



Recommissioning of a Large Middle School

The school district's primary objective in recommissioning this middle school was to bring the ventilation rates up to the 15 cfm/student level currently recommended by the Minnesota Department of Children, Families and Learning. Heating and cooling outside air is expensive, so an additional objective was to improve the efficiency of the building systems to reduce or hold the line on energy costs while increasing outside air flow. The third objective was to solve chronic problems such as overcooling and IAQ complaints.

The district was particularly interested in using a recommissioning process to increase ventilation rates because they had had poor experiences in the past with test and balance (TAB) contractors. Recommissioning gave them a way to assure the quality of the TAB work and to piggyback other objectives on the TAB process.

The school is a single story, 220,000 sq. ft. facility located in a rapidly growing suburban community. The oldest part of the school was built in 1959. Since then there have been at least eight phases of additions and remodels, including conversion from steam to hot water heating, addition of cooling, and phased addition of a building automation system, enlarging the building to ten times its original size and creating complex and poorly documented systems. Five of the remodels and additions occurred in the 1990s, so much of the equipment being investigated is fairly new.



There are 48 air handlers, an unusually large number that strains maintenance resources (A recently recommissioned hospital is three times the size and has only 16 air handlers!). Some of the air handlers are variable volume systems, others are constant volume. Three 125 hp steam boilers supply steam-to-hot water converters and two 147 ton chillers supply chilled water.

The project began with a recommissioning planning process to scope and budget the work and decide on an implementation strategy. CEE then prepared a detailed specification for the TAB work, including a stringent process for verification of final air flows. Requirements to check the condition and function (C&F) of key equipment were included in the TAB specification, with procedures and checklists provided by CEE. C&F checks that fall outside the expertise of TAB contractors were contracted to one of the district's regular mechanical contractors, again with CEE providing the procedures and checklists.

A stunning 481 deficiencies were identified through the C&F check process, even though much of the equipment is fairly new and the district has more funds than most. The variable air



volume boxes serving 30 of the classrooms were unable to operate properly because of low pneumatic air pressure, a problem traced to burns in the plastic pneumatic tubing incurred during piping work with a blowtorch six or eight years earlier. The water in the heating loop, which should be clear or lightly tinted, was as black as used engine oil, a clear sign of extreme corrosion. The expansion tank in the hot water loop was completely filled with sediment. A half dozen of the air handlers had outdoor air intakes with a very

fine mesh that had become completely clogged with dust and dirt, preventing any outdoor air from entering. Cost-driven remodels had crammed cooling coils so close to some fans that water droplets were pulled off the coils and carried downstream, providing moisture for mold growth. One exhaust fan had an inlet grill but no ductwork, another had ductwork but no inlet. Some chilled water coils were completely plugged, allowing no water to pass. Numerous items were broken, worn out or out of calibration – bad thermostats, velocity controllers, relays, valves, bearings, belts, and other items critical to the proper operation of the HVAC systems.

Most of the deficiencies were repaired by one of the district's regular mechanical contractors under CEE's direction, while a few were taken care of by the school's maintenance staff. After the deficiencies were corrected, the test and balance work was able to proceed efficiently to set the outside air flow to the levels currently recommended by DCFL and expected by staff and parents.



In this project, the school was also undergoing work through a performance contract with a different company at the time of the recommissioning. The performance contract included work to optimize the HVAC control strategies, so this was not a major focus of the recommissioning. Energy savings from the recommissioning cannot be unambiguously separated from the savings due to the performance contract. However, the energy savings in the building have very substantially exceeded the performance contractor's forecasts, and the district's energy tracking consultant attributes the additional gains to the recommissioning work.

Through the recommissioning, the school has been transformed from an inefficient, under-ventilated and uncomfortable facility with a huge backlog of deferred maintenance to a healthy, comfortable and efficient building that provides a productive school environment.

For more information about this project or other recommissioning projects, contact Martha Hewett (612) 335-5865 or Mark Hancock (612) 335-5861.