VIRGINIA MILITARY INSTITUTE
Mechanical Engineering Department
Cooperative Engineering Center (CEC)

DESIGN OF THE HVAC SYSTEM FOR MT. VIEW ELEMENTARY SCHOOL, BUENA VISTA, VA.

Client:
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Rockbridge County Schools
Maintenance Division

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The purpose of our project was to design a modern air-conditioning system for Mt. View Elementary School. This system will replace the existing system, which is 50+ years old and is to be implemented when the school is renovated. Renovation will be completed by summer 2004.

The first thing that was required before any system could be evaluated was a load analysis. We used the *Carrier Hourly Analysis Program v. 4.04* to complete this analysis. We determined that the cooling load was 66 tons. The heating load was calculated to be 346 thousand BTU/hour. A total airflow rate of 27,400 cubic feet per minute (CFM) is needed, with a ventilation requirement of 3525 CFM based on an average of 15 CFM per person.

Three systems were evaluated for the design of the air conditioning system. The first system is a geothermal heat pump system with vertically bored wells. The second system that we evaluated was a conventional Water Source Heat Pump (WSHP) System that uses a boiler to heat the water for the WSHP's and a cooling tower to cool the water. The third system used a forced-air system that included packaged rooftop air conditioning units with gas heaters.

We evaluated these systems based upon operating cost, as well as yearly payback cost. Upon completion of an economic analysis, we determined that the best system for this school is the geothermal heat pump system. Although the cost of the geothermal heat pump system is significantly more than either of the other two systems, the energy savings of this system simply outweigh the initial costs.