

Chapter 1: Executive Summary

The final report is the result of all of the work that has been put forth in the last year of the architectural engineering program. It aspires to accurately portray the thoughts of the fifth year architectural engineering students and what they have to offer to the industry. The following report details the possibility for implementing a ground coupled system in the Medical Office Building located in the northeast United States and resolutions to the potential impacts this system may have on the rest of the building.

There were two logical ground coupled systems that would be feasible on the site of the Medical Office Building, vertical loop system and a horizontal loop system. After conducting calculations to determine the length of tubing that would be needed to satisfy the load needs of the building, two different layouts were presented with the cost and payback of each detailed. The vertical loop system ultimately had a payback of 28.9 years where the horizontal loop had a payback of 4.9 years. Both of these layout options are feasible for this building, but the horizontal loop would offer a more immediate savings and therefore is more desirable.

As a result of adding a ground coupled system to the building, the original rooftop units could not be used due to the lack of ability to accept an exterior cooling and heating source. Five Trane units were selected to replace the original units. These new units would require a different amount of power and therefore the original panel board and wiring would not suffice. The wires supplying the rooftop units were resized along with the breakers for the units, the ground wire size for the units and the conduit size. A separate panel was used for the units which resulted in the need to size a breaker for the panel, the wires running from the main distribution panel to the subpanel, and the conduit size.

Finally, with the addition of more units to the roof, the roof structure would need to be examined to determine if it was suitable to hold the load of the units. The original structure was suitable but a more cost effective design could have been used for the area of roof that supported the units. After conducting load analysis calculations and selecting an open web steel joist member to replace the original W-shape members, a savings of \$32,724 was realized. This savings could potentially help to offset the cost of the ground coupled system.