

Operation and Maintenance Measurers
Upgrade/Calibrate AHU Pneumatic Controls

The pneumatic controls, valves, sensors, and actuators in the air handlers in the building should be examined and calibrated/replaced as needed. Typically, these items are installed and left as is unless there is a major problem. However, over time, sensor and actuator setpoints can drift out of calibration causing occupant discomfort and also wasted energy. Items to examine include the discharge air temperature sensor and controller, the mixed-air temperature sensor and controller, heating and cooling valves and actuators, and individual zone sensors.

North Side Police Station

This building was built in 1997. The building, mechanical equipment and electrical equipment are in good condition. The building has two air handlers, AHU-1 is 10 HP and roughly 9,000 CFM which serves the majority of the building. A smaller air handler serves only a conference room. AHU-1 is a constant volume reheat (CVRH) air-handler system. During the heating season, the CVRH system provides heat to occupants with hot water coils in the ductwork. Thermostats in individual rooms or areas control the coils. During the cooling season, the CVRH system works by cooling air at the air-handling unit. This both cools the air and removes moisture. The cool dry air is then heated back up at the reheat coils. It is noted that both the cooling and heating need to run all summer to provide comfort conditions. Without the reheat in the summer, the building is too cold. See also the Energy Use Data section for more information.

There are three exhaust fans serving various spaces and a digital control system in the building with remote access at the City. There are two Lockenvar boilers providing hot water for the booster coils. The boilers have outdoor air reset, but the reset range is limited in its turn-down range due to the boiler type. The building is fully occupied from roughly 6 a.m. to 10 p.m. As this is a police station, the building is occupied around the clock but not to the same extent as during the day. Occupants note the building is usually overly cool during the summer, especially during the warmest days. This leads to the boiler being run to warm the space up to attain

comfort conditions. The fact that the building is overly cool during the warmest days indicates the cooling system is oversized. The space sensors are programmed to provide 73°F air year round. The occupants have the ability to change the temperature setting +/- 2 degrees. This allows the temperature to range from 71°F to 75°F depending on the occupant.

Energy-Efficiency Measurers

EEM-3 - AHU Variable Frequency Drive (VFD) and Hot Water Reset

The oversized air handler will have a VFD added for reducing the system airflow. Based on building modeling, the airflow can be reduced to 6,000 CFM. In addition, in order to control the reheat system better, a three-way mixing valve and controls will be added to the boiler water circulation system. The three-way valve will be used for outdoor air reset of the hot water. This way the boilers can operate within their temperature parameters, and the building hot water temperature can be turned down in the summer. It is recommended the reset range be as follows: OA temp -20, HWS temp 180; OA temp 50, HWS temp 110 or lower. There are several options for repiping the system. See B&G Equipment Room Piping Practices, 1965. The combination of resetting the hot water supply temperature and adjusting the airflow through the air handler will result in savings of \$5,000 a year. Savings are the result of reduced airflow for cooling and subsequent reheating as well as reduced fan horsepower requirements. For the lower airflow strategy to work, verify there is an AHU discharge temperature low-limit sensor set to 45°F prevent freezing the coil.

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It is recommend the space temperature be varied from summer to winter. During the winter, the setpoint should be 70°F, and in the summer it should be 76°F. Discussion with the occupants revealed they are generally overly cool and would be comfortable at warmer temperatures. Even if the occupants override the settings (up

2°F in the winter and down 2°F in the summer), this will still produce energy savings from the current single year-round setpoint.

In addition, during the winter, a night setback temperature should be experimented with. A recommended setback temperature is 66°F. The station captain notes there should be not problem with this as staff using the building during winter nights are typically in full gear, warmly dressed, and are often in their cars.

Traffic Engineering Building

This facility houses office, printing, painting, garage, and warehouse storage functions. The office area of the facility has a brick façade stud walls and a flat build-up roof. The garage and warehouse areas are metal skin pre-engineered buildings with ceiling and wall insulation. Overhead doors have been upgraded to low-infiltration high-insulation doors. In the office areas, the majority of the windows have been retrofit with efficient double-glazed insulated windows. The steam boiler operates no higher than 15 psig and has a central day/night switch that provides temperature setback capability. The boiler was originally from a different building and is oversized for this building. Temperature setback is estimated at 5°F. Garage and warehouse areas are also heated with gas-fired, ceiling-mounted furnaces. The boiler serves the office area and some parts of the garage areas via ceiling-mounted unit heaters.

The water heater is an older 74-gallon 120,000 Btu per hr input unit. This unit should be replaced with a new more energy-efficient model when it wears out. ASHRAE standard 90.1-2001, Energy Standard for Buildings Except Low-Rise Residential Buildings, requires a minimum thermal efficiency of 80% for gas storage water heaters between 75,000 and 155,000 Btu per hr.