Energy Improvements for 79 Elm Street (under DPW contract)

Expected completion: late 2009

The following six items will be completed during 2009 to improve energy efficiency at 79 Elm Street in Hartford. If you are interested in reading the entire energy analysis for 79 Elm Street, please contact the pollution prevention group at 424-3297.

Install Super T-8 Lamp Lighting Systems

Replace all existing fluorescent fixtures with low mercury 25 watt ST8 'super T8' lamps and low-power electronic ballasts to optimize system performance and energy efficiency. Super T8 lamps produce more light than standard T8 lamps. This enables them to be paired with reduced-power electronic ballasts for maximum savings. Thus, system light output can be maintained while achieving significant wattage reduction.

Super T8 systems are programmed-start/rapid-start. This optimizes lamp life for applications where the lights are frequently switched – such as the next measure recommendation, where occupancy sensor installations are prescribed.

Install Occupancy Sensors

Occupancy sensors will be installed in all areas where lighting systems operate under manual control and whose occupancy patterns were classified as sporadic. The type of sensor (ultrasonic, passive infrared, dual technology, and/or microphonic) and location (wall or ceiling) of each sensor must be carefully selected for each individual room's layout and expected activity.

Replace Metal Halide Lighting

Replace the 36 decorative, pendant style metal halide fixtures found in the historic meeting rooms and hallways of third floor east and fifth floors with high efficiency compact fluorescent fixtures. Because of 'warm up' and 'restrike' limitations inherent with high-intensity discharge lighting, these metal halide fixtures operate for far longer periods than they should based on occupancy.

Using the compact fluorescent, architecturally appropriate fixtures [each with (3) 39-watt lamps] will improve light levels, make the space more secure, and reduce energy costs.

Install Premium-Efficiency Motors

Replace fan and pump motors greater than 3HP that run 1,500 or more hours per year with new premium efficiency motors. Four chilled water and hot water pumps and fourteen air handling unit fan motors have been targeted at 79 Elm Street. Replacement of standard V-belt drives with cogged belts will provide for additional energy savings for the fan motors.

Install VFD's on Water Pumps

Install variable frequency drives (VFDs) on two 20-HP pumps that deliver hot water during the heating season to fan coil units throughout the facility. The pumps operate in lead/lag fashion with one pump always remaining as a back-up. These pumps currently operate at constant speed regardless of the heating load in the building. The existing (33) fan coil units are equipped with 3-way control valves.

Significant amounts of energy can be saved by controlling the speed of the motors based on the heating load in the building. By installing the VFDs, the speed of the pump motors is slowed based on the pressure drop in the hot water loop. New 2-way control valves will be installed on each fan coil unit and differential pressure sensors will be installed to allow the VFDs to operate properly. The VFDs have a network card that allows them to communicate directly with the EMS.

The VFDs will provide smooth modulation of pump speed (flow control) in response to changes in the building load, and provide an essential cost advantage during periods of low system demand. Because of the cubic power relationship in power output versus speed (Affinity Laws), a reduction in speed of 10% results in a 25% reduction in power, resulting in significant energy savings.

Implement Demand Control Strategies to existing Building Automation System (BAS)

A central 'head-end' device, consisting of a PC, is used to facilitate system commands and monitor system operation. Major control strategies employed by the BAS include: scheduled equipment start/stop, space temperature reset, hi/low reset, supply air reset, economizer, scheduled 'on/off' of the noted building systems and time of day schedule control for the lighting circuits. The BAS provides centralized system monitoring with status indication and alarm enunciation.

The energy consultants were shown the front end PC and reviewed the system to see available schedules, setpoints, control logic, temperature readings and trending capability. They then physically inspected selected air handling units, controllers, transducers and terminal equipment. They also field checked the status of these heating, ventilation and air conditioning (HVAC) devices to verify that the BAS readings and real HVAC conditions matched. This process allowed them to identify control strategy issues, mechanical deficiencies and sensor reading variations that all contribute to negative impact on energy consumption, operating efficiency, air quality, and environmental conditions.

They observed indications of problems and conditions due to a lack of system calibration and commissioning. Specifically, the basis for the original BAS programming was the 1993 building configurations, space utilization and the prevailing low cost of energy. Over time, with various changes to individual pieces of equipment and different building operators making changes to the program, the system has 'drifted' and now is no longer maintaining all the building equipment or the individual zones as a unified whole.

As a result, the temperature and static pressure control for each air handler runs independently of each other often resulting in building pressurization problems. Not all downstream VAV's are precisely calibrated to their primary air handler, or to adjoining VAV's event within the same floor area. In effect, each HVAC device has different, and at times, conflicting temperature control strategies. This was also noted with the interaction of the supply fans, exhaust fans, relief fans and the building differential pressure. All of these conditions contribute towards wasted energy use, temperature 'hot' and 'cold' spots, unnecessary wear and tear on the equipment and an inability of the building operators to successfully control the environment with setpoint changes that have meaningful and dependable outcomes.

The BAS system will be recommissioned to re-verify control logic and confirm software and operational performance. Demand control will be added to create a more energy efficient and well-balanced system.