



CARBON FOOTPRINT



MONTH 1 - THE ENERGY CONSERVATION OPPORTUNITY: K-12 School Building with New DOAS and Existing Unit Ventilator System Application – Basis of Design Document

BASIS OF DESIGN - ORIGINAL 1971

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

System	Capacity	Months On-Line	Hours of Operation	ATC Controls
Chilled water	650 tons	May 1 – Oct. 15	24 hrs/day	Three-way valve, fixed CHWS temperature
Hot water	350 bhp	Oct. 15 – May 1	24 hrs/day	Three-way valve, 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 CHWS and 55° CHWR	190° HWS and 170° HWR	

ENERGY RETROCOMMISSIONING REPORT/RECOMMENDATION/IMPLEMENTATION

New Design Intent – Disconnect existing outdoor air connections to unit ventilators and open the individual unit ventilator outdoor air dampers to accept the new DOAS connection to provide outdoor air to individual rooms based on room occupancy and CO₂ level within the room. In addition, add water-to-water energy recovery by capturing individual room exhaust energy and transferring the recovered energy to the new DOAS unit. Energy recovery application is estimated to be approximately 50% efficient with 12-yr ROI.

New DOAS unit shall be 100% outdoor air system with energy recovery coil, preheating coil, cooling and dehumidification coil, supply fan, and reheat coil for dehumidification sequence of operation. Individual exhaust fans shall have filters and energy recovery coils and shall be in sync with associated CO₂ control.

Supply fan shall operate with VFDs responding to individual room occupancy schedule and CO₂ sensors.

All existing three-way valves shall be replaced with two-way valves. Refer to December 2011 B2B for more information.

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	Refer to DOAS	Individual room occupancy schedule	

DOAS Unit	ERU Coil	Preheat Coil	Cooling Coil	SAF Fan CFM	Reheat	Remarks
100% OA	0° to 35°	0° to 60°	90° to 55°	14,000	55° to 60°	10 DOAS units

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

NOTES:

- Final heating and cooling of the individual rooms will be by the unit ventilator serving the room, along with its associated exhaust fan.
- Other considerations could be to eliminate the individual DOAS unit reheat coils and design the individual unit ventilators to do the reheat within each room based on how the unit ventilators are zones.
- In the dehumidification sequence of operation, space humidistats located throughout the facility will have the capability to reset the DOAS supply air from 60° supply air temperature down to 55° temperature to remove excess moisture from the outdoor air. On other occasions, the DOAS unit may deliver 60° to save outdoor energy consumption.