If walls could talk..

BY ERIC HUBBS, AIA, CSI

Selecting construction materials for your new facility can be a crucial marketing decision

Typically, the design and construction phases of a senior-living project are not considered times to think about marketing. During these phases, a vast number of decisions are made concerning different materials, using an array of comparisons. An inordinately large number of variables are compared when making these product choices, such as durability, aesthetics, quality and, ultimately, value.

While these decisions impact the care and pocketbooks of the end-user—the resident—rarely do the benefits of the construction materials themselves find their way to the marketing materials of the senior-living community. Should it be merely price that determines which material or product is chosen by the commun-ity's owner, or should the de-cision be more complex? What if an owner focused on the fact that these product decisions might determine the ease of marketing his/her community vis-à-vis competing communities?

Let's investigate that proposition, looking at the three basic wall systems—wood, steel, and insulated concrete forms (ICF)—taking into account the lifestyle and financial benefits most desired by seniors. Through this analysis we will, hopefully, determine whether walls (or wall-construction products) can really "talk" to seniors. What, basically, are the choices?

Wood Framing

Until the 17th century, most buildings in England were timber-framed. Consequently, this framing method was America's earliest. In this type of construction, the structural skeleton of a building is held together by interlocking joints cut into the timbers. (Incidentally, the first joints were invented almost simultaneously in India, Europe, and Japan around 200 BC.)

In the mid-1800s the invention of the balloon frame, held together with nails instead of complex joints, virtually ended timber framing. The balloon frame, although less sturdy than a timber frame, is much easier to design and build. Therefore, it was ideal for the westward expansion occurring at that time. Today, western (platform) framing is the most common manner of framing residential and small-scale commercial buildings.

Steel Framing

After World War II there was an abundance of steel in the United States. To take advantage of the manufacturing capabilities gained during the war effort, steel companies looked to home construction. During the 1940s and 1950s, thousands of homes near steel-producing centers in the United States were built using light-gauge steel framing. The low cost of lumber, combined with some characteristic weaknesses of steel (rust and thermal deficiencies), prevented the widespread use of steel framing for residential use. Nevertheless, the strength and durability of steel-framing systems made them common in commercial construction throughout the United States by the late 1950s. This remains the case today.

Insulated Concrete Forms (ICF)

Introduced in Europe in the early 1960s, ICF is the newest wall system. Basically, it has walls consisting of concrete and surrounded by foam. Demand for products that could provide superior energy conservation for the harsh Canadian winters pushed the introduction of ICF into North America in recent decades and, by the 1990s, ICF had made limited inroads into both the residential and commercial marketplace within the United States. Today, there is broad awareness of this framing

system, and usage is spreading across the various types of construction.

What's the Best Choice?

Because seniors are more sensitive to heating and cooling, they are anxious to live in an environment with a constant and evenly distributed temperature. A residence free from drafts and cold spots is ideal for them. Seniors also have a greater need than their younger counterparts for a quiet living space. And, perhaps most importantly, seniors want the knowledge that they are safe and well protected from natural disasters (not to mention intruders). Let's compare the three wall systems on how they meet these criteria (see Table 1 for a summary).

Residents desire a space that maintains a uniform temperature with less drafts and cold spots and, for that matter, lower utility bills. Because ICF's concrete mass is sandwiched between two layers of foam, heat flow both in and out of the wall is slowed, thereby creating the least thermal transfer among the three wall systems. This makes the ICF wall far and away the most energy efficient, with an R-value of 40+ compared to effective R-values of 15.1 for wood-stud framing and 7.1 for steel-stud framing.

A quieter, more peaceful living space. The Sound Transmission Coefficient (STC) measures the resistance of a material to the transmission of sound. Basically, the higher the STC, the quieter the space. The ICF wall system is the quietest wall type, with an STC of 50+. Comparable wood systems have an STC of 37, and steel, an STC of 40. Both wood and steel systems can achieve higher sound resistance, however, by adding more material or increasing the thickness of the wood or steel.

Protection against fire and natural disasters. Most codes mandate that the healthcare portions of retirement facilities be constructed of noncombustible materials. This precludes wood-stud framing from a healthcare-related portion of the retirement community, and steel-stud framing must be combined with other noncombustible materials to obtain fire ratings similar to those of ICF. Depending upon the thickness of the walls, ICF framing systems are fire-resis-

Table 1. Wall Comparisons Across Senior Lifestyle Benefits.

Senior Lifestyle Benefits/Wall Attributes	Insulated Concrete Forms 6" Wall System	Steel-Stud Construction	Wood-Stud Construction
Comfort			
Thermal R-Value	R-40+	R-7.1*	R-15.1*
Serenity			
Sound Attenuation	STC = 50+	STC = 40 ↑	STC = 37 ↑
Safety			
Fire Rating	4 HR	1 HR ↑	45 min ↑
Security			
Flying Debris Test†	103.8 mph—no damage to wall, with projectile splintering into pieces	50.9 mph—projectile perforated wall ↑	69.4 mph—projectile perforated wall ↑
Sheer Stability	Winds up to 250 mph§	↑	↑
Sustainability			
Indoor Air Quality	Less Volatile Organic¶ Compounds (VOCs) Humidity Control as well as greater atmospheric control	↑	↑

↑ = System can be upgraded to a higher rating or, in terms of sustainability, can be equal to ICF with additional costs.

** = 2" x 6" oc stud wall system using R-19 batt insulation with the framing factor incorporated into R-value. 16" oc stud spacing assumes 11.9% of wall area is framing.*

§ = Maximum capabilities if built according to FEMA Standards for Safe Room Construction.

¶ = Can contribute to LEED™ System in several credit areas: Energy & Atmosphere, Materials & Resources, and Innovation & Design.

† = Information from test conducted at the Wind Engineering Research Center at Texas Tech University. 15 lb. wood stud fired at 4' x 4' test panels.

tant and maintain fire-resistance ratings of up to four hours.

The walls can withstand high winds and flying objects. Testing the ICF framing system has revealed no observable damage to the system when projectiles hit it at nearly 104 mph and when it encounters winds of up to 250 mph. On the other hand, the test projectile perforated the entire wood and steel walls at little more than half the speed—69.4 mph and 50.9 mph, respectively. Wood and steel systems can be designed with additional structural elements to achieve code compliance for wind resistance of up to 150 mph. Some ICF manufacturers also comply with FEMA standards for safe rooms. A senior residence could, at the very least, well protect its seniors from major natural disasters by building either a safe room or shelter with ICF.

Financial Impacts

A detailed analysis of the relative cost impacts of the three wall systems discussed here can be found in Table 2. The basic model is a four-story, 419,000-sq.-ft. CCRC. In general, the ICF wall system is more reasonably priced. Both the wood and steel wall-framing systems are more expensive across all three construction-cost dimensions—labor, materials, and time. Another major advantage of ICF wall systems, though often overlooked, is the debt service savings it can contribute to the project's bottom line. In this particular example, constructing walls of ICF amounted to a debt service savings of approximately $345,000 per month when compared to wood (and savings are even higher with steel) because a reduced construction schedule saved time and resulted in lower interest and quicker occupancy.

Conclusion

In this study comparison, the wall-framing systems available to owners have been analyzed by the benefits they would offer the resident and, as a result, the marketing value owners could derive from each alternative. Obviously, while one system offers many advantages over the other two, this decision is a difficult one and involves a number of characteristics beyond those presented in this article. Hopefully, this analysis of wall systems based on seniors' preferences will aid owners in their decision-making process. **NH**

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Table 2. Wall Comparisons Across Senior Financial Benefits.

Senior Financial Benefits/Wall Attributes	Insulated Concrete Forms 6" Wall System	Steel-Stud Construction	Wood-Stud Construction
Cost of Materials	$8.66 per s.f.	$9.31 per s.f.*	$10.14 per s.f.
Labor Installation	0.033 manhr./s.f.	0.061 manhr./s.f.	0.040 manhr./s.f.
Construction Duration	21 weeks to dry in stage*	60 weeks to dry in stage*	50 weeks to dry in stage
Debt Service Savings	$385,000 per mo./avg.†	N/A	N/A
Engineering Savings			
Electrical	10% Savings§	N/A	N/A
Mechanical	8% Savings§	N/A	N/A
Insurance Costs	15-20% savings yearly	N/A	N/A
Utility Costs	Estimated $35,000 per year savings§	N/A	N/A

** = Based on pricing received in case study.*
† = Based on owner provided information in case study.
§ = Architecture and Engineering early estimate case study.