



Photo: Emc2 Group Architects Planners, PC/Shelley Marie Images

Desert Edge High School Goodyear, Arizona

“Building a green school is much easier than many people think. It also doesn’t necessarily cost more. It does have to be a team effort, and the results are worthwhile. The building provides a healthy environment to learn and work in and is in itself an educational tool.”

—John Schmadeke, Assistant Superintendent,
Agua Fria Union High School District

A High-Performance Model for Other Schools

The construction of Desert Edge High School in Goodyear, Arizona, exemplifies the vital link between good planning and high performance. From the earliest stages of the project, the district and its design team set ambitious targets for energy and water savings and sustainable design features. They also involved a third-party expert to commission the facility when completed, ensuring that it did indeed achieve those goals. The result: each year, Desert Edge saves the district \$58,000 in energy costs and uses 1 million fewer gallons of water than a typical school of its size. Remarkably, the project met its high-performance goals while coming in early and *under* budget.

Desert Edge sits on a 55-acre lot west of downtown Phoenix. Besides classrooms and administrative areas, it includes a media center, a gymnasium, a freestanding 522-seat fine arts auditorium, a career technology area, and a student bookstore. It also houses a Green Touchscreen interactive kiosk that features a virtual tour displaying many of the school’s energy-efficient features. The kiosk displays electricity, water, and carbon dioxide savings and has real-time animations that illustrate the heating and cooling systems, an interactive building directory, bus routes and schedules, and real-time weather conditions. Desert Edge was the first public high school in Arizona (and the fourth in the nation) to be certified LEED Silver. *(continued on Page 4)*

Project Details

This project was conducted in two phases. Phase I was a new building; Phase II was a major expansion of the first phase and included a freestanding auditorium. Phase II was completed four weeks ahead of schedule at \$450,000 under budget and received LEED Silver certification.

Building: Two buildings; one story;
218,783 square feet

Completed: Phase I: 2002; Phase II: 2005

Grades served: 9–12

Funding and grants:

- \$9.1 million: Arizona School Facilities Board
- \$3.6 million: District B Bond

Cost: \$10 million; \$150 per square foot

Capacity: 1,600 students
(current enrollment of 1,350)

Energy performance and savings:

- 921,000 kWh of electricity saved per year
- 1 million gallons of water saved per year
- Energy cost savings of \$58,000 per year

Awards:

- 2002 American School & University Architectural Portfolio Outstanding Building Award
- 2006 “Best of Green Building—Public” award from Southwest Contractor magazine
- 2006 Valley Forward Association Award of Merit

Agua Fria Union High School District:

- 5 schools; 6,064 students

Saving Energy and Water

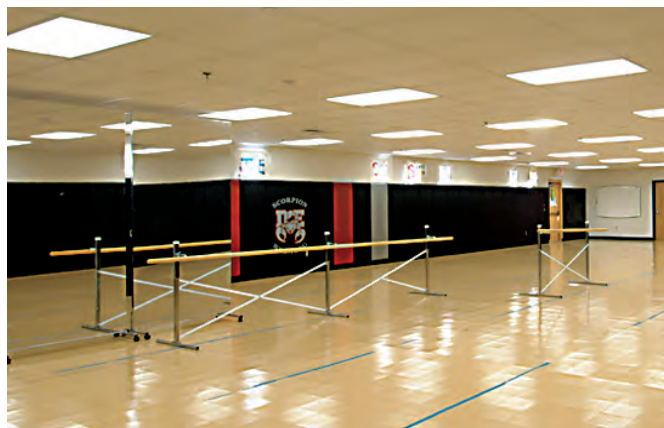
Desert Edge uses the following energy saving features inside the building:

- Low-flow restroom fixtures, hand-washing stations, and waterless urinals, which reduce water use by almost 38%
- A meter that tracks electricity consumption
- Shading devices and overhangs on windows
- Daylighting and occupancy sensors
- Compact fluorescent lamps in the gymnasium



Photos: Emc2 Group Architects Planners, PC/Shelley Marie Images

Carbon dioxide monitoring in the gymnasium allows outside air to be adjusted depending on the amount of occupants. More fresh air is allowed in when the gymnasium is full than when there is only a PE class in the gymnasium. Too much carbon dioxide reduces indoor air quality, and fresh air provides balance.



T-8 fluorescent lighting is an energy-saving feature throughout the school.

Desert Edge High School—EnergySmart Choices

Feature	Benefit
Building envelope	Masonry walls and R-19 cavity insulation.
Windows	Low-e glass with a gray tint and an assembled U-factor of 0.33; double glazing and a third pane for integral microblinds; daylight sensors that are used in conjunction with motor sensors; and overhangs.
Ventilation	Demand-controlled ventilation using carbon dioxide sensors in classrooms.
Water	Low-flow fixtures and showers, waterless urinals, low water use landscaping, and desert landscaping.
Site orientation	Elongated east-west axis to take advantage of daylighting and winter passive solar gain.
Lighting	T-8 fluorescent electronic ballasts used in most of the school with lighting power density of 1.09 W/ft ² in classrooms, 1.04 W/ft ² in the gymnasium, and 1.27 W/ft ² in the auditorium.
System controls	Occupancy sensors and multiple light switches.
Roof	Built-up metal, R-30 insulation, and an ENERGY STAR®-rated system coating.
Recycling	Workers recycled 1,200 tons of construction waste.
Chiller plant	Two high-efficiency (centrifugal) water cooled chillers, water side economizing via a plate-and-frame heat exchanger, and variable-speed pumping.

Desert Edge High School—Energy-Related Outcomes

Goal	Project Outcome
Energy savings beyond code	28% better than ASHRAE 90.1-1999; 921,000 kWh saved
Annual energy cost savings over code	\$58,000
Annual water savings	1 million gallons relative to EPA 1992



Students use the Green Touchscreen interactive kiosk to learn more about the school's energy-efficient features.

Breathing Easier

The school uses several approaches to maintain good indoor air quality:

- A carbon dioxide monitoring system monitors interior and exterior air concentrations
- Workers used low-emitting adhesives and sealants during construction
- The carpet complies with the Carpet and Rug Institute Green Label Program
- A permanent all-season temperature and humidity system helps maintain indoor comfort.
- Entryway grates are recessed into the floors at doorways. They trap the dirt below the mats so it is not tracked into the school. This helps eliminate dust, allergens, and pollutants from the indoor environment.

Photo: Courtesy of Agua Fria Union High School District



The classrooms have CO₂ monitors for enhanced student learning.

Photo: Emc2 Group Architects Planners, PC/Shelley Marie Images

Eighteen percent of Desert Edge’s construction material was from recycled sources, and almost 84 percent of the project’s 1,200 tons of construction waste was recycled and diverted from the landfill. Nearly 30 percent of the total construction material was manufactured with raw materials that were harvested within 500 miles of the site. The site uses native landscaping, drought-tolerant plantings, and drip irrigation. It also has six storm water sub-basins that retain water runoff. It encourages alternative transportation by providing 72 bicycle stalls and 22 carpool spaces. The open space on the campus is equal to the building footprint.

Goals

The primary goal for Desert Edge was to be LEED certified and about halfway through construction, the team realized that Silver

certification was possible. Phase II was certified LEED Silver; in fact, the school exceeded the LEED 10 percent requirement by 8 percent. The design consultants were surprised at the actual savings.

The school also strived to be environmentally friendly by using recycled construction materials and minimizing construction waste. The team worked to improve indoor air quality by using low volatile organic compound adhesives, sealants, paints, and coatings, and used composite wall panels with no added urea-formaldehyde.

Financing

The school was finished four weeks ahead of schedule and \$450,000 under budget.

The \$10 million school was funded by the Arizona School Facilities Board and a District B Bond.

Results

The final results and savings exceeded team members’ expectations and the facilities’ success has helped spread the good word about green buildings throughout the community. The overall working and learning environment was improved; in fact, one of the science teachers uses the building as a learning project. The team’s practices eliminated harmful chemical use in the building.

School officials have noted a reduction in student and teacher absenteeism, as well as school liability. Operations and maintenance costs have dropped, while the school’s life cycle economic performance has improved. The buildings have less of an impact on the community.

A Model for the Community

Desert Edge High School set a new standard for schools in Arizona with its LEED Silver certification. It provides a healthy environment for students, teachers, and staff.

Lessons Learned

- Build quality into the design from the beginning.
- Approach the project as a team.
- Third-party commissioning is a must.
- A green building does not need to cost more than a standard one.



Photo: Donna Long, Desert Edge High School

The front entrance to the school was designed to allow more natural light inside.

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