

Concrete Walls are "Green"

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The construction industry in the United States is like the Titanic sometimes. You send the message to turn hard to port but it takes a long time for the ship to start turning and an even longer time to actually complete the turn. Before you know it, you hit an iceberg at that pace. Changing construction methods, techniques and traditions is a long-term effort in the construction industry. Fortunately, sustainable building ideology is spreading like a wildfire across America and it may just be the catalyst needed to drive change around outmoded and less efficient ways of constructing our built environment. This article is going to focus on one aspect of that change, wall systems.

The traditional construction method of choice for residential and some light commercial projects is wood frame construction. This must have originated from our pioneer and agrarian roots. Land and trees were plentiful and a man with a horse, mule or ox and some hand tools could hack out a dwelling in the wilderness. As the wilderness became more densely populated, entrepreneurial Americans created sawmills and introduced more refined construction techniques using lumber. Unfortunately, little has changed in over a hundred years of building in this manner. In the southern United States where I live, the moniker "stick built" is a commonplace name for this type of construction.

A number of types of concrete wall systems are increasingly being used in commercial as well as residential construction. Concrete wall systems generally fall into one of three types:

- Concrete placed in conventional forming systems
- Insulating concrete form systems
- Tilt-up construction

All three construction processes surpass the performance of competing methods in numerous ways. Those ways include sustainability, speed of construction, security, comfort and last but surely not least, cost.



Webster's online dictionary defines sustainable as, "of or relating to a lifestyle involving the use of sustainable methods." Concrete has proven itself to be one of the best materials to use when sustainability is one of the project goals. What material lasts longer than concrete? Wood can rot, it exhibits substantial creep under sustained loading and is consumed by a number of insects. Even when pressure treated, most wood products are not warranted past 30 years. Steel is susceptible to corrosion when exposed to the environment. In order to last extended time periods, steel must be coated, painted or modified in some other way. Concrete on the other hand can last for genera-

tions. Concrete made by the Romans still exists and there are people who theorize that the pyramids themselves contain concrete-like materials. While there is a cost in energy and materials to replace structures that don't last as long as concrete structures, that is only one concrete advantage in sustainable construction.

Concrete is produced from local materials. By utilizing local materials we reduce the pollution burden on the environment by significantly reducing heavy truck delivery miles. Concrete also does not include cardboard, steel straps or boxes utilized in the shipping of other materials. The concrete truck is the packaging and it gets reused over and over so that boxes and other trash don't go to the landfill. While sustainability usually refers to the environmental aspects of construction, there is also economic sustainability that is also important to our future. By using local materials, the local economy benefits with jobs, paychecks and the sustaining purchasing power of those dollars moving through the local economy.

The most noted advantage of concrete wall systems is the effect on reducing energy consumption for heating and cooling loads. Concrete walls have a large thermal mass effect that reduces energy consumption. By taking a long time to heat up or cool down, the large mass of the concrete wall creates a leveling effect for the HVAC system so it has less peaks and valleys in the load it must offset. This is no small effect. By spreading the heating or cooling loads out over a greater portion of the day, in many cases a smaller HVAC system can be employed. This is not only good for the environment, it is good for everyone's wallet. Also, concrete walls don't have as many places for air to infiltrate and waste precious heating and cooling energy. In many parts of the United States, stick build buildings are now required to be sealed with foam sealants to try and address this wood frame construction limitation.

Just like other construction methods, you can insulate concrete walls to meet any climatic need. Insulated concrete forms include

the insulation as a stay-in-place form. Tilt-up construction can be insulated in the casting bed or once tilted into place. Many traditional cast-in-place wall form manufacturers offer forming systems that allow insulation to be placed prior to the concrete creating a sandwich panel. All of these can add significant R-values where needed. Concrete savings can be measured.

Speed of construction is an area where some may debate concrete's advantages. Naturally, when any technology is new like ICF or Tilt-up in a market, there is a learning curve that contractors and subcontractors must push through. Once the market has some experience with concrete wall systems, the speed of construction is generally not debated. All three systems noted here have shown dramatic productivity gains over conventional techniques in many markets.

Security is a less tangible benefit of concrete wall systems, until the time it matters to you or your family. Wind events like hurricanes and tornadoes can be devastating and



threaten not only property damage but in many cases loss of life. Concrete walls have proven to be superior over many competing systems time and time again. Just look at the pictures of Hiroshima after the dropping of the atomic bomb in WWII. Some of the only buildings remaining were reinforced concrete structures. Another aspect of security includes errant cars and trucks. ICF homes have been hit by cars and trucks and exhibited as little as a few hundred dollars in

cosmetic damage. Wood frame homes have been shown in the media with cars literally in the living room or bedroom after an accident. While working construction during a summer break from college, I personally jacked up the side of a brick-faced wood frame home that a truck had run through. The inherent fire resistance of concrete wall systems outperforms other building materials in most applications. In many applications, national codes recognize concrete structural systems as not requiring additional fire protection. Steel generally requires a

spray-on fire protection material and wood generally has to have layers of fire protection surrounding it. Concrete wins hands down on security issues like wind, vehicular intrusion and fire resistance.

Comfort can include many things. Consistent temperature has been noted earlier (due to the thermal mass effect). What about the sound level inside your home? Concrete wall systems consistently outperform wood or steel frame buildings in this measurable performance criterion. While not something we think about, if it means a better night's rest to you, how will that effect your tomorrow?

The first cost difference between concrete walls and other products has virtually disappeared in many markets in the U.S. Over the last decades, the price of wood and steel continue to grow at a faster pace than that of concrete. If you don't believe me, follow the materials cost indexes at www.enr.com, home of *Engineering News-Record*, a leading McGraw-Hill publication. While steel has seen some price reductions this year, you need to look at last year's major price run up to get the whole picture. Monthly numbers don't show the trends. Even if you don't believe that concrete walls are competitive on a first-cost basis, when you look at the life cycle cost and add in maintenance, repair and replacement costs, heating and cooling costs to name a few, concrete almost always wins the life cycle battle.

Despite our industry's notorious reputation for not embracing change, with these many advantages it is inevitable that concrete wall systems will continue to gain traction in the marketplace. Owners, architects and engineers are generally the first to embrace the change, but there are many contractors across America who have developed profitable business models with these proven construction techniques. When you consider sustainability, speed of construction, security, comfort and cost, concrete wall systems are the system to choose. The next question is which of the three types of concrete wall systems make the most sense for your project?

For more information on insulating concrete form construction, visit www.forms.org. For more information on tilt-up concrete construction, visit www.tilt-up.org. For information on the most versatile building material in the world, visit www.nrmca.org. ■