

**SEQUENCE OF OPERATIONS – DINING FACILITY**

**GENERAL**

1. ALL CONTROLS SYSTEMS TO BE COMPLETE AND OPERATIONAL AT THE CONCLUSION OF THE CONSTRUCTION PROJECT.
2. IN A VISIBLE LOCATION ON HVAC EQUIPMENT UNDER DIRECT DIGITAL CONTROL (DDC), MOUNT A LAMINATED PLATE INSCRIBED WITH THE FOLLOWING:  
 "CAUTION: THIS EQUIPMENT IS UNDER CENTRAL CONTROL AND MAY START OR STOP SUDDENLY. CONTACT FACILITIES MAINTENANCE PERSONNEL BEFORE PERFORMING ANY MAINTENANCE OR DISCONNECTING ANY COMPONENTS."
3. DDC CONTROLLERS SHALL UTILIZE SHORT CYCLING DELAYS TO PROTECT NON-MODULATING TYPE EQUIPMENT SUCH AS FANS, PUMPS, COMPRESSORS, ETC. FROM SHORT CYCLING.
4. ALL CONTROL AND INTERLOCK WIRING SHALL BE SUPPLIED AND INSTALLED IN ACCORDANCE WITH THE UNIT MANUFACTURER'S RECOMMENDATIONS.

**AIR HANDLING UNITS: AHU-1, AHU-2 AND AHU-3**

**GENERAL**

1. THE AHU SHALL BE STARTED AND STOPPED BY ITS DIRECT DIGITAL CONTROLLER (DDC) BASED ON A TIMED OCCUPANCY AS SCHEDULED THROUGH THE BUILDING STAND-ALONE CONTROLLER (BSAC).
2. A DUCT MOUNTED SMOKE DETECTOR SHALL SHUT DOWN THE AHU FAN, CLOSE THE OUTSIDE AIR DAMPER AND SIGNAL THE BUILDING FIRE ALARM CONTROL PANEL (FACP) UPON SENSING SMOKE.
3. A WALL MOUNTED SPACE SENSOR SHALL CONTROL ROOM CONDITIONS THROUGH THE DDC AND ALLOW ROOM OCCUPANTS TO VARY THE SPACE SET POINTS OVER A LIMITED RANGE AS DETERMINED BY THE DDC.
4. THE SPACE SENSOR SHALL DISPLAY SPACE SET POINT AND SPACE TEMPERATURE.
5. THE SPACE SENSORS SHALL BE PROVIDED WITH A TIMED OVERRIDE SCHEDULE THROUGH AN ON/OFF BUTTON.

**OCCUPIED MODE**

1. DURING THE OCCUPIED MODE THE AHU FAN SHALL RUN CONTINUOUSLY, THE OUTSIDE AIR DAMPER SHALL BE OPEN.
2. IN THE COOLING MODE, THE DDC SHALL MODULATE THE COOLING COIL CONTROL VALVE TO MAINTAIN THE SPACE TEMPERATURE SET POINT OF 76 DEGREES F (ADJUSTABLE).
3. IN THE HEATING MODE, THE DDC SHALL MODULATE THE HEATING COIL CONTROL VALVE TO MAINTAIN THE SPACE TEMPERATURE SET POINT OF 68 DEGREES F (ADJUSTABLE).

**UNOCCUPIED MODE**

1. DURING THE UNOCCUPIED MODE THE AHU FAN SHALL BE OFF AND THE OUTSIDE AIR DAMPER SHALL BE CLOSED, EXCEPT AS REQUIRED BELOW.
2. IN THE COOLING MODE THE DDC SHALL START THE AHU FAN AND MODULATE THE COOLING COIL CONTROL VALVE TO MAINTAIN THE UNOCCUPIED SPACE TEMPERATURE SET POINT OF 85 DEGREES F (ADJUSTABLE).
3. IN THE HEATING MODE THE DDC SHALL START THE AHU FAN AND MODULATE THE HEATING COIL CONTROL VALVE TO MAINTAIN THE UNOCCUPIED SPACE TEMPERATURE SET POINT OF 60 DEGREES F (ADJUSTABLE).
4. FOR AHU-1 ONLY: IF THE KITCHEN EXHAUST HOOD SYSTEM EF-1/SF-2 IS RUNNING, THE AHU FAN SHALL RUN CONTINUOUSLY, THE OUTSIDE AIR DAMPER SHALL BE OPEN AND THE DDC SHALL MODULATE THE COOLING/HEATING COIL CONTROL VALVES TO MAINTAIN THE UNOCCUPIED SPACE TEMPERATURES INDICATED ABOVE.
5. FOR AHU-3 ONLY: IF THE KITCHEN EXHAUST HOOD SYSTEM EF-3/SF-4 IS RUNNING, THE AHU FAN SHALL RUN CONTINUOUSLY, THE OUTSIDE AIR DAMPER SHALL BE OPEN AND THE DDC SHALL MODULATE THE COOLING/HEATING COIL CONTROL VALVES TO MAINTAIN THE UNOCCUPIED SPACE TEMPERATURES INDICATED ABOVE.

**SAFETY FEATURES**

1. A FREEZE STAT SHALL SHUT DOWN THE AHU AND CLOSE THE OUTSIDE AIR DAMPER WHEN AIR ENTERING THE SUPPLY AIR FAN DROPS BELOW 40 DEGREES F (ADJUSTABLE).
2. UPON ACTIVATION OF ANY SMOKE DETECTION OR ACTUATION OF THE BUILDING FACP, THE AHU SHALL SHUT DOWN AND THE OUTSIDE AIR DAMPER SHALL CLOSE.
3. A DIFFERENTIAL PRESSURE SWITCH ACROSS THE AHU FILTERS SHALL ALARM THE DDC AND BSAC FOR FILTER MAINTENANCE.

**AIR HANDLING UNIT: AHU-4**

**GENERAL**

1. THE AHU SHALL BE STARTED AND STOPPED BY ITS DIRECT DIGITAL CONTROLLER (DDC) BASED ON A TIMED OCCUPANCY AS SCHEDULED THROUGH THE BUILDING STAND-ALONE CONTROLLER (BSAC).
2. A DUCT MOUNTED SMOKE DETECTOR SHALL SHUT DOWN THE AHU FAN, CLOSE THE OUTSIDE AIR DAMPER AND SIGNAL THE BUILDING FIRE ALARM CONTROL PANEL (FACP) UPON SENSING SMOKE.
3. A WALL MOUNTED SPACE SENSOR SHALL CONTROL ROOM CONDITIONS THROUGH THE DDC AND ALLOW ROOM OCCUPANTS TO VARY THE SPACE SET POINTS OVER A LIMITED RANGE AS DETERMINED BY THE DDC.
4. THE SPACE SENSORS SHALL BE PROVIDED WITH A TIMED OVERRIDE SCHEDULE THROUGH AN ON/OFF BUTTON.

**OCCUPIED MODE**

1. DURING THE OCCUPIED MODE THE AHU FAN SHALL RUN CONTINUOUSLY, THE OUTSIDE AIR DAMPER SHALL BE OPEN AND THE RETURN AIR DAMPER (LOCATED ABOVE THE KITCHEN AREA CEILING) SHALL BE CLOSED.
2. IN THE COOLING MODE, THE DDC SHALL MODULATE THE COOLING COIL CONTROL VALVE TO MAINTAIN THE SPACE TEMPERATURE SET POINT OF 80 DEGREES F (ADJUSTABLE).
3. IN THE HEATING MODE, THE DDC SHALL MODULATE THE HEATING COIL CONTROL VALVE TO MAINTAIN THE SPACE TEMPERATURE SET POINT OF 85 DEGREES F (ADJUSTABLE).

**UNOCCUPIED MODE**

1. DURING THE UNOCCUPIED MODE THE AHU FAN SHALL BE OFF, THE OUTSIDE AIR DAMPER SHALL BE CLOSED AND THE RETURN AIR DAMPER (LOCATED ABOVE THE KITCHEN AREA CEILING) SHALL BE OPEN, EXCEPT AS REQUIRED BELOW.
2. IN THE COOLING MODE THE DDC SHALL START THE AHU FAN AND MODULATE THE COOLING COIL CONTROL VALVE TO MAINTAIN THE UNOCCUPIED SPACE TEMPERATURE SET POINT OF 85 DEGREES F (ADJUSTABLE).
3. IN THE HEATING MODE THE DDC SHALL START THE AHU FAN AND MODULATE THE HEATING COIL CONTROL VALVE TO MAINTAIN THE UNOCCUPIED SPACE TEMPERATURE SET POINT OF 60 DEGREES F (ADJUSTABLE).
4. IF DURING THE UNOCCUPIED MODE THE KITCHEN EXHAUST HOOD SYSTEM EF-1/SF-2 IS STARTED, THE AHU SHALL BE INDEXED TO OCCUPIED MODE OPERATION.

**SAFETY FEATURES**

1. A FREEZE STAT SHALL SHUT DOWN THE AHU AND CLOSE THE OUTSIDE AIR DAMPER WHEN AIR ENTERING THE SUPPLY AIR FAN DROPS BELOW 40 DEGREES F (ADJUSTABLE).
2. UPON ACTIVATION OF ANY SMOKE DETECTION OR ACTUATION OF THE BUILDING FACP, THE AHU SHALL SHUT DOWN AND THE OUTSIDE AIR DAMPER SHALL CLOSE.
3. A DIFFERENTIAL PRESSURE SWITCH ACROSS THE AHU FILTERS SHALL ALARM THE DDC AND BSAC FOR FILTER MAINTENANCE.

**KITCHEN HOOD EXHAUST/SUPPLY SYSTEMS: EF-1/SF-2 AND EF-3/SF-4**

**GENERAL**

1. EACH EXHAUST/SUPPLY FAN SYSTEM SHALL BE STARTED AND STOPPED BY A LOCAL PUSH BUTTON START/STOP STATION PROVIDED BY THE EXHAUST HOOD SYSTEM MANUFACTURER.
2. A SUPPLY AIR DUCT MOUNTED SMOKE DETECTOR SHALL SHUT DOWN THE SUPPLY FAN AND SIGNAL THE BUILDING FIRE ALARM CONTROL PANEL (FACP) UPON SENSING SMOKE.

**SYSTEMS IN THE ON POSITION (RUNNING)**

1. THE EXHAUST/SUPPLY FANS SHALL RUN CONTINUOUSLY.
2. IN THE HEATING MODE, THE DDC SHALL MODULATE THE HEATING COIL CONTROL VALVE TO MAINTAIN THE SUPPLY AIR DISCHARGE TEMPERATURE SET POINT OF 55 DEGREES F (ADJUSTABLE).

**SYSTEMS IN THE OFF POSITION (NOT RUNNING)**

1. THE EXHAUST/SUPPLY FANS SHALL BE OFF.
2. THE DDC SHALL MODULATE THE HEATING COIL CONTROL VALVE TO MAINTAIN HOT WATER CIRCULATION THROUGH THE COIL IF THE TEMPERATURE IN THE SUPPLY DUCT FALLS BELOW 45 DEGREES F (ADJUSTABLE).

**SAFETY FEATURES**

1. A FREEZE STAT SHALL SHUT DOWN THE SUPPLY FAN WHEN AIR LEAVING THE HEATING COIL DROPS BELOW 40 DEGREES F (ADJUSTABLE).
2. UPON ACTIVATION OF ANY SMOKE DETECTION OR ACTUATION OF THE BUILDING FACP, THE EXHAUST/SUPPLY SYSTEM SHALL SHUT DOWN.
3. A DIFFERENTIAL PRESSURE SWITCH ACROSS THE SUPPLY FAN FILTERS SHALL ALARM THE DDC AND BSAC FOR FILTER MAINTENANCE.

**EXHAUST AND SUPPLY FANS: SF-5, EF-6, EF-7, EF-8 AND EF-9**

**GENERAL**

1. SUPPLY FAN SF-5 SHALL BE STARTED AND STOPPED BY THE BSAC TO MAINTAIN A MAXIMUM SPACE TEMPERATURE SET POINT OF 85 DEGREES F (ADJUSTABLE).
2. EXHAUST FAN EF-6 AND EF-8 SHALL BE INTERLOCKED TO RUN WHENEVER AHU-4 IS OPERATING IN THE OCCUPIED MODE.
3. EXHAUST FAN EF-7 SHALL BE INTERLOCKED TO RUN WHENEVER AHU-2 IS OPERATING IN THE OCCUPIED MODE.
4. EXHAUST FAN EF-9 SHALL BE STARTED AND STOPPED BY THE BSAC TO MAINTAIN A MAXIMUM ATTIC SPACE TEMPERATURE SET POINT OF 90 DEGREES F (ADJUSTABLE).

**SAFETY FEATURES**

1. UPON ACTIVATION OF ANY SMOKE DETECTION OR ACTUATION OF THE BUILDING FACP, THE EXHAUST/SUPPLY FANS SHALL SHUT DOWN.

**UNIT HEATER: UH-1 AND UH-2**

**GENERAL**

1. THE UNIT HEATER SUPPLY FAN SHALL BE STARTED AND STOPPED BY THE BSAC TO MAINTAIN A MINIMUM SPACE TEMPERATURE SET POINT OF 55 DEGREES F (ADJUSTABLE).

**HEATING HOT WATER SYSTEM: B-1, P-3 AND P-4 (NOTE: P-3 AND P-4 ARE RENUMBERED P-8 AND P-9 IF THE CHILLER PLANT REPLACEMENT OPTION IS ACCEPTED)**

**GENERAL**

1. THE HEATING HOT WATER SYSTEM ENABLE/DISABLE SHALL BE INITIATED BY THE BSAC. THE BSAC SHALL NOT START/STOP THE BOILER OR THE PRIMARY HEATING WATER PUMP.
2. THE BOILER CONTROLLER SHALL PROVIDE ITS OWN INTERNAL STAGING COMMANDS TO MAINTAIN A LEAVING WATER TEMPERATURE SET POINT OF 190 DEGREES F (ADJUSTABLE).
3. THE BOILER INTERNAL CONTROLLER SHALL INTERFACE WITH THE BSAC FOR MONITORING OF INPUTS AND OUTPUTS AS REQUIRED BELOW AND AS INDICATED IN THE INPUT/OUTPUT (I/O) SUMMARY. THE BSAC SHALL NOT START/STOP THE BOILER OR THE PRIMARY HEATING WATER PUMP.

**SYSTEM STARTUP**

1. THE HEATING WATER SYSTEM STARTUP SHALL BE INITIATED BY THE BSAC.
2. PRIMARY PUMP P-3 SHALL BE PROVIDED WITH A "HAND-OFF-AUTO" SWITCH. IN THE "HAND" POSITION THE PUMP SHALL BE CONTROLLED MANUALLY. IN THE "AUTO" POSITION THE PUMP SHALL BE CONTROLLED BY THE BOILER INTERNAL CONTROLLER. THE BOILER SHALL NOT BE ENABLED UNTIL SYSTEM FLOW IS PROVEN.
3. SECONDARY PUMP P-4 SHALL BE PROVIDED WITH A VARIABLE SPEED DRIVE. IN THE "AUTO" POSITION THE PUMP SHALL BE CONTROLLED BY THE BSAC. THE VARIABLE SPEED DRIVE SHALL BE CONTROLLED TO MAINTAIN THE HEATING SYSTEM WATER PRESSURE SET POINT (ADJUSTABLE). IN THE "BYPASS" POSITION THE PUMP SHALL BE CONTROLLED MANUALLY.
4. THE BSAC, THROUGH AN OUTSIDE AIR TEMPERATURE SENSOR SHALL PROVIDE HOT WATER SUPPLY RESET. THE BSAC SHALL MODULATE THE THREE-WAY VALVE TO MIX PRIMARY LOOP SUPPLY HOT WATER AND SECONDARY LOOP RETURN WATER TO MAINTAIN SECONDARY SUPPLY LOOP WATER TEMPERATURE SETPOINT. RESET SCHEDULE SHALL BE FROM 180 DEGREES F WATER TEMPERATURE AT 27 DEGREES F OUTSIDE AIR TEMPERATURE TO 100 DEGREES F WATER TEMPERATURE AT 70 DEGREES F OUTSIDE AIR TEMPERATURE. THE RESET SCHEDULE SHALL BE OVERRIDDEN IF HIGHER WATER TEMPERATURE IS REQUIRED BY ANY ASSOCIATED SYSTEM. RESET SCHEDULE PARAMETERS SHALL BE OPERATOR ADJUSTABLE.

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