Photographer: Dennis O'Kane

Deerwood North Building 300

Jacksonville, Florida

An architectural precast concrete, loadbearing wall panel system not only saved costs but also provided the desired aesthetics for a four-story, Class A office building in Jacksonville, Florida.

The challenge to the architect from the owner-developer was to design a four-story, 117,000 sq ft (10,900 m²) Class A office building to meet high aesthetic standards and a tight budget in a fiercely competitive office market. The owner, Flagler Development Company, knew that to remain competitive in the office market, a more innovative building system had to be developed.

The architect, Rolland Delvalle & Bradley, accepted the challenge and started to study various design alternatives. Initially, the building was to have been a steel-framed structure with a gypsum board elevator shaft and clad with tilt-up wall panels. However, the inclusion of tilt-up wall panels did not meet the required aesthetic standards.

Working closely with the precaster, Gate Precast Company, the precast specialty engineer, LEAP Associates International, Inc., and the structural engineer from The Haskell Company, together they devised a more efficient design using structural loadbearing precast concrete. There was some precedent for this collaboration because two earlier office buildings in the same development program had been clad with architectural non-structural precast concrete with the same precaster.

The basic concept was to replace the tilt-up wall panels with loadbearing architectural precast concrete wall panels. These panels would not only be self-supporting but would also carry part of the steel frame and floor load. Importantly, the new design would eliminate all the perimeter steel columns. Another decision taken was to make the elevator shaft into a precast concrete lateral load resisting frame.

The result of this new precast system was that it significantly improved the aesthetics of the building but it also saved more than $250,000 over a conventional precast and structural steel building of similar size.

Two-story loadbearing window punch wall units were engineered to become an integral part of the structure taking the vertical and horizontal

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floor and roof loads. This arrangement was not only economical from a structural viewpoint but also facilitated the construction. From an architectural viewpoint, the flexibility of the precast system offered the owner unlimited colors and textures, deep reveals, custom designed cornice details, and a virtually maintenance-free exterior finish. Many of these features would not have been possible with a tilt-up concrete system.

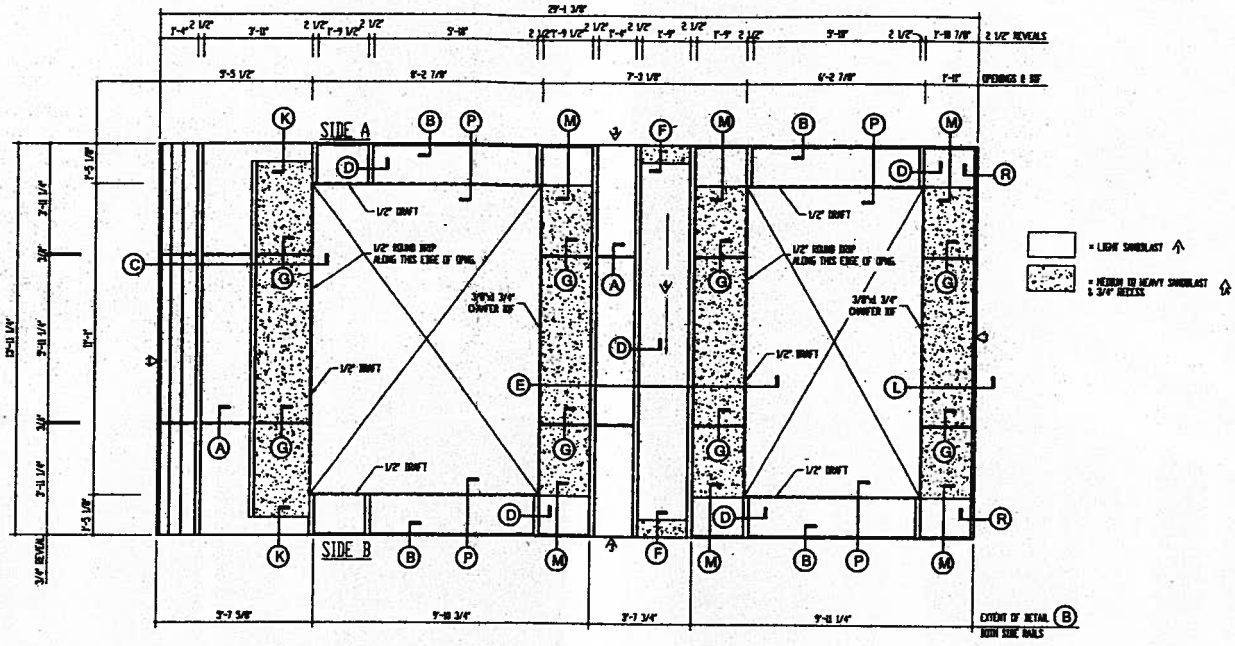
One further advantage is that the window openings were cast within the same wall panel. Note that these openings were relatively large.

The designers chose a white cement panel with a sandblast aggregate finish. Normally, two textures were employed. In all, 179 architectural precast concrete components were used covering a vertical wall area of 35,212 sq ft (3274 m^2). A typical panel was 14 x 31 ft (4.27 x 0.95 m) in section and $9^1/_2$ in. (240 mm) thick. In general, a 2 in. (51 mm) thick architectural face mix with a gray concrete backup was used. Reveals were $1^1/_2$ in. (38 mm) deep.

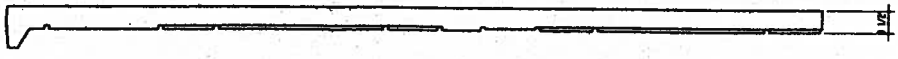
The structure was governed by the 2001 Florida Building Code (FBC), which is similar to the International Building Code (IBC). As the 2001 FBC allows, the wind analysis was based on ASCE 7-98. The design wind speed is 119 miles per hour (192 km/hr), Exposure B, and the project is located in a hurricane prone area. Wind loads, rather than gravity and live loads, controlled the design.

Due to the flexibility of the panel frames, volumetric restraint was a design issue which had to be carefully analyzed and designed to accommodate the anticipated volumetric displacements. The column sections of the panels were post-tensioned to control possible cracking due to any anticipated thermal movements. The post-tensioning also prevented cracking during panel handling/shipping.

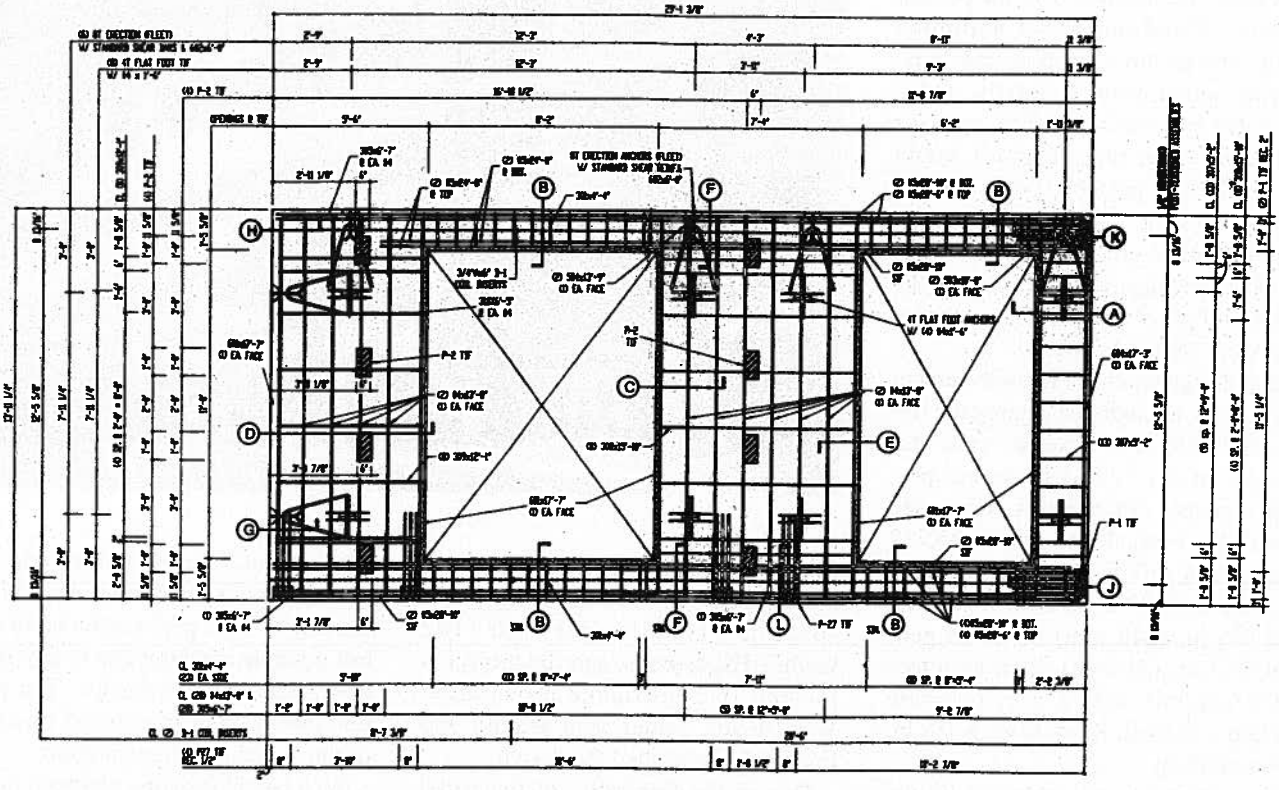
As a lateral resisting element, the elevator shaft is naturally significantly stiffer than the exterior frames. Thus, the shaft would tend to absorb most of



MOLD VIEW & FINISHES



SIDE B VIEW



CAST-IN-VIEW & REINFORCING

the lateral loads imparted to the building. Coordination between LEAP and The Haskell Company resulted in a system where the frames would carry 50 percent of the lateral load, and the precast elevator shaft would carry the remaining 50 percent. This resulted in a smaller foundation under the shaft, smaller foundation connections, and lighter chord forces in the building diaphragm. To achieve this even distribution of lateral loads, LEAP designed a foundation connection in the elevator shaft that achieved the desired strength, yet allowed for enough elongation to create comparable drift with the exterior frames.

LEAP, the precast specialty engineer, was responsible for preparing the shop drawings for the building. Even during the early stages of the project, LEAP provided expertise in areas such as drafts, drips, panel sizes, reveals, and mold building issues. There was also close collaboration between the general contractor and design team with regard to the foundation design of the building.

Preliminary design work on the project began in November 2002. This continued through the next year until the final design was approved in February 2003.

The precast concrete components were fabricated by Gate Precast Company at their plant in Kissimmee, starting in March 2003. Production took about two months. The components were then shipped by tractor-trailer to the project site, a distance of about 150 miles (240 km). While the precast components were being fabricated, the concrete foundation of the building was being completed.

Erection of the precast panels started in May 2003, first with the interior panels of the lower level working all the way to the upper levels. The erection process took only nine weeks. Gate Precast Company was responsible for both the transportation and erection of the precast components.

The project was completed in mid-December 2003 and was occupied by several offices in early 2004. The early sentiment is that their personnel are already enjoying the new facility.

The total cost of the project was about $6,800,000.

Photographer: Brian Griffis, Gate Precast Company

The entire design-construction team, and especially the owner-developer, are very pleased with the manner in which this project evolved and the final completed structure.

The aesthetics of the building are particularly appealing, and it is expected the building will have a long durable life with minimal maintenance. This confidence is best expressed by the statement of the developer's construction manager. "The loadbearing architectural precast system allowed us to capture most of the cost savings usually attributed to tilt-up construction and gave us the assurance that we would have the aesthetics we wanted."

Already, a fourth office building (using the same precast concrete system) in the same development program has been approved for construction and is now underway.

CREDITS

Owner: Flagler Development Company, Jacksonville, Florida

Architect: Rolland Delvalle & Bradley, Jacksonville, Florida

Structural Engineer and General Contractor: The Haskell Company, Jacksonville, Florida

Precaster: Gate Precast Company, Kissimmee, Florida

Precast Specialty Engineer: LEAP Associates International, Inc., Tampa, Florida

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