

May 20, 2019

Westwind at Vail HOA
c/o Mr. Steven MacDonald
President
Vail Management Company
P.O. Box 145
Vail, Colorado 81658

Re: Report on Limited Engineering Evaluation of Balconies
Westwind at Vail
548 S Frontage Rd W, Vail, Colorado 81657
BC&E No. 19035

Dear Mr. MacDonald:

In general accordance with our proposal dated February 26, 2019, BC&E, LLC has completed a limited engineering evaluation of the existing balconies at the Westwind at Vail. The following report summarizes our observations, opinions, and recommendations for repair.

PURPOSE AND SCOPE OF OUR LIMITED EVALUATION

The purpose of our limited engineering evaluation was to observe portions of the concealed plywood deck and wood framing at the second, third, and fourth floor balconies and provide our opinions on their condition and whether further evaluation and/or repairs may be necessary. We also made limited observations at the first-floor balconies. We did not analyze the structural systems, check the original structural design, or perform any testing.

Our limited, initial evaluation included the following to date:

1. On February 19, 2019, we met at the property with Jeff Jacobs (General Manager), Don Meier (Unit Owner), and William Markus (Unit Owner) to briefly review the scope of the evaluation and to visually observe several of the balconies.
2. We reviewed relevant portions of the original architectural and structural drawings by Anderson, Barker, Rinker Architects, to become familiar with the intended balcony design.
3. We reviewed the Asbestos Sampling Report for the popcorn soffits located on the underside of balconies on floors 2 through 4, dated April 4, 2019, by Element Environmental.
4. We visited the site on April 22, 2019, to perform initial visual observations, document locations of distress in the concrete slabs and finishes installed on the underside of the balconies, and measure slope at each balcony. While on site, we selected locations for exploratory openings into two concrete topping slabs and five soffits.

5. We visited the site again on April 25, 2019, to document the condition of visible portions of the wood framing and plywood sheathing at the exploratory openings.
6. We prepared this report summarizing our findings, initial opinions, and preliminary recommendations for repairs.

Description of Balconies and Document Review

According to documentation made available online by the Eagle County Assessor's Office, the multi-family residential property was originally constructed in 1969 and the architect is Anderson, Barker, Rinker. The building consists of four residential levels constructed around a central, exposed courtyard and located above one level of below-grade parking.

As-built Drawings

There are approximately 36 balconies at the property. The first-floor balconies are supported by precast concrete double tees which are the lid of the below-grade parking structure. The drawings indicate that a waterproofing membrane was installed over the double tees and a concrete topping slab was installed over the waterproofing membrane (*Figure 1*). The drawings indicate that the second, third, and fourth floor balconies are wood framed with a plywood deck and concrete topping slab installed directly on the deck (no waterproofing membrane is indicated on the drawings) (*Figure 2*).

We understand that the second, third, and fourth floor balconies were originally cantilevered out from the building walls, and around the year 1994, columns were added for additional support after the balconies were observed to be sagging. See *Figure 3* for a plan of the third floor showing typical balcony locations, although location varies slightly with each level, and locations of added columns shown with red arrows. See *Photo 1* for a typical balcony tier.

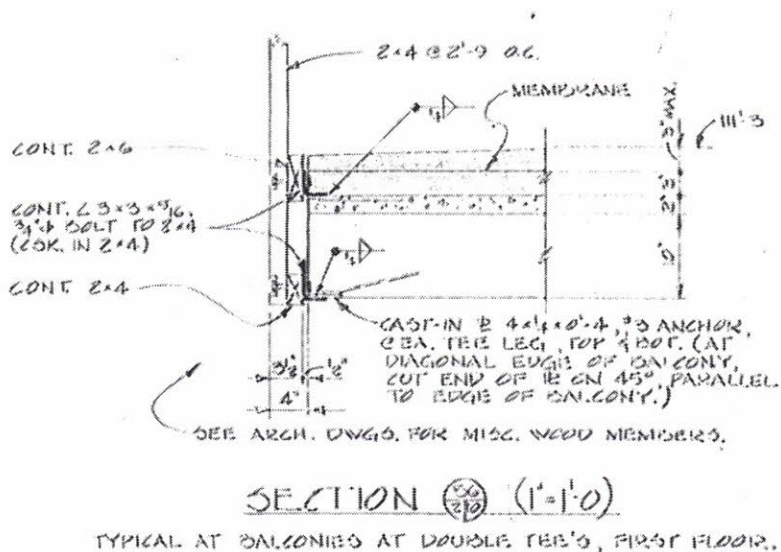


Figure 1. Section through first floor balcony (*Structural Drawings*).

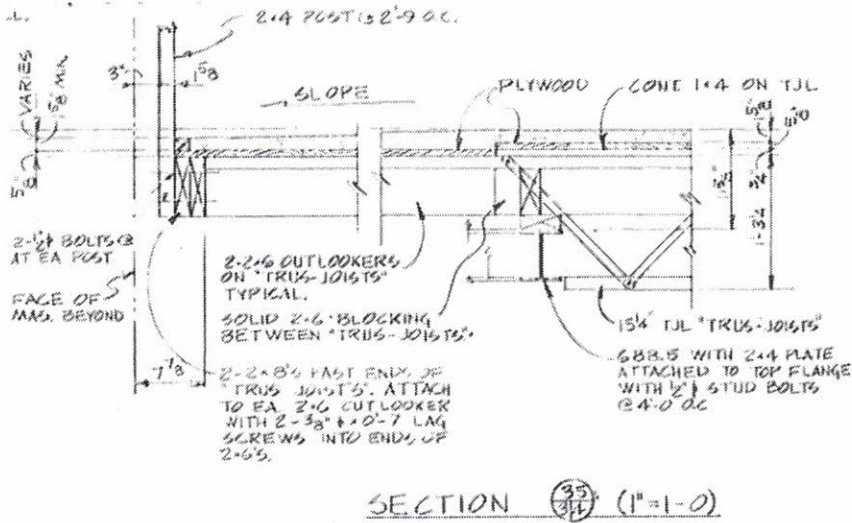


Figure 2. Section through 2nd-4th floor balconies (Structural Drawings).

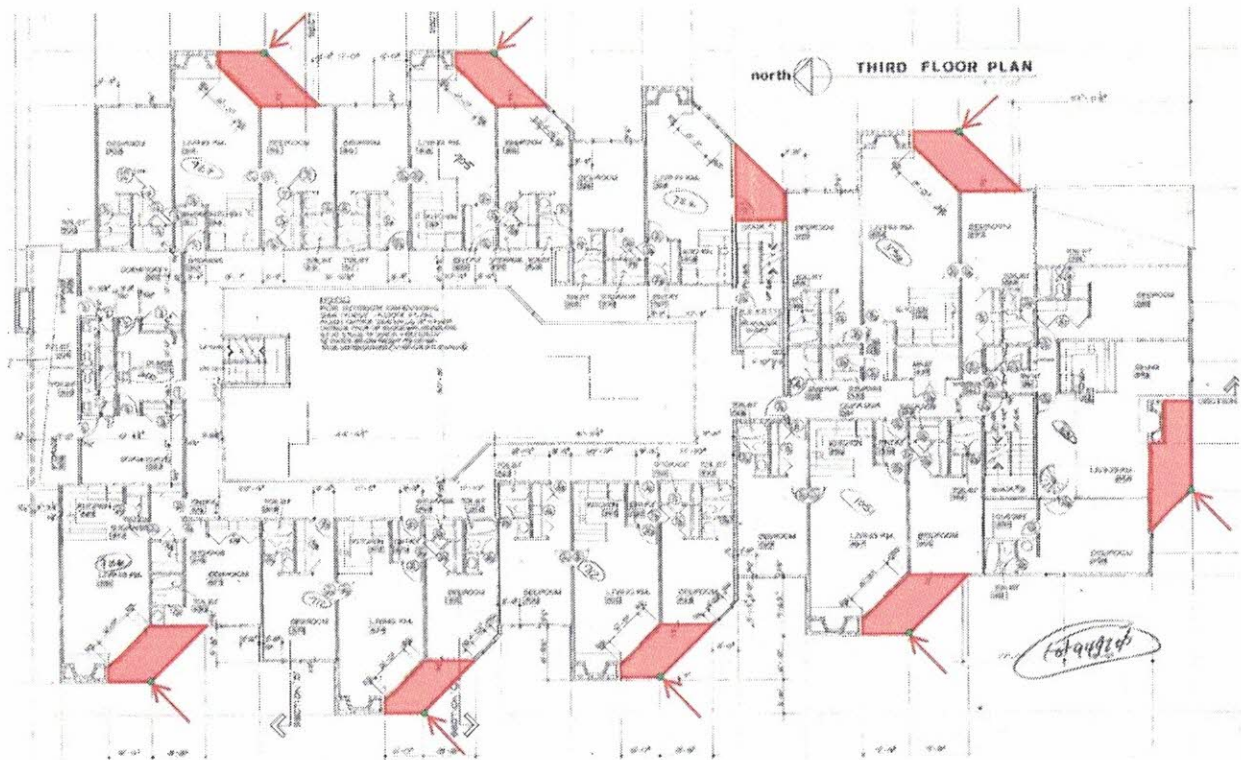


Figure 3. Third Floor Plan (Architectural Drawings). Note added columns indicated with arrows.

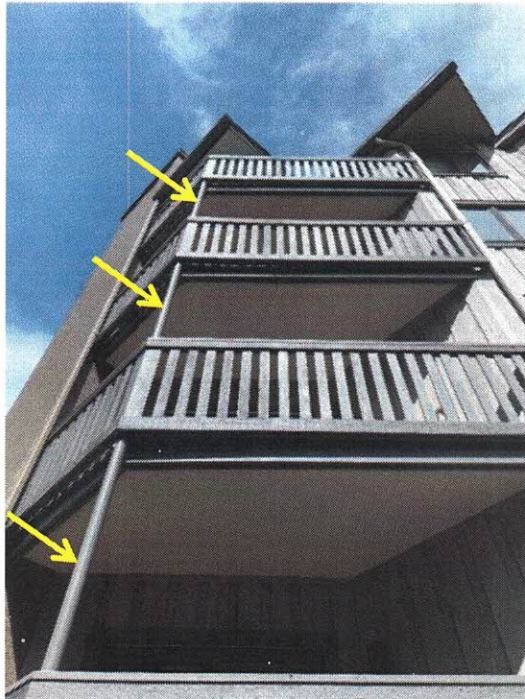


Photo 1: Typical tier of balconies (2nd through 4th floors). Note supplemental columns indicated by arrows.

Asbestos Sampling Report

Popcorn finished ceilings installed on structures of similar age often include asbestos containing materials (ACM) which can be hazardous if not handled properly. Therefore, the Westwind HOA retained Element Environmental to perform limited initial testing at the balcony soffits of Units 304 and 306. Sampling included testing of the popcorn texture, joint tape, joint compound, and drywall. No ACM were found in the samples tested. Note that per the report (attached), additional sampling will need to be performed to be sufficient for permitting of any repair work that disturbs the soffits.

Field Investigation

Visual Survey

We performed a visual survey and took level readings at each balcony. The following is a summary of our observations.

The design of the balconies for floors 2 through 4 is such that water is managed by draining over the outside edges. We took level readings at each balcony and found that the concrete topping slabs are typically sloped 1/8 to 1/4 inch per foot toward the outside edge. This amount of slope is what is typically recommended for proper drainage on balconies. We did not observe any balconies which exhibit negative slope, i.e. are sloped toward the building walls instead of the outside edge.

The non-structural concrete topping slabs are generally in good condition given their age and exposure to moisture. Limited cracking was typical (*Photo 2* and *Photo 3*). We observed isolated deterioration at the edge of some topping slabs (*Photo 4*).

Carpets are installed over the topping slab on a majority of the balconies (*Photo 5*). We pulled back the carpet at some balconies where it was not adhered but the carpets prevented us from viewing the slab at a majority of the balconies. When we did peel back the carpets, there was often moisture trapped below the carpets and the adhesive residue remained on the slab.



Photo 2: Crack in concrete topping slab.



Photo 3: Crack in concrete topping slab below carpet covering. Note yellow residue from failed adhesive.



Photo 4: Concrete deterioration at edge of concrete topping slab.



Photo 5: Balcony with carpet covering.

At several balconies we observed tile installed over the concrete topping slab (Photo 6) or coating (Photo 7 and Photo 8). A variety of coatings were observed which appeared to include paint, elastomeric coatings, and cementitious coatings. Only a few concrete topping slabs remain uncovered and exposed. We observed relatively minor deterioration of wood trim around the perimeter of the balconies (Photo 8). The joint sealants installed between the slab and the claddings are typically deteriorated. Debonding and gaps at the edges of the sealant are apparent (Photo 9).



Photo 6: Tile installed over concrete topping slab.



Photo 7: Minor deterioration of wood trim adjacent to balcony. Note the balcony at this location has been coated.



Photo 8: Deterioration of wood trim adjacent to balcony. Note the balcony at this location has been coated.

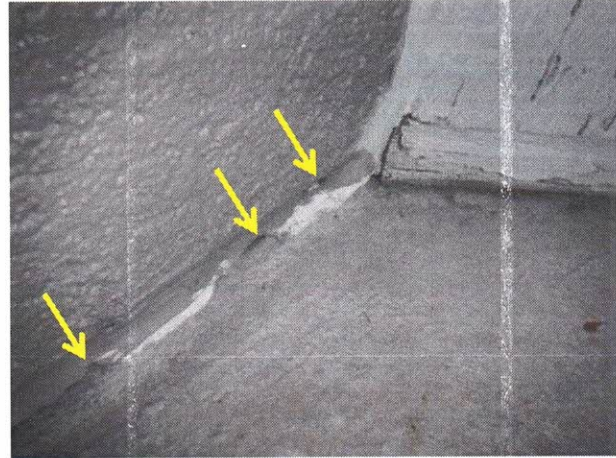


Photo 9: Gaps in perimeter joint sealant.

The guardrails on the balconies appear to be attached to the building at each end, and through the face of the two wood rim joists along their length (Photo 10 and Photo 11). Deterioration is concentrated at the outside edge of the balconies. We observed isolated concrete deterioration at the edges in the form of scaling, spalling,

and voids (*Photo 11*). We typically observed deteriorated joint sealant between the top edge of the rim joist and the concrete topping slab (*Photo 12 through Photo 15*). The sealant is aged and has typically failed adhesively and is no longer bonded.

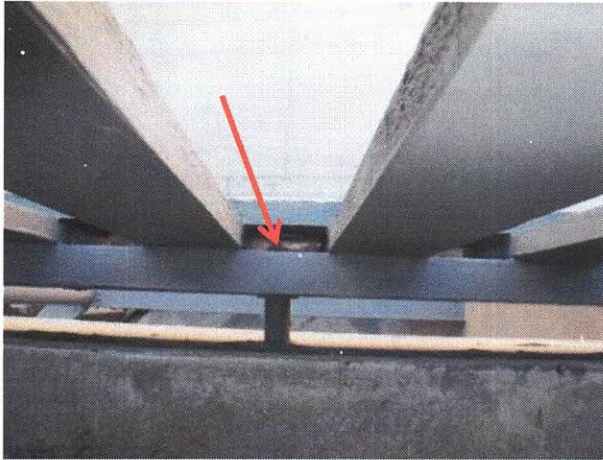


Photo 10: Guardrail is attached through face of rim joists (typical).



Photo 11: Guardrail is attached through face of rim joists. Note void in concrete at edge of balcony.



Photo 12: Deteriorated joint sealant at edge of balcony.



Photo 13: Deteriorated joint sealant at edge of balcony.



Photo 14: Deteriorated joint sealant at edge of balcony.



Photo 15: Deteriorated joint sealant at edge of balcony.

Gypsum board with a popcorn textured plaster is installed on the soffits (underside) of the second through fourth floor balcony decks. We observed isolated areas of deterioration concentrated near balcony edges, and below balconies which are more exposed to moisture. In some cases, the plaster finish is sagging (Photo 16) or has peeled/flaked off of the gypsum board substrate (Photo 17).



Photo 16: Popcorn finish at soffit is deteriorated.



Photo 17: Popcorn finish at soffit is deteriorated.

Exploratory Openings

Westwind maintenance staff created exploratory openings into two concrete topping slabs and five soffits at balcony locations selected by BC&E to allow us to observe and document the condition of the underlying plywood sheathing and wood framing supporting the balconies since they are concealed by finishes. We selected locations for the exploratory openings that exhibited some level of deterioration at the surface.

Topping Slab of Unit 404 and Soffit of Unit 304

An exploratory opening was made into the concrete topping slab of Unit 404. The slab is 1-3/4 inches thick at this location and welded wire reinforcing is present in the slab. The reinforcing only exhibits minor surface corrosion and the slab cross section is in good condition at this location. An unbonded layer of black membrane or sheet is present between the plywood sheathing and concrete slab (Photo 18). It appears to consist of two plastic sheets with some type of fabric reinforcing in between. This material resembles the membrane found below the courtyard topping slab which was found to contain asbestos; therefore, we recommend that that Association retain an environmental consultant to test the membrane for ACM prior to any repairs being performed.

The plywood sheathing is stained and was noticeably moist at the time of our site visit. We used a hand-held moisture meter and measured moisture contents in excess of 40 percent (readings in excess of about 15 percent are considered the threshold for problematic moisture levels). Westwind maintenance staff noted that there was moisture below both of the concrete topping slabs at the time they created the openings. We were able to push an awl through the sheathing with little force (Photo 19). We drilled through the sheathing at several locations and observed dark-colored, moist, and soft shavings at each location indicating deterioration of the wood materials (Photo 20).

An exploratory opening was made into the soffit at Unit 304, directly below the balcony of Unit 404 (Photo 21). The plywood sheathing is in poor condition at this location. The visible portion of sheathing is heavily stained, almost black in color (Photo 22). Similar to the top side of the sheathing, we were able to push an awl through the sheathing with little force (Photo 23). Staining was apparent on the visible portions of joists, but shavings produced by drilling through the joists were firm, although they exhibited dark discoloration near the surface. Drill shavings through the rim joists were soft and discolored through the thickness of the member indicating that the wood materials of the rim joists are deteriorated.



Photo 18: Exploratory opening into concrete topping slab. Note the presence of a black membrane over the plywood sheathing and staining on the sheathing. (Unit 404)



Photo 19: Awl was able to penetrate through the plywood sheathing with little force. (Unit 404)



Photo 20: Plywood shavings are moist and soft. (Unit 404)



Photo 21: Exploratory opening into soffit. (Unit 304)

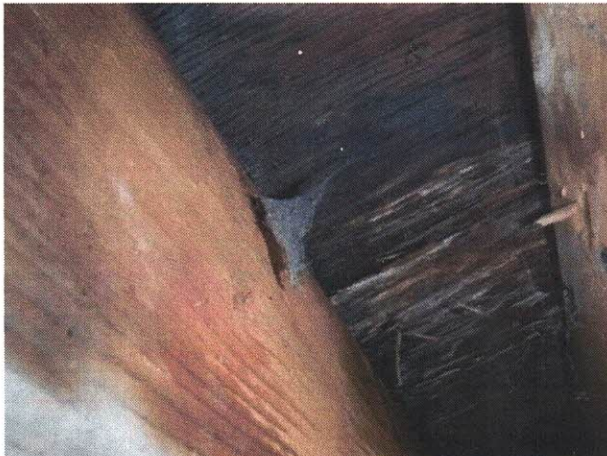


Photo 22: Plywood sheathing is heavily stained, almost black at all visible areas. (Unit 304)



Photo 23: Awl was able to penetrate through the plywood sheathing with little force. (Unit 304)

Topping Slab of Unit 407

An exploratory opening was made into the concrete topping slab of Unit 407. The slab is 1-3/4 inches thick at this location and welded wire reinforcing is present in the slab. Similar to Unit 404, the reinforcing only exhibits minor corrosion and the slab cross section is in good condition at this location. A black membrane similar to that described at Unit 404 is present.

The plywood sheathing was moist at the time of our site visit and exhibited minor staining in a corner of the exposed area (*Photo 24*). At the stained area, we measured moisture contents above 33 percent (*Photo 25*), while the unstained area measured approximately 8 percent. Awl penetration was relatively minor at 1/8 inch to 1/4 inch. Drill shavings were generally firm and dry but were flakey, dry, and discolored at the stained corner.



Photo 24: Exploratory opening into concrete topping slab. Note lower right-hand corner of sheathing is stained. (Unit 407)



Photo 25: Moisture content reading of 33.6 percent at plywood sheathing. (Unit 407)

Soffit of Unit 302

An exploratory opening was made into the soffit at Unit 302 (*Photo 26*). The plywood sheathing is in poor condition at this location. Heavy staining is apparent on the sheathing and joists (*Photo 27*). We also observed the presence of white-colored organic growth in the sheathing at multiple areas (*Photo 28* and *Photo 29*). The outer layer of wood sheathing is no longer bonded and we were able to push an awl through the sheathing with little force (*Photo 29*). Moisture content readings at the sheathing ranged from 7 percent in unstained areas to 20 percent in stained areas.



Photo 26: Exploratory opening at soffit. (Unit 302)



Photo 27: Staining is apparent on sheathing and joists. (Unit 302)



Photo 28: Organic growth is present on the plywood sheathing (arrows) and the outer layer of the sheathing is no longer bonded. (Unit 302)

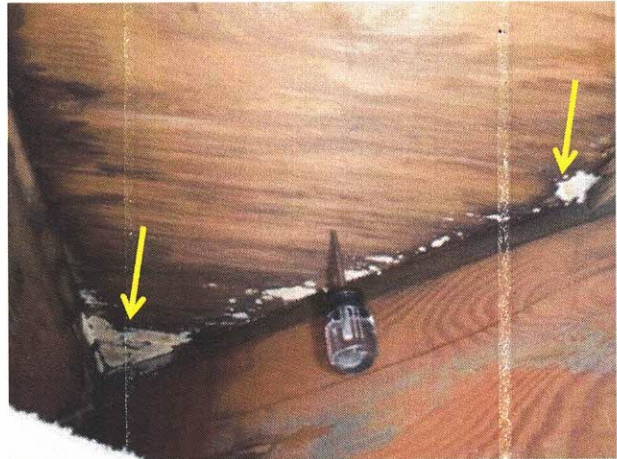


Photo 29: Organic growth is present on the sheathing (arrows) and an awl was able to penetrate through the plywood sheathing with little force. (Unit 302)

Soffit of Unit 209

An exploratory opening was made into the soffit at Unit 209 (*Photo 30*). The plywood sheathing is in good condition at this location. Staining is present on the wood framing around the bolts which connect the balcony to the supplemental column (*Photo 31*). Moisture content readings at the sheathing ranged from 7 to 9 percent. Awl penetration at the sheathing was minimal, 1/8 inch.

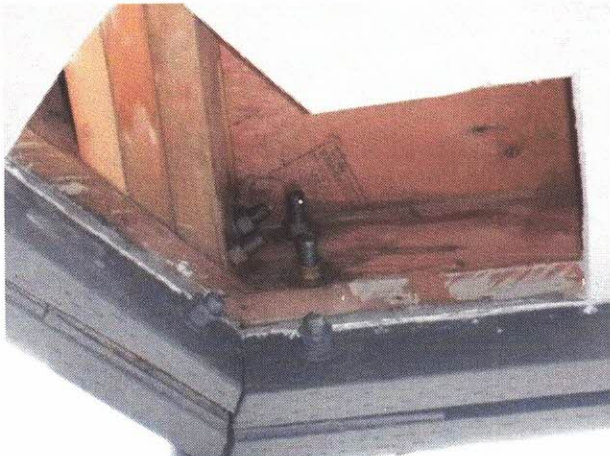


Photo 30: Exploratory opening at soffit. (Unit 209)

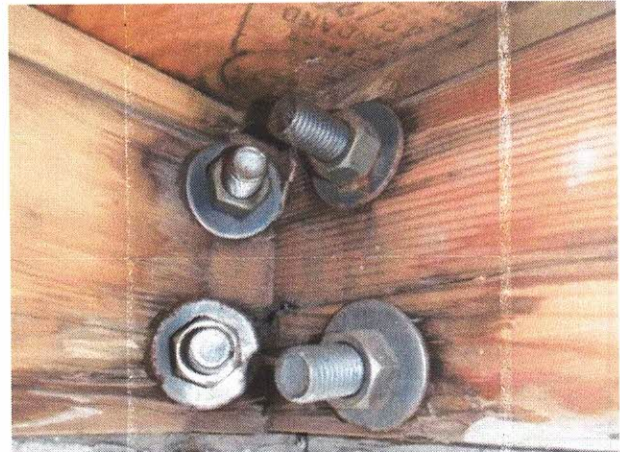


Photo 31: Staining around bolts connecting balcony to column. (Unit 209)

Soffit of Unit 201

An exploratory opening was made into the soffit at Unit 201 (*Photo 32*). The plywood sheathing is in good condition at this location. Similar to the previous location, staining is present on the wood framing around the

bolts (*Photo 33*). Moisture content readings at the sheathing ranged from 6 to 8 percent. Awl penetration at the sheathing was minimal, 1/8 inch.



Photo 32: Exploratory opening at soffit. (Unit 201)

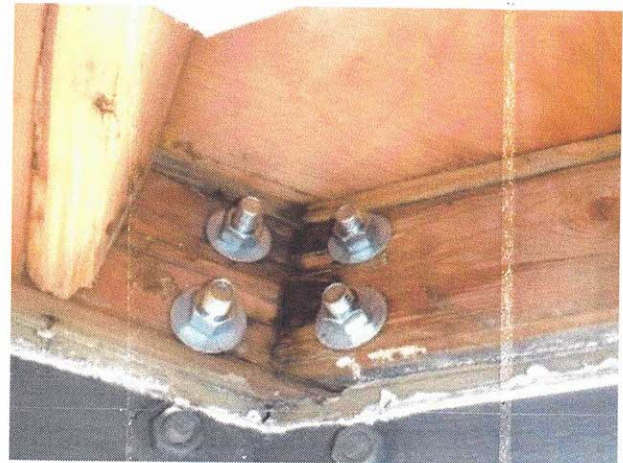


Photo 33: Staining around bolts connecting balcony to column. (Unit 201)

Soffit of Unit 104

An exploratory opening was made into the soffit at Unit 104 (*Photo 34*). We observed that the original (2) 2x6 members have been sistered with a new 2x6, this appears to be the case with some joists at other exploratory openings as well. The plywood sheathing is in fair condition at this location. We did observe some minor staining on the sheathing and supporting wood joists at this location (*Photo 35*). Awl penetration at the sheathing was minimal, 1/8 inch.



Photo 34: Exploratory opening at soffit. Note sistered joists (arrows). (Unit 104)

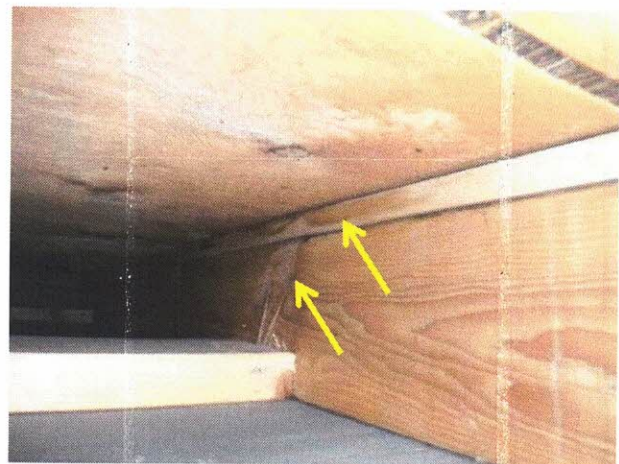


Photo 35: Minor staining is present on sheathing and joists.

Discussion

Based on our review of the drawings, our limited visual survey, and observations at the inspection openings, the wood framing supporting the balconies is not adequately waterproofed, has resulted in isolated locations of structural deterioration, and if left unaddressed, could lead to more significant structural issues in the future.

Concrete is a porous material, therefore any materials below the concrete topping slab should be protected from moisture. It does not appear that the supporting wood deck is sloped to drain, rather the concrete slab provides the slope to drain. We assume that was the intended use of the black membrane that is present between the sheathing and the topping slab, however, this material is not currently performing as a waterproofing material.

Current construction practice is to install a continuous waterproofing assembly on the wood sheathing below the concrete topping slab and to provide flashings at the edge of the slab to protect the wood framing and manage the water at this level.

In addition to concrete being a porous material, any cracks and voids in the concrete also provide a pathway for water to access the underlying sheathing. Once moisture reaches this level, we anticipate it likely gets trapped between the sheathing and the topping slab. This was confirmed by staining and organic growth on the sheathing at some of the inspection openings which is indicative of long-term water penetration. The high moisture readings that we measured at some locations are sufficient to support microbial growth which can lead to wood decay. The presence of carpeting is also not recommended on exterior slabs as it can also trap moisture below. The surface-applied paints, waterproofing membranes, and tile pavers may reduce the risk of moisture penetration, but where they are not maintained, can result in isolated locations of moisture penetration and wood deterioration.

At the outer edges of the balconies, the deteriorated joint sealant between the top of the rim joist and the concrete topping slab also allows a pathway for water to access the plywood sheathing and cavity above the soffit. We anticipate that some of the concrete deterioration at the edge of the slab is caused by water accessing the joint below the slab and being subjected to freeze thaw cycling.

The current as-built construction does not allow for the observation of the structural framing, this is problematic as you cannot see whether deterioration is occurring unless these finishes are removed. Significant structural deterioration was observed at the sheathing as viewed from the soffits of Units 302 and 304 and should be replaced, while the sheathing and framing at the remaining exploratory openings appeared to be in fair to good condition and will not likely need replaced at this time, but if the sources of moisture are not eliminated deterioration will continue.

Recommendations

Based on our review of the drawings, our limited visual survey, and observations at the inspection openings, we recommend the following:

1. We recommend that the existing popcorn-finished, gypsum board soffits be removed to allow for observation of the plywood sheathing and wood framing above at all 2nd through 4th floor balconies.
2. Based on observations after the soffits are removed, we recommend one of the following repair options be performed:

- a. If the plywood sheathing and wood framing are in good condition, we recommend incorporating a flashing detail at the edge of the concrete topping slabs and the installation of a waterproofing membrane over the prepared top surface of the existing concrete topping slabs. If properly installed and maintained, the waterproofing membrane will substantially reduce or eliminate the ability of moisture to access the underlying plywood sheathing and wood framing and the flashing at the edge of the topping slab will prevent water from entering through the joint between the wood rim joist and concrete topping slab and causing damage to the wood framing and soffits below. This will require the removal of tile pavement, paint, and other existing coverings/finishes that have been installed over the concrete topping slab. We would not recommend re-installation of these types of finishes. Modifications to the wood siding and balcony drip edges will also be necessary with this approach.
 - b. If the plywood sheathing is in poor condition as seen at Unit 302 and Unit 304, the concrete topping slab must be removed and replaced in order to replace the wood sheathing. It is also possible that some wood framing members may need repaired or replaced.
3. After the sheathing and framing are evaluated at every balcony on the 2nd through 4th floors, and repairs are made, the soffits can be replaced. There are various options that may be available for replacement of the soffits. It may be advantageous to install a more breathable or vented type of soffit assembly to allow drying of the framing in this space. Additional research is needed into what requirements will be necessary from a fire safety standpoint to understand what options are available.

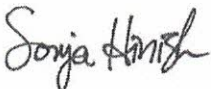
At this time estimating the cost of the recommended repairs is difficult due to the unknown conditions which will be discovered when the framing is exposed. Even after the framing is fully exposed for inspection, additional deterioration may be discovered during the repairs. Therefore, we recommend the soffits be removed and all framing be inspected prior to developing an estimate of repair costs for the repairs and new waterproofing installation. It may be possible to phase the further investigation and repairs, and an initial repair project could include repairing one vertical stack of balconies such that the scope of the work, repair details, and repair costs can be more accurately developed for the remaining balconies.

The fees associated with the design and construction observation services for the repair work are not included in our scope at this time, but we would be glad to provide proposals for such services if requested. Please call if you have any questions or if we can be of further service.

We would welcome the opportunity to discuss our findings and recommendations with the Association in a conference call if you desire.

Sincerely,

BC&E, LLC



Sonja G. Hinich, P.E.
Associate



Reviewed by: Christopher M. Morgan, P.E.
Principal

BC&E LLC

303-350-1000

Westwind Balcony Eval.

BY

PROJ. NO.

SCALE

SHEET NO.

DATE

4-22-19.

Opening Locations:

In Soffit.

- ① Unit 304 - adjacent to Post.
- ② Unit 302 - damage at exterior edge.
- ③ Unit 209 - soffit below tiled balcony
- ④ Unit 201 - badly damaged soffit w/ water stains.
- ⑤ Unit 104 - Below exposed conc. deck.

In Slab.

① Unit 404 → adjacent to post.

~~②~~ Unit 402 → uncoated slab @ crack.

③ Unit 407 → at spalled edge adjacent to post.

