ENGINEERING AWARDS of EXCELLENCE

2003

The *Engineering Awards of Excellence* are presented annually by AISC to recognize engineering excellence and innovation in steel-framed buildings.

There are four categories, based on project cost: less than $10 million; $10 million and greater but less than $25 million; $25 million and greater but less than $100 million; and $100 million and greater.

More than one project may be submitted by the same firm and each submittal will be considered as a separate entry.

ELIGIBILITY

- A significant part of the framing system must be steel wide-flange structural shapes or hollow structural sections;
- Building construction must have been completed between January 1, 1999 and December 31, 2002; and
- Projects must be located in the U.S., Canada or Mexico.

JUDGING CRITERIA

- Creativity in response to the owner's and architect's program;
- Application of new or innovative technology in areas such as connections, gravity systems, lateral load resisting systems and fire protection;
- Structural efficiency; and
- Significance of engineering achievement.

2003 JURY

- Jon Magnusson, P.E., Hon. AIA
Chairman/C.E.O.
Magnusson Klemencic Associates
Seattle
- Nancy Hamilton, P.E., S.E.
Principal
ARUP
Chicago
- Robert McNamara, P.E., S.E.
President
McNamara/Salvia, Inc.
Boston

AWARD WINNERS

$100M OR GREATER

NATIONAL WINNER
Torre Mayor—Mexico City, Mexico
Enrique Martinez Romero, S.A. Consulting Engineers

MERIT AWARD
The Dallas Convention Center - 2002 Expansion—Dallas
Datum Engineers, Inc.

MERIT AWARD
DFW Consolidated Rent-a-Car Facility, Dallas-Fort Worth
L.A. Fuess Partners, Inc.

$25M OR GREATER, BUT LESS THAN $100M

NATIONAL WINNER
Stonebriar Centre—Frisco, TX
L.A. Fuess Partners, Inc.

MERIT AWARD
Erie on the Park—Chicago
Thornton-Tomasetti Engineers

MERIT AWARD
Seuss Landing—Orlando
Walter P. Moore and Associates, Inc.

$10M OR GREATER, BUT LESS THAN $25M

MERIT AWARD
New Haven Athletic Center—New Haven, CT
The S/L/A/M Collaborative

LESS THAN $10M

NATIONAL WINNER
Mon-Fayette Toll Plaza & Pedestrian Bridge—Allegheny County, PA
Wilbur Smith Associates

MERIT AWARD
EWPPA Cruise Boat Visitor's Terminal—Erie, PA
Steele Structural Engineering

NATIONAL WINNER

$100M OR GREATER

Torre Mayor
MEXICO CITY

JUROR COMMENTS:

State-of-the-art design using performance-based seismic criteria and in-line passive damping that addresses the issues of safety and damage control in a commercial building.

Located within Mexico City's major business district, the 225 m (738 ft) Torre Mayor is a landmark building, with 57 floors and a heliport. Four underground and nine above-ground parking levels accommodate about 2000 cars.

The building consists of 43 typical column-free office floors, with floor plates ranging from 1700 m^2 to 1800 m^2 (18,300 sq. ft to 19,300 sq. ft). A two-story retail concourse surrounds the entrance plaza.

The building has an 80 m-by-80 m (262 ft by 262 ft) footprint at below-grade levels, which is reduced to an 80 m-by-65 m (262 ft by 213 ft) footprint from the fourth to the 10^{th} level. Above the 10^{th} level, the footprint is further reduced to its typical tower size of 48 m by 36 m (157 ft by 118 ft) , where a geometrical combination of a rectangle merged with an arch segment at the south side of the building forms a curved façade at the south face.

The innovative approach taken in the seismic design of Torre Mayor embraces a performance-based criterion, which is becoming the standard of advanced seismic design. This criterion is concerned not only with the final safety of the building in an event of a strong earthquake, but it also expects the building to be operational after a strong earthquake.

The tower is designed according the latest Mexico City Building Code (MCBC) and its seismic provisions are among the most stringent requirements worldwide. It also complies with the Uniform Building Code-1994, and several of the latest FEMA 274 provisions.

The building's superstructure is a combination of steel and concrete. The columns at the interior and perimeter of the tower are encased in reinforced concrete for the lower half of the

STRUCTURAL ENGINEER
Enrique Martinez-Romero, S.A. Consulting Engineers, Mexico City

Cantor Seinuk Group, New York

ARCHITECTS
Adamson Associates Architects, Toronto

IDEA Asociados de México, S.A. de C.V., Mexico City

Zeidler Roberts Partnership, Inc. Toronto

GENERAL CONTRACTOR
ICA-Reichmann
Mexico City

ENGINEERING SOFTWARE
SAP 2000

tower for added stiffness, strength, and economy.

Typical floor framing is comprised of 3″-deep composite metal deck with 2.5″ of concrete supported on steel framing connected via shear-studs, except at the mechanical floor, where thicker slabs are used.

The selected structural system is based on a redundant multiple system, which is a further enhancement of the "dual" concept recommended by seismic codes worldwide. This is accomplished by introducing a dual conventional (deflection sensitive) lateral-force resisting system in combination with a supplementary damping system (velocity sensitive). In effect, a "trio" system, composed of a primary super-braced frame at the perimeter of the tower coupled with a perimeter moment frame, forms an HSS system, and a trussed HSS at the core of the building is provided to respond to the seismic energy from an earthquake.

The bracing connecting the composite core columns creates a structural spine in the building core. The perimeter frame and the powerful super-diagonal system create an efficient HSS structure, joining the spine in resisting the seismic forces. This system is augmented by the supplemental viscous dampers that are highly effective in reducing the impact of seismic motion on both the structure and the non-structural elements. The system reduces the overall and inter-story sway of the tower, as well as the vibration and the seismic forces of the structural elements. ★

Read more about Torre Mayor in the April 2003 issue of *Modern Steel Construction*.

MERIT AWARD

$100M OR GREATER

Dallas Convention Center 2002 Expansion

DALLAS, TX

Plans for the 2002 expansion of the Dallas Convention was would make the updated 290′-by-600′ building the largest column-free convention center in the country. The functional criteria established for the space included a flat ceiling 40′ above the convention center floor. The ceiling was designed to be flat in order to attach banners, lights, and other convention function props, and the module of the ceiling grid was designed to center over the electrical outlet boxes in the floor at 30′ by 30′. The goal was for the interior ceiling structure to match the existing convention center ceiling structure while providing column-free space.

These criteria required locating the long-span structure above the roof grid and spanning 190′. The basic roof structure could then remain the same. The only difference was that the roof would be supported by a structure above in lieu of columns. Trusses that span 60′ to 120′ were spaced at 30′ on center. These trusses have a maximum

STRUCTURAL ENGINEER
Datum Engineers, Inc., Dallas, TX

ASSOCIATE STRUCTURAL ENGINEER
Charles Gojer and Associates, Inc., Dallas, TX

ARCHITECTS
Skidmore, Owings and Merrill, LLP, Chicago, IL
HKS Architects, Dallas, TX

GENERAL CONTRACTOR
Manhattan Construction Company, Dallas, TX

FABRICATOR AND DETAILER
North Texas Steel Company (AISC member), Ft. Worth, TX

CURVED PIPE MANUFACTURER
Bendtec (AISC member), Duluth, MN

ENGINEERING SOFTWARE
SAP 2000, RAM Structural System

JUROR COMMENTS:

The use of large scale pipe (48″) for primary structure is excellent.

depth of 14′ for shipping purposes. The bottom chord is horizontal, and the top chord sloped to create the drainage for the roof structure. Bracing trusses 14′-0″ deep were situated in the transverse direction at 30′ on center, creating a 30′-by-30′ main truss grid. Shallow 30′-span bar joists were centered in each grid to reduce the metal deck span to 15′- 0″.

Seven concepts for spanning the 390′ dimension and supporting the 14′-0″ deep trusses were value engineered. Two systems were developed far enough to obtain a cost estimate from the construction manager. The two final systems were a cable-suspended system and the double-pipe parabolic arch concept, which ultimately was selected as the most economical solution.

The two double-pipe parabolic arches are supported on 5′-by-5′ concrete columns that are spaced 60′-0″ apart. The pipes also curve in the horizontal plane and lean against each other at mid span. The top chord is a bent 48″-diameter pipe with wall thicknesses that vary from $^{5}/_{8}$″ to $1^{1}/_{2}$″. The thrust of each double arch is taken by the top chord of a 14′-0″ truss centered on the concrete column support at each end. The top and bottom chords of the tension-tie trusses are 12″-diameter pipes.

In order to transfer the thrust of the parabolic arch to the tension-tie trusses, a 60″-diameter steel pressure-vessel connection was developed. The round ball configuration allowed every member intersecting at the single point to have a plane perpendicular to the member for a connection.

To facilitate erection of the pipe sculptures after the finished ceiling was in place, temporary tie rods and turnbuckles were installed and careful attention to detailing of the connection points was required. A sequence of erection and tensioning of the tensegrity system was implemented to allow removal of the temporary tie rods and installation of the completed pipe sculptures. The tensegrity system has successfully integrated the structural system into a unique artistic and architectural expression. ★

Big Bends

The entire roof-truss support system for the Dallas Convention Center was fabricated and delivered to the job site by BendTec, Inc., a pipe fabricator located in Duluth, MN that specializes in the fabrication of HSS trusses. BendTec's scope included the sizing of connections, detailing, bending of the arches, fabrication of the trusswork and delivery to the job site.

The four arches were bent from 48" OD API 5lX52 pipe using BendTec's induction pipe bending process. Pipe wall thickness varied from 0.625" to 1.5". Since the arches were parabolic, not circular, special measures were taken to guarantee the correct shape. The induction bending process utilized an electric induction coil to heat a narrow band around the pipe to a predetermined, controlled bending temperature. As the pipe was pushed through the machine at a controlled rate, a hinged arm clamped to the pipe caused it to bend. Bendtec utilized specially qualified bending procedures to control essential bending machine parameters and guarantee that required mechanical properties were maintained throughout the bend. After bending, Bendtec installed the gusset plates for the truss hangers and preassembled the arch structures in the shop to ensure correct field fit-up. Each arch was shipped to the field in nine segments ranging from 30' to 50' in length.

The arches were anchored to the north and south end trusses, supported by a total of only three columns (one on the south end truss at mid span, and two on the north end truss). The complex intersections at the corners of the end trusses where five to six members intersect were simplified by using 5'-diameter spheres constructed from hemispherical heads welded together by the SAW process. The spheres varied in thickness from 2" to 3".

The south end truss was fabricated from 30" OD by 2"-thick API 5lX52 pipe and weighs 186,300 lb. After fabrication, this truss was split into two pieces and truck-shipped from Duluth, MN to Dallas, TX. The lighter north end truss was fabricated from 30" OD by ½" API 5lX52 pipe and was also shipped by truck in two pieces.

The side trusses, which connect to the north and south end trusses, were fabricated from 24" API 5lX52 pipe with wall thicknesses ranging from ½" to 1.25". Each truss was furnished in nine shop-fabricated segments, 14'-6" wide by 30' to 58' long.

BendTec detailed the entire project in-house, developing 140 (24" by 36") drawings. Because the arches were slanted towards the center of the truss assembly, the horizontal cross braces presented special challenges to both detailing and fit-up. By accurately drawing the entire truss assembly on CAD, these connections could be isolated and patterns made for coping the cross braces to intersect the arches.

The project involved furnishing of 1,200 tons of architecturally exposed steel for the two truss assemblies. ★

MERIT AWARD

$100M OR GREATER

DFW Consolidated Rent-a-Car Facility

DALLAS-FORT WORTH, TX

JUROR COMMENTS:

A striking example of what a cabled steel structure can do for an ordinary design problem.

STRUCTURAL ENGINEER
L.A. Fuess Partners Inc., Dallas

ARCHITECT
Corgan Associates, Inc., Dallas

GENERAL CONTRACTOR
Thomas S. Byrne, Inc., Fort Worth

FABRICATOR AND DETAILER
North Texas Steel Company Inc. (AISC member), Fort Worth

ERECTOR
Bob McCaslin Precast Erection Company (SEAA member), Fort Worth

ENGINEERING SOFTWARE
RAM Structural System, RISA 3D

DETAILING SOFTWARE
MicroStation

Recognizing the car rental industry as an integral component of the aviation transportation system, DFW International Airport and the architect, Corgan Associates, developed this new rental car terminal to consolidate older, obsolete rental car facilities. The new facility is more convenient and reduces traffic congestion.

The rental car facility encompasses 200 acres. The keystone of the facility is a two-story, 130,000-sq.-ft common "terminal" building. The crescent-shaped plan easily guides passengers through the facility. It houses 10 rental car companies; and a two-story, 1.4 million-sq.-ft parking structure with capacity for 5,000 cars. Both the common building and garage are expandable.

The structure has been designed to accommodate operational and safety requirements by separating the garage into three parking areas which are covered to provide protection from the harsh Texas elements. The upper level of the garage, where cars are returned, is partially covered by a suspended metal roof canopy to protect customers and vehicles from inclement weather.

This is one of the primary areas of the project in which structural steel is expressed architecturally—in the repeating system of trusses constructed of arched structural pipe, wire rope tension members, and vertical pipe struts. The vaulted roof forms are arranged to direct travelers between the car-rental and car-return areas outside, and the check-in desks inside. The repeating pattern of arched trusses, rolled metal roofing over structural metal decking, and tension cables anchored to architecturally expressed, gusseted column

capitals gives the upper level of parking areas its identity.

On the opposite side of the rental car facility from the covered parking area, a dramatically curved HSS framework defines the upstairs bus pick-up area, where travelers begin their short return trip to the airline terminals. Tension cables and gusseted column capital details seen in the covered parking areas recur here.

The facility's design reflects simple, elegant forms that provide a pleasant atmosphere for travelers. It creates a strong identity for the car rental operations while acknowledging the character of the airport's original terminal design. ★

NATIONAL WINNER

$25M OR GREATER, BUT LESS THAN $100M

Stonebriar Centre

FRISCO, TX

JUROR COMMENTS:

Outstanding use of an exposed structure to create architecture, giving interest, light and economy to a mall environment.

STRUCTURAL ENGINEER
L.A. Fuess Partners, Inc., Dallas

ARCHITECT
ELS Architecture and Urban Design
Berkeley, CA

STEEL DETAILERS
Steel Dimensions, Inc. (NISD member), Milford, TX

Steelweb, Inc. (NISD member), Coral Springs, FL

CONTRACTOR
Vratsinas Construction Co., Dallas

STEEL FABRICATORS
Bratton Steel, Inc. (AISC member), Dallas, TX

Alamo Steel Company (AISC member, SEAA member), Waco, TX

STEEL ERECTOR
Baten Steel Erectors (SEAA members), Dallas

ENGINEERING SOFTWARE
RAM Structural System, RISA 3D

DETAILING SOFTWARE
SDS/2, SSDCP

Read more about Stonebriar Centre in the July 2002 issue of *Modern Steel Construction*.

The Stonebriar Centre is an example of how a traditional, regional shopping mall can be a dynamic public space that serves as a major local landmark. The finishes above the public areas of the complex are nearly exclusively exposed structural steel, which is used to highlight and identify major spaces. The defining characteristic of the project is "light," both in terms of natural lighting and lightness of structure.

The central concourse is defined by a 1,500′-long raised slit in the roof, modeled as though a gentle sine-wave curve had been cut into a flat roof and

then raised up along its edges. Constructed using a series of king-post trusses assembled from wide-flange steel top chords, HSS compression struts, tension rods, and steel rod bracing, the undulating roof bears lightly on a diagonal HSS truss framing the clerestory glass.

Secondary spaces are defined by a variety of truss systems. One area incorporates an HSS "bicycle wheel" truss that appears to float above the floor and supports a truncated cone-shaped roof. At the main entry, access from the upper-level parking deck is across a pedestrian bridge supported and covered by a leaf-like structure of steel and glass. The roof structure above the children's carousel is an inverted carousel of steel tubes and rods.

The intricate detail of the exposed structural steel elements of this center was achieved through close collaboration between the architect and the structural engineer. ★

MERIT AWARD

$25M OR GREATER, BUT LESS THAN $100M

Erie on the Park

CHICAGO

JUROR COMMENTS:

Structural steel responding well to irregular floor-plate geometry and need to keep floor-to-floor heights at a minimum.

STRUCTURAL ENGINEER
Thornton-Tomasetti Engineers, Chicago

ARCHITECT
Lucien Lagrange Architects, Chicago

FABRICATOR
Zalk Josephs Fabricators (AISC member), Stoughton, WI

ERECTOR
Area Erectors (NEA member), Wheeling, IL

DETAILER
Dowco Consultants, Ltd. (NISD member), Burnaby, BC Canada

JOIST FABRICATOR
Canam Steel Corporation (AISC member), Washington, MO

ENGINEERING SOFTWARE
RAM Structural System, ETABS

DETAILING SOFTWARE
Xsteel

Read more about Erie on the Park in the May 2002 issue of *Modern Steel Construction.*

Erie on the Park is a striking statement in steel. This sleek 25-story residential tower emphasizes the material with exposed chevron-shaped steel bracing punctuating the façade. The result is a distinctive design that stands out in the Chicago cityscape, where concrete is the typical choice for apartment buildings. Floor-to-ceiling glass runs between steel spandrels and the dramatic chevrons, achieving an open airy look and offering building residents views of nearby Lake Michigan.

The building site is in the shape of a parallelogram, with existing neighboring buildings located directly on the property line on the east and west sides, and major streets on the north and south sides. The dimensions of the site and the largest floor plates are approximately 90′ between the existing buildings and 120′ between the streets. The 266,000-sq.-ft building consists of three concrete stories at the base, and 22 stories framed in rolled shapes and steel joists rising above the base. The typical floor-to-floor height is 10'–8". The lateral system is comprised of concrete shear walls at the base and three-story steel mega-braces in the steel stories. The foundation system consists of grade beams and caissons. Unlike typical mid-rise construction, there is no basement. As a result, a structural slab was designed at the base of the building to act as a rigid diaphragm and transmit the base shear to all of the caissons.

STEEL-FRAMED RESIDENTIAL BUILDING

Architecture and structural engineering are virtually inseparable at Erie on the Park. The design team began with several constraints: the owner wanted to optimize the space within the tight confines of the site, offer a range of floor plans and unit sizes, and achieve fast-track construction.

Thornton Tomasetti Engineers began by analyzing a concrete structural system and found insufficient torsional resistance, due to Chicago's high winds and the unusual parallelogram building shape. Changing concrete formwork for varied layouts would have slowed erection, and concrete was more costly than steel.

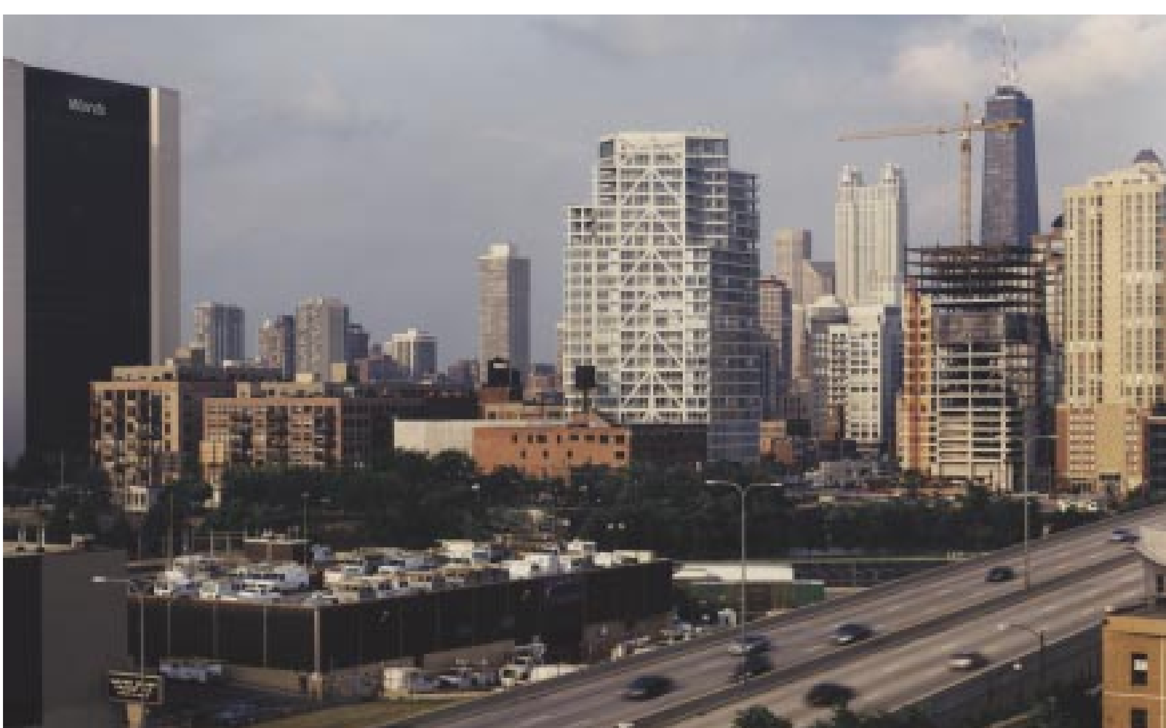
The design team, led by Lucien Lagrange Architects (LLA), explored a steel structural system, and focused on bracing. Thornton-Tomasetti Engineers's decisions on the type of needed bracing for the size and shape of the building influenced LLA's aesthetic choices. In one direction, the engineers placed bracing within two interior walls, but the building core made this approach impossible in the other direction.

The design team then developed the dramatic exterior chevron design, which was derived from the angles that the engineers calculated for optimal bracing shapes. These chevrons brace two sides of Erie on the Park. The bracing on each side forms eight vertically stacked chevrons 52' wide; seven are three stories high, and the uppermost is two stories high. The result is an aesthetic marriage of architectural interest and structural elegance. The diagonal elements transfer lateral loads from floor to floor, and a column bisects the chevrons for gravity resistance. At the three-story-high lobby, construction transitions to concrete. Chevron bracing lateral loads are transferred to concrete shear walls, and uplift is resisted by a reinforced-concrete, grade beam-and-caisson foundation.

3-DIMENSIONAL MODELING

Thornton-Tomasetti used Xsteel, a 3-D computer-modeling tool from Tekla, to efficiently handle the project's difficult geometry and to accelerate steel production. Xsteel allowed geometry and member sizes to be exported directly from compatible analysis programs, potentially to be used to develop fabrication shop drawings. All parties could see in a three-dimensional model how the structural steel and connections fit together. In particular, Xsteel allowed Thornton-Tomasetti to model the architecturally exposed structural steel with the structural steel to determine how they looked together. This attribute was instrumental in achieving the desired aesthetic appearance, such as having all gusset connections concealed by the architectural covers for the steel.

Erie on the Park is an example of how a design team's creative approach achieved a distinctive building. In contrast to concrete frames typically used in residential construction, the project illustrates how the use of steel both structurally and architecturally proved to be an economical and efficient way to frame the building. The use of Xsteel modeling enabled the team to facilitate erection speed and achieve the desired building aesthetic. The result is a boldly modern structure that takes residential construction in a new direction. ★



MERIT AWARD

$25M OR GREATER, BUT LESS THAN $100M

Seuss Landing
ORLANDO

JUROR COMMENTS:

This project highlights the flexibility of steel to create complex shapes of a make-believe world where gravity doesn't exist. The use of wire frame CADD modeling demonstrates the state of the art in geometry definition.

STRUCTURAL ENGINEER
Walter P. Moore and Associates, Inc., Dallas

ARCHITECT
HKS, Dallas

GENERAL CONTRACTOR
Whiting-Turner Contracting Co.

PROJECT OWNER
Universal Studios

STEEL FABRICATOR, DETAILER, ERECTOR
Met-con, Inc. (AISC member), Cocoa, FL

ENGINEERING SOFTWARE
SAP, RISA 3D, RAM Structural System

Read more about Seuss Landing in the August 2002 issue of *Modern Steel Construction.*

Since his first book was published in 1937, Dr. Seuss has stirred the imaginations of children. Universal Studios has recreated the world of Dr. Seuss in Seuss Landing, one of six "islands" in its new theme park, Universal's Islands of Adventure, in Orlando, FL. Seuss Landing was created to entertain the young as well as the young-at-heart through the fantastic shapes, fun characters and vivid colors depicted in the books of Dr. Seuss.

The imaginary settings in the illustrations of Dr. Seuss should not exist in real life. Buildings lean at unnatural angles with curving and branching columns. Bridge supports are so thin and twisted that they would immediately buckle in our world. If gravity existed in the world of Dr. Seuss, structures would surely tumble to the ground. And yet, Seuss Landing was built in the real world of gravity, fabrication processes, and erection tolerances. The designers of Seuss Landing turned to structural steel to bring this imaginary world into our world.

The design combined the talents of artists, technicians, architects and engineers. First, a program of eight buildings was conceived, containing a variety of fanciful rides, shows, restaurants and shops. Next, artists drew renderings of the buildings based on the illustrations and story lines of Dr. Seuss. Architects and engineers melded the program and renderings to produce design development drawings. Model artisans then used the drawings and renderings to build ½″=1′-0″ scale models out of wood and clay. Technicians ran a robotic arm over the surface of each model to measure and record three-dimensional coordinates of thousands of points on the exterior skin of the physical models. These coordinates were linked in a CADD model to form a wire frame. The faces of the wire frame were linked with planar surfaces and the edges smoothed to replicate the physical models. The architect and structural engineer used this CADD model to sculpt structural steel supports so that steel members would stay within skin surfaces.

Keeping the structural steel within the skin led the fabricator and erector to the creation of structural steel sculptures in lieu of typical structural steel framing. Steel sections are bent, segmented and welded together to snake through thin free-form shapes. Steel appendages are fastened to building frames to hold up features such as Seussian characters, 29′ ice-cream cones and star-shooting cannons. The Onceler's House is an example of a structural steel sculpture used to support Seussian art. From the top of the Onceler's house, the Onceler tells park guests a story of environmental disaster caused by his own greed. In addition to the environmental theme of the story line, sustainable design principles were used for the sculpture, and the Onceler's House was constructed from recycled and recyclable materials.

The engineering achievements of Seuss Landing are made possible through science, technology and steel. The results are fantastic works of art that are enjoyed by thousands of park guests every day. ★

MERIT AWARD

$10M OR GREATER,
BUT LESS THAN $25M

New Haven Athletic Center

NEW HAVEN, CT

The challenge presented by the New Haven Athletic Center was to provide a clear-span arena of 60,000 sq. ft that maximized the availability of clear height within a structure for athletic events, while minimizing the apparent exterior height of the facility for the community it serves.

To achieve these conflicting goals, the structural team developed a shallow triangular truss system comprised of 16″-diameter HSS for top and bottom chord members with 7″-diameter web members capable of spanning the 160′ width of the arena. The complexity of the project lay in achieving the simplicity of the geometry and the dimensional requirements of the roof truss system.

To achieve the architects' desire for a uniform and visually elegant structural system, the tri-dimensional trusses were designed to be shipped as 40 units and joined in the field with full-penetration splice welds, thereby minimizing the number of bolted connections. The criteria for the welds in the field were to maintain the same tolerances as those in the factory. The uniformity in the truss appearance was achieved through careful modeling and analysis of the truss loading, and then detailing of the web thicknesses to achieve the required strengths. The resistance of the welded joints was modeled to represent a tri-dimensional elliptical shape, substantially increasing the complexity of the technical analysis. Moreover, one

JUROR COMMENTS:

Brilliant integrated solution with architecture and services. The technical analysis of the joints resulted in clean, clear details.

PROJECT OWNER
City of New Haven, Board of Education

ARCHITECT AND STRUCTURAL ENGINEER
The S/L/A/M Collaborative, Glastonbury, CT

GENERAL CONTRACTOR
Giordano Construction, Branford, CT

ERECTOR
Kenerect, LLC (NEA member), Newington, CT

ENGINEERING SOFTWARE
STAAD, RAM Structural System

DETAILING SOFTWARE
SDS/2

single joint could be comprised of the concentric junction of up to six tubular members.

Because of limited staging area (most of the truss staging occurred within the arena itself) and the need to minimize erection time, the trusses were shipped pre-assembled as 15′ wide by 12.5′ high, in lengths up to 80′. They were coated with a factory-applied finish, thereby requiring only touch-up painting at the splice welds and a final coat of paint at the site. Because of their size and weight (each truss weighed between 36,000 lb. and 48,000 lb.) specialized equipment was required for the transportation of the individual pieces from the fabrication plant. The trusses were shipped upside down on an independent hydro-pneumatic suspension system that allowed adjustments in the transport height of the individual trusses. The pieces were then rotated 180 degrees when delivered at the site.

The resulting truss system, which totals 750 tons and is supported by an additional 680 tons of structural steel, is expressed in its triangular form on the exterior of the building through the clerestory glazing system. The flat plane of the main roof appears lifted up over the building form, achieving the architects' desire to reduce the apparent height of the building.

The steel fabricator worked in collaboration with the construction manager, the erector and the design team for four months prior to fabrication of the trusses, planning the delivery of this challenging project. As can be seen in the photographs, the elegance of the exposed structure is the major visual feature of the arena's interior. ★

NATIONAL WINNER

LESS THAN $10M

Mon-Fayette Toll Plaza and Pedestrian Bridge

ALLEGHENY COUNTY, PA

The Pennsylvania Turnpike Commission (PTC) retained Wilbur Smith Associates to provide a mainline toll plaza facility to service the Mon-Fayette Expressway. The new mainline toll plaza was designed to be physically pleasing, customer friendly, safe for employees, cost effective, and different from any of the PTC's existing facilities. The PTC requested that the facility should present itself as "The Gateway into Pittsburgh," because of its proposed location on an expressway entering the greater Pittsburgh metropolitan area. Alternates studied included variations of tunnels and pedestrian bridges. Based on total cost and past maintenance problems with tunnels, the PTC decided to develop the pedestrian bridge as the preferred alternate.

WSA advanced the conceptual design with several enhancements. These included modifying the center pier design, the addition of fully functional, stainless-steel tie members, the selection of HSS members, and protecting the steel with a fire-retardant paint system. The final design executed by WSA provided a facility that is fully integrated with the highway system through many unique features.

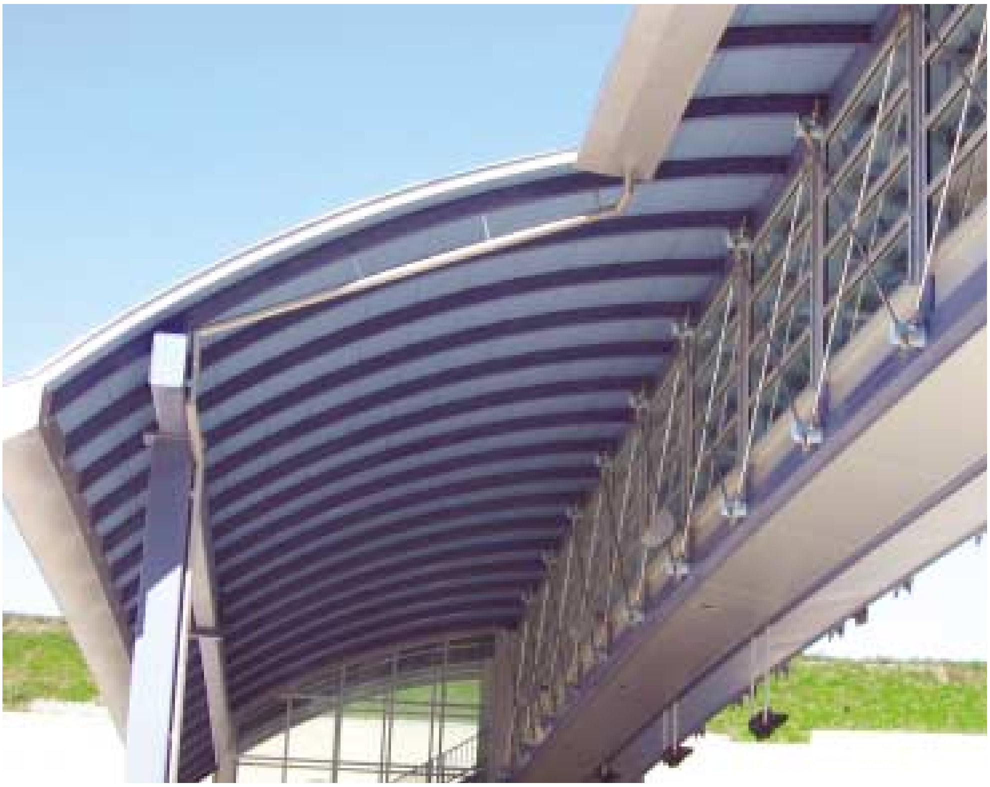
A lively and innovative design utilizes a curved stainless steel roof and integral canopy; fully functional diagonal tie rods; and a centrally located V-shaped pier supporting the "lookout" from which the plaza is operated. The stairwells are glass enclosed for safety and aesthetic purposes.

Some exciting architectural features include visual security techniques, gull-winged canopies curved in two directions, an arched truss, and a stainless steel roof selected for aesthetics and long-term maintenance.

Above the bridge pier is the main operation center for the plaza. Its location allows operations personnel full

JUROR COMMENTS:

The use of the pre-tensioned rods for bracing is a simple elegant application of post-tensioning creating a light and airy bridge. The attention to detail produced simple and elegant connections.



OWNER
Pennsylvania Turnpike Commission, Harrisburg, PA

STRUCTURAL ENGINEER
Wilbur Smith Associates, Pittsburgh

ARCHITECT
Celli, Flynn and Brennan, Inc., Pittsburgh

GENERAL CONTRACTOR
A&L Inc., Belle Vernon, PA

ENGINEERING SOFTWARE
STAAD

views of the expressway and the individual toll lanes. It also permits full operation of the facility from the center of the bridge.

The plaza can accommodate both electronic and coin toll collection. The plaza has been designed to adapt to the state-of-the-art Electronic Tolls and Traffic Management (ETTM) System which will be mounted to the bridge so expressway customers can bypass toll collection machines and pay tolls while maintaining a high rate of speed through the facility. The overhead bridge allows safe passage (lane crossing) of PTC employees.

The use of pre-tensioned stainless steel rods as the truss tension and compression diagonals provided light, non-intrusive views as well as a decorative focal point for travelers viewing the structure. Pre-tensioning allowed the use of the rods, and avoided larger-size members that would have been required based on slenderness ratios. The rod connections to the truss were performed utilizing steel pipe extended through the main truss tube members, and the rods were then bolted to the pipe. The use of pipes at the truss joints reflected the pin-type connections of traditional roadway trusses, while providing an architectural enhancement. ★

MERIT AWARD

LESS THAN $10M

Erie Western Pennsylvania Port Authority Cruise Boat Visitors' Terminal

ERIE, PA

JUROR COMMENTS:

The use of a repeating graceful module creates a sculptural building that responds to water and is a light and economical response to the program.

The new Cruise Boat Visitors Terminal is situated at the end of the Holland Street Pier in Erie's Bayfront district. Formally an industrial site squarely in the country's "Rust Belt," the Erie Western Pennsylvania Port Authority was looking for a signature building to continue Erie's bayfront renaissance.

With the building serving as first contact to the City of Erie and possibly the United States, the owner wanted a bright, modern facility that also evoked the area's industrial heritage.

Using this as the backdrop, the architects at Weborg Rectenwald Buehler seized on the prototypical industrial sawtooth—updating it with curves and offsets that added both visual interest and mimicked the waves in the adjacent bay.

The site and resulting building shape also accommodated the building's primary tenants—U.S. Customs and the Immigration and Naturalization Service. Programmatically, both tenants required a controlled, linear path through the building to control the flow of arrivals to the area that still maintained an open, welcoming feel.

The structural engineers at Steele Structural Engineering were tasked with providing an economical structural system that could be quickly and easily constructed. A laminated timber/deck system was quickly eliminated as being too heavy in appearance

STRUCTURAL ENGINEER
Steele Structural Engineering, Erie, PA

ARCHITECT
Weborg Rectenwald Buehler Architects, Inc., Erie, PA

STEEL FABRICATOR/DETAILER
Amthor Steel (AISC member), Erie, PA

STEEL ERECTOR
Cararra Steel Erectors (AISC member), Erie, PA

ENGINEERING SOFTWARE
RISA-3D, RISABase, RISAFoot, Enercalc Structural Engineering Library

and outside of the project budget. The design team turned to a combination of wide-flange and hollow structural shapes to provide the ideal combination of clean lines, strength and cost effectiveness.

Using RISA-3D to perform the finite element analysis, a modular frame was designed that could be repeated through the building and be used as the primary structure. Save the front and rear building canopies, the frames utilized bent HSS sections for the roof and W8 shapes for the column assembly. Spaced at 17′ centers and using 4½″ long-span deck, the system easily resists the high winds and lake effect snows coming off Lake Erie while exhibiting minimal drift–critical to the exterior cladding.

The frames relied on bolted end-plate moment connections throughout to eliminate field welding. Additional HSS and channels were used for supporting both the continuous clerestories in each sawtooth as well as the large expanses of glass block in the building cladding.

Mechanical spaces were framed with wide flanges to support the units and 4½″ long-span deck for the floor (with plywood walking surface). The sloped ceiling in the private spaces throughout the building used a lighter gage of the same 4½″ long-span deck.

The project was completed in fall 2002, providing an effective programmatic and structural solution for the City of Erie's newest landmark building. ★