Malory J. Faust
Mechanical Option
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1050 K STREET
Washington, D.C.
Shell & Core Design

EXECUTIVE SUMMARY

1050 K Street is an office building located in downtown Washington, D.C. The mechanical system currently provides energy efficient cooling and heating to the occupants through one central outdoor air unit and variable air volume units located on each floor. The outdoor air unit utilizes an energy recovery wheel to preheat and cool the incoming air. Cooling coils are provided in both the ERU and each AHU to provide further cooling. All of the coils are fed by three 115 ton rotary screw chillers and when whether permits, a water side economizer heat exchanger between the cooling towers and the chilled water loop. All space heating is provided by the energy recovery unit and electric reheat at the perimeter terminal units.

Based upon an analysis of the mechanical system enveloping ventilation requirements, energy analysis, and the system overview, a new design will be provided. Since the building is already designed to be very energy efficient, the new design will incorporate many of the aspects of the original design. The designs greatest energy consumers include both fan energy and lighting. To reduce energy consumption, the new analyses will include an assessment of a chilled beam system to replace the VAV distribution system. Since chilled beams require only the main distribution fan in the energy recovery unit, the potential for savings is extremely high. However, as the fan energy drops it can be expected that the pump energy will increase, so it will be necessary to acknowledge that in the simulations.

To further examine energy savings in the building, additional simulations will be created to assess other options to enhance the building design. Because 1050 K Street has curtainwall facades, the envelope loads will be examined with the edition of solar shading devices. Mylar shading will be assessed due to their transparent appearance and minimal effect on the aesthetics of the design. The final analysis will examine the lighting system in the building. With a curtain wall façade, there is a plethora of light available that can be harnessed and used within the building. A final simulation will be run to determine the effects of implementing a daylighting system into the lighting design of the building.

The DOE-2 software eQuest will be utilized to determine the energy loads of both the VAV and chilled beam systems. EQuest will also be used to analyze the solar shading and daylighting effects on the overall energy consumption. Once the analyses are complete, Halton chilled beam design programs will help to determine the types of chilled beams necessary to effectively condition the building. Sizing the chilled beams will allow for a rough comparison between the VAV and chilled beams systems in a cost perspective and will determine whether the chilled beam system will save enough energy over the current design to recommend.