WHITE PAPERS

BRUTE STRENGTH & BEAUTY: NO LONGER AT ODDS

New wall panel combines the inherent durability of concrete with new aesthetic features.

PAYING THE COST OF A commercial building can be unpleasant. But paying it twice? It's the plight of many building owners who face premature replacement costs and high maintenance expenses. There is good news, however, in durable building materials. New advancements in precast manufacturing are making the long-term financial picture of concrete buildings look brighter than ever.

Built to Last

It's no secret that the structural performances of building materials are far from equal. Follow the path of a tornado through a community of stick-construction homes, farms and a trailer park, and you see first-hand that some structures fare better than others. Natural disasters, such as hurricanes, tornadoes, hail or fire are the most common elements leading to premature facility replacement. In fact, every year property losses from these disasters exceed $22 billion. Some loss may be unavoidable, but durable building materials can help mitigate the disaster effects.

Durability depends on the ability of a structure to withstand extreme loads. In the case of concrete, durability is often reflected by flexural strength, or the ability to resist bending. Measured by loading un-reinforced panels, flexural strength is expressed as "Modulus of Rupture" (MR) in psi. The results of such tests provide designers and constructors with improved methods to predict and assess the resistance of buildings and structures to wind and seismic loads.

The American Concrete Institute (ACI) standard recommends a concrete strength of 5,000 psi for walls. Fabcon Inc. significantly exceeds this recommendation with strengths of 8-11,000 psi. This benefit is fully realized in flexural load tests in which both ends of a 24-foot precast concrete wall panel are supported, and weight is placed in the middle of the span until it sags and breaks. Fabcon panels are tested at more than 30,000 pounds, exhibiting high flexural strength and resistance to cracking.

Concrete construction is, in general, exceptionally strong. It gains most of its strength in the first 28 days, but it continues to gain strength over the life of a building. Because structures have a tendency to degrade over time, rather than improve, concrete is an interesting anomaly. Hydration causes the compounds in cement to elongate. As the compounds lengthen, they intertwine and create an impermeable surface.

This is also the reason why concrete walls require minimal maintenance. This is especially welcomed due to the price-sensitive nature of the construction market and the increasing costs of facility repair. A sporadic, high-pressure wash-down is all that is needed to maintain a concrete finish, and re-caulking about every 15 years helps eliminate fissions that may appear over time.

Conversely, other building materials require much higher maintenance. With precast concrete, less than one percent of its surface area is caulked, compared to 20-30 percent of brick surface area that is mortar. Masonry also is susceptible to cracking because of the sheer number of components bound by mortar. When cracks appear, a procedure called tuck-pointing is necessary. Tuck-pointing involves reapplying mortar to all of the joints and is expensive because it takes time to remove old, failed mortar. And because masonry is porous, it requires a sealer (like paint) applied at installation and at regular intervals to control the migration of moisture from the outside atmosphere. Composite sandwich wall panels can achieve either strength or energy efficiency, but not both. Composite panels use ties, which may not create acceptable composite action, or solid concrete blockouts, which reduce the effective R-value (insulation).

For tilt-up panels, concrete is generally poured outside, and its exposure to environmental conditions, such as rain and freezing temperatures, can alter the wall's structural integrity and durability. And while metal walls are initially inexpensive, they cannot compete with the lifespan of other building materials. A hailstorm, strong wind or misguided delivery truck can easily disfigure a metal exterior.

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To help ensure the strength of concrete, Fabcon considers a number of other factors that impact durability, including: curing conditions, temperature, cement porosity, construction methods, and reinforcement supports. For example, company engineers perform separate tests on the inserts embedded into panels to prove that product meets the same high standards. Fabcon also cures panels at the plant. This controlled environment eliminates the negative effects that rain, snow, humidity and extreme temperatures can have on the curing process.

Compromising Durability

Previously, some building owners were motivated to compromise durability in exchange for a desired exterior look. This sacrifice is no longer necessary. Fabcon has introduced a new wall panel that maintains its impressive load-bearing capability and provides thousands of finishes, textures and new aesthetic features. To help understand the value of this new panel, it is worth looking at its predecessor.

In Fabcon's previous manufacturing process, pea gravel occupied a panel's interior. After the concrete cured, Fabcon tilted the panels up and emptied the gravel, leaving hollow cores. The disadvantage of this process was that extrusion equipment necessary to form the hollow cores physically got in the way of being able to cast-in window and door openings—an obstacle to design options. The alternative was equally limiting. Manufacturing "solid" rather than non-composite panels would give Fabcon the ability to cast-in openings, but would result in heavier panels and drastically higher shipping and handling costs.

To solve the dilemma, Fabcon developed a new technology that helps retain its shipping cost advantage and provides the ability to cast-in openings and accommodate structural design requests like pocketed connections. The outcome significantly increases what architects, engineers and building owners can expect when it comes to design flexibility.

Fabcon's new VersaCore™ line accomplishes this feat by putting Expanded Polystyrene (EPS) foam billets directly into the wet concrete, putting insulation in an area traditionally left hollow.

Previous attempts to change a panel's underlying technology have not succeeded because manufacturers have been unable to stabilize lightweight materials, such as foam, within a layer of wet concrete. Fabcon's new, patented manufacturing process remedies this issue

VersaCore™ panels allow Fabcon to cast-in window and door openings of any size. This saves time in the construction process, helps control costs and provides architects and engineers with a whole new range of aesthetic options and tools.