Architectural Precast Façade and Seating Risers Bring Elegance and Construction Speed to Broward County Arena

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The National Car Rental Center in Broward County, Florida features architectural precast panels on its façade and precast concrete seating treads and risers inside, both of which give uniqueness and elegance to this facility devoted to hockey, basketball, concerts and special events. Close coordination was required to meet the tight 27-month design and construction schedule. The panels used on the exterior comprise only one mix but other panels also feature a series of tightly spaced reveals that add texture and contrast while reflecting the long, thin, skating lines of hockey skates. The interior precast concrete seating required tight tolerances and well-planned logistics to coordinate the erection of the upper tiers. This article presents the design aspects and erection highlights of the project.

The new National Car Rental Center in Broward County, Florida, home to the National Hockey League’s Florida Panthers hockey team, features a unique, user-friendly design that provides efficient pedestrian circulation and takes full advantage of its distinctive setting (see Fig. 1). The new facility is located in the City of Sunrise, a few miles west of Fort Lauderdale.

But completing the project within the required schedule—27 months from letting of contract to occupancy—demanded close communication among the members of the construc-
A major key to success in completing the work on that short timetable was the use of a variety of precast concrete components, including risers and treads, vomitory walls, and architectural precast panels on the façade.

The 27-month schedule was so condensed that the project team came to think of the project based on a “flashtrack” schedule rather than the more common “fast-track” format as is done for many time-sensitive projects. In a typical fast-track system, one often hears the expression that the owner can have only two out of three options, namely: quality, schedule, and cost.

In this case, the team delivered all three options by designing and constructing a facility that offers a dramatic addition to the landscape while hosting hockey and basketball games, concerts, and other special events (see Fig. 2). All this was achieved on schedule and within budget.

The facility seats 19,000 people for hockey matches and 20,000 for basketball. Included are 70 private suites, four party suites, eight co-op suites, and 2330 club seats. The 135 acre (54.6 ha) site is accessible from the Sawgrass Expressway by a newly constructed interchange. The facility provides 7500 on-site parking spaces, including 226 enclosed spaces.

The site is located along the western perimeter of the urban development within Broward County. The sporting complex is situated directly across from Sawgrass Mills Regional Mall, a 2.35 million sq ft (0.218 million m²) commercial center. It is bounded by vacant land to the north, a single-family residential development to the south, and the Florida Everglades to the west. A 22 acre (8.9 ha) wetland-mitigation area was developed on the
site as part of a commitment by the local Development of Regional Impact for the mall.

The arena plays host to more than 200 events per year. The site was designed to facilitate the efficient flow of fans to and from the stadium and into and out of its interior arena. Fans leave their cars and approach the arena along pedestrian spines that gently slope up to the main concourse-level entry plaza (see Fig. 3). They enter through the main entrance lobby adjacent to a large outdoor plaza designed for prefunction activities and civic events (see Fig. 4).

The arena’s entrance is located 20 ft (6.1 m) above the parking level so the event level could be located above the area’s high water table. As a result, the arena is the tallest structure in a multi-mile radius, making it a landmark visible from a long distance. Because of this high-profile location, the designers knew the structure needed a distinctive and powerful design (see Figs. 5 and 6).

TRIANGULAR ARENA PLAN

The arena’s plan resembles the shape of a triangle (see Figs. 7 and 8), with two of its sides acting as billboards to approaching motorists on the expressway. The remaining side faces a nearby street and features the multistory glass entry lobby, which serves as the site’s focal point. The triangular shape was derived from the owner’s desire to collect the concession offerings into three food courts attached to the concourses, instead of spacing them out evenly around the arena as is typically done.

This triangular design makes a bold architectural statement. Functionally, it leaves the concourses open for unrestricted circulation. Each food court is
located at a point of the triangle and comprises one fully glazed wall leading to an outdoor terrace. Large areas of glass are distributed around the building, providing views into and out of the public spaces.

Exterior terraces are located off 14 key function spaces and public-circulation areas to take full advantage of the tropical climate and the views offered by the wetlands and Everglades. The Panthers’ main offices are situated within one of the triangle’s points to enjoy this dramatic scenery. Other elements include three times the number of toilets required by code and wide concourses to speed up pedestrian flow.

The arena in plan measures 550 x 574 ft (167 x 174 m); it stands 142 ft (43.1 m) from event-floor level to the top of the roof; and 103 ft (31.2 m) from the event floor to the roof trusses. It includes 254 ft (77 m) of clear span across the event floor.

The arena consists of a cast-in-place concrete superstructure with precast concrete seating bowl treads and risers. The exterior features architectural precast panels along with a lower, tinted-glass curtain-wall system, metal panels, single-ply EPDM roofing and colored concrete pavers in the plaza.

After observing several existing facilities, the developer quickly defined the building goals for the new arena. The project team was selected in part due to their experience with this type of stadium. Several members worked together on the Fleet Center in Boston, Massachusetts, and the Ice Palace in Tampa, Florida. All the participants, from the design team to the general contractor, were selected quickly and became principal players in establishing the design goals, project objectives, building program and construction schedule.
The design team consisted of approximately 150 people from 15 companies. Design goals and project objectives were established. “Communication is everything,” became the slogan. Calendars were mounted on walls, decision dates were targeted and then shifted as other dates fell into place. Nothing was omitted; each meeting date, document-package due date, permit submission, and construction milestone was noted. The final deadline was set as the end goal and the preliminary schedule served as the framework within which every item was programmed.

Everyone involved in the project became totally committed to the target schedule. Each team member proudly wore shirts displaying the Panthers logo with “Arena Development Team” written on them.

In quick order, project members met with officials from Broward County and the City of Sunrise to discuss design goals, review schedules, and receive input on code and zoning requirements. Meetings were then arranged on a two-week schedule to discuss programming, design, budget, schedule, constructibility, and coordination issues. Each meeting focused on the following two weeks of details and progress so everyone had a clear understanding of what the process was and how rapidly they needed to move.

Communication between meetings was maintained through conference calls, e-mails, faxes and overnight delivery. CAD drawing standards were established and schedules were distributed electronically to all members and updated. CAD files also were provided to the subcontractors, including the precasters.

The “flash-track” project-delivery method was continually evaluated. Nine different construction-issue packages were released on strategic dates to facilitate construction. At the onset of construction, after only five months of development and design,
Due to the facility’s high profile and location across from a shopping mall, the construction process captured the attention of the local newspapers. A civic event was in the making. The *Miami Herald* published four ongoing full-page features complete with drawings. These full-page articles were turned into posters and distributed to local schools and colleges.

Although the designers of this project have previously used precast concrete risers and vomitory panels for stadiums, the construction schedule was the main reason why architectural precast concrete was specified for the façade. The precast concrete panels could be fabricated in a plant while foundation work and the structural frame were being completed. Thus, the precast panels could be erected and finished much faster than any other material.

Furthermore, several members of the construction team had just finished work on the Ice Palace in Tampa, Florida, a similar arena for the NHL’s Tampa Lightning team. On this job, the masonry exterior took far longer to finish than would the precast concrete façade proposed for the National Car Arena.

The precaster was consulted to determine the most advantageous size for designing the panels. The project team wanted to use the largest panel size possible to limit the total number of components and speed up the process by reducing the total pick count. But the panels also provided an attractive and distinctive façade that meshed with the arena’s function and met the owner’s need for a grand exterior on this high-profile project.

The precast panels, many of which measured more than 100 sq ft (9.3 m²) in size, feature only one mix design, consisting of 1/2 in. (12.7 mm) Jacksonville limestone, guaranteed white sand, Federal White cement, and Lambert Dark Buff dye. However, the finished panels include rows of closely spaced reveals on the top halves of many panels in order to impart a two-tone look for the façade. This depth, provided by form liners and an abrasive blast on the panels, creates shadows and changes in color as the sun...
passes over the facing (see Fig. 9).

The reveals also reflect the long, thin marks left by hockey skates in the ice, providing a connection to the key event held inside. This concept was emphasized further by using long bands of color in the concrete plaza blocks leading up to the main entry. Portions of the panels were lightly sandblasted to add texture, but no exposed aggregate was featured. While the long color bands provide a sense of motion, energy and a playful aspect to the building, the precast concrete panel design contrasts that effect. The precast panels offer the grandeur, permanence and monumentality that the owners wanted.

The remainder of the main façade features accents of silver-colored metal at the roof line and green-tinted glass. The materials were designed in a layered style as if in thin layers that peel back to expose layers of increasing transparency. The light-colored precast concrete panels give way to clear glass stepped back inside the panels, which reveal the arena's interior behind them (see Fig. 10).

The entry makes this layered look especially clear as it projects off the
main triangular shape with a concave design that draws visitors to its center. The precast concrete panels that frame this entry structure feature segmented and slightly radiused pieces. Two different radiiuses were used to create contrast: fiberglass forms were employed in casting all the panels, and granite inserts were inset along the bottom of the panels along this face to add visual interest.

Fabricating these entry panels was particularly challenging. The precast concrete engineer and precaster based their design calculations on wind tunnel tests conducted at the facility to determine lateral loading requirements on these unusually shaped components. In addition to these segmented or radiused shapes, the end panels feature returns that expose the front and back of the panel, requiring both sides to be finished.

The geometry of these panels required detailed engineering that was complicated by the fast erection schedule. But by the time the drawings were required, the details had been worked out. Production of the architectural panels took only 18 weeks.

Inside, the finish materials and colors work as an extension of the building’s exterior sophistication. Off-white, beige, and soothing greens provide a classic backdrop to the excitement of the entertainment spaces, including surrounding retail stores and sports bars. The arena seating has padded seats and green, tan, and blue upholstery fabrics to differentiate the major seating terraces. On the upper-bowl level, the concourses feature an indirectly lit, painted, sloped “ceiling” of the precast concrete seating deck above and a patterned vinyl-tiled floor.

Precast concrete double and triple risers were used to create the lower bowl as well as the upper seating levels. One section of the lower bowl features seating that was raked at a steeper angle than all other arena seating. This stacks the risers higher but closer, raising the noise and excitement levels in this area.

ERECITION HIGHLIGHTS

Sequencing the construction of this complicated facility on a fast speed schedule required close communication and presented many logistical challenges. One particular challenge was erecting the upper-bowl seating while simultaneously erecting the steel trusses for the roof overhead.

The designers had to quickly pin down the interior geometry for the bowl design, vomitory locations, and food courts, so the precaster, thus, could begin production while construction proceeded. For example, the order for structural roof steel was placed before the groundbreaking to ensure its delivery to the site as soon as the concrete frame was completed. At the same time, the precast concrete components would also be ready to arrive.

The upper-level precast concrete had to be set before the line of roof trusses because there would be no way for the crane to reach around the trusses to set the pieces once the first roof truss was set. Thus, the crane was used to assemble the trusses at the east end of the bowl during the day, and then was used to set the upper-level precast concrete seating risers at the west end at night. While these precast concrete components were being assembled and set in place, work continued by setting the upper bowl precast...
units on the east side, after which the roof steel could be completed.

During this same period, the structural precast concrete progressed on the west end beyond the first two roof trusses. The west end trusses, each in two separate 180 ft (54.6 m) pieces, were lifted by separate cranes and air-spliced together. Once these pieces were in place, work turned to setting the lower-bowl components, and the roof could be set.

This progression was the most economical and fastest but required switching around the drawing schedule to accommodate it. The smooth sequencing was a direct result of early critical-path planning. The ability of precast concrete to be fabricated off-site and to be produced without any unforeseen delays ensured that the schedule would progress on time.

Coordinating the exterior erection also took close communication. For example, the precaster and precast concrete engineer were responsible for producing the shop drawings and other engineering details. This included laying out all the embeds and installing them as cast-in-place work proceeded.
Most of this work was accomplished before final drawings were completed. The precaster used a mobile crane in the parking lot and within three months erected the architectural panels in a vertical alignment around the outside, moving along the circular perimeter as needed.

Figs. 11 and 12 show progress in constructing the roof of the structure and erecting the precast wall panels.

In all, some 671 pieces of architectural precast concrete, totaling 110,000 sq ft (9900 m²), were used to clad the exterior of the arena.

Overall, the project cost $136 million for construction out of a total $192 million development budget. From programming and design through to its grand opening, the project was completed in the required 27 months. This included five months of design prior to the groundbreaking and 22 months from groundbreaking until occupancy.

The structure was completed in September 1998, in time for the hockey season.

Fig. 13 shows an interior view of the arena while Figs. 14 and 15 show exterior views of the finished facility.

CONCLUDING REMARKS

The opening of the arena was seen as an important milestone in the maturation of the young hockey team and a key to building fan loyalty over time. The facility’s character reflects that of the team in expressing a youthful, confident, and dynamic attitude. It also projects an appropriate civic image for the full range of entertainment offerings for the region. Some people have likened the arena to an opera house.

Such results confirm that the project team not only met a record-setting schedule and stayed within the prescribed budget, but that a high quality standard was maintained in design and construction. From the beginning, the design-construction team recognized that a successful project could be accomplished only with collaboration, respect for each other’s unique contributions, close communication at the highest level, and harmonious working relationships.

Since its opening 2 ½ years ago, the facility has fulfilled the expectations of the owner, design-construction team and general public. Indeed, the structure, because of its architectural aesthetics and sheer size, has quickly become a popular venue and major landmark in the area.

CREDITS

Owner: Broward County, Florida
Developer: Arena Development Co. Ltd., Fort Lauderdale, Florida
Developer’s Representative: Morse Diesel International, Miami, Florida
Architect: Ellerbe Becket Architects & Engineers Inc., Kansas City, Missouri
Structural Engineers: Ellerbe Becket Architects & Engineers Inc., Kansas City, Missouri and Walter P. Moore & Associates Inc., Tampa, Florida
General Contractor: a joint venture of Centex Rooney Inc., Fort Lauderdale, Florida & Hunt Construction Group, Tampa, Florida
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Fig. 15. Finished view of Broward County Arena. Because of its architecture, functionality and size, the facility is already a major landmark in the area.