

- LEGEND**
- |                                    |   |                            |
|------------------------------------|---|----------------------------|
| (T) SPACE TEMPERATURE SENSOR       | (CT) CURRENT TRANSFORMER                          | — CAPPED LINE              |
| (P) SPACE PRESSURE SENSOR          | (M) MANOMETER                                     | ⊖ PUMP                     |
| (H) SPACE HUMIDITY SENSOR          | (VFD) VARIABLE FREQUENCY DRIVE                    | → FLOW DIRECTION INDICATOR |
| (DP) DIFFERENTIAL PRESSURE SENSOR  | (C) CONTACTOR/STARTER                             | ⊕ MULTI VALVE              |
| (H) HUMIDITY SENSOR                | (MCC) MOTOR CONTROL CENTER                        | ⊗ 3-WAY VALVE              |
| (T) TEMPERATURE SENSOR             | (SD) SMOKE DETECTOR                               | ⊗ 2-WAY VALVE              |
| (LL) TEMPERATURE LOW LIMIT SENSOR  | (F) FLOW SENSOR (WATER OR AIR)                    |                            |
| (FL) FLUID LEVEL SENSOR            | (P) DUCT PRESSURE SENSOR                          |                            |
| (AQ) AIR QUALITY SENSOR            | (CO2) CO2 SENSOR @ 48" AFF UNLESS NOTED OTHERWISE |                            |
| (OS) OCCUPANCY SENSOR (SEE DIV 26) | (FS) FLOW SWITCH                                  |                            |

**EQUIPMENT ABBREVIATIONS:**

- P - PUMP  
 SP - SUMP PUMP  
 BP - BOOSTER PUMP  
 HWP - HEATING WATER PUMP  
 CHP - CHILLED WATER PUMP  
 CWP - CONDENSING WATER PUMP  
 CSP - COOLING TOWER SUMP PUMP  
 HWRP - DOMESTIC HOT WATER RECIRCULATION  
 VFD - VARIABLE FREQUENCY DRIVE  
 CT - CONTACTOR  
 CC - CONTROL COMPRESSOR  
 CH - CHILLER  
 B - BOILER  
 EF - EXHAUST FAN  
 RF - RETURN/RELIEF FAN  
 AH - AIR HANDLER  
 VAV - VARIABLE AIR VOLUME DAMPER BOX  
 AD - AREA DAMPER  
 SD - SMOKE DAMPER  
 SFD - FIRE SMOKE COMBINATION DAMPER  
 H - HUMIDIFIER  
 V - VALVE  
 WH - WATER HEATER  
 BAS - BUILDING AUTOMATION SYSTEM

**PLUMBING ABBREVIATIONS:**

- HWS - HEATING WATER SUPPLY  
 HWR - HEATING WATER RETURN  
 HW - DOMESTIC HOT WATER  
 CW - DOMESTIC COLD WATER  
 GPM - GALLONS PER MINUTE  
 DB - DOUBLE VALVE OPERATOR
- OSA - OUTSIDE AIR  
 RA - RETURN AIR  
 SA - SUPPLY AIR  
 EXH - EXHAUSTED AIR

**CO2-ALARM SEQUENCE**

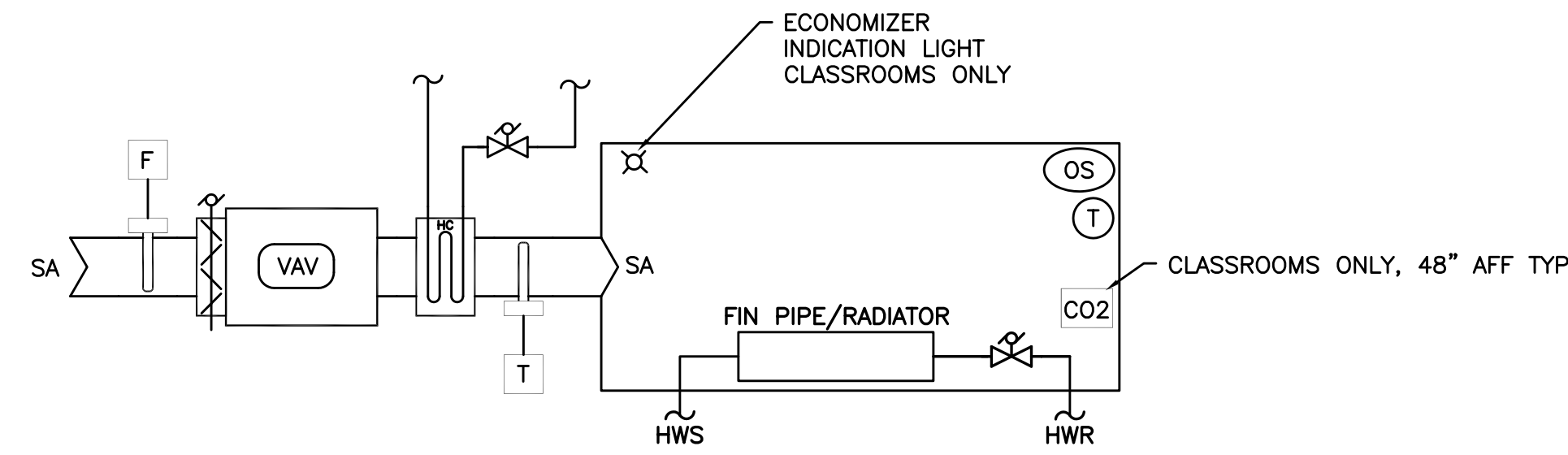
**SPACED BASED CO2/VENTILATION ALARMS**

A LEVEL 4 ALARM MESSAGE SHOULD BE SENT IF: CO2 LEVELS RISE ABOVE THE ALARM SETPOINTS (900 PPM) BY 10%.

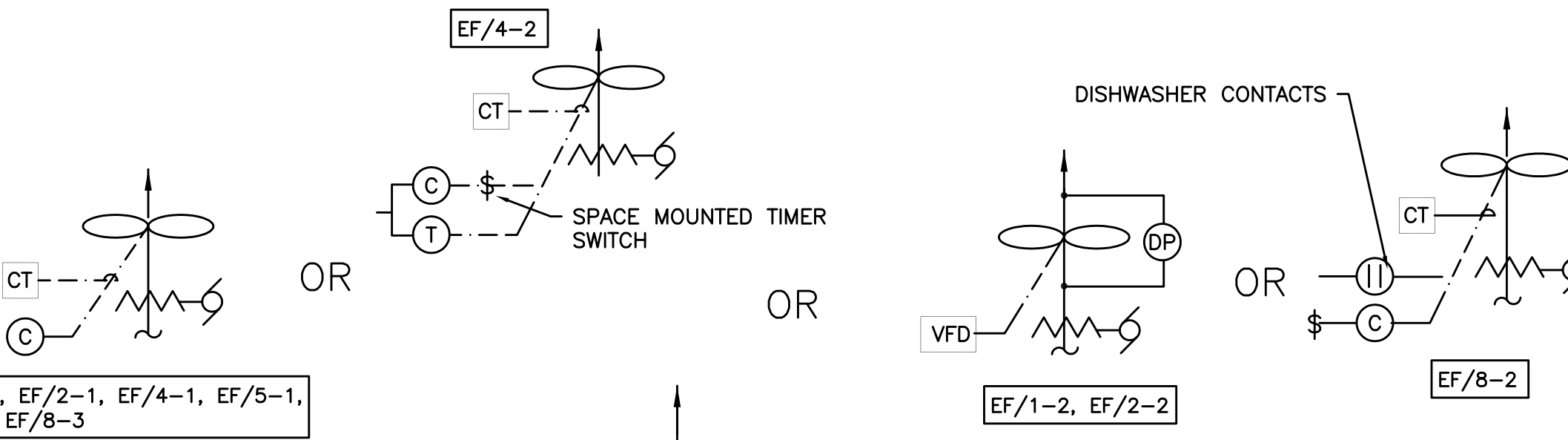
LEVEL 4 ALARM MESSAGE IS 'CO2 LEVELS HAVE EXCEEDED OPERATIONAL LIMITS BY 10%. CHECK DEVICE AND OUTSIDE AIR DAMPER OPERATION'

**UNIT BASED CO2/VENTILATION ALARMS**

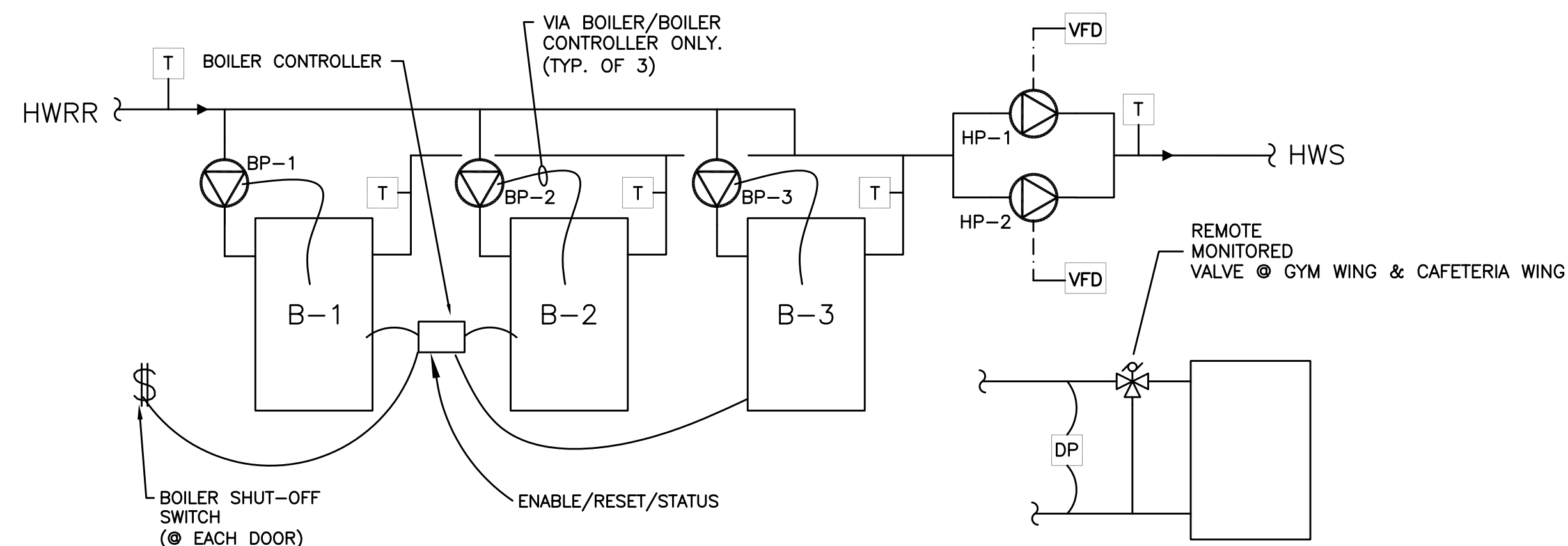
WHEN OUTSIDE AIR MEASURING STATION AND SUPPLY SIDE CO2 SENSOR (USING DDC SYSTEM TO CALCULATE OCCUPANCY LEVELS AND CORRESPONDING VENTILATION REQUIREMENTS) SHOW THAT VENTILATION RATES ARE 10% OR MORE BELOW THE REQUIRED CALCULATED VALUE, THE DDC SYSTEM SHALL ACTIVATE A LEVEL 4 ALARM AT THE OPERATORS WORK STATION.



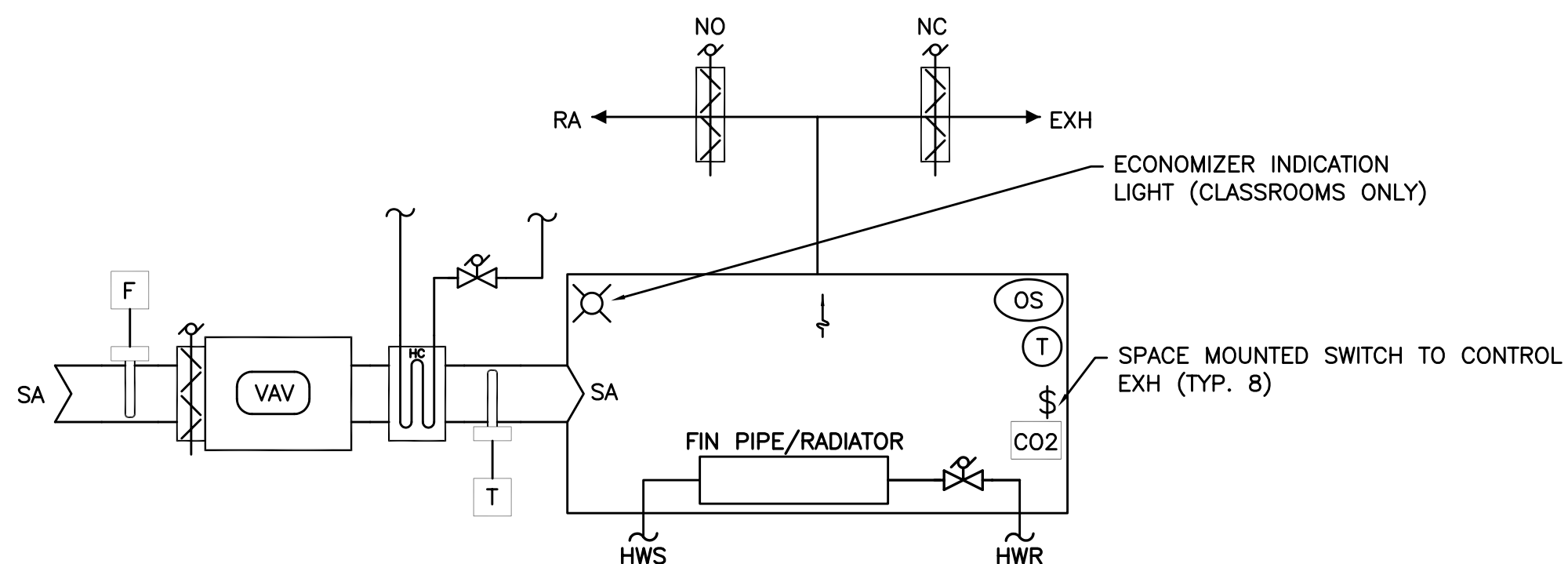
**4 STANDARD VAV BOX W/RH & RAD CONTROL DIAGRAM**  
 SCALE: SCHEMATIC



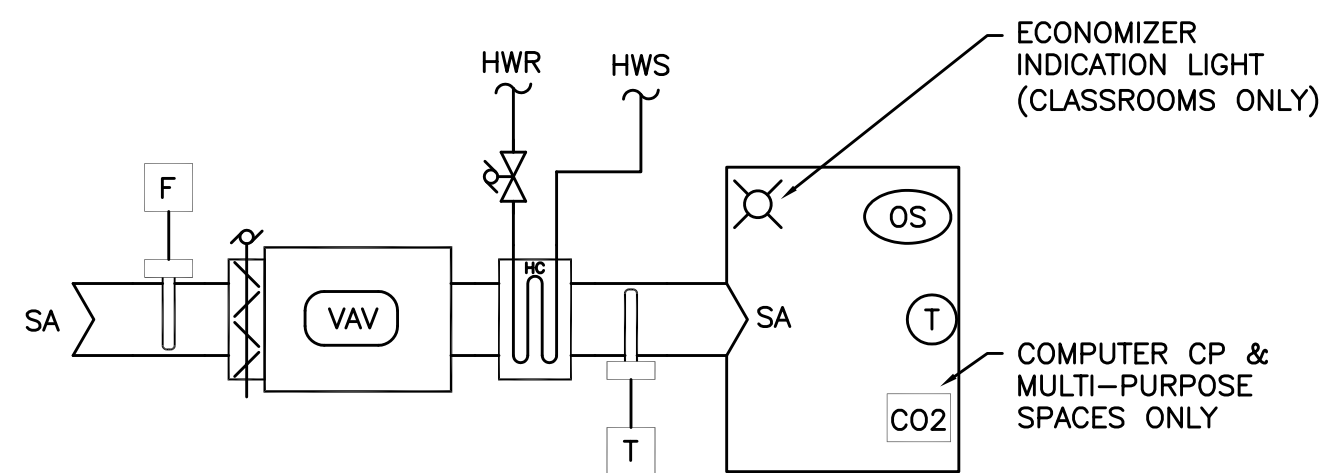
**5 EXHAUST FAN**  
 SCALE: DETAIL



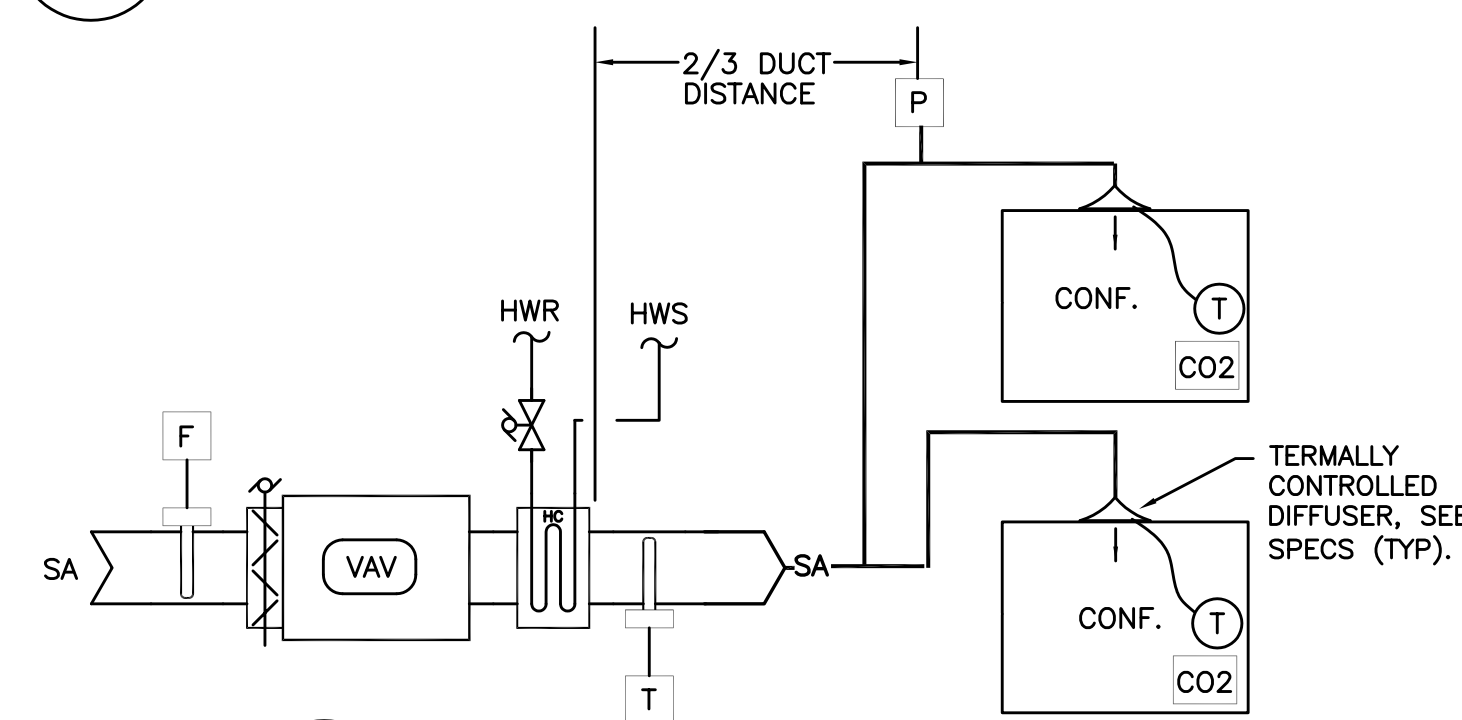
**1 BOILER SYSTEM CONTROL DIAGRAM**  
 SCALE: SCHEMATIC



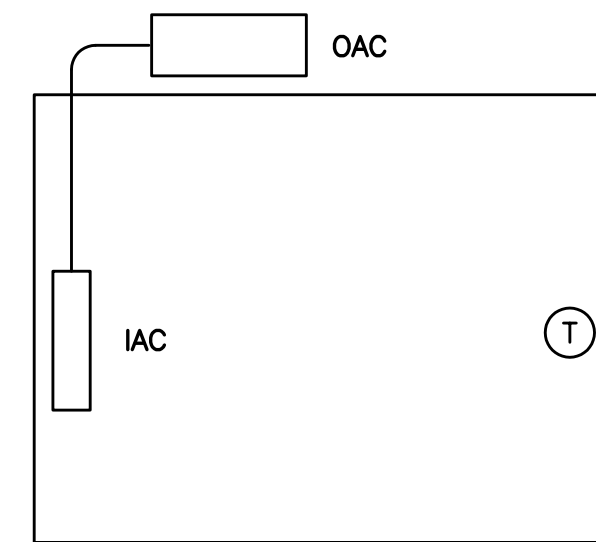
**2 SCIENCE CLASSROOMS ONLY- STANDARD VAV BOX W/RH & RAD CONTROL DIAGRAM**  
 SCALE: SCHEMATIC



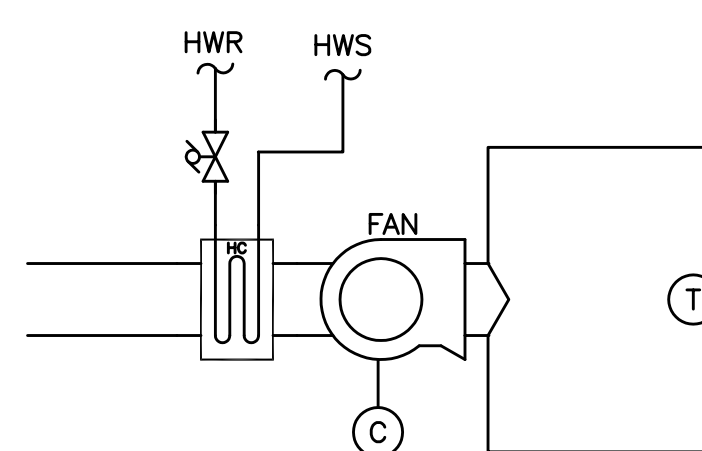
**3 STANDARD VAV BOX W/RH CONTROL DIAGRAM**  
 SCALE: SCHEMATIC



**8 VAV 3.5**  
 SCALE: SCHEMATIC



**6 DUCTLESS SPLIT CONTROL DIAGRAM**  
 SCALE: DETAIL



**7 CONVECTOR**  
 SCALE: SCHEMATIC

**GENERAL CONTROLS**

| POINT DESCRIPTION                         | INPUT   |        | OUTPUT  |        | ALARM |
|---|---------|--------|---------|--------|-------|
|   | DIGITAL | ANALOG | DIGITAL | ANALOG |       |
| FIRE ALARM PANEL                          | X       |        |         |        | X     |
| OUTSIDE AIR TEMPERATURE                   |         | X      |         |        |       |
| OUTSIDE AIR HUMIDITY                      |         | X      |         |        |       |
| OUTSIDE AIR PRESSURE                      |         | X      |         |        |       |
| DOM. HW RECIRC PUMP START/STOP (TYP OF 2) |         |        | X       |        |       |
| LIGHT CONTROL RELAY (TYP. 24)             |         |        | X       |        |       |
| ELEVATOR SUMP PUMP                        |         |        |         |        | X     |
| SPACE PRESSURE DP (TYP. 7)                |         | X      |         |        |       |

**CONTROLS FOR BOILER SYSTEM, SEE 1/M5.00**

| POINT DESCRIPTION                           | INPUT   |        | OUTPUT  |        | ALARM |
|---|---------|--------|---------|--------|-------|
|   | DIGITAL | ANALOG | DIGITAL | ANALOG |       |
| HTG SYS ENABLE*                             |         |        |         |        |       |
| HWS RESET*                                  |         |        | X       |        |       |
| HTG SYS ALARM/FAULT*                        | X       |        |         |        | X     |
| HW PUMP COMMAND VFD (TYP OF 2)              |         |        | X       |        |       |
| HW PUMP STATUS VFD (TYP OF 2)               |         | X      |         |        | X     |
| HW PUMP SPEED VFD (TYP OF 2)                |         |        |         | X      |       |
| BOILER SUPPLY WATER TEMPERATURE (TYP. OF 2) |         | X      |         |        |       |
| SYSTEM SUPPLY WATER TEMPERATURE             |         | X      |         |        |       |
| SYSTEM RETURN WATER TEMPERATURE             |         | X      |         |        |       |
| SYSTEM DIFFERENTIAL PRESSURE (TYP. 2)       |         | X      |         |        |       |
| BOILER SHUT-OFF SWITCH (TYP. OF 2)          | X       |        |         |        | X     |

**CONTROLS FOR VAV TERMINAL UNIT (SCIENCE CR), SEE 2/M5.00**

| POINT DESCRIPTION                  | INPUT   |        | OUTPUT  |        | ALARM |
|------------------------------------|---------|--------|---------|--------|-------|
|                                    | DIGITAL | ANALOG | DIGITAL | ANALOG |       |
| SPACE TEMP                         |         | X      |         |        |       |
| AIR FLOW                           |         | X      |         |        |       |
| DAMPER POSITION                    |         |        |         | X      |       |
| HEATING VALVE                      |         |        |         | X      |       |
| FIN PIPE OR RADIATOR HEATING VALVE |         |        |         | X      |       |
| DISCHARGE TEMPERATURE              |         | X      |         |        |       |
| CO2 LEVEL **                       | X       |        |         |        | X     |
| OCC SENSOR *                       | X       |        |         |        |       |
| RA/EXH DAMPERS (2) (TYP. 8)        | X       |        | X       |        |       |
| EXH/RA SWITCH                      | X       |        |         |        |       |
| ECONOMIZER LIGHT                   |         |        | X       |        |       |

**CONTROLS FOR VAV TERMINAL UNIT, SEE 3/M5.00**

| POINT DESCRIPTION                  | INPUT   |        | OUTPUT  |        | ALARM |
|------------------------------------|---------|--------|---------|--------|-------|
|                                    | DIGITAL | ANALOG | DIGITAL | ANALOG |       |
| SPACE TEMP                         |         | X      |         |        |       |
| AIR FLOW                           |         | X      |         |        |       |
| DAMPER POSITION                    |         |        |         | X      |       |
| HEATING VALVE                      |         |        |         | X      |       |
| FIN PIPE OR RADIATOR HEATING VALVE |         |        |         | X      |       |
| DISCHARGE TEMPERATURE              |         | X      |         |        |       |
| CO2 LEVEL **                       | X       |        |         |        | X     |
| OCC SENSOR *                       | X       |        |         |        |       |
| ECONOMIZER OPERATION INDICATOR     |         |        | X       |        |       |

**CTRLS FOR VAV TERM UNIT W/ RAD, SEE 4/M5.00**

| POINT DESCRIPTION                  | INPUT   |        | OUTPUT  |        | ALARM |
|------------------------------------|---------|--------|---------|--------|-------|
|                                    | DIGITAL | ANALOG | DIGITAL | ANALOG |       |
| SPACE TEMP                         |         | X      |         |        |       |
| AIR FLOW                           |         | X      |         |        |       |
| DAMPER POSITION                    |         |        |         | X      |       |
| HEATING VALVE                      |         |        |         | X      |       |
| FIN PIPE OR RADIATOR HEATING VALVE |         |        |         | X      |       |
| DISCHARGE TEMPERATURE              |         | X      |         |        |       |
| CO2 LEVEL **                       | X       |        |         |        | X     |
| OCC SENSOR *                       | X       |        |         |        |       |
| ECONOMIZER OPERATION INDICATOR     |         |        | X       |        |       |

**CONTROLS FOR EXHAUST FANS, SEE 5/M5.00**

| POINT DESCRIPTION           | INPUT   |        | OUTPUT  |        | ALARM |
|-----------------------------|---------|--------|---------|--------|-------|
|                             | DIGITAL | ANALOG | DIGITAL | ANALOG |       |
| SWITCH ENABLE               | X       |        |         |        |       |
| FAN MOTOR STATUS *          | X       |        |         |        | X     |
| START/STOP TYP OF ALL       |         |        | X       |        |       |
| SPACE TEMP                  |         | X      |         |        |       |
| DAMPER POSITION             | X       |        |         | X      |       |
| FAN SPEED (ECM OR VFD FANS) |         |        |         | X      |       |

**CONTROLS FOR DUCTLESS SPLIT, SEE 6/M5.00**

| POINT DESCRIPTION | INPUT   |        | OUTPUT  |        | ALARM |
|-------------------|---------|--------|---------|--------|-------|
|                   | DIGITAL | ANALOG | DIGITAL | ANALOG |       |
| SPACE TEMP        |         | X      |         |        | X     |

**CONTROLS FOR CONVECTOR, SEE 7/M5.00**

| POINT DESCRIPTION | INPUT   |        | OUTPUT  |        | ALARM |
|-------------------|---------|--------|---------|--------|-------|
|                   | DIGITAL | ANALOG | DIGITAL | ANALOG |       |
| SPACE TEMP        |         | X      |         |        |       |
| FAN S/S           |         |        | X       |        |       |
| HW VALVE          |         |        |         | X      |       |

**CONTROLS FOR VAV TERMINAL UNIT, SEE 8/M5.00**

| POINT DESCRIPTION     | INPUT   |        | OUTPUT  |        | ALARM |
|-----------------------|---------|--------|---------|--------|-------|
|                       | DIGITAL | ANALOG | DIGITAL | ANALOG |       |
| SPACE TEMP (2)        |         | X      |         |        |       |
| AIR FLOW              |         | X      |         |        |       |
| DAMPER POSITION       |         |        |         | X      |       |
| HEATING VALVE         |         |        |         | X      |       |
| DISCHARGE TEMPERATURE |         | X      |         |        |       |
| CO2 LEVEL * (2)       | X       |        |         |        | X     |
| DUCT PRESSURE         |         | X      |         |        |       |

\* - BACNET INTEGRATION

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**RECORD DRAWINGS**

key plan

phase | RECORD DRAWING

date | 11/09/2015

revisions |

project # | 11082

MECHANICAL CONTROLS

**M5.00**

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