

Executive Summary

The Gateway at MICA is a 120,000 ft² building used primarily for student housing. The building consists of ten floors, two of which are public space, seven floors of student apartments, and a mechanical penthouse on the roof.

This report looks at the feasibility of alternative mechanical systems not incorporated in the original design. The systems added are geared towards reducing the impact the building has on its environment by cutting energy consumption. The initial costs of these systems will increase the first cost of the mechanical system but have the potential to have a quick payback period and, in the future, save the owner money.

The first system analyzed is a ground source heat pump. The initial thought on adding a system of this nature to the project was that this system would decrease the energy used by the building. The decrease in energy usage would decrease the electric bill, saving the owner money, as well as reduce the building's impact on its environment by requiring less electricity from the grid.

The second alternative considered is a cogeneration or combined heat and power system. In adding this system to the building, the electric load would again be reduced, further diminishing its need for electricity from the grid. This system would also aid in thermal needs for the building by using the byproduct, heat, created while generating electricity. This increases the efficiency of the building and decreases costs to the owner after the building is up and running.

Because new equipment is being added to the building, space is needed to house this equipment. A new mechanical room will be designed and the cost of this room will be evaluated. Labor and material costs will be incorporated as well as excavating costs.

The electrical system is partially distributed transformers and partially centralized transformer. The option of an entire system of distributed transformers will be looked into and a cost analysis will be done. The purpose of this is to see if a distributed transformer system would save the owner money on initial cost.

The overall findings of this report were that the impact this building has on its environment can be reduced by implementing a combined heat and power system. It was determined that the initial cost of the ground source heat pump system was too high and that it would not be cost effective to implement a system like this.

The initial cost of the electrical system could be reduced by changing to a distributed transformer system and this would offset the cost of a new mechanical equipment room with a large savings left over for the owner.