I. AIR HANDLER AC–1

A.GENERAL

1. AC1 SERVES THE KITCHEN AREA. THE SYSTEM CONSISTS OF A PAIR OF PREHEAT COILS IN SERIES, A COOLING COIL, A 100% OUTSIDE AIR TWO POSITION DAMPER AND A SUPPLY FAN. IN ADDITION HV–1 AND EXHAUST FANS 1, 2, 26 AND 27 ALL OPERATE TOGETHER AS A COMPLETE SYSTEM.

B.SUPPLY FAN CONTROL

1. OCCUPIED MODE – WHENEVER THE UNIT IS IN OCCUPIED MODE THEN THE FAN WILL BE COMMANDED ON AFTER DAMPER IS PROVEN OPEN BY DAMPER END SWITCH.
2. UNOCCUPIED MODE – WHENEVER THE UNIT IS IN UNOCCUPIED MODE THE FAN WILL BE COMMANDED OFF.
3. IF THE SUPPLY FAN IS COMMANDED ON AND THE RUN STATUS IS NOT DETECTED WITHIN THE FAN ALARM DELAY PERIOD (300 SECONDS, DEFAULT) THEN THE FAN WILL BE COMMANDED OFF AND AN ALARM WILL BE GENERATED. IF THE FAN HAS BEEN RUNNING FOR MORE THAN TWO MINUTES AND RUN STATUS IS LOST THEN THE FAN WILL BE COMMANDED OFF AND AN ALARM WILL BE GENERATED. IF THE LOW TEMPERATURE LIMIT IS DETECTED THEN THE FAN WILL BE COMMANDED OFF AND AN ALARM WILL BE GENERATED.

C.COOLING COIL CONTROL

1. THE COOLING COIL IS CONTROLLED BY A NORMALLY CLOSED 5 TO 13 PSI VALVE.
2. UNOCCUPIED MODE – WHENEVER THE FAN IS OFF OR THE OUTSIDE AIR TEMPERATURE IS LESS THAN THE UNIT DISCHARGE AIR TEMPERATURE SET POINT THEN THE VALVE WILL BE CLOSED.
3. OCCUPIED MODE – WHEN THE SUPPLY FAN IS RUNNING AND THE OUTSIDE AIR TEMPERATURE IS GREATER THAN THE DISCHARGE AIR SET POINT PLUS 1°F THEN THE VALVE WILL MODULATE TO MAINTAIN THE DISCHARGE AIR SET POINT.

D.PREHEAT COIL CONTROL

1. THE PREHEAT COILS ARE JOINTLY CONTROLLED BY A NORMALLY OPEN VALVE USING A 3 TO 13 PSI VALVE.
2. UNOCCUPIED MODE – IF THE SUPPLY FAN AND THE SUPPLY FAN RUN INDICATION ARE BOTH OFF AND THE LOW LIMIT IS NOT TRIPPED OR IF THE OUTSIDE AIR TEMPERATURE IS GREATER THAN THE DISCHARGE AIR SET POINT THEN THE PREHEAT VALVE WILL BE CLOSED. IF THE LOW LIMIT IS TRIPPED THEN THE PREHEAT VALVE SIGNAL WILL BE SET TO 10 PSI. IF THE PREHEAT TEMPERATURE IS LESS THAN THE LOW LIMIT PREHEAT SET POINT THEN THE VALVE WILL BE MODULATED TO CONTROL TO THE LOW LIMIT PREHEAT SET POINT PLUS 4°F.
3. OCCUPIED MODE – WHEN THE SUPPLY FAN IS STARTED OR THE SUPPLY FAN RUN IS SENSED AND THE OUTSIDE AIR TEMPERATURE IS LESS THAN THE DISCHARGE AIR TEMPERATURE SET POINT MINUS 1°F OR THE OUTSIDE AIR TEMPERATURE IS LESS THAN 43°F, THE VALVE WILL BE MODULATED TO CONTROL THE PREHEAT TEMPERATURE TO THE LOW LIMIT PREHEAT SET POINT PLUS 4°F. IF THE PREHEAT TEMPERATURE IS GREATER THAN THE LOW LIMIT PREHEAT SET POINT PLUS 3°F THEN THE PREHEAT VALVE WILL BE MODULATED TO CONTROL THE UNIT DISCHARGE AIR TEMPERATURE TO THE DISCHARGE AIR SET POINT.

E.DAMPER CONTROL

1. WHENEVER THE UNIT IS COMMANDED ON, THE OUTSIDE AIR DAMPER SHALL OPEN TO 100% OUTSIDE AIR, WHEN PROVEN OPEN BY ITS END SWITCH, THE SUPPLY FAN SHALL BE ENERGIZED. WHEN THE SUPPLY FAN IS OFF THE DAMPERS WILL BE CLOSED.

F. ALARMING

1. FAN RUN FAILURE ALARM – IF THE SUPPLY FAN RUN INDICATION IS NOT SENSED WITHIN 30 SECONDS AFTER THE FAN HAS BEEN COMMANDED ON THEN AN ALARM WILL BE GENERATED AT THE OPERATOR WORKSTATION.
2. FLOW PROBLEM ALARM – IF THE SUPPLY FAN IS COMMANDED ON AND RUN INDICATION IS NOT SENSED WITHIN THE FAN ALARM DELAY TIME (5 MINUTE, DEFAULT) THEN A FLOW ALARM FLAG WILL BE ENABLED AND AN ALARM WILL BE GENERATED AT THE OPERATOR WORKSTATION. THE FAN WILL BE SHUTDOWN UNTIL THE FLOW ALARM FLAG IS MANUALLY RESET THROUGH THE OPERATOR INTERFACE AT THE FRONT END.
3. LOW LIMIT ALARM – IF A LOW LIMIT TEMPERATURE CUTOUT IS DETECTED THEN AFTER 180 SECONDS AN ALARM WILL BE GENERATED AT THE OPERATOR WORKSTATION.
4. FREEZE PROBLEM ALARM – IF THE SUPPLY FAN HAS BEEN RUNNING FOR MORE THAN 150 SECONDS AND A LOW LIMIT TRIP IS DETECTED THEN A FREEZE PROBLEM FLAG WILL BE ENABLED AND AN ALARM WILL BE GENERATED AT THE OPERATOR WORKSTATION. THE FAN WILL BE SHUTDOWN AND WILL REMAIN OFF UNTIL THE PROBLEM IS CLEARED AND THE FREEZE PROBLEM FLAG IS MANUALLY RESET THROUGH THE OPERATOR INTERFACE AT THE FRONT END.
5. DISCHARGE AIR TEMPERATURE ALARM – IF THE DISCHARGE AIR TEMPERATURE IS NOT BETWEEN 40°F AND 90°F AND THE UNIT IS OCCUPIED THEN AN ALARM WILL BE GENERATED AT THE OPERATOR WORKSTATION.
6. DIRTY FILTER ALARM – IF A DIRTY FILTER IS DETECTED BY AN EXCESSIVE PRESSURE DROP ACROSS IT THEN AN ALARM WILL BE GENERATED AT THE OPERATOR WORKSTATION.

II. AIR HANDLER HV–1

A.GENERAL

1. THE AIR HANDLER HV–1 SERVES THE KITCHEN AREA. THIS UNIT WORKS AS A SYSTEM ALONG WITH AC–1, EF–1, EF–2, EF–26 AND EF–27. THE AIR HANDLER CONSISTS OF A PAIR OF PREHEAT COILS IN SERIES, A 100% OUTSIDE AIR TWO POSITION DAMPER AND A SUPPLY FAN.

B.SUPPLY FAN CONTROL

1. OCCUPIED MODE – THE SUPPLY FAN WORKS ALONG WITH AC–1 SUPPLY FAN. WHEN AC–1 UNIT OCCUPANCY IS ON AND A FAN RUN INDICATION IS SENSED FOR AC–1 THEN HV–1 SUPPLY FAN WILL BE COMMANDED ON AFTER HV–1 DAMPER IS PROVEN OPEN BY DAMPER END SWITCH. IF AC–1 HAS A FLOW PROBLEM ALARM OR A FREEZE PROBLEM ALARM THEN THE SUPPLY FAN WILL BE COMMANDED OFF UNTIL THE FLOW OR FREEZE PROBLEM FLAGS HAVE BEEN CLEARED.
2. UNOCCUPIED MODE – WHENEVER AC–1 IS IN THE UNOCCUPIED MODE THEN HV–1 SUPPLY FAN WILL BE COMMANDED OFF.

C.PREHEAT COIL CONTROL

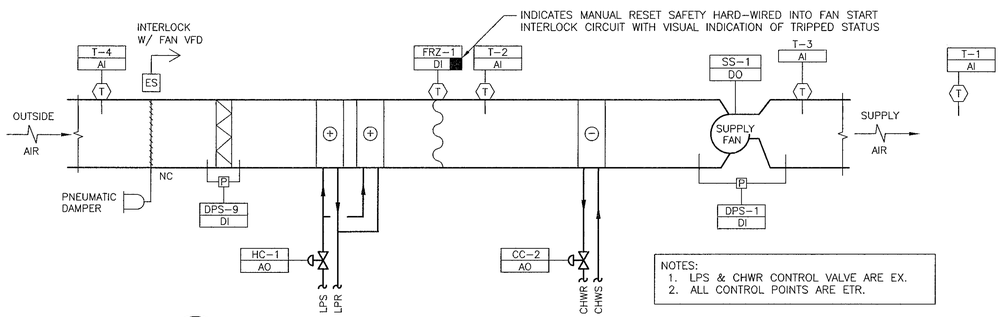
1. THE PREHEAT COILS ARE JOINTLY CONTROLLED BY A NORMALLY OPEN VALVE, USING A 3 TO 13 PSI VALVE.
2. UNOCCUPIED MODE – IF THE SUPPLY FAN RUN INDICATION IS OFF AND THE OUTSIDE AIR TEMPERATURE IS LESS THAN 42°F THEN THE VALVE SIGNAL WILL BE SET TO 10 PSI, BUT IF THE OUTSIDE AIR TEMPERATURE IS GREATER THAN 42°F THEN THE VALVES WILL BE CLOSED. IF THE LOW LIMIT IS TRIPPED THEN THE VALVES WILL BE FULLY OPEN.
3. OCCUPIED MODE – IF THE SUPPLY FAN RUN INDICATION IS ON, THEN THE VALVES WILL BE MODULATED TO MAINTAIN THE DISCHARGE AIR TEMPERATURE TO THE DISCHARGE AIR TEMPERATURE SET POINT (ADJUSTABLE).

D.DAMPER CONTROL

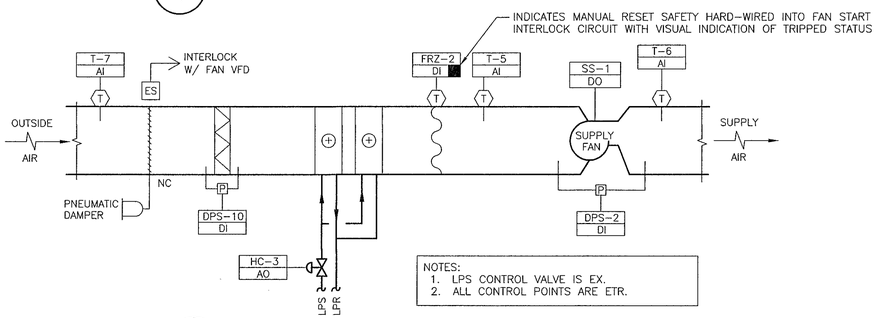
1. WHENEVER THE UNIT IS COMMANDED ON, THE OUTSIDE AIR DAMPER SHALL OPEN TO 100% OUTSIDE AIR, WHEN PROVEN OPEN BY ITS END SWITCH, THE SUPPLY FAN SHALL BE ENERGIZED. WHEN THE SUPPLY FAN IS OFF THE DAMPERS WILL BE CLOSED.

E. ALARMING

1. FAN RUN FAILURE ALARM – IF THE SUPPLY FAN RUN INDICATION IS NOT SENSED WITHIN 30 SECONDS AFTER THE FAN HAS BEEN COMMANDED ON THEN AN ALARM WILL BE GENERATED AT THE OPERATOR WORKSTATION.
2. FLOW PROBLEM ALARM – IF THE SUPPLY FAN IS COMMANDED ON AND RUN INDICATION IS NOT SENSED WITHIN THE FAN ALARM DELAY TIME (5 MINUTE, DEFAULT) THEN A FLOW ALARM FLAG WILL BE ENABLED AND AN ALARM WILL BE GENERATED AT THE OPERATOR WORKSTATION. THE FAN WILL BE SHUTDOWN UNTIL THE FLOW ALARM FLAG IS MANUALLY RESET THROUGH THE OPERATOR INTERFACE AT THE FRONT END.
3. LOW LIMIT ALARM – IF A LOW LIMIT TEMPERATURE CUTOUT IS DETECTED THEN AFTER 180 SECONDS AN ALARM WILL BE GENERATED AT THE OPERATOR WORKSTATION.
4. FREEZE PROBLEM ALARM – IF THE SUPPLY FAN HAS BEEN RUNNING FOR MORE THAN 150 SECONDS AND A LOW LIMIT TRIP IS DETECTED THEN A FREEZE PROBLEM FLAG WILL BE ENABLED AND AN ALARM WILL BE GENERATED AT THE OPERATOR WORKSTATION. THE FAN WILL BE SHUTDOWN AND WILL REMAIN OFF UNTIL THE PROBLEM IS CLEARED AND THE FREEZE PROBLEM FLAG IS MANUALLY RESET THROUGH THE OPERATOR INTERFACE AT THE FRONT END.
5. DISCHARGE AIR TEMPERATURE ALARM – IF THE DISCHARGE AIR TEMPERATURE IS NOT BETWEEN 40°F AND 90°F AND AC–1 IS IN THE OCCUPIED MODE THEN AN ALARM WILL BE GENERATED AT THE OPERATOR WORKSTATION.
6. DIRTY FILTER ALARM – IF A DIRTY FILTER IS DETECTED BY AN EXCESSIVE PRESSURE DROP ACROSS IT THEN AN ALARM WILL BE GENERATED AT THE OPERATOR WORKSTATION.



1 CONTROL DIAGRAM – AC–1
NO SCALE



2 CONTROL DIAGRAM – HV–1
NO SCALE

I. AIR HANDLER HV–3

A.GENERAL

1. HV–3 SERVES THE BASEMENT AREA. THE UNIT CONSISTS OF A PREHEAT COIL, A COOLING COIL, A REHEAT COIL, A 100% OUTSIDE AIR TWO POSITION DAMPER, AND A CONSTANT SPEED SUPPLY FAN. THE SYSTEM ALSO INCLUDES EF–9, EF–10 AND EF–11 THAT ARE STARTED AND STOPPED WITH HV–3.

B.SUPPLY FAN CONTROL

1. OCCUPIED MODE – WHENEVER THE UNIT IS IN OCCUPIED MODE THEN THE SUPPLY FAN WILL BE COMMANDED ON AFTER DAMPER IS PROVEN OPEN BY END SWITCH. ONCE SUPPLY FAN RUN INDICATION IS SENSED, HV–3'S ASSOCIATED EXHAUST FANS WILL BE STARTED.
2. UNOCCUPIED MODE – WHENEVER THE UNIT IS IN UNOCCUPIED MODE THE SUPPLY FAN AND ASSOCIATED EXHAUST FANS WILL BE COMMANDED OFF.
3. IF THE SUPPLY FAN IS COMMANDED ON AND THE RUN STATUS IS NOT DETECTED WITHIN THE FAN ALARM DELAY PERIOD (300 SECONDS, DEFAULT) THEN THE SUPPLY FAN AND ITS ASSOCIATED EXHAUST FANS WILL BE COMMANDED OFF AND AN ALARM WILL BE GENERATED. IF THE FAN IS RUNNING AND RUN STATUS IS LOST THEN THE FAN WILL BE COMMANDED OFF AND AN ALARM WILL BE GENERATED. IF THE LOW TEMPERATURE LIMIT IS DETECTED THEN THE SUPPLY FAN AND ITS ASSOCIATED EXHAUST FANS WILL BE COMMANDED OFF AND AN ALARM WILL BE GENERATED.

C.PREHEAT COIL CONTROL

1. THE PREHEAT COILS IS CONTROLLED BY A NORMALLY OPEN 0–24V VALVE.
2. UNOCCUPIED MODE – IF THE SUPPLY FAN AND THE SUPPLY FAN RUN INDICATION ARE BOTH OFF AND IF THE OUTSIDE AIR TEMPERATURE IS GREATER THAN THE DISCHARGE AIR SET POINT THEN THE PREHEAT VALVE WILL BE CLOSED. IF THE PREHEAT TEMPERATURE IS LESS THAN THE LOW LIMIT PREHEAT SET POINT OR THE UNIT FREEZE PROBLEM FLAG IS ON THEN THE VALVE WILL BE MODULATED TO CONTROL TO THE LOW LIMIT PREHEAT SET POINT PLUS 4°F.
3. OCCUPIED MODE – WHEN THE SUPPLY FAN IS STARTED OR THE SUPPLY FAN RUN IS SENSED AND THE OUTSIDE AIR TEMPERATURE IS LESS THAN THE DISCHARGE AIR TEMPERATURE THEN THE VALVE WILL BE IMMEDIATELY OPENED AND THEN, IF THE SUPPLY FAN RUN INDICATION IS VERIFIED, THE VALVE WILL BE MODULATED TO CONTROL HEATING OPERATION TO THE LOW LIMIT PREHEAT AIR SET POINT.

D.COOLING COIL CONTROL

1. THE COOLING COIL IS CONTROLLED BY A NORMALLY CLOSED 0–24V VALVE.
2. UNOCCUPIED MODE– WHENEVER THE FAN IS OFF THE VALVE WILL BE CLOSED.
3. OCCUPIED MODE– WHEN THE SUPPLY FAN IS RUNNING AND THE OUTDOOR AIR TEMPERATURE IS ABOVE 58 DEGREES F, THE VALVE IS MODULATED TO MAINTAIN THE DEW POINT TEMPERATURE IN THE BASEMENT CORRIDOR AT BETWEEN 54 AND 56 DEGREES F.

E.REHEAT COIL CONTROL

1. THE REHEAT COIL IS CONTROLLED BY A NORMALLY OPEN 0–24V VALVE.
2. UNOCCUPIED MODE– IF THE SUPPLY FAN IS OFF AND THE LOW–LIMIT ALARM IS TRIPPED, THE VALVE SHALL REMAIN OPEN.
3. OCCUPIED MODE– WHEN THE SUPPLY FAN IS STARTED AND THE SUPPLY FAN RUN IS SENSED, THE VALVE WILL BE MODULATED TO MAINTAIN THE DISCHARGE AIR TEMPERATURE TO THE DISCHARGE AIR SETPOINT.

F.DISCHARGE AIR RESET CONTROL

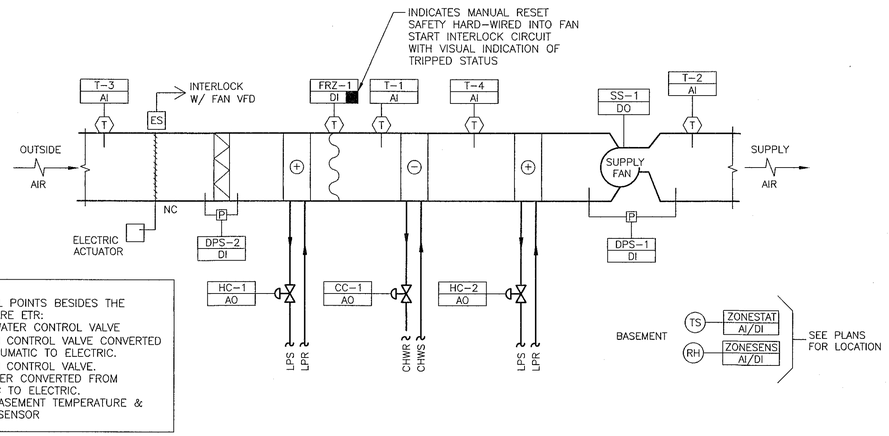
1. IF THE UNIT SUPPLY FAN RUN IS OFF THEN THE DISCHARGE AIR SET POINT WILL BE 55°F OTHERWISE THE DISCHARGE AIR SET POINT IS RESET BASED ON THE SPACE TEMPERATURE ERROR (DIFFERENCE BETWEEN SPACE AND SPACE SET POINT). AS THE SPACE TEMPERATURE ERROR VARIES FROM 0°F TO ±1°F THE DISCHARGE AIR TEMPERATURE WILL MODULATE FROM 55°F TO 90°F.

G.DAMPER CONTROL

1. WHENEVER THE UNIT IS COMMANDED ON, THE OUTSIDE AIR DAMPER SHALL OPEN TO 100% OUTSIDE AIR, WHEN PROVEN OPEN BY ITS END SWITCH, THE SUPPLY FAN SHALL BE ENERGIZED. WHEN THE SUPPLY FAN IS OFF THE DAMPERS WILL BE CLOSED.

H.ALARMING

1. SUPPLY FAN RUN FAILURE ALARM – IF THE SUPPLY FAN RUN INDICATION IS NOT SENSED WITHIN 30 SECONDS AFTER THE FAN HAS BEEN COMMANDED ON THEN AN ALARM WILL BE GENERATED AT THE OPERATOR WORKSTATION.
2. FLOW PROBLEM ALARM – IF THE SUPPLY FAN IS COMMANDED ON AND RUN INDICATION IS NOT SENSED WITHIN THE FAN ALARM DELAY TIME (5 MINUTE, DEFAULT) THEN A FLOW ALARM FLAG WILL BE ENABLED AND AN ALARM WILL BE GENERATED AT THE OPERATOR WORKSTATION. THE FAN WILL BE SHUTDOWN UNTIL THE FLOW ALARM FLAG IS MANUALLY RESET THROUGH THE OPERATOR INTERFACE AT THE FRONT END.
3. LOW LIMIT ALARM – IF A LOW LIMIT TEMPERATURE CUTOUT IS DETECTED THEN AFTER 180 SECONDS AN ALARM WILL BE GENERATED AT THE OPERATOR WORKSTATION.
4. FREEZE PROBLEM ALARM – IF THE SUPPLY FAN HAS BEEN RUNNING FOR MORE THAN 90 SECONDS AND A LOW LIMIT TRIP IS DETECTED THEN A FREEZE PROBLEM FLAG WILL BE ENABLED AND AN ALARM WILL BE GENERATED AT THE OPERATOR WORKSTATION. THE FAN WILL BE SHUTDOWN AND WILL REMAIN OFF UNTIL THE PROBLEM IS CLEARED AND THE FREEZE PROBLEM FLAG IS MANUALLY RESET THROUGH THE OPERATOR INTERFACE AT THE FRONT END.
5. DISCHARGE AIR TEMPERATURE ALARM – IF THE DISCHARGE AIR TEMPERATURE IS NOT BETWEEN 40°F AND 90°F AND THE UNIT IS OCCUPIED THEN AN ALARM WILL BE GENERATED AT THE OPERATOR WORKSTATION.
6. DIRTY FILTER ALARM – IF A DIRTY FILTER IS DETECTED BY AN EXCESSIVE PRESSURE DROP ACROSS IT THEN AN ALARM WILL BE GENERATED AT THE OPERATOR WORKSTATION.



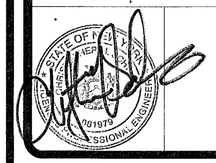
3 CONTROL DIAGRAM – HV–3
NO SCALE

NEW YORK STATE OF OPPORTUNITY. Office of General Services

DESIGN & CONSTRUCTION

CONSULTANT

FPM ENGINEERING GROUP, P.C.



CONTRACT: HVAC

TITLE: REMOVE/ REPLACE AIR HANDLING UNITS BUILDING 144

LOCATION: COOK CHILL PRODUCTION CENTER 145 OLD ORANGEBURG ROAD ORANGEBURG, NY 10962

CLIENT: NEW YORK STATE OFFICE OF MENTAL HEALTH

MARK	DATE	DESCRIPTION
	09/29/2020	BID DOCUMENTS

PROJECT NUMBER: 46024–H

DESIGNED BY: JM
DRAWN BY: JM
FIELD CHECK:
APPROVED: CMS

SHEET TITLE: SEQUENCES OF OPERATION & CONTROL DIAGRAMS

DRAWING NUMBER: M–502

SHEET 6 OF 7