General Air Handling Unit Checklist

- [ ] **Verify Proper Operation of Air Dampers**
Confirm that all AHU dampers are operating correctly. Have an operator send a control signal to open and close all dampers and visually confirm that they are fully opening and closing. Also have the operator open the dampers to about 50% to make sure they are modulating correctly. Repair any actuators or damper banks that are not functioning correctly. In some cases modulating damper actuators will need to be installed to allow for changes in outside airflow rates if the current dampers are open/closed.

- [ ] **Verify Proper Operation of Air-side Economizer**
Check the DDC system control sequence to see if the current control system is using an air-side economizer. Make sure the economizer is working correctly by viewing damper positions and outside airflow rates at different outside air temperatures. If no air-side economizer function is currently used, determine the applicability of enabling one. Outside air temperature sensors are required for dry bulb–based economizers and an additional outside air relative humidity sensor is needed for enthalpy-based economizers. Both of these sensors need to be working correctly for the system to operate as designed.

- [ ] **Verify Proper Operation of Heating and Cooling Valves**
Check all heating and cooling valves for proper operation. Check the heating valve in the winter by shutting off the valve and checking the air handler mixed air and discharge temperatures. If the valve is closed and supply is still heated by the coil, the valve isn't seating correctly and is causing unnecessary simultaneous heating and cooling. The same procedure should be followed for cooling coil analysis.

- [ ] **Check the Condition of Heating and Cooling Coils and AHU Filters**
Visually inspect the condition of the heating and cooling coils and the AHU filters. If the coils are dirty or the filters are clogged, change out the filters and clean the coils. If the current maintenance schedule isn't sufficient, revise the schedule accordingly. If static pressure sensors are used to determine filter dirt loading, make sure the sensors are working correctly. Dirty filters and coils will increase the static pressure across the coil, increasing fan system energy use in addition to reducing the heat transfer coefficient of the coil, forcing the system to move more air over the coil for the same heating/cooling effects.

- [ ] **Eliminate Duct Leakage**
Periodically trace the main heating, ventilating, and air conditioning (HVAC) duct runs and listen for air leaks in the duct system. Confirm that the duct static pressure setpoint is within the pressure class of the installed ductwork before repairing any leaks. If the distribution system is really leaky, consider replacing the ductwork or using a duct sealant system to seal the leaks.

- [ ] **Eliminate 100% of Outside Air Systems if Practicable**
One of the largest energy-wasting systems is 100% outside air ventilation in areas that don't require it. Common areas that require 100% outside air are operating rooms (ORs) and labs. If 100% outside air AHUs are being used for differing space types that don't require outside air, modulating outside air dampers and return air systems should be installed to reduce outside air.

☐ **Reduce Outside Airflow Rates to ASHRAE 62.1-2010**
Most buildings are bringing in more outside air than they are required to per ASHRAE 62.1-2010. Outside airflow rates should be reduced to the minimum allowed by ASHRAE for each space. Consider installing CO_2 sensors in return air ductwork and maintaining interior CO_2 levels at <700 ppm above outside air CO_2 levels during occupied hours. Also consider implementing an outside air damper reset schedule based on time of day and occupancy patterns within the building. During unoccupied hours and during morning warm-up cycles, all outside air dampers should be 100% closed.

☐ **Implement an HVAC System Night Setback Schedule**
For all HVAC systems that serve non 24/7 areas, make sure that night setback controls have been implemented. Work with site staff to identify operational hours of HVAC equipment. Some areas may contain equipment that have acceptable temperature limits, thus it is important that unoccupied set-points are not outside the acceptable limits of the equipment in the space.

☐ **Track HVAC Setback**
Set up trend logs of your HVAC systems to collect data on whether your systems are actually going into night setback mode. If your system is coming on during the night to either warm up or cool down spaces, look at the unoccupied temperature range of the space to see if it can be adjusted. Also check to see if there is something going on in the space causing the temperature to go out of range. In addition, the site can implement an optimum start/stop sequence through the building automation system or advanced programmable thermostat.

☐ **Monitor Exhaust Fan Controls**
For HVAC zones that are utilizing night setbacks, make sure the exhaust fans serving that zone are shutting down on a similar schedule. If exhaust fans are left on 24/7 a negative pressure will form within the building that will draw in unconditioned outside air, increasing the amount of time and energy it will take the HVAC system to bring the space temperature back to the occupied setpoints. This will also use additional electrical energy at night to power the fans, which can be reduced or eliminated by turning the fans off or installing variable frequency drives (VFDs) to set back the flow rate at night.

☐ **Slow Down Systems During Unoccupied Hours**
If certain parts of the building are occupied after hours, implement the following measures:

- Reset outside air intake to a lower level (outside air damper 0-5% open)
- Reset minimum airflow to a lower value (typically 33% to 50% of current flow)
- Reset supply air static to a lower level or set supply air fan speed to a lower value

Constant Volume Air Handling Unit Checklist

☐ **Adjust Total Airflow and Head**
Airflow rates are often significantly higher than required in buildings primarily due to system oversizing. In some large systems, an oversized fan causes over-pressurization in terminal boxes. The excessive airflow can often cause excessive fan energy consumption, excessive heating and cooling energy consumption, humidity control problems, and excessive noise in terminal boxes. Calculate the required airflow rate in heating and cooling mode to determine the correct flow rates. If the airflow rate can be reduced, install a VFD and slow the fan down to the required flow rates. The VFD can also be used to slow down the fan during unoccupied hours if the AHU has to stay on at night. In addition, make sure outside air is reduced accordingly.

☐ **Convert the Constant Volume System to a VAV System**
A VAV system can significantly reduce HVAC system energy use. All constant volume AHUs should be identified and considered for retrofit to a VAV system.

☐ **Implement a Supply Air Temperature Reset Schedule**
The goal of a supply air temperature reset schedule is to minimize combined fan power and thermal energy consumption or cost. For single duct constant volume systems, maintain the supply air temperature no higher than 57°F if the outside air humidity ratio is higher than 0.009 or the dew point is higher than 55°F. When the outside air humidity ratio is lower than 0.009, the supply air temperature can be reset to a higher temperature over the temperature range of 55°F to 65°F.

Variable Air Volume Air Handling Unit Energy Conservation Measures

☐ **Investigate Duct Static Pressure**
For VAV systems, review your duct static pressure setpoints and adjust them as low as possible while keeping all VAV dampers below 90% open. If VAV dampers are 100% open during periods, identify the reasons the space is calling for additional air flow and adjust system loads (i.e., relocate certain internal loads).

☐ **Reset the Supply Air Temperature**
Maintain the air temperature no higher than 57°F if the outside air humidity ratio is higher than 0.009 or the dew point is higher than 55°F. Both humidity ratio and dew point can be determined using dry bulb temperature and relative humidity data. Maintain the supply air temperature no higher than 57°F if the fan air flow is higher than 70% of the air flow under the maximum load conditions. This is often significantly smaller than 70% of the design air flow. When the air flow is higher than 70%, increased air flow has a significant impact on fan power. For example, resetting the supply air temperature from 55°F to 57°F can potentially increase the air flow by 10%. This will increase fan power from 34% to 51% of the maximum value. When the outside air humidity ratio is lower than 0.009 and the air flow is lower than 50%, the supply air temperature can be modulated to maintain total airflow at 50% or lower. If the air flow is lower than 50%, the supply air temperature can be increased. However, the supply air temperature must be lower than a high limit, which can be set to 65°F.

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