CaseStudy

Maximizing View & Value With Wood

Marselle's 5½-story podium design takes wood to new levels

Wood-frame podium construction is nothing new, particularly for Seattle, Washington. But when developers built the Marselle Condos, they did something new by literally taking wood to the next level. By designing the 160,000-square-foot condo complex to meet Type III-A construction requirements, they were able to build five and one-half floors with wood over a two-story concrete podium deck.

The extra half-story mezzanine added about $250,000 to the construction cost of the building, but the architect and builder estimated that the added height and space increased the value of the complex by $1 million.

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According to PB Architects, "citation of the techniques used in its construction contributed to a 2009 change to the *British Columbia Building Code*, allowing the development of timber-frame medium-rise structures, firmly planting The Marselle in the pantheon of buildings that are part of a worldwide movement to use more cost-effective, greener building materials."

Smart, Speedy

The Marselle is a hybrid concrete and wood structure consisting of five stories of wood framing plus a wood mezzanine and six stories of concrete, two of which are above ground. The combination of 'five and one-half over two' made Marselle the tallest modern wood-frame structure in Seattle.

From the outside, the Marselle looks like a typical 132-unit condominium structure. But on closer inspection, wood framing added value in a number of ways.

Located just north of the city's downtown core, not far from Seattle's famous Space Needle, Marselle was certified Built Smart℠ by Seattle City Light and constructed to meet the Master Builders Association Built Green™ program by utilizing wood as an earth-friendly, energy-efficient building material.

While the environmental recognition was an added benefit, the decision to use wood framing was purely a financial one, according to Kory Knudson, vice president of Norcon, NW, Inc. "If the project had been built using all concrete, for instance, it would have cost about 30 percent more. If we had built the entire project out of steel, it would have taken much longer and we would have had to make many energy modifications."

Construction began in August 2007 and was completed in April 2009. Joe Hanley, president of Norcon, NW, Inc., said the use of wood contributed substantially to the speed with which the building was able to be constructed. "The concrete and steel hotel right behind Marselle had a similarly-sized footprint, but floor-by-floor, our framing went up much faster. They had a lot of on-site welding but by using wood, we were able to work through all types of weather."

Code Advantage

Marselle's main distinction lies in the way wood framing was used to maximize the value of the finished space. Two key code requirements allowed that to happen.

The City of Seattle's *2003 Building Code* (SBC), under which the Marselle was built, was based on the *2003 International Building Code* (IBC). As is the case with many cities, though, the SBC contains a number of changes adopted by the City of Seattle. One of those changes was that, under the 2003 IBC, mezzanines were limited to 33 percent of the floor area beneath. However, SBC allowed five stories of wood construction over two stories of Type I construction plus 50 percent for a mezzanine. Mezzanine levels are not considered floors.

Under the SBC, Type V-A construction allowed a fully-sprinklered 70-foot maximum height for five stories while Type III-A allowed a fully-sprinklered 85-foot maximum height for five stories. Zoning regulations allowed a maximum height of 85 feet. Therefore, the design team took advantage of Type III-A construction by adding a mezzanine level on top of the allowed five-story structure, to fill in the building envelope to the 85-foot maximum zoning height allowed.

The second criteria concerned construction type. According to architect Michael Shreve with PB Architects, "under the 2003 SBC, section 504.2, the allowable height for buildings of Type III-A construction in Group R-2 could be increased to five floors of wood-frame construction above two stories of Type I concrete construction and an 85-foot maximum height. The two floors of concrete construction were required to be Type I construction with a three-hour horizontal fire rating separating the wood construction from the concrete construction."

"Once built, the top level units would have water views of Seattle's Lake Union," explained structural engineer Panos Trochalakis P.E., S.E., principal with YT Engineers. "For obvious reasons, the developer wanted to take advantage of that."

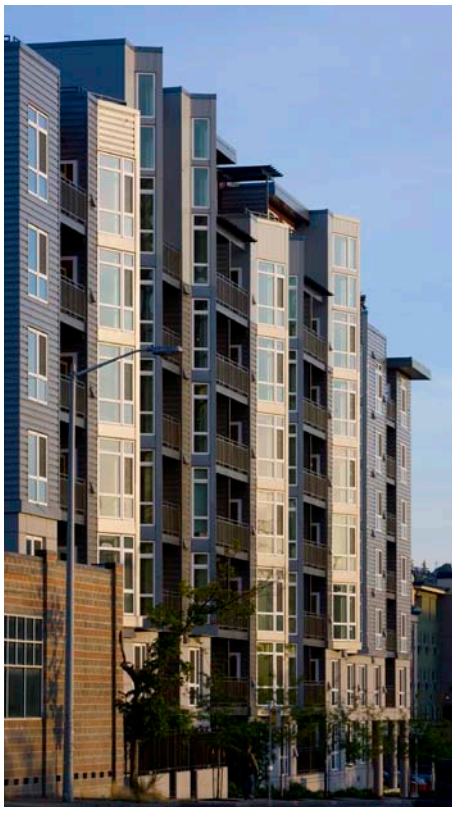
Higher Structure, Higher Value

Adding ten feet to the building's height added some costs to the project.

For example, the contractor had to increase the thickness of the post-tensioned concrete podium slab by one inch to accommodate the additional mezzanine level above. This podium slab, sometimes referred to as the transfer slab, takes the loads from the wood-framed floors above and transfers them to the columns and walls in the concrete structure below.

The shift from Type V to Type III-A construction also resulted in additional costs. ICC Section 602.3 required "…that type of construction in which the exterior walls are of noncombustible materials and the interior building elements are of any material…" In addition, the code stipulated that "…fire-retardant-treated wood framing… shall be permitted within exterior wall assemblies of two-hour rating or less." This allowed fire-retardant-treated (FRT) wood framing to be used in a noncombustible application.

Knudson said they did experience a slight increase in cost because the FRT lumber and plywood used in the exterior walls was more expensive than standard untreated material. "But overall, it was not a lot. And by taking the building up an extra 10 feet, we created view units whose value far outweighed the extra cost of the construction. In general, any time you can maximize the potential of your site, it's going to be beneficial."



Smart Use of Wood

The majority of Marselle's framing consisted of engineered lumber. Floor and roof structures used wood I-joists and parallel strand lumber (PSL), laminated strand lumber (LSL) and laminated veneer lumber (LVL) beams 9-1/2 inches deep. They used dimension lumber for some joists as well as walls, plates and studs, and APA-rated sheathing.

Trochalakis said they oriented the I-joists to run from exterior walls to corridor walls, which is not typical. "We do it this way on less than 10 percent of jobs; most projects run in a perpendicular direction, which is party wall to party wall. There are advantages and disadvantages both ways. If you run joists from party wall to party wall, it's actually a little more economical in terms of framing. But when they run ducts to the outside for venting kitchens and bathrooms, you need a drop soffit. If you rotate the joist, you can push the ducts up inside the joist and avoid a drop soffit."

While he said most other jobs use 11-7/8-inch deep I-joists, they were able to use the shallower 9-1/2-inch deep I-joists because of the shorter joist spans. "To fit the 'five and a half plus two' levels within the 85-foot height restriction, we would have had to create ceiling heights shorter than desirable from a developer's standpoint. The shallower joists provided an additional 2-3/8 inches per floor for ceiling height, which is just what we needed."

Prefabricated Wall Panels Speed Construction

Norcon constructed the Marselle using pre-panelized walls for two reasons—to speed construction and because space was limited on the job site (as is common in urban infill projects such as this). The panels ranged from four to 20 feet long; they were pre-assembled by a local framer in an offsite warehouse, and then quickly and easily lifted into place at the job site by crane.

Pre-panelized walls add value in other ways. Because they are assembled in a controlled environment, finished panels typically meet tighter tolerances, which can help reduce shrinkage due to gaps.

Typical wall framing used FRT APA-rated sheathing and 2x6 Douglas-fir for exterior walls and untreated 2x4 for party walls, which were installed back-to-back with a 1-inch air space between the two to reduce sound transmission. Corridor walls used 2x4 dimension lumber. Most panels were eight to nine feet high.

Trochalakis said they varied stud spacing by floor. "Typical lower floor spacing was 12 inches and included some doubled studs," he said. "As we worked our way up the structure, we increased the spacing because the vertical loads become less. There are enough cost savings that you don't want to just standardize the stud spacing all the way up."

"We also specified Douglas-fir #2 to help minimize shrinkage and twisting," added Shreve. "If you need to frame in bad weather, which is not uncommon in Seattle, you will get some swelling. Naturally, any movement magnifies itself on the top floor and the 'high rent district,' so using the right species is just one thing we do to minimize it."

According to the Western Wood Products Association, "Douglas-fir is naturally dimensionally stable, having the ability to season well in position. Many builders prefer to cut, nail and fasten Douglas-fir in the 'green' or unseasoned condition, allowing it to air dry during construction."

Design for Shrinkage

The International Code Council (ICC 2304.3.3) stipulates that, "wood walls and bearing partitions shall not support more than two floors and a roof unless an analysis …shows that shrinkage of the wood framing will not have adverse effects on the structure…"

"If a wood-frame building is constructed in Seattle in January or February and it's pouring rain, you could get up to a quarter inch of shrinkage as the wood dries," said Trochalakis. "And the taller the building, the more significant shrinkage could become. Wood-frame structures can also shorten vertically due to loading. Therefore, we made sure to include design considerations to accommodate these factors."

As is typical with wood-framed podium structures, Marselle's contractors used a continuous rod tie-down system with a shrinkage compensation device to limit deflection and avoid wall separation due to wood shrinkage under wind and seismic forces. They also included an expansion joint in the cladding and were careful to specify proper panel spacing in the exterior wall sheathing. They also included a provision in the mechanical system to allow for movement.

Advantages of Wood-frame Podium Construction

In looking back on the job, all involved were able to identify the advantages of using wood to frame the five and one-half story over two podium structure.

"Lower construction costs were the number one reason to use wood," said Trochalakis. "Wood-frame construction is virtually impossible to beat in terms of cost. It's also light, which is a big benefit from a seismic standpoint."

Pre-panelized walls and speed of construction also made a big difference for Marselle's schedule. "If you can install the walls on a building the size of Marselle in less than two weeks per floor, then you lower construction costs significantly," Trochalakis added. "Plus, wood offers quite a few advantages from an environmental standpoint."

Since 2009, Norcon has built several other wood podium structures in Seattle. "But Marselle was different in that it was a five and one-half stories over two; most have been five over one," said Knudson. "We knew at the time this building was unique. Together, we were able to help the developer maximize the potential of the building site. We built a structure that had more value for less money—by using wood."

Project Overview

Name:	Marselle Condominiums
Location:	Seattle, WA
Owner:	Marselle Partners, LLC
Architect:	PB Architects
Structural Engineer:	Yu & Trochalakis, PLLC
General Contractor:	Norcon, NW, Inc.
Completed:	2009

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