ATC GENERAL NOTES

MC023

1. THE ATC CONTRACTOR SHALL FURNISH AND INSTALL ALL ELECTRICAL WIRING AND CONDUIT FROM POWER SOURCE, INCLUDING TERMINATION TO ALL REQUIRED ATC RELATED POWER CONNECTIONS INCLUDING, BUT NOT LIMITED TO, DDC CONTROLLERS (PROVIDE LOW VOLTAGE CONTROLLER FOR AIR TERMINAL UNITS INCLUDING TRANSFORMERS AND DISCONNECT SWITCHES AS REQUIRED), SENSORS, VALVE AND DAMPER ACTUATORS (INCLUDING SMOKE DAMPERS), AIR FLOW MONITORS, ATC PANELS, ETC. THE ATC CONTRACTOR SHALL OBTAIN A SEPARATE ELECTRICAL PERMIT AS REQUIRED BY THE LOCAL AUTHORITY. THE ATC CONTRACTOR SHALL BE WHOLLY RESPONSIBLE FOR ALL POWER REQUIREMENTS NECESSARY FOR A COMPLETE INSTALLATION FROM THE POWER SOURCE TO ALL ATC RELATED CONNECTIONS.
2. WATER PRESSURE DROP THROUGH ATC CONTROL VALVES SHALL NOT EXCEED 10 FT. HEAD. TWO-POSITION ATC VALVES UTILIZED FOR ISOLATION, BY-PASS OR SHUT-OFF PURPOSES SHALL BE FULL LINE SIZE.
3. EACH AIR DISTRIBUTION SYSTEM SHALL BE PROVIDED WITH NOT LESS THAN ONE (1) MANUALLY OPERABLE MEANS TO STOP THE OPERATION OF THE SUPPLY, RETURN AND EXHAUST FAN(S) IN AN EMERGENCY. THE MEANS OF MANUAL OPERATION SHALL BE LOCATED AT A LOCATION APPROVED BY THE LOCAL AUTHORITY HAVING JURISDICTION (AHJ). TYPICALLY, PROVIDE A MANUAL FIRE DEPARTMENT HVAC SHUTDOWN VIA A KNOX KEY SWITCH FOR ALL SUPPLY, AND EXHAUST FAN(S) AS REQUIRED BY THE LOCAL AHJ. SWITCH SHALL BE LOCATED ADJACENT TO THE FIRE ALARM ANNUNCIATOR PANEL AND SHUTDOWN CONTROL SHALL BE HARD-WIRED IN CONDUIT THROUGH THE ATC SYSTEM. ALL WORK SHALL COMPLY WITH NFPA 90A AND THE NATIONAL ELECTRICAL CODE. COORDINATE EXACT REQUIREMENTS WITH AHJ.
4. THE ATC CONTRACTOR SHALL PROVIDE ALL POINTS REQUIRED TO ACCOMPLISH THE CONTROL SEQUENCES INDICATED ON THE DRAWINGS AND IN THE SPECIFICATIONS. ALL POINTS SHALL BE TIED INTO THE ENERGY MANAGEMENT CONTROL SYSTEM (EMCS). IN ADDITION, THE ATC CONTRACTOR SHALL PROVIDE ALL POINTS REQUIRED TO CONTROL, OPERATE AND MONITOR ALL EQUIPMENT AND DEVICES (IE, CHILLERS, BOILERS, PUMPS, AIR HANDLING UNITS, TERMINAL UNITS, AIR VOLUME TERMINALS, FANS, HUMIDIFIERS, VALVES, DAMPERS, FLOW MEASURING DEVICES, SENSORS, ETC.) INDICATED THROUGHOUT THE CONTRACT DOCUMENTS.
5. PROVIDE EQUIPMENT STATUS FOR ALL MECHANICAL EQUIPMENT. EQUIPMENT FAILURES SHALL BE ALARMED AT THE EMCS. PROVIDE END SWITCHES FOR ALL MOTOR OPERATED DAMPERS. END SWITCHES SHALL BE INTERFACED WITH THE EMCS.
6. PROVIDE TEMPERATURE SENSORS TIED INTO THE EMCS AT THE INLET AND OUTLET OF ALL HEAT EXCHANGE EQUIPMENT (CHILLERS, COOLING TOWERS, BOILERS, HEAT EXCHANGERS, AIR HANDLING UNITS, ETC.) IN ADDITION, PROVIDE TEMPERATURE SENSOR IN SUPPLY DUCTWORK DOWNSTREAM OF ALL TERMINAL REHEAT UNITS, VAV TERMINALS WITH REHEAT COILS AND DUCT MOUNTED HEATING COILS.
7. PROVIDE EMERGENCY SHUT-OFF SWITCHES FOR ALL FUEL BURNING EQUIPMENT (BOILERS, WATER HEATERS, ETC.) COORDINATE WIRING TERMINATIONS WITH EQUIPMENT MANUFACTURERS. SEE SPECIFICATIONS FOR ADDITIONAL INFORMATION.
8. GENERAL EXHAUST FANS, VENTILATION FANS, RELIEF AND INTAKE HOODS SHALL BE PROVIDED WITH MOTOR OPERATED DAMPERS. UNLESS OTHERWISE NOTED, DAMPERS SHALL OPEN WHEN FAN IS ENERGIZED AND CLOSED WHEN FAN IS DE-ENERGIZED.
9. ALL SAFETIES FOR AIR HANDLING EQUIPMENT (FREEZESTATS, SMOKE DETECTORS, PRESSURE SWITCHES, ETC.) SHALL BE HARDWIRED TO THE FAN STARTER .
10. ALL AIR FLOW MONITORS (AFM) AND CO2 SENSORS SHALL GENERATE AN ALARM CONDITION AT THE EMCS WHENEVER CONDITIONS EXCEED SETPOINT (ADJUSTABLE) BY 10% OR MORE.
11. PROVIDE CURRENT SENSING RELAYS FOR ALL MECHANICAL EQUIPMENT AS REQUIRED TO PROVIDE EQUIPMENT STATUS. EQUIPMENT STATUS SHALL BE INDICATED AS THE EMCS.

CABINET HEATER CONTROL

MC004

1. CABINET HEATER THERMOSTATS SHALL BE DESIGNED TO OPERATE ON A 2°F DIFFERENTIAL OVER A RANGE OF 55°F-85°F AND SHALL BE OF THE START/STOP TYPE.
2. FAN MOTOR SHALL CYCLE TO MAINTAIN THERMOSTAT SETTING (65°F). THERMOSTAT SHALL BE MOUNTED IN RETURN AIR .
3. PROVIDE AQUASTAT MOUNTED TO HEATING RETURN LINE TO PREVENT OPERATION OF CABINET HEATER FAN MOTOR WHEN HOT WATER IS NOT AVAILABLE TO COIL. AQUASTAT SETTING SHALL BE APPROXIMATELY 90°F.
4. PROVIDE TWO WAY CONTROL VALVE (2-POSITION TYPE), BELOW 60°F OUTSIDE AIR (ADJUSTABLE) TEMPERATURE, CONTROL VALVE SHALL BE OPEN. ABOVE 60°F OUTSIDE AIR (ADJUSTABLE) TEMPERATURE, CONTROL VALVE SHALL BE CLOSED.

SPACE CONTROL

MC015

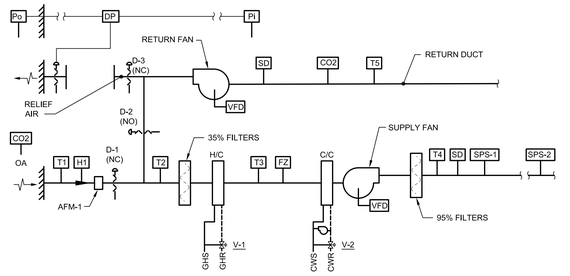
VARIABLE VOLUME TERMINAL WITH HEATING COIL AND RADIATION;

1) ON A FALL IN SPACE TEMPERATURE, THERMOSTAT SHALL MODULATE VAV DAMPER TOWARD MINIMUM COOLING CFM SETTING.

2A) ON A CONTINUED FALL IN TEMPERATURE WITH O.A. TEMPERATURE BELOW 60°F (ADJUSTABLE) AIR TERMINAL SHALL OPEN TO HEATING CFM SETPOINT AND THERMOSTAT SHALL MODULATE HEATING COIL TWO-WAY VALVE AND RADIATION TWO-WAY VALVE TO MAINTAIN SETPOINT.

2B) ON A CONTINUED FALL IN TEMPERATURE WITH O.A. TEMPERATURE ABOVE 60°F (ADJUSTABLE) AND HEATING WATER IS AVAILABLE TO THE COIL, AIR TERMINAL SHALL REMAIN AT MINIMUM COOLING CFM AND THERMOSTAT SHALL MODULATE HEATING COIL VALVE ONLY TO MAINTAIN SETPOINT. RADIATION VALVE SHALL BE CLOSED ABOVE 60°F O.A. TEMPERATURE (ADJUSTABLE).

3) ON A RISE IN TEMPERATURE, THE OPPOSITE SHALL OCCUR .



AIR HANDLING UNIT #1 CONTROL SEQUENCE

1. GENERAL

1.1 SUPPLY AIR FAN AND RETURN AIR FAN OPERATION SHALL BE INTERLOCKED. SUPPLY AND RETURN FANS SHALL OPERATE CONTINUOUSLY IN THE OCCUPIED MODE. H-O-A SWITCH SHALL BE KEPT IN "AUTO" POSITION. IN "OFF" POSITION, D-1 AND D-3 SHALL BE FULLY CLOSED AND D-2 SHALL BE FULLY OPEN. WHEN FANS ARE DE-ENERGIZED, D-1 AND D-3 SHALL BE FULLY CLOSED.

1.2 OCCUPIED-UNOCCUPIED MODE SHALL BE AS DETERMINED BY THE ENERGY MANAGEMENT CONTROL SYSTEM (EMCS).

1.3 PROVIDE SEPARATE, INDEPENDENT LINKAGE CONTROL FOR EACH M.O.D. (D-1, D-2 & D-3).

2. TEMPERATURE CONTROL

2.1 OCCUPIED:

A. WHEN THE OUTSIDE AIR ENTHALPY IS ABOVE THE RETURN AIR ENTHALPY, D-1, D-2 & D-3 SHALL MODULATE AS FOLLOWS:

1) D-1 (OUTSIDE AIR) SHALL MODULATE TO MINIMUM OUTSIDE AIR POSITION IN RESPONSE TO AIRFLOW MONITOR, AFM-1. SEE AIR FLOW CONTROL BELOW.

2) D-2 (RETURN AIR) SHALL FULLY OPEN.

3) D-3 (RELIEF AIR) SHALL MODULATE TO MAINTAIN A POSITIVE BUILDING PRESSURIZATION OF 0.05 IN. WC. AS SENSED BY INDOOR AND OUTDOOR PRESSURE SENSORS (PI VERSUS Po).

4) D-3 SHALL BE CLOSED WHENEVER BUILDING PRESSURIZATION (PI VERSUS Po) IS LESS THAN 0.01" WC.

B. WHEN THE OUTSIDE AIR ENTHALPY IS LESS THEN THE RETURN AIR ENTHALPY, D-1, D-2 & D-3 SHALL MODULATE TO MAXIMIZE ATMOSPHERIC (FREE) COOLING AND MAINTAIN A MIXED AIR TEMPERATURE EQUAL TO THE SUPPLY AIR TEMPERATURE SETPOINT (ADJUSTABLE). THE RELIEF DAMPER SHALL MODULATE TO MAINTAIN A POSITIVE BUILDING PRESSURE OF 0.05" W.C. (ADJUSTABLE) AS SENSED BY INDOOR AND OUTDOOR PRESSURE SENSORS (PI AND Po).

C. THE SUPPLY AIR TEMPERATURE, SENSED BY T4, SHALL THEN BE MAINTAINED AT SETPOINT BY MODULATING V-1 OR V-2 AS REQUIRED. THE SUPPLY AIR TEMPERATURE SETPOINT SHALL BE AS PER THE FOLLOWING SUPPLY AIR RESET SCHEDULE (ALL TEMPERATURES SHALL BE ADJUSTABLE).

SUPPLY AIR RESET SCHEDULE	
OA TEMP (°F)	SUPPLY AIR TEMP (°F)
ABOVE 65	55
55 - 65	*
BELOW 55	55

* SUPPLY AIR TEMPERATURE SHALL BE LINEAR BETWEEN ABOVE 65' SETPOINT AND 'BELOW 55' SETPOINT.

2.2 UNOCCUPIED (HEATING): NIGHT THERMOSTAT SHALL CYCLE FANS AND OPEN HEATING VALVE, V-1, TO MAINTAIN NIGHT SETBACK TEMPERATURE. D-1 AND D-3 SHALL BE FULLY CLOSED AND D-2 FULLY OPEN. WHEN SUPPLY FAN CYCLES 'ON' THE ASSOCIATED VAV TERMINAL DAMPERS SHALL OPEN. BELOW 35 °F OUTSIDE AIR TEMPERATURE, HEATING VALVE SHALL MODULATE TO MAINTAIN INTERIOR UNIT TEMPERATURE OF 90°F (ADJUSTABLE).

2.3 UNOCCUPIED (COOLING): NIGHT THERMOSTAT AND HUMIDISTAT SHALL CYCLE FAN(S) AND OPEN COOLING VALVE, V-2. TO MAINTAIN NIGHT SETBACK TEMPERATURE AND HUMIDITY SETPOINTS (ADJUSTABLE). D-1 AND D-3 SHALL BE FULLY CLOSED AND D-2 FULLY OPEN.

2.4 MORNING WARM-UP: WHEN SYSTEM IS FIRST INDEXED TO OCCUPIED, DAMPERS D-1 & D-3 SHALL REMAIN CLOSED, D-2 SHALL REMAIN OPEN, VAV TERMINAL DAMPERS SHALL OPEN, AND FANS SHALL OPERATE WITH HEATING VALVE OPEN UNTIL RETURN AIR, AS SENSED BY T5, REACHES 65 °F (ADJUSTABLE). AT THIS TIME, SYSTEM SHALL RETURN TO THE OCCUPIED MODE, SEE 2.1 AND LOCAL THERMOSTATS SHALL REGAIN CONTROL OF ASSOCIATED VAV TERMINALS.

3. AIR FLOW / FAN CONTROL

3.1 OCCUPIED:

A. FAN PRESSURE OPTIMIZATION (STATIC PRESSURE RESET): EVERY 10 MINUTES (ADJUSTABLE) DURING THE OCCUPIED MODE, THE DAMPER POSITIONS OF EACH VAV TERMINAL ASSOCIATED WITH THE AHU SHALL BE POLLED. BASED ON FEEDBACK FROM THE VAV DAMPER POSITIONS, THE STATIC PRESSURE SETPOINT SHALL BE RESET IN +/- 0.1" W.C. INCREMENTS (MAX 0.1" PER 10 MINUTE POLLING CYCLE) BETWEEN A FIXED RANGE (LOW END SHALL BE MINIMUM 1.0" W.C. - ADJUSTABLE, UPPER END SHALL BE 0.25" W.C. ABOVE THE STATIC PRESSURE SETPOINT DETERMINED BY THE BALANCE CONTRACTOR). IF THERE ARE NO VAV DAMPER POSITIONS GREATER THAN 90% OPEN (ADJUSTABLE), THEN THE STATIC PRESSURE SET POINT SHALL BE LOWERED UNTIL AT LEAST ONE VAV DAMPER IS AT LEAST 90% OPEN (ADJUSTABLE). IF ANY ONE VAV DAMPER OPENS GREATER THAN 95% OPEN (ADJUSTABLE), THEN THE STATIC PRESSURE SET POINT SHALL BE RAISED UNTIL THE MAXIMUM VAV DAMPER POSITION IS BELOW 95% OPEN (ADJUSTABLE). IF THE MAX. VAV DAMPER POSITION IS BETWEEN 90% AND 95% OPEN (ADJUSTABLE), THEN THE STATIC PRESSURE SET POINT SHALL REMAIN IN STEADY STATE UNTIL THE NEXT TEN MINUTE POLLING CYCLE.

B. THE EMCS SHALL MODULATE THE RETURN FAN VARIABLE FREQUENCY DRIVE TO MAINTAIN AN OFFSET BETWEEN THE SUPPLY AND RETURN FAN AS REQUIRED TO MAINTAIN AN AIR FLOW OFFSET EQUAL TO THE OUTSIDE AIR .

C. AIR FLOW MONITOR, AFM-1, LOCATED AT THE OUTSIDE AIR INTAKE SHALL MODULATE D-1 TO MAINTAIN VENTILATION AIR QUANTITY AS INDICATED ON AIR HANDLING UNIT SCHEDULE. AFM-1 CONTROL SHALL BE OVERRIDDEN DURING ECONOMIZER MODE (ATMOSPHERIC COOLING), OR BY AHU VENTILATION RESET CONTROL / DEMAND CONTROLLED VENTILATION (SEE ATC SPECIFICATION FOR AHU VENTILATION RESET REQUIREMENTS).

3.2 UNOCCUPIED: DURING NIGHT SETBACK AND MORNING WARM-UP OPERATION, FANS SHALL BE ENERGIZED AS PER 2.2 AND 2.3 ABOVE. RETURN FAN VARIABLE FREQUENCY DRIVE, VFD, SHALL MODULATE TO MAINTAIN FULL AIRFLOW (EQUAL TO SUPPLY AIRFLOW) DURING WARM-UP & NIGHT SETBACK OPERATION.

4. FREEZE PROTECTION

4.1 CHILLED WATER COIL CIRCULATOR PUMP SHALL OPERATE CONTINUOUSLY BELOW OUTSIDE AIR TEMPERATURE OF 40°F.

4.2 HEATING WATER COIL CIRCULATOR PUMP:

A. WHEN THE OUTDOOR AIR TEMPERATURE IS BELOW 40°F (ADJUSTABLE) AND THE SUPPLY FAN IS ENERGIZED, THE PUMP SHALL BE ENERGIZED IF THE HEATING WATER CONTROL VALVE IS LESS THAN FIVE (5) PERCENT (ADJUSTABLE) OPEN.

B. WHEN THE OUTDOOR AIR TEMPERATURE IS BELOW 40°F (ADJUSTABLE), AND THE SUPPLY FAN IS DE-ENERGIZED, THE PUMP SHALL BE ENERGIZED TO RUN CONTINUOUSLY. WHEN THE OUTDOOR AIR RISES ABOVE 40°F, THE PUMP SHALL BE DE-ENERGIZED.

5.3 WHEN THE AIR TEMPERATURE, AS SENSED BY T3, FALLS BELOW 40°F, AN ALARM SIGNAL SHALL BE INDICATED AT THE EMCS. IF THIS TEMPERATURE FALLS BELOW 36 °F, THE UNIT SUPPLY AND RETURN FAN(S) SHALL DE-ENERGIZE, AND A CRITICAL ALARM SHALL BE INDICATED AT THE EMCS, THE FREEZE PROTECTION PUMPS SHALL BE ENERGIZED AND THE OUTSIDE AIR DAMPER SHALL CLOSE.

6. MISCELLANEOUS

6.1 SMOKE DETECTORS, SD, LOCATED IN THE SUPPLY AND RETURN AIR SHALL DE-ENERGIZE FANS SHOULD PRODUCTS OF COMBUSTION BE SENSED. ALARM AT THE EMCS.

6.2 HIGH LIMIT STATIC PRESSURE SENSOR, SPS-1 SHALL DE-ENERGIZE AHU FANS WHEN STATIC PRESSURE REACHES 6.0" (ADJUSTABLE). ALARM AT THE EMCS.

6.3 THE EMCS SHALL MONITOR FILTER LOADING ACROSS EACH FILTER BANK. ALARM AT THE EMCS.

6.4 PROVIDE OUTDOOR AIR AND RETURN AIR CO2 SENSORS AND MONITOR AT THE EMCS.

three inches = one foot
one and one half inch = one foot
one inch = one foot
three-quarters inch = one foot
one-half inch = one foot
three-eighths inch = one foot
one-quarter inch = one foot
one-eighth inch = one foot

Additions: | *Date:*

Revisions:

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Drawing Scale:
Drawing Start Date:
Drawing Finish Date:
Drawing Approved:

Drawing Title: ATC

Approved: Associate Director for Operations:
Approved: Chief, Facilites Engineer:
Approved: Director, Medical Center:

Project Title: BUILDING 15 RENOVATION

Building No: 15
Checked: JDS
Drawn: DAT

Location: VAMHCS MEDICAL CENTER WILMINGTON, DELAWARE

Date: 12-19-2012
Project No: xxx-10-xxx
DRAWING NO: 15-H18
Dwg. – Of xx

DEPARTMENT OF VETERANS AFFAIRS

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