

HVAC SEQUENCE OF OPERATIONS:

1. GENERAL SYSTEM OPERATIONS.

1.1. TEMPERATURE CONTROL PANEL(S), TEMPERATURE CONTROL PANEL(S) (TCP) AND EQUIPMENT CONTROL PANELS (ECP) IDENTIFIED IN THE SEQUENCE OF OPERATION SHALL BE PROVIDED WITH THE INDICATING LIGHTS, RUNNING LIGHTS, ALARM LIGHTS, AUDIBLE ALARMS, TIMERS, AND SELECTOR SWITCHES FOR CONTROL AND STATUS INDICATION OF THE EQUIPMENT SERVED. WHERE NO CONTROL PANELS ARE PROVIDED FOR EQUIPMENT, THE LIGHTS AND SWITCHES SHALL BE AT THE STARTER OR MCC. RUNNING LIGHTS SHALL BE PROVIDED TO INDICATE BOTH ENERGIZED AND DE-ENERGIZED CONDITIONS FOR THE EQUIPMENT AND SHALL POSITIVELY INDICATE EQUIPMENT CONDITIONS FROM THE MOTOR STARTER OR CURRENT SENSOR. SWITCH POSITION SHALL NOT BE USED FOR LIGHT ILLUMINATION. INDICATING AND RUNNING LIGHTS SHALL BE LOCATED DIRECTLY ABOVE EACH RESPECTIVE SELECTOR SWITCH WITH LIGHT COLORS AS FOLLOWS:

Table with 2 columns: Color and Status. Rows include RED - ENERGIZED, GREEN - DE-ENERGIZED, AMBER - ALARM, WHITE - STATUS.

INDICATING LIGHTS AND SELECTOR SWITCHES SHALL BE LOCATED ON THE FACE OF THE TEMPERATURE CONTROL PANEL SERVING THE RESPECTIVE EQUIPMENT. IN ADDITION TO THE LIGHTS, TIMERS, AND SELECTOR SWITCHES DESCRIBED IN THE SEQUENCE OF OPERATION FOR THE INDIVIDUAL EQUIPMENT, EACH CONTROL PANEL SHALL BE PROVIDED WITH THE FOLLOWING:

Table with 2 columns: Label and Description. Rows include 'CONTROL POWER ON' STATUS LIGHT, 'INDICATING LIGHT TEST' PUSHBUTTON, 'ALARM SILENCE' PUSHBUTTON, 'ALARM RESET' PUSHBUTTON (WHERE APPLICABLE).

CONTROL PANELS SPECIFIED TO BE PROVIDED WITH ALARM CONDITION INDICATING LIGHTS SHALL BE PROVIDED WITH AN ELECTRICALLY ISOLATED CONTACT TO PROVIDE A COMMON ALARM TO THE PLANT CONTROL SYSTEM (PCS). EACH CONTROL PANEL SHALL BE PROVIDED WITH A MINIMUM OF ONE COMMON ALARM OUTPUT POINT TO THE PCS AND ADDITIONAL INDIVIDUAL ALARM POINTS AS INDICATED BELOW.

TEMPERATURE CONTROL PANELS SHALL COME WITH PHENOLIC NAMEPLATES FOR EACH CONTROL SWITCH INDICATING SWITCH TYPE, EQUIPMENT CONTROLLED, ROOM OR AREA SERVED, AND SWITCH AUTOMATIC POSITION EQUIPMENT INTERLOCK.

1.2. SYSTEM INTERLOCKS AND ALARMS

UNLESS OTHERWISE INDICATED, ALL EQUIPMENT INTERLOCKING DEVICES AS DESCRIBED HEREIN SHALL BE PROVIDED WITHIN THE RESPECTIVE TEMPERATURE/EQUIPMENT CONTROL PANEL (TCP/ECP).

1.2.1. SMOKE DETECTION SYSTEMS

1.2.1.1. SMOKE DETECTION (DUCT MOUNTED DETECTORS). SMOKE DETECTORS SHALL BE LOCATED IN THE DUCT OF EQUIPMENT LISTED BELOW. IN THE EVENT SMOKE IS DETECTED BY A DETECTOR, A SMOKE DETECTED SIGNAL SHALL BE TRANSMITTED TO THE REMOTE TEST STATION AND FIRE ALARM PANEL OR PLANT CONTROL SYSTEM (PCS) AND TCP/ECP WHEN A FIRE ALARM PANEL IS NOT PRESENT. A "SMOKE DETECTED" ALARM LIGHT ON THE RESPECTIVE REMOTE TEST STATION SHALL BE ILLUMINATED. WHERE A TCP/ECP IS PRESENT, THE REMOTE TEST STATION SHALL BE MOUNTED ON OR ADJACENT TO THE TEMPERATURE CONTROL PANEL. THE RESPECTIVE EQUIPMENT AND ANY INTERLOCKED EQUIPMENT SHALL BE DE-ENERGIZED AND OUTSIDE AIR DAMPERS ASSOCIATED WITH THE DE-ENERGIZED EQUIPMENT SHALL CLOSE.

IN THE EVENT A SMOKE DETECTOR MALFUNCTIONS, A MALFUNCTION SIGNAL SHALL BE TRANSMITTED TO THE REMOTE TEST STATION OR FIRE ALARM PANEL, ILLUMINATING A "SMOKE DETECTOR MALFUNCTION" INDICATING LIGHT.

Table with 2 columns: SMOKE DETECTOR and DE-ENERGIZED EQUIPMENT. Row: SMD-A01 MAU-A01.

1.2.1.2. SMOKE DETECTION (AREA SMOKE DETECTION). A SMOKE DETECTED SIGNAL SHALL BE SENT FROM THE FIRE ALARM PANEL TO THE RESPECTIVE TEMPERATURE/EQUIPMENT CONTROL PANEL IN THE EVENT SMOKE IS DETECTED BY THE BUILDING SMOKE DETECTION SYSTEM. THE EQUIPMENT BELOW AND ANY INTERLOCKED EQUIPMENT SHALL BE DE-ENERGIZED AND OUTSIDE AIR DAMPERS ASSOCIATED WITH THE DE-ENERGIZED EQUIPMENT SHALL CLOSE.

Table with 2 columns: EQUIPMENT and TEMPERATURE/EQUIPMENT CONTROL PANEL. Lists MAU-A02, MAU-A03, PAC-A01, PAC-A02, SF-A01, PAC-J01, PAC-J02, PHP-L01, PHP-L02, PHP-L03, DOAU-L01, MAU-M01, MAU-M02, PHP-M01.

1.2.2. LOW TEMPERATURE PROTECTION. LOW AIR TEMPERATURE THERMOSTATS/SENSORS SHALL BE LOCATED IN THE SYSTEMS INDICATED BELOW. UPON DETECTION OF LOW AIR TEMPERATURE, THE THERMOSTAT SHALL DE-ENERGIZE THE RESPECTIVE EQUIPMENT AND ALL INTERLOCKED EQUIPMENT, CONTROL DAMPER(S) OF THE RESPECTIVE EQUIPMENT AND INTERLOCKED EQUIPMENT SHALL RETURN TO THE NORMAL POSITION, AND A "LOW AIR TEMPERATURE" ALARM LIGHT ON THE FACE OF THE RESPECTIVE TEMPERATURE/EQUIPMENT CONTROL PANEL SHALL BE ILLUMINATED OR ALARM INDICATION SENT TO THE PLANT CONTROL SYSTEM. AN ADJUSTABLE 0 TO 5 MINUTE TIME DELAY RELAY SHALL BE PROVIDED TO ALLOW FOR STARTING OF THE EQUIPMENT UNDER COLD AMBIENT CONDITIONS. UPON LOW TEMPERATURE SHUTDOWN, THE EQUIPMENT SHALL REQUIRE A MANUAL RESTART.

Table with 3 columns: EQUIPMENT, THERMOSTAT, TEMPERATURE/EQUIPMENT CONTROL PANEL. Lists MAU-A01, MAU-A02, MAU-A03, SF-A01, SF-A02, DOAU-L01*, MAU-M01, MAU-M02, PHP-M01.

* THIS EQUIPMENT SHALL ONLY GENERATE AN ALARM IN THE INSTANCE OF LOW TEMPERATURE AS DESCRIBED ABOVE, BUT SHOULD NOT BE DE-ENERGIZED.

** THIS THERMOSTAT SHALL GENERATE A FREEZE WARNING ALARM TO THE PLANT CONTROL SYSTEM.

1.2.3. HIGH FILTER PRESSURE LOSS. A HIGH LIMIT PRESSURE DIFFERENTIAL FLOW SWITCH SHALL BE LOCATED ACROSS THE FILTER BANK OF THE EQUIPMENT INDICATED BELOW. IN THE EVENT THE PRESSURE DIFFERENTIAL ACROSS THE FILTER EXCEEDS THE PRESET VALUE, A "HIGH FILTER PRESSURE LOSS" ALARM LIGHT ON THE FACE OF THE RESPECTIVE TEMPERATURE/EQUIPMENT CONTROL PANEL OR THERMOSTAT (WHERE FURNISHED WITH LIGHTS) SHALL BE ILLUMINATED.

Table with 3 columns: EQUIPMENT, FLOW SWITCH, TEMPERATURE/EQUIPMENT CONTROL PANEL. Lists MAU-A01, MAU-A02, MAU-A03, SF-A01, PDS-A06, PDS-A07, PDS-A05, PAC-A01, PAC-A02, PAC-J01, PAC-J02, PHP-L01, PHP-L02, PHP-L03, DOAU-L01, MAU-M01, MAU-M02, PHP-M01.

1.2.4. VENTILATION SYSTEM FAILURE.

1.2.4.1. VENTILATION SYSTEM FAILURE (AIRFLOW SWITCHES). VENTILATION SYSTEM FAILURE PRESSURE DIFFERENTIAL SWITCHES SHALL BE LOCATED IN THE SYSTEMS INDICATED BELOW. IN THE EVENT THAT AIRFLOW IS NOT ATTAINED OR LOST AS DETERMINED BY THE PRESSURE DIFFERENTIAL FLOW SWITCH, A "VENTILATION SYSTEM FAILURE" SIGNAL SHALL BE TRANSMITTED TO THE FIRE ALARM SIGNALING SYSTEM. WHERE A FIRE ALARM SIGNALING SYSTEM IS NOT PRESENT, THE "VENTILATION SYSTEM FAILURE" SIGNAL SHALL BE TRANSMITTED TO THE PLANT CONTROL SYSTEM (PCS). WHERE INDICATED ON THE DRAWINGS, A VISUAL ALARM SHALL BE ILLUMINATED AND AUDIBLE ALARM SHALL SOUND AT EACH ROOM ENTRANCE AND WITHIN THE ROOM. THE FIRE ALARM SIGNALING SYSTEMS HAVE A NORMALLY OPEN CONTACT FOR TRANSMITTING A SIGNAL TO THE RESPECTIVE TEMPERATURE/EQUIPMENT CONTROL PANEL ILLUMINATING AN ALARM INDICATING LIGHT FOR THE RESPECTIVE EQUIPMENT.

Table with 3 columns: EQUIPMENT, FLOW SWITCH, TEMPERATURE/EQUIPMENT CONTROL PANEL. Lists MAU-A01, MAU-A02, SF-A01, SF-A02, DOAU-L01, PDS-A01, PDS-A08, PDS-A05, PDS-A03, PDS-L01, ECP-A01, ECP-A02, TCP-A01, TCP-A01, ECP-L01.

1.2.4.2. VENTILATION SYSTEM FAILURE. PRESSURE DIFFERENTIAL SWITCHES SHALL BE LOCATED IN THE AIR LOCK VESTIBULE AS SHOWN IN THE AIR FLOW DIAGRAMS. IN THE EVENT AN AIR LOCK DOOR IS OPEN FOR LONGER THAN 20 SECONDS OR VENTILATION FAILS AS DETERMINED BY THE PRESSURE DIFFERENTIAL SWITCH (PDS-A02) (AN ADJUSTABLE 0 TO 5 MINUTE TIME DELAY RELAY SHALL BE PROVIDED TO ALLOW FOR DOOR TO CLOSE) OR COMBUSTIBLE GAS CONCENTRATIONS ARE GREATER THAN 10 PERCENT OF THE LOWER FLAMMABLE LIMIT OR FAN FAILURE, A "VENTILATION SYSTEM FAILURE" SIGNAL SHALL BE TRANSMITTED TO THE PLANT CONTROL SYSTEM AND VISIBLE AND AUDIBLE ALARMS SHALL ACTIVATE AT THE ENTRANCES AND WITHIN THE ROOM.

2. HEATING SYSTEMS.

2.1. UNIT HEATERS. UNIT HEATERS SHALL BE CONTROLLED BY THEIR RESPECTIVE THERMOSTATS.

3. VENTILATING/EXHAUST SYSTEMS.

3.1. "ON-OFF" EQUIPMENT CONTROL. EQUIPMENT INDICATED FOR "ON-OFF" CONTROL SHALL EACH BE CONTROLLED BY AN INDIVIDUAL "ON-OFF" FAN SELECTOR SWITCH. THE SWITCH LOCATION SHALL BE AS INDICATED BELOW. WHEN THE SWITCH IS PLACED IN THE "ON" POSITION, THE RESPECTIVE EQUIPMENT FAN SHALL BE ENERGIZED. BEFORE THE FAN CAN OPERATE, THE CONTROL DAMPER(S) SHALL BE PROVEN OPEN. WHEN THE EQUIPMENT FAN IS DE-ENERGIZED, THE CONTROL DAMPER(S) SHALL RETURN TO THE NORMAL POSITION.

Table with 3 columns: EQUIPMENT, SWITCH LOCATION, CONTROL DAMPER(S). Lists SF-A01, EF-L03, EF-M04, SF-A02, TCP-A01, TCP-L01, TCP-M01, TCP-A01, CD-A10, ---, ---, CD-A09.

3.2. "ON-OFF-AUTO" EQUIPMENT CONTROL. EQUIPMENT INDICATED FOR "ON-OFF-AUTO" CONTROL SHALL EACH BE CONTROLLED BY AN INDIVIDUAL "ON-OFF-AUTO" FAN SELECTOR SWITCH. THE SWITCH LOCATION SHALL BE AS INDICATED BELOW. WHEN THE SWITCH IS PLACED IN THE "AUTO" POSITION, THE FAN SHALL BE INTERLOCKED AND CONTROLLED BY THE FAN INTERLOCK. WHEN THE SWITCH IS PLACED IN THE "ON" POSITION, THE FAN SHALL BE ENERGIZED. BEFORE A FAN CAN OPERATE, THE CONTROL DAMPER(S) SHALL BE PROVEN OPEN. WHERE THE FAN IS INTERLOCKED WITH ANOTHER FAN OR EQUIPMENT WITH A FAN, THE FANS SHALL BE ENERGIZED SIMULTANEOUSLY AFTER ALL ASSOCIATED CONTROL DAMPERS ARE PROVEN OPEN. WHEN THE FAN IS DE-ENERGIZED, THE CONTROL DAMPER(S) SHALL RETURN TO THE NORMALLY CLOSED POSITION UNLESS OTHERWISE INDICATED.

Table with 4 columns: EQUIPMENT, SWITCH LOCATION, FAN INTERLOCK, CONTROL DAMPER(S). Lists EF-A01, EF-A02, EF-A03, EF-A04, EF-J01, EF-L05, EF-L06*, TCP-A01, TCP-L01, CS-A01, TCP-J01, TCP-L01, PHP-L03, TCP-L01, PHP-L01, TCP-L01, TCP-M01, TCP-M01, TCP-M01, TCP-M01, MAU-M01, MAU-M02, MAU-M02.

* EF-L06 SHALL BE INTERLOCKED WITH PHP-L03 TO MAINTAIN THE LAB UNDER NEGATIVE PRESSURE WHEN THE PHP-L03 IS OPERATING.

4. HEATING AND VENTILATING SYSTEMS.

4.1. MAKEUP AIR UNITS (100% OUTSIDE AIR). MAKEUP AIR UNITS SHALL EACH BE CONTROLLED BY AN INDIVIDUAL "SUMMER-OFF-WINTER" SYSTEM SELECTOR SWITCH. THE SWITCH LOCATION SHALL BE AS INDICATED BELOW. WHEN THE SWITCH IS PLACED IN THE "WINTER" POSITION, THE FAN SHALL OPERATE AND THE SUPPLY AIR SENSOR/THERMOSTAT SHALL MODULATE THE HEATING OUTPUT OF THE UNIT TO MAINTAIN THE DESIRED SUPPLY AIR TEMPERATURE. BEFORE THE FAN CAN OPERATE, THE CONTROL DAMPERS SHALL BE PROVEN OPEN. WHEN THE OUTSIDE AIR TEMPERATURE IS GREATER THAN THE HEATING CHANGEOVER TEMPERATURE SETPOINT AS DETECTED BY THE OUTDOOR AIR SENSOR/THERMOSTAT, THE HEATING SHALL BE LOCKED OUT. WHEN THE SWITCH IS PLACED IN THE "SUMMER" POSITION, THE FAN SHALL OPERATE AND THE HEATING SHALL BE LOCKED OUT. WHEN THE UNIT IS DE-ENERGIZED, THE CONTROL DAMPER(S) SHALL CLOSE.

Table with 4 columns: EQUIPMENT, SWITCH LOCATION, SUPPLY AIR THERMOSTAT, CONTROL DAMPER(S). Lists MAU-A01#, MAU-A02#, MAU-A03*#, MAU-M01, MAU-M02, ECP-A01, ECP-A02, ECP-A03, ECP-M01, ECP-M02, BUILT-IN, BUILT-IN, BUILT-IN, BUILT-IN, BUILT-IN, CD-A01, CD-A02, CD-A07, CD-M01, CD-M02.

* MAU-A03 SHALL BE INTERLOCKED WITH COMPRESSOR(S) AS WELL AS WITH THE ROOM THERMOSTAT, T-A01. THE SUPPLY FAN OF MAU-A03 SHALL BE PROVIDED WITH A VARIABLE FREQUENCY DRIVE. THE MAU SHALL BE ABLE TO VARY THE SUPPLY AIR CFM ACCORDING TO BELOW SPECIFIED SCENARIOS. SET FAN SPEED IN TESTING AND BALANCING.

Table with 3 columns: SCENARIO, HEATING COIL, SUPPLY AIRFLOW. Lists BOTH COMPRESSORS OFF, ONLY ONE COMPRESSOR ON, ONLY ONE COMPRESSOR ON AND ROOM TEMPERATURE BELOW SETPOINT, BOTH COMPRESSORS ON AND ROOM TEMPERATURE ABOVE SETPOINT, BOTH COMPRESSORS ON AND ROOM TEMPERATURE BELOW SETPOINT, BOTH COMPRESSOR ON AND ROOM TEMPERATURE BELOW SETPOINT.

WHEN THE HEATING COIL IS ENERGIZED, THE CAPACITY SHALL BE MODULATED TO MAINTAIN THE SUPPLY AIR SETPOINT.

THE ECP FOR MAU-A01, A02, AND A03 SHALL BE PROVIDED WITH A RELAY TO DISABLE THE HEATING UPON RECEIVING A GENERATOR POWER SIGNAL FROM THE PLC. WHEN THE SIGNAL IS LOST, THE RELAY SHALL RETURN TO NORMAL POSITION.

4.2. FANS WITH DUCT HEATERS. FANS ASSOCIATED WITH DUCT HEATERS SHALL BE CONTROLLED BY AN "ON-OFF" SELECTOR SWITCH LOCATED ON THE FACE OF THE TEMPERATURE CONTROL PANEL. WHEN THE SWITCH IS PLACED IN THE "ON" POSITION, THE FAN SHALL BE ENERGIZED. BEFORE THE FAN CAN OPERATE, THE CONTROL DAMPER(S) SHALL BE PROVEN OPEN. WHEN THE FAN IS DE-ENERGIZED, THE CONTROL DAMPER(S) SHALL CLOSE. DUCT HEATERS SHALL EACH BE CONTROLLED BY A DUCT MOUNTED SUPPLY AIR THERMOSTAT. THE THERMOSTAT SHALL MODULATE THE OUTPUT OF THE DUCT HEATER TO MAINTAIN THE DESIRED SUPPLY AIR TEMPERATURE. AIRFLOW THROUGH THE HEATER SHALL BE PROVEN BEFORE THE HEATER CAN OPERATE.

Table with 4 columns: EQUIPMENT, DUCT HEATER, SUPPLY AIR THERMOSTAT, CONTROL DAMPER(S). Lists SF-A01, SF-A02, EDH-A01, EDH-A02, BUILT-IN, BUILT-IN, ---, ---.

5. AIR CONDITIONING SYSTEMS.

5.1. PACKAGED SYSTEMS. PACKAGED SYSTEMS SHALL BE CONTROLLED BY THEIR RESPECTIVE THERMOSTAT. SYSTEM OPERATION SHALL BE CONTROLLED BY AN "OFF-HEAT-AUTO-COOL" (AUTOMATIC CHANGEOVER, PROGRAMMABLE) SYSTEM SWITCH AND AN "AUTO-ON" FAN SWITCH LOCATED ON THE THERMOSTAT SUB-BASE. HEAT PUMPS SHALL ALSO HAVE AN "EMERGENCY HEAT" SYSTEM SWITCH POSITION TO ENERGIZE THE HEATING AND DE-ENERGIZE THE COMPRESSORS.

WHEN THE SWITCH IS PLACED IN "HEAT" POSITION, COOLING SHALL BE LOCKED OUT, THE FAN SHALL OPERATE AND THE ROOM THERMOSTAT SHALL MODULATE THE HEATING OUTPUT OF THE UNIT TO MAINTAIN DESIRED ROOM TEMPERATURE SETPOINT. BEFORE THE FAN CAN OPERATE THE CONTROL DAMPER(S) SHALL BE PROVEN OPEN. WHEN THE SWITCH IS PLACED IN "COOL" POSITION, HEATING SHALL BE LOCKED OUT, THE FAN SHALL OPERATE AND THE THERMOSTAT SHALL ENERGIZE COMPRESSOR(S) TO MAINTAIN DESIRED ROOM TEMPERATURE SETPOINT. WHEN THE SWITCH IS PLACED IN "AUTO" POSITION, THE FAN SHALL BE ENERGIZED UPON A CALL FOR COOLING OR HEATING AS REQUIRED TO MAINTAIN THE DESIRED ROOM TEMPERATURE.

EACH SYSTEM SHALL BE PROVIDED WITH AN ECONOMIZER IF SPECIFIED IN THE SCHEDULE OF DRAWINGS. THE SYSTEM SHALL BE IN THE ECONOMIZER MODE WHEN THE SYSTEM IS IN THE AUTO MODE, COOLING IS REQUIRED, AND THE OUTSIDE AIR IS SUITABLE FOR COOLING. OUTSIDE AIR IS SUITABLE FOR COOLING WHEN THE OUTSIDE AIR TEMPERATURE IS BELOW THE CHANGEOVER TEMPERATURE INITIALLY SET AT 75F AND THE OUTSIDE AIR ENTHALPY IS LESS THAN THE RETURN AIR ENTHALPY ON SYSTEM EQUIPPED WITH DIFFERENTIAL ENTHALPY WITH FIXED DRY BULB TEMPERATURE CONTROL. THE CONTROLS SHALL BE CAPABLE OF MODULATING THE OUTSIDE AIR, RETURN AIR, AND RELIEF AIR DAMPERS IN CONJUNCTION WITH THE MECHANICAL COOLING TO SATISFY THE SPACE CONDITIONS. THE HEATING CONTROLS SHALL BE LOCKED OUT. WHERE POWER EXHAUST IS INDICATED, THE ECONOMIZER CONTROL SHALL SEND AN ENABLE SIGNAL TO THE POWER EXHAUST ACCESSORY WHEN THE ECONOMIZER MODE IS INITIATED. POWER EXHAUST SHALL HAVE A VARIABLE FREQUENCY DRIVE FOR MODULATING SPEED WITH RESPECT TO ROOM PRESSURE BY USING BUILT-IN DIFFERENTIAL PRESSURE TRANSDUCER.

Table with 4 columns: EQUIPMENT, ROOM THERMOSTAT, CONTROL DAMPER(S), ECONOMIZER. Lists PAC-A01, PAC-A02, PAC-J01, PAC-J02, PHP-L01*, PHP-L02, PHP-L03*, PHP-M01, T-A02, T-A02, T-J01, T-J01, T-L01, T-L03, T-L02, T-M04, CD-A03, CD-A04, CD-A05, CD-A06, CD-J01, CD-J02, CD-J03, CD-J04, CD-L03, CD-L04, CD-L07, CD-L08, CD-L05, CD-L06, PEKH-A01, PEKH-A02, PEKH-J01, PEKH-J02, PEKH-L01, ---, PEKH-L02, PEKH-M01.

THE BELOW SYSTEM(S) SHALL MONITOR THE SPACE RELATIVE HUMIDITY AND SHALL NOT ALLOW THE SUPPLY AIR TEMPERATURE TO BE RESET UPWARD IF THE SPACE RELATIVE HUMIDITY EXCEEDS 60%. MODULATING HOT GAS REHEAT SHALL BE UTILIZED TO CONTROL THE SPACE RELATIVE HUMIDITY IN CONTROL.

Table with 2 columns: EQUIPMENT, ROOM HUMIDISTAT. Lists PHP-L01, PHP-L02, PHP-L03, PHP-M01, H-L01, H-L03, H-L02, H-M01.

* THESE PHP(S) SHALL HAVE CAPACITY TO BE INTERLOCKED WITH EXHAUST FAN, REFER SECTION 3.2. WHEN THE PHP IS CALLED TO OPERATE, THE PHP SHALL SEND A SIGNAL TO TEMPERATURE CONTROL PANEL TO ENERGIZE THE INTERLOCKED EXHAUST FAN AND WHEN THE PHP IS DE-ENERGIZED, THE INTERLOCKED EXHAUST FAN SHALL BE DE-ENERGIZED.

5.1.1. DUTY/STANDBY CONTROL. THE AIR CONDITIONING SYSTEM CONSISTING OF TWO 100% CAPACITY PACKAGED UNITS SHALL OPERATE IN A DUTY/STANDBY CONFIGURATION. THE PACKAGED AIR CONDITIONING UNITS INDICATED BELOW SHALL BE PROVIDED WITH A DUTY/STANDBY TYPE CONTROL SYSTEM. THE UNITS SHALL BE CONTROLLED BY THEIR DUTY/STANDBY CONTROL PANEL (DSCP) AND RESPECTIVE THERMOSTATS. THE DSCP SHALL BE PROGRAMMED AS DESCRIBED HEREIN. IF THE DUTY OPERATING SYSTEM IS UNABLE TO MAINTAIN SPACE TEMPERATURE, THE DSCP SHALL ENERGIZE THE STANDBY UNIT TO ASSIST IN COOLING THE SPACE. THE DSCP SHALL BE FIELD PROGRAMMABLE FOR THE BUILT-IN CONTROLS OF THE EQUIPMENT AND SHALL BE CAPABLE OF CONTROLLING ANY PRE-EXISTING FUNCTIONS INCLUDING, BUT NOT LIMITED TO MIXED AIR ECONOMIZER, COOLING STAGES, AUTO CHANGEOVER ETC.

Table with 3 columns: EQUIPMENT, ROOM THERMOSTAT, DUTY/STANDBY CONTROL PANEL. Lists PAC-A01, PAC-A02, PAC-J01, PAC-J02, T-A02, T-A02, T-J01, T-J01, DSCP-A01, DSCP-A01, DSCP-J01, DSCP-J01.

5.2. 100% DEDICATED OUTDOOR AIR UNIT. THE DEDICATED OUTDOOR AIR UNIT SHALL BE OPERATED TO PROVIDE 100% CONDITIONED OUTDOOR AIR TO THE LABORATORY SPACE TO ACT AS MAKE-UP AIR FOR THE FUME HOOD EXHAUST. DOAU SHALL BE CONTROLLED BY "ON-OFF-AUTO" SELECTOR SWITCH. WHEN THE SWITCH IS PLACED IN "AUTO" POSITION, THE DOAU SHALL BE INTERLOCKED WITH FUME HOOD EXHAUST FAN, EF-L01. WHEN THE EF-L01 IS CALLED TO OPERATE, THE DOAU SHALL BE ENERGIZED. BEFORE THE FAN CAN OPERATE, THE CONTROL DAMPER(S) SHALL PROVE OPEN. WHEN THE FAN IS DE-ENERGIZED, THE CONTROL DAMPER(S) SHALL RETURN TO NORMAL POSITION. THE SUPPLY AIR BLOWER OPERATES CONTINUOUSLY TO PROVIDE CONSTANT AIR FLOW WHILE THE FUME HOOD EXHAUST FAN IS ON.

THE PACKAGED COOLING SYSTEM SHALL BE ENERGIZED WHEN TEMPERATURE OF OUTSIDE AIR IS GREATER THAN THE COOLING SETPOINT AS SENSED BY BUILT-IN TEMPERATURE SENSOR. THE COMPRESSOR SHALL MODULATE TO MAINTAIN A CONSTANT SUPPLY AIR SETPOINT. WITH FURTHER REDUCTION IN THE OUTDOOR AIR TEMPERATURE, THE HEATING COIL SHALL BE ENERGIZED, AND COOLING SHALL BE LOCKED OUT. HEATING COIL SHALL BE MODULATED TO MAINTAIN THE SUPPLY AIR TEMPERATURE SETPOINT.

THE DOAU SHALL ALSO ADJUST THE SUPPLY AIR DEWPOINT BASED ON THE INPUT OF ROOM THERMOSTAT AND HUMIDISTAT TO AVOID CONDENSATE FORMATION. MODULATING HOT GAS REHEAT COIL SHALL BE UTILISED TO MAINTAIN SUPPLY AIR DEW POINT.

Table with 5 columns: EQUIPMENT, SWITCH LOCATION, FAN INTERLOCK, CONTROL DAMPER(S), ROOM THERMOSTAT / HUMIDISTAT. Lists DOAU-L01, ECP-L01, EF-L01, CD-L09, T-L04, H-L04.

6. LAB CONTROL SYSTEMS

6.1. LAB FUME HOOD EXHAUST SYSTEM. THE EXHAUST FAN SHALL BE PROVIDED WITH A "OFF-AUTO-ON" SELECTOR SWITCH. WHEN THE SWITCH IS PLACED IN "AUTO" POSITION, FUME HOOD CONTROLLER/SASH POSITION SENSOR SHALL CONTROL THE EXHAUST FAN OPERATION. BEFORE THE FAN CAN OPERATE, THE CONTROL DAMPER(S) SHALL BE PROVEN OPEN. WHEN THE FAN IS DE-ENERGIZED, THE CONTROL DAMPER(S) SHALL RETURN TO NORMAL POSITION.

Table with 4 columns: EQUIPMENT, FAN INTERLOCK, CONTROL DAMPER(S), SWITCH LOCATION. Lists EF-L01, FUME HOOD, CD-L10, TCP-L01.

7. THERMOSTAT SETPOINTS

7.1. THERMOSTAT SETPOINTS SHALL BE AS INDICATED BELOW, UNLESS THE SETPOINT HAS BEEN DESCRIBED PREVIOUSLY IN THIS SEQUENCE OF OPERATIONS.

Table with 2 columns: Description and Value. Lists LOW TEMPERATURE THERMOSTATS (40 F, 60 F, 60 F, 45 F, 90 F, 75 F), HEATERS (75 F COOLING, 72 F HEATING, 70 F COOLING, 70 F HEATING, 50 F), MAKEUP AIR SUPPLY HEATING (MAU-M01, M02), MAKEUP AIR SUPPLY HEATING (MAU-A01, A02, A03), VENTILATING EQUIPMENT (75 F), AIR CONDITIONED AREAS (75 F COOLING, 72 F HEATING, 70 F COOLING, 70 F HEATING, 50 F), PROGRAMMABLE THERMOSTATS (75 F ECONOMICIZING), LABORATORY, CHANGEOVER TEMPERATURE SETPOINT.

Revision table, title block, and drawing information. Includes title 'BENTONVILLE WATER RESOURCE RECOVERY FACILITY IMPROVEMENTS', project 'HVAC SEQUENCE OF OPERATIONS', date 'MARCH 2025', scale 'AS SHOWN', and drawing by 'AK'. Includes logos for Hawkins Weir Engineers, Inc. and Black & Veatch.

2/12/2025 10:27:58 AM / CP / HVAC

Autodesk Docs://410144 - Bentonville Water Resource Recovery Facility Improvements/H--GENERAL.rvt