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Technical Brief

When to choose precast over tilt-wall

ABOVE:
Dollar General Distribution Center
Bessemer, Alabama
Architect: Leo A. Daly

carboncast®

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Concrete is a preferred material for many exterior wall applications because of its strength, durability and resilience. There are two primary methods for producing concrete wall panels: precasting them in a factory and shipping them to the job site, or casting them at the job site and either craning or lifting them into place, resulting in the common terms “tilt-wall” or “tilt-up.” While tilt-up is often a lower first-cost option, it is essential to evaluate design options, job site space, dry-in speed, installation, carbon footprint and performance to evaluate which option is best suited for each project.

continued

When quality is important, choose precast

One of the biggest differentiators is that precast concrete panels can be prestressed, which provides better crack control and durability compared to conventionally reinforced tilt-up concrete panels. Tilt-up panels cannot be prestressed. Prestressing can also result in larger and taller crack-free panels.

Higher quality precast concrete panels are produced in factory-controlled PCI-Certified plants by a highly skilled and trained workforce. Site-cast tilt-up concrete panels are exposed to adverse weather conditions and jobsite congestion. Tilt-up contractors often rely on multi-discipline flat prep workers that wear many hats as opposed to skilled and trained workers that specialize in precast manufacturing.

Because tilt-wall panels are usually cast on the building floor slab, any imperfection in the foundation is imparted to every panel. Precasters use highly durable steel or wood molds that are routinely maintained to deliver a tight tolerance flat surface.

Intricate designs—such as data centers that require complex integration of electrical and mechanical conduits—are better suited for fabrication in a factory. Outdoor fabrication introduces too many variables that can be missed or overlooked during the casting phase.

When schedule is important, choose precast

From a project's early stages through wall erection, precast offers the opportunity for advance planning and fabrication to speed dry-in of the structure and accelerate the project timeline.

Precast concrete panel shop drawings and production can begin early in the project design process, which accelerates overall project speed of construction. Precast panels are made in long beds in a consistent setting—often climate protected—enabling several panels to be fabricated simultaneously. Panels can be made in advance and safely stored for immediate transport once the job site is ready for them.

Weather is not a factor with prefabrication. Year-round factory fabrication of precast wall panels allows for erection in almost any weather condition in any region of North America. Precast concrete panels also allow the building superstructure and roof to be installed before the floor slab is cast, which eliminates weather impacts and casting-related damage to floor slabs, which can be costly to repair or recast. Additionally, electrical or plumbing work that is required under the slab (as with data centers) can be completed while precast panels are fabricated off-site.

ABOVE: Universal Alloy Light Press Plant, Ball Ground, Georgia
Architects–Wakefield & Beasley & Associates Architects, Inc. and Querkraft Architects

RIGHT: Peak 10 Data Center, Tampa, Fla.
Architect: kNovations

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When space is important, choose precast

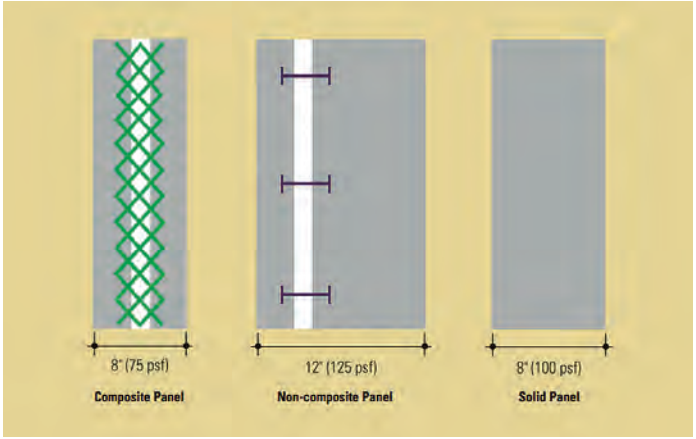
The materials and equipment for tilt-up panel fabrication take up significant space on most job sites. In general, the larger the job—think big distribution centers—the more advantageous precast becomes. To pour tilt-up panels fast enough, the project may need an on-site casting operation, which consumes even more space on the job site. Precast concrete plants batch their own concrete, eliminating this issue.

When aesthetics are important, choose precast

The craftsmanship required for a true architectural finish demands a high quality forms. That would include the incorporation of finishes like surface treatments such as acid etching or sandblasting, any articulations beyond a reveal, or embedding thin brick or stone.

Even something as seemingly simple as concrete pigmentation benefits from the consistency of a computer-controlled mix design and batching as opposed to on-site pours from a concrete mixer truck that might need to travel more than an hour to the jobsite. A precaster will buy all the aggregate for a project at the same time, ensuring both ample supply and consistent quality.

Tilt-up is best suited for simple, gray finishes. Even then, job-site surface treatments such as painting or staining



A CarbonCast© panel with 2" of integral insulation between two 3" wythes connected by carbon fiber shear trusses uses 33 percent less concrete than a 3-2-6 non-composite tilt-up panel.

will add to the post-erection cost and the time required for touch-ups and maintenance. Finally, precast provides most flexibility. Less lead-time is needed for changes. Precasters have robust supply chain relationships and inventories that they can leverage to accommodate late changes to the finish.

When panel thickness and carbon footprint are important, choose precast

Insulated prestressed precast walls with composite design enabled by carbon fiber grid shear connectors reduce embedded carbon compared to partially composite designs and non-prestressed panels. A CarbonCast© High Performance Insulated Wall Panel with 2" of integral insulation between two 3" wythes connected by carbon fiber shear trusses performs as well as a 3-2-6 non-composite

When to choose precast over tilt-wall *continued*

Innovation One, Wauwatosa, Wis.
Architect: Kahler Slater

tilt-up panel. The thinner CarbonCast panel uses 33% less concrete. Solid tilt-wall panels can have an even higher carbon footprint.

Precast is favored when a project requires continuous insulation to meet ASHRAE 90.1 energy codes. The rigid quality control in a precast plant ensures that wythe connectors and insulation are designed and installed properly — especially on panels with openings for windows, doors, and dock and bay openings. High R-values and continuous insulation reduce a building's energy consumption and operational carbon. CarbonCast panels can use any common insulation style: EPS, XPS, GPS and more depending on architectural preference and R-value demands. In addition to saving money, the thermal efficiency of precast panels is ideal for applications where temperature control is critical, like food processing, beverage storage and data centers.

When long-term costs are important, choose precast

As noted, first costs of precast concrete panels can be lower than tilt-up due to faster speed of construction, which enables earlier project completion and faster revenue generation.

The long-term durability of precast is generally greater than tilt-up concrete panels because of prestressing and the use of concrete mixes starting at 5,000 psi and as high as 10,000 psi compared to the typical 4,000 psi mixes that are generally used for tilt-up concrete panels. Precast usually requires less maintenance, which reduces cost of ownership.

Finally, high quality continuous insulation leads to predictable energy savings and cost reductions over the life of the building.

Before selecting precast or tilt-up, ask yourself these questions

Each project is different. It is prudent to reflect fully on project-specific needs before selecting one system over another.

- How important is it to commission the building on an established timeline?
- How critical is the finish?
- What energy codes need to be met and how crucial is continuous insulation?
- Is prestressing important?
- How variable is the weather? How suitable will it be when we intend to erect panels?
- Do the demands of the wall panels require a high level of engineering aptitude?
- How tight is space on the jobsite?

With a thorough review, you can select the system that best meets your needs during construction, commissioning and long-term use.

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AltusGroup Inc.

833.GO-ALTUS (1.833.462.5887)
info@altusprecast.com altusprecast.com

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