Total Precast Concrete Offers Multiple Benefits

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Combining architectural and structural components in one project creates efficiency, speed, sustainability and many other benefits

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When I relocated to Denver after finishing my graduate degree in Chicago, the first project on which I worked as a young architectural designer was an operations and administrative facility for the Waste Management Division of the City and County of Denver, which featured a total precast concrete system. It was the first of many projects that I have done using this system, which offers a startling array of benefits to owner, architect and contractor.

At the time, I knew very little about precast concrete, because it was rarely mentioned in my school's technical classes, and it was never discussed in my design studios. But I didn't think twice about designing in a medium that I knew so little about. After all, an architect's education is all about learning different aesthetic, structural, technical and material choices, so learning another way to use precast concrete seemed like a logical extension of my academic experience.

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It was not until I returned to Chicago years later, after being invited by PCI to participate in a focus group discussing a revision of its *Architectural Precast Concrete Design Manual*, that I realized that other architects, designers and engineers around the country were unfamiliar with the total precast system. "Total precast?" I remember being asked, "isn't that a parking garage?" This confounded me, because 90 percent of the work I had done since moving to Denver had used the total precast system, and I knew its benefits for all building types.

A total precast system is so much simpler than a steel or cast-in-place concrete system with some type of weatherproof exterior cladding applied.

The Enterprise IV facility in Shelton, Conn., uses a total-precast concrete structural system to create five levels of office space on top of a 2½-level parking structure. The design made efficient use of the available space while providing an attractive look.

Its "dual use" ability, which combines the structure and exterior cladding into a single element, provides many advantages unmatched by other materials.

Eliminates Redundancy

Foremost among its benefits is that a total precast system eliminates the redundancy of creating separate systems for structural loading and cladding support. Unlike cladding systems, architectural precast concrete panels are fabricated in large sizes. Bigger panels depend less on large quantities of applied sealant, unlike typical stone panel cladding, or the many vulnerable mortar joints of traditional masonry veneer construction. Using fewer lineal feet of sealant translates directly into less probability of sealant failure, which would allow both air and moisture infiltration into the wall cavity. Using fewer panels also means less complex shop-drawing reviews, more efficient transportation to the job site from the precast plant and a cleaner job site.

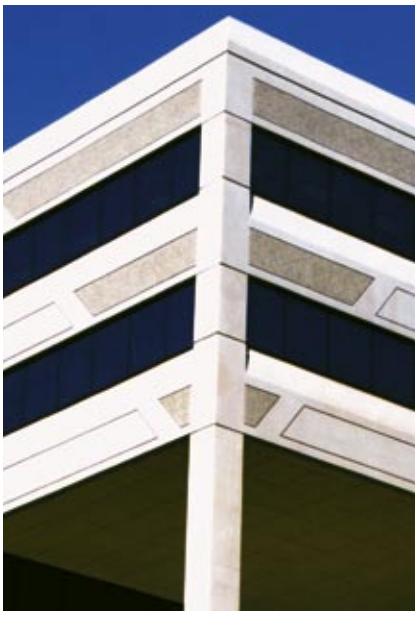
Quicker Erection

Larger panels go up remarkably fast. My experience has shown that the decision to use a total precast concrete system can trim 2½ to three months off a typical construction schedule for a mid-sized, 100,000-square-foot structure.

In the case of a recent municipal center project I worked on, large floor plates necessitated a "tower" type construction sequence, erecting entire sections of building from the ground floor all the way to the roof. This early structural erection allowed the subcontractor to begin installation of the building's freight elevator sooner in the process. Shortly after the balance of the structure was completely erected, the building's freight elevator was operational, saving the extra cost and coordination of a temporary exterior construction lift.

Also, unlike a steel frame, a total precast system eliminates the need for cementitious fireproofing and the associated costs and schedule impact of tenting and temporary heat.

A simpler wall construction has hidden benefits, too. Since the panels need only panel-to-panel or panel-to-window sealant and exterior glazing to be considered weatherproof, interior trades such as drywall can begin work much sooner. Also, the airspace cavity between the exterior cladding and the backup structure that is normally found in a veneer system is eliminated, along with the need to vent and weep this cavity to avoid condensation and the formation of mold.



Textures and varying depths added visual interest to the structure. The panels feature both rough, exposed aggregates and a smooth, sandblasted appearance.

Exterior Finish Variety

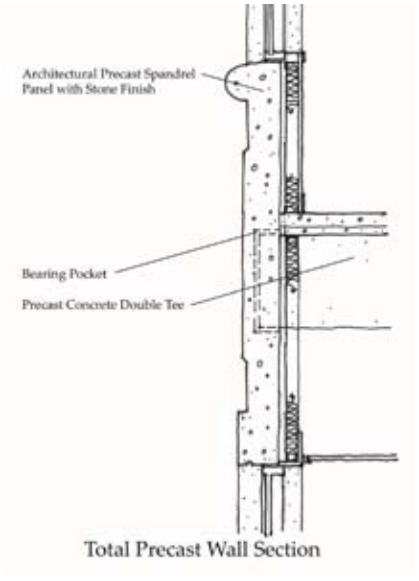
The finish options available for architectural precast panels are numerous. In addition to the infinite mix designs possible for the actual concrete, various textures such as simulated stone or ribbed form liners can be added to increase the visual interest of a panel. Deep reveals and features such as bullnoses, belt courses, bases and large cornices are easily integrated into a particular form. Multiple mix designs with different colors can be placed in the same mold and separated by thin reveals. Thin-brick veneer also can be cast directly onto the face of a panel.

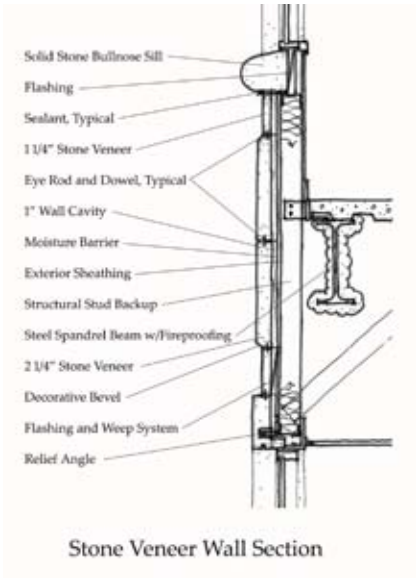
In another way, precast is a paradox — one that architects can exploit. When placed, concrete has the plasticity to form into virtually any shape, but when cured, it becomes an extremely durable material. In no other medium can large, curvilinear shapes be obtained as easily and efficiently as they are with precast concrete.

Sustainability

Precast concrete can contribute significantly toward a green-building rating such as the United States Green Building Council's Leadership in Energy & Environmental Design (LEED) program. There are five categories in which projects may earn points toward LEED certification, but precast concrete has the most potential to earn points in the "Materials and Resources" category.

Precast concrete can help earn points toward certification because it can utilize recycled content such as fly ash as a substitute for cement and recycled steel in reinforcement bars, key factors in LEED ratings. But where a total precast system really begins to shine is in the fact that most precast is produced locally, that is, within a 500-mile range of the job site, which meets another of the LEED criteria. Multiple points may be earned





These diagrams produced by Todd Architecture show the simplicity of a total-precast concrete wall section compared to one featuring stone veneer. It also avoids the need to add cementitious fireproofing after installation, eliminating cost and speeding construction.

The Enterprise IV project features double tees as flooring, which create large, open floor plans that add flexibility for tenants. Stairs also were made of precast concrete, which helped interior trades gain access quicker, speeding final occupancy.

depending on the relative percentage of precast product on a job compared to the total dollar amount for all construction products used.

Increased Involvement

Most architects and designers have an affinity for learning about construction materials and the technical details required to assemble the variety of materials necessary for a project. Like no other architectural building product, precast concrete offers the architect an opportunity to become truly involved in its design, engineering and fabrication. Whether it involves going to the plant to see samples or visiting the form shop during mold fabrication to help work out a tricky detail, I find it immensely gratifying to be able to work closely with my local precaster and to see first-hand how this unique product is manufactured.

Concrete has been around since the Romans invented it around 100 A.D. What pleases me as an architect is to see that it is a product that continues to improve and evolve. New precast materials are pushing boundaries to new heights. From photo-engraved concrete to translucent concrete to new polymers that can stretch its strength to more than 20,000 psi, precast concrete is a technology that continues to evolve and challenge designers to use it in creative ways. This technological innovation, combined with the inherent efficiency and flexibility of total precast, make it a building method, that in my opinion, is hard to beat. ■

In the next issue: The second half of this article introduces some of the "Basic Building Blocks" of the Total Precast Concrete system, including required panel dimensions, the importance of repetition, tolerances and finish options.

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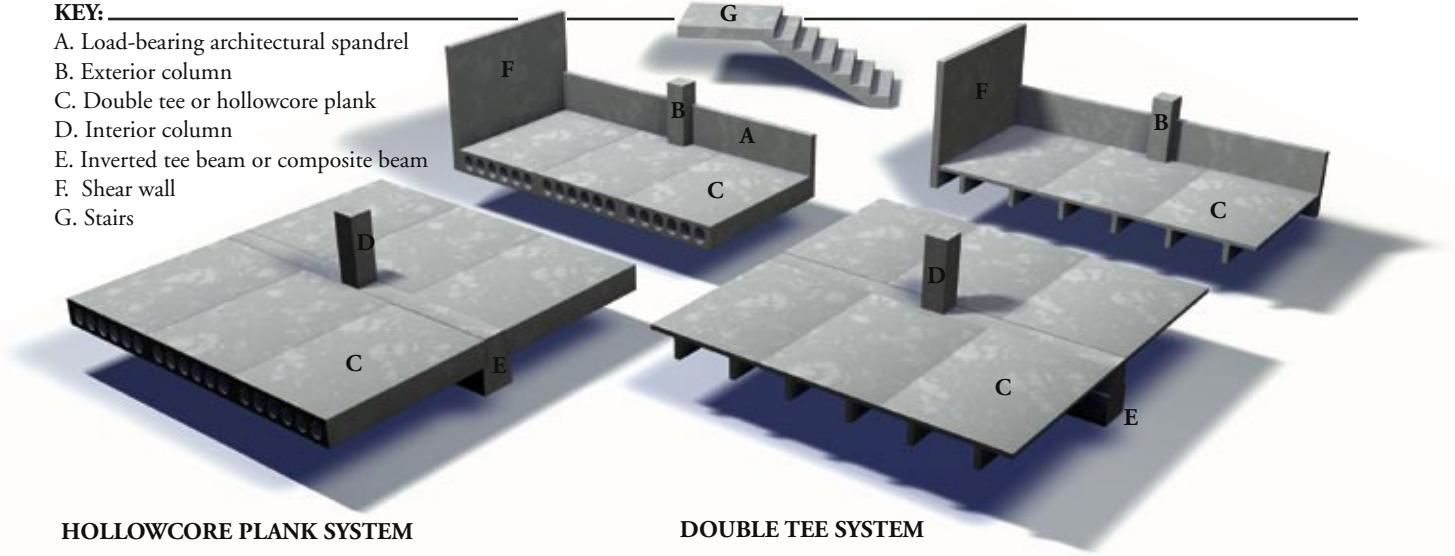
To learn more about **total precast systems**, visit the Designer's Knowledge Bank by clicking on the DKB icon at **www.pci.org** or at your local precaster's Web site. (Adobe Acrobat version 5 or greater required.)

KEY:
A. Load-bearing architectural spandrel
B. Exterior column
C. Double tee or hollowcore plank
D. Interior column
E. Inverted tee beam or composite beam
F. Shear wall
G. Stairs



HOLLOWCORE PLANK SYSTEM

DOUBLE TEE SYSTEM