1. Rooftop Unit #3
    a. General
        i. Unit consists of a supply fan with variable frequency drive (VFD), return air fan with VFD, direct expansion (DX) cooling coils, electric resistance heating coils, outdoor air dampers, mixed air dampers, barometric relief air dampers, and filters.
        ii. Unit is capable of operating in economizer mode.
        iii. Unit is capable of supply air temperature control reset from the BAS
        iv. Unit's Control Panel shall be monitored by the building's automatic system (BAS).
    b. Airflow Control
        i. Supply and return fan shall be controlled manually or automatically by the AHU Control Panel.
        ii. The supply fan shall be controlled by the RTU control panel modulating the supply fan variable frequency drive (VFD) to maintain a duct static pressure setpoint.
        iii. If a fan failure is detected, the Control Panel shall shut down all fans associated with the RTU (supply, return) and send an alarm to the BAS System
    c. Temperature Control
        i. The supply air temperature, as sensed by the supply air temperature sensors, shall be maintained at setpoint of (55°F adj.) by the DX cooling coils.
        ii. Supply air temperature reset (within McQuay controls) shall be provided to adjust temperature setpoint in (1°F adj.) increments based on (airflow/ return air temperature)
        iii. Heating/Cooling change over shall be based on (OA Temp/ return air temp). Heating to Cooling changeover temperature setpoint shall be (65°F adj.). Cooling to Heating changeover temperature setpoint shall be (50°F adj.).
    d. Economizer Control
        i. The system shall go into economizer mode whenever the outdoor air dry-bulb temperature, as sensed by the outdoor air temperature sensor, is below (66°F adj.).
        ii. When the temperature of the outdoor air is above (66°F adj.), the RTU control panel shall prevent the modulation of the outdoor and mixed air dampers. The outdoor air damper shall assume the minimum outdoor air position and the mixed air dampers shall by fully open.
        iii. When the temperature of the outdoor air is between (66°F adj.) and the supply air temperature setpoint, the outdoor air damper shall be fully opened (maximum outdoor air position) and the mixed air dampers shall be fully closed.
        iv. When the temperature of the outdoor air is below the supply air temperature setpoint, the outdoor and mixed air dampers shall modulate in sequence to maintain the supply air temperature setpoint.

2. Variable Air Volume (VAV) Units (Units 3.2, 3.3, 3.15, 3.17, 3.20, and 3.22)
    a. The VAV units shall be controlled within minimum and maximum supply air volume settings by space thermostat through pneumatic controls to provide the required airflow to maintain temperature setpoint (74°F adj.). Supply air volume remains at minimum CFM scheduled before the hot water reheat valve is modulated open.
    b. The VAV units shall be controlled to unoccupied mode from (20:00 adj.) to (04:00 adj.). Unit supply air damper and hot water valves shall modulate closed. Upon a rise or drop in temperature exceeding unoccupied setpoints of (78°F adj.) and (65°F adj.) , the unit supply air damper and hot water valve shall modulate sequentially until space temperature is maintained for (30 MINUTES adj.).

3. Rooftop Unit #6
    a. General
        i. Unit consists of a supply fan, return air fan, direct expansion (DX) cooling coils, electric resistance heating coils, outdoor air dampers, mixed air dampers, barometric relief air dampers, and filters.
        ii. Unit is capable of operating in economizer mode.
        iii. Unit is capable of supply air temperature
        iv. Unit's Control Panel shall be monitored by the building's automatic system (BAS).
    b. Temperature Control
        i. The supply air temperature, as sensed by the supply air temperature sensors, shall be maintained at setpoint of 55°F (adj) by the DX cooling coils.
        ii. Supply air temperature reset (within McQuay controls) shall be provided to adjust temperature setpoint in (1°F adj.) increments based on (airflow/ return air temperature)
        iii. Heating/Cooling change over shall be based on OA Temp. Heating to Cooling changeover temperature setpoint shall be (65°F adj.). Cooling to Heating changeover temperature setpoint shall be (50°F adj.).
    c. Economizer Control
        i. The system shall go into economizer mode whenever the outdoor air dry-bulb temperature, as sensed by the outdoor air temperature sensor, is below (69°F adj.).
        ii. When the temperature of the outdoor air is above (69°F adj.), the RTU control panel shall prevent the modulation of the outdoor and mixed air dampers. The outdoor air damper shall assume the minimum outdoor air position and the mixed air dampers shall by fully open.
        iii. When the temperature of the outdoor air is between (69°F adj.) and the supply air temperature setpoint, the outdoor air damper shall be fully opened (maximum outdoor air position) and the return air dampers shall be fully closed.
        iv. When the temperature of the outdoor air is below the supply air temperature setpoint, the outdoor and return dampers shall modulate in sequence to maintain the supply air temperature setpoint.

d. Unoccupied Mode
    i. The system shall de-energize during unoccupied mode from (20:00 adj.) to (04:00 adj.) every day.
    ii. If space temperature exceeds night setback temperature setpoints of (65°F adj.) and (80°F adj.), the system shall energize and operate until space temperature has been maintained for (1 HOUR adj.).
e. Automatic Shutdown/Restart
    i. When smoke is detected by duct smoke detectors, the supply fan shall de-energize and an alarm shall be transmitted to the fire alarm system and the BAS system. Mixed air dampers shall modulate closed. Return air fans shall continue to run.
    ii. Supply fans shall restart when fire alarm circuit is reset.

4. Electrical Room Fan
    a. General
        i. The unit consists of supply fan controls by a local line voltage thermostat.
        ii. The unit does not utilize any heating or cooling.
    b. Start/Stop
        i. The unit shall be started and stopped manually or at the thermostat. When the space temperature exceeds the space temperature setpoint (75°F adj.), the fan shall energize.

5. Air Handling Unit (AHU-1)
    a. General
        i. The unit consists of supply fan with variable frequency drive (VFD), return fan, direct expansion cooling coils, minimum outdoor air dampers, economizer outdoor air dampers, mixed air dampers, relief air dampers, and filters.
        ii. The unit is capable of economizer mode.
        iii. The unit is capable of supply air temperature reset.
        iv. The unit does not contain any heating coils. All heat is from local reheat coils.
        v. Outdoor air and relief air dampers are normally closed. Mixed air dampers are normally open.
    b. Start/Stop
        i. Unit fans shall be started and stopped manually at the AHU control panel or by the BAS control system. When the system is energized, the OA damper and mixed air dampers shall open. After the dampers have opened, the supply fan shall energize and ramp up to maintain a constant speed. When the system is shutdown, the supply and return fans shall de-energize. The outside and relief dampers shall modulate closed after the fan has stopped.
        ii. If a fan failure is detected, the BAS shall shut down all fans associated with the AHU (supply, return) per the start/stop sequence and send an alarm to the BAS system.

c. Airflow Control
    i. Supply airflow shall be controlled by the BAS modulating the supply fan variable frequency drive (VFD) to maintain constant occupied and unoccupied air volumes based on time of day.
    ii. Outdoor airflow shall be controlled by the BAS modulating the minimum outdoor air dampers to maintain occupied and unoccupied outdoor air volumes based on time of day.
    iii. A low static pressure cutout switch located at the supply fan's intake shall prevent the supply fan from exceeding negative (2 in.w.c. adj.) of static pressure. If the static pressure exceeds negative (2 in.w.c. adj.) the supply fan shall de-energize and an alarm shall be sent to the BAS.

d. Temperature Control
    i. A supply air temperature sensor will be located in the system supply ductwork. The supply air temperature setpoint (55°F adj.) shall be maintained by DX cooling coils.
    ii. A supply air temperature reset shall be provided to adjust temperature setpoint based on outdoor air temperature. If the outdoor air temperature is equal to or greater than (58°F adj.), the BAS shall control the temperature setpoint to (55°F adj.). If the outdoor air temperature is less than (58°F adj.), the BAS shall control the temperature setpoint to (60°F adj.) to the extent possible using return air as the heat source.

e. Economizer Control
    i. The system shall go into economizer mode whenever the outdoor air dry-bulb temperature, as sensed by the outdoor air temperature sensor, is below (66°F adj.).
    ii. When the temperature of the outdoor air is above (66°F adj.), the BAS shall prevent the modulation of the outdoor, mixed, and relief air dampers. The outdoor air damper shall assume the minimum outdoor air position. The mixed air dampers shall be fully open and the relief air dampers shall be fully closed.
    iii. When the temperature of the outdoor air is between (66°F adj.) and the supply air temperature setpoint, the outdoor air damper shall be fully opened (maximum outdoor air position). The mixed air dampers shall be fully closed and the relief air dampers shall be fully open.
    iv. When the temperature of the outdoor air is below the supply air temperature setpoint, the outdoor, mixed, and relief dampers shall modulate in sequence to maintain the supply air temperature setpoint.

f. Unoccupied Mode
    i. The system shall go into unoccupied mode from (18:00 adj.) to (06:00 adj.) every day.
    ii. The BAS shall modulate the supply fan VFD to maintain a supply airflow of 2000 CFM, the OA dampers to 1600 CFM, and the return air fan OFF. This is a constant low speed setting.
    iii. When outdoor temperature is below (32°F adj) the BAS shall return to full flow by increasing speed on Supply air fan and energizing the return air fan in order to prevent freezing air from entering the system. During unoccupied mode, when the outdoor temperature increases to (35°F adj) the fans shall return to low speed.

g. Automatic Shutdown/Restart
    i. When smoke is detected by duct smoke detectors, the supply fan shall de-energize and an alarm shall be transmitted to the fire alarm system. Exhaust fans serving the space shall continue to run.
    ii. Supply fans shall restart when fire alarm circuit is reset.