Gloria Marshall Elementary School
Spring Independent School District
Houston, TX
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Size: 105,390SF
Cost: 15.6 million
Completed: 2010

PROJECT NARRATIVE

What initially began as a re-site of an already successful elementary school design resulted in one of the greenest elementary schools in the state of Texas without adding any costs to the district's capital budget. When SHW Group and Spring ISD first began exploring the goals for the new school, conversations quickly turned to daylighting, energy efficiency and water conservation. This led to an original sustainable, high-performance school designed as a teaching tool that will educate generations of students about resource conservation.

The school was designed to achieve LEED Gold certification and has already been accepted by the U.S. Environmental Protection Agency (EPA) to receive an ENERGY STAR rating due to its energy-efficient building design. The building is the first school in Houston to use geothermal heating and cooling, which is expected to save at least 25 percent in energy consumption over the current code.

The 105,000 SF, two-story rectangular facility is oriented with long sides facing north and south. Each classroom takes advantage of natural light while the south-facing classrooms take advantage of daylight harvesting allowing each classroom to operate with natural light 75% of the time. Each room has sensors that control the lighting system based on the levels of natural light in the classroom.

Adjacent to the school’s main entrance are a science garden and eco-pond that includes an above-ground cistern and a water trough. These can be used to teach students integrated concepts about math and science that allow for real-world experiences. Under the parking lot and playgrounds is a geothermal well field housing a system of tubes and valves that take hot and cold water in and out of the building. Through the use of a web-based learning tool, students will be able to interact with the building systems and know the temperature of the water as it leaves the building and when it returns from deep in the earth.

Additional green features include a highly reflective white-colored roof; an on-site wind turbine; 10 kilowatts of roof-mounted photovoltaic cells (which will convert sunlight directly into electricity); a butterfly garden along a walking trail; and an underground cistern that will collect rainwater from the roof and be used to flush toilets and urinals. Also, trees from the existing site will be reused in the building as a treehouse, benches and conference room tables. The school will also use less water by having no irrigation, and many of the construction materials were made with recycled content and within 500 miles of the school. These sustainable amenities will allow the school itself to act as a tool for teaching and for learning.

ENERGY USE

Annual purchased energy use (based on utility bills) 24 kBTU/sf
Actual Carbon Footprint 8.2lbs CO²/sf (43kg CO²/m²)
65% energy use reduction compared to ASHRAE 2010 base model (73 kBTU)
53% Lighting consumption reduction over baseline model
54% Water consumption reduction over baseline model
INTERACTIVE DISPLAY SHOWING REAL-TIME ENERGY USE AND BUILDING’S GREEN FEATURES

ENERGY USE COMPARISON

<table>
<thead>
<tr>
<th>75 KBTU</th>
<th>US Average school</th>
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<tbody>
<tr>
<td>73 KBTU</td>
<td>ASHRAE</td>
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<tr>
<td>72 KBTU</td>
<td>Houston Average school</td>
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<tr>
<td>66 KBTU</td>
<td>Spring</td>
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<tr>
<td>49 KBTU</td>
<td>GM Promised</td>
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<td>39 KBTU</td>
<td>GM Predicted</td>
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<tr>
<td>24 KBTU</td>
<td>GM Actual</td>
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1. WIND POWERED TURBINE
2. PHOTOVOLTAIC SOLAR PANELS
3. DAYLIGHT HARVESTING
4. GEOTHERMAL HVAC
5. RAINWATER COLLECTION
A CISTERN GRAVITY-FEEDS THE RIVER TABLE THAT FLOWS TO THE ECO-POND IN THE SCIENCE GARDEN AT THE EAST ENTRY TO THE SCHOOL.
TEAM

Architectural Design - SHW Group, now Stantec
Contractor - Purcell Construction
MEP - CMTA
Geothermal - CMTA
Structural - SHW Group, now Stantec
Acoustics - BAi
Civil - LJA Engineering and Surveying
Landscape - LJA Engineering and Surveying