Expanding on Success

— Craig A. Shutt

Thornton-Tomasetti Senior Vice President Paul Lew serves on the parking committee of the Precast/Pretsressed Concrete Institute, attending meetings to offer suggestions and learn what projects are underway. "I think I can provide a different insight than contractors or precasters can offer," he says, noting that he's typically the only consulting engineer that attends. "Architects and engineers have different needs on a project, and I like to ensure that all of the needs are met when programs are being considered."

In part, that interest in aiding these programs derives from the expanding ways in which precast concrete is being used in projects today, which can impact the work done by an international engineering and design firm such as Thornton-Tomasetti. The 52-year-old New York-based company specializes in sports facilities, skyscrapers and other innovative structures around the country. It also is well known for its forensic work, determining why such systems failed, and for its historic-preservation projects.

– Paul Lew, vice president

'Architects and engineers have different needs on a project, and I like to ensure that all of the needs are met when programs are being considered.'

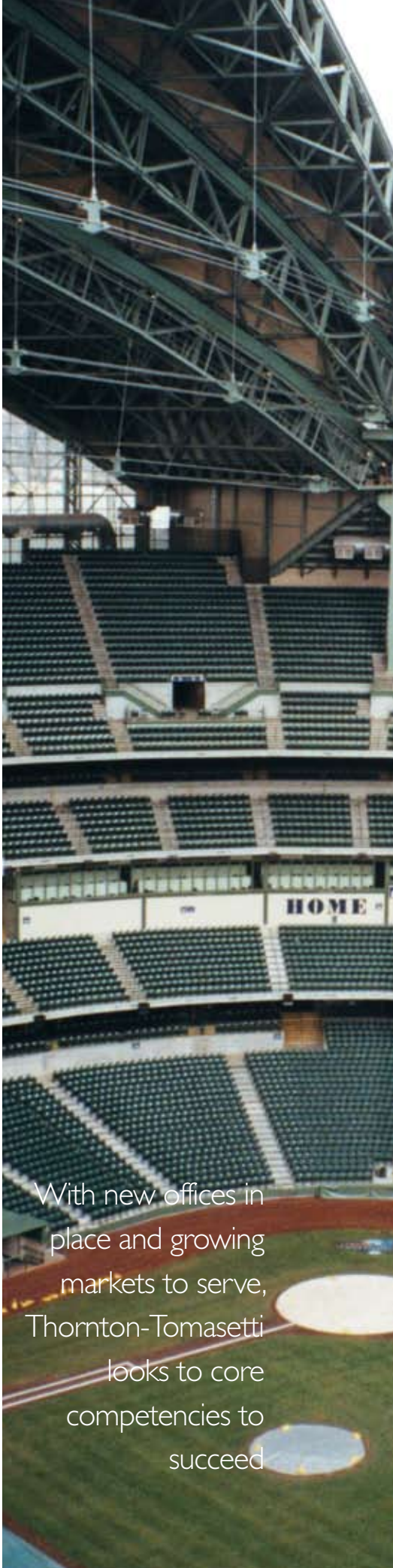
The firm was founded in 1956 as Lev Zetlin & Associates, at a time when precast concrete materials were just beginning to be introduced. The company today works with the material primarily as a structural material through its work on stadiums and parking structures and as an architectural feature as cladding on dramatic buildings of all types.

Stadium Work Expands

"A lot of the precast concrete materials we use come in connection with our stadium and sports-facility work," says Michael J. Squarzini, a principal with the firm. "It's been a large market for us, especially in the Eastern region recently. There's been a real expansion of the sports market, and precast concrete almost always plays a role in these projects with some components."

Indeed, its current work offers an embarrassment of riches in the region. It includes the $800-million Yankee Stadium in the Bronx, The Washington Nationals Ballpark slated to open in April, the $435-million Barclays Center in Brooklyn, which will play host to the New Jersey Nets professional basketball team, the recently opened $375-million Prudential Center in Newark, New Jersey, where the New Jersey Devils professional hockey team plays, and the $1.4-billion Meadowlands Sports Complex in East Rutherford, New Jersey, home to both the New York Giants and New York Jets professional football teams. All projects are underway, and some remain under wraps as details are finalized.

Precast concrete components, especially seating units, risers, and



With new offices in place and growing markets to serve, Thornton-Tomasetti looks to core competencies to succeed

Photo:

Miller Park in Milwaukee features precast concrete seating sections and architectural precast concrete panels inset with thin brick to provide a classic look to the domed ballpark.

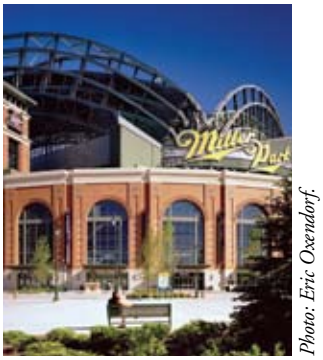


Photo: Eric Oxendorf.

PROJECT SPOTLIGHT

Miller Park

Location: *Milwaukee*

Project Type: *Domed baseball stadium*

Area: *221,000 sq ft*

Designer: *HKS Sport & Entertainment Group/NBBJ Sports & Entertainment/ Eppstein Uhen Associated Architects, a joint venture*

Structural Engineer: *Thornton-Tomasetti, Chicago*

Owner: *Milwaukee Brewers*

Contractor: *HCH Miller Park Joint Venture*

PCI-Certified Precaster (architectural precast panels): *International Concrete Products, Germantown, Wis.*

PCI-Certified Precaster (risers, tubs, raker beams, stairs and landings): *The Spancrete Group Inc., Waukesha, Wis. (For technical information on these projects, contact the precaster; see the Plant Certification listing on page 47.)*

Precast Concrete Specialty Engineer: *Consulting Engineers Group, Mt. Prospect, Ill.*

Description: *The 42,500-seat home to the Milwaukee Brewers is a modern engineering marvel with traditional baseball flavor. Its unique, fan-shaped structure features the first retractable roof of its kind in the world. The building's façade uses architectural precast concrete panels to convey the classic look of past ballparks combined with wide, arched windows reminiscent of historic European train stations.*

Precast seating elements included about 2,500 pieces of risers, tub units, walls, raker beams, and stairs. Some of the components were as long as 50 ft and ranged in weight up to 50,000 lbs.

raker beams, will be used in all of these projects, Squarzini notes. "Precast concrete is uniformly utilized in these stadiums because the bowl seating in particular benefits from its use," he says. Both the prestressing and the unitized nature of the precast seating elements, which permit free thermal movements, result in enhanced long-term performance of open-air stadium bowls by reducing the likelihood of concrete cracking, he explains.

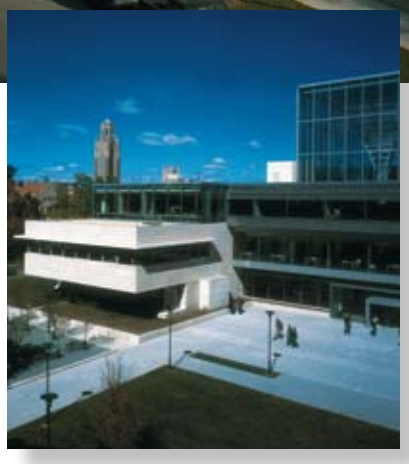
"Additionally, the ability to cast the pieces off-site both controls quality and eliminates formwork in the field," he says. Erecting pieces quickly once they are delivered, and to be able to continue construction through harsh winter weather, has made precast concrete the de facto design approach.

Lower-level seating rakers also can be designed with precast concrete units, although crane logistics must be worked out carefully due to having to erect from within the confines of the structure. "The lower-level bowl rakers can be designed with precast concrete components when they can lean on other portions in the bents that create the structure's lateral system," he explains. Vomitory walls also are designed in precast concrete when they are part of the seating-bowl system, he notes.

– Michael Squarzini, principal

'We absolutely continue to grow internationally and see those markets as offering great opportunities for our work.'

Photos: ©2004 Brad Feinknopf.



The Charles M. Harper Center at the University of Chicago's Graduate School of Business features thinly cut limestone cast into precast concrete panels to achieve the look of masonry with additional benefits.

PROJECT SPOTLIGHT

Charles M. Harper Center at the University of Chicago School of Business

Location: *Chicago*

Project Type: *Academic facility*

Area: *415,000 sq ft*

Designer: *Rafael Viñoly Architects P.C., New York*

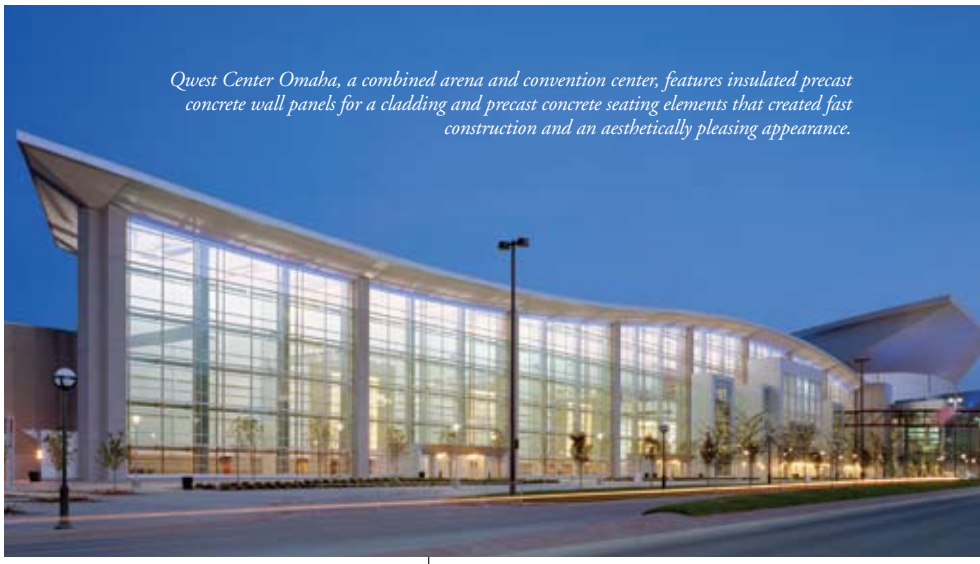
Owner: *The University of Chicago, Chicago*

Contractor: *Turner Construction Co., Chicago*

PCI-Certified Precaster: *Gate Precast Co., Winchester, Ky.*

Description: *This award-winning, five-story graduate academic facility on the University's main Hyde Park campus features a base building with five above-grade levels, two below-grade levels, and a glass-enclosed winter garden. To achieve the desired appearance, thinly cut limestone slabs were cast into architectural precast concrete panels. Precast concrete also was used for horizontal sunshade elements that provide sun relief to the interior perimeter spaces.*

'We work with a number of architectural firms that know how to enhance a structure to add value.'



Qwest Center Omaha, a combined arena and convention center, features insulated precast concrete wall panels for a cladding and precast concrete seating elements that created fast construction and an aesthetically pleasing appearance.

Designing seating with precast concrete components can create challenges, he notes. The typical shallow sections required to create the rake of the seating bowl require careful evaluation for vibration under occupant load. The shallow end-support connections also require careful detailing.

Architectural precast concrete wall panels also are being used more often as cladding on stadium projects, particularly to achieve a masonry look that otherwise would be more costly or labor intensive he notes. Many projects are looking to create a classic design using brick, which can be achieved with inset thin brick or even form liners on precast concrete panels.

"In addition to the highest level of spectator amenities offered, aesthetics are a key part of today's design strategies, because these facilities become an integral and iconic part of the community's fabric," he says. "Precast concrete can provide a high-quality finish, and there are endless variations in aesthetic looks that can be achieved."

International Projects Grow

The company's stadium work continues to expand in its applications and its locations. Soccer, NASCAR, and other sporting activities are growing in popularity, requiring specialized stadiums. Likewise, countries around the world are expanding their facilities, creating more international work. "There are numerous sports facilities being built internationally," he notes. Some of the work follows the Olympics designations, with a multitude of venues required for each city being given hosting responsibilities.

The company also is seeing considerable work involving casino theater-type projects, which require extensive seating designs. "We view stadiums and casinos as one entertainment market, and it's a strong market—there is always work progressing in both areas."

To facilitate its communication in the international market, the company opened a London office in early 2007, operating under the name Thornton Tomasetti Postawa de Hoog. The office is overseeing the firm's expansion in the United Kingdom and Western European markets and help it expand in the Middle East. "We absolutely continue to grow internationally and see those markets as offering great opportunities for our work."

Two Types of Clients

Structural considerations also play a key role in designing parking structures, where the precast concrete components make up a significant portion of the project, says Lew. In creating these structures, designers work with two types of owners, he notes.

"There are the bottom-line-oriented owners who want exposed-aggregate or reveals as the only decoration, to create the classical parking-structure appearance," he explains. The other type, which has become more prominent, he says, is looking for "urban camouflage," a design that blends with the surrounding neighborhood's style. "They're more conscious of the environment of the building and don't want to have a strictly utilitarian structure on the site."

Thornton-Tomasetti has seen interest in decorative touches grow,

PROJECT SPOTLIGHT

Qwest Center Omaha

Location: *Omaha, Neb.*

Project Type: *Convention center arena*

Area: *1.1 million sq ft*

Designer: *DLR Group, Omaha, Neb.*

Structural Engineer: *Thornton-Tomasetti, New York*

Owner: *City of Omaha, operated by Omaha Metropolitan Entertainment & Convention Authority, Omaha, Neb.*

Contractor: *Kiewit Construction Co., Omaha, Neb.*

PCI-Certified Precaster: *Rinker Materials (now a division of Coreslab Structures Inc.), LaPlatte, Neb.*

Description: *The $208-million Qwest Center, which combines both an arena and convention center, is part of the total redevelopment along the riverfront, containing $1.6 billion worth of new structures and infrastructure. The facility features insulated precast concrete wall panels with 3 in. of extruded polystyrene insulation with a 3-in. exterior wall. Some of the panels feature a 6-in. interior wythe of concrete, while others have a 9-in. interior wall.*

The precaster became involved in the project at the early design stages to ensure the system worked effectively. As a result, the components were ready to be erected as they were needed, saving time and labor. Construction was started prior to all the architectural documents being completed.

PROJECT SPOTLIGHT

Frank R. Lautenberg Rail Station

Location: *Secaucus Junction, N.J.*

Project Type: *Rail station*

Area: *300,000 sq ft*

Designer: *Brennan Beer Gorman Architects, New York*

Structural Engineer: *Thornton-Tomasetti, Newark, N.J.*

Owner: *New Jersey Transit Corp.*

Contractor: *Terminal Construction Corp., Woodbridge, N.J.*

PCI-Certified Precaster: *Coreslab Structures (CONN), Thomaston, Conn.*

Description: *The largest rail station built on the East Coast since the 1930s, the Secaucus Junction station features architectural precast concrete walls on the four-story building as well as structural components (double tees and girders) for the north and south platforms.*

The ability to repeat panels with the same form allowed for a continuation of articulations, color and texture, and the large size of the panels allowed custom liners to be produced economically. The stone appearance of the panels was created with rubber form liners using stone faces from a quarry in Colorado.

he adds. "We work with a number of architectural firms that know how to enhance a structure to add value." This is becoming more important as codes reduce the amount of open area that can be provided on the building's façade, dropping it from about 50% in the past to as little as 20% today.

"Some of the projects look like townhomes rather than parking. It's not a simple thing to do, but it's becoming more popular." Mixed-use projects also are growing, although integrating parking with other functions, particularly residential needs, creates unique challenges.

Stand-alone parking structures are using precast concrete more often for a variety of reasons, Lew says. Foremost among them is cost—and the guarantee of that cost, which eliminates contingency needs. "Contractors have an aversion to risk," he notes. "When you have the precast concrete making up 50% of the cost, and you can nail down that cost during the design phase—and be assured that it will be maintained—you have a big advantage."

Material prices have become so volatile that it can be difficult to estimate costs when the products may not be purchased for many months. "The vagaries of construction can make pricing difficult," he says. "As a result, contractors have to ensure they don't bid too low due to the variables that can't be predicted." Contractors thus estimate for worst-case scenarios to cover their needs. "That can create a pretty substantial premium. You can take a key variable out of the design process by using precast concrete, which can provide a set price."

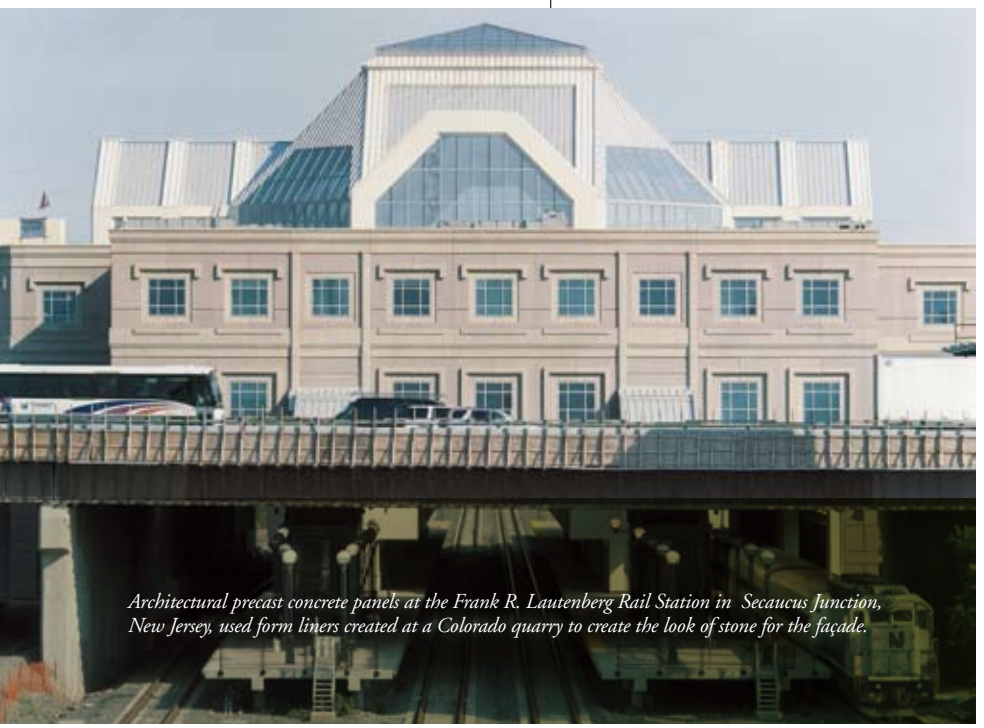
The variables also extend to labor shortages, he adds. "Finding carpenters or masons can be difficult, and you have to pay a premium. Plus, weather on the East Coast doesn't lend itself well to cast-in-place concrete or masons for a large portion of the year."

Cast-in-place designs also can create a quality issue. "It can achieve a high quality, but the cost can get out of hand to do so." Precast also offers durability benefits, he says. "It can create a pretty crack-free structure that is also corrosion resistant. We try to address those issues upfront by putting in materials that will aid in preventing corrosion and lower maintenance needs."

Owners do have to be aware of the need to maintain joints, he notes. "But cast-in-place designs also require some maintenance, and it can be expensive to fix problems if they arise. Owners who think cast-in-place projects are maintenance free are going to learn an expensive lesson."

Lew also is seeing more interest in green roofs for parking structures, aiding their sustainability by cutting the heat-island effect and adding a distinctive amenity. "These are mostly on the higher end of the spectrum, where owners are trying to achieve a specific goal for marketing or other reasons." (For more on green roofs for parking structures, see the article on page 20.)

The engineers are continually looking at new building materials and techniques to improve green designs, including the use of recycled and minimally processed or transported materials. Precast concrete offers significant benefits in those regards, using local materials and typically having a plant within a few hundred miles of the site.



Architectural precast concrete panels at the Frank R. Lautenberg Rail Station in Secaucus Junction, New Jersey, used form liners created at a Colorado quarry to create the look of stone for the façade.

Communication Speeds Up

The company uses Advanced Structural Detailing (ASD) and Integrated Modeling for concrete. "Our ASD models contain pure structural information that is vital to our design and analytical needs as

The five pavilions in the Nasher Museum of Art at Duke University feature load-bearing, insulated precast concrete sandwich wall panels that allow the exterior cladding to flow into the buildings' interiors while providing functional benefits.

PROJECT SPOTLIGHT

Nasher Museum of Art at Duke University

Location: *Durham, N.C.*

Project Type: *Campus museum*

Area: *64,942 sq ft*

Designer: *Rafael Viñoly Architects P.C., New York*

Structural Engineer: *Thornton-Tomasetti, Newark, N.J.*

Owner: *Duke University*

Contractor: *Beck Group, Durham, N.C.*

PCI-Certified Precaster: *Metromont Corp., Charlotte, N.C.*

Description: *The goal for this project was to create a distinctive campus landmark that will serve as the center of cultural life for both the university and the local communities. The designers specified load-bearing, insulated precast concrete wall panels for the structures to serve as the finished architectural surface that continues the exterior cladding seamlessly into the museum's interior.*

'You can take a key variable out of the design process by using precast concrete, which can provide a set price.'

well as the needs of fabricators and contractors," he says. The concrete modeling includes the creation of three-dimensional models including both member geometry and reinforcing steel. The models can be given to the formwork manufacturers and rebar detailers to assist the production of their work.

These tools help the company provide better, faster service and keep it on the cutting edge of engineering needs. The expertise is shared with others, including subcontractors through involvement with programs such as PCI's committee work. "As engineers, we take a different perspective than architects do, and we have different needs. Precasters need to take all of these needs into account to ensure their products work as they were designed to work," Lew says. "By working closely with others on the construction team outside of specific project needs, we ensure future designs are efficient and cost effective." ■

For more information on these or other projects visit *www.pci.org/ascent.*

50+ Years of History

Thornton-Tomasetti celebrated its 50th anniversary of operation in 2006, having begun in 1956 as Lev Zetlin & Associates. Today, the company has more than 500 employees collaborating from offices across the globe. It operates 12 office nationally (Boston; Chicago; Dallas; Fort Lauderdale, Florida; Irvine, California; Kansas City, Missouri; Los Angeles; New Haven, Connecticut; New York, Newark, New Jersey; Philadelphia; and Washington, D.C.). Internationally, it has four offices, in London, Hong Kong, Shanghai, and Moscow.

The company has been responsible for engineering some of the world's most impressive towers, such as the Petronas Towers in Kuala Lumpur, Shanghai 101 and Taipai 101, as well as the restoration of some of the world's most famous historic buildings and landmarks. Earlier this year, it celebrated the topping out of the 975-ft-tall Comcast Tower in Philadelphia, the tallest building between New York and Chicago.

'There's been a real expansion of the sports market, and precast concrete almost always plays a role.'

Photo: Eric Oxendorf.

PROJECT SPOTLIGHT

Miller Park

Location: *Milwaukee*

Project Type: *Domed baseball stadium*

Area: *221,000 sq ft*

Designer: *HKS Sport & Entertainment Group/NBBJ Sports & Entertainment/Eppstein Uhen Associated Architects, a joint venture*

Structural Engineer: *Thornton-Tomasetti, Chicago*

Owner: *Milwaukee Brewers*

Contractor: *HCH Miller Park Joint Venture*

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Description: *The 42,500-seat home to the Milwaukee Brewers is a modern engineering marvel with traditional baseball flavor. Its unique, fan-shaped structure features the first retractable roof of its kind in the world. The building's façade uses architectural precast concrete panels to convey the classic look of past ballparks combined with wide, arched windows reminiscent of historic European train stations.*

Precast seating elements included about 2,500 pieces of risers, tub units, walls, raker beams, and stairs. Some of the components were as long as 50 ft and ranged in weight up to 50,000 lbs.

A sophisticated level of craftsmanship was required to create the intricate detailing on the precast panels. The arched windows not only had half-bricks cast into the precast panels, they also stepped several times and included a return, all created on a radius. The mortar joints are part of the monolithic precast concrete panels, thus, tuck point maintenance is eliminated. This panel system allowed the building to be enclosed quickly.

The cornice and architectural precast pieces were finished with an etching process to create the stone look. These pieces, 45' 11 1/4" long, required exacting precision to ensure the inside and outside miter lined up.The cornice projects 1' 8 1/8" off the face of the panel. Reveals were cast into the clock tower panels to further enhance the stone look using precast.

In all, 475 panels totaling 150,000 sq ft of architectural precast concrete were used to accomplish the wide variety of architectural expressions of texture and detail that were required.

The sweeping arches of the roof give the building a distinctive character, as they reach more than 600 ft across the field in a one-of-a-kind, fan shaped retractable roof. Five of the seven roof panels can open or close in less than 10 minutes and are engineered to withstand 12-ft snowdrifts.

Photos: ©2004 Brad Feinknopf.

The Charles M. Harper Center at the University of Chicago's Graduate School of Business features thinly cut limestone cast into precast concrete panels to achieve the look of masonry with additional benefits.

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Owner: *The University of Chicago, Chicago*

Contractor: *Turner Construction Co., Chicago*

PCI-Certified Precaster: *Gate Precast Co., Winchester, Ky.*

Description: *This award-winning, five-story graduate academic facility on the University's main Hyde Park campus features a base building with five above-grade levels, two below-grade levels, and a glass-enclosed winter garden. To achieve the desired appearance, thinly cut limestone slabs were cast into architectural precast concrete panels. Precast concrete also was used for horizontal sunshade elements that provide sun relief to the interior perimeter spaces.*

The architectural design, marked by the building's horizontal massing and cantilevered exterior walls, reference Frank Lloyd Wright's Prairie style used on the neighboring Robie House. The resulting cantilevers range from 3 to 42 ft and required more than 600 moment connections.

By casting limestone into the panels, a secondary structural system was not required, as the panels span between the structural columns. The panels also arrived at the site with the stone in place, saving time and money involved in the masonry process.

PROJECT SPOTLIGHT

Qwest Center Omaha

Location: *Omaha, Neb.*

Project Type: *Convention center arena*

Area: *1.1 million sq ft*

Designer: *DLR Group, Omaha, Neb.*

Structural Engineer: *Thornton-Tomasetti, New York*

Owner: *City of Omaha, operated by Omaha Metropolitan Entertainment & Convention Authority, Omaha, Neb.*

Contractor: *Kiewit Construction Co., Omaha, Neb.*

PCI-Certified Precaster: *Rinker Materials (now a division of Coreslab Structures Inc.), LaPlatte, Neb.*

Description: *The $208-million Qwest Center, which combines both an arena and convention center, is part of the total redevelopment along the riverfront, containing $1.6 billion worth of new structures and infrastructure. The facility features insulated precast concrete wall panels with 3 in. of extruded polystyrene insulation with a 3-in. exterior wall. Some of the panels feature a 6-in. interior wythe of concrete, while others have a 9-in. interior wall.*

The arena offers six levels of seating, all featuring precast concrete vomitory walls and seating decks. The treads range from 11½ to 14 in. high on level 2, progressing to 16 in. on level 3, 19 in. on level 4 and 21½ in. on levels 5 and 6. Using the precast components saved material, time and cost while providing the aesthetics that the designers wanted to achieve.

The precaster became involved in the project at the early design stages to ensure the system worked effec-tively. As a result, the components were ready to be erected as they were needed, saving time and labor. Construction was started prior to all the architectural documents being completed.

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Structural Engineer: *Thornton-Tomasetti, Newark, N.J.*

Owner: *New Jersey Transit Corp.*

Contractor: *Terminal Construction Corp., Woodbridge, N.J.*

PCI-Certified Precaster: *Coreslab Structures (CONN), Thomaston, Conn.*

Description: *The largest rail station built on the East Coast since the 1930s, the Secaucus Junction station features architectural precast concrete walls on the four-story building as well as structural components (double tees and girders) for the north and south platforms.*

The panels allowed for a variety of properly scaled projections and ornamentations, and sped up the process of enclosing the building, which enhanced worker safety, scheduling and cost. The panels also limited the amount of materials and equipment near the active rail lines.

The ability to repeat panels with the same form allowed for a continuation of articulations, color and texture, and the large size of the panels allowed custom liners to be produced economically. The stone appearance of the panels was created with rubber form liners using stone faces from a quarry in Colorado.

PROJECT SPOTLIGHT

Nasher Museum of Art at Duke University

Location: *Durham, N.C.*

Project Type: *Campus museum*

Area: *64,942 sq ft*

Designer: *Rafael Viñoly Architects P.C., New York*

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Owner: *Duke University*

Contractor: *Beck Group, Durham, N.C.*

PCI-Certified Precaster: *Metromont Corp., Charlotte, N.C.*

Description: *The goal for this project was to create a distinctive campus landmark that will serve as the center of cultural life for both the university and the local communities. The designers specified load-bearing, insulated precast concrete wall panels for the structures to serve as the finished architectural surface that continues the exterior cladding seamlessly into the museum's interior.*

The precast panels provide both the structural system and the insulation and water-protection system for the five pavilions comprising the structure. Each pavilion contains a specific component of the building program and are loosely placed in a radial pattern. They were conceived as monolithic forms with limited fenestration.

The precast concrete walls contain an architectural precast mix design that blends several aggregates and sands to achieve a natural and aesthetically pleasing color and texture. Sandblasting and the insertion of horizontal reveals create an attractive, functional, durable system to meet the needs of the permanent collection as well as the traveling exhibition.

'Some of the projects look like townhomes rather than parking. It's not a simple thing to do, but it's becoming more popular.'