOP POSITIVE GAS OFF VALVE OPEN/CLOSE
2 GAS FIRED BOILERS 4 PUMPS	AHU	FAN STATUS SPACE HUMIDITY SUPPLY AIR TEMP MIXED AIR TEMP	FAN START/STOP OUTSIDE AIR DAMPER POSITION CHW VALVE POSITION HW VALVE POSITION
	RTUS	VERIFY INCLUDED CONTROL WITH THE UNIT AND INTERFACE/INTEGRATE ALL CONTROL POINTS WITH THE NEW EMS.	THESE RTUS ARE PRESENTLY CONNECTED TO THE EXISTING EMS AND ARE MANUALLY OPERATED. PROVIDE ALL NECESSARY CONTROL INTERFACES TO BE ABLE TO BE CONTROLLED AUTOMATICALLY LOCALLY & FROM THE NEW EMS.
82 (VERIFY)	VAV TERMINAL UNITS	EXISTING UNITS ARE TUTTLE & BAILEY. REFER TO MANUFACTURER'S CONTROL POINTS FOR INTERFACING TO THE NEW EMS.	UNITS ARE PRESENTLY HAVING PROBLEMS COMMUNICATING WITH THE EXISTING EMS. CONTRACTOR SHALL PROVIDE UNIT PRICE FOR EACH SIZE & COMPLETE INSTALLATION TO REPLACE DEFECTIVE UNITS.
5	PTACS FOR COMPUTER ROOM	SPACE TEMP SUPPLY AIR TEMP	MOTOR START/STOP
SEE FLOOR PLAN	EXHAUST FANS	SPACE TEMP	MOTOR START/STOP
SEE FLOOR PLAN	UNIT HEATERS	SPACE TEMP SUPPLY AIR TEMP	MOTOR START/STOP
NOTES:			
1. CONTRACTOR SHALL PROVIDE A UNIQUE IDENTIFIER ON EACH UNIT IN ACCORDANCE WITH THE USPS IDENTIFICATION METHOD. PROVIDE THE APPROPRIATE LABELING OF THE UNIT AND THE CONTROL POINTS PER USPS SPECIFICATIONS AND USE THIS IN DEVELOPING THE CONTROL DIAGRAMS.			
2. NEW DDC CONTROL SYSTEM SHALL BE BACNET BASED.			
3. EXACT QUANTITIES SHALL BE FIELD VERIFIED BEFORE BID.			
4. THE ABOVE TABLE IS TO GIVE THE CONTRACTOR A GENERAL IDEA OF THE SCOPE OF THE CONTROL WORK. REFER TO THE USPS CONTROL SPECIFICATIONS FOR COMPLETE REQUIREMENTS.			

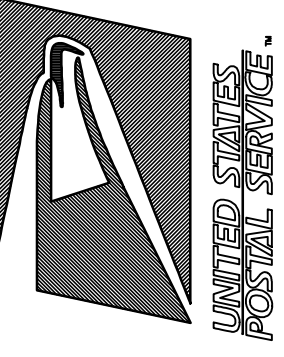
BROWN REYNOLDS WATFORD
ARCHITECTS
1620 MONTGOMERY
SAN FRANCISCO, CA 94111
415.749.2670
WWW.BRWARCH.COM



GRANT CLAUSSEN
WASHINGTON REG. #21021603
13101 Preston Road
Dallas, Texas 75240
(214) 659-9000
Job #22099



TACOMA P&DC
HVAC UPGRADES
4001 SOUTH PINE STREET
TACOMA, WA 98413

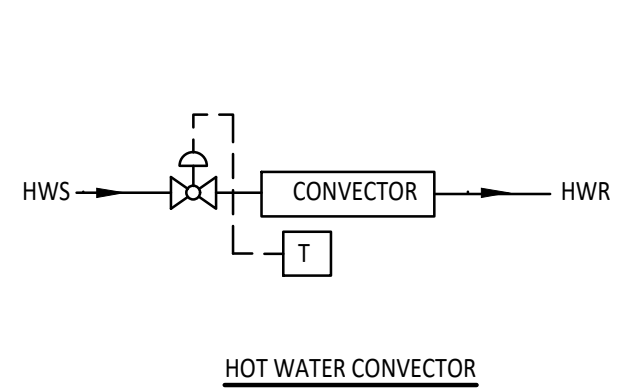


COPYRIGHT © 2024 BROWN REYNOLDS WATFORD ARCHITECTS, INC.

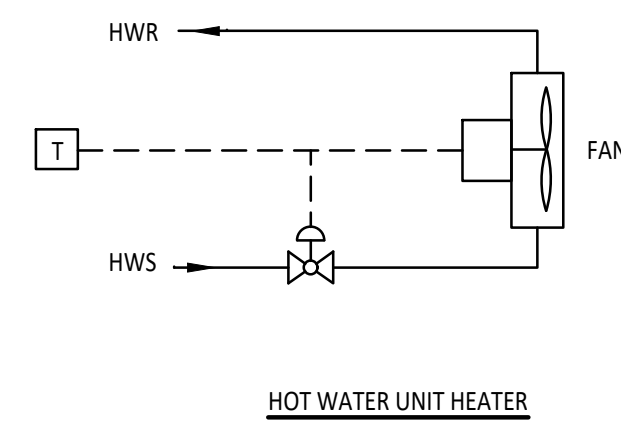
DATE: MARCH 27, 2024
DRAWN BY: HS
CHECKED BY: HS, TB
BRV PROJECT NO. 222109.00
USPS PROJECT NO. K72311

M4.0

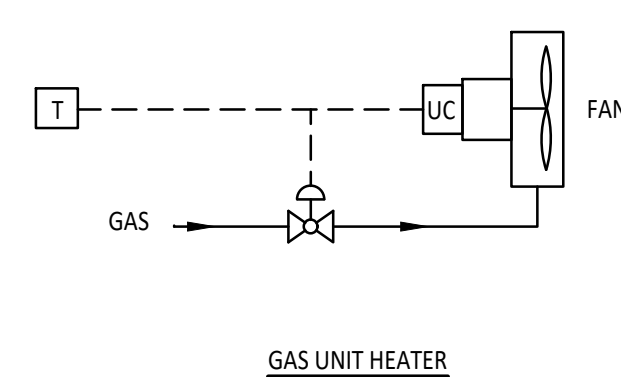
CONTROL SEQUENCES



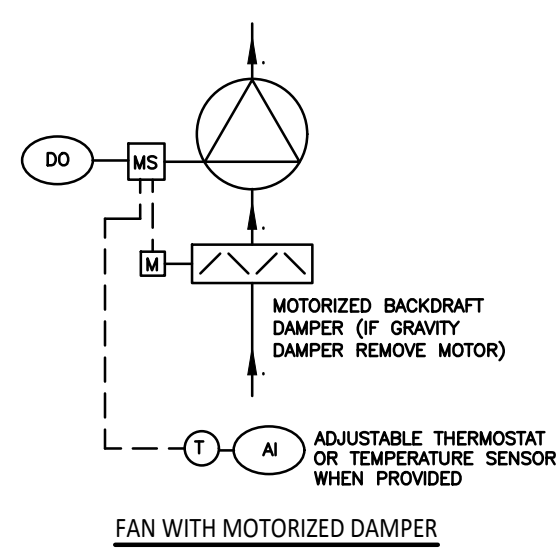
HOT WATER CONVECTOR



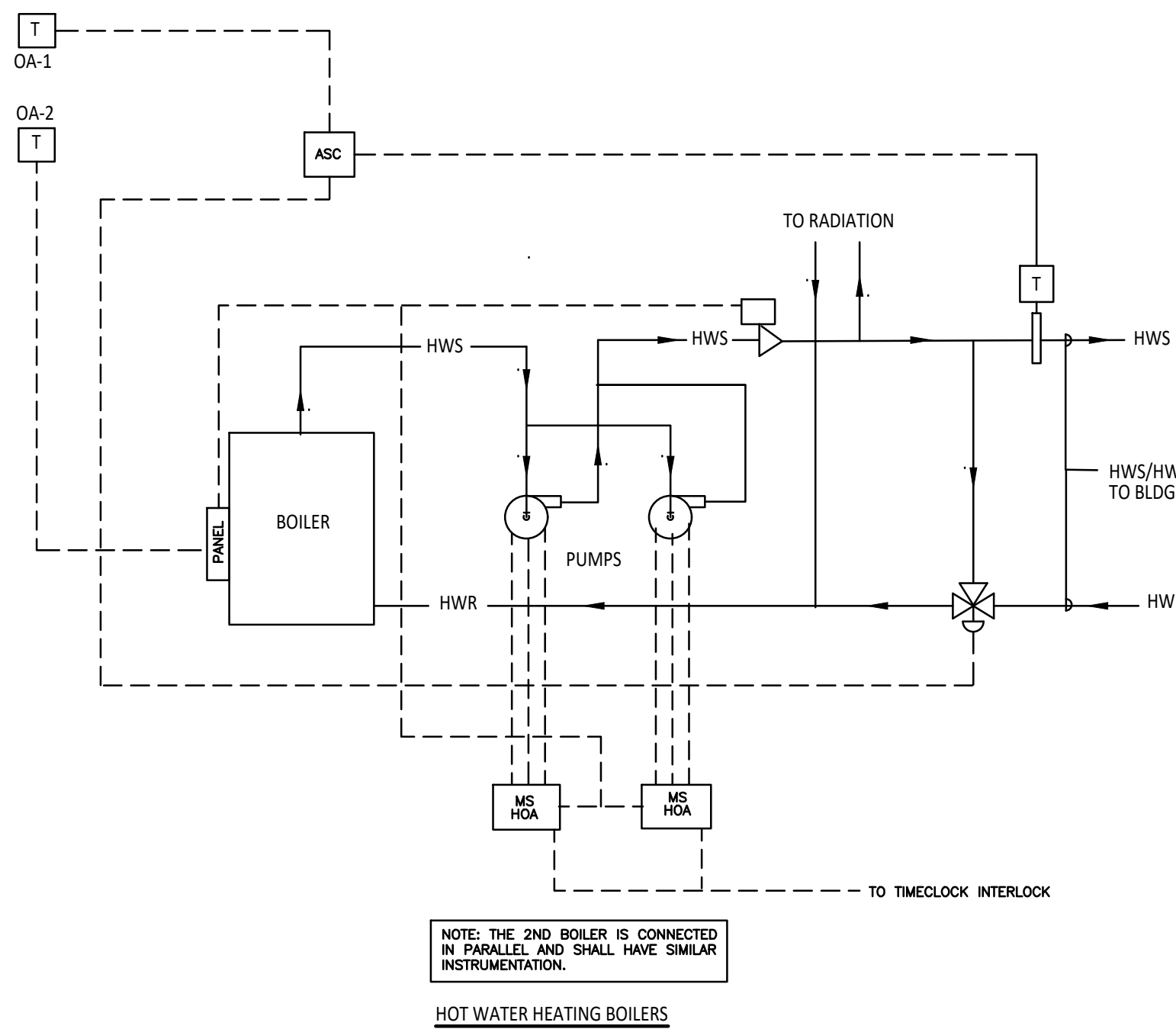
HOT WATER UNIT HEATER



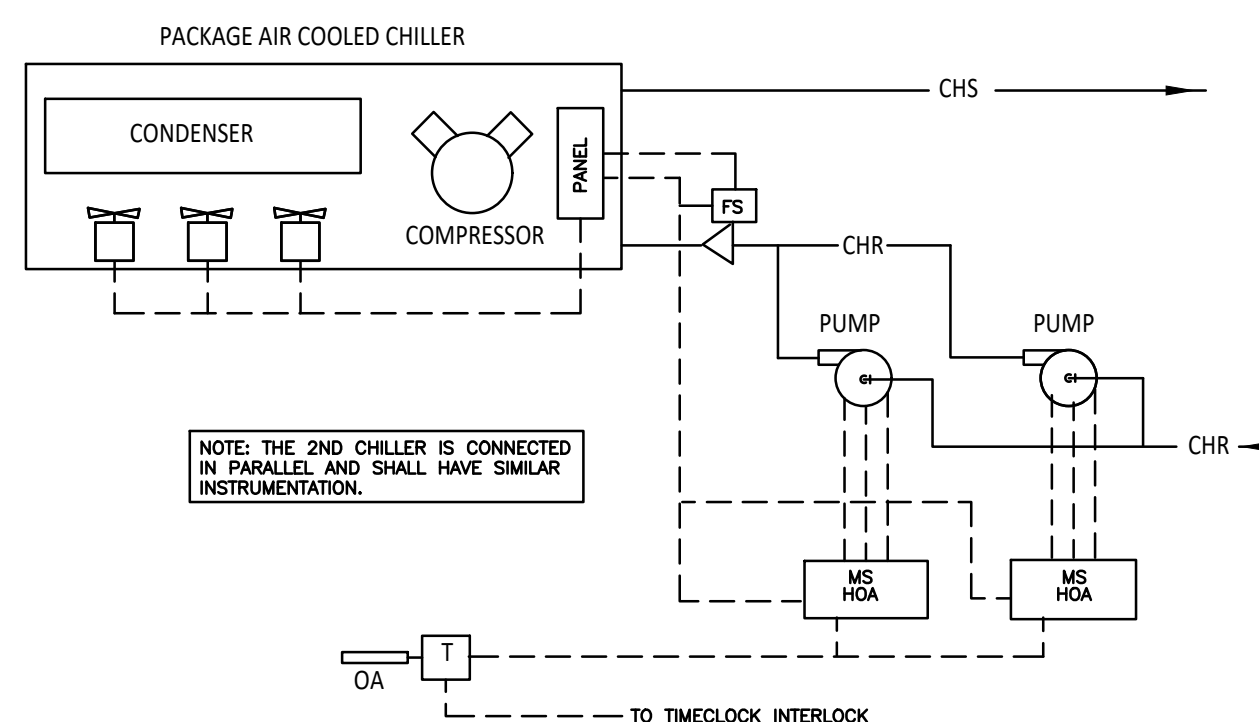
GAS UNIT HEATER



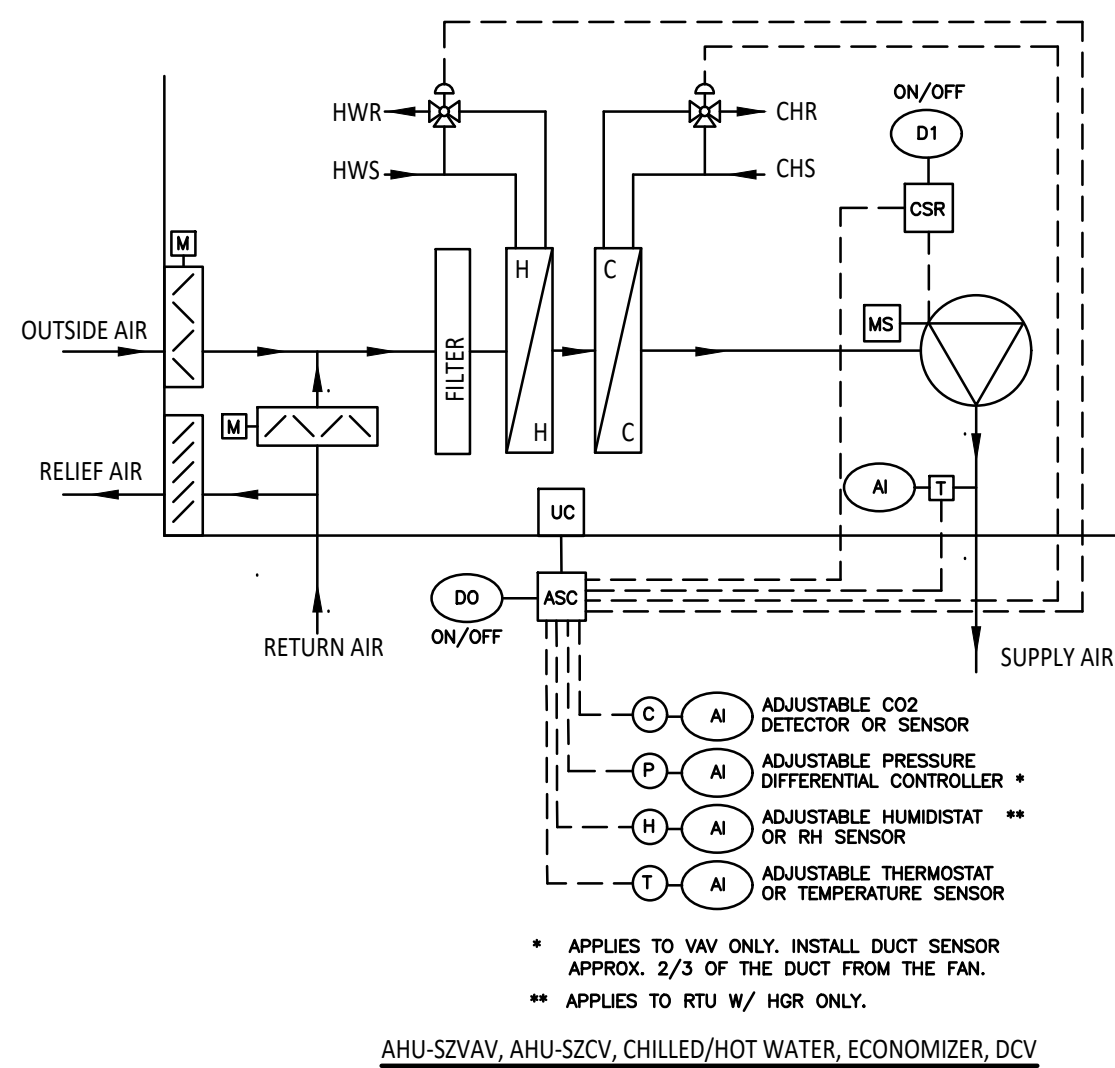
FAN WITH MOTORIZED DAMPER



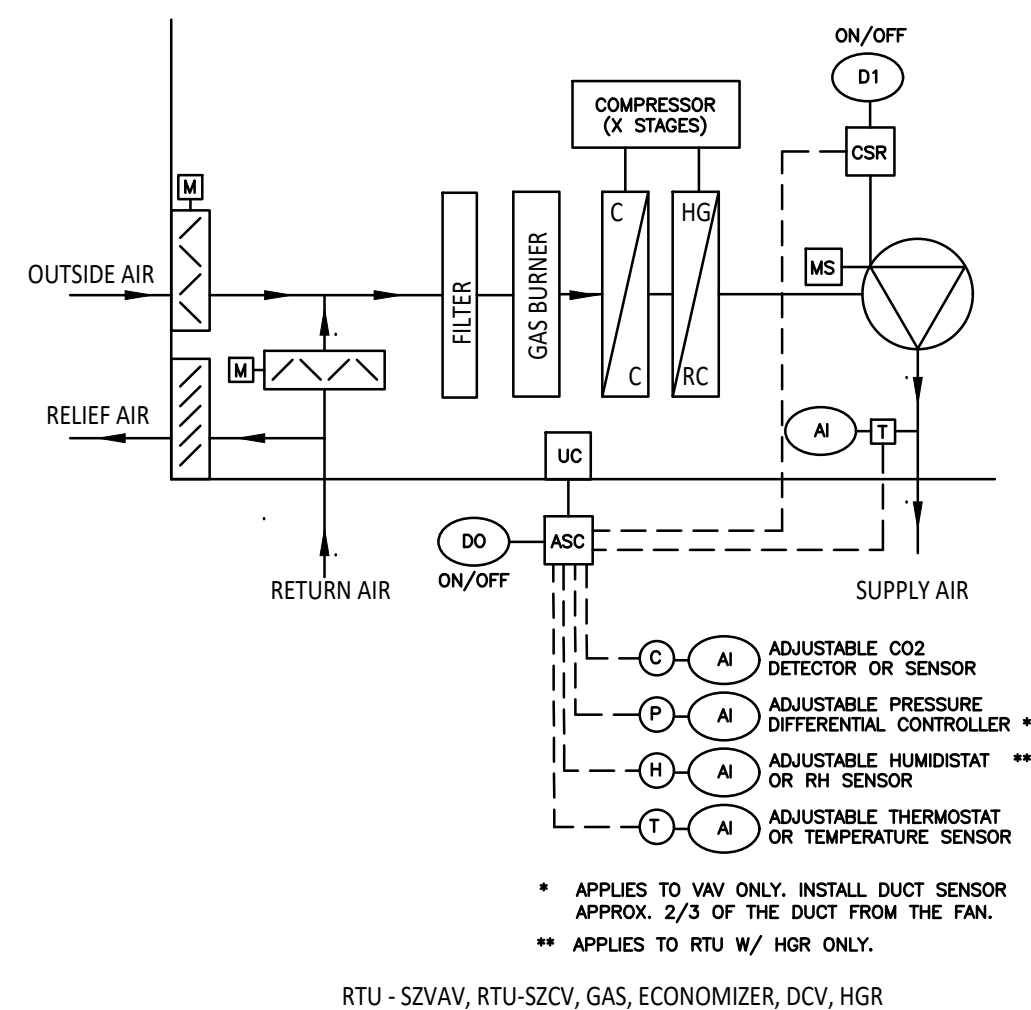
HOT WATER HEATING BOILERS



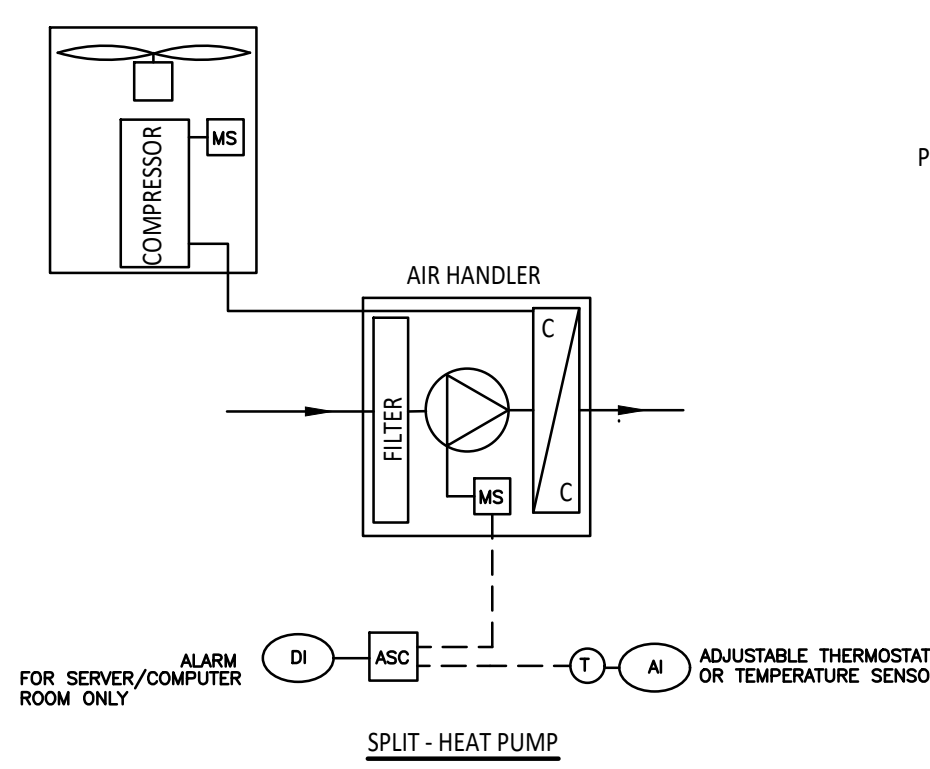
AIR COOLED CHILLERS



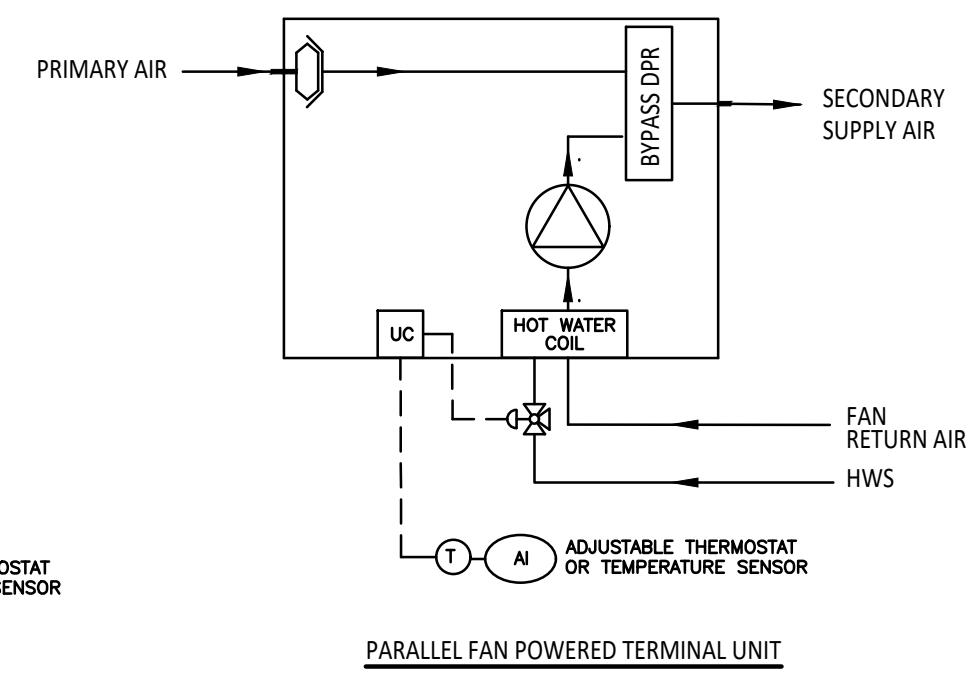
AHU-SZVAV, AHU-SZCV, CHILLED/HOT WATER, ECONOMIZER, DCV



RTU-SZVAV, RTU-SZCV, GAS, ECONOMIZER, DCV, HGR



SPLIT-HEAT PUMP



PARALLEL FAN POWERED TERMINAL UNIT

CONTROL SUMMARY

RTU W/ HUMIDITY CONTROL/DCV/ECONOMIZER
3-5 TONS 2-STEP COMPRESSOR, 2-SPEED FAN,
SZVAV, SZCV, HEAT PUMP
6 TONS AND UP, DUAL COMPRESSOR/CIRCUITS
FAN VFD, MSVAV
BMS INTERFACE
DUCT-FREE SPLIT-DX SYSTEM
STAND-ALONE, BMS
EXHAUST FANS:
RESTROOMS WALL SWITCH W/ PILOT, BMS
TOILET WALL SWITCH W/ PILOT LIGHT
JAN WALL SWITCH W/ PILOT LIGHT
WATER HEATER TSTAT, BMS
MECH ROOM TSTAT, LOUVER, BMS
LOCKER 0-15-MIN TIMER, BMS

INPUT/OUTPUT SUMMARY

1.0 SINGLE ZONE VAV RTU (MULTIPLE CIRCUIT)

POINT NAME	FUNCTION	BI	BO	AI	AO	DEVICE
SUPPLY FAN	START/STOP		X			TERMINAL STRIP
SUPPLY FAN	SPEED			X		TERMINAL STRIP (0-10VDC)
SUPPLY FAN	STATUS	X				CURRENT SENSING RELAY
SUPPLY AIR	TEMPERATURE			X		DUCT TEMPERATURE
SPACE	TEMPERATURE			X		SPACE TEMPERATURE
SPACE	HUMIDITY			X		SPACE HUMIDITY
SPACE	CO2			X		SPACE CO2
DX CLG STG 1	ON/OFF		X			TERMINAL STRIP
DX CLG STG 2	ON/OFF		X			TERMINAL STRIP (AS APPLICABLE)
DX CLG STG 3	ON/OFF		X			TERMINAL STRIP (AS APPLICABLE)
DX CLG STG 4	ON/OFF		X			TERMINAL STRIP (AS APPLICABLE)
COMPRESSOR	SPEED			X		TERMINAL STRIP (1.5-5VDC)
SUCTION	PRESSURE		X			TERMINAL STRIP (0-10VDC)
HTG STG 1	ON/OFF		X			TERMINAL STRIP
HTG STG 2	ON/OFF		X			TERMINAL STRIP
OADAMPER	MODULATE			X		TERMINAL STRIP (0-10VDC)
POWER EXHAUST	START/STOP	X	X			TERMINAL STRIP (AS APPLICABLE)
POWER EXHAUST	STATUS		X			CURRENT SENSING RELAY (AS APPLICABLE)

NOTE:
ABOVE CONTROL POINTS APPLY TO SINGLE ZONE-VAV WITH MULTIPLE COMPRESSOR CIRCUITS. USE THE APPLICABLE POINTS FOR A SINGLE-VAV WITH SINGLE COMPRESSOR CIRCUIT.

INPUT/OUTPUT SUMMARY

3.0 STANDARD RTU

POINT NAME	FUNCTION	BI	BO	AI	AO	DEVICE
SUPPLY FAN	START/STOP		X			TERMINAL STRIP
SUPPLY FAN	SPEED		X			TERMINAL STRIP (0-10VDC)
SUPPLY FAN	STATUS	X			X	CURRENT SENSING RELAY
SUPPLY AIR	TEMPERATURE			X		DUCT TEMPERATURE
SPACE	TEMPERATURE			X		SPACE TEMPERATURE
SPACE	HUMIDITY			X		SPACE HUMIDITY
SPACE	CO2			X		SPACE CO2
DX CLG STG 1	ON/OFF		X			TERMINAL STRIP
DX CLG STG 2	ON/OFF		X			TERMINAL STRIP
HTG STG 1	ON/OFF		X			TERMINAL STRIP
HTG STG 2	ON/OFF		X			TERMINAL STRIP
OA DAMPER	MODULATE			X		TERMINAL STRIP (0-10VDC)
POWER EXHAUST	START/STOP	X	X			TERMINAL STRIP (AS APPLICABLE)
POWER EXHAUST	STATUS		X			CURRENT SENSING RELAY (AS APPLICABLE)

4.0 MISCELLANEOUS POINTS

- EXHAUST FANS: PROVIDE DDC CONTROL AND FAN STATUS (VIA CURRENT SENSING RELAY) ON EXHAUST FANS NOTED TO BE CONTROLLED BY THE BUILDING AUTOMATION SYSTEM.
- OUTSIDE AIR MONITORING: PROVIDE ONE OUTSIDE AIR TEMPERATURE AND RELATIVE HUMIDITY SENSOR.
- OUTSIDE LIGHTING: COORDINATE WITH LIGHTING DRAWINGS FOR THE REQUIRED CONTROL.

INPUT/OUTPUT SUMMARY

RTU Alarms	Name	Alarm Class	Annunciation
Current Sensor - Fan Failure	CV_FAN_ALM	Critical	Graphic/Email
Out of Range Supply Air Temp	CV_TEMP_ALM	General	Graphic
Freeze Stat	CV_FRZ_ALM	Critical	Graphic/Email
Server/Computer/Dimmer Room			
High Temperature Alarm	SCR_HT_ALM	General	Graphic

MECHANICAL LEGEND

SYMBOL	DESCRIPTION
	OPPOSED BLADE DAMPER
	HEATING OR COOLING COIL
	AUTOMATIC TWO-WAY VALVE
	AUTOMATIC THREE-WAY VALVE
	FAN OR PUMP
	BRANCH DUCT CONNECTION W/VOL. DAMPER
	CURRENT SENSING RELAY
	FLOW SWITCH MONITORING
	SMOKE DETECTOR
	TEMPERATURE SENSOR
	THERMOSTAT OR TEMPERATURE SENSOR
	HUMIDISTAT OR HUMIDITY SENSOR
	CO2 SPACE DETECTOR OR SENSOR
	APPLICATION SPEED CONTROLLER
	VARIABLE FREQUENCY DRIVE
	VIBRATION SENSOR
	VAV DAMPER FLOW MOTOR
	DIGITAL INPUT POINT
	DIGITAL OUTPUT POINT
	ANALOG INPUT POINT
	ANALOG OUTPUT POINT
	OPEN PROTOCOL BUS
	MOTOR
	MOTOR STARTER
	ENTHALPY SENSOR
	HIGH PRESSURE SWITCH
	CARBON DIOXIDE DETECTOR
	AIRFLOW MONITORING STATION
	WATER DETECTOR
	HUMIDITY SENSOR (DUCT TYPE)
	UNIT CONTROLLER

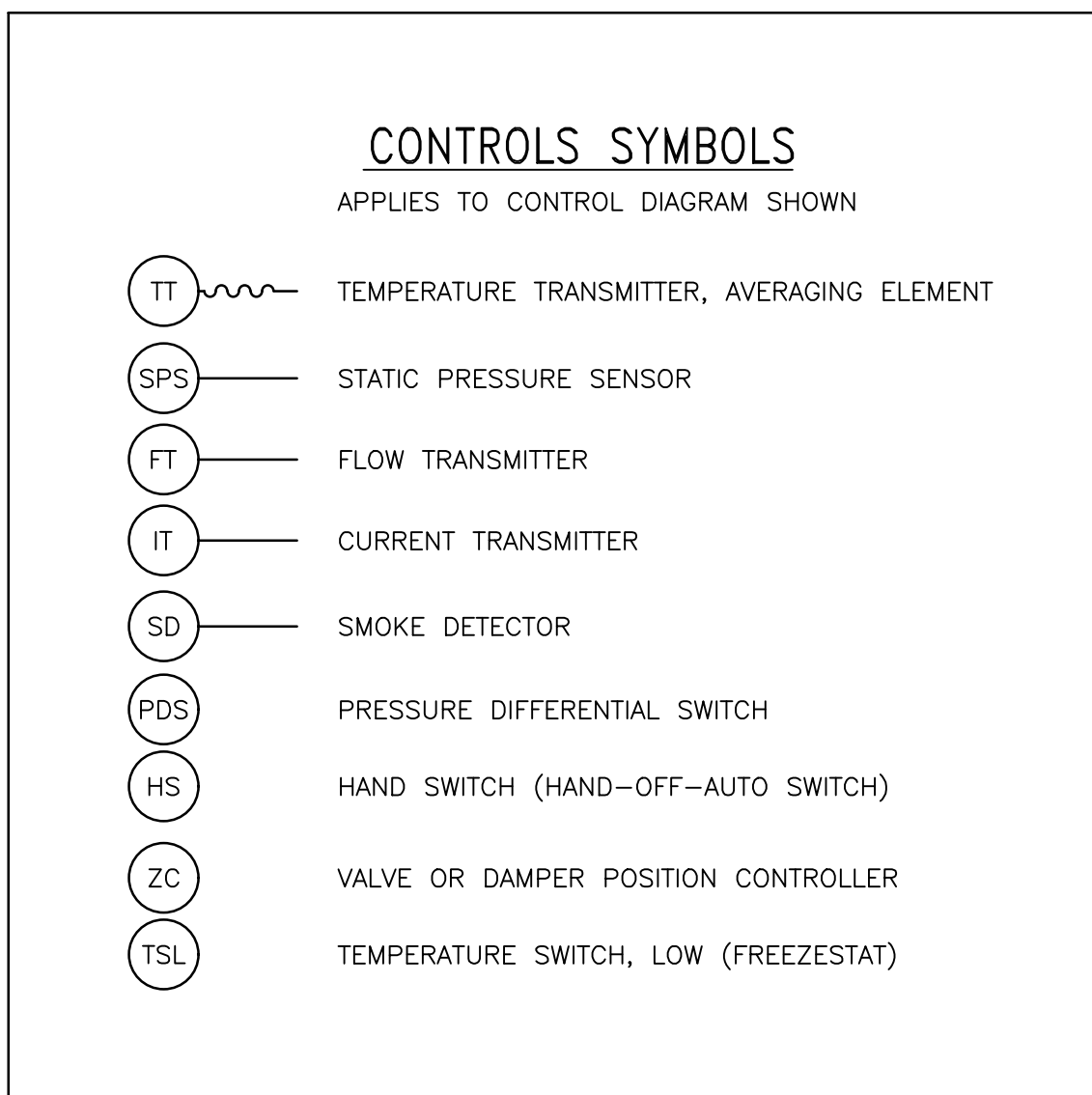
Note:
All symbols may not appear on these drawings.

GENERAL REFER TO M4.0 FOR ADDITIONAL SEQUENCES OF OPERATION FOR AIR HANDLING UNITS, SUCH AS ECONOMIZER, WARM-UP, ETC. CONTROLS



- ### SEQUENCE OF OPERATION FOR CONSTANT AIR VOLUME AIR HANDLING UNIT WITH MINIMUM OUTSIDE AIR

GENERAL REFER TO M4.0 FOR ADDITIONAL SEQUENCES OF OPERATION FOR AIR HANDLING UNITS, SUCH AS ECONOMIZER, WARM-UP, ETC. CONTROLS



THE CONTROL SEQUENCE DESCRIBED HERE IS FOR THE MAIN PURPOSE OF DEFINING THE INSTRUMENTATION OF THE CONTROL DIAGRAM. THE INCLUDED SEQUENCES SHALL BE CONSOLIDATED WITH THE SEQUENCES DESCRIBED ON SHT M4.0. ANY DISCREPANCY BETWEEN THESE TWO (2) DRAWINGS SHALL BE BROUGHT TO THE ATTENTION OF THE A/E FOR PROPER DISPOSITION.

- ## 1 CONTROL DIAGRAMS - AIR HANDLING UNITS

NOT TO SCALE

DATE:	MARCH 27, 2024
DRAWN BY	HS
CHECKED BY	HS, TB
BRW PROJECT NO.	222109.00
USPS PROJECT NO.	K72311

M4.2