

EXECUTIVE SUMMARY

The following report is regarding the mechanical design of the Enviro Center Phase II, an environmentally conscious office building in Jessup, MD. The existing mechanical design was very innovative and was not wanting for much in terms of improvement. One feature of the existing system, the earth tubes was of particular interest, and it seemed like there was more potential there than was being used at the moment. This report focuses on two changes proposed for this mechanical system – sensible cooling with chilled sails, and the use of displacement ventilation. The goal is to see how the loads change with these different systems and how much less work is needed by the system to achieve a comfortable environment using different methods.

The use of radiant cooling is risky, especially in a humid environment like Maryland, so humidity control is a high priority. Condensation forming on the chilled sails could have very poor effects on the indoor air quality and potentially cause sick building syndrome. While the chilled sails will be handling the sensible loads, the displacement ventilation system will be responsible for all of the latent cooling. One experimental approach to humidity control shows great promise with the ability to use heated and cooled liquid desiccants to provide almost 200 MBH of latent cooling with very little energy input.

The use of displacement ventilation combined with chilled sails allowed for a substantial decrease in fan power required. During peak heating conditions, there was only a 9% reduction in fan energy. During peak cooling, however, the fan energy was reduced by over 90%.

It was determined that implementing a chilled beam / displacement ventilation system would provide energy savings for the building by allowing the use of smaller fans and less extreme cooling and heating of water. However, the use of less orthodox, experimental humidity control schemes make this set up less feasible in the real world.