

## **2.0 Introduction**

### **2.1 Objective**

The main goal of the redesign is to take a different approach in designing the mechanical system for the Straumann USA facility while striving to reduce energy consumption. This redesign does not imply that there were flaws in the original design, or that another alternative should have been pursued, it is for educational purposes only.

### **2.2 Scope**

The mechanical system redesign will compare the effects of replacing the existing VAV system with a combination dedicated outdoor air system (DOAS) and a parallel radiant cooling system. The DOAS system will supply ventilation air and meet any latent loads, while the parallel radiant system will provide any additional sensible cooling needed. The mechanical redesign will also include comparing a direct-fire absorption chiller, with a centrifugal electric chiller to determine which would be the best selection as a replacement for the central cooling plant. A third option that will be explored is the possibility of gaining more free cooling hours by using a series free cooling layout rather than the currently installed parallel system.

The electrical redesign will include resizing any electrical equipment that is effected by the mechanical redesign. The electric requirements of the DOAS air-handlers are less than those of the VAV units resulting in some of the feeders, branch wiring, over current protection devices and panel boards needing resized. A direct-fire absorption chiller would also reduce the electric requirements for the building possible resulting in overall energy savings.

A detailed analysis of the various first costs associated with each system will be compared in order to determine the lowest life cycle cost system. There will be a significant difference in required materials for the VAV and DOAS systems. The DOAS system will require radiant panels, and more copper piping, while the VAV system will require a larger amount of ductwork and diffusers.

### **2.3 Methods**

In order to carry out the proposed redesigns several methods will be used. Carrier's Hourly Analysis Program (HAP) will be used to calculate loads for the mechanical systems as well as yearly energy costs. For the electrical redesign, the National Electric Code will be used as a reference. Resources such as sales representative quotes, RS Means, and CostWorks will be utilized to calculate initial construction costs.