Thesis Proposal

Executive Summary

The Mirenda Center is primarily heated and cooled by 6 roof top air handling units; their location is above the auxiliary gym. RTU-5&6 serve the main gymnasium and the indoor running track in unison. RTU-3 & 4 serve only the auxiliary gym. RTU-1 and 2 serve the remaining perimeter spaces: the auditorium and fitness center, the offices, and entry. There is natural gas burners for heating of the RTU's and reheats for each zone in the constant air volume boxes. There is also electric resistant strip heat around the perimeter of the building. This electric resistance heat is primarily to keep condensation from forming on the glazing. Auxiliary Gym requires 41 tons of cooling, Main gymnasium requires 152.4 tons of cooling, and the perimeter system requires 125.1 tons of cooling. Auxiliary Gym requires 571.0MBh of heating, Main gymnasium requires 575.9 MBh of heating, and the perimeter system requires 580.9MBh of heating.

The annual cost of the DX-Roof Top Air Handling units is significant, approximately $150,000 per year for cooling mode and $7000 per for heating mode. The problem is that the electric utility costs for are expensive, which drive the cost of cooling up. The Mirenda Center could take advantage of the 52 °F ground temperature for free cooling with a geothermal cooling system. This system will be explored.

This proposal will study the effects of converting the 6 roof top air handling units from refrigerant to air heat rejection to refrigerant to earth heat rejection. (Geothermal earth-sink heat rejection system) The goal of this proposal is to design a geothermal system of The Mirenda Center, and compare a life cycle cost of geothermal to a life cycle cost the installed existing refrigerant to air system. The total building cooling load is approximately 3500 Mbh, and the total heating load is approximately 1150 Mbh.

A significant amount of square footage need to be available for a geothermal system to installed. The location underneath the soccer field could be an optimum spot. This location will be considered for the geothermal field installation.