



**AHU SEQUENCE OF OPERATION**

**OCCUPIED MODE:** THE SUPPLY FAN WILL START AND RUN CONTINUOUSLY AND THE OUTDOOR AIR DAMPER WILL OPEN TO MINIMUM POSITION DURING "OCCUPIED" MODE AS DETERMINED BY THE BUILDING MANAGEMENT SYSTEM (BMS). THE RETURN FAN WILL BE INTERLOCKED TO MODULATE WITH THE SUPPLY FAN. RELIEF AIR AND RETURN AIR DAMPERS TO MODULATE TO MAINTAIN STATIC PRESSURE SETPOINT.

**ENERGY SAVINGS MODE:** DURING "ENERGY SAVINGS" MODE, THE SUPPLY AND RETURN FANS WILL STOP. THE OUTDOOR AIR AND RELIEF AIR DAMPERS WILL CLOSE AND THE RETURN AIR DAMPER WILL OPEN. WHEN A MINIMUM OF TWO (2) (ADJ.) VAV BOXES CALL FOR HEATING, THE SUPPLY AND RETURN AIR FANS WILL START AND ALL VAV BOXES WILL INDEX TO OCCUPIED TO ALLOW FANS TO OPERATE AT A MINIMUM OF 20% SPEED. SPACE TEMPERATURE SET-POINTS WILL REMAIN AT UNOCCUPIED SETPOINTS OF 78° IN THE SUMMER AND 64° IN THE WINTER ONCE ALL ZONES ARE SATISFIED, THE SUPPLY AND RETURN AIR FAN WILL STOP.

**MIXED AIR DAMPER CONTROL:** WHEN THE OUTDOOR AIR TEMPERATURE IS BELOW THE DAT, THE MIXED AIR DAMPERS WILL MODULATE IN SEQUENCE TO MAINTAIN DISCHARGE AIR TEMPERATURE SETPOINT OF 55°F.

WHEN THE OUTDOOR AIR TEMPERATURE IS ABOVE THE DAT, THE OUTDOOR AND RELIEF AIR DAMPERS MODULATE TO MINIMUM POSITION AND THE RETURN AIR DAMPER WILL FULLY OPEN. IF MINIMUM OUTDOOR AIR FLOW SETPOINT IS NOT MET, AS SENSED BY THE MINIMUM OUTDOOR AIR FLOW MEASURING STATION (AFMS-1), THE OUTDOOR AIR DAMPER WILL MODULATE OPEN AND THE RETURN AND RELIEF DAMPERS WILL MODULATE TO MAINTAIN OUTDOOR AIR VOLUME SETPOINT.

**CO2 OUTDOOR AIR CONTROL:** DURING OCCUPIED MODE, BASED ON ROOM CARBON DIOXIDE MONITORS, MODULATE OUTSIDE AIR DAMPER TO MINIMUM POSITION TO MAINTAIN A SPACE CO2 LEVEL OF 900 PPM. THE OUTDOOR AIR DAMPER POSITION SHALL BE OVER RIDDEN BY THE STATIC PRESSURE CONTROL.

**HEATING CONTROL:** THE INTERNAL FACE AND BY-PASS HOT WATER COIL TO BE LOCKED OUT WHEN MIXED AIR TEMPERATURE IS AT OR HIGHER THAN THE DAT. IF MIXED

AIR TEMPERATURE IS LESS THAN 35°F, THE BMS COMMANDS THE HEATING VALVE TO FULL OPEN AND MODULATES THE FACE & BY-PASS DAMPER TO MAINTAIN DISCHARGE AIR TEMPERATURE AT SET-POINT. IF MIXED AIR TEMPERATURE IS GREATER THAN 36°F, THE BMS COMMANDS THE FACE BY-PASS DAMPERS TO FULL BY-PASS AND MODULATES THE HEATING VALVE TO MAINTAIN DISCHARGE AIR TEMPERATURE.

**DISCHARGE AIR TEMPERATURE CONTROL:** THE DISCHARGE AIR TEMPERATURE WILL BE AUTOMATICALLY RESET FROM 53°F TO 65°F BASED OFF OF (3) (ADJ.) CALLS FOR HEATING OR COOLING IN INCREMENTS OF 1°F.

**VARIABLE SPEED DRIVE CONTROLS:** THE CONTROLLER WILL MEASURE DUCT STATIC PRESSURE AND MODULATE THE SUPPLY FAN VFD SPEED TO MAINTAIN THE DUCT STATIC PRESSURE SETPOINT. THE SPEED WILL NOT DROP BELOW 30% (ADJ.). THE STATIC PRESSURE SETPOINT WILL BE RESET BASED ON ZONE COOLING REQUIREMENTS. THE INITIAL DUCT STATIC PRESSURE SETPOINT WILL BE 1.0in H2O (ADJ.). AS COOLING DEMAND INCREASES, THE SETPOINT WILL INCREMENTALLY RESET UP TO A MAXIMUM OF 1.5in H2O (ADJ.). AS COOLING DEMAND DECREASES, THE SETPOINT WILL INCREMENTALLY RESET DOWN TO A MINIMUM OF 0.5in H2O (ADJ.). THE COOLING DEMAND IS BASED UPON THE TERMINAL BOX DAMPER POSITIONS. THE STATIC PRESSURE RESET IS DESIGNED TO KEEP ONE TERMINAL BOX DAMPER 50% (ADJ.) OPEN. THE SUPPLY FAN SPEED WILL BE LIMITED BY THE DISCHARGE AIR STATIC PRESSURE TO PREVENT THE DISCHARGE STATIC PRESSURE FROM EXCEEDING 4.0in H2O (ADJ.). THE RETURN AIR SPEED WILL MODULATE TO MAINTAIN A SPECIFIED DIFFERENTIAL BELOW SUPPLY FAN FLOW AS MEASURED BY THE FANS AIR FLOW MEASURING STATIONS AND FLOOR STATIC PRESSURE CONTROLLER.

**DE-HUMIDIFICATION CONTROL:** WHEN THE R.A. HUMIDITY SENSOR SENSES A RETURN AIR HUMIDITY OF 60% OR HIGHER (ADJ). AHU CHILLED WATER COIL CONTROL VALVE INDEXES TO FULL OPEN AND DISCHARGE AIR TEMPERATURE SENSOR IS OVER RIDDEN TO ALLOW DE-HUMIDIFIED LOW TEMP AIR TO THE SYSTEM. VAV BOX RE-HEAT COILS

MODULATE TO PROVIDE TEMPERED AIR TO SPACE.

ONCE R.A. HUMIDITY REACHES 50% R.H., AHU INDEXES BACK TO OCCUPIED MODE.

**COIL FREEZE PROTECTION:** AT OUTDOOR AIR TEMPERATURE OF 34°F OR LESS, CHILLED WATER FREEZE PUMP TO BE ACTIVATED AND RUNS CONTINUOUSLY.

**FILTER MONITORING:** A DIFFERENTIAL PRESSURE SWITCH WILL MONITOR THE UNIT'S FILTER STATUS. AN ALARM WILL BE ISSUED TO THE BMS WHEN FILTER PRESSURE EXCEEDS 0.75".

**SAFETIES:** THE SUPPLY AND RETURN FANS WILL BE STOPPED, THE HEATING VALVE INDEXED TO 100% OPEN AND AN ALARM WILL BE ISSUED TO THE BMS ON ANY OF THE FOLLOWING CONDITIONS:

- IF EITHER OF THE TEMPERATURE LOW LIMIT SWITCHES SENSES A TEMPERATURE BELOW 35°F AT ANY POINT ALONG ITS ELEMENT. LOW LIMIT TEMPERATURE ALARM MUST BE MANUALLY RESET BEFORE THE UNIT CAN RESUME OPERATION.
- IF EITHER SMOKE DETECTOR SENSES PARTICLES OF COMBUSTION IN ITS RESPECTIVE DUCT.
- IF THE DISCHARGE AIR STATIC PRESSURE HIGH LIMIT SENSES A STATIC PRESSURE HIGHER THAN 4"WC. HIGH STATIC PRESSURE ALARM MUST BE MANUALLY RESET BEFORE THE SUPPLY FAN CAN BE RESTARTED.
- IF THE RETURN AIR STATIC PRESSURE LOW LIMIT SENSES A STATIC PRESSURE BELOW 2"WC. LOW LIMIT STATIC PRESSURE ALARM MUST BE MANUALLY RESET BEFORE THE RETURN FAN CAN BE RESTARTED.
- IF THE SYSTEM RECEIVES A "STOP" COMMAND FROM THE BUILDING FIRE ALARM SYSTEM.

ALL SETPOINTS ARE ADJUSTABLE.

SEE SPECIFICATION SECTION 230993 SEQUENCE OF OPERATION HVAC CONTROLS FOR GRAPHIC DISPLAY REQUIREMENTS

**BSU TYPICAL VAV AHU CONTROL DIAGRAM**

SCALE: NONE