The Hamptons at MetroWest, a Case Study of an Investigation Into the Causes For Structural Rot Damage

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ABSTRACT

The Hamptons at Metro West, a wood-framed condominium complex located in Orlando, Florida, has suffered extensive long-term large-scale structural wood decay. Framing members inside the stucco-covered exterior walls had rotted to the extent that they provided little or no structural support, and the walls had begun to sag away from the main structure. Large sections of stucco had become detached and begun to fall from the buildings. Exterior balcony floor framing was so decayed it could no longer provide adequate support. Problems with the construction of building envelope weather protection systems were ignored or poorly understood, leading to the long term underestimation of the causes, repair and extent of damage. It was not until a thorough forensic investigation was undertaken, beginning approximately eight years after construction was completed, that the causes for and the full extent of the structural damage was understood sufficiently for a repair protocol to be developed. This paper discusses the forensic investigation undertaken to identify the sources of water intrusion, the rot damage they produced, and the efforts to maintain the buildings safe and habitable during the four-year litigation process.

PROJECT DESCRIPTION

The Hamptons at MetroWest consists of a residential condominium development, located within a major mixed-use development called MetroWest near Universal Studios Park, in southwest Orlando, Florida.

The project consists of seven-hundred-forty-three residential units and thirty retail units, spread over fifty-nine buildings, plus a gymnasium, two pool buildings, trash compactor enclosure, mail kiosks, and a guard house/entry gate.

The buildings are divided into three basic types, historically referred to as the Flats, the Big Homes and the Townhomes. Although different in appearance the three types all share the same manner and materials of construction, so that notwithstanding the unit or building type the same roof, window, and exterior wall assemblies were used and installed.

Photo 1 – Building 41 at The Hamptons.

The Flats are typically three-story buildings except along Turkey Lake, where they have a partial basement level facing the lake and resultant four story elevations. All Flats have stacked exterior balconies, except for Buildings 2 and 41 at the project entry which have additional open balconies at the second level and commercial units along the front of the bottom level. There are a total of sixteen Flat buildings on site.

The Big Homes are two-stories in height with typically six to eight units per building. With large sloping roofs and partial second levels, they resemble large single-family dwellings. They are the most common building type with a total of thirty-one buildings.

The Townhomes are townhome-style units, resembling typical brownstone buildings. They are two stories in height, with five units per building and a garage basement at the rear. There are a total of twelve Townhome buildings.

All construction is wood-frame over monolithic concrete slab-on-grade foundations. Exterior finishes are one-coat fiber-reinforced stucco plaster. Roofs are pitched with composition shingles and small areas of standing seam metal roofs. Roof and floor framing consists of gang-nailed trusses. The project was originally designed and built as the Park Avenue at Metrowest Apartments. Construction took place between 2000 and 2001. The buildings were subsequently converted to condominiums in 2005.

PROJECT HISTORY

Beginning with its tenure as apartments and continuing after conversion to condominiums, water intrusion had historically been a problem at The Hamptons. Attempts had been made to address stucco cracks and window leaks through the application of additional caulking and other repairs handled by the maintenance staff. Because the underlying problems were much more complicated than what could be addressed through regular maintenance, the water intrusion worsened along with the manifestations of damage such as stucco cracking and mold growth.

Although the association at one time retained an engineer to prepare a report, that firm's investigation did not go far enough into the causes for the water intrusion. As a result, the recommendations from the resultant report were insufficient to arrest the entry of weather-related moisture through the building envelope and then resultant on-going wood decay of structural elements.

By 2008, the existence of severely damaged exterior walls was becoming more evident, particularly at Buildings 2 and 41. These two buildings had been designed with retail units along the bottom level. A walkway runs along the front of the retail units, covered by the open exterior balconies of the residential units above. Sections of the ceilings over the first floor walkways under the open balconies collapsed, exposing the decayed floor sheathing, framing trusses and wall elements. A temporary (un-engineered) shoring was erected by the condominium association.

The second floor exterior wall framing was partially exposed by removing sections of drywall from some of the Building 41 interior wall faces and was found to be heavily damaged: The exterior OSB sheathing had largely rotted away, and most of the wall studs were largely rotted and decomposed, to the extent that they would be considered incapable of supporting load. This situation triggered concern at the City of Orlando building department, and condemnation of Buildings 2 and 41 as structurally unsafe was considered.

Marcon Forensics' (Marcon) initial visit to the site occurred in March, 2008. After analyzing the original plans, Marcon determined that the majority of the damage was to non-bearing exterior walls and that Buildings 2 and 41 were in no immediate danger of collapse. However, localized failures remained a possibility, particularly from possible hurricane winds, and the damaged floors at the second floor exterior balcony floors were not capable of providing proper support.

Because of the collapsed ceilings, Buildings 2 and 41 were judged to be the most heavily damaged and in need of immediate attention. In order to fully determine the causes for the water intrusion and to better understand the extent of structural damage, destructive testing was initiated on those two entry buildings at the beginning of summer of 2008.

An engineered shoring system was designed and installed under the Buildings 2 and 41 damaged second floor balconies. Based on the findings from the destructive testing, a repair for the exterior walls and balconies was designed and plans for the work were approved by the City of Orlando. Unfortunately, the repair work could not be undertaken at the time due to the Hamptons Condominium Owners Association's (the Association) lack of funds.

Since all buildings at The Hamptons regardless of type shared the same materials and type of construction, suspicion existed that the same defective construction would exist in the other buildings on site. Additional destructive testing was done on other buildings in July, 2008. This testing confirmed that due to similarities in construction materials and means and methods used, the same defective construction discovered at Buildings 2 and 41 existed at all other buildings in the project. Moreover, in some cases the level of wood decay structural damage was on par with that observed at Buildings 2 and 41. The expanded testing established the commonality of the defective construction, water intrusion sources, and extent of structural damage throughout the project.

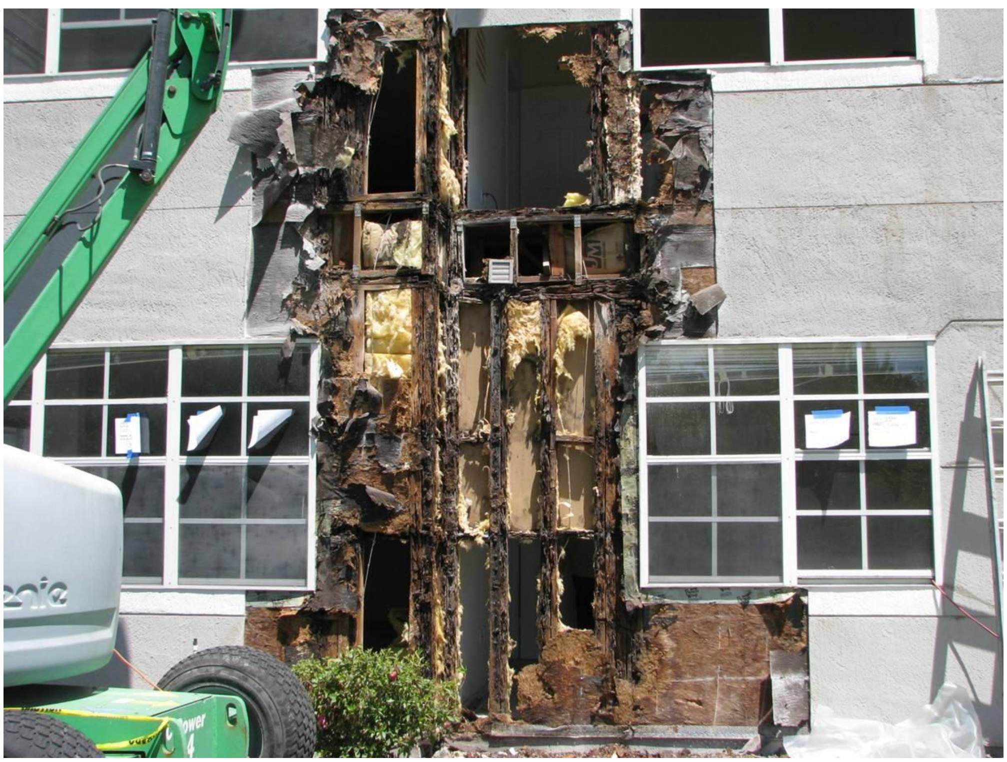

Photo #2 – Rot decayed wall framing.

The destructive testing also established that because of the multiple water intrusion streams through the building envelope, localized repairs would not provide substantial relief from the resultant wood decay structural damage. Localized repairs would also deplete Association funds without providing permanent solutions. The most cost-effective permanent repair would be a global repair, where all defective conditions are repaired at one time.

Based on the test findings, the Association decided to pursue a lawsuit against the original builder and developer, seeking funds to repair the defective construction and consequential damage. A risk assessment was made and a decision reached that the risk of localized failure was acceptable over the expected term of the lawsuit, as long as no danger of general structural collapse existed. Localized failures would be dealt with if and when they occurred, as emergency repairs. Over the life of the lawsuit this created some tense moments with tenants when they were told problems would not be repaired (unless it was a structural emergency) pending final resolution of the case.

Destructive testing was expanded in March and April, 2010, to include a wider sampling of building types. The 2010 testing again exposed the systemic nature of the defective construction and damage level observed during the initial testing regardless of building type, location, or orientation.

Photo #3 – Decay damage at un-flashed dryer vent.

An initial report of findings was published by Marcon in September, 2008. This report outlined any defective construction observed as installed in violation of the building codes in effect at the time of original construction.

Building code violations were found in all areas of construction, but particularly at weather protection systems, which had allowed weather-related moisture to penetrate the building envelope and damage the wood-framed structural systems. A follow-up report was published in November, 2010, after the 2010 testing. This report focused more on defective construction issues done in violation of the building code *and* resulting in damage (as opposed to just done in violation of the building code), and on the extent of that damage. It also presented a scope of repairs to address those deficiencies.

TESTING PROGRAM

Test procedures used publications such as SEI/ASCE 11 ("*Guidelines for Structural Condition Assessment of Existing Buildings*") and SEI/ASCE 30 ("*Guideline for Condition Assessment of the Building Envelope*") as base guidelines, adjusted for past experience and the specifics of the work scope. These publications provide excellent suggested (although not required) frameworks for establishing test protocols. The investigation included a mixture of visual inspections (SEI's "Preliminary Assessment"), plus destructive testing and analysis of available documents (SEI's "Detailed Assessment").

Over one hundred and thirty-six units were visually inspected (roughly eighteen per cent) and over seventy-six units were destructively tested (roughly ten per cent). Additional data was collected from units that required emergency repairs.

Destructive testing involved removing sections of the buildings' exterior or interior finishes to expose the framing below. These cuts need to be large enough to provide ease of investigation and a significant basis for findings. For this work a licensed general contractor was retained, who was able to not just cut, remove, demolish, pry and otherwise destructively expose an area of wall, roof or balcony, but was also able to put it all back in an acceptable manner.

Access to exterior walls and roofs was by "cherry-picker" style lifts, one dedicated to wall/window cuts and one dedicated to roof testing. In order to minimize the impact on tenants, all interior testing concluded by 2:00 pm, allowing the contractor time to cover and texture the test openings by the end of each day. Exterior stucco cuts were completed by 4:00 pm, to allow for the installation of temporary weather protection. All stucco cuts were completely re-patched within a week. Roof testing concluded by 2:00 pm each day, to allow for the complete replacement of all roofing by the end of the day.

The testing used a "peel-the-onion" approach. Layers of architectural finishes were removed consequentially in a reverse order of original installation to expose the structure underneath, and with as little disturbance to the lower layers as possible. This required the constant presence of testing personnel to direct, provide guidance and document. Data collection was photo-based. Each photograph taken was identified by:

- Photo number.
- Date photo was taken.
- The initials of the person taking the photograph.
- The overall location of the photograph (address, building number).
- A more detailed location of the photograph (floor level, unit number).
- A specific location for the photograph (destructive test cut number, room identifier).
- An in-house developed code number identifying a specific construction category (i.e., "Flashing around window").
- A brief field observation of what is shown by the photograph).

By the time all testing was completed, over 14,000 photographs had been taken. This large a sample size required a search and catalogue system. Fortunately, Marcon developed a proprietary in-house database system (the "*Building Analysis Database And Search System*"), that allows for relatively easy search of data once the information is downloaded.

The selection of the locations to be tested was based on a mix of random number generation, the even spread of the results over the entire site, and availability of units. This method led some to grumble that the selection of locations was not done in a truly random manner. While this is true, a truly random selection would not have provided the best sampling.

FINDINGS

The investigation of the buildings concluded that all buildings onsite, regardless of type, location, or orientation suffered from widespread decay damage to the wood structural components of the exterior walls and balconies, rendering them incapable to perform their intended structural support function. Wall studs, floor and roof sheathing, beams and headers, floor and roof trusses have all been extensively damaged. Exterior wall elevations have exterior rot damage that exceeds 60% of wall areas. In the Flats, exterior wall rot damage exceeds 90% on some elevations. This damage had come as the result of sustained long-term water intrusion from defective installations of weather-protective components of the building envelope such as the roof, the stucco, the windows and doors, and the waterproofing of the balcony decks.

The water intrusion problems were systemic and directly the result of construction that violated the requirements of the building code in effect at the time of original construction, of the approved plans and specifications and of manufacturers' installation requirements. These problems included, but were not limited to, the following:

- Roof flashing was installed so as to direct rainwater into exterior wall cavities, rather than diverting it away.
- The original standard 7/8" thick stucco was replaced with fiber-reinforced 3/8" one-coat stucco, in violation of the approved plans and against the design architect's recommendation. In a cost-saving move, the plans were never revised to show and detail the new 3/8" stucco. The stucco installation violated the manufacturer's installation requirements and had a systemic myriad of water intrusion problems such as: Reversed lapped weather barriers; Un-flashed wall penetrations; Building paper installed over reinforcing wire lath, preventing embedment in the plaster; Tops of handrail walls with unsealed handrail fastener holes, providing a means for water to enter the wall cavities; Short lath staples not embedded in the framing, or too few in number, resulting in stucco sections literally falling off the buildings.
- Although the plans required the installation of building wrap under the stucco weather barrier and lapped inside of window openings, in a cost-saving move the wrap was deleted by the developer.
- All windows leaked at the sill corners and intersections of the sill and vertical mullions. Because the specified building wrap had been deleted from the construction, the windows leaked directly into the exterior wall cavities.
- While the plans called for a decorative foam band around the windows, a stucco band was used instead. The installation used a large number of staples, which tore the "peel-and-stick" flashing around the window allowing water to penetrate into the wall cavities around the window perimeters.
- The deck floor membrane at the exterior balconies was installed without a means for water to exit, resulting in the retention of water between the concrete floor fill and the deck membrane.
- Flange-less dryer vents were installed without any flashing around the edges, allowing water to penetrate into the wall cavities.
- The exterior balconies' deck membranes were not continuously sealed along the edges, or had fasteners penetrating through them, allowing moisture to reach the wood substrate.
- Deck scuppers installed without flanges on the outside (weather) side of handrail walls, resulting in unsealed penetrations though a stucco wall.

The only positive finding was that the wood decay damage extent was largely confined to the exterior building envelope. Interior walls and floors were largely undamaged. The design of the buildings made use of the interior walls as shear walls, so that the loss of the exterior walls to wood decay damage did not severely compromise the buildings structurally against wind loads (a point made to the city building department when arguing against condemnation of the buildings).

However, concern existed for the bearing capacity of three and four story bearing walls that had mostly rotted away. The condition of the walls could lead to localized failures of exterior wall sections under hurricane force winds. In addition, the continuous water intrusion problem results in mold and water ingression into the living areas. These walls were continuously monitored for signs of structural distress such as additional cracking of the stucco and physical sagging of the exterior walls.

EMERGENCY REPAIRS

While the Association continued to seek ways to finance a global repair, the ongoing water intrusion continued to wreak havoc with the buildings. In some areas the wood decay damage to the structural support members became so problematic, emergency repairs had to be implemented.

The extensive wood decay damage to the three and four-level exterior walls of the Flats buildings facing the lake led in 2010 to the decision to install emergency shoring under the bearing walls. Because the worst decay damage occurred in the lower levels, the shoring was installed in the basement and first levels. In order to accommodate continued occupancy of the units, new temporary bearing walls were built six inches inside the face of the old walls. The new walls were finished with drywall, and electrical, phone and cable outlets were relocated to the new walls. It was not a repair, but it provided a temporary means to safely maintain the units occupied.

At other three-story Flats exterior wall elevations, exterior shoring was added under bearing walls when they were observed to sag and develop additional stucco cracking.

The balconies have been particularly problematic in that wood decay damage occurs to the lower level vertical support members as well as to the balcony floors. Two buildings (Building 51 and Building 26) have required complete basement-to-third level removal and replacement of a balcony stack. This repair included the complete replacement of corner box columns and handrail walls, and partial replacement of the balcony floors.

Shoring has also been added to some exterior wall locations at the Townhomes, where the garage header was determined to be too damaged by decay to provide unaided support. No shoring has yet been necessary at the Big Homes, although rot and water intrusion have required spot repairs of roofs and exterior walls. A number of buildings have required the removal of sections of stucco that had either through poor anchoring of the lath to the framing or because of the decayed nature of the wood substrate, become detached from the building and were threatening to collapse.

Photo #4 – Stucco detaching from building.

Already mentioned was the un-engineered shoring that was initially installed at the Buildings 2 and 41 exterior walkways to support the second level balconies following the ceiling collapse, replaced later with an engineered shoring system. Over the last few years the framing members have continued to decay to the extent that there is very little left to shore up. The stud walls at the lower levels had completely decayed away and could no longer provide support for the slightly less severely damaged walls above. The entire exterior wall building façade had begun to sag away from the building. At this point there was simply little choice but to proceed with a global repair of the entire exterior façade.

Fortunately, the Association was able to collect some funds at the end of 2011, sufficient to underwrite the repair of these two buildings. Repair plans for Buildings 2 and 41 were updated and the repair work is set to begin in the summer of 2012.

FINAL REPAIRS

Given the extent of defective construction and of structural damage, the repair concept requires the removal and replacement of the building envelope components currently allowing water to penetrate and damage the wall and floor cavities. This will include:

- The removal of sections of roof to install proper flashing along the edges.
- The removal and replacement of the entire exterior stucco system.
- The removal and replacement of all windows.
- The removal and reinstallation of a balcony waterproofing system.

In addition, all decay damaged framing will need to be removed and replaced. This is expected to include 100% of the exterior wall framing at the lower floors, with diminishing replacement required for the upper floors. Based on past emergency repairs, the exterior balconies are expected to require removal and replacement of all the perimeter framing and at least most of the support box column framing.

All windows tested leaked, and it is assumed that all windows on site leak. The water intrusion thus generated is directly diverted into the wall cavity. This will require the removal of all existing windows and re-installation of new windows. The re-installation will include the use of building wrap, and the installation of a peel-and-stick water dam over the framed sill of every window.

CONCLUSION

The Hamptons at Metrowest is a case history of the consequences of poor wood construction in a wet climate. Where a constant exposure to weather would seem to require a higher level of care, builders instead responded with a lower threshold of protection against the elements. Similarly, building codes and building officials failed to provide a proper level of protection for the general public. Finally, it represents a case history for what can happen when forensic investigations do not go far enough to properly identify the extent of the problem and the resultant damage. The result, though predictable, has weighed heavily on the residents of the Hamptons at Metrowest.