GREEN SCHOOLS CASE STUDY
Desert Edge High School

Name: **Desert Edge High School, Phase II** – Agua Fria Union High School District
Address: 15778 W. Yuma Road, Goodyear, AZ 85338
Contact: Gary Gable, Facilities and Construction Manager
Phone number: 623-932-7019
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General location: Southwest Valley
Grade levels: 9 - 12
Number of students: 1350
Number of staff: 160
Superintendent/Principal: Dr. Bob Rossi
Phone number: 623-932-7000 ext. 13001

Physical descriptors: Phase II: expansion of an existing facility

Building area	84,200 sq ft*	Number of stories	1
Number of buildings	2	Number of classrooms	33
Landscape area	n/a	Site area	50 acres gross

*additions to the classroom wings and gymnasium, a maintenance building, and an auditorium

Date of "commissioning": Completed 2005, March 17, 2006 - Silver LEED certification

School Cost:
Total construction cost: $12.7 million; SFB funding: $9.1 million; District B bond funding: $3.6 million
Cost per square foot: $150.00
Additional funding sources: District B bond funding: $3.6 million
Savings/payback time: Completed four weeks ahead of schedule and $450,000 under budget

SUSTAINABLE SITES GOALS

Erosion & Sedimentation Control
Site Selection
Alternative Transportation – Bicycle storage/changing rooms (coaches locker room)
MAG (Maricopa Association of Governments) Travel Reduction Program
Parking Capacity worked with city for variance – city wanted more parking
Reduced Site Disturbance, Development Footprint 50 acres (building/parking minimum disturbance)
Stormwater Management, Rate and Quantity
Landscape & Exterior Design to Reduce Heat Island: Surfaces – face buildings for daylighting (minimum southern exposure), coating for roof
Light Pollution Reduction – local ordinances, staged exterior lighting – security lights only after midnight

Sustainable sites strategies used
Alternative transportation
Bus turnouts
Maricopa County Trip Reduction Program
Bike storage, changing rooms and showers
Sports lighting fixtures with shields to limit light pollution at night
Building used as Community Space – 75,000 square feet

Results obtained
Fewer cars driven to school

WATER EFFICIENCY GOALS
Water Efficient Landscaping, reduce by 50%
Water Use Reduction, 20% reduction
Water Use Reduction, 30% reduction

Water efficiency strategies used
Low-flow fixtures
Waterless urinals
Low-flow showers
Handwash stations
Low water use Landscaping/Desert Landscaping

Results obtained
38% water savings as compared to the Energy Policy Act of 1992 requirements
Saving more than 1,000,000 gallons of water each year due to efficient plumbing fixtures.

Additional information:
Including water saving devices increased overall cost YES **NO**

Having waterless urinals turns out to be a wash. (Note: Staff was trained for proper maintenance of urinals.) School district commonly followed water saving practices before going LEED

Overall, incorporating water saving devices into the school was worthwhile **YES** NO

ENERGY AND ATMOSPHERE GOALS
Fundamental Building Systems Commissioning
Minimum Energy Performance
CFC Reduction in HVAC&R Equipment 134A, .52 kw/ton 75% load
Optimize Energy Performance, 20% new/10% existing
Optimize Energy Performance, 40% new/30% existing
Ozone Protection – CFC

Energy and atmosphere strategies used

Energy sources: electric, natural gas

HVAC type	chilled water	Number of Units	2	BTU Rating	75,000 – 750 tons
Insulation R-Values	roof	R-30	walls	R-11 (block)	
Window types	Low-e glaze, dual pane				

High efficiency lighting – electronic ballast, T-8
Daylighting / Occupancy sensors
Variable Speed Drives on chilled water pumps and tower fans
Demand Control Ventilation CO2 as sensor gas
High efficiency chiller in central plant with R134A HFC refrigerant
Plate and frame heat exchanger/Variable Speed Drives
Meter to track electricity consumption
Used technology that provides "free cooling" for many hours each year
Energy Star®-rated roofing system coating
Use of shading devices/overhangs
Multiple light switching
Thermostats that allow temperature adjustments of two degrees up or down
Gym lighting with compact fluorescent lamps

Performance measurement equipment installed in the facility:
Central Energy Management System (EMS) with BTU measurement capability

Results obtained
28% more energy efficient than ASHRAE 90.1-1999 building energy standard
(American Society of Heating, Refrigerating, and Air- Conditioning Engineers)
equaling: 921,000 KWH saved
$58,000 projected savings per year
Equivalent to 86 average sized homes

MATERIALS AND RESOURCES GOALS

Storage and Collection of Recyclables
Construction Management, Divert 50%
Construction Management, Divert 75%
Recycled Content, specify 5%
Recycled Content, specify 10%
Local/Regional Materials, 20% manufactured regionally
Local/Regional Materials, 50% extracted regionally

Construction waste management strategies used

Separate disposal bins used
Continual monitoring of receptacles to prevent overloading
Material purchasing agreements to purchase local manufactured and harvested materials

Results obtained
85% of construction waste diverted from landfill
    1200 tons of debris
    Equivalent of 800 Honda Accords

Integrated material strategies used
Structural steel
Hollow metal doors
Concrete
Low VOC adhesives, sealants, paints and coatings
CRI certified carpet
Composite panels with no added Urea Formaldehyde
More than 18% of materials used on job were recycled content
    Dance floor, carpet, etc.
More than 50% were manufactured locally
Attempt to match materials that are installed in the existing structures with environmentally-preferred alternatives, as appropriate

Results obtained
Exceed LEED 10% requirement by 8% for total of 18%
Provides healthy learning environment
Contributes to educational effort

Additional information:
Recycling during the construction phase was
Very easy easy **average** difficult very difficult not applicable

Finding materials with recycled content was
Very easy easy **average** difficult very difficult not applicable

Finding materials to “reuse” was
Very easy easy **average** difficult very difficult not applicable

INDOOR ENVIRONMENTAL QUALITY GOALS
Minimum IAQ Performance
Environmental Tobacco Smoke (ETS) Control
Carbon Dioxide (CO2) Monitoring
Construction IAQ Management Plan, during construction
Low Emitting Materials, Adhesives and Sealants

Low Emitting Materials, Paints
Low Emitting Materials, Carpet
Low Emitting Materials, Composite wood
Indoor Chemical and Pollutant Source Control
Thermal Comfort, Compliance with ASHRAE 55-1992
Thermal Comfort, Permanent Monitoring System

Indoor Environmental Quality strategies used
Carbon dioxide sensors that shut off the fan coil when the rooms are unoccupied
CO2 sensors
Entryway grate(s)

Results obtained
Better working and learning environment

Integrated Pest Management (IPM)-- *No formal program yet*

Finding materials with low VOC content was:
Very easy **easy** average difficult very difficult not applicable

The benefit from incorporating daylighting as been:
Very beneficial beneficial no change not worth the effort

INNOVATION AND DESIGN PROCESS GOALS
Exemplary Performance for local/regional materials 20% manufactured regionally
LEED Accredited Professional
EPA IAQ tools for schools program
Green building education
Green cleaning/housekeeping
Exceptional manufactured locally

Innovation in design strategies used
Green cleaning/housekeeping
EPA “Tools for Schools” IAQ program
Exceeded local/regional materials use
Green Building Educational Program

Results obtained
Eliminated harmful chemical use within building
Healthy, enhanced learning environment
Encouraged purchasing from local suppliers
Spreading the good word about green buildings

OVERALL BENEFITS TO DESERT EDGE

Reduced student absenteeism
Reduced teacher absenteeism and turnover
Improved student performance
Improve learning
Provide a healthy environment
Reduced school liability – negates the why haven't you done _____ question
A role model for the community
Optimized life-cycle economic performance
Competitive first construction costs
Reduced operating and maintenance costs
Reduced impact on community infrastructure

TRAINING

Did staff attended trainings on Design for Green Schools? **Yes** No

Staff attended trainings on Green Schools Operations and Maintenance? **Yes** No

Has staff attended trainings on energy efficient operations? **Yes** No

Staff has attended trainings on water conservation? Yes No **Unknown**

Has staff attended trainings on pollution prevention for transportation? **Yes** No
MAG

LESSONS LEARNED

Before design phase: It is a lot easier than people think. Build quality to begin with. It doesn't cost you that much more.

During design phase: Started out low in achievable points and through the process kept adding additional points. Goal was certified and about half way through decided they could meet Silver. Energy studies were interesting and consultants were surprised at the actual savings. It was a learning process for design consultants. They actually got away from the cookie cutter approach and stretched their wings.

During build phase: Have a really good general contractor. CMR is essential. More of a team effort – not a we vs. they mentality. Third party commissioning is a must vs. subcontractor commissioning. It creates less issues and fewer items that need to be addressed. Purging the building was a challenge to coordinate with construction activities and close out but it was doable.

After completion: Have a big party!!! Thrill was going through the building with students – seeing it being used. Difference in air quality between Phase I and II.

SUGGESTIONS FOR OTHER SCHOOL DISTRICTS: Build Green - Don't be afraid. This isn't rocket science. Get a good architect and construction firm. Get folks you can trust. Become better informed – USGBC web site is a great resource.

The LEED process has improved between completing the certification process for Desert Ridge and Verrado. It is much simpler now.

We have been able to use the "green" features of our school as teaching tools:

Yes No

A science teacher uses the building as a project; there is a brochure on building and a recycling project. The school also has a Web-based interactive touch screen kiosk.

> Note: The web-enabled software powering the kiosk computer monitor allows visitors to read the whole "green" story about Desert Edge High School and see the actual energy and water savings--either from the school lobby or anywhere in the world displays data on electricity, water and CO2 use and savings. These savings are displayed in standard values and every day concepts such as the number of minutes in a shower for water use. Students can also view the operation of the high performance heating and cooling systems in real time, use the interactive building directory, learn about sustainability and even get bus route schedule and stop information.

A number of infrastructure features of the school are visible to the students so they can see how the system operates, but they need to be taught about what the features are, why they're important, and how seemingly little changes can bring tremendous environmental benefits.

Students and staff ***like*** *dislike* the daylighting aspects of the buildings.

The green projects included in the design and operation of this school have improved the overall efficiency of the campus: **Yes** No definitely

Staff absenteeism has decreased Yes No If yes, by how much? **Unknown**

Student absenteeism has decreased Yes No If yes, by how much? **Unknown**

Number of asthma attacks has decreased Yes No If yes, by how much? **Unknown**

If only one of your "Green Features" could be highlighted, it would be:

Can't single one out. Lighting and Indoor Air Quality are both important for classroom environment and learning.

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