



## NET-ZERO SCHOOL: LADY BIRD JOHNSON MIDDLE SCHOOL

Cost of project: \$29 million  
 Number of students: Approximately 900  
 Square footage: 150,250  
 Projected savings: \$200,000 annually (80 percent)  
 Ribbon cutting: August 2011  
 Link to virtual tour of project: [www.irvingisd.net](http://www.irvingisd.net)  
 Video of opening ceremony: [video.irvingisd.net/videos](http://video.irvingisd.net/videos)

Contract Architecture  
 (USA)

IN AUGUST 2011, LADY BIRD JOHNSON MIDDLE SCHOOL IN IRVING, TEXAS, OPENED THE FIRST NET-ZERO MIDDLE SCHOOL AND THE LARGEST NET-ZERO PUBLIC SCHOOL IN THE UNITED STATES.

A net-zero building produces as much energy as it consumes, so its overall energy consumption over a year is net zero, which helps to reverse negative trends associated with climate change.

The Irving Independent School District hired Corgan Associates to design a net-zero school building that also functioned as a learning tool for students throughout the school district. The architecture firm worked with general contractor Charter Builders on construction of the building. Spazio interviewed **Sangeetha Karthik**, Project Architect with Corgan Associates for this case study.

### DESIGNING A NET-ZERO SCHOOL

Designing a net-zero school is somewhat easier than designing a net-zero commercial building because schools use little energy during the summer and the energy they save can be returned to the grid. **So the architecture firm's objectives were first to incorporate elements to reduce energy consumption** as much as possible, and then determined how much energy had to be produced to meet the building's needs. In addition, because budget was a primary concern for the public school, Corgan planned **to use materials that would not be cost prohibitive and that would require low-cost maintenance.**

Lady Bird Johnson Middle School sits on a very long and narrow tract of land that is surrounded by apartments and commercial buildings, including laundromats and strip malls. **Corgan designed the building so that all of the classrooms faced west to make use of the best possible views offered by the urban location of the site.** A two-story classroom block is on the west side, and the fine arts areas, administration space and gymnasium are on the east. The library, which is considered the school's jewel, has an elliptical shape and is in the southwest corner near the front entrance. A light interior color scheme with a few dark accents helps to make the spaces look bright and airy.



### THREE PRIMARY GOALS

To make the building as energy efficient as possible on an ongoing basis, Corgan's three primary goals were to:

- Minimize energy loss and reduce heat gain by making the building envelope as tight as possible;
- Reduce energy use by incorporating high-efficiency building systems; and
- Produce energy on site to meet the building's needs.

#### Minimizing Energy Loss and Reducing Heat Gain

To help achieve the first goal, insulation in the walls and roof was increased to an R value of 30, and double-glazed windows were installed.

In addition, first-floor classroom windows on the west side are shaded by the second floor, which projects over the first level. The windows on the second floor are shaded by an overhang, which is supported by concrete columns.

Floor-to-ceiling windows in the library bring natural light into the space. To reduce glare and heat gain inside the library, Corgan primarily used frosted panels in the curtain wall system on the west facade of the library.

#### Reducing Energy Use

To achieve the net-zero goal, Corgan had to incorporate numerous energy-efficient design features, including a geothermal heating and cooling system, which significantly more efficient than typical HVAC systems.

Daylight harvesting, an Energy Star-rated kitchen and CONVIA energy-monitoring system that tracks plug loads and lighting loads also reduce energy use. In addition, the building incorporates high-efficiency lighting, including high-efficiency fluorescent fixtures and—in cases where it wasn't cost prohibitive—some LED fixtures.

Most classrooms get natural light, including interior classrooms. Clerestory windows in the tall main corridor bring light to the interior hallway and interior classrooms. Daylight sensors harvest light by turning off artificial lighting when there is sufficient natural light.

#### Producing Energy On Site

The majority of the energy that is used by the school is produced on site from highly efficient rooftop Solyndra 191 solar panels that cover almost two-thirds of the roof.

Twelve wind turbines, which were installed adjacent to the building, produce a very small percentage of the school's energy and serve primarily a learning feature for the students.

#### Eco-friendly elements

The building incorporates a number of sustainable and eco-friendly design features as well, including a pulper that compresses and pulverizes cafeteria waste, which reduces the amount of trash generated by the dining area.

The exterior uses locally available brick, which has low lifecycle costs and low maintenance costs. Exposed, unpainted concrete columns with recycled content support the second-story overhang.

The school's flooring also is eco-friendly. Easy to maintain, Mondo's Harmoni rubber flooring never requires waxing or refinishing, and it can be cleaned with just a scrubber, soap and water. This saves on water usage and eliminates the use of chemicals that might be damaging to the environment. Mondo's rubber flooring is also comfortable under foot and reduces the noise that is produced in the hallways and classrooms.

To help conserve water, an underground, 4,000 gallon tank collects water from the roof and uses it as drip irrigation for a portion of the landscaping. A separate deep-water well is used to irrigate the football field.

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## HANDS-ON LEARNING

In keeping with the building's primary function, district officials wanted to ensure that Lady Bird Johnson Middle School would provide **hands-on learning not only for its own students, but also for students from throughout the school district.**

One large classroom, called the Omni Room, serves as a learning lab. Immediately outside the Omni Room, a touchscreen monitor enables users to learn about the building's energy features and environmental goals.

Inside the school's main hallway are four "nodes"—14-foot wide, museum-like displays—one each dedicated to earth, wind, sun and water. TV monitors at the nodes help students track data from the various sustainable design features in the building.

Each of the nodes has its own color theme—dark brown for earth, green for wind, yellow for sun and blue for water. The classrooms behind the nodes have flooring that is the same color as the node, so all of the classrooms behind the earth node have brown flooring, those behind the wind node have green flooring, and so on.

An additional educational feature is the **solar panel observation deck, which is accessible from the main hallway rather than the classroom hallway, to prevent guests and tours from disturbing students during classroom instruction.**







