Luxury Wood-Frame Apartment Community Completes Dense, Mixed-Use Urban Development

Flagship project in the heart of Atlanta connects developer with goals

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Surrounded by high-rise buildings in the upscale Buckhead neighborhood of Atlanta, Crescent Terminus is a new three-building, luxury apartment complex offering resort-style amenities, including a salt-water pool, rooftop terraces with dramatic skyline views, a gourmet coffee bar and more. Featuring five stories of wood over a concrete podium, the project fills the last three parcels of land in the Terminus complex, completing this unique urban development. And while the prime piece of real estate carried a corresponding price tag, the developer was able to move ahead with the project thanks in large part to the choice of an affordable, high-quality wood-frame structure.

"This site has all the ingredients for a successful luxury apartment community," said Jay Curran, Vice President of Crescent Communities' multi-family group. "Its location in the heart of Buckhead is ideal. Surrounded by world-class office space, luxury condominiums, outstanding public art, five-star dining and street-level retail, Crescent Terminus will offer a unique lifestyle that allows residents an opportunity to work, play and live all within easy walking distances. This location and all those attributes are consistent with the Crescent brand of exceptional development."

The Crescent Terminus project was inspired through extensive review and analysis of current industry trends and marketplace needs. "This land was at a cost basis that is among the highest in our portfolio," said Jared Ford, Senior Vice President for Crescent Communities. "It's prime real estate, but that's where the market is. Our strategy is to build on these Main-and-Main sites using wood-frame construction—it just makes sense."

Three Separate Buildings, One Unique Complex

The five-story, wood-frame buildings stand unique among the high-rise buildings that surround them. Crescent Terminus focuses on providing a sense of community for tenants within the Terminus complex, which is at the corner of Peachtree and Piedmont Roads in Atlanta. Crescent Communities broke ground on the property in January 2013; the 355-unit development opened in June 2014.

Crescent Terminus consists of three separate buildings; each has three levels of parking topped with five stories of wood-frame apartments. In total, there are about 275,000 square feet of rentable space on the three-acre site. All three buildings are Type III-A construction over a Type I-A concrete podium built to 2006 *International Building Code* (IBC) and 2006 *International Fire Code* standards with current Georgia amendments.

The wood-frame portion of Crescent Terminus includes dimension lumber, laminated veneer lumber (LVL), laminated strand lumber (LSL), metal-plate-connected roof and floor trusses, and wood structural panel sheathing.

The architecture takes its inspiration from the surrounding structures, with a contemporary exterior that mixes stucco and stone with cementitious and aluminum composite panels. To maximize the buildable area, the project bridges over an existing street and shared service drive.

Wood Makes a Big Statement to a Big Audience

"Crescent Terminus has a high profile location, so our client, Crescent Communities, wanted this to be a flagship project," said Eric Brock, Director, Housing and Mixed-Use Studio at Lord Aeck Sargent. "The project was under a lot of scrutiny from the surrounding property owners, so it needed to be of a quality that complemented the rest of the mixed-use development. It was Crescent's requirement to use wood framing to accomplish this."

Crescent Terminus

PROJECT ARCHITECT: Lord Aeck Sargent • Atlanta, GA

STRUCTURAL ENGINEER: SCA Consulting Engineers • Sugar Land, TX

GENERAL CONTRACTOR: DPR Hardin Construction • Atlanta, GA

FRAMING CONTRACTOR: Great American Framing, Inc. • Atlanta, GA

DEVELOPER: Crescent Communities, LLC • Charlotte, NC

OWNER: An affiliate of Boston-based Berkshire Group

SCHEDULE: Construction started January 2013 • Completed November 2014

He added, "Some other developers and surrounding property owners were a little skeptical about Crescent being able to achieve this objective with a wood-frame structure, but the Crescent team has extensive experience developing five-story, Type III-A wood-frame multi-family properties around the country."

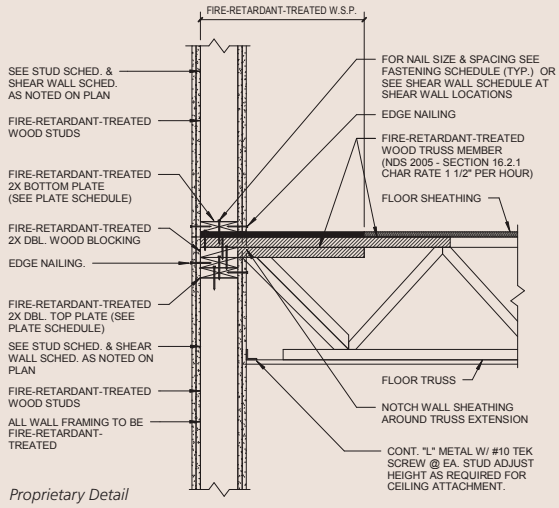
The affordability of wood also allowed the team to meet Crescent Terminus' overall budget goals. "From a design standpoint, we were able to use wood to introduce a fresh, contemporary aesthetic to a mid-rise multi-level development," said Brock. "By saving on the framing and speed of construction, Crescent is able to deliver a higher quality finished product for their tenants by putting more into the amenity package as well as landscaping, finishes and character of the residential units."

Five-story wood structures are nothing new for Crescent Communities. In fact, of the 20 investments (valued at $1.5 billion) they currently have under construction or in planning, all but one is wood-frame. "We're either building or hunting in 13 of the top 20 metropolitan markets," said Ford. "And we're almost entirely focused on wood-frame multi-family apartments. Most of these projects are similar to Crescent Terminus—urban infill, five-story, Type III-A Class A construction in Main-and-Main locations. Obviously, we build for return on our investment, and wood-frame construction is just more cost efficient per square foot than steel and concrete."

When asked how building this project with wood fits into Crescent Communities' quality mission, Ford said two things jump out. "Number one, Crescent is very dedicated to building sustainable, environmentally-friendly investments; it's not just a slogan, it's one of our core values. We have people who are dedicated solely to that initiative, to influence the design on all our properties across all of our divisions. Wood is obviously a renewable, sustainable product, and that's one way it fits into our overarching mission.

"The second is the fact that wood gives us some design flexibility that you wouldn't have with concrete," he added. "With concrete, you can't easily design to have the building pop in and out to create the architectural reveals the way you can with a wood-frame building. We can do a lot more design-wise with wood that we couldn't do with other products. So both our environmental goals and our design goals provided the motivation for this to be a wood-frame building."

Example: Type III Floor-to-Exterior Wall Detail



Proprietary Detail

Innovative Truss Design

One of the challenges with five-story Type III-A wood construction is maintaining the integrity of the fire rating of the exterior bearing walls. The approach for this project was to use top-chord bearing trusses for the floor framing.

"The metal-plate-connected wood trusses use FRT (fire retardant-treated) top chords on the ends that penetrate the exterior wall," said Stephan Voss, Engineer of Record and Principal of SCA Consulting Engineering. "These are 18-inch trusses, placed at 24 inches on center, which is fairly standard. But the FRT portion of the top chord extends back to the first panel joint, where it is connected to the remaining top chord using the metal plate connectors."

SCA's top chord-bearing design offers a number of benefits in addition to the fire rating integrity, says Voss. "First, it allows quick installation. Since the trusses rest on the top chord, their natural behavior is to hang vertically, eliminating the chance of roll-over. Furthermore, full-depth truss blocks are not required, thus saving material. We also find some sound insulation advantages. In the top chord application, we run the wall sheathing all the way up to the bottom of the top chord, essentially up to the top plate, which eliminates any gaps. And, since the sheathing goes all the way up, it also means that our shear walls run floor-to-floor, so we don't have to transfer shear through the blocking."

The roof on this project was essentially flat, sloping from the exterior toward the interior for drainage, with trusses ranging from 24 to 36 inches deep. "We used girder trusses at the exterior to limit the number of exterior walls that were load bearing," said Voss. "The girder truss distributes the load to the interior walls so the exterior wall could remain non-load bearing and therefore not have to be 2-hour rated."

Managing Shrinkage

Shrinkage is also a consideration with a five-story wood structure. "We're very careful with our exterior detailing—we use larger sealant joints around windows and doors, for example, to allow movement of the skin," said Brock. "We're also careful to select structural engineers like SCA with considerable experience and understanding of wood construction."

Voss said their main approach was to use engineered lumber wall plates to minimize shrinkage. "We don't use engineered lumber in the top chords of the trusses, but we do for the plates and the blocking in the first two floors. In doing so, it essentially turns a five-story into a three-story building with regard to shrinkage. We try to limit it to an inch of shrinkage over the height of the building."

Voss added that they also try to minimize the steel in the wood frame to avoid any differential shrinkage. "There were several club areas on the lower floors of Crescent Terminus that did not allow the wood structure to stack down, so we did use some structural steel," he said. "But, we worked hard on our design and detailing to avoid bringing the steel up any higher than one or two floors inside the structure. Otherwise it requires special detailing, which requires additional cost."

Other Design Considerations

Crescent Terminus has roughly 25 different unit types in its three buildings. As with any complex project, there were a number of design considerations:

- The team designed stairs with double stud walls providing a 2-hour fire separation. They also specified concrete block construction at the elevator shafts, and used a wood-frame wall to separate the elevator shaft from the rest of the construction.
- They filled the interstitial space between floors with blown insulation instead of using sprinklers, which avoided technical concerns related to having sprinklers in inaccessible spaces.
- Thermal imaging tests were conducted to provide a tighter building envelope and achieve good thermal performance.
- The HVAC system was right-sized to match the thermal performance of the envelope, to avoid short cycling (when the residential air conditioning systems cool the air to a comfortable temperature but don't run long enough to dehumidify the air in the units).
- Two of the buildings include rooftop gardens, which Voss says is relatively rare for wood-frame structures, though he's seeing it more often. Roof trusses below were designed to support the concentrated load coming down at those points. While a typical rooftop garden load used by SCA can be up to 350 pounds per square foot, the garden loads for Crescent Terminus were 125 pounds per square foot based on the garden plans of the project.
- They used 2x4 or 2x6 studs for wood-frame walls with spacing based on the load. "We don't just design one wall and consider it typical; we design every single wall in the building and then schedule each to the right spacing and stud size," said Voss.
- Voss said lateral system design is based on a rigid diaphragm analysis, which was justified by deflection calculations. "It makes our buildings more efficient because we can do a large diaphragm that spreads the load out over the entire building," he said.
- The lateral systems for all three buildings used wood structural panel-sheathed shear walls. For overturning resistance, they used a tension threaded rod system that accommodated the movement of the building. Steel rod hold-downs embedded into the podium transferred overturning loads to the podium below. According to Voss, coordination was key to getting the hold-downs properly embedded into the podium deck. "That's always a challenge, to coordinate the interface of the wood with the concrete portion below," said Voss. "For Crescent Terminus, the podium where the wood terminated was a post-tension deck 12 to 14 inches thick, which would have made it very difficult to drill and epoxy in a hold-down later."

Location Challenged Design and Construction

One of the unique yet challenging aspects of the project had to do with its location, since Crescent Terminus is surrounded by existing development and roads, leaving very little room for construction equipment. But that certainly didn't limit the design. "Instead of trying to stay within the confines of the land itself, Crescent decided to build two of the buildings over existing roads," said Dave Conlon, Project Executive for DPR Hardin Construction. "The site was incredibly tight, and many of the decisions made in terms of construction were based on logistics."

For example, when DPR Hardin interviewed framing contractors, their goal was to find a firm with an off-site storage yard, where they could stage materials from the manufacturers and then deliver to the site as needed. "With Crescent Terminus, trusses, plywood, wall studs and other materials would arrive and be flown immediately by crane onto the appropriate floor," Conlon said. "Nothing was ever left staged at the job site."

According to Conlon, they considered having the walls pre-panelized, which saves money in labor, but transportation would have been more expensive. "Plus, it would have required more trucks coming to our site, which would have meant more congestion, and we wanted to avoid that. Instead, we had the studs and other materials cut to length off site, which helped speed construction on the job site."

John Adams, president of Great American Framing, agreed that the project was uniquely difficult in terms of where it was located. "We deal with a lot of urban projects, but this was a very densely populated urban area of Atlanta. As a result, the material supply side of this ended up being just as important as the labor component. But that's a big part of why we were chosen for the project. The FRT material requirements also required detailed planning, since many of those products have a six- to eight-week lead time. We've provided materials and labor for a lot of Type III wood construction, and each project we do presents its own challenges, but there's no doubt that the most challenging part of Crescent Terminus was logistics."

The New Normal

As land costs continue to rise and as developers work to put more units on less land, projects like Crescent Terminus will grow increasingly complicated. "Eight of the ten projects we're looking at right now are tight urban infill projects, five stories of wood over a two- or three-story podium with very difficult logistical requirements," Adams said. "So, this is becoming the new normal for urban areas, and I don't see that ending."

Brock agreed, saying that Crescent Terminus was built on a challenging site, but he expects that trend to continue. "We're continually looking at what we can to do improve our approach for these types of projects." Voss added that while their biggest structural challenge concerned the concrete portion of the structure, "the building itself, the wood part, was very straightforward."

Another growing expectation is that of sustainability. Crescent Terminus is pursuing National Green Building Standard Certification under the Home Innovation Research Labs (formerly the NAHB Research Center). "We currently have more than 8,500 units in planning or under construction across the country," said Ford. "Environmental sustainability is and will continue to be important to us."

They say that Crescent Terminus has filled in the last corner of a prime intersection in the Buckhead district of Atlanta. "Many people have been watching us; they wanted to make sure that when Crescent Communities built this project, it matched the aesthetics of the rest of the area," said Conlon. All agree it did. It was also designed and built to meet the high quality expectations of both neighboring properties and tenants. Crescent Communities achieved all that—and is building a successful, profitable development—using wood.

Carbon Benefits

Wood lowers a building's carbon footprint in two ways. It continues to store carbon absorbed by the tree while growing, keeping it out of the atmosphere for the lifetime of the building—longer if the wood is reclaimed and reused or manufactured into other products. When used in place of fossil fuel-intensive materials such as steel and concrete, it also results in 'avoided' greenhouse gas emissions.

Volume of wood products used:
3.1 million board feet (equivalent)

U.S. and Canadian forests grow this much wood in:
16 minutes

Carbon stored in the wood:
4,327 metric tons of CO_2

Avoided greenhouse gas emissions:
9,196 metric tons of CO_2

TOTAL POTENTIAL CARBON BENEFIT:
13,523 metric tons of CO_2

EQUIVALENT TO:

Source: US EPA

2,583 cars off the road for a year

Energy to operate a home for 1,149 years

Estimated by the Wood Carbon Calculator for Buildings, based on research by Sarthre, R. and J. O'Connor, 2010, A Synthesis of Research on Wood Products and Greenhouse Gas Impacts, FPInnovations. Note: CO_2 on this chart refers to CO_2 equivalent.

Use the carbon calculator to estimate the carbon benefits of wood buildings. Visit **woodworks.org**.

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