



Precast Helps Break Design Boundaries

This year's Harry H. Edwards Industry Advancement award-winning structures provide examples of ways precast concrete continues to expand its usefulness to designers of both buildings and bridges. Incorporating new seismic techniques into a 39-story retail/residential complex in San Francisco offers dramatic proof of the advantages this precast system offers. Meanwhile, the research underway with Carbon-Fiber Reinforced Polymer (CFRP) strands in bridges will create efficient ways for designers to create long-span bridges. These projects, together with the Best All-Precast Concrete Solution Award, show the ways precast continues to expand construction's boundaries.

SPECIAL AWARD JURY



Jury Chairman
Mario J. Bertolini
President
Blakeslee Prestress Inc.
Branford, Conn.



Roy L. Eriksson
President/CEO
Eriksson Technologies Inc.
Tampa, Fla.



Kim Seeber
Consulting Engineer
Cantonment, Fla.

SPECIAL AWARD WINNERS

Harry H. Edwards Industry Advancement Award, Co-Winner: The Paramount retail/residential tower, San Francisco.	7
Harry H. Edwards Industry Advancement Award, Co-Winner: Bridge Street Bridge, Southfield, Mich	8
Best All-Precast Solution: University of Georgia Carlton Street Parking Facility, Athens, Ga.	10



Harry H. Edwards Award

Architect Of Record

Kwan Henmi,
Architecture/Planning
San Francisco

Design Architect

Elkus/Manfredi Architects Ltd.
Boston

Engineer

Robert Englekirk Consulting
Structural Engineers Inc.
Santa Ana, Calif.

Design-Builder

Pankow Residential Builders II LP
Altadena, Calif.

Owner

Related Management Co.
New York City

"Compared to other common structural-steel or cast-in-place concrete systems, this manner of resisting earthquake forces significantly reduces damage to the key elements of a building frame."

—Bill Long, project architect,
Kwan Henmi, Architecture/Planning



The Paramount, San Francisco

DESIGN GOALS

- Design a 39-story multi-use retail/residential structure in a high-seismic zone.
- Accommodate a congested urban site with a tight budget and efficient time table for construction.

PRECAST SOLUTIONS

- At 420 feet tall, this structure holds the title as the tallest precast concrete building in a high-seismic zone.
- Two types of systems for structural lateral-force resistance were used. Below the 8th floor, cast-in-place concrete shear walls were used between parking and living spaces on each level coupled with a curved, hybrid precast moment-frame bracing system on the Mission Street façade starting at the 4th level.
- The post-tensioned strands run the length of the multi-bay frames and are anchored in the end columns of the frame after stressing. The clamping force provided by these strands creates a friction force between the beams and columns that transfers the shear demands through the interface joint.
- Mild steel is placed at the top and bottom of the beam through the interface joint with the column and is grouted. Straining this mild steel provides the necessary energy dissipation. An unbonded region adjacent to the column reduces inelastic strain and forces all post-yield rotation to occur at the beam-column interface.



PROJECT SPECS

- 39-story mixed-use project offering 486 apartments in 547,000 square feet plus an 8-story, 113,000-square-foot, 350-car parking structure
- Precast and cast-in-place structural system comprising 478 precast moment-frame columns (3 by 3 by 18 feet), 732 precast moment-frame beams (2 by 3 by 12 to 24 feet), 68 precast gravity columns (2 by 2 by 40 feet), 641 precast architectural panels (50 to 100 square feet apiece) and 312 prestressed beams (40 feet long)
- Total cost: \$92.7 million;
Precast cost: \$8.9 million

THE JUDGES SAID...
"This structure is a classic example of combining the knowledge and wisdom learned from academia engineering, architecture and construction, to create a landmark project and advance the precast industry. The path is now open for others to apply this technology with precast prestressed concrete structures in high-seismic areas."

A key advantage supplied by the Paramount's uses of a precast hybrid moment-resisting frame as part of its structural system is that it creates a restoring force provided by its elastic post-tensioned strands that rights the building following a seismic event.



"The quality and extent to which CFRP tendons were successfully used in this project has established another benchmark for advanced composite technology in a civil-engineering application."

—Dr. Nabil F. Grace

chairman, Civil Engineering Department, Lawrence Technological University



Harry H. Edwards Award

Research, Development & Design Consultant

Civil Engineering Department
College of Engineering
Lawrence Technological University
Southfield, Mich.

Designer

Hubbell, Roth & Clark Inc.
Bloomfield Hills, Mich.

Precaster

Hollowcore Inc./Prestressed Systems Inc.
Detroit

General Contractor

Angelo Iafrate Construction Co.
Warren, Mich.

Owner

City of Southfield
Southfield, Mich.

Bridge Street Bridge Southfield, Mich.

DESIGN GOALS

- Create two, three-span, 206-foot bridges, one using conventional steel reinforcement with AASHTO beams and a second using Carbon Fiber Reinforced Polymer (CFRP) tendons in modified double tees.
- Test the benefits of CFRP construction subjected to the same traffic and weather conditions as the traditional construction.
- Maintain a tight schedule of staged construction and open both bridges on time.
- Monitor bridges to determine specific advantages and disadvantages provided by CFRP.

PRECAST SOLUTIONS

- Three precast concrete double tee spans using CFRP were created, measuring 67 feet for the center span and 70 feet for the end spans.
- The steel form used for the 13 complicated modified double tees was difficult to construct due to the shape and geometry of the tees. Some parts of the form had to be modified to include soft rubber and plywood so detensioning would not cause internal stresses that cracked the beam.
- Detensioning was performed at the dead end of the beam by wrapping each strand in plastic to control the splintering that occurred when the carbon fibers were cut.
- External supports were developed for longitudinal post-tensioning.
- The bridges opened 11 days ahead of schedule.

PROJECT SPECS

- 12 modified double tees, encompassing 6,200 square feet and containing CFRP tendons. The tees comprised three spans of 67 (center span), 70 feet
- 15 precast concrete AASHTO Type III girders totaling 1,005 linear feet with regular steel reinforcing. The beams comprised three spans of 67 (center span), 70 feet
- Total cost: \$8.5 million

THE JUDGES SAID...

"The use of CFRP tendons in precast concrete bridges opens new potential for bridge designers to solve design problems more cost effectively and with faster construction. This project takes existing components and materials and expands on their abilities in new ways that will benefit the industry overall. These attributes define a Harry H. Edwards award winner."



This three-span bridge was designed with precast concrete components incorporating carbon fibers about the diameter of a human hair that are woven together and encased in epoxy. The design offers key advantages over steel strands, and those benefits will be tested via monitors on the bridge.



"Giving the precaster single-point responsibility for the structure and building façade played a major role in making this a successful project.

*—Howard H. Stewart, project architect,
Smallwood Reynolds, Stewart, Stewart & Associates*



Best All- Precast Solution

University of Georgia Carlton Street Parking Structure, Athens, Ga.

Architect

Smallwood, Reynolds, Stewart,
Stewart & Associates Inc.
Atlanta

Engineer

Sedki & Russ Engineers Inc.
Atlanta

Precaster

Metromont Prestress Co.
Greenville, S.C.

General Contractor

Choate Construction Co.
Marietta, Ga.

Owner

UGA Real Estate Foundation
Athens, Ga.

DESIGN GOALS

- Design a parking structure on a tight site near Stegeman Coliseum on the university campus.
- Create an aesthetically pleasing appearance incorporating brick and traditional styling.
- Meet a fast-track, eight-month schedule to ensure the structure's readiness for the fall football season.

PRECAST SOLUTIONS

- An all-precast concrete structure was specified due to the fast-track schedule and winter construction. The architect and contractor worked closely with the precaster from the initial design phases to ensure all aesthetic and logistical needs could be met.
- The structure consists of precast, prestressed concrete double tees supported by walls and inverted tee beams at the interior column lines, plus wall columns and L-beam spandrels with inset brick applied at the precast plant. Precast shear walls were located at each end of the structure.
- The design features a Neo-Classical Georgian style that blends inset brick with limestone-like spandrel accents. The building's base is detailed with a series of arches in combination with horizontal rustication bands and implied keystones. The cornice is visually accented with a step profile and dentil molding.
- The long spans provided by the precast double tees, complemented by the smooth finish on the tees and columns, provide an openness that fosters a sense of security.

PROJECT SPECS

- Five-level, 648-car parking deck with parking for 39 buses on the ground level, encompassing 208,847 square feet
- 1,213 precast concrete components, comprising double tees (60 feet long by 10 feet wide and 24 or 36 inches deep), wall columns (5'2" wide by 1'4" thick), intermediate wall columns (3'10" wide by 1 foot thick), spandrel beams (4 feet tall by 8 inches thick), inverted tee beams (43 feet long and 34 inches deep) and roof panels (8 inches thick)
- Total cost: \$7.68 million;
Precast cost: \$3.35 million



Unexpected site conditions for the University of Georgia's new parking facility delayed construction for one month, causing lead time for precast approval to be shortened. A detailed schedule also had to be devised to handle brick selection, phased shop-drawing development and review/approval prior to production.

THE JUDGES SAID...

"This project combines precast's ability to create a classical university campus look with its state-of-the-art functional advantages, such as providing long spans and an open feeling. Precast also allowed construction to begin during the winter and helped the project make the final deadline despite a delayed start. The difficult site also was overcome by precast's off-site fabrication methods and fast construction."