



# Why We Need to Rethink the Business of Mid-Rise Wood Frame Student Housing

By Derek Hodgin, RBEC, RRO, PE, CDT

**W**hile mid-rise wood frame construction has its own set of unique challenges,<sup>1</sup> the student housing version of this relatively new product represents the “perfect storm” where the risk of performance issues is drastically increased.<sup>2</sup> This opinion is based on the extent of problems that the author has investigated over the past few years, as well as personal knowledge and observation of multiple student housing projects during construction. The frequency of student housing cases (e.g., structural failure, water damage, etc.) seems to be increasing, as more of these buildings spend time in service and begin to show signs of distress. The author felt strongly enough about this issue to send the letter in *Figure 1* to two prominent national newspapers in early 2018:

Many college students are currently living in recently constructed mid-rise wood frame buildings that are intended to meet minimum building code requirements to be reasonably safe and durable. The mid-rise wood frame student housing business is huge. There has been such a tremendous amount of construction that competition to sell beds is fierce. The industry has responded by spending money on amenities and marketing gimmicks to attract students, rather than on improved construction quality. Our forensic engineering firm has investigated water intrusion, wood rot, termites, fire safety issues, and structural failures on more than 20 mid-rise wood frame projects in the last two years, and they are becoming more frequent.

Combining code-minimum construction with disconnected student occupants (who may occasionally be less than mature) is a terrible idea that has (and will continue) to result in problems. There is a reason that traditional university dorms were constructed to be institutional-grade buildings. To sit back and continue to defend our current path by saying that it is allowed by the building code is irresponsible and shows a lack of understanding. As a Professional Engineer, I am required to protect the welfare and safety of the public. Until the building code changes, or we figure out alternate ways to improve construction practices, we will continue to deal with predictable problems of safety and durability. Unfortunately, any significant changes in the building code are historically preceded by a tragedy. With as much evidence as we already have regarding performance issues, you would think that we could be proactive and make changes now, instead of waiting for the tragedy.

Students deserve safe and durable buildings; we are currently not doing a good job delivering. Just because something is allowed, or provides an attractive return on investment, does not make it a good idea. We have an opportunity to put the brakes on minimum code-compliant mid-rise wood frame student housing and implement requirements to improve construction practices. There are fellow engineers and architects, manufacturers of building components, and students and professors across the country who would likely be available to collaborate on revising existing standards and developing incentives for constructing better buildings. Others (elected officials, firefighters, building officials, and construction experts) are speaking out across the country to make changes to this segment of construction; now is the time to join the discussion, not after we allow more potential problems to be constructed!

We keep saying: “If you see something, say something.” I am saying something.

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Figure 1 – Letter to the editor sent March 18, 2018.

Figure 2 – View of damaged wood truss due to dynamic condition.



Figure 3 – View of collapsed floor framing.



After our most recent wood frame floor collapse case made national news in October of 2018, the letter above was sent again to both newspapers. They were asked to reconsider if the letter was relevant, and they were informed that the letter was responding to the floor collapse that was currently in the news. A response was never received from either newspaper, and the letter was never printed.

#### THE PROBLEMS

There are many factors that make the combination of mid-rise wood frame construction and student housing a predictable problem. Some of the factors are construction related and some are not, but all

can have an effect on the final product. The most significant factors are described below.

#### Inflated Real Estate Prices

Most student housing projects are located proximate (within walking distance if

I received a response from the newspapers that: 1) the topic was not relevant, and 2) I was not responding to anything.

Our firm has recently consulted on two collapses of wood frame floors and a collapse of a wood frame deck in student-occupied

buildings. College students have much greater potential of generating dynamic loading conditions on floor framing due to dancing and deciding to “see what happens if we all jump together!” as reported in one of our floor collapse cases (Figure 2).



Figure 4 – View of a building in various stages of construction.



Figure 5 – View of the interior of student housing building.

possible) to a college campus, in an urban environment, where land prices are at a premium. This is particularly true after the first mega-sized student housing project breaks ground. Adjacent landowners cash in on the student housing potential by selling any and all property near campus at inflated prices. The inflated real estate prices directly contribute to the poor construction practices by forcing the developer to: 1) maximize the scale of the project, 2) value-engineer all of the best-practice details out of the project, 3) build to code-minimum standards, and 4) select low-bid contractors.

### Unreasonable Contracts/Rushed Schedules

Because the economics of student housing are based on selling beds, most projects

are required to be completed in August, at the start of the fall semester, regardless of when the project was started. When a hard finish date is desired, contracts can become

unreasonable in terms of penalties and bonuses for late or early completion, respectively. The frenzy to complete projects in time to rent beds has resulted in haphazard

sequencing that has caused significant damage during construction.

A recent student housing project was damaged by water intrusion that was directed into the unprotected wood framing of the building due to improper sequencing of the roofing membrane and associated drains. This project required significant repairs before it was even completed.

Another project trapped water in the exterior wall assembly due to rain events that occurred while the walls were in a variety of stages of completeness. Areas of incomplete weather-resistant barrier (WRB) served to trap and funnel water into the wall assembly, where it remained while the wall construction continued, with no efforts to dry out the wall (Figure 4).

### Misguided Budgets/Delivery Methods

With so much student housing being constructed, the competition for selling beds is stiff. Since students care most about convenience and amenities, and less about quality construction, construction budgets get trimmed in all of the wrong places. Specifically, in all of these markets

there appears to be an all-out amenity war. It is no longer acceptable to only have a pool, lazy river, and fitness center. To attract more students, most current projects include volleyball, a DJ booth, hip communal spaces, frequent social functions, and an array of promotional giveaway gear fashioned in school colors (Figure 5).

The money spent on amenities and marketing makes it difficult to maintain adequate budgets for anything above and beyond code-minimum construction. Most of the student housing projects investigated to date have been constructed to minimum standards and lack durability, as evidenced by construction litigation and/or repairs that commenced within only a few years after completion.

### Value Engineering

“Value engineering” is the term used to describe an alternate product and/or detail that is associated with a savings in time and/or money that does not compromise the performance of the delivered product. It is unclear why the term “engineering” became associated with this process,

since engineers are rarely included. In most cases, this process is undertaken by the contractor and owner.

In the context of construction litigation, the author has observed that in nearly all cases in which value engineering was undertaken, the performance of the delivered product was compromised. While we have the technology and the products available to construct reasonably durable buildings, the specific product of mid-rise wood frame student housing is not conducive to implementing these “best-practices” due to schedule and budget constraints. In most cases, construction litigation is associated with these buildings being constructed to code-minimum standards, which (for this type of building) has repeatedly been found to be inadequate to provide reasonable durability as intended by the building code.

A recent example of a value engineering failure involved balcony waterproofing details. While the project plans depicted a well-known waterproofing system, a decision was made to replace the best-practices waterproofing system with a code-compliant waterproof coating over a flat wood balcony

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Figure 6 – View of water damage at balcony.

subfloor and cover the waterproofing with a concrete topping slab. Significant water intrusion and rot were documented within five years after the project was completed. The balcony repairs that are now required will be significant. Fortunately, no one was injured or physically harmed by the resulting damages (Figure 6).

### Disconnected Occupants/Improper Repairs

In owner-occupied buildings, problems are typically dealt with as they present themselves. In apartment buildings, problems are dealt with when the issue becomes serious enough for the tenant to complain about it. In student housing projects, the occupants are more disconnected and are less likely to complain about issues until they disrupt their quality of life.

In order to keep the buildings occupied, significant repairs are rarely performed. The author has observed multiple “repairs” that were simply performed to mask a problem, such as towels stuffed along windowsills to soak up water and repeated applications of paint and caulk. To perform a proper repair would involve evaluating the cause

of visible distress, potentially including destructive testing. This process would possibly interrupt the occupancy of a unit and impact rental revenue. Therefore, “band-aid” repairs are commonly implemented to temporarily deal with problems and satisfy the tenant. Meanwhile, the cause of the problem is not dealt with, and the damages grow over time.

### THE SOLUTIONS Liability Issues

In the author’s opinion, the IIBEC membership is the most qualified group of individuals to improve the durability and safety of mid-rise wood frame student housing projects. However, given the litigious nature of the construction industry, it is somewhat intimidating to offer assistance on these types of projects, regardless of one’s level of expertise and experience. While we may be offering solutions to temporarily improve building enclosure and/or structural performance, there remains a disadvantage to repairing large buildings that are framed with moisture-sensitive wood framing, tend to move more than most buildings, and are subject to potential abuse and/or misuse

by high-impact occupants.

In the author’s opinion, this is a real issue that will need to be addressed by IIBEC to protect its consultant membership against undue liability. Specifically, qualified IIBEC members should be able to offer assistance with original design and/or repairs to student housing projects without significant concern for exposure to litigation related to non-performance issues. Numerous construction litigation projects

have included qualified waterproofing consultants as defendants. In most cases, the consultant provided objective and thoughtful input to the project during construction. Many issues identified by the consultant (e.g., flashing details, flood testing, mock-ups, etc.) were not addressed by the contractor, and the consultant was sued by the overzealous plaintiff attorney without merit. Unless more robust agreements can be used, qualified and experienced consultants will remain in the crosshairs of construction litigation attorneys—particularly if there is viable insurance money available to collect. This could be the subject of an entirely different article.

### Occupancy Type

Should there be a student occupancy type added to the building code? In the author’s opinion, this should absolutely be considered. Many structural failures associated with wood-frame student housing projects are associated with the behavior of the occupant. If we allow college students to occupy these buildings, shouldn’t we anticipate college student behavior? This behavior could include dynamic loading

conditions, as well as live load conditions above and beyond those anticipated by typical residential occupancies.

### Construction Type

Should student housing greater than three stories be required to be Type 1 or 2 construction? This would be a simple solution to provide more robust buildings for this type of occupancy. As stated by the letter at the top of this article, there is a reason that college dormitories have traditionally been constructed to be commercial-grade structures that last for decades.

With minor exception, college-funded projects are still constructed in a more durable, long-lasting manner. However, the author is currently investigating problems with a wood frame dormitory project at a major university that has been taken out of service after only two years. In this case, the university was talked into value engineering the dormitory by switching the construction to wood framing—a decision that has resulted in significant problems, costly repairs, and displaced students.

### Best Practices

As an industry, we need to figure out how to provide incentives for contractors

to deliver buildings that incorporate best practices. These types of projects will continue to have significant problems (and costly repairs) if we continue constructing to code-minimum standards.

The 2018 International Building Code (IBC)<sup>3</sup> took a positive step by requiring the waterproofed surface of balconies to be sloped. While this may seem like a fundamental requirement, it was not previously addressed by the IBC, and thousands of wood frame balconies were constructed with waterproofing installed over flat (or reverse-sloped) wood framing. These conditions caused significant damages in a short period of time. This is only one example of a condition that has been allowed by the building code, but can result in damage and/or failure. Other examples of problematic conditions allowed by the code (that we should consider changing) include those in *Table 1*.

### CONCLUSIONS/CALL TO ACTION

If we continue to allow student housing projects to be constructed using typical mid-rise wood frame details, we can expect to continue investigating problems associated with numerous issues, including those identified by this article. If we do not

Code-Allowed Condition	Potential Consequence
Providing code-minimum slope on wood frame roofs	Deflection, ponding, roof leak, collapse <sup>4,5</sup>
Not providing good drainage details on balconies and walkways	Water intrusion, rot, deflection, collapse
Installing canopy anchors in brick veneer after the brick is installed	Compromised drainage plane, water intrusion, rot
Over-driving nails in coated OSB wall sheathing	Water intrusion, rot, corroded fasteners
Installing brick veneer against the bottom of a window <sup>6</sup>	Brick damage, window damage, water intrusion, rot
Not allowing for vertical and lateral building movements <sup>7,8</sup>	Broken plumbing fixtures, cladding component damage, water intrusion, rot
Constructing exterior walls with poor drainage characteristics	Water intrusion, rot
Not providing a vertical offset at balcony doors	Water intrusion, damage to interior flooring, rot
Not requiring a building envelope inspection	Poor construction details, building damage, construction litigation
Allowing paint to be used to provide fire resistance in wood construction <sup>9</sup>	Unknown fire resistance due to water damage, nail penetration, cut edges, abrasion, and absence of repairs

Table 1

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change our course regarding this type of construction, we will increase our chances of an eventual tragedy.

Collaboration is needed to make a change in this part of our industry. The author is currently working on putting together a group of college town municipalities in South Carolina that are affected by these issues and will propose code changes to the South Carolina Building Code Council for these types of projects. Please consider stepping up to do your part to make a change. 

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A 17-story apartment building in Montpellier, France, looks a bit like a white porcupine on steroids. L'arbre Blanc, meaning "White Tree," is a unique building with some of the largest balconies available in residential construction. The winner of a competition that was intended to bring more experimental architecture to the city, the curvilinear structure is across the Lez River from the Antigone complex. It was conceived by Tokyo architect Sou Fujimoto working with Parisian architects Manal Rachdi, Nicolas Laisné, and Dimitri Roussel.

The kidney-shaped building has 113 luxury apartments—many with cantilevered balconies—some as long as 25 feet out from the building and formed of built-up welded sections and bolted to vertical steel H-beams fixed to the concrete floor slabs. Steel pergolas serve as sun-breakers above the balconies.

The reinforced-concrete column-and-slab structure and enclosing walls rely on faceted planes to bend around corners.

The building includes a rooftop bar and restaurant, and an art gallery is housed in the base, with coworking office space on the floor above.

To view a video of the building, visit <https://www.youtube.com/watch?v=z8mHwpMi6uQ>. Our French-speaking readers can watch this video about the building's construction: <https://www.youtube.com/watch?v=-weeTAqxuoc>.



## L'arbre Blanc Branches Out

*Photo by SFA+NLA+OXO+DR*