CONSTANT VOLUME AIR HANDLER UNIT WITH BYPASS DAMPER AND HYDRONIC HEATING/COOLING MULTI-PURPOSE CONTROLLER

A. OCCUPANCY - THE OCCUPANCY MODE CAN BE SCHEDULED BY THE MULTI-PURPOSE CONTROLLER. VALID OCCUPANCY MODES FOR THE MULTI-PURPOSE CONTROLLER SHALL BE:

1. OCCUPIED: NORMAL OPERATING MODE FOR OCCUPIED SPACES OR DAYTIME OPERATION. WHEN THE UNIT IS IN THE OCCUPIED MODE THE MULTI-PURPOSE CONTROLLER SHALL MAINTAIN THE SPACE TEMPERATURE AT THE ACTIVE OCCUPIED HEATING OR COOLING SETPOINT. THE OCCUPIED MODE SHALL BE THE DEFAULT MODE OF THE MULTI-PURPOSE CONTROLLER.

2. UNOCCUPIED: NORMAL OPERATING MODE FOR UNOCCUPIED SPACES OR NIGHTTIME OPERATION. WHEN THE UNIT IS IN UNOCCUPIED MODE THE MULTI-PURPOSE CONTROLLER SHALL MAINTAIN THE SPACE TEMPERATURE AT THE STORED UNOCCUPIED HEATING OR COOLING SETPOINT REGARDLESS OF THE PRESENCE OF A HARDWIRED OR COMMUNICATED SETPOINT. WHEN THE SPACE TEMPERATURE EXCEEDS THE ACTIVE UNOCCUPIED SETPOINT THE MULTI-PURPOSE CONTROLLER SHALL BRING ON 100% OF THE PRIMARY HEATING OR COOLING CAPACITY.

B. HEATING/COOLING MODE - THE HEATING/ COOLING MODE CAN BE SET BY A COMMUNICATED VALUE OR AUTOMATICALLY BY THE MULTI-PURPOSE CONTROLLER. THE MULTI-PURPOSE CONTROLLER SHALL AUTOMATICALLY DETERMINE THE HEATING OR COOLING MODE BY INTEGRATING OVER TIME BETWEEN THE ACTIVE SETPOINT AND THE SPACE TEMPERATURE OF BOTH ZONES.

1. HEATING AND COOLING SETPOINT- THE SPACE TEMPERATURE SETPOINT SHALL BE DETERMINED EITHER BY A LOCAL HARDWIRED OF A SETPOINT KNOB OR AT THE LOCAL DISPLAY.

C. COOLING OPERATION - WHEN THE UNIT IS IN COOLING MODE, THE MULTI-PURPOSE CONTROLLER SHALL MAINTAIN THE AVERAGE SPACE TEMPERATURE AT THE ACTIVE COOLING SETPOINT. BASED ON THE MULTI-PURPOSE CONTROLLER OCCUPANCY MODE, THE ACTIVE COOLING SETPOINT SHALL BE ONE OF THE FOLLOWING:

SETPOINT	DEFAULT VALUE
OCCUPIED COOLING SETPOINT	72°F
UNOCCUPIED COOLING SETPOINT	82°F

THE MULTI-PURPOSE CONTROLLER SHALL MEASURE EACH SPACE TEMPERATURE, THE ACTIVE COOLING SETPOINTS AND THE DISCHARGE AIR TEMPERATURE TO DETERMINE THE REQUESTED COOLING CAPACITY OF THE UNIT (0-100%). THE OUTPUTS SHALL BE CONTROLLED BASED ON THE UNIT CONFIGURATION AND THE REQUESTED COOLING CAPACITY.

D. HEATING OPERATION - WHEN THE UNIT IS IN HEATING MODE, THE MULTI-PURPOSE CONTROLLER SHALL MAINTAIN THE SPACE TEMPERATURE AT THE ACTIVE HEATING SETPOINT. BASED ON THE MULTI-PURPOSE CONTROLLER OCCUPANCY MODE, THE ACTIVE HEATING SETPOINT SHALL BE ONE OF THE FOLLOWING:

SETPOINT	DEFAULT VALUE
OCCUPIED HEATING SETPOINT	70°F
UNOCCUPIED HEATING SETPOINT	65°F

THE MULTI-PURPOSE CONTROLLER SHALL MEASURE EACH SPACE TEMPERATURE, THE ACTIVE HEATING SETPOINTS AND THE DISCHARGE AIR TEMPERATURE TO DETERMINE THE REQUESTED HEATING CAPACITY OF THE UNIT (0-100%). THE OUTPUTS SHALL BE CONTROLLED BASED ON THE UNIT CONFIGURATION AND THE REQUESTED HEATING CAPACITY.

E. TRANSITION FROM UNOCCUPIED TO OCCUPIED - WHEN THE UNIT TRANSITIONS FROM UNOCCUPIED MODE TO THE OCCUPIED MODE, MORNING WARM-UP/COOL DOWN ROUTINES SHALL BE ACTIVATED.

1. MORNING WARM-UP - WHEN THERE IS A CALL FOR HEATING AND THE SPACE TEMPERATURE IS 2°F OR MORE BELOW THE OCCUPIED HEATING SETPOINT A MORNING WARM-UP SEQUENCE SHALL BE ACTIVATED. DURING WARM-UP THE FAN SHALL BE TURNED ON, THE OUTSIDE AIR DAMPER SHALL REMAIN CLOSED, AND THE HEATING CAPACITY SHALL BE ENABLED AT FULL CAPACITY. WHEN THE SPACE TEMPERATURE REACHES THE OCCUPIED HEATING SETPOINT THE MULTI-PURPOSE CONTROLLER SHALL OPERATE IN OCCUPIED MODE.

2. MORNING COOL-DOWN - WHEN THERE IS A CALL FOR COOLING AND THE SPACE TEMPERATURE IS 2°F OR MORE OVER THE OCCUPIED COOLING SETPOINT A MORNING COOL-DOWN SEQUENCE SHALL BE ACTIVATED. DURING MORNING COOL-DOWN THE FAN SHALL BE TURNED ON, THE OUTSIDE AIR DAMPER SHALL REMAIN CLOSED, AND THE COOLING CAPACITY SHALL BE ENABLED AT FULL CAPACITY. WHEN THE SPACE TEMPERATURE REACHES THE OCCUPIED HEATING SETPOINT THE MULTI-PURPOSE CONTROLLER SHALL OPERATE IN OCCUPIED MODE.

F. FAN OPERATION - THE FAN SHALL OPERATE CONTINUOUSLY IN ALL OCCUPIED MODES. DURING UNOCCUPIED OPERATION, THE FAN SHALL CYCLE BETWEEN OFF AND ON FOLLOWING THE HEATING OR COOLING REQUEST. THE SUPPLY FAN SHALL BE OFF WHENEVER THE AHU RUN STOP INTERLOCK IS OPEN, THE MIXED AIR LOW LIMIT SWITCH IS TRIPPED OR A SUPPLY FAN STATUS INDICATES A FAILURE.

G. HYDRONIC COOLING VALVE CONTROL- IF THE UNIT IS IN THE COOLING MODE THE MULTI-PURPOSE CONTROLLER SHALL MODULATE THE COOLING VALVE TO MAINTAIN DISCHARGE TEMPERATURE AS REQUIRED TO SATISFY SPACE COMFORT. IF THE ECONOMIZER FUNCTION IS ENABLED THE COOLING VALVE SHALL BE CLOSED. THE COOLING VALVE SHALL BE CLOSED IF THE FAN IS OFF OR IF THE HEATING VALVE IS OPEN. THE COOLING VALVE WILL BE FULLY OPEN IF THE OUTSIDE AIR TEMPERATURE IS BELOW THE FREEZE AVOIDANCE SETPOINT [40°F], OPERATOR ADJUSTABLE.

H. HYDRONIC HEATING VALVE CONTROL- IF THE UNIT IS IN THE HEATING MODE, THE MULTI-PURPOSE CONTROLLER SHALL MODULATE THE HYDRONIC HEATING VALVE TO MAINTAIN THE SPACE COMFORT. THE HEATING VALVE SHALL BE CLOSED IF THE COOLING VALVE IS OPEN. THE HEATING VALVE SHALL BE POSITIONED TO AN OPERATOR CONFIGURED POSITION IF THE SUPPLY FAN IS OFF AND THE OUTDOOR AIR TEMPERATURE DROPS BELOW THE FREEZE AVOIDANCE TEMPERATURE SETPOINT [40°F], OPERATOR ADJUSTABLE. IF THE LOW LIMIT IS TRIPPED, THE HOT WATER VALVE WILL BE OPEN FULLY, THE FAN WILL BE OFF AND THE OUTSIDE AIR DAMPER SHALL BE CLOSED.

I. OUTSIDE AIR DAMPER CONTROL - DURING ALL OCCUPIED MODES THE OUTSIDE AIR DAMPER SHALL BE CONTROLLED TO THE EFFECTIVE MINIMUM POSITION [10%] OPERATOR ADJUSTABLE SUBJECT TO CO2 SENSOR INDICATION. EXCEPT WHEN THE ECONOMIZING MODE OR MIXED AIR TEMPERATURE CONTROL ROUTINES ARE ACTIVE. DURING UNOCCUPIED MODE, MORNING WARM-UP AND COOL DOWN MODES OR THE OUTSIDE AIR DAMPER SHALL BE CLOSED. THE OUTSIDE AIR DAMPER SHALL BE SET TO MINIMUM POSITION IF THE OUTSIDE AIR TEMPERATURE FALLS BELOW A LOW AMBIENT DAMPER LOCKOUT SETPOINT [35°F], OPERATOR ADJUSTABLE.

J. MIXED AIR TEMPERATURE CONTROL - THE MULTI-PURPOSE CONTROLLER SHALL REDUCE THE OUTSIDE AIR DAMPER BELOW THE MINIMUM POSITION TO MAINTAIN THE MIXED AIR TEMPERATURE ABOVE THE MIXED AIR LOW LIMIT SETPOINT [48°F], OPERATOR CONFIGURABLE. IF THE MIXED AIR TEMPERATURE SENSOR FAILS THE OUTSIDE AIR DAMPER SHALL BE CLOSED.

CONSTANT VOLUME AIR HANDLER UNIT WITH BYPASS DAMPER AND HYDRONIC HEATING/COOLING MULTI-PURPOSE CONTROLLER (CONT.)

K. ECONOMIZER CONTROL - THE MULTI-PURPOSE CONTROLLER SHALL ALLOW ENTHALPY CONTROLLED ECONOMIZING DURING ALL OCCUPIED AND UNOCCUPIED MODES. THE MODULATING OUTDOOR AIR DAMPER SHALL PROVIDE THE FIRST SOURCE OF COOLING. ECONOMIZING SHALL BE ENABLED BY THE MULTI-PURPOSE CONTROLLER. THE MULTI-PURPOSE CONTROLLER SHALL ENABLE ECONOMIZING IF THE OUTSIDE AIR TEMPERATURE IS BELOW THE ECONOMIZER ENABLE SETPOINT [55°F], OPERATOR CONFIGURABLE AND THE HUMIDITY IS AT SET POINT. IF ECONOMIZING IS INITIATED, THE MULTI-PURPOSE CONTROLLER SHALL MODULATE THE OUTSIDE AIR DAMPER BETWEEN THE ACTIVE MINIMUM POSITION AND FULLY OPEN TO MAINTAIN SPACE COMFORT. ECONOMIZING SHALL BE DISABLED WHEN THE OUTSIDE AIR TEMPERATURE RISES 5 DEGREES F ABOVE THE ECONOMIZER ENABLE SETPOINT. IF A HARDWIRED OUTDOOR AIR TEMPERATURE SENSOR OR A COMMUNICATED VALUE IS NOT PRESENT, ECONOMIZING SHALL NOT BE ALLOWED. THE ECONOMIZER OPERATION CAN BE OVERRIDDEN BASED ON CO2/OCCUPANCY LEVELS.

L. BYPASS DAMPER CONTROL

WHEN THE SUPPLY FAN IS ON, THE BYPASS DAMPER WILL SLOWLY OPEN, AND MODULATE AS REQUIRED TO MAINTAIN THE PROPER DISCHARGE DUCT STATIC PRESSURE SETPOINT.

M. ZONE DAMPER CONTROL (VISITORS GALLERY)

1. ZONE CONTROL - THE MULTI-PURPOSE CONTROLLER SHALL CONTINUOUSLY MONITOR ZONE TEMPERATURE, DAMPER POSITION, AND ZONE SETPOINT. A PROPORTIONAL PLUS INTEGRAL (PI) CONTROL LOOP MAINTAINS ZONE COMFORT BY POSITIONING THE DAMPER TO MEET LOAD REQUIREMENTS.

N. AUTOMATIC CHANGE OVER

MULTI-PURPOSE CONTROLLER SHALL DETERMINE HEATING AND COOLING MODE OF OPERATION BASED ON OUTDOOR AIR TEMPERATURE, SPACE TEMPERATURE AND HOT WATER/CHILLED WATER CONTROL VALVE POSITIONS.

O. CHILLER OCCUPIED/UNOCCUPIED

OCCUPIED MODE - WHEN THE AIR HANDLER IS OCCUPIED AND A REQUEST FOR MECHANICAL COOLING IS INITIATED, THE MULTI-PURPOSE CONTROLLER SHALL START THE CHILLED WATER PUMP AND PUT THE CHILLER INTO AN OCCUPIED MODE. WHEN A PROOF OF FLOW IS ESTABLISHED, THE CHILLER WILL LOCALLY CONTROL TO ITS LOCAL CHILLED WATER SETPOINT.

IF THE CHILLER DOES NOT CONFIRM FLOW OR THE CHILLER ALARM CONTACT COMMUNICATES A FAILURE, A RED ALARM LIGHT LOCATED NEAR THE MULTI-PURPOSE CONTROLLER WILL BE INITIATED. THE ALARM WILL BE MANUALLY RESET AT THE CHILLER AND MULTI-PURPOSE CONTROLLER.

UNOCCUPIED MODE - WHEN INITIATED TO UNOCCUPIED MODE, THE CHILLER SHALL BE OFF AND THE CHILLED WATER PUMP SHALL BE DISABLED.

P. UNIT HEATER

UNIT HEATER FAN SHALL CYCLE TO MAINTAIN 60°F ABOVE CEILING ON CONTACT CLOSURE FROM AQUASTAT ON/OFF CONTROL VALVE SHALL CYCLE ON REMOTE WALL MOUNTED, LINE VOLTAGE, THERMOSTAT CLOSURE.

Q. SAFETIES AND ALARMS

1. SPACE SENSOR FAILURE - IF THERE IS A FAULT WITH THE OPERATION A ZONE SENSOR MODULE, IT SHALL BE FEED BACK TO THE BAS. IF THE ZONE SENSOR FAILS, A RETURN SENSOR IN THE DUCTWORK SHALL BE USED. THE DIAGNOSTIC SHALL BE RESET MANUALLY AND INITIATE AN ALARM LIGHT LOCATED NEAR THE MULTI-PURPOSE CONTROLLER PANEL.

2. FAN STATUS - THE MULTI-PURPOSE CONTROLLER SHALL MONITOR THE FAN OUTPUTS TO DETERMINE FAN STATUS AND SUPPORT A POSITIVE PROOF FAN SWITCH. IF AFTER A MINUTE OF ENERGIZING THE FAN OUTPUT OR DURING NORMAL OPERATION THE FAN STATUS SWITCH INDICATES NO FAN OPERATION, THE MULTI-PURPOSE CONTROLLER SHALL PERFORM A SHUTDOWN AND GENERATE A FAN FAILURE DIAGNOSTIC. THE DIAGNOSTIC SHALL BE RESET MANUALLY AND INITIATE AN ALARM LIGHT LOCATED NEAR THE MULTI-PURPOSE CONTROLLER PANEL.

3. FILTER STATUS - A NORMALLY OPEN, OPERATOR CONFIGURABLE, DIFFERENTIAL PRESSURE SWITCH SHALL MONITOR THE DIFFERENTIAL PRESSURE ACROSS THE FILTER WHEN THE FAN IS RUNNING. IF DURING NORMAL OPERATION THE SWITCH CLOSES A DIRTY FILTER ALARM SHALL BE ISSUED AND INITIATE A SEPARATE FILTER ALARM LIGHT NEAR THE MULTI-PURPOSE CONTROLLER PANEL.

4. LOW TEMPERATURE DETECTION - A BINARY SIGNAL WILL SHUT THE UNIT DOWN, CLOSE THE OUTSIDE AIR DAMPER, AND OPEN ALL VALVES WHEN THE DISCHARGE AIR TEMPERATURE FALLS BELOW 35 °F (FACTORY CONFIGURED). A LOW COIL TEMPERATURE DETECT DIAGNOSTIC SHALL BE GENERATED. THE DIAGNOSTIC SHALL BE RESET MANUALLY AND INITIATE AN ALARM LIGHT LOCATED NEAR THE MULTI-PURPOSE CONTROLLER PANEL.

5. UNOCCUPIED FREEZE AVOIDANCE - THE MULTI-PURPOSE CONTROLLER SHALL OPEN ALL VALVES WHEN THE OUTSIDE AIR TEMPERATURE DROPS BELOW 38°F (OPERATOR CONFIGURABLE) DURING THE UNOCCUPIED MODE.

6. ALL FANS SHALL SHUT DOWN ON SMOKE DETECTOR ACTUATION.

MECHANICAL SYSTEM INSTALLATION

1. COORDINATE WORK WITH WORK OF OTHER TRADES

2. DO NOT START PROPOSED WORK PRIOR TO COMPLETION OF COORDINATED SHOP DRAWINGS

3. SCHEDULE WORK WITH OWNER.

4. PROVIDE PROTECTION FOR CONTROL ROOM EQUIPMENT DURING DEMOLITION AND INSTALLATION WORK. PROVIDE TEMPORARY HEATING, COOLING AND VENTILATION AS REQUIRED.

5. CLEAN WORK SPACE OF ANY DEBRIS AT THE END OF EACH WORKING DAY.

TESTING, ADJUSTING AND BALANCING

1. PROVIDE TESTING, ADJUSTING AND BALANCING OF AIR AND WATER DISTRIBUTION, MEASURING ELECTRICAL PERFORMANCE OF HVAC EQUIPMENT, SETTING QUANTITATIVE PERFORMANCE OF HVAC EQUIPMENT, VERIFYING AUTOMATIC-CONTROL DEVICE FUNCTIONS, MEASURING SOUND AND VIBRATION AND REPORTING RESULTS OF ACTIVITIES AND PROCEDURES.

2. SUBMIT PRELIMINARY REPORT FORMATS FOR REVIEW. SUBMIT CERTIFIED TESTING, ADJUSTING AND BALANCING REPORTS INCLUDING PUMP AND FAN CURVES. SUBMIT CERTIFICATION SHEET. FINAL FORMAT AND CONTENT SHALL BE PER AABC OR NEBB.

3. TESTING, ADJUSTING AND BALANCING AGENT QUALIFICATIONS: AABC OR NEBB CERTIFIED.

4. EQUIPMENT SETTINGS MARKED TO SHOW FINAL SETTINGS.

5. HVAC SYSTEMS AIRFLOW AND WATER FLOW RATE TOLERANCES:
   a. SUPPLY, RETURN AND EXHAUST FANS: PLUS 5 PERCENT TO PLUS 10 PERCENT
   b. AIR OUTLETS AND INLETS: 0 TO MINUS 10 PERCENT
   c. HEATING-WATER FLOW RATE: 0 TO MINUS 10 PERCENT
   d. COOLING-WATER FLOW RATE: 0 TO MINUS 5 PERCENT

START UP SERVICES

1. COORDINATE INSTALLATION OF HVAC WORK WITH TEMPERATURE CONTROL AND DIVISION 16 TO PROVIDE THE NECESSARY POWER AND CONTROL WIRING AND DEVICES.

2. PROVIDE SERVICES OF FACTORY AUTHORIZED TECHNICIAN TO START UP AIR HANDLING UNIT, FAN AND CHILLER.

3. PROVIDE SERVICE OF FACTORY AUTHORIZED TECHNICIAN TO START UP AND ADJUST BUILDING MANAGEMENT SYSTEM. PROVIDE EIGHT (8) HOURS OF TRAINING OF OWNER'S PERSONNEL INCLUDING WEB ACCESS TRAINING.

4. PROVIDE ADJUSTMENT OF CONTROLS DURING HEATING SEASON, COOLING SEASON AND PRIOR TO TERMINATION OF WARRANTY.

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REVISIONS

NUMBER	DATE	REMARKS

CONTROL ROOM HVAC SYSTEMS IMPROVEMENT

300 MAXIM ROAD
HARTFORD, CT.

PROJECT NO:	36937520.00001
DRAWN BY:	DEP
CHECKED BY:	VMD
DATE:	04/28/08
CADD FILE:	AS NOTED

TEMPERATURE CONTROLS SPECIFICATIONS & SEQUENCE

M-002

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