

## **BUILDING STATISTICS – PART TWO**

### **Construction**

Bentworth Middle School used a Design-Bid-Build building delivery method. It had a construction start date of May 2007 and was completed in January 2009. Oxford Development Company was construction manager for the \$18 million project. Several building permits had to be acquired for the project including the approval for a new school zone, approval from the Pennsylvania Department of Environmental Protection, and vertical test bore and thermal conductivity test for the geothermal loopfield.

### **Mechanical**

A geothermal system consisting of 96 six inch diameter wells, each of which are 350 feet deep, allows for the building to either gain or reject heat to the ground depending on the building's heating and cooling needs. A water glycol mixture is driven through this loopfield by two variable frequency drive pumps in parallel, which then circulate the mixture to the building's heat pumps. The ground source heat pumps, which provide heated or cooled air to most of the building spaces are equipped with water economizers for energy saving purposes while the six rooftop heat pump units are equipped with an enthalpy wheel for energy recovery. The rooftop heat pumps either provide ventilation air to the classroom, library, and administration areas or service large single zones such as the cafeteria, stage, gymnasium, and the kitchen.

Electric cabinet heaters, electric baseboard heaters, and electric wall heaters provide additional heating at the entrance and perimeter areas of the building. Natural gas fired hot water heaters provide domestic hot water to the building

### **Electrical**

The utility company provided a pad-mounted transformer outside the building which routes power to the main switchboard located inside the electrical room. This main switchboard is a three sectioned 2000A, 277/480V, 3 phase, 4-wire board. The primary loads on this switchboard are the rooftop heat pump units and the lighting loads. A second switchboard, which stems off of the first, is a 1600A 120/208V, 3phase, 4-wire board and it provides power to most of the building's ground source heat pumps. Emergency power is provided by an 85KW generator and provides power to two separate systems on automatic transfer switches.

### **Lighting**

Classrooms spaces are primarily lit by direct/indirect luminaires using three T5 lamps while the corridors make utilize 2'x4' troffers using T8 lamps and eight inch round down lights using compact fluorescence lamps. The gymnasium makes use of metal halide luminaires, which provide 12% uplight and have a totally enclosed prismatic glass reflector.

### **Structural**

The academic wing's foundation is a continuous concrete spread footing reaching 3'-6" below the surface, which supports a 4" slab on grade. This foundation supports load bearing, reinforced concrete masonry walls and floors made of 10" precast planks with a 2" reinforced concrete topping. The wing containing the office area, gymnasium, cafeteria, and a few additional educational spaces has the same foundation and not only makes use of load bearing, reinforced

concrete masonry walls, but also steel beams and K-joists. Some of the most common steel beam members are W12x22 and W16x45, while the most common K-joists were 18K10, 12K5, and 12K1. 40LH11's were used in the gymnasium area. Light gauge metal trusses and walls support the prefinished standing seam metal roofing system. This attic area also houses the mechanical mezzanine.

### **Security System**

The security system is provided by Hirsch Electronics. It is fully customizable, allowing for adjustable privileges and accessibility to individuals based on time of day, day of week, holiday scheduling, automatic or manual retrieval of cardholder photographs, and access validation based on positive verification of card, card/PIN, and PIN. The camera system controls are able to function both automatically and manually in order to provide the best security to building as possible as well as has a friendly user interface in order to simplify camera operation.