

**STRIVING.
ACHIEVING.
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NEW GREEN SCHOOLS CASE STUDY, GUILFORD COUNTY SCHOOLS

NC Project Green

Green Building Webinar Series

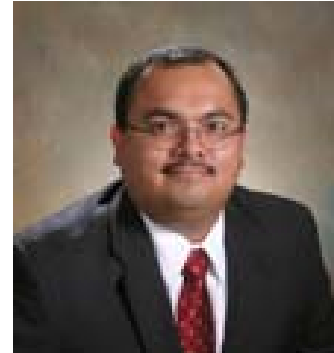
May 12, 2010



Guilford County Schools

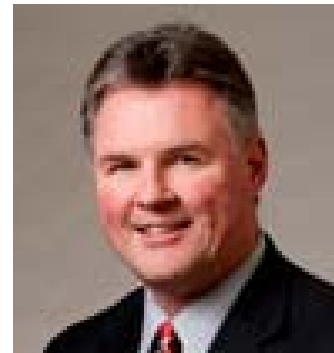
Mr. Leo Bobadilla

Chief Operations Officer



Mr. Andrew LaRowe

Executive Director for
Planning and Construction



Planning for New Construction

GCS has definite and aggressive goals for its new school projects:

- Reduce operating costs
- Protect the environment
- Design buildings that teach
- Improve academic performance
- Optimize health, safety, and comfort.



Design Buildings that Teach

- Environmental education is a great hook for getting kids interested in math and science
- Environmental science is extremely integrated
- A huge occupational component to environmental education that has developed in the last year or so—green jobs, whether in alternative energies, new green construction techniques, or sustainable design



Involvement

- Each project has a *Building Advisory Team* composed of the design team, school principal, school staff representatives, parents, and board of education members.
- The board of education also appoints a *Construction Advisory Committee*, composed of board of education members, an architect from a local university, construction executives, and local business leaders, to offer input into the process.



Northern Middle School



Project Details

Building: Single story, 140,000 square feet Completed: January 2007

Financing: General Obligation Bonds

Cost: \$20.7 million; \$148 per square foot; \$21,789 per student

Capacity: 950 students

Energy Performance and Savings

43% below a comparably sized school based on ENERGY STAR® data; \$77,097 annual reduction in energy cost

Energy costs: \$0.65 per square foot per year and approximately 45,000 Btu per square foot annually

Northern Middle School

Solar power

A drainback solar thermal system comprised of 10 compound parabolic collector panels provides 75% of the school's hot water. The school also features three photovoltaic (PV) systems totaling 1.5 kW that are used for the school sign and the wetland's aerators. Using PV for these remote energy needs was less expensive than running electrical lines from the main building.



Northern Middle & Reedy Fork Elementary

Building Envelope

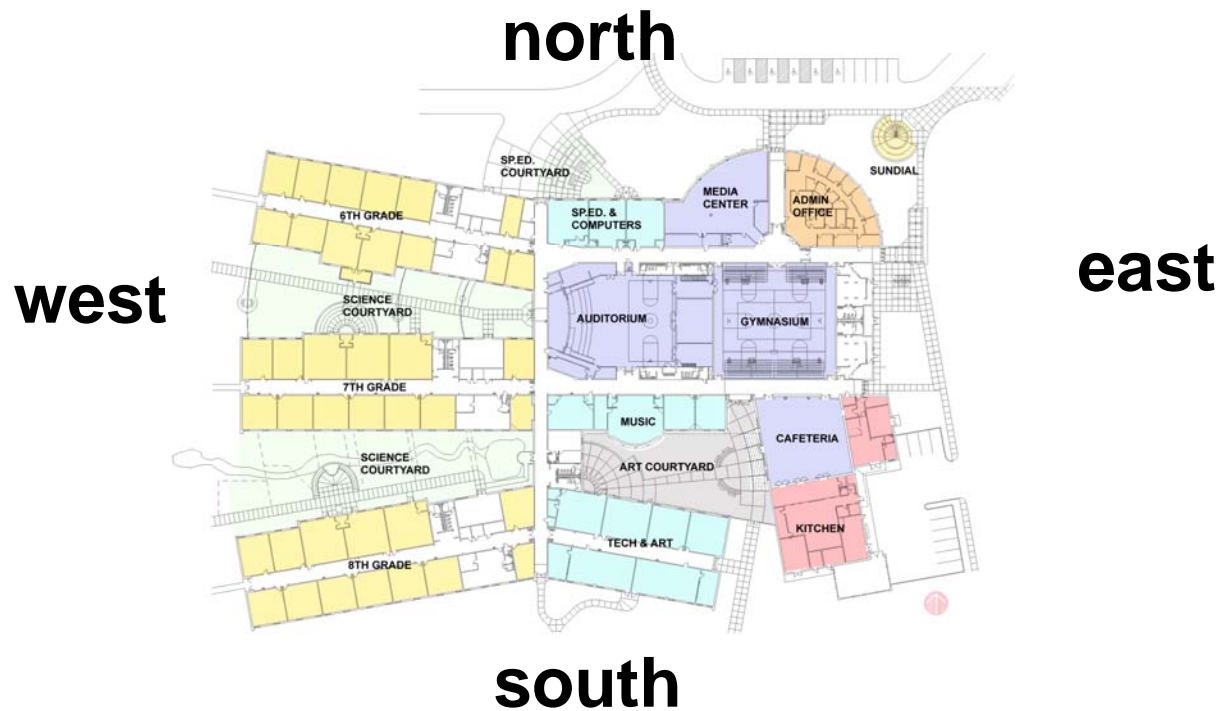
The two roofing systems used, a thermoplastic membrane and an insulated metal roof, are rated at least R-30. These materials have a high reflectance that reduces heat gain and cooling load. Overall, the envelope is more insulated than standard practice; the wall insulation is 3 times code and the roof levels exceed code by double.



Northern Middle School

Site Orientation and Design

The school is oriented on an east-west axis to take advantage of southern exposure for applications such as daylighting, solar hot water, and PV.



Northern Middle & Reedy Fork Elementary

Daylighting

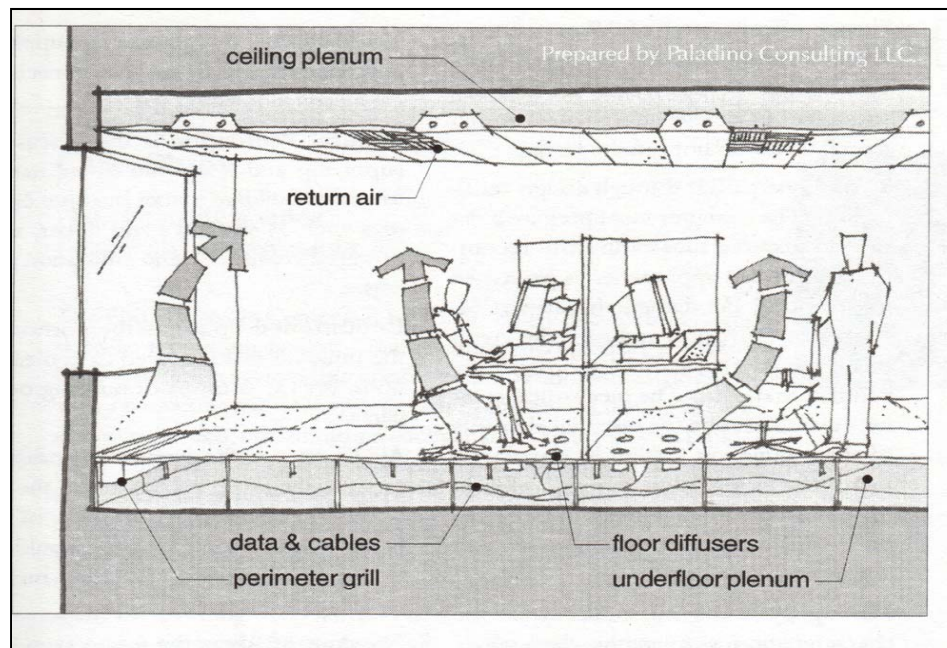
Extensive daylighting is used, including revolutionary curved, translucent interior light shelves. This design provides uniform light with less glare. Natural light is the primary source for all educational and administrative spaces during two-thirds of the daylight hours. Daylighting produces half the heat and the same amount of light as fluorescent fixtures.



Northern Middle & Reedy Fork Elementary

Heating, Ventilating, and Air Conditioning (HVAC)

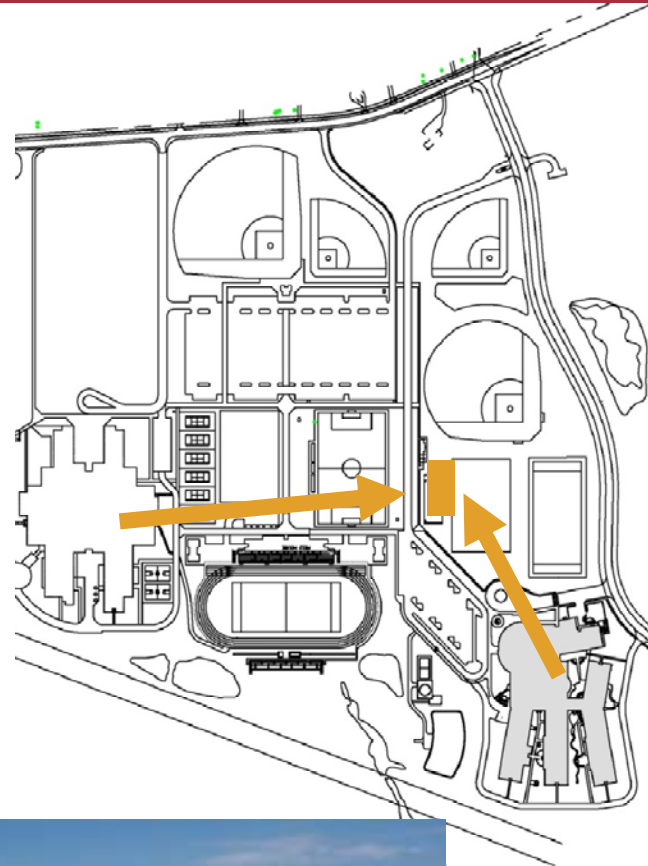
An under-floor air distribution system is coupled with an energy efficient mechanical and ventilation system. Because of daylighting and other efficiency strategies, the school's heating and air-conditioning system is 20% smaller than is typical for a school this size.



Northern Middle School

Water Conservation

A 360,000 rainwater cistern provide water for toilet flushing, irrigation and fire protection (reserve at bottom of tank). System provides water for irrigation and the toilets of the middle and high school saving 4 million gallons of water per year.



Lessons Learned

- Importance of monitoring the facility
- Plan carefully at the beginning of the design process.
- Follow a commissioning process to achieve peak performance and efficiency.
- Concentrate on the controls, as these pose the biggest problem in achieving high levels of energy efficiency if not set properly and monitored.
- Design the daylighting so that teachers and students do not need to be actively involved in managing it.
- More work is needed in humid climates where moisture must be removed from the air but the air does not necessarily need to be cooled.
- Provide good training and orientation for the building staff.

Tools and Resources

- *G3-Guilford Green Guide* www.gcsnc.com/depts/facilities/G3.pdf
- *The U.S. Department of Energy Case Study for Northern Middle School* www1.eere.energy.gov/buildings/energysmartschools/case_studies.html
- *Advanced Energy Design Guide for K–12 School Buildings* www.ashrae.org/aedg
- *ASHRAE Indoor Air Quality Guide, Best Practices for Design, Construction and Commissioning*