Mechanical Systems Project Proposal
December 15, 2006

Depth - Mechanical

Upon carefully considering all the options and combination of options available for Straumann USA the following proposal will be the focus of the semester long redesign. The results be presented to the Architectural Engineering Department in mid April 2006.

Scope

The scope of the redesign will include the airside and waterside components of the mechanical system. The effects on the electrical system as well as the impact on the initial costs and construction schedule will also be considered.

The airside mechanical redesign will focus on the implementation of DOAS ventilation system with a parallel radiant cooling system. Currently, one of the largest contributors to mechanical costs of the building are fans. The fans from the ten air-handling units account for about 30% of the yearly mechanical electrical energy consumed. By implementing a DOAS system, the size of air-handling units will decrease along with the size of the fans and ultimately the amount of required energy for the units will also be reduced. In order to prevent condensation problems from occurring in the building, the size of the DOAS air-handling units will probably be increased slightly to ensure the latent load is also met by the air system. An energy recovery system will also be implemented with each of the DOAS units to help reduce energy costs. The energy recovery could include a desiccant wheel, enthalpy wheel, sensible wheel, or a combination of two wheels.

As stated earlier, at the start of the Straumann Renovation, the chilled water plant was considered for an update but was later removed. The waterside redesign of the mechanical system will explore whether a direct-fire absorption chiller or electric centrifugal chiller would be the best replacement selection. This will allow for the direct-fire absorption chillers to be compared to a electric centrifugal chiller with both airside systems, DOAS and VAV.

Justification

Reducing energy consumption is a major goal of the redesign. Implementing a DOAS system should certainly accomplish this since fan energy which is the largest component of the annual mechanical costs will be reduced. The direct-fire absorption chiller certainly will reduce electric consumption, however, whether or not the overall energy consumption will be reduced will be determined by the redesign. Changes in initial cost will certainly have to be carefully analyzed to determine if the potential cost savings of the redesigned systems offset any increased initial costs. Regardless of the outcome, the redesign will provide a very valuable learning experience.

Coordination and Integration

Both the airside and waterside systems will need to be analyzed for potential coordination and integration issues. Since the project was a renovation, the redesigned systems will need to work within any constraints of the original project.

The airside systems should not pose any large issues. The Straumann portion of the building was completely gutted before new construction took place. The air-handling units were located on the roof, and since the DOAS units will be smaller, neither location nor weight should be an issue for the redesign of the airside system.

The chillers may pose the greatest difficulty to integrate into the existing building. The current mechanical room is quite crowded with existing equipment. Direct-fire absorption chillers are typically larger than electric centrifugal chillers. Final selection of the units may be constrained by space limitations.

Location and size of equipment will not be the only impact the redesign has on the building. Other systems will certainly be effected. Impacts of the redesign on the electrical system, initial costs, and schedule impacts will be discussed in the proposed breadth topics sections.