

Truckee Middle School: A CHPS High Performance Demonstration School



General Information

Location: Hwy 89 at Alder Drive, Truckee, Calif.

Expected Completion: August 2004

Project Size: 87,000 sq ft

Total Budget: \$30 million (including contingency and soft costs)

Construction Cost: \$24 million (\$275 per sq ft)

This new middle school is located in rural Truckee, California, near scenic Lake Tahoe. It is designed to serve 1,000 students in the sixth-through eighth-grade levels. As of May 2003, the school's construction had just begun and the school had yet to be officially named.

Construction is expected to be completed in August of 2004, so the school can open that fall.

One of the project goals is to make this a demonstration school through the Collaborative for High Performance Schools (CHPS). CHPS is a

nonprofit organization with representatives from other nonprofit organizations, State agencies, and utilities. It was established in 2001 to promote high-performance, sustainable practices in new school construction in California. The project was designed according to the CHPS Criteria through a grant from the California Energy Commission (CEC) with additional assistance provided by the California Integrated Waste Management Board (CIWMB).

An expected 25 percent reduction in energy costs alone will yield at least \$17,000 in savings annually.

The CHPS Criteria cover a broad range of high-performance building design strategies. Some of these include daylighting, energy efficiency, indoor air quality, acoustics, building commissioning, sustainable materials, waste

reduction, preventative maintenance, site protection, and water conservation. CHPS is a self-certifying system whereby projects must achieve at least 28 out of a possible 81 points on the CHPS scorecard. For certain credits, CHPS allows projects to use either a performance-based or prescriptive approach to meet the goal.

This case study primarily focuses on the project's implementation of the materials-related goals, but the project's other high-performance features are also outlined. The new middle school will be an energy-efficient building with a ground-source heat pump for heating and cooling. The project will also feature recycled-content and low-emitting materials, and at least 50 percent of the construction waste will be recycled rather than landfilled. The building's sustainable design features are intended to serve as a teaching tool for student education.

Project Team

Owner:

Tahoe Truckee Unified School District

Architect:

Lionakis Beaumont Design Group (LBDG)

Mechanical/Plumbing Engineer:

Capital Engineering Consultants

Electrical Engineer:

Harry Yee and Associates

Civil Engineer:

K.B. Foster Civil Engineering

Landscape Architect:

Yamasaki Landscape Architects

Contractor:

Clark & Sullivan Builders

Green/Materials Consultant:

Simon & Associates

Commissioning Agent:

Keithly Welsh Associates

Daylighting/Energy Consultant:

Heschong Mahone Group

Energy Analysis Consultant:

Eley Associates

High-Performance Features

Following is a summary of some of the high-performance features that this project is expected to showcase:

Site

- Minimal earth relocation.
- Footprint minimized, open space preserved.
- Landscaping with native plants.
- Erosion and sedimentation control.
- Stormwater collection from roofs and hard surfaces.
- Infiltration basins for stormwater management/groundwater recharge.
- Light pollution reduction.
- Riparian corridor and forest runs through the site for natural drainage areas and science curriculum opportunities.

Energy

- Superior energy performance: At least 20 percent beyond Title 24 (2001).
- Building orientation for maximized southern exposure.
- Thermal insulation benefits from berming building into sloped site.
- Ground-source heat pump (with ultra high-efficiency pumps) for heating and cooling (pipes are exposed so that students can feel and compare the pipe temperatures along the supply and return lines).
- EnergyStar-compliant, high-reflectance, high-emissivity roof.
- Building systems commissioning.
- High-efficiency indirect lighting with daylight sensors.
- High-efficiency central boiler for domestic water.

Water

- Low-flow water fixtures.
- High-efficiency irrigation system.
- Synthetic athletic field requires no water or chemicals for maintenance.

Materials

- Recycled-content products.
- Durable, low-maintenance materials.
- Structural system made of steel and locally manufactured concrete masonry units (CMU), which double as the building's exterior skin, reducing the need for additional finish materials.
- Construction waste management/recycling.
- Recycling bin areas designated.

Indoor Environmental Quality

- Daylighting design: Large windows on north and south faces, skylights, high ceilings with good reflectance, U-shaped horizontal window blinds that reduce glare and act as light shelves housed between dual-pane window glass to eliminate cleaning and maintenance.
- Views through glazing from 90 percent of classrooms and other regularly occupied rooms.
- Operable windows for natural ventilation.
- 30-day building flush-out (after construction and prior to occupancy).
- Noise levels minimized for acoustical comfort.
- Meeting ASHRAE-55 Thermal Comfort standard.
- Low-emitting building materials.

Three out of four of the low-emitting building materials in the new Truckee Middle School will double-count for recycled-content credit as well as contribute to a healthy indoor environment.

The following sections provide more detailed information on the major materials-related CHPS Criteria selected for this project: recycled-content, low-emitting materials, and site waste management.

Recycled-Content Materials

The project is expected to receive two CHPS points for using at least eight different types of recycled-content materials. The design team followed the prescriptive approach and selected materials from a list issued by the U.S. Environmental Protection Agency (U.S. EPA) under their Comprehensive Procurement Guidelines (CPG) for Construction Products.

The list includes the specific recycled-content targets (required percentages of postindustrial [PI] and postconsumer [PC] recycled content) for each material. The table below shows the recycled-content materials expected to be used in the construction of the building.

Recycled Content of Building Materials Projected for Truckee Middle School

Building Material	Minimum Recycled Content
Acoustical ceiling tiles	80% PI newsprint
Carpet	50%, including 10% PC plastic
Concrete	20% PI flyash
Fiberglass insulation	20% PI glass
Rigid, poly insulation	9% PI plastic
Tackable wall panels (Homasote)	100% PC newsprint
Medium-density fiberboard (Meditate II)	100% PI wood fiber
Toilet partitions	20–100% PC plastic

Low-Emitting Materials

Many conventional building products contain a host of toxic chemicals, including volatile organic compounds (VOC) such as formaldehyde. When these materials are installed in a building, these VOCs often continue to be emitted into the indoor air that building occupants breathe. Fortunately, an

increasing number of low-VOC, alternative materials are now available.

The team intends to use at least four products in the project that meet the rigorous emissions testing standards outlined in the CHPS Material Specifications Section 01350. These standards were used in the specifications for the State of California's recent Capitol Area East End Complex Block 225 construction project.

The materials for which the Truckee Middle School team might seek compliance with the Section 01350 emissions testing requirements include: medium-density fiberboard, paint, insulation, carpet, and acoustic ceiling tiles.

In order to ensure that certain products meet the Section 01350 standards, the team is working with manufacturers to determine which products have already undergone the emissions testing. For products that have previously passed the testing requirements, the team will determine which products will meet the standards for use in this particular school project.

Construction Waste Management

CIWMB staff provided valuable assistance to Truckee Middle School team members, particularly in the areas of recycled-content materials and construction waste management.

The project team decided to aim for a 50 percent waste diversion goal for one CHPS point. The project might exceed the 50 percent goal, but the higher 75 percent goal seemed too difficult to achieve in a rural area with a limited number of recycling facilities.

Some recycling facilities accept construction and demolition (C&D) waste materials in Truckee (concrete and asphalt) and nearby Tahoe City (metal and wood). A Reno facility accepts a wider range of materials, but because it is 30 miles away, the transportation costs may be prohibitive for using that facility. The CIWMB provided the contractor with a list of local recyclers, and the contractor is developing a waste management plan.

CIWMB also provided the contractor with spreadsheets for tracking the actual waste diversion and costs for the project. These documents are part of the Master Specifications of the California Department of General Services Project Management Branch.

In addition, CIWMB provided language for a site waste management section for the project specifications. This was adapted from Section 01565 of the Reference Specifications for Energy and Resource Efficiency, which was prepared by Eley Associates for the CEC, Public Interest Energy Research (PIER).

A 50 percent construction and demolition (C&D) waste diversion goal was adopted for the project.

Financing

The additional first costs associated with the green design for CHPS are expected to be fully recovered through the school's savings in operations and maintenance costs. These savings will accrue because of the energy and water conservation measures, as well as the use of durable, low-maintenance materials. The expected 25 percent reduction in energy costs alone will yield at least \$17,000 in savings annually.

Before the project began, the school district and the architect applied together for a \$250,000 high performance school grant from the CEC. The district was one of only two to receive the grant. The funding was used to offset the up-front costs related to incorporating CHPS Criteria, such as building systems commissioning, a ground-source heat pump with high-efficiency components, and the energy-efficient windows and lighting system.

The CEC grant was made possible from the Department of Energy through the National Association of State Energy Officials. The grant stipulated that the project would be a CHPS school and exceed Title 24 by at least 20 percent.

The project also benefited from Proposition 47 energy efficiency funding. The CIWMB provided

additional funds to hire a green building consultant, Simon & Associates, who reviewed the project specifications for CHPS-compliant materials and provided materials research assistance.

Lessons Learned

The school district and many members of the design team were new to the CHPS program, so they needed to dedicate some research time to get up to speed on the issues. Now that they've climbed the learning curve, they believe that they have gained valuable knowledge through this process that they will be able to apply to future projects.

As is typical for demonstration projects, the project team encountered some challenges along the way. The team also achieved some successes. Lessons learned included the following:

- **Building Material Emissions Testing:** The CHPS Section 01350 emissions testing standards are still relatively new and have not yet been used on many projects. Finding manufacturers that were aware of the testing requirements and that have had their products tested was challenging. This project team helped to encourage the use of rigorous emissions testing for building materials by educating themselves and manufacturers about this protocol.
- **Recycled-Content Targets:** The CHPS prescriptive method of the recycled-content credit is based on the recycled-content targets of the U.S. EPA Comprehensive Procurement Guidelines. For some materials, these targets are slightly higher than the State of California's recommended targets outlined in the State Agency Buy Recycled Campaign (SABRC).

At first, the team found that it was difficult to find three or more products readily available in the marketplace that meet the U.S. EPA's suggested recycled-content percentages. However, the CIWMB has developed a matrix of products that meet the U.S. EPA's

guidelines. This matrix is distributed during the materials portion of the CHPS trainings for design professionals. The matrix was helpful in identifying products to include in the project specifications.

- **Familiarity with Alternative Materials:** As is common, the district and architects were hesitant about using products that they had not used in previous projects. For example, the district had maintenance concerns about the removability of graffiti on the plastic toilet partitions with high levels of recycled content, but after reviewing the product information, district staff found that some recycled-content plastic partitions are more resistant to graffiti than standard products.
- **Materials Cost:** Certain green materials, such as Forest Stewardship Council (FSC)-certified sustainably harvested wood doors, could not be specified for the project because of their higher first cost. There was no cost difference to specify the 82 percent recycled-content, formaldehyde-free ceiling tiles.
- **Energy Modeling:** The team found that the EnergyPro software calculations did not capture all of the project's innovative energy saving elements. While the software model does show energy savings exceeding Title 24 (2001) by 20 percent, the team believes that the building, as designed, is even more efficient than that.
- **Team Communication and Collaboration:** The process of using the CHPS Criteria was made easier because of good communication between district staff and the architects, and also because the contractor has been very receptive to the CHPS Criteria and is working with the design team to achieve the project's goals. The project used the lease/lease-back method of construction delivery rather than the typical low-bid process. This allowed the district the flexibility to analyze the cost of multiple materials, which otherwise would not have been possible.

- **Project Specifications:** The fact that many green materials requirements were incorporated throughout the project specifications will help ensure that CHPS-compliant materials are actually purchased for the project. Because this is a public bid project, the specifications had to list three alternate materials; where this was not possible for unique green materials, the specs could state “No known equal.” LBDG has updated its own master specs to include some of the CHPS-related materials language.

Next Steps

The Tahoe Truckee Unified School District intends to apply the CHPS concepts and lessons learned from the new Truckee Middle School project to its future building projects. The school district’s project manager for the upcoming replacement of the North Tahoe Middle School/High School is particularly interested in doing so.

The district has yet to adopt an official policy to use CHPS for all future projects, but there is some interest in developing such a policy. The Los Angeles and Santa Ana Unified School Districts have passed district resolutions requiring that their district incorporate CHPS Criteria into all new construction and modernization projects.

The passage of such a resolution for the Tahoe Truckee district would enable the district’s future projects to qualify for extra points on the CHPS scorecard. The CEC intends to assist the Tahoe Truckee Unified School District in adopting a CHPS resolution to present to the school board.

Resources for More Information

CHPS Case Study on Truckee Middle School
www.chps.net/chps_schools/truckee.htm

Tahoe Truckee Unified School District
www.ttusdprojects.org

Lionakis Beaumont Design Group, Inc.
www.lbdg.com/truck.htm

CHPS, 1-877-642-CHPS, info@chps.net
www.chps.net

CIWMB High Performance Schools
www.ciwmb.ca.gov/GreenBuilding/Schools/

DSA Sustainable Schools
www.sustainableschools.dgs.ca.gov/SustainableSchools/

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This case study was prepared by Simon & Associates, www.greenbuild.com

The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut energy costs, **Flex Your Power** and visit www.consumerenergycenter.org/flex/index.html.