

MECHANICAL SYSTEM REDESIGN

The mechanical system for the HSS River Building was designed adequately for its purpose of reducing the spread of contaminants, providing controllability to the user, and reducing energy use. But as with any system, there can be alternative designs for improvement. The following proposal for redesign of the heat rejection and air distribution systems will be studied for the Senior Thesis.

HEAT PUMP SYSTEM REDESIGN

The heat pump system in the HSS River Building provides simultaneous cooling and heating in occupant spaces depending on the needs of the occupant. In order to do so, the heat pump loop maintains a delicate temperature range by rejecting or absorbing heat from a cooling tower and heat exchanger respectively. The current method of heat rejection uses a cooling tower to spray water and to blast air on the loop in order to bring down the temperature. This method requires intense energy use by pumps and fans. As previously calculated, the fan energy is 16% of the total energy used in the building. The River Building is also being built next to the East River, a tidal strait with a semi constant water temperature. This being said, the proposed alternative redesign will take advantage of the site and use the river as a heat rejection source rather than a cooling tower, reducing energy costs and equipment energy.

The system for using natural bodies of constant temperature for heat rejection is common in heat pump systems. Besides rivers, other thermal bodies such as underground soil, lakes, and ponds can be used as a heat rejection and absorption source. This can be achieved as the thermal body acts as a reservoir to supply or absorb the energy coming from the heat pump loop.

SOLAR SHADING DESIGN

The HSS River Building contains over 50% of glass as analyzed in the ASHRAE Standard 90.1-2007 Compliance requirements. This curtain wall system can increase the cooling load of the system dramatically as solar radiation will penetrate through the glass. In order to reduce the amount of solar radiation hitting the glass without dramatically altering the curtain wall façade, solar shades will be installed and calculated for their affects to the internal thermal load of the building.