

And the Winner Is...

CASE Firms Take Five at ACEC's Engineering Excellence Awards

With two Grand awards and three Honor awards, CASE members took five of the twenty-four honors handed out at the annual ACEC Engineering Excellence Awards. Grand awards went to Graef, Anhalt, Schloemer & Associates, Milwaukee, WI, for the addition to the Milwaukee Art Museum and to The Thornton-Tomasetti Group, New York City, for its World Trade Center Disaster Response.

The Honor awards went to Walter P. Moore Inc. Houston, TX, for the new Reliant Stadium in Houston; Weidlinger Associates, New York City, for the Cheju Stadium in Cheju, Korea; and to T.Y. Lin International, San Francisco, for the Diamondback Bridge in Tucson, AZ.

The Milwaukee Art Museum Addition exhibits many unique structural elements, including soaring free form concrete arches, a cable-stayed pedestrian bridge, a 90 foot cantilevered concrete arch that supports a glass and steel cathedral-like hall and a concrete canopy that swoops out from the building using members that could only be described with clay models prior to construction.

Thornton-Tomasetti was hired to manage all structural engineering operations for the World Trade Center Disaster Response after September 11th. Engineers from 23 ACEC member firms participated in the rescue and recovery efforts. Engineers worked in shifts ensuring experts were always available to consult with construction workers and rescue crews on the safest ways to carry out their operations.

Reliant Stadium in Houston, TX is the largest in the National Football League. Serving as the structural engineer on this project, Walter P. Moore Inc. demonstrated engineering excellence in the complex design and construction of the fully integrated roof and movement mechanism. The retractable giant roof is 3.75 acres wide and is the largest of its kind in the United States.

Cheju Stadium has a huge crescent-shaped frame, suspended from six gigantic masts, that anchors a 16,500 square meter Teflon-coated fiberglass membrane. The roof resembles a giant falcon's wing and follows the outline of a nearby mountain. Weidlinger Associates was the engineer of record for the roof, which was structurally independent. The stadium is partially buried to protect the playing field from the island's notorious typhoon winds.

Tucson's Diamondback Bridge is shaped like a Diamondback rattlesnake. T.Y. Lin guided the project from concept to completion. The design of the bridge is a unique combination of art and engineering. It is a post-tensioned reinforced concrete box with metal fencing material over the top to simulate snakeskin. The concrete box is tub-shaped to represent a snake's belly. The bridge represents what would have been an otherwise mundane structure and turns it into something creative and unique.

For further information and details about CASE, please visit www.acec.org/programs/case.htm

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WTC Disaster Response

Grand Award Winner

Engineering Firm: The Thornton-Tomasetti Group, Inc. (New York, NY)

Owner: NYC Department of Design and Construction

After the terrorist attacks of September 11, 2001, specialists from a wide variety of fields contributed their expertise to the rescue and recovery efforts at the World Trade Center in Lower Manhattan. While hundreds of emergency personnel worked at the Trade Center site, the New York City Department of Design and Construction was working to engage the engineering and construction experts needed to direct the safe removal of debris from the collapsed towers. Thornton-Tomasetti Engineers/LZA Technology was hired to manage all structural engineering operations. Engineers from ACEC member firms and the Structural Engineers Association of New York (SEAoNY) participated in the efforts, with engineering crews working on a twenty-four-hour, seven-day-a-week basis.

Over the course of 10 months, more than 1.6 million tons of debris was removed from the site where the World Trade Center once stood. The recovery program was complete \$1 billion under its original cost estimate, and four months ahead of its original estimated schedule. Most importantly, it was carried out safely, without a single major injury... a reflection of the hard work and dedication of everyone involved.



WTC Disaster Response

Reliant Stadium



Reliant Stadium

Honor Award Winner

Engineering Firm: Walter P. Moore (Houston, TX)

Owner: Harris County Sports & Convention Corp.

You've heard that "Everything in Texas is bigger and better!" And, Houston's Reliant Stadium is certainly both. It is the National Football League's largest stadium, covering over 12 acres and comprising 1.9 million square feet. It is the first NFL stadium with an operable roof, and is the largest such roof in the U.S. Designing a retractable roof this large – 3.75 acres wide – is challenging to say the least. Imagine constructing a giant lightweight kite, one football field wide and three football fields long... then try to control the kite in 30-mile per hour winds!

Structural engineers from Walter P. Moore developed the translucent roof structure, created by two enormous fabric-covered roof panels spanning 354 feet between parallel supertrusses. A computerized system of electric motors moves the panels, creating a roof opening of 175,000 feet.

Milwaukee Art Museum Addition

Grand Award Winner

Engineering Firm: Graef, Anhalt, Schloemer & Associates, Inc. (Milwaukee, WI)

Owner: Milwaukee Art Museum

Designed by a team led by architect and engineer Santiago Calatrava, and implemented by a design team including Graef, Anhalt, Schloemer & Associates, Inc (GASAI), this project features numerous unique structural elements. The most unique and impressive element is the Brise Soleil, a 110-ton moveable sunshade that rests on top of the Museum's vaulted glass-enclosed reception hall and is raised and lowered to control heat and light in the structure. This unparalleled piece of sculpture rotates a full 90 degrees in just over 3 minutes. When open, it has a total "wingspan" of 217 feet.

The cable-stayed pedestrian bridge is also a signature element of the project. Constructed of closed-cell stressed skin steel, the bridge is only 2' 4" deep, and yet spans 232 feet over three lanes of traffic. The leaning mast of the bridge, along with highly stressed locked coil cables, actually work to balance significant loads from the pavilion and the Brise Soleil.

Milwaukee Art Museum



Diamondback Bridge

Diamondback Bridge

Honor Award Winner

Engineering Firm: T.Y. Lin International (San Francisco, CA)

Owner: City of Tucson, AZ

In 1997, local Tucson artist Simon Donovan developed an idea for a bridge shaped like a diamondback rattlesnake. T.Y. Lin International's Tempe office was selected to bring the vision and unique concept to reality. TYLI's solution integrates modern post-tensioning technology with classic concrete construction techniques.

The 280-foot long, 16-foot wide Diamondback Bridge is a post-tensioned concrete box with metal fencing over the top to simulate snakeskin. The concrete box has a tub shape to represent the snake's belly. The snake "shape" presented a formidable task of having to fit steel forms to concrete forms. A unique diamond paint pattern on the grating, stonework for abutments and piles, and illuminated glass eyes accentuate the characteristics of a rattlesnake.

Cheju Stadium

Honor Award Winner

Engineering Firm: Weidlinger Associates (New York, NY)

Owner: Municipality of Seogwipo, Korea

A Korean/American team of Weidlinger Associates (Engineer of Record for the roof) and Poong Lim Construction Company and Ilkun Architects (Korea) joined together to produce a competition-winning design for Cheju Stadium, host of the 2002 World Cup.

Cheju Stadium has a huge crescent-shaped frame, suspended from six gigantic masts, that anchors a 16,500-square-meter Teflon-coated fiberglass membrane. To create the lightweight roof, the designers exploited the concept of tensegrity... a structure that continues to yield instead of breaking or coming apart. The shape is defined by the continuous, closed and finite tensional behavior of the overall system, as opposed to the discontinuous and exclusively local compressional behavior of its members.

Cheju Stadium

