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Mid-Rise Light Wood Frame Construction Gains Momentum

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DES517-A Mid-Rise Light Wood Frame Construction Gains Momentum

Description:

The case for using wood in mid-rise multi-story construction is continuing to grow – fueled in large part by rising costs, green building mandates, and the need for urban intensification. In recent years, jurisdictions across North America have amended or expanded building codes to permit the use of wood as a structural material in mid-rise construction. A growing list of exemplary projects – many of which employ the most modern design approaches to seismic and fire safety, acoustical and material performance – and subsequent studies and best practices, are leveling the playing field so that wood, concrete and steel can compete equally. This course discusses the growing acceptance of mid-rise light wood frame construction.

Please note that since the article was published, Ontario has adopted mid-rise construction in 2015.

Learning Objectives:

After reading this article, you should be able to:

1. **list** the advantages of mid-rise light wood-frame construction.
2. **discuss** the impact of changes in the BC Building Code, combined with the BC Wood First Act.
3. **identify** and describe several examples of mid-rise wood-frame construction.
4. **explain** the correlation between wood use and carbon footprint.

To receive credit, you are required to read the entire article and pass the test. Go to <http://awc.org/education/ecourses> for complete text and to take the test for free.



DRAWING/ILLUSTRATION:
Marco VanderMaas,
Quadrangle Architects Limited

Mid-rise light wood frame construction gains momentum

The case for using wood in mid-rise, multi-storey construction is continuing to grow – fuelled in large part by rising costs, green building mandates, and the need for urban intensification.

In recent years, jurisdictions across North America have amended or expanded building codes to permit the use of wood as a structural material in mid-rise construction; in states like Minnesota, California, Virginia, Oregon and Washington, five- and six-storey light wood frame (LWF) structures – both residential and non-residential – are now commonplace.

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and best practices, are levelling the playing field so that wood, concrete and steel can compete equally.

Widely accepted as the most economical option for building single family homes, light wood frame (LWF) construction in the mid-rise sector has many advantages. According to Wood Solutions in Mid-rise Construction (October 2010), compiled by The Walker Consulting Group for Ontario Wood WORKS!, there are several tangible benefits to using wood: sustainability; reduced construction time; and, perhaps

most notably, reduced costs.

“One of the fundamental reasons mid-rise, light wood frame buildings have caught on in many jurisdictions – across Canada, the States and Europe – is the cost efficiencies, with materials being a key component of that,” says Steven Street, technical director with Ontario Wood WORKS! “Often wood is available locally and that has a huge impact. There’s also the availability of trades with knowledge to put the buildings up. One of the big things also is that you end up with a much lighter building which has a mas-

sive impact on the amount of concrete in the foundation. That's a big factor.”

According to the developers, architects and engineers interviewed for Wood Solutions in Mid-rise Construction, the top aspects of mid-rise light wood-frame structures that reduce construction costs are: lower labour and material cost; reduced construction time; improved quality through off-site prefabrication; improved productivity levels; lighter construction (eliminates preloading requirements in some cases); ease of running services; wider range of labour available; and locally available resources.

Indeed, a cost analysis by BTY Group shows wood (vs. steel and concrete) results in a cost-savings of up to 10 per cent in many buildings, particularly in the Vancouver, BC area. BTY Group originally compared wood-framed design

with reinforced concrete and light steel frame following the 2009 amendment to the BC Building Code that increased the allowable height of wood-frame residential buildings from four to six storeys. The code change in combination with BC's Wood First Act, which requires that wood be considered as the primary structural material for all provincially funded projects, has resulted in almost 50 mid-rise wood frame projects currently underway.

“Wood-framed buildings are showing an 11 per cent cost reduction over concrete and steel frame depending on location and other building characteristics,” says Neill McGowan, quantity surveyor and partner at BTY Group in Vancouver. “The huge majority of four-storey buildings are done in wood for obvious reasons – because it brings residential into the realm of affordability for

more people – so it makes sense that this would extend to six-storey buildings as well.”

Case in point, says McGowan, is the six-storey Remy condominium in Richmond, BC (by Oris Development Corporation), which saw substantial material cost savings. When developers for the project substituted wood for a light steel and concrete frame, they realized a 12 per cent drop in hard costs. The first six-storey wood-frame residential development permitted under the new code provisions in BC, the Remy features energy-efficient geothermal heating and cooling, co-op cars and green roofing.

BTY projects savings in Ontario to reach nine to 10 per cent by using wood. “Every bit makes a difference. It can be huge for some projects,” says Mark Ravelle, a partner with BTY Group in



DRAWING/ILLUSTRATION: Marco VanderMaas, Quadrangle Architects Limited

St. Catharines. Although wood is more expensive in Ontario, he adds, labour costs are lower. For its part, Ontario currently permits wood frame buildings up to four storeys high, but amendments to the Ontario Building Code are currently being considered that would permit the construction of six-story wood-frame buildings.

Minnesota's Copperfield Hill65, a 165,000 square foot self-contained retirement community, is the first five-storey wood-frame building built in Minneapolis. According to Wood Solutions in Mid-rise Construction, wood-frame was chosen based primarily on cost compared to steel-frame: bids for steel-frame came in at more than 75 per cent higher than the wood-frame. And the ease of wood construction allowed the building to be framed in less than six months.

McGowan says in addition to costing, wood structures have displayed a high level of seismic/earthquake performance and safety that comes from a material with greater ductility and a lighter building mass than other building materials. Due to the high risk of earthquakes in Richmond, BC, it was of particular benefit for the Remy structure, for instance, to be light, says McGowan. "The Remy also used wood in its core structures – elevator shafts and stair shafts – making it even lighter," he says. "Most four-storey buildings still have concrete block core structure."

Sprinkler systems are used along with fire resistance rated wall, floor and ceiling assemblies to maintain occupant safety. And building code provisions for wood frame construction make it equivalent to other construction methods in terms of fire and life safety.

"Wood is not getting a free ride – it still has to perform with respect to fire safety, structure, occupant comfort and quality of the building. It still has to meet those code objectives. But now it can compete with steel and concrete," says Street.

"Fundamentally this will give developers, builders and design teams more choice – this opens up a whole new genre



Saint James Condominiums, designed by
 Quadrangle Architects Limited

PHOTO CREDIT: Robert Burley

for them. They're no longer limited to two or three different methods of constructing these higher buildings – we're actually introducing a new one...and without compromising or lessening any of the code objectives."

New wood technologies and building materials like cross-laminated timber (CLT) have even greater structural and fire resistance properties, and have been shown to further reduce construction time while maintaining a high level of precision and quality. Ultimately, such new innovations will likely enable wood systems to be considered in structures greater than six storeys. "It's all creating a whole new breed of structure over the next few years. It will change how we build with wood and hopefully the perceptions about building with wood," adds Street.

It quickly becomes apparent that there's a definite need for this type of building, he says, when you consider all the rejuvenation models in municipalities across North America. He expects urban planners and city officials to increasingly consider wood-framed mid-rise construction as part of their mandates to increase densification and reduce urban sprawl. Wood-frame mid-rise buildings enable more dispersed urban intensification (vs. high rises) that maintains neighbourhood charm and community appeal and doesn't overburden the infrastructure and transit services already in place.

"Officials want more families back in the cores and out of suburbia. They want five- to six-storey buildings. The cost-savings with wood can be passed along to the end user, and you give developers another way of building," says Street.

Light wood-frame systems have also become a preferred building solution for publicly funded social housing, satisfying faster timeline and lower-cost-per-square foot demands. "Any cost savings that municipalities can achieve for cost-effective social housing, seniors, etc. is going to be of benefit. There is going to be a market for these buildings very quickly," he says. "There's a market for them now."

Another reason it has been so successful in other jurisdictions, especially Europe, says Street, is because they calculate the carbon footprint of their buildings, something which North America hasn't really had to explore yet.

"When that tide of change hits here, and we are expected to carbon footprint, people will have to stand behind their choice(s) of materials," he says, adding that wood has the lowest embodied energy of any construction material, and substituting wood for concrete or steel reduces the carbon footprint of buildings. "If wood can be considered, it needs to be considered. If there is an application where wood can be used and it will still give the qualities and performance that are needed, then it needs to be considered and used." ■