

**RUN CONDITIONS:**

UNIT SHALL OPERATE AS FOLLOWS:

- 1. ONE (1) DRYER - UNIT SHALL BE OFF
- 2. TWO (2) DRYERS - UNIT SHALL OPERATE AT 2500 CFM.
- 3. THREE (3) DRYERS - UNIT SHALL OPERATE AT FULL DESIGN CFM.

CONTACTS SHOULD BE PROVIDED FROM THE DRYERS TO A CONTROLLER TO MONITOR QUANTITY OF DRYERS IN OPERATION.

ALARMS SHALL BE PROVIDED AS FOLLOWS:

- 1. SUPPLY FAN FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
- 2. SUPPLY FAN IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.

**HEATING - GAS:**

GAS HEAT SHALL BE PROVIDED WHEN THE TEMPERATURE IS BELOW 55-DEG F AND MAINTAIN A DISCHARGE AIR TEMPERATURE OF 60-DEG F.

**MONITORING:**

INTERFACE WITH MANUFACTURER PROVIDED CONTROLLER.

**5 LAUNDRY MAKE-UP AIR UNIT (MAU-1) CONTROL SEQUENCE**

M-700 / SCALE: N.T.S.

**1) DIGITAL THERMOSTATIC MASTER MIXING VALVE (TMV-1):**

MONITOR ALL POINTS AVAILABLE FROM DIGITAL MIXING VALVE.

**2) THERMOSTATIC MIXING VALVE (TMV-2, 3, & 4):**

MONITOR THE TEMPERATURE DOWNSTREAM OF EACH THERMOSTATIC MIXING VALVE.

**3) EMERGENCY EYEWASH/SHOWER ALARMS:**

MONITOR THE ALARMS FOR EACH EMERGENCY EYEWASH/SHOWER.

**4) EMERGENCY GENERATOR STATUS:**

MONITOR THE ON/OFF STATUS FOR THE GENERATOR.

**5) SUMP PUMP AND SEWAGE PUMP MONITORS:**

MONITOR THE ALARMS FOR THE SUMP PUMP AND SEWAGE PUMPS.

**6) DOMESTIC HOT WATER HEATERS:**

INTERFACE WITH THE DOMESTIC HOT WATER HEATER CONTROLLER FOR MONITORING.

**7) PACKAGED ROOFTOP UNITS:**

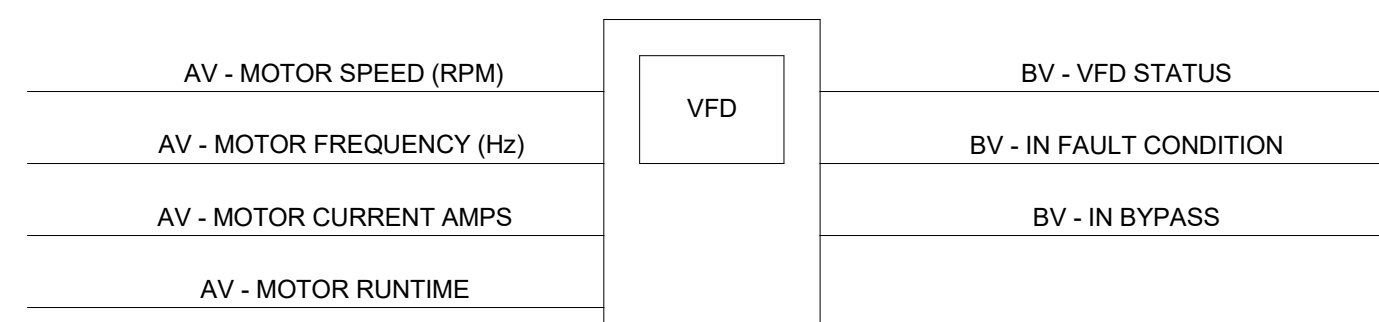
INTERFACE WITH MANUFACTURER PROVIDED CONTROLS FOR MONITORING.

**8) DEDICATED OUTDOOR AIR UNITS:**

INTERFACE WITH MANUFACTURER PROVIDED CONTROLS FOR MONITORING.

**4 MISCELLANEOUS MONITORING POINTS**

M-700 / SCALE: N.T.S.



**1) VARIABLE FREQUENCY DRIVE (VFD) INTERFACE MONITOR:**  
CURRENT VFD STATUS AND OPERATING CONDITIONS SHALL BE MONITORED THROUGH ITS COMMUNICATIONS INTERFACE PORT. THE INTERFACE SHALL MONITOR AND TREND THE POINTS.

**NOTE:**

THIS VFD INTERFACE SCHEMATIC MAY NOT REFLECT THE ACTUAL SENSORS AND POINTS AS SUPPLIED BY THE VFD MANUFACTURER. ALL INTERFACE POINTS SHALL BE COORDINATED WITH THE VFD SUPPLIER.

**3 VARIABLE FREQUENCY DRIVE CONTROLS SCHEMATIC**

M-700 / SCALE: N.T.S.

**1 AIR HANDLING UNIT CONTROL SCHEMATIC (AHU-1)**

M-700 / SCALE: N.T.S.

**1) RUN CONDITIONS - CONTINUOUS:**

THE UNIT SHALL RUN CONTINUOUSLY.

**2) EMERGENCY SHUTDOWN:**

THE UNIT SHALL SHUT DOWN AND GENERATE AN ALARM UPON RECEIVING AN EMERGENCY SHUTDOWN SIGNAL.

**3) FREEZE PROTECTION:**

THE UNIT SHALL SHUT DOWN AND GENERATE AN ALARM UPON RECEIVING A FREEZESTAT SHUTDOWN SIGNAL.

**4) HIGH STATIC SHUTDOWN:**

THE UNIT SHALL SHUT DOWN AND GENERATE AN ALARM UPON RECEIVING A HIGH STATIC SHUTDOWN SIGNAL.

**5) RETURN AIR SMOKE DETECTION:**

THE UNIT SHALL SHUT DOWN AND GENERATE AN ALARM UPON RECEIVING A RETURN AIR SMOKE DETECTOR STATUS.

**6) SUPPLY FAN:**

THE SUPPLY FAN SHALL RUN ANYTIME THE UNIT IS COMMANDED TO RUN, UNLESS SHUTDOWN ON SAFETIES. TO PREVENT SHORT CYCLING, THE SUPPLY FAN SHALL HAVE A USER DEFINABLE (ADJ.) MINIMUM RUNTIME.

**A) ALARMS SHALL BE PROVIDED AS FOLLOWS:**

- I) SUPPLY FAN FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
- II) SUPPLY FAN IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.

**7) SUPPLY AIR DUCT STATIC PRESSURE CONTROL:**

THE CONTROLLER SHALL MEASURE DUCT STATIC PRESSURE AND MODULATE THE SUPPLY FAN VFD SPEED TO MAINTAIN A DUCT STATIC PRESSURE SETPOINT. THE SPEED SHALL NOT DROP BELOW 30% (ADJ.). THE STATIC PRESSURE SETPOINT SHALL BE RESET BASED UPON THE POSITION OF THE ZONE DAMPERS, WITH A GOAL OF REDUCING THE STATIC PRESSURE UNTIL AT LEAST ONE ZONE DAMPER IS NEARLY WIDE OPEN.

THE INITIAL DUCT STATIC PRESSURE SETPOINT SHALL BE 1.5IN H2O (ADJ.).

IF NO ZONE DAMPER IS NEARLY WIDE OPEN, THE SETPOINT SHALL INCREMENTALLY RESET DOWN TO A MINIMUM OF 1.3IN H2O (ADJ.).

AS ONE OR MORE DAMPERS NEARS THE WIDE OPEN POSITION, THE SETPOINT SHALL INCREMENTALLY RESET UP TO A MAXIMUM OF 1.8IN H2O (ADJ.).

**A) ALARMS SHALL BE PROVIDED AS FOLLOWS:**

- I) HIGH SUPPLY AIR STATIC PRESSURE: IF THE SUPPLY AIR STATIC PRESSURE IS 25% (ADJ.) GREATER THAN SETPOINT.
- II) LOW SUPPLY AIR STATIC PRESSURE: IF THE SUPPLY AIR STATIC PRESSURE IS 25% (ADJ.) LESS THAN SETPOINT.
- III) SUPPLY FAN VFD FAULT.

**8) RETURN FAN:**

THE RETURN FAN SHALL RUN WHENEVER THE SUPPLY FAN RUNS.

**A) ALARMS SHALL BE PROVIDED AS FOLLOWS:**

- I) RETURN FAN FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
- II) RETURN FAN IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.
- III) RETURN FAN VFD FAULT.

**9) BUILDING STATIC PRESSURE CONTROL:**

THE CONTROLLER SHALL MEASURE BUILDING STATIC PRESSURE AND MODULATE THE RETURN FAN VFD SPEED TO MAINTAIN A BUILDING STATIC PRESSURE SETPOINT OF 0.05IN H2O RELATIVE TO OUTDOORS (ADJ.). THE RETURN FAN VFD SPEED SHALL NOT DROP BELOW 20% (ADJ.).

**A) ALARMS SHALL BE PROVIDED AS FOLLOWS:**

- I) HIGH BUILDING STATIC PRESSURE: IF THE BUILDING AIR STATIC PRESSURE IS 25% (ADJ.) GREATER THAN SETPOINT.
- II) LOW BUILDING STATIC PRESSURE: IF THE BUILDING AIR STATIC PRESSURE IS 25% (ADJ.) LESS THAN SETPOINT.

**10) SUPPLY AIR TEMPERATURE SETPOINT - OPTIMIZED:**

THE CONTROLLER SHALL MONITOR THE SUPPLY AIR TEMPERATURE AND SHALL MAINTAIN A SUPPLY AIR TEMPERATURE SETPOINT RESET BASED ON ZONE COOLING AND HEATING REQUIREMENTS.

THE SUPPLY AIR TEMPERATURE SETPOINT SHALL BE RESET FOR COOLING BASED ON ZONE COOLING REQUIREMENTS AS FOLLOWS:

- I) THE INITIAL SUPPLY AIR TEMPERATURE SETPOINT SHALL BE 55°F (ADJ.).
- II) AS COOLING DEMAND INCREASES, THE SETPOINT SHALL INCREMENTALLY RESET DOWN TO A MINIMUM OF 53°F (ADJ.).
- III) AS COOLING DEMAND DECREASES, THE SETPOINT SHALL INCREMENTALLY RESET UP TO A MAXIMUM OF 63°F (ADJ.).

THE SUPPLY AIR TEMPERATURE SETPOINT FOR HEATING SHALL BE 55°F.

**11) COOLING COIL VALVE:**

THE CONTROLLER SHALL MEASURE THE SUPPLY AIR TEMPERATURE AND MODULATE THE COOLING COIL VALVE TO MAINTAIN ITS COOLING SETPOINT.

**A) THE COOLING SHALL BE ENABLED WHENEVER:**

- I) OUTSIDE AIR TEMPERATURE IS GREATER THAN 60°F (ADJ.).
- II) AND THE ECONOMIZER IS DISABLED OR FULLY OPEN.
- III) AND THE SUPPLY FAN STATUS IS ON.
- IV) AND THE HEATING IS NOT ACTIVE.

**B) THE COOLING COIL VALVE SHALL OPEN TO 100% (ADJ.) WHENEVER THE FREEZESTAT IS ON.**

**C) ALARMS SHALL BE PROVIDED AS FOLLOWS:**

- I) HIGH SUPPLY AIR TEMP: IF THE SUPPLY AIR TEMPERATURE IS 5°F (ADJ.) GREATER THAN SETPOINT.
- II) LOW SUPPLY AIR TEMP: IF THE SUPPLY AIR TEMPERATURE IS 5°F (ADJ.) LESS THAN SETPOINT.

**12) HEATING COIL VALVE:**

THE CONTROLLER SHALL MEASURE THE SUPPLY AIR TEMPERATURE AND MODULATE THE HEATING COIL VALVE TO MAINTAIN A DISCHARGE AIR TEMPERATURE OF 55°F.

**A) THE HEATING SHALL BE ENABLED WHENEVER:**

- I) OUTSIDE AIR TEMPERATURE IS LESS THAN 65°F (ADJ.).
- II) AND THE SUPPLY FAN STATUS IS ON.
- III) AND THE COOLING IS NOT ACTIVE.

**B) THE HEATING COIL VALVE SHALL OPEN WHENEVER:**

- I) SUPPLY AIR TEMPERATURE DROPS FROM 40°F TO 35°F (ADJ.).
- II) OR THE FREEZESTAT IS ON.

**C) ALARMS SHALL BE PROVIDED AS FOLLOWS:**

- I) LOW SUPPLY AIR TEMP: IF THE SUPPLY AIR TEMPERATURE IS 5°F (ADJ.) LESS THAN SETPOINT.
- II) HIGH SUPPLY AIR TEMP: IF THE SUPPLY AIR TEMPERATURE IS GREATER THAN 120°F (ADJ.).
- III) LOW SUPPLY AIR TEMP: IF THE SUPPLY AIR TEMPERATURE IS LESS THAN 45°F (ADJ.).

**13) ECONOMIZER:**

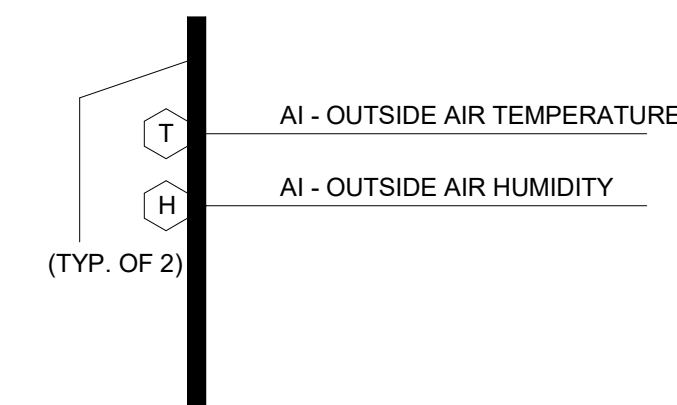
THE CONTROLLER SHALL MEASURE THE MIXED AIR TEMPERATURE AND MODULATE THE ECONOMIZER DAMPERS IN SEQUENCE TO MAINTAIN A SETPOINT 2°F (ADJ.) LESS THAN THE SUPPLY AIR TEMPERATURE SETPOINT. THE OUTSIDE AIR DAMPERS SHALL MAINTAIN A MINIMUM ADJUSTABLE POSITION OF 20% (ADJ.) OPEN CONTINUOUSLY.

**A) THE ECONOMIZER SHALL BE ENABLED WHENEVER:**

- I) OUTSIDE AIR TEMPERATURE IS LESS THAN 65°F (ADJ.).
- II) AND THE OUTSIDE AIR TEMPERATURE IS LESS THAN THE RETURN AIR TEMPERATURE.
- III) AND THE SUPPLY FAN STATUS IS ON.
- IV) THE ECONOMIZER SHALL CLOSE WHENEVER:

**B) THE ECONOMIZER SHALL CLOSE WHENEVER:**

- I) MIXED AIR TEMPERATURE DROPS FROM 40°F TO 35°F (ADJ.).
- II) OR THE FREEZESTAT IS ON.
- III) OR ON LOSS OF SUPPLY FAN STATUS.
- IV) THE OUTSIDE AND EXHAUST AIR DAMPERS SHALL CLOSE AND THE RETURN AIR DAMPER SHALL OPEN WHEN THE UNIT IS OFF.



**1) OUTSIDE AIR CONDITIONS:**

THE CONTROLLER SHALL MONITOR THE OUTSIDE AIR TEMPERATURE AND HUMIDITY AND CALCULATE THE OUTSIDE AIR ENTHALPY ON A CONTINUAL BASIS. THESE VALUES SHALL BE MADE AVAILABLE TO THE SYSTEM AT ALL TIMES.

**A) ALARM SHALL BE GENERATED AS FOLLOWS:**

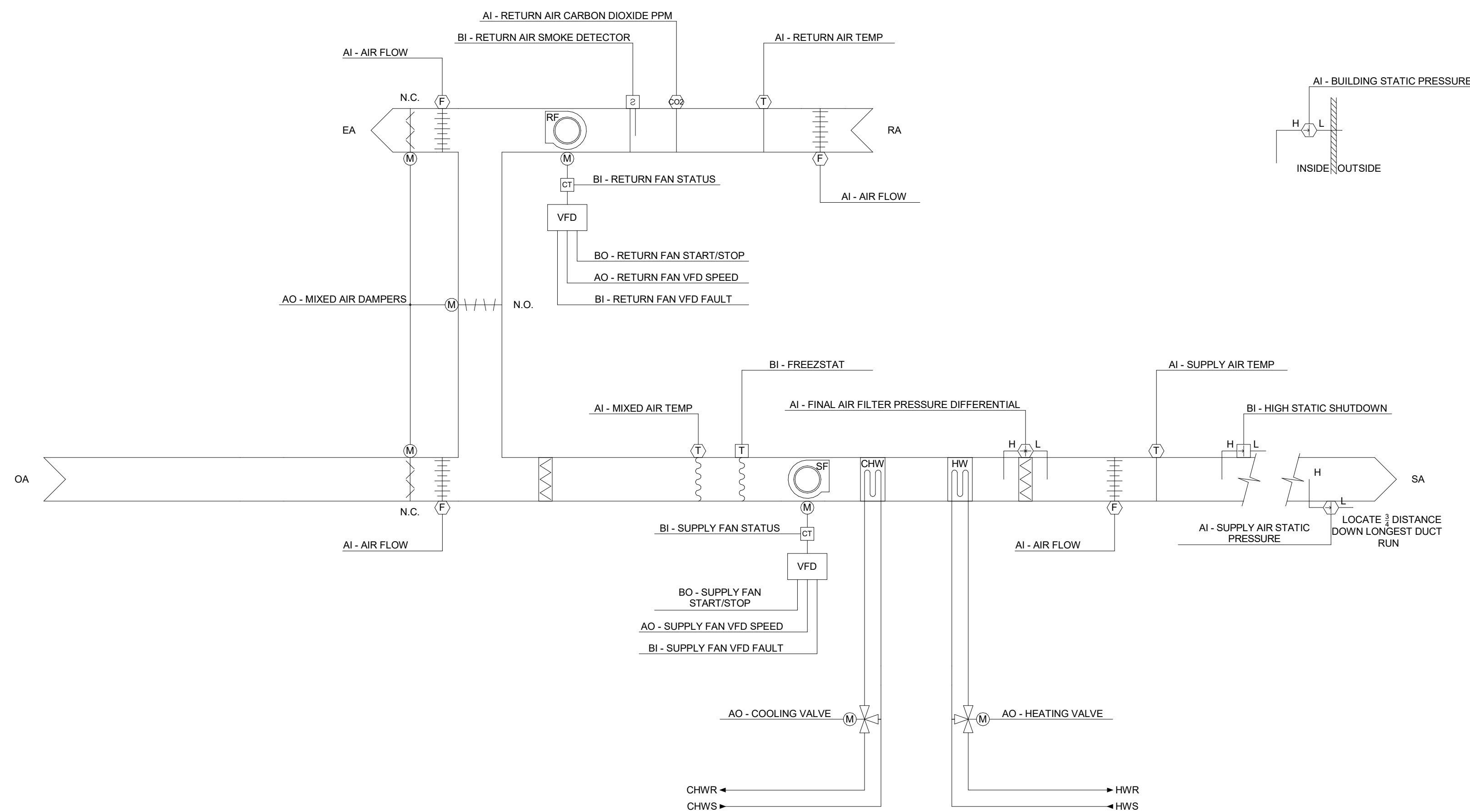
- I) SENSOR FAILURE: SENSOR READING INDICATES SHORTED OR DISCONNECTED SENSOR. IN THE EVENT OF A SENSOR FAILURE, AN ALTERNATE OUTSIDE AIR CONDITION SENSOR SHALL BE MADE AVAILABLE TO THE SYSTEM WITHOUT INTERRUPTION IN SENSOR READINGS.
- II) IF AN OUTSIDE AIR TEMPERATURE SENSOR CANNOT BE READ, A DEFAULT VALUE OF 65°F WILL BE USED.
- III) IF AN OUTSIDE AIR HUMIDITY SENSOR CANNOT BE READ, A DEFAULT VALUE OF 50% WILL BE USED.

**2) OUTSIDE AIR TEMPERATURE HISTORY:**

THE CONTROLLER SHALL MONITOR AND RECORD THE HIGH AND LOW TEMPERATURE READINGS FOR THE OUTSIDE AIR. THESE READINGS SHALL BE RECORDED ON A DAILY, MONTHLY, AND YEARLY BASIS.

**2 OUTSIDE AIR CONDITIONS CONTROL SCHEMATIC**

M-700 / SCALE: N.T.S.



**14) MINIMUM OUTSIDE AIR VENTILATION - CARBON DIOXIDE (CO2) CONTROL:**

WHEN IN THE OCCUPIED MODE, THE CONTROLLER SHALL MEASURE THE RETURN AIR CO2 CONCENTRATION AND MODULATE THE OUTSIDE AIR DAMPERS OPEN ON RISING CO2 CONCENTRATIONS, OVERRIDING NORMAL DAMPER OPERATION TO MAINTAIN A MAXIMUM CO2 SETPOINT OF 700 PPM (ADJ.).

THIS SHALL OVERRIDE THE RETURN AIR CO2 SENSOR.

**15) MINIMUM OUTSIDE AIR VENTILATION - SPACE CARBON DIOXIDE (CO2) CONTROL:**

WHEN IN THE OCCUPIED MODE, THE CONTROLLER SHALL MEASURE THE SPACE CO2 (WHERE INDICATED ON PLANS) CONCENTRATION AND MODULATE THE OUTSIDE AIR DAMPERS OPEN ON RISING CO2 CONCENTRATIONS, OVERRIDING NORMAL DAMPER OPERATION TO MAINTAIN A MAXIMUM CO2 SETPOINT OF 700 PPM (ADJ.).

THIS SHALL OVERRIDE THE RETURN AIR CO2 SENSOR.

**16) FINAL FILTER DIFFERENTIAL PRESSURE MONITOR:**

THE CONTROLLER SHALL MONITOR THE DIFFERENTIAL PRESSURE ACROSS THE FINAL FILTER.

**A) ALARMS SHALL BE PROVIDED AS FOLLOWS:**

- I) FINAL FILTER CHANGE REQUIRED: FINAL FILTER DIFFERENTIAL PRESSURE EXCEEDS A USER DEFINABLE LIMIT (ADJ.).

**17) MIXED AIR TEMPERATURE:**

THE CONTROLLER SHALL MONITOR THE MIXED AIR TEMPERATURE AND USE AS REQUIRED FOR ECONOMIZER CONTROL (IF PRESENT) OR PREHEATING CONTROL (IF PRESENT).

**A) ALARMS SHALL BE PROVIDED AS FOLLOWS:**

- I) HIGH MIXED AIR TEMP: IF THE MIXED AIR TEMPERATURE IS GREATER THAN 80°F (ADJ.).
- II) LOW MIXED AIR TEMP: IF THE MIXED AIR TEMPERATURE IS LESS THAN 45°F (ADJ.).

**18) RETURN AIR CARBON DIOXIDE (CO2) CONCENTRATION MONITORING:**

THE CONTROLLER SHALL MEASURE THE RETURN AIR CO2 CONCENTRATION.

**A) ALARMS SHALL BE PROVIDED AS FOLLOWS:**

- I) HIGH RETURN AIR CARBON DIOXIDE CONCENTRATION: IF THE RETURN AIR CO2 CONCENTRATION IS GREATER THAN 1000PPM (ADJ.) WHEN IN THE UNIT IS RUNNING.

**19) RETURN AIR TEMPERATURE:**

THE CONTROLLER SHALL MONITOR THE RETURN AIR TEMPERATURE AND USE AS REQUIRED FOR SETPOINT CONTROL OR ECONOMIZER CONTROL (IF PRESENT).

**A) ALARMS SHALL BE PROVIDED AS FOLLOWS:**

- I) HIGH RETURN AIR TEMP: IF THE RETURN AIR TEMPERATURE IS GREATER THAN 90°F (ADJ.).
- II) LOW RETURN AIR TEMP: IF THE RETURN AIR TEMPERATURE IS LESS THAN 45°F (ADJ.).

**20) SUPPLY AIR TEMPERATURE:**

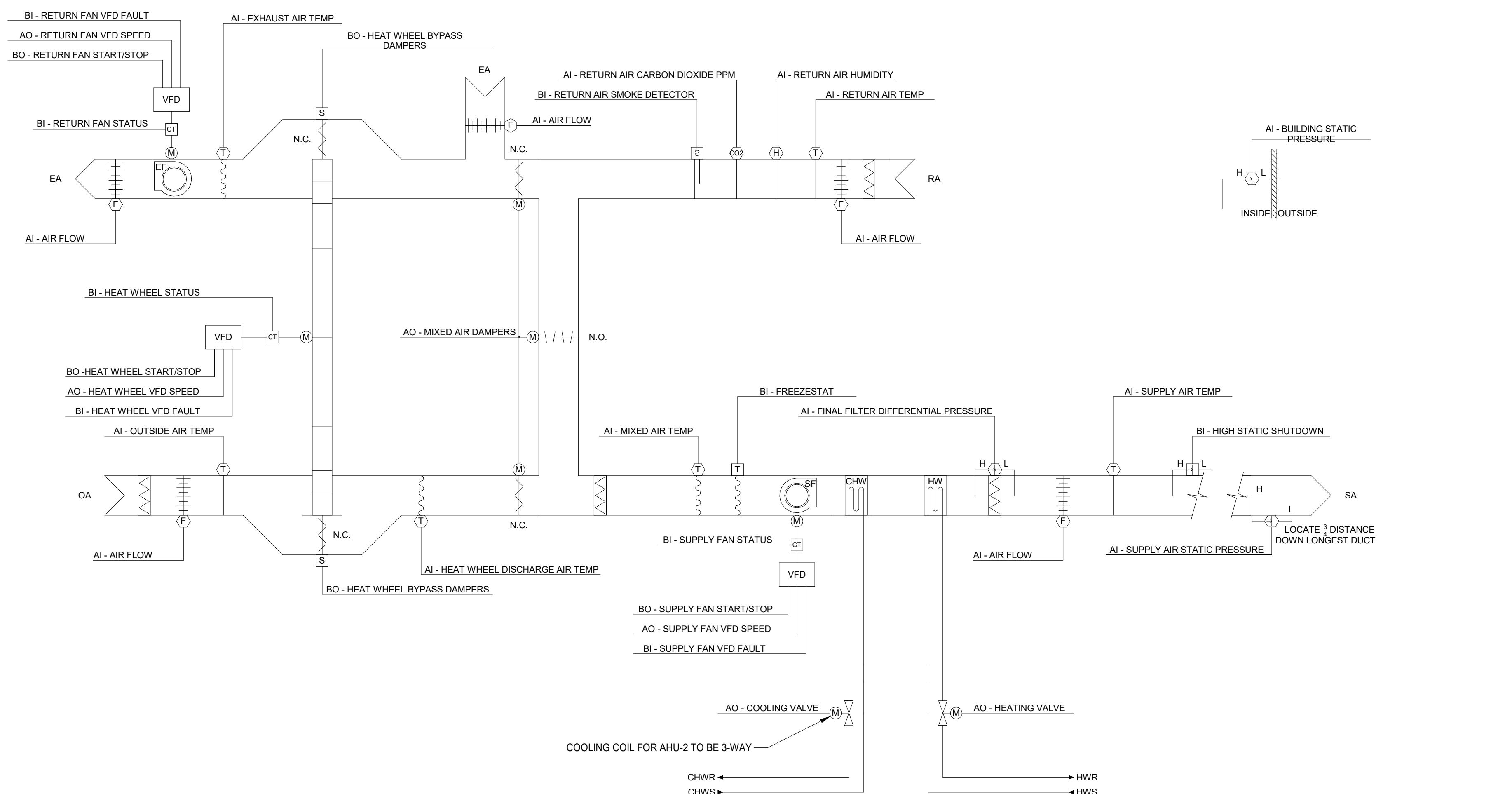
THE CONTROLLER SHALL MONITOR THE SUPPLY AIR TEMPERATURE.

**A) ALARMS SHALL BE PROVIDED AS FOLLOWS:**

- I) HIGH SUPPLY AIR TEMP: IF THE SUPPLY AIR TEMPERATURE IS GREATER THAN 120°F (ADJ.).
- II) LOW SUPPLY AIR TEMP: IF THE SUPPLY AIR TEMPERATURE IS LESS THAN 45°F (ADJ.).

NO.	REVISION	DATE

DRAWN: DWB	CHKD: JRA
DESIGNED: DWB	APPRVD: JRA
DATE: September 5, 2019	PROJECT NUMBER
16631-190-90	



**1) RUN CONDITIONS:**

- A) THE SMOKE EXHAUST FAN SHALL BE INTERLOCKED TO RUN WHENEVER ENABLED BY ZONE SMOKE DETECTOR.
  - B) EACH SMOKE EXHAUST FAN MAY BE MANUALLY ACTIVATED THROUGH A SWITCH ON THE FIREFIGHTER'S SMOKE CONTROL PANEL LOCATED IN THE CONTROL ROOM.
  - C) EACH SMOKE EXHAUST FAN MAY BE MANUALLY ACTIVATED THROUGH A SP. SWITCH LOCATED IN THE CONTROL ROOM FOR ZONE AIR PURGE NEEDS.
- 2) SMOKE EXHAUST AIR DAMPER:**  
THE SMOKE EXHAUST AIR DAMPER ASSOCIATED WITH THE ROOM WITH THE EVENT SHALL OPEN AND THE SHALL UNIT RUN. THE EXHAUST DAIR DAMPER WITH THE OTHER DAYROOM SHALL REMAIN CLOSED.  
DAMPERS SHALL CLOSE ANYTIME THE UNIT STOPS. THE EXHAUST AIR DAMPER SHALL CLOSE 30 SEC. (ADJ.) AFTER THE FAN STOPS.
- A) ALARMS SHALL BE PROVIDED AS FOLLOWS:
    - I) DAMPER FAILURE: COMMANDED OPEN, BUT THE STATUS IS CLOSED.
    - II) DAMPER IN HAND: COMMANDED CLOSED, BUT THE STATUS IS OPEN.
- 3) RETURN AIR DAMPER:**  
THE RETURN AIR DAMPER SERVING THE AFFECTED SPACE SHALL CLOSE ANYTIME THE SMOKE EXHAUST FAN RUNS, AND SHALL OPEN ANYTIME THE SMOKE EXHAUST FAN STOPS.
- A) ALARMS SHALL BE PROVIDED AS FOLLOWS:
    - I) DAMPER FAILURE: COMMANDED OPEN, BUT THE STATUS IS CLOSED.
    - II) DAMPER IN HAND: COMMANDED CLOSED, BUT THE STATUS IS OPEN.
- 4) TRANSFER AIR DAMPER:**  
THE TRANSFER AIR DAMPER SERVING THE AFFECTED SPACE SHALL CLOSE ANYTIME THE SMOKE EXHAUST FAN RUNS, AND SHALL OPEN ANYTIME THE SMOKE EXHAUST FAN STOPS.
- A) ALARMS SHALL BE PROVIDED AS FOLLOWS:
    - I) DAMPER FAILURE: COMMANDED OPEN, BUT THE STATUS IS CLOSED.
    - II) DAMPER IN HAND: COMMANDED CLOSED, BUT THE STATUS IS OPEN.
- 5) CELL EXHAUST MAIN AIR DAMPER:**  
THE EXHAUST MAIN AIR DAMPER ASSOCIATED WITH THE ROOM WITH THE EVENT SHALL CLOSE.  
DAMPERS SHALL OPEN ANYTIME THE EXHAUST FAN STOPS. THE EXHAUST AIR DAMPER SHALL CLOSE 30 SEC. (ADJ.) AFTER THE FAN STOPS.
- A) ALARMS SHALL BE PROVIDED AS FOLLOWS:
    - I) DAMPER FAILURE: COMMANDED OPEN, BUT THE STATUS IS CLOSED.
    - II) DAMPER IN HAND: COMMANDED CLOSED, BUT THE STATUS IS OPEN.
- 6) FAN STATUS:**  
THE CONTROLLER SHALL MONITOR THE FAN STATUS.
- A) ALARMS SHALL BE PROVIDED AS FOLLOWS:
    - I) FAN FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
    - II) FAN IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.
- 7) ALL CONTROLLERS RELATED TO THE SMOKE EXHAUST SYSTEM SHALL BE UL-864 COMPLIANT, INCLUDING BUT NOT LIMITED TO THE SMOKE EXHAUST FANS, DAMPERS, AIR-HANDLING UNITS, AND THE VAV BOXES.

**2 EXHAUST FAN - SMOKE CONTROL SCHEMATIC**  
M-701 SCALE: N.T.S.

**1) RUN CONDITIONS - CONTINUOUS:**

- THE UNIT SHALL RUN CONTINUOUSLY.
- 2) EMERGENCY SHUTDOWN:**  
THE UNIT SHALL SHUT DOWN AND GENERATE AN ALARM UPON RECEIVING AN EMERGENCY SHUTDOWN SIGNAL.
- 3) FREEZE PROTECTION:**  
THE UNIT SHALL SHUT DOWN AND GENERATE AN ALARM UPON RECEIVING A FREEZESTAT STATUS.
- 4) HIGH STATIC SHUTDOWN:**  
THE UNIT SHALL SHUT DOWN AND GENERATE AN ALARM UPON RECEIVING A HIGH STATIC SHUTDOWN SIGNAL.
- 5) RETURN AIR SMOKE DETECTION:**  
THE UNIT SHALL SHUT DOWN AND GENERATE AN ALARM UPON RECEIVING A RETURN AIR SMOKE DETECTOR STATUS.
- 6) SUPPLY FAN:**  
THE SUPPLY FAN SHALL RUN ANYTIME THE UNIT IS COMMANDED TO RUN, UNLESS SHUTDOWN ON SAFETIES. TO PREVENT SHORT CYCLING, THE SUPPLY FAN SHALL HAVE A USER DEFINABLE (ADJ.) MINIMUM RUNTIME.

  - A) ALARMS SHALL BE PROVIDED AS FOLLOWS:
    - I) SUPPLY FAN FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
    - II) SUPPLY FAN IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.

- 7) SUPPLY AIR DUCT STATIC PRESSURE CONTROL:**  
THE CONTROLLER SHALL MEASURE DUCT STATIC PRESSURE AND MODULATE THE SUPPLY FAN VFD SPEED TO MAINTAIN A DUCT STATIC PRESSURE SETPOINT. THE SPEED SHALL NOT DROP BELOW 30% (ADJ.). THE STATIC PRESSURE SETPOINT SHALL BE RESET BASED UPON THE POSITION OF THE ZONE DAMPERS, WITH A GOAL OF REDUCING THE STATIC PRESSURE UNTL AT LEAST ONE ZONE DAMPER IS NEARLY WIDE OPEN.  
THE INITIAL DUCT STATIC PRESSURE SETPOINT SHALL BE 1.5IN H2O (ADJ.). IF NO ZONE DAMPER IS NEARLY WIDE OPEN, THE SETPOINT SHALL INCREMENTALLY RESET DOWN TO A MINIMUM OF 1.3 IN H2O (ADJ.).  
AS ONE OR MORE DAMPERS NEARS THE WIDE-OPEN POSITION, THE SETPOINT SHALL INCREMENTALLY RESET UP TO A MAXIMUM OF 1.8IN H2O (ADJ.).

  - A) ALARMS SHALL BE PROVIDED AS FOLLOWS:
    - I) HIGH SUPPLY AIR STATIC PRESSURE: IF THE SUPPLY AIR STATIC PRESSURE IS 25% (ADJ.) GREATER THAN SETPOINT.
    - II) LOW SUPPLY AIR STATIC PRESSURE: IF THE SUPPLY AIR STATIC PRESSURE IS 25% (ADJ.) LESS THAN SETPOINT.
    - III) SUPPLY FAN VFD FAULT.

- 8) EXHAUST FAN:**  
WHENEVER OA ENTHALPY IS HIGHER THAN RA ENTHALPY, THE WHEEL SHALL RUN AT THE MINIMUM REQUIRED EXHAUST AIR AND INCREASE IN FLOW WHEN REQUIRED TO MATCH THE ECONOMIZER CYCLE.

  - A) ALARMS SHALL BE PROVIDED AS FOLLOWS:
    - I) RETURN FAN FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
    - II) RETURN FAN IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.
    - III) RETURN FAN VFD FAULT.

- 9) BUILDING STATIC PRESSURE CONTROL:**  
THE CONTROLLER SHALL MEASURE BUILDING STATIC PRESSURE AND MODULATE THE RETURN FAN VFD SPEED TO MAINTAIN A BUILDING STATIC PRESSURE SETPOINT OF 0.05IN H2O (ADJ.). THE RETURN FAN VFD SPEED SHALL NOT DROP BELOW 20% (ADJ.).

  - A) ALARMS SHALL BE PROVIDED AS FOLLOWS:
    - I) HIGH BUILDING STATIC PRESSURE: IF THE BUILDING AIR STATIC PRESSURE IS 25% (ADJ.) GREATER THAN SETPOINT.
    - II) LOW BUILDING STATIC PRESSURE: IF THE BUILDING AIR STATIC PRESSURE IS 25% (ADJ.) LESS THAN SETPOINT.

**1 AIR HANDLING UNIT WITH HEAT RECOVERY CONTROL SCHEMATIC (AHU-2, AHU-3, AHU-4)**  
M-701 SCALE: N.T.S.

**10) SUPPLY AIR TEMPERATURE SETPOINT - OPTIMIZED:**

- THE CONTROLLER SHALL MONITOR THE SUPPLY AIR TEMPERATURE AND SHALL MAINTAIN A SUPPLY AIR TEMPERATURE SETPOINT RESET BASED ON ZONE COOLING AND HEATING REQUIREMENTS  
THE SUPPLY AIR TEMPERATURE SETPOINT SHALL BE RESET FOR COOLING BASED ON ZONE COOLING REQUIREMENTS AS FOLLOWS:
- I) THE INITIAL SUPPLY AIR TEMPERATURE SETPOINT SHALL BE 55° F (ADJ.)
  - II) AS COOLING DEMAND INCREASES, THE SETPOINT SHALL INCREMENTALLY RESET DOWN TO A MINIMUM OF 53° F (ADJ.)
  - III) AS COOLING DEMAND DECREASES, THE SETPOINT SHALL INCREMENTALLY RESET UP TO A MAXIMUM OF 63° F (ADJ.)
- THE SUPPLY AIR TEMPERATURE SETPOINT FOR HEATING SHALL BE 55° F.
- 11) COOLING COIL VALVE:**  
THE CONTROLLER SHALL MEASURE THE SUPPLY AIR TEMPERATURE AND MODULATE THE COOLING COIL VALVE TO MAINTAIN ITS COOLING SETPOINT.
- A) THE COOLING SHALL BE ENABLED WHENEVER:
    - I) OUTSIDE AIR TEMPERATURE IS GREATER THAN 60° F (ADJ.)
    - II) AND THE ECONOMIZER IS DISABLED OR FULLY OPEN.
    - III) AND THE SUPPLY FAN STATUS IS ON.
    - IV) AND THE HEATING IS NOT ACTIVE.
  - B) THE COOLING COIL VALVE SHALL OPEN TO 100% (ADJ.) WHENEVER THE FREEZESTAT (IF PRESENT) IS ON.
  - C) ALARMS SHALL BE PROVIDED AS FOLLOWS:
    - I) HIGH SUPPLY AIR TEMP: IF THE SUPPLY AIR TEMPERATURE IS 5° F GREATER THAN SETPOINT.
- 12) HEATING COIL VALVE:**  
THE CONTROLLER SHALL MEASURE THE SUPPLY AIR TEMPERATURE AND MODULATE THE HEATING COIL VALVE TO MAINTAIN A DISCHARGE AIR TEMPERATURE SETPOINT OF 55° F.
- A) THE HEATING SHALL BE ENABLED WHENEVER:
    - I) OUTSIDE AIR TEMPERATURE IS LESS THAN 65° F (ADJ.)
    - II) AND THE SUPPLY FAN STATUS IS ON.
    - III) AND THE COOLING IS NOT ACTIVE.
  - B) THE HEATING COIL VALVE SHALL OPEN WHENEVER:
    - I) SUPPLY AIR TEMPERATURE DROPS FROM 40° F TO 35° F (ADJ.)
    - II) OR THE FREEZESTAT IS ON.
  - C) ALARMS SHALL BE PROVIDED AS FOLLOWS:
    - I) LOW SUPPLY AIR TEMP: IF THE SUPPLY AIR TEMPERATURE IS 5° F (ADJ.) LESS THAN SETPOINT.

**13) ENTHALPY WHEEL OPERATION:**

- WHENEVER OA ENTHALPY IS HIGHER THAN RA ENTHALPY, THE WHEEL SHALL BE TURNED ON AND BOTH OA AND EA BYPASS DAMPERS SHALL BE CLOSED. WHEN OA ENTHALPY IS LESS THAN RA ENTHALPY AND AHU IS COOLING (OR AIRSIDE ECONOMIZING), THE WHEEL SHALL BE TURNED OFF AND BOTH OA AND EA BYPASS DAMPERS SHALL BE OPEN.  
WHEN THE AHU IS HEATING, THE WHEEL SHALL BE TURNED ON AS THE FIRST STAGE OF HEAT. THE OA BYPASS DAMPER SHALL BE CLOSED, AND THE EA BYPASS DAMPER SHALL MODULATE (AS NECESSARY) TO MAINTAIN DISCHARGE AIR TEMPERATURE AT SETPOINT (ADJ.).  
IF THE OA TEMPERATURE DROPS BELOW THE FROST THRESHOLD SETPOINT (ADJ.), THE OA BYPASS DAMPER SHALL MODULATE TO MAINTAIN, THE EXHAUST SIDE LEAVING TEMPERATURE AT SETPOINT. IF THE OA BYPASS DAMPER REACHES 100% OPEN FOR 5 MINUTES (ADJ.), THE WHEEL SHALL BE TURNED OFF TO PREVENT FROSTING.  
PERIODIC SELF CLEANING: THE HEAT WHEEL SHALL RUN AT 5% SPEED (ADJ.) FOR 10 SEC (ADJ.) EVERY 4 HOURS (ADJ.) THE UNIT RUNS.  
ALARMS SHALL BE PROVIDED AS FOLLOWS:  
A) HEAT WHEEL ROTATION FAILURE: COMMANDED ON BUT THE STATUS IS OFF.  
B) HEAT WHEEL IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.  
C) HEAT WHEEL VFD IN FAULT.

**13) ECONOMIZER:**

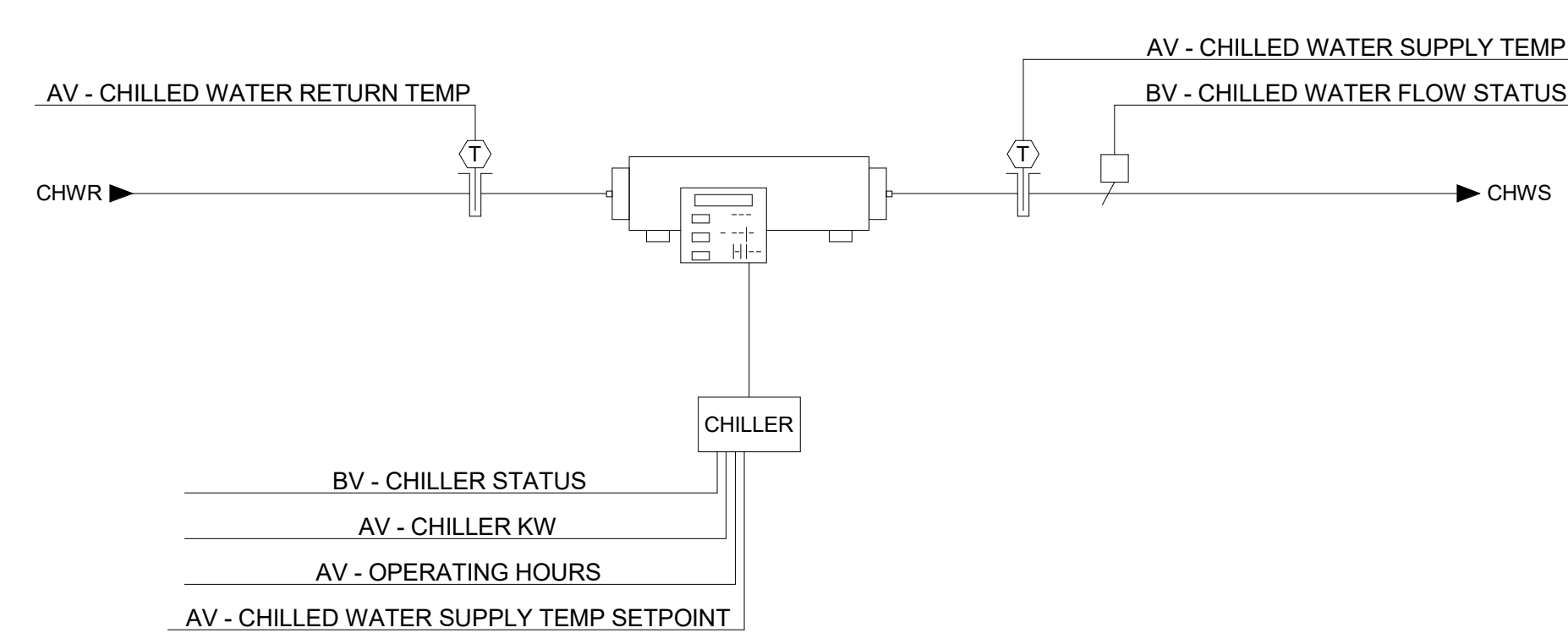
- THE CONTROLLER SHALL MEASURE THE MIXED AIR TEMPERATURE AND MODULATE THE ECONOMIZER DAMPERS IN SEQUENCE TO MAINTAIN A SETPOINT 2° F (ADJ.) LESS THAN THE SUPPLY AIR TEMPERATURE SETPOINT. THE OUTSIDE AIR DAMPERS SHALL MAINTAIN A MINIMUM ADJUSTABLE POSITION OF 20% (ADJ.) OPEN WHENEVER OCCUPIED.
- A) THE ECONOMIZER SHALL BE ENABLED WHENEVER:
    - I) OUTSIDE AIR TEMPERATURE IS LESS THAN 65° F (ADJ.)
    - II) AND THE OUTSIDE AIR TEMPERATURE IS LESS THAN THE RETURN AIR TEMPERATURE.
    - III) AND THE SUPPLY FAN STATUS IS ON.
  - B) THE ECONOMIZER SHALL CLOSE WHENEVER:
    - I) MIXED AIR TEMPERATURE DROPS FROM 40° F TO 35° F (ADJ.)
    - II) OR THE FREEZESTAT IS ON.
    - III) OR ON LOSS OF SUPPLY FAN STATUS.
  - C) THE OUTSIDE AND EXHAUST AIR DAMPERS SHALL CLOSE AND THE RETURN AIR DAMPER SHALL OPEN WHEN THE UNIT IS OFF. IF OPTIMAL START UP IS AVAILABLE THE MIXED AIR DAMPER SHALL OPERATE AS DESCRIBED IN THE OCCUPIED MODE EXCEPT THAT THE OUTSIDE AIR DAMPER SHALL MODULATE TO FULLY CLOSED.
- 14) MINIMUM OUTSIDE AIR VENTILATION - CARBON DIOXIDE (CO2) CONTROL:**  
WHEN IN THE OCCUPIED MODE, THE CONTROLLER SHALL MEASURE THE RETURN AIR CO2 CONCENTRATION AND MODULATE THE OUTSIDE AIR DAMPERS OPEN ON RISING CO2 CONCENTRATIONS, OVERRIDING NORMAL DAMPER OPERATION TO MAINTAIN A CO2 SETPOINT OF 700 PPM (ADJ.).
- 15) FINAL FILTER DIFFERENTIAL PRESSURE MONITOR:**  
THE CONTROLLER SHALL MONITOR THE DIFFERENTIAL PRESSURE ACROSS THE FINAL FILTER.
- A) ALARMS SHALL BE PROVIDED AS FOLLOWS:
    - I) FINAL FILTER CHANGE REQUIRED: FINAL FILTER DIFFERENTIAL PRESSURE EXCEEDS A USER DEFINABLE LIMIT (ADJ.).
- 16) MIXED AIR TEMPERATURE:**  
THE CONTROLLER SHALL MONITOR THE MIXED AIR TEMPERATURE AND USE AS REQUIRED FOR ECONOMIZER CONTROL (IF PRESENT) OR PREHEATING CONTROL (IF PRESENT).
- A) ALARMS SHALL BE PROVIDED AS FOLLOWS:
    - I) HIGH MIXED AIR TEMP: IF THE MIXED AIR TEMPERATURE IS GREATER THAN 90° F (ADJ.)
    - II) LOW MIXED AIR TEMP: IF THE MIXED AIR TEMPERATURE IS LESS THAN 45° F (ADJ.)
- 17) RETURN AIR CARBON DIOXIDE (CO2) CONCENTRATION MONITORING:**  
THE CONTROLLER SHALL MEASURE THE RETURN AIR CO2 CONCENTRATION.
- A) ALARMS SHALL BE PROVIDED AS FOLLOWS:
    - I) HIGH RETURN AIR CARBON DIOXIDE CONCENTRATION: IF THE RETURN AIR CO2 CONCENTRATION IS GREATER THAN 1000PPM (ADJ.) WHEN IN THE UNIT IS RUNNING.
- 18) RETURN AIR TEMPERATURE:**  
THE CONTROLLER SHALL MONITOR THE RETURN AIR TEMPERATURE AND USE AS REQUIRED FOR SETPOINT CONTROL OR ECONOMIZER CONTROL (IF PRESENT).
- A) ALARMS SHALL BE PROVIDED AS FOLLOWS:
    - I) HIGH SUPPLY AIR TEMP: IF THE SUPPLY AIR TEMPERATURE IS GREATER THAN 120° F (ADJ.)
    - II) LOW SUPPLY AIR TEMP: IF THE RETURN AIR TEMPERATURE IS LESS THAN 45° F (ADJ.)
- 19) SUPPLY AIR TEMPERATURE:**  
THE CONTROLLER SHALL MONITOR THE SUPPLY AIR TEMPERATURE.
- A) ALARMS SHALL BE PROVIDED AS FOLLOWS:
    - I) HIGH SUPPLY AIR TEMP: IF THE SUPPLY AIR TEMPERATURE IS GREATER THAN 120° F (ADJ.)
    - II) LOW SUPPLY AIR TEMP: IF THE SUPPLY AIR TEMPERATURE IS LESS THAN 45° F (ADJ.)

NO.	REVISION	DATE

DRAWN: DWB	CHKD: JIRA
DESIGNED: DWB	APPRVD: JIRA
DATE: September 5, 2019	PROJECT NUMBER: 1663-1190-90

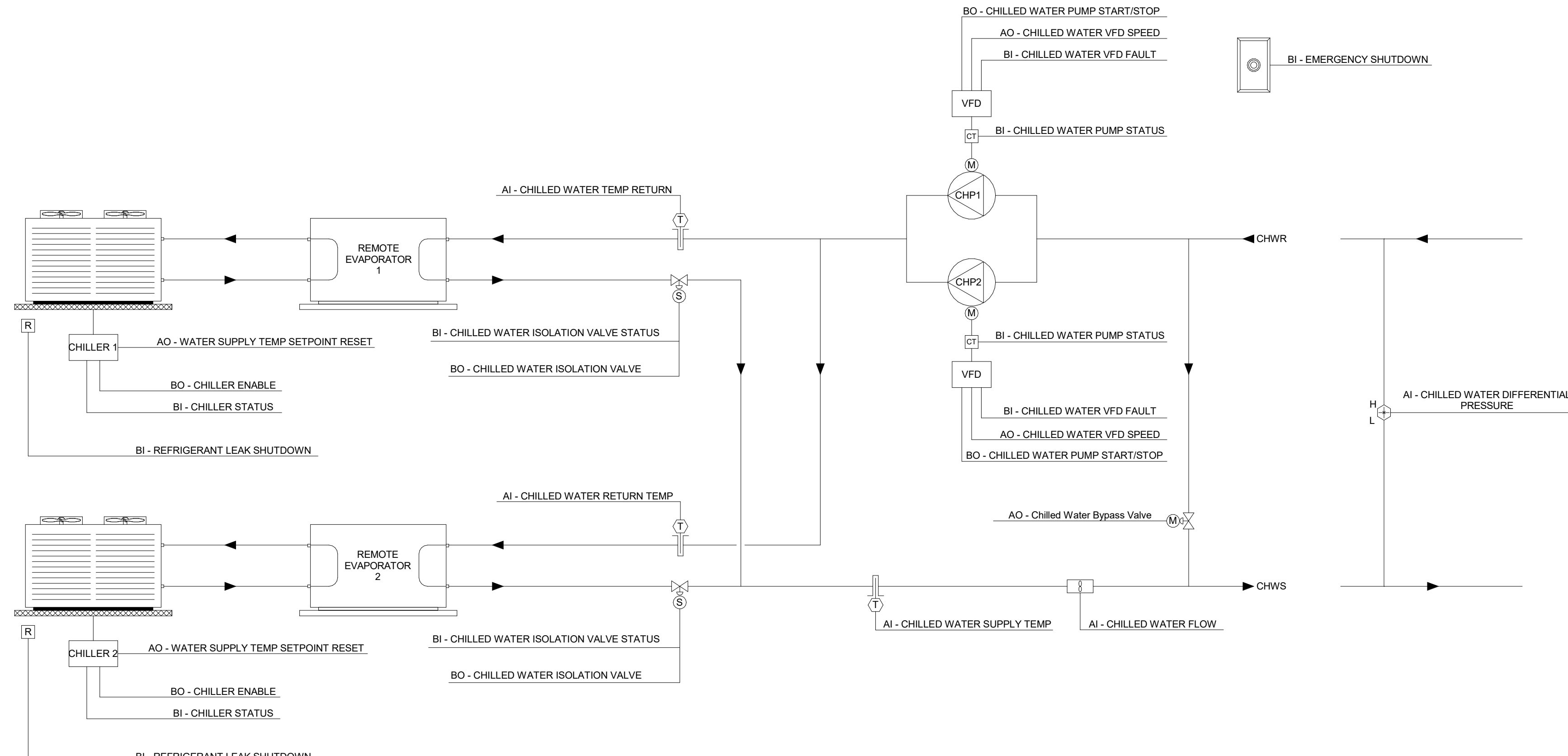
VIGO COUNTY SECURITY CENTER	TERRE HAUTE, INDIANA
CONTROL SCHEMATICS	MECHANICAL
DRAWING NUMBER: M-701	





**1) CHILLER INTERFACE MONITORING:**  
CURRENT CHILLER STATUS AND OPERATING CONDITIONS SHALL BE MONITORED THROUGH ITS COMMUNICATION INTERFACE PORT. THE INTERFACE SHALL MONITOR AND TREND THE POINTS SHOWN.  
**NOTE:**  
THIS CHILLER INTERFACE SCHEMATIC MAY NOT REFLECT THE ACTUAL SENSORS AND POINTS AS SUPPLIED BY THE CHILLER MANUFACTURER. ALL INTERFACE POINTS SHALL BE COORDINATED WITH THE CHILLER SUPPLIER.

**2 CHILLER MONITORING CONTROL SCHEMATIC**  
M-703 / SCALE: N.T.S.



- 1) CHILLER - RUN CONDITIONS:**  
THE CHILLER SHALL BE ENABLED TO RUN WHENEVER THE OUTSIDE AIR TEMPERATURE IS GREATER THAN 60°F (ADJ.).  
TO PREVENT SHORT CYCLING, THE CHILLER SHALL RUN FOR AND BE OFF FOR MINIMUM ADJUSTABLE TIMES (BOTH USER DEFINABLE), UNLESS SHUTDOWN ON SAFETIES OR OUTSIDE AIR CONDITIONS.  
THE CHILLER SHALL RUN SUBJECT TO ITS OWN INTERNAL SAFETIES AND CONTROLS.
- 2) EMERGENCY SHUTDOWN:**  
THE CHILLER SHALL SHUT DOWN AND AN ALARM GENERATED UPON RECEIVING AN EMERGENCY SHUTDOWN SIGNAL STATUS.
- 3) REFRIGERANT DETECTION:**  
THE CHILLER SHALL SHUT DOWN AND AN ALARM GENERATED UPON RECEIVING A REFRIGERANT LEAK DETECTION STATUS.
- 4) CHILLED WATER ISOLATION VALVE:**  
THE VALVE SHALL OPEN ANYTIME THE CHILLER IS CALLED TO RUN. THE VALVE SHALL ALSO OPEN WHENEVER THE CHILLED WATER PUMP RUNS FOR FREEZE PROTECTION.  
A) THE VALVE SHALL OPEN PRIOR TO THE CHILLER BEING ENABLED AND SHALL CLOSE ONLY AFTER THE CHILLER IS DISABLED. THE VALVE SHALL THEREFORE HAVE:  
i) A USER ADJUSTABLE DELAY ON START  
ii) AND A USER ADJUSTABLE DELAY ON STOP.  
B) THE DELAY TIMES SHALL BE SET APPROPRIATELY TO ALLOW FOR ORDERLY CHILLED WATER SYSTEM START-UP, SHUTDOWN AND SEQUENCING.  
C) ALARMS SHALL BE PROVIDED AS FOLLOWS:  
i) FAILURE VALVE COMMANDED OPEN BUT THE STATUS INDICATES CLOSED.  
ii) OPEN IN HAND; VALVE COMMANDED CLOSED BUT THE STATUS INDICATES OPEN.
- 5) CHILLED WATER PUMP LEAD/STANDBY OPERATION:**  
THE TWO CHILLED WATER PUMPS SHALL RUN ANYTIME THE CHILLER IS CALLED TO RUN. THE CHILLED WATER PUMP SHALL ALSO RUN FOR FREEZE PROTECTION WHENEVER THE OUTSIDE AIR TEMPERATURE IS LESS THAN A USER DEFINABLE SETPOINT (ADJ.).  
A) THE LEAD PUMP SHALL START PRIOR TO THE CHILLER BEING ENABLED AND SHALL STOP ONLY AFTER THE CHILLER IS DISABLED. THE PUMP(S) SHALL THEREFORE HAVE:  
i) A USER ADJUSTABLE DELAY ON START  
ii) AND A USER ADJUSTABLE DELAY ON STOP.  
B) THE DELAY TIMES SHALL BE SET APPROPRIATELY TO ALLOW FOR ORDERLY CHILLED WATER SYSTEM START-UP, SHUTDOWN AND SEQUENCING.  
C) THE TWO PUMPS SHALL OPERATE IN A LEAD/STANDBY FASHION.  
i) THE LEAD PUMP SHALL RUN FIRST.  
ii) ON FAILURE OF THE LEAD PUMP, THE STANDBY PUMP SHALL RUN AND THE LEAD PUMP SHALL TURN OFF.  
D) THE DESIGNATED LEAD PUMP SHALL ROTATE UPON ONE OF THE FOLLOWING CONDITIONS (USER SELECTABLE):  
i) MANUALLY THROUGH A SOFTWARE SWITCH  
ii) DAILY  
iii) WEEKLY  
iv) MONTHLY  
E) CHILLED WATER PUMP ALARMS SHALL BE PROVIDED AS FOLLOWS:  
i) FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.  
ii) RUNNING IN HAND; COMMANDED OFF, BUT THE STATUS IS ON.
- 6) CHILLED WATER DIFFERENTIAL PRESSURE CONTROL:**  
THE CONTROLLER SHALL MEASURE CHILLED WATER DIFFERENTIAL PRESSURE AND MODULATE THE LEAD CHILLED WATER PUMP VFD TO MAINTAIN ITS CHILLED WATER DIFFERENTIAL PRESSURE SETPOINT. THE FOLLOWING SETPOINTS ARE RECOMMENDED VALUES. ALL SETPOINTS SHALL BE FIELD ADJUSTED DURING THE COMMISSIONING PERIOD TO MEET THE REQUIREMENTS OF ACTUAL FIELD CONDITIONS.  
A) THE CONTROLLER SHALL MODULATE CHILLED WATER PUMP SPEED TO MAINTAIN A CHILLED WATER DIFFERENTIAL PRESSURE OF 12.8PSI(2 (ADJ.). THE VFD MINIMUM SPEED SHALL NOT DROP BELOW 10% (ADJ.).  
B) ALARMS SHALL BE PROVIDED AS FOLLOWS:  
i) HIGH CHILLED WATER DIFFERENTIAL PRESSURE: IF THE CHILLED WATER DIFFERENTIAL PRESSURE IS 25% (ADJ.) GREATER THAN SETPOINT.  
ii) LOW CHILLED WATER DIFFERENTIAL PRESSURE: IF THE CHILLED WATER DIFFERENTIAL PRESSURE IS 25% (ADJ.) LESS THAN SETPOINT.
- 7) CHILLER:**  
THE CHILLER SHALL BE ENABLED A USER ADJUSTABLE TIME AFTER PUMP STATUSES ARE PROVEN ON. THE CHILLER SHALL THEREFORE HAVE A USER ADJUSTABLE DELAY ON START.  
A) THE DELAY TIME SHALL BE SET APPROPRIATELY TO ALLOW FOR ORDERLY CHILLED WATER SYSTEM START-UP, SHUTDOWN AND SEQUENCING.  
B) THE CHILLER SHALL RUN SUBJECT TO ITS OWN INTERNAL SAFETIES AND CONTROLS.  
C) ALARMS SHALL BE PROVIDED AS FOLLOWS:  
i) CHILLER FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.  
ii) CHILLER RUNNING IN HAND; COMMANDED OFF, BUT THE STATUS IS ON.  
8) CHILLED WATER SUPPLY TEMPERATURE SETPOINT:  
THE CHILLED WATER SUPPLY TEMPERATURE SETPOINT SHALL RESET USING A TRIM AND RESPOND ALGORITHM BASED ON COOLING REQUIREMENTS.  
THE CHILLED WATER SUPPLY TEMPERATURE SETPOINT SHALL RESET TO A LOWER VALUE AS THE FACILITY'S CHILLED WATER VALVES OPEN BEYOND A USER DEFINABLE THRESHOLD (90% OPEN, TYP.). ONCE THE CHILLED WATER COILS ARE SATISFIED (VALVES CLOSING) THEN THE CHILLED WATER SUPPLY TEMPERATURE SETPOINT SHALL GRADUALLY RISE OVER TIME TO REDUCE COOLING ENERGY USE.  
9) CHILLED WATER TEMPERATURE MONITORING:  
A) THE FOLLOWING TEMPERATURES SHALL BE MONITORED:  
i) CHILLED WATER SUPPLY.  
ii) CHILLED WATER RETURN.  
B) ALARMS SHALL BE PROVIDED AS FOLLOWS:  
i) HIGH CHILLED WATER SUPPLY TEMP: IF THE CHILLED WATER SUPPLY TEMPERATURE IS GREATER THAN 55°F (ADJ.).  
ii) LOW CHILLED WATER SUPPLY TEMP: IF THE CHILLED WATER SUPPLY TEMPERATURE IS LESS THAN 38°F (ADJ.).

**1 CHILLED WATER SYSTEM CONTROL SCHEMATIC**  
M-703 / SCALE: N.T.S.

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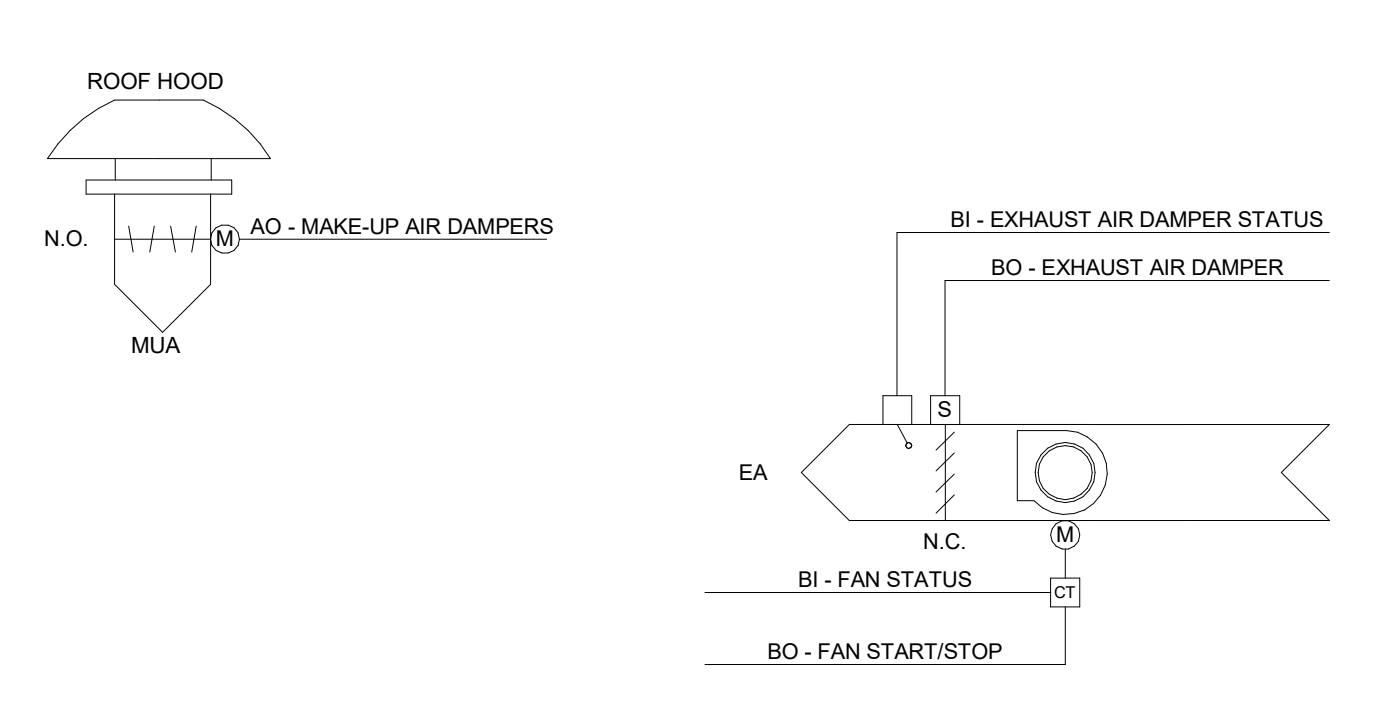
DRAWN: DWB	CHKD: JIRA
DESIGNED: DWB	APPRVD: JIRA
DATE: September 5, 2019	PROJECT NUMBER: 1663-1190-90

<b>VIGO COUNTY SECURITY CENTER</b>	<b>CONTROL SCHEMATICS</b>
A NEW	TERRE HAUTE, INDIANA
<b>M-703</b>	MECHANICAL

NO.	REVISION	DATE

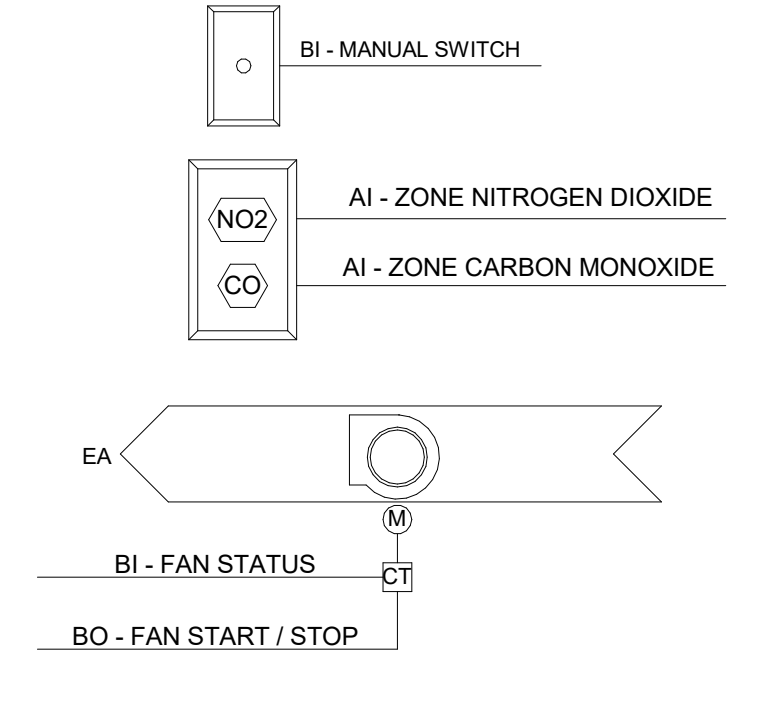
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<b>VIGO COUNTY SECURITY CENTER</b>	<b>CONTROL SCHEMATICS</b>
TERRE HAUTE, INDIANA	
<b>M-704</b>	<b>MECHANICAL</b>



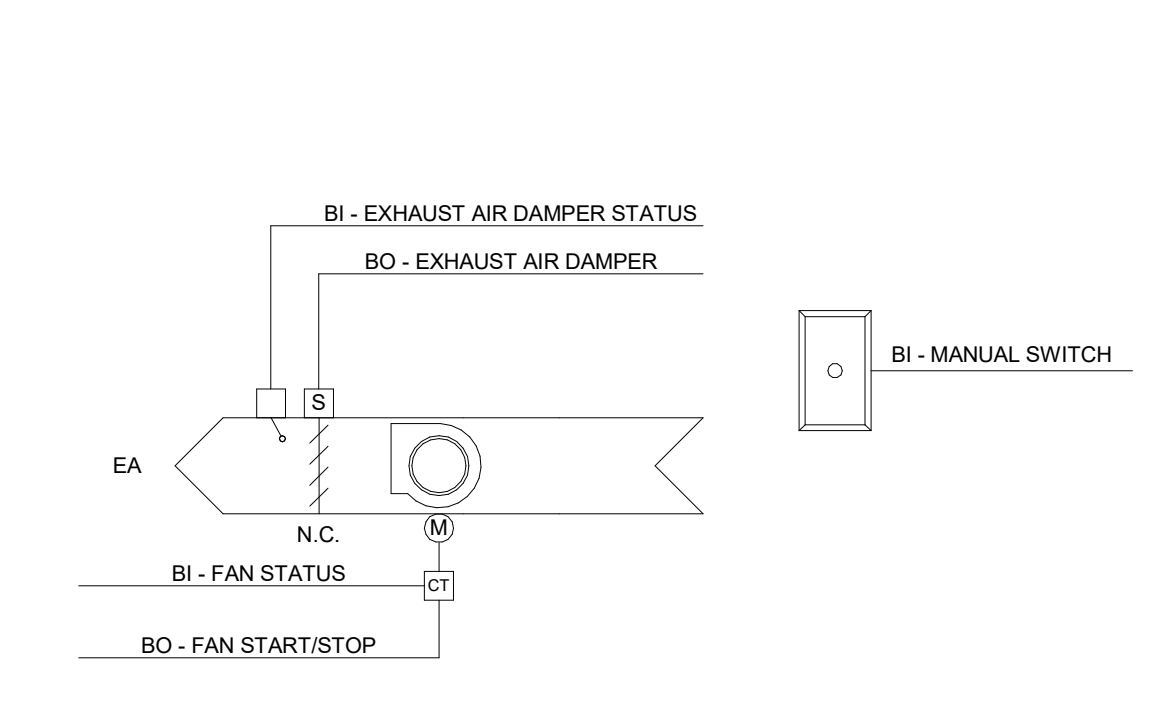
- 1) EXHAUST FAN RUN CONDITIONS:**  
THE FAN SHALL RUN CONTINUOUSLY.
- 2) FAN:**  
THE FAN SHALL HAVE A USER DEFINABLE (ADJ.) MINIMUM RUNTIME.
- 3) EXHAUST AIR DAMPER:**  
THE EXHAUST AIR DAMPER SHALL OPEN ANYTIME THE UNIT RUNS AND SHALL CLOSE ANYTIME THE UNIT STOPS. THE EXHAUST AIR DAMPER SHALL CLOSE 30 SEC (ADJ.) AFTER THE FAN STOPS.
- 4) DAMPER STATUS:**  
THE FAN SHALL BE ENABLED AFTER THE DAMPER STATUS HAS PROVEN OPEN.
- 5) FAN STATUS:**  
THE CONTROLLER SHALL MONITOR THE FAN STATUS.
- A) ALARMS SHALL BE PROVIDED AS FOLLOWS:**
- I) DAMPER FAILURE: COMMANDED OPEN, BUT THE STATUS IS CLOSED.
  - II) DAMPER IN HAND: COMMANDED CLOSED, BUT THE STATUS IS OPEN.
  - III) FAN IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.
  - IV) FAN RUNTIME EXCEEDED: FAN STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT (ADJ.).

**1 EXHAUST FAN - CONTINUOUS CONTROL SCHEMATIC**  
M-704 / SCALE: N.T.S.



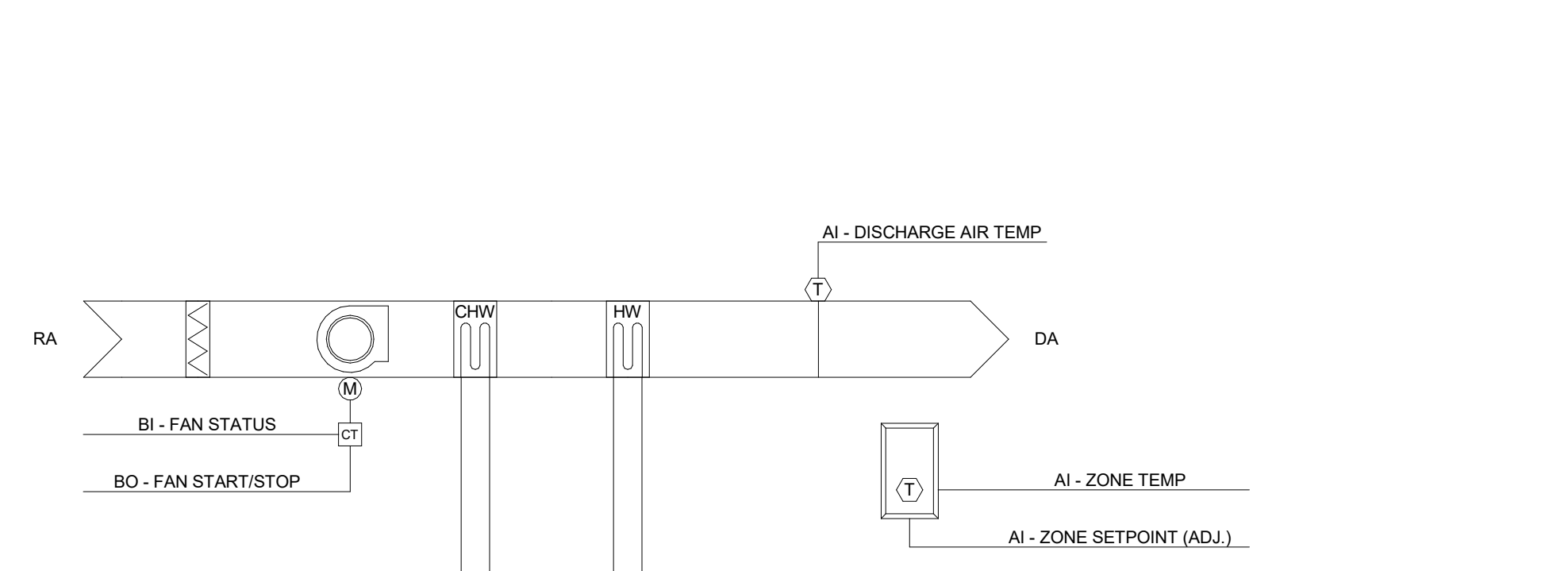
- 1) EXHAUST FAN RUN CONDITIONS:**  
THE FAN SHALL RUN WHENEVER ZONE NITROGEN DIOXIDE (NO2) OR ZONE CARBON MONOXIDE (CO) RISES ABOVE 25 PPM (ADJ.).
- 2) FAN:**  
THE FAN SHALL HAVE A USER DEFINABLE (ADJ.) MINIMUM RUNTIME.  
FAN CAN BE TURNED ON AND OFF USING MANUAL SWITCH.
- 3) EXHAUST AIR DAMPER:**  
THE EXHAUST AIR DAMPER SHALL OPEN ANYTIME THE UNIT RUNS AND SHALL CLOSE ANYTIME THE UNIT STOPS. THE EXHAUST AIR DAMPER SHALL CLOSE 30 SEC (ADJ.) AFTER THE FAN STOPS.
- 4) DAMPER STATUS:**  
THE FAN SHALL BE ENABLED AFTER THE DAMPER STATUS HAS PROVEN OPEN.
- 5) FAN STATUS:**  
THE CONTROLLER SHALL MONITOR THE FAN STATUS.
- A) ALARMS SHALL BE PROVIDED AS FOLLOWS:**
- I) DAMPER FAILURE: COMMANDED OPEN, BUT THE STATUS IS CLOSED.
  - II) DAMPER IN HAND: COMMANDED CLOSED, BUT THE STATUS IS OPEN.
  - III) FAN IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.
  - IV) FAN RUNTIME EXCEEDED: FAN STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT (ADJ.).

**2 EXHAUST FAN - CO & NO2 CONTROL SCHEMATIC**  
M-704 / SCALE: N.T.S.



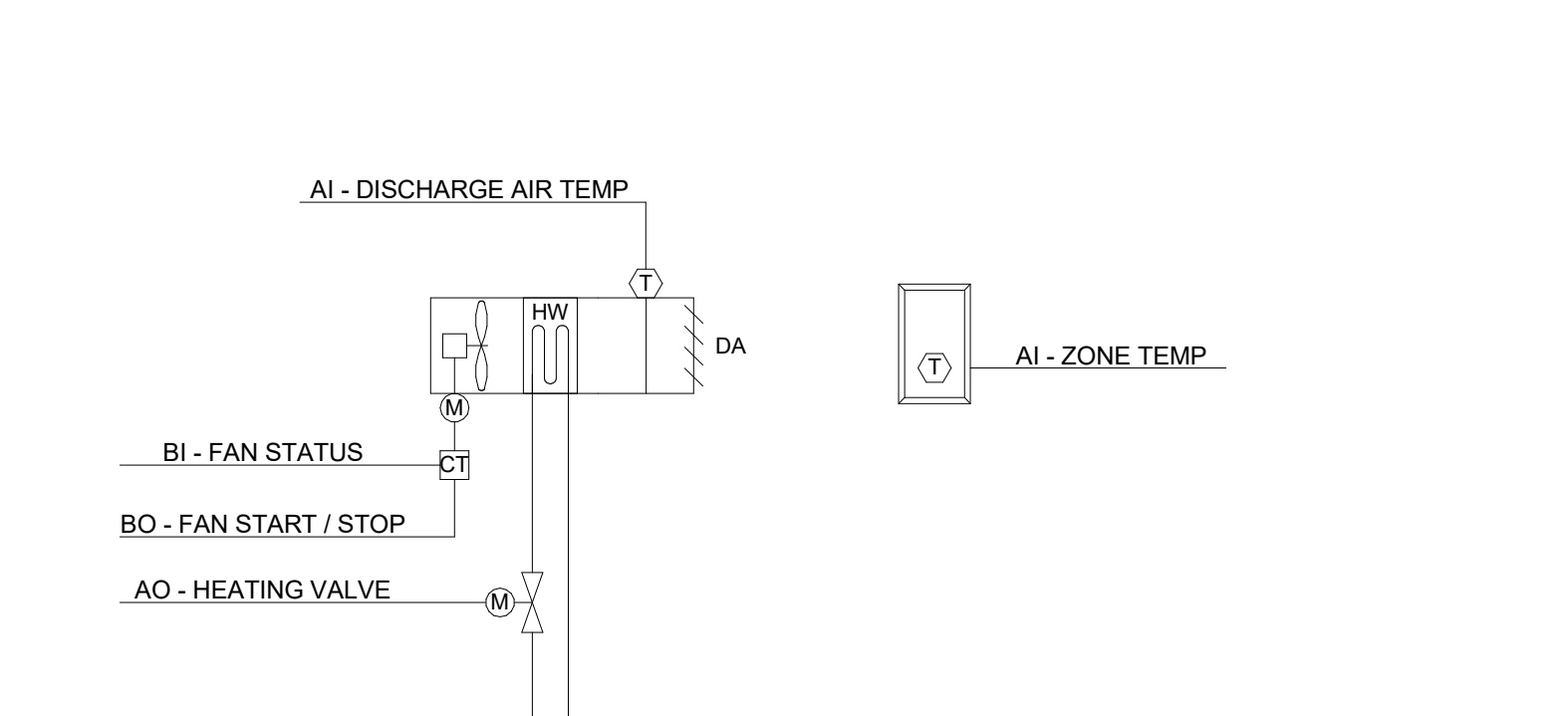
- 1) EXHAUST FAN RUN CONDITIONS-MANUAL SWITCH:**  
THE FAN SHALL RUN WHEN ACTIVATED BY MANUAL SWITCH.
- 2) EXHAUST AIR DAMPER:**  
THE EXHAUST AIR DAMPER SHALL OPEN ANYTIME THE UNIT RUNS AND SHALL CLOSE ANYTIME THE UNIT STOPS. THE EXHAUST AIR DAMPER SHALL CLOSE 30 SEC (ADJ.) AFTER THE FAN STOPS.
- 3) DAMPER STATUS:**  
THE FAN SHALL BE ENABLED AFTER THE DAMPER STATUS HAS PROVEN OPEN.
- 4) FAN STATUS:**  
THE CONTROLLER SHALL MONITOR THE FAN STATUS.
- A) ALARMS SHALL BE PROVIDED AS FOLLOWS:**
- I) FAN FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
  - II) FAN IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.

**3 EXHAUST FAN - MANUAL CONTROL SCHEMATIC**  
M-704 / SCALE: N.T.S.



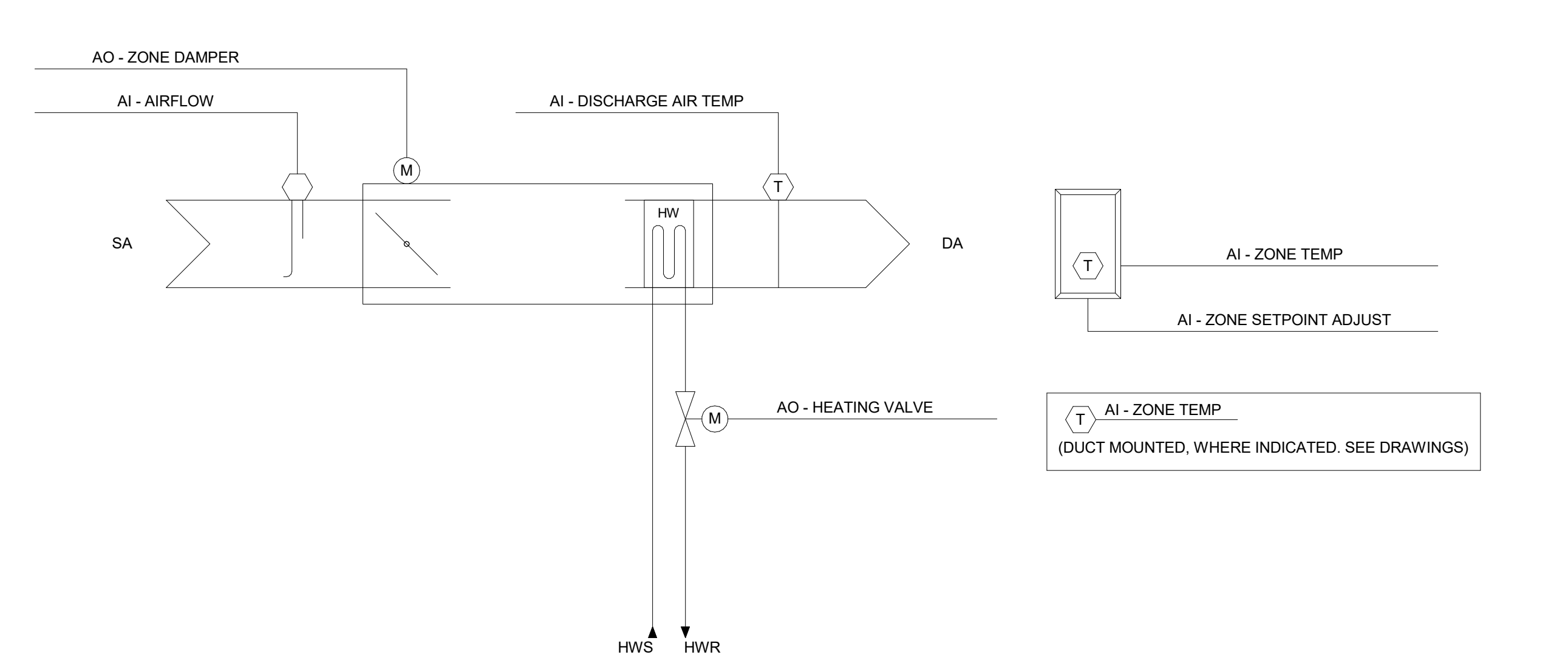
- 1) RUN CONDITIONS - CONTINUOUS:**  
THE UNIT SHALL RUN CONTINUOUSLY AND SHALL MAINTAIN:
- A) 75°F (ADJ.) COOLING SETPOINT.
  - B) 70°F (ADJ.) HEATING SETPOINT.
- 2) ZONE SETPOINT ADJUST:**  
THE OCCUPANT SHALL BE ABLE TO ADJUST THE ZONE TEMPERATURE HEATING AND COOLING SETPOINTS AT THE ZONE SENSOR.
- 3) FAN:**  
THE FAN SHALL RUN ANYTIME THE UNIT IS COMMANDED TO RUN, UNLESS SHUTDOWN ON SAFETIES.
- 4) COOLING COIL VALVE:**  
THE CONTROLLER SHALL MEASURE THE ZONE TEMPERATURE AND MODULATE THE COOLING COIL VALVE TO MAINTAIN ITS COOLING SETPOINT.
- 5) HEATING COIL VALVE:**  
THE CONTROLLER SHALL MEASURE THE ZONE TEMPERATURE AND MODULATE THE HEATING COIL VALVE TO MAINTAIN ITS HEATING SETPOINT.
- 6) DISCHARGE AIR TEMPERATURE:**  
THE CONTROLLER SHALL MONITOR THE DISCHARGE AIR TEMPERATURE.
- 7) FAN STATUS:**  
THE CONTROLLER SHALL MONITOR THE FAN STATUS.
- A) ALARMS SHALL BE PROVIDED AS FOLLOWS:**
- I) HIGH DISCHARGE AIR TEMP: IF THE DISCHARGE AIR TEMPERATURE IS GREATER THAN 120°F (ADJ.).
  - II) LOW DISCHARGE AIR TEMP: IF THE DISCHARGE AIR TEMPERATURE IS LESS THAN 40°F (ADJ.).

**4 PIPE FAN COIL CONTROL SCHEMATIC**  
M-704 / SCALE: N.T.S.



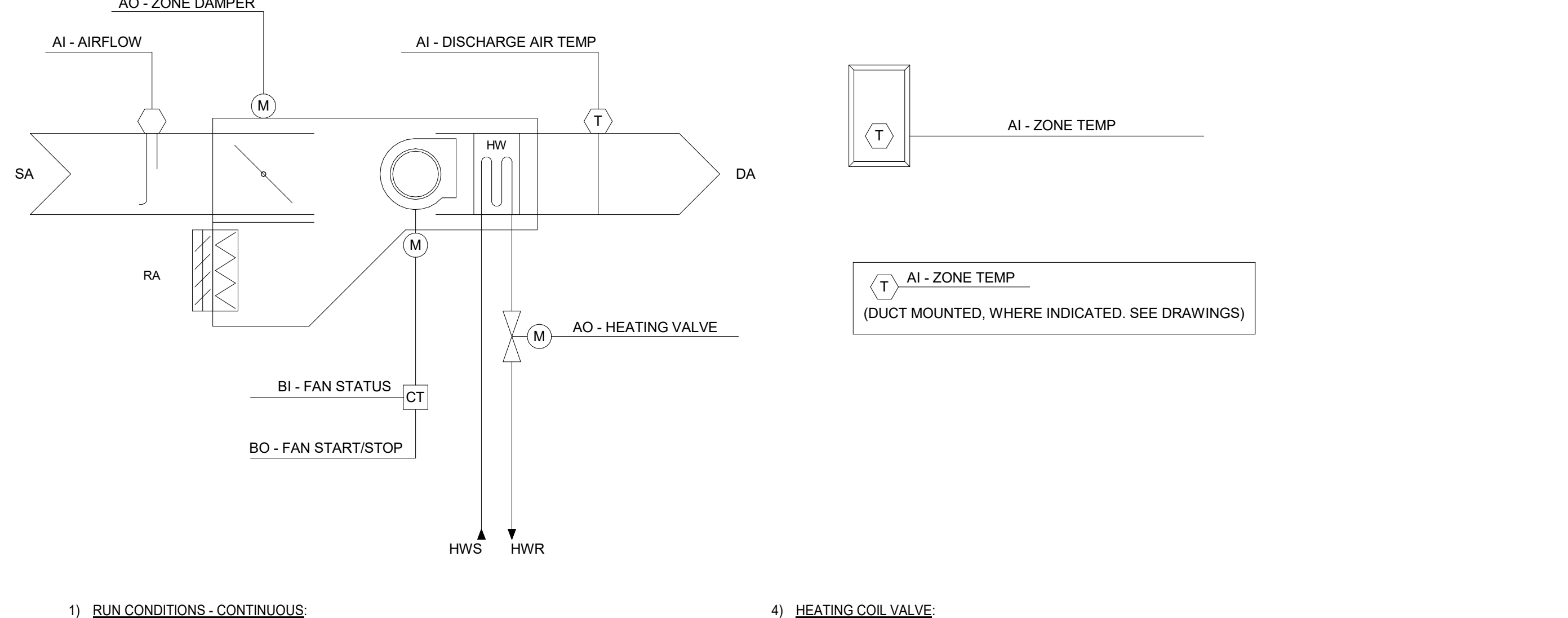
- 1) RUN CONDITIONS:**  
THE UNIT SHALL RUN WHEN REQUIRED TO MAINTAIN A HEATING SETPOINT OF 55°F (ADJ.).
- 2) FAN:**  
THE FAN SHALL RUN ANYTIME THE ZONE TEMPERATURE DROPS BELOW HEATING SETPOINT, UNLESS SHUTDOWN ON SAFETIES.
- 3) HEATING COIL VALVE:**  
THE CONTROLLER SHALL MEASURE THE ZONE TEMPERATURE AND MODULATE THE HEATING COIL VALVE TO MAINTAIN ITS HEATING SETPOINT.
- 4) DISCHARGE AIR TEMPERATURE:**  
THE CONTROLLER SHALL MONITOR THE DISCHARGE AIR TEMPERATURE.
- 5) FAN STATUS:**  
THE CONTROLLER SHALL MONITOR THE FAN STATUS.
- A) ALARMS SHALL BE PROVIDED AS FOLLOWS:**
- I) LOW ZONE TEMP: IF THE ZONE TEMPERATURE IS LESS THAN THE HEATING SETPOINT BY A USER DEFINABLE AMOUNT (ADJ.).
  - II) HIGH ZONE TEMP: IF THE ZONE TEMPERATURE IS GREATER THAN THE HEATING SETPOINT BY A USER DEFINABLE AMOUNT (ADJ.).
  - III) AND THE ZONE TEMPERATURE IS LESS THAN HEATING SETPOINT, UNLESS SHUTDOWN ON SAFETIES.

**5 UNIT HEATER CONTROL SCHEMATIC**  
M-704 / SCALE: N.T.S.



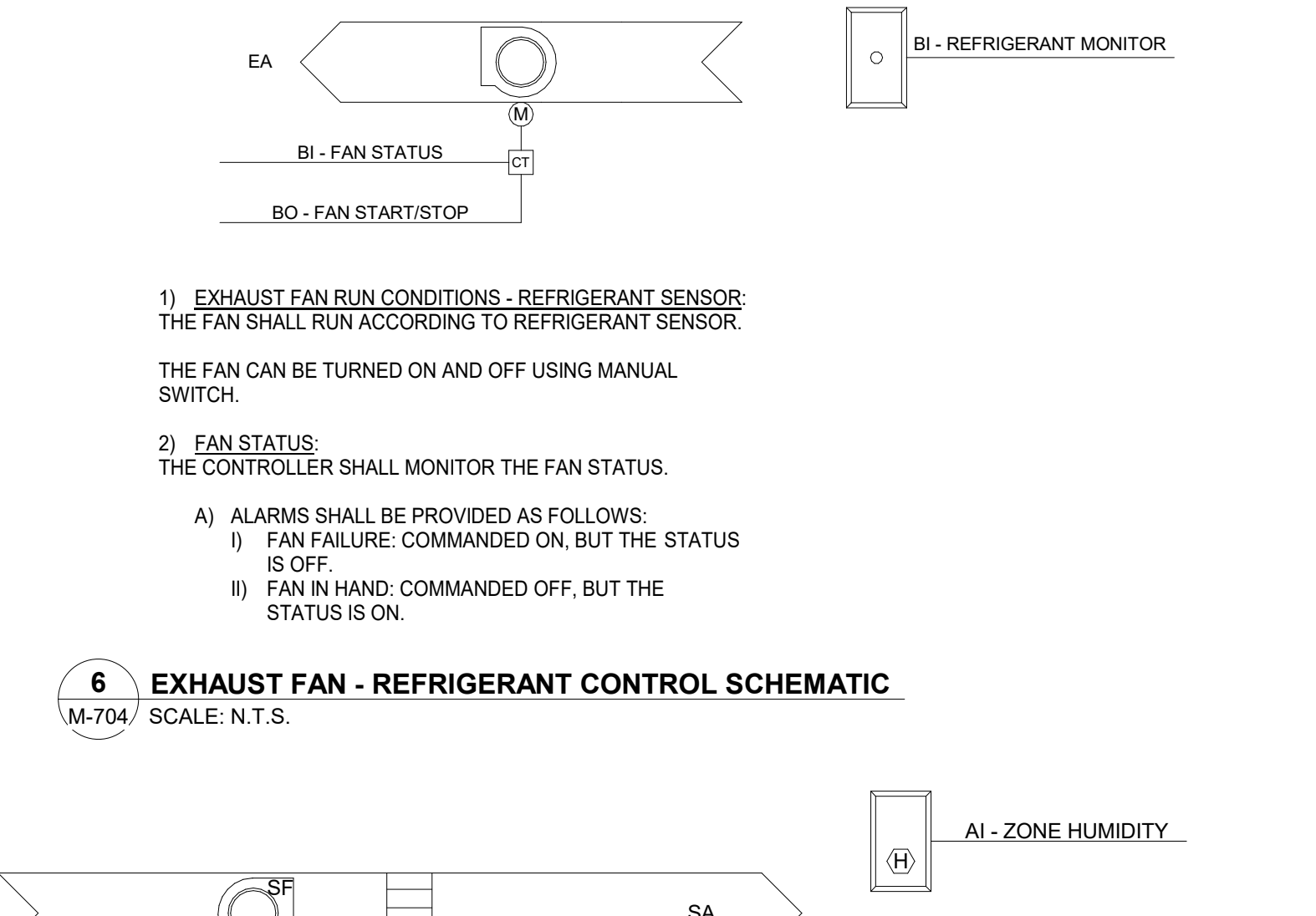
- 1) EXHAUST FAN RUN CONDITIONS - REFRIGERANT SENSOR:**  
THE FAN SHALL RUN ACCORDING TO REFRIGERANT SENSOR.
- 2) FAN STATUS:**  
THE CONTROLLER SHALL MONITOR THE FAN STATUS.
- A) ALARMS SHALL BE PROVIDED AS FOLLOWS:**
- I) FAN FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
  - II) FAN IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.

**6 EXHAUST FAN - REFRIGERANT CONTROL SCHEMATIC**  
M-704 / SCALE: N.T.S.



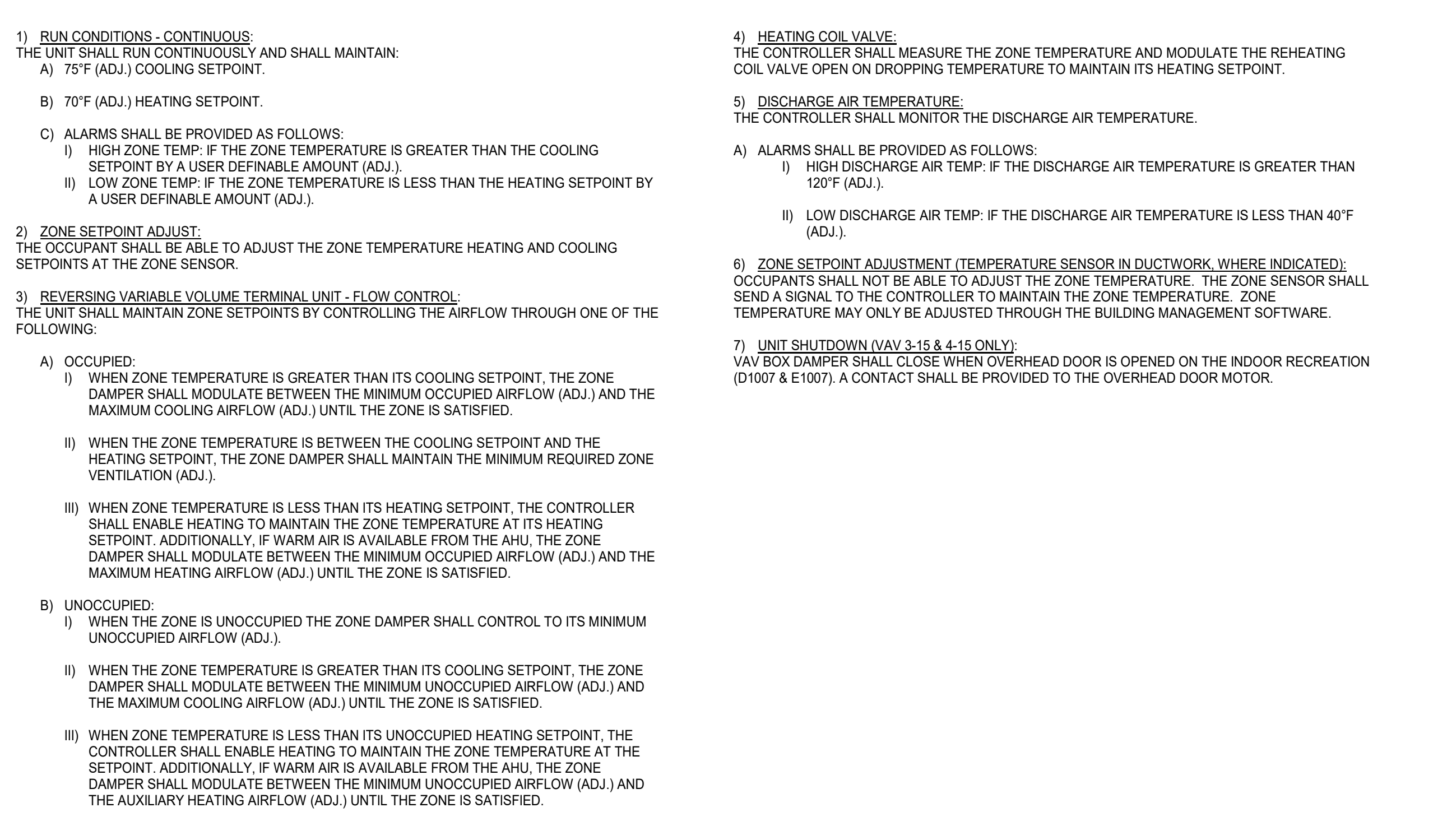
- 1) RUN CONDITIONS - CONTINUOUS:**  
THE UNIT SHALL RUN CONTINUOUSLY AND SHALL MAINTAIN:
- A) 75°F (ADJ.) COOLING SETPOINT.
  - B) 70°F (ADJ.) HEATING SETPOINT.
- 2) REVERSING VARIABLE VOLUME TERMINAL UNIT - FLOW CONTROL:**  
THE UNIT SHALL MAINTAIN ZONE SETPOINTS BY CONTROLLING THE AIRFLOW THROUGH ONE OF THE FOLLOWING:
- A) OCCUPIED:
    - I) WHEN ZONE TEMPERATURE IS GREATER THAN ITS COOLING SETPOINT, THE ZONE DAMPER SHALL MODULATE BETWEEN THE MINIMUM OCCUPIED AIRFLOW (ADJ.) AND THE MAXIMUM COOLING AIRFLOW (ADJ.) UNTIL THE ZONE IS SATISFIED.
    - II) WHEN THE ZONE TEMPERATURE IS BETWEEN THE COOLING SETPOINT AND THE HEATING SETPOINT, THE ZONE DAMPER SHALL MAINTAIN THE MINIMUM REQUIRED ZONE VENTILATION (ADJ.).
    - III) WHEN ZONE TEMPERATURE IS LESS THAN ITS HEATING SETPOINT, THE CONTROLLER SHALL ENABLE HEATING TO MAINTAIN THE ZONE TEMPERATURE AT ITS HEATING SETPOINT. ADDITIONALLY, IF WARM AIR IS AVAILABLE FROM THE AHU, THE ZONE DAMPER SHALL MODULATE BETWEEN THE MINIMUM OCCUPIED AIRFLOW (ADJ.) AND THE MAXIMUM HEATING AIRFLOW (ADJ.) UNTIL THE ZONE IS SATISFIED.
  - B) UNOCCUPIED:
    - I) WHEN THE ZONE IS UNOCCUPIED THE ZONE DAMPER SHALL CONTROL TO ITS MINIMUM UNOCCUPIED AIRFLOW (ADJ.).
    - II) WHEN THE ZONE TEMPERATURE IS GREATER THAN ITS COOLING SETPOINT, THE ZONE DAMPER SHALL MODULATE BETWEEN THE MINIMUM UNOCCUPIED AIRFLOW (ADJ.) AND THE MAXIMUM COOLING AIRFLOW (ADJ.) UNTIL THE ZONE IS SATISFIED.
    - III) WHEN ZONE TEMPERATURE IS LESS THAN ITS UNOCCUPIED HEATING SETPOINT, THE CONTROLLER SHALL ENABLE HEATING TO MAINTAIN THE ZONE TEMPERATURE AT THE SETPOINT. ADDITIONALLY, IF WARM AIR IS AVAILABLE FROM THE AHU, THE ZONE DAMPER SHALL MODULATE BETWEEN THE MINIMUM UNOCCUPIED AIRFLOW (ADJ.) AND THE AUXILIARY HEATING AIRFLOW (ADJ.) UNTIL THE ZONE IS SATISFIED.
- 3) FAN CONTROL - SERIES:**  
THE FAN SHALL RUN ANYTIME THE UNIT IS COMMANDED TO RUN. THE FAN SHALL RUN FOR A MINIMUM USER DEFINABLE TIME (ADJ.). THE ZONE DAMPER WILL CLOSE COMPLETELY BEFORE THE FAN STARTS TO PREVENT AIR FROM THE AHU FROM CAUSING THE FAN TO SPIN BACKWARD. THE ZONE DAMPER WILL RETURN TO AUTOMATIC CONTROL AFTER THE FAN STARTS.
- 4) HEATING COIL VALVE:**  
THE CONTROLLER SHALL MEASURE THE ZONE TEMPERATURE AND MODULATE THE REHEATING COIL VALVE OPEN ON DROPPING TEMPERATURE TO MAINTAIN ITS HEATING SETPOINT.
- 5) DISCHARGE AIR TEMPERATURE:**  
THE CONTROLLER SHALL MONITOR THE DISCHARGE AIR TEMPERATURE.
- 6) FAN STATUS:**  
THE CONTROLLER SHALL MONITOR THE FAN STATUS.
- 7) ZONE SETPOINT ADJUSTMENT (TEMPERATURE SENSOR IN DUCTWORK):**  
OCCUPANTS SHALL NOT BE ABLE TO ADJUST THE ZONE TEMPERATURE. THE ZONE SENSOR SHALL SEND A SIGNAL TO THE CONTROLLER TO MAINTAIN THE ZONE TEMPERATURE. ZONE TEMPERATURE MAY ONLY BE ADJUSTED THROUGH THE BUILDING MANAGEMENT SOFTWARE.
- 8) KITCHEN EXHAUST HOOD OPERATION (FPV-VAV-24):**  
BOX SHALL BE INTERLOCKED WITH KITCHEN EXHAUST HOOD TO OPEN TO 100% WHEN KITCHEN EXHAUST HOOD IS IN OPERATION.
- 9) LAUNDRY DRYER OPERATION (FPV-VAV-25):**  
BOX SHALL BE INTERLOCKED WITH DRYER TO OPEN TO 100% WHEN DRYER EXHAUST IS IN OPERATION.
- 10) SMOKE CONTROL ACTIVATION (FPVS IN AREA D & E):**  
IF A SMOKE DETECTOR IS ACTIVATED IN THE DAYROOM, THE ASSOCIATED BOX SHALL OPEN TO 100% SUPPLY AIR AND THE RECIRCULATION DAMPER SHALL CLOSE.
- THE UNIT SERVING THE ADJACENT DAYROOM SHALL ALSO BE COMMANDED TO 100% SUPPLY AIR.

**7 COMPUTER ROOM CONTROL SCHEMATIC**  
M-704 / SCALE: N.T.S.



- 1) COMPUTER ROOM UNIT:**  
CONTROL SEQUENCE PER MANUFACTURER'S STANDARD CONTROL. REFER TO SPECIFICATIONS FOR DETAILS.
- CONTRACTOR TO MOUNT ZONE SENSORS AND PROVIDE CONTROL WIRING TO SPACE SENSORS AND TO ASSOCIATED AIR COOLED CONDENSING UNIT.
- 2) FAN STATUS:**  
THE CONTROLLER SHALL MONITOR THE FAN STATUS.
- A) ALARMS SHALL BE PROVIDED AS FOLLOWS:**
- I) FAN FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
  - II) FAN IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.

**8 VAV FAN POWERED BOX CONTROL SCHEMATIC**  
M-704 / SCALE: N.T.S.



- 1) RUN CONDITIONS - CONTINUOUS:**  
THE UNIT SHALL RUN CONTINUOUSLY AND SHALL MAINTAIN:
- A) 75°F (ADJ.) COOLING SETPOINT.
  - B) 70°F (ADJ.) HEATING SETPOINT.
- 2) ZONE SETPOINT ADJUST:**  
THE OCCUPANT SHALL BE ABLE TO ADJUST THE ZONE TEMPERATURE HEATING AND COOLING SETPOINTS AT THE ZONE SENSOR.
- 3) REVERSING VARIABLE VOLUME TERMINAL UNIT - FLOW CONTROL:**  
THE UNIT SHALL MAINTAIN ZONE SETPOINTS BY CONTROLLING THE AIRFLOW THROUGH ONE OF THE FOLLOWING:
- A) OCCUPIED:
    - I) WHEN ZONE TEMPERATURE IS GREATER THAN ITS COOLING SETPOINT, THE ZONE DAMPER SHALL MODULATE BETWEEN THE MINIMUM OCCUPIED AIRFLOW (ADJ.) AND THE MAXIMUM COOLING AIRFLOW (ADJ.) UNTIL THE ZONE IS SATISFIED.
    - II) WHEN THE ZONE TEMPERATURE IS BETWEEN THE COOLING SETPOINT AND THE HEATING SETPOINT, THE ZONE DAMPER SHALL MAINTAIN THE MINIMUM REQUIRED ZONE VENTILATION (ADJ.).
    - III) WHEN ZONE TEMPERATURE IS LESS THAN ITS HEATING SETPOINT, THE CONTROLLER SHALL ENABLE HEATING TO MAINTAIN THE ZONE TEMPERATURE AT ITS HEATING SETPOINT. ADDITIONALLY, IF WARM AIR IS AVAILABLE FROM THE AHU, THE ZONE DAMPER SHALL MODULATE BETWEEN THE MINIMUM OCCUPIED AIRFLOW (ADJ.) AND THE MAXIMUM HEATING AIRFLOW (ADJ.) UNTIL THE ZONE IS SATISFIED.
  - B) UNOCCUPIED:
    - I) WHEN THE ZONE IS UNOCCUPIED THE ZONE DAMPER SHALL CONTROL TO ITS MINIMUM UNOCCUPIED AIRFLOW (ADJ.).
    - II) WHEN THE ZONE TEMPERATURE IS GREATER THAN ITS COOLING SETPOINT, THE ZONE DAMPER SHALL MODULATE BETWEEN THE MINIMUM UNOCCUPIED AIRFLOW (ADJ.) AND THE MAXIMUM COOLING AIRFLOW (ADJ.) UNTIL THE ZONE IS SATISFIED.
    - III) WHEN ZONE TEMPERATURE IS LESS THAN ITS UNOCCUPIED HEATING SETPOINT, THE CONTROLLER SHALL ENABLE HEATING TO MAINTAIN THE ZONE TEMPERATURE AT THE SETPOINT. ADDITIONALLY, IF WARM AIR IS AVAILABLE FROM THE AHU, THE ZONE DAMPER SHALL MODULATE BETWEEN THE MINIMUM UNOCCUPIED AIRFLOW (ADJ.) AND THE AUXILIARY HEATING AIRFLOW (ADJ.) UNTIL THE ZONE IS SATISFIED.
- 4) HEATING COIL VALVE:**  
THE CONTROLLER SHALL MEASURE THE ZONE TEMPERATURE AND MODULATE THE REHEATING COIL VALVE OPEN ON DROPPING TEMPERATURE TO MAINTAIN ITS HEATING SETPOINT.
- 5) DISCHARGE AIR TEMPERATURE:**  
THE CONTROLLER SHALL MONITOR THE DISCHARGE AIR TEMPERATURE.
- 6) ZONE SETPOINT ADJUSTMENT (TEMPERATURE SENSOR IN DUCTWORK, WHERE INDICATED):**  
OCCUPANTS SHALL NOT BE ABLE TO ADJUST THE ZONE TEMPERATURE. THE ZONE SENSOR SHALL SEND A SIGNAL TO THE CONTROLLER TO MAINTAIN THE ZONE TEMPERATURE. ZONE TEMPERATURE MAY ONLY BE ADJUSTED THROUGH THE BUILDING MANAGEMENT SOFTWARE.
- 7) UNIT SHUTDOWN (VAV 3-16 & 18 ONLY):**  
VAV BOX DAMPER SHALL CLOSE WHEN OVERHEAD DOOR IS OPENED ON THE INDOOR RECREATION (D1007 & E1007). A CONTACT SHALL BE PROVIDED TO THE OVERHEAD DOOR MOTOR.

**9 VAV SHUT-OFF BOX CONTROL SCHEMATIC**  
M-704 / SCALE: N.T.S.