Steel Framing Adds Value, Safety to Virginia Senior-Living Structure

By using steel framing instead of wood, a design and construction team in coastal Virginia was able to substantially increase the height/useable area-and potential revenue—of a senior—living condominium building.

Similar situations are emerging throughout the country as light-gauge cold-formed steel framing components gain favor for light construction projects with specific needs.

The result at the Atlantic Shores Retirement Community in Virginia Beach, Va., is a beautiful finished structure that is everything the owners had asked for and more. Not only is it 50 percent bigger—both in height and usable square footage—than was originally planned, but it was built to the owners’ specific “above and beyond” wind requirements to withstand the rigors of its location, just one mile away from the hurricane-prone Atlantic Ocean.
And with an elegant red-brick facade, the new 150-unit, 227,000 square-foot residential structure is identical in appearance to the complex’s original buildings.

**The Decision to Go with Steel**

By using prefabricated light-gauge cold-formed steel framing components and panels in lieu of wood, the owners of Atlantic Shores Retirement Community, the architect/engineer, the general contractor and the steel fabricator constructed a building that offered unique benefits.

At the outset of the project, a new four-story “stick-built” condominium structure was planned. The building’s structural direction took a different course with the presentation of construction drawings in the summer of 1998. It was at that point that a new idea was proposed to the owner and general contractor—the use of steel framing.

“We suggested a combination of steel beams and prefabricated steel panels instead of wood to frame the structure,” remembers Jim Holland, vice president of sales for EFCO Steel, Inc., the North Carolina-based fabricator of the steel-framing components. “The framing made it possible to increase the building height from the original four floors to the final six floors, for a 50 percent increase in square footage and potential revenue.”

Project Architect David Moniot, of Clark-Nexsen in nearby Norfolk, says there were two key reasons why steel was chosen over wood as the framing material.

“For one, Virginia’s building code required noncombustible materials for a residential building of this size. With this requirement, steel was the most cost-effective choice. While wood was still a possibility, it could only have been used if chemically treated to be fire-resistant—a very expensive process.

“Also, the owner dictated shear-wind requirements of 110 mph.”

After considering costs and benefits, the building owner and the general contractor decided to move ahead with the steel framing, and to construct the larger building.

**Safety Was a Major Selling Point for Steel Framing**

Moniot remarks that safety was an important consideration, especially in light of the building’s final use as a senior-living residence.

Again, steel framing presented real advantages. As a noncombustible material, the structure’s prefabricated steel framing offered increased safety in the event of fire.

Special care was also taken in the selection of the material used to complete the exterior of the building. Brick and vinyl siding were applied over Dens-Glass® sheathing—a “paperless” sheathing panel that is engineered with a water-resistant
Few union laborers in the area were trained to work with light-gauge, cold-formed steel framing, so the union carpenters were given special training. They now have a valuable, marketable new skill.

Challenges Faced, Lessons Learned

The Atlantic Shores project came with its own set of requirements and challenges.

The easy one was the appearance of the finished structure. As an addition to an established retirement-living community, the building design and finished look had to match that of the existing facilities. As the project team discovered, this was not an issue. The building envelope for steel-framed construction typically looks no different from "stick-built."

Bigger challenges were finding qualified construction workers and managing a team that had little experience with the basics of steel framing. Construction was financed by the Brotherhood of Electrical Workers, which required 100 percent union labor on the project. But few union laborers in the Tidewater area of Virginia were trained to work with light-gauge, cold-formed steel framing.

In a win-win solution, a special training session was provided by Holland of EFCO Steel to teach the union workers the fundamentals of working with steel. The union carpenters volunteered their time for the 18 hours of training, and in turn gained a valuable—and very marketable—new skill.

Then there was the weather. Three hurricanes—including the 100-year record-setting Hurricane Floyd—hit the coastal Virginia area during construction. Even with substantial winds, there was no damage to the incomplete structure.

The use of steel framing offered a myriad of structural benefits. For example, the steel-stud framing and the composite-deck flooring system allowed for a thinner floor profile and, consequently, a more compact floor-to-floor height.
By incorporating five-inch concrete floors, the architect was able to reduce the floor profile from the customary 10 inches to 6 inches without affecting the floor-to-ceiling height of the interior space. Moniot, at the owners’ request, was able to take almost 3 feet off the overall building height. This significantly reduced the costs for framing and the building envelope.

Moniot explains that the shear-wind resistance of the building—of up to 110 mph—was created by using a combination of sizes and gauges of steel studs, along with various spacing configurations.

According to the American Iron and Steel Institute, the yield strength—and to a lesser extent the ultimate strength—of steel is increased as a result of cold-forming in the bends of the section. “In this instance,” Moniot continues, “tubular lateral-force resistant steel K trusses were located at the center of each wing, while longitudinal-force resistance was accomplished using the light-gauge-steel studs and X bracing in the corridor walls.”

“The finished concrete floor composite with an 18-gauge, G-60 galvanized steel deck supported all working loads. The deck alone was designed to support the weight of the wet concrete, reinforcing steel and construction loads.”

The architect adds that the use of metal decking, rather than a conventional wood-form system, significantly reduced construction cost and time. The steel decking was an integral part of the structure, as opposed to the wood forms, which would have had to be stripped once the concrete was set.

Finally, the project’s steel roof framing was cost-competitive with conventional wood systems, and offered several advantages. A steel roof-truss system, at less than a quarter of the weight of a wood roof frame, minimized problems with cracked walls, sagging and roof undulation.

EFCO Steel’s Jim Holland adds, “Steel framing also helps to alleviate shrinking or warping, which can cause cracks in joints
and walls, and to prevent energy loss through air leaks. We also think that these benefits help to reduce the need for contractor callbacks.”

**Advantages During Construction**

There were also construction benefits realized with panelized steel framing.

The pre-assembled panels reduced overall construction time because fewer hours were spent assembling components on site.

Holland says, “At Virginia Beach, the panels were readily available when the general contractor was ready to use them. There was also a space savings during construction because prefabricated panels were brought to the site as needed rather than assembled on site.”

Holland emphasizes that an additional measure of quality control was rendered over the finished product because the pre-fabricated panels were assembled in the controlled environment of his facility in Rocky Mount, N.C.

In general, and specifically at Virginia Beach, the relative lightness of prefabricated stud panels offers versatility in building and ease of handling and erection.

**Close and Clear Communication IS Essential**

The project team agrees that one thing is clear: When working with an unfamiliar building method such as prefabricated steel framing, the architect, engineer, general contractor and steel fabricator must work closely and communicate clearly, from pre-fabrication to final assembly.

Architect Moniot had this to say on the subject: “A special challenge was the continual coordination required between design disciplines during document production to avoid conflicts unique to the panelized system.”
Pre-fabricated steel components and panels were used instead of wood to create the framework.

“In itself,” he says, “the use of prefabricated panels delivered to the jobsite is not a new concept. A drawback until now has been the repetitive nature of the design solutions.”

Moniot adds, “By developing a seamless production process from design through fabrication and erection, more design options emerge. This flexibility invites creative solutions with the benefits of simplified construction.”

He concludes, “With the process mastered, this system has a bright future due to the benefits of using steel panels from a building-code standpoint and steel’s inherent structural properties. The key lies in the designer, manufacturer, and contractor working in concert to optimize full use of the method.”

About the Author
David Sindrey is manager of advanced marketing at Ontario-based Stelco, Inc. and chairman of the American Iron and Steel Institute’s Commercial Framing Task Force. Founded in 1998, the task force enables the development of light steel commercial framing. Comprised of members in the United States and Canada, the group meets regularly to develop technical aids to assist architects, engineers and contractors in building quality structures using galvanized, cold-formed steel products.