



STRUCTURAL INTEGRITY WITHOUT COMPROMISE

IS IT NECESSARY TO compromise aesthetics, costs, or design flexibility in return for structural integrity? With today's pre-cast concrete technology, the answer is fortunately, "no." Using insulated, pre-cast wall systems, builders can readily achieve their design and cost goals, thanks to the inherent durability and economy of concrete.

When building an exterior wall, there are essentially five construction options: masonry, tilt-up wall panels, composite precast wall panels, metal and non-composite precast wall panels.

Masonry is typically the most susceptible to cracking of any exterior wall 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 due to the time it takes to remove old mortar.

Because masonry is porous, it needs a sealer (most often paint) to be applied at installation and at regular intervals ranging from 2-15 years (depending on the quality of sealer applied and workmanship of the applicator). This controls the migration of moisture from the outside atmosphere. Also, the porous nature of masonry often requires an added insulation layer to meet code. And to achieve a smooth interior finish, masonry requires the wall to be furred out and sheetrocked. All of these added requirements increase the cost of the building both initially and throughout the life cycle of the building.

Typical composite wall panels are constructed with a 3 to 7 inch layer of concrete, a 2-inch layer of foam, and a 3-inch layer of concrete. With composite sandwich wall panels, either strength or energy efficiency can be achieved, but not both. Sandwich panel construction uses ties, which may not create acceptable composite action, or solid concrete blockouts, which reduce the effective R-value (insulation).

Most tilt-up panels are created without integral insulation. This requires the interior surface to be furred out and insulated, thereby exposing the entire structural panel to thermal forces. When tilt-up is done with integral insulation, it is similar to composite type precast panels without the advantage of being in a controlled environment. The concrete for tilt-up panels is generally poured outside, its exposure to environmental

conditions, such as rain and freezing temperatures, can alter the wall's structural integrity and durability.

Metal-based walls are not as inherently strong as concrete. The extensive studwork associated with a metal wall creates a passageway for air. Since a skin of thin metal panels covers the metal frame, each screw used acts as a miniature point of failure—for air penetration, as well as rust.

The design limitations of metal walls can be another concern. Large steel frames of beams and columns need to bear the load. This can be especially inhibiting for retail and distribution outlets where storage space is at a premium. Columns, which often extend 2-3 feet from the wall into interior space, impede the placement of racks, pallets and other storage devices making the space less flexible.

Metal walls are also not as durable as other types of walls. While initially inexpensive, metal walls cannot compete with the lifespan of concrete and masonry. A hailstorm, strong wind or misguided delivery truck can easily disfigure a metal exterior.

An alternative to these options is non-composite pre-cast concrete wall panels. Precast expert Fabcon Inc. produces non-composite pre-cast sandwich wall panels composed of an 8-inch hollow core layer of concrete, a 2.5-inch layer of foam, and a 1.5-inch layer of concrete. Due to its high density, a Fabcon wall panel has an R-value of 16.4 while the composite wall panel described above, with 9 percent solid concrete, could have an R-value as low as 2.34.

Non-composite panels combine a unique structural core, a rigid insulation layer and a nonstructural façade for exceptional strength without the need for a thermal bridge. Besides the calculated energy efficiency, the thermal mass effect on Fabcon's non-composite wall panels can increase the R-value. This improves livability by ensuring the elimination of cold spots. They also increase the aesthetic options available for commercial buildings.

Because non-composite pre-cast walls are concrete-based, they enjoy all of the benefits of concrete construction. For example, concrete gains most of its strength in the first 28 days, but it continues to gain strength over the life of a building. Since structures have a tendency to degrade over time, rather than improve, concrete is an interesting anomaly. Its hydration



process is the reason behind its nontraditional aging process. Hydration causes the compounds in cement to elongate; as the compounds lengthen, they intertwine and create an impermeable surface.

As a result, concrete walls require minimal maintenance. A sporadic, high-pressure wash-down is all that is needed to maintain its finish, and re-caulking about every 15 years helps eliminate fissions that may appear over time.

To help you determine the best exterior wall system for your needs, ask yourself the following questions:

How can I achieve maximum flexibility? Adding a window, pedestrian door or a new addition to a building is much easier if the wall system can handle varying load capacities, if wall panels can be moved and re-used, and if extra openings require no special structural supports.

How can quality be assured? With pre-cast, ask if the supplier is PCI (Prestressed Concrete Institute) certified. Or ask about the design strength of the wall panels. The industry standard is 5,000 PSI, but some suppliers offer a much higher strength as their standard.

How can I reduce wall “movement?” Falling ceiling tiles, failing caulk joints and deteriorating connections are just a few calamities of water and air penetration. Ask about the thermal differences expected with each type of exterior, and each option’s tendency to bend, flex and bow. Also ask if the wall can be load-bearing or ask about each method’s effectiveness as a vapor barrier.

How can I maximize energy efficiency? Ask about R-value. The higher the R-value, the more energy-efficient your building will be, lowering your heating and cooling costs.

What kind of maintenance is needed? Paint, tuck-pointing, caulking, and damage repair can all add to the cost of a building. While some maintenance procedures are relatively inexpensive, such as caulking (approximately 35 cents per square foot), other procedures can be surprisingly high.