



CARBON FOOTPRINT



MONTH 1 - THE ENERGY CONSERVATION OPPORTUNITY: K-12 School Building Unit Ventilator System

BASIS OF DESIGN - ORIGINAL 1971

Application: Original design intent – Four-pipe hot water heating and chilled water cooling serving 200,000 sq ft of K-12 school.

| System | Capacity | Months On-Line | Hours of Operation | ATC Controls |
|---------------|----------|-----------------|-------------------------|---------------------------------------|
| Chilled water | 650 tons | May 1 - Oct. 15 | 13 hrs/day, 5.5 days/wk | Two-way valve, reset CHWS temperature |
| Hot water | 350 bhp | Oct. 15 - May 1 | 13 hrs/day, 7 days/wk | Two-way valve, reset HWS temperature |

| Pumps | Flow | GPM/Unit | Pump Head | Balancing Valve | Motor | Pump Flow |
|---------------|-------|----------|-----------|-----------------|----------|-----------|
| Chilled water | 1,560 | 2.4/Ton | 95 ft | 70% open | Original | Constant |
| Hot water | 1,200 | 3.4/bhp | 70 ft | 70% open | Original | Constant |

| Unit Ventilators | Total CFM | Outdoor Air CFM | Hours of Operation | Remarks |
|------------------|-----------|-----------------|-----------------------------|-----------------|
| Through-the-wall | 1,200 | 600 | 6 a.m. to 7 p.m., 7 days/wk | 600 cfm exhaust |

| Chilled Water Temperatures | Hot Water Temperatures | Remarks |
|--------------------------------------|---------------------------------------|---------|
| 45°F to 50° CHWS and 55° to 60° CHWR | 190° to 170° HWS and 170° to 150° HWR | |

ENERGY RETROCOMMISSIONING REPORT/RECOMMENDATION/IMPLEMENTATION

New design intent – Close off the individual unit ventilator outdoor air dampers, add new 100% outdoor air system with heating, cooling, energy recovery, and more efficient air filtration of outdoor air, add energy recovery coils and filters to associated room exhaust fans, replace three-way valves with two-way valves and VFD pumping, add occupancy sensors to classrooms, resize heating and cooling pumps using hydraulic modeling, and replace antiquated pump motors with high-efficiency motors.

| System | Capacity | Months On-Line | Hours of Operation | ATC Controls |
|---------------|----------|-----------------|-------------------------|---------------------------------------|
| Chilled water | 650 tons | May 1 - Oct. 15 | 13 hrs/day, 5.5 days/wk | Two-way valve, reset CHWS temperature |
| Hot water | 350 bhp | Oct. 15 - May 1 | 13 hrs/day, 7 days/wk | Two-way valve, reset HWS temperature |

| Pumps | Flow | GPM/Unit | Pump Head | Balancing Valve | Motor | Pump Flow |
|---------------|-------|----------|-----------|-----------------|-------------------------|---------------|
| Chilled water | 1,560 | 2.4/Ton | 55 ft | 100% open | High efficiency and VFD | Variable flow |
| Hot water | 1,200 | 3.4/bhp | 40 ft | 100% open | High efficiency and VFD | Variable flow |

| Unit Ventilators | Total CFM | Outdoor Air CFM | Hours of Operation | Remarks |
|------------------|-----------|-----------------|-----------------------------|-----------------|
| Through-the-wall | 1,200 | 600 | 6 a.m. to 7 p.m., 7 days/wk | 600 cfm exhaust |

| Chilled Water Temperatures | Hot Water Temperatures | Remarks |
|--------------------------------------|---------------------------------------|---------|
| 45°F to 50° CHWS and 55° to 60° CHWR | 190° to 170° HWS and 170° to 150° HWR | |

OTHER ENERGY CONSERVATION OPPORTUNITIES

ECM-8: Replace antiquated chiller and CFC refrigerant R-12 and further study downsizing chiller size based on new estimated peak demand and consideration towards thermal energy storage (TES) using ice.

Comment: Return on investment (ROI) is out of the acceptable range for the energy retrocommissioning guidelines but may be feasible taking into account the age and condition of the chiller.

ECM-9: Replace antiquated #4 oil boiler with high-performance condensing boiler and further study downsizing boiler size based on new estimated peak demand.

Comment: ROI is out of the acceptable range for the energy retrocommissioning guidelines but may be feasible taking into account the age and condition of the boiler.