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MS. MYRNA WEBBER
COBBLEFIELD POINT CONDO ASSOCIATION
3858 THORNHILL CIRCLE
CHAMPAIGN, ILLINOIS 61822
CLAIM NUMBER: 3187291
DONAN PROJECT NUMBER: 13-18080194-0

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SEPTEMBER 7, 2018

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September 7, 2018

Mr. Mike Wilkinson
Cincinnati Insurance Company
P.O. Box 733
Savoy, Illinois 61874

RE: **Ms. Myrna Webber**
Cobblefield Point Condo Association
3858 Thornhill Circle
Champaign, Illinois 61822
Claim Number: 3187291
Donan Project Number: 13-18080194-0

Dear Mr. Wilkinson:

At your request, on September 5, 2018, a study was made on the condominium unit at the above-referenced address. The purpose of the study was to determine the cause of water intrusion on the exterior wall of the unit. Ms. Myrna Webber, a property manager with Devonshire Residential Management, was present to point out areas of concern and to provide firsthand information. Ms. Vicki Williams and Ms. Paula Goebel, members of the Cobblefield Point Condo Association board, were both present during the site visit. This letter, with the enclosed photographs, is the report of my findings and conclusions.

Description of Property

For purposes of this report, the condominium building is considered to face east toward Thornhill Circle (Photographs 1 through 3). The condominium building is a two-story, wood-framed structure built over a crawlspace with concrete masonry unit (CMU) walls. The exterior walls are clad with a combination of brick veneer and vinyl siding, and the roof is covered with dimensional-style asphalt shingles. According to Ms. Webber, the condominium

buildings were constructed in 2003, and Devonshire Residential Management has owned this unit since construction.

Background

According to Ms. Webber, the previous tenant was moving out and a new tenant was set to move in during August 2018. During the process, the carpet was to be removed and replaced. When the carpet was removed, the discoloration and damage to the west exterior wall were discovered by the contractor. The drywall on the adjacent wall, the carpet, and portions of the subfloor were also removed to determine the extents of the discoloration and damage to the wall framing. Ms. Webber stated that the developer reportedly had subcontracted work for the various buildings to different contractors, and it is not clear at this time who did the initial construction on this building.

Ms. Goebel stated that work was previously done on two additional buildings along the north end of the property. Her unit in building A3, two additional adjacent units, and two units in the building to the east of A3 reportedly all had water damage to the flooring along the north wall and had to be repaired approximately two years ago under the previous property management company. She stated that the damage to her unit was similar to what was discovered in the subject property. Repairs at that time included replacement of the vinyl siding, some interior wall and floor framing, partial removal of the exterior brick veneer, and replacement of the capstone on the brick veneer with a limestone cap and new flashing.

Observations

On the west wall of the living room, the lower 24 inches of drywall and portions of the subfloor have been removed to the right (north) and left (south) of the patio doors (Photograph 4). The exterior sheathing consists of $^{7}/_{16}$-inch oriented strand board (OSB) over nominal 2-inch by 4-inch (2x4) wall framing. The exterior sheathing, walls studs, bottom plate, and the header joists in the crawlspace are discolored with apparent fungal growth. The exterior wall sheathing at the lower right corner to the left of the doorframe is deteriorated, exposing the fabric house wrap on the exterior of the OSB (Photograph 5). The framing in the bottom left corner of the door is deteriorated with partial section loss of the doorframe and wall framing (Photograph 6). Near the operational section of the patio doors, the OSB subfloor is discolored and deteriorated with a

hole, approximately 3 inches in diameter, at the left jamb of the door (Photograph 7). To the right of the door, the lower 6 inches of the studs and the bottom plate are discolored with minimal deterioration or section loss relative to the left side of the door (Photograph 8). The header joist is discolored and deteriorated below the subfloor.

In the adjacent bedroom to the north of the living room, the lower 24 inches of drywall have been removed along the south half of the west wall, and a portion of the subfloor is removed at the center of the west wall (Photograph 9). The OSB on the interior corner framing is discolored on the south side of the corner and discolored with full section loss on the north side (Photographs 10 and 11). The 2x4 studs on the north side of the corner are deteriorated with partial section loss (Photograph 12). The exposed fabric house wrap is over brick veneer on the left and vinyl siding on the right. Daylight can be seen in the gap between the exterior claddings (Photograph 13). The floor joists are discolored around the interior corner (Photograph 14).

In the adjacent bedroom to the north, the lower 18 inches of drywall are removed on the south half of the west wall, the drywall is completely removed on the north half of the west wall, and a portion of the subfloor under the north half of the west wall is removed (Photograph 15). On the south side of the interior corner, the OSB is discolored and deteriorated with full section loss, exposing the fabric house wrap. Daylight exposure is noted between the brick and vinyl siding (Photograph 16). The top edge of the brick veneer has a metal flashing cap that terminates at the south end of the wall (Photograph 17). At the base of the wall, the bottom plate is deteriorated and missing, and the plywood covering the bottom of the overhanging floor section is displaced (Photographs 18 and 19). On the north side of the interior corner, the OSB is discolored at the top left and the top right corners of the wall, both at the same height as the deterioration on the south side of the interior corner (Photograph 20). The discoloration in the top left corner is light with apparent fungal growth but minimal deterioration. The discoloration in the top right corner is dark with deterioration and full section loss of the OSB, exposing the fabric house wrap and the brick veneer (Photographs 21 and 22). At the base of the wall, the framing is deteriorated with full section loss of the west end of the floor joists intersecting the interior corner, full section loss of the bottom plate at the left and right ends of the wall section, full section loss of the floor joist webbing on the header joist, and full section loss of the top chord of the header joist at the north end of the wall (Photographs 23 and 24).

On the patio, the patio door is framed out with vinyl siding overhead, and brick veneer to the north and south (Photograph 25). The doorframe is discolored over the door, and at the bottom right (south) and bottom left (north) corners of the doorframe and trim (Photographs 26 through 29). The top right (south) and bottom left (north) corners of the outer framework of the patio windows adjacent to the door are discolored, and the paint is split and peeling (Photographs 30 and 31). The flashing over the brick veneer to both sides of the door is bent upward exposing the top edge of the brick across the exterior face (Photographs 32 and 33). From above, the flashing laps with the siding below the top edge of the brick, forcing the flashing to rotate upward off the top of the brick (Photograph 34). The J-channel over the flashing is also forced upward on the end of the doorframe, creating a low point over the door and gaps between the J-channel and door trim (Photograph 35). The sealant applied between the brick veneer and the wood trim on the outer face of the door is separated along the vertical corner.

The brick veneer on the exterior of this unit is approximately 8 feet above the finished grade. The exterior walls outside the bedrooms are partially covered in vinyl siding, and partially covered with the brick veneer. The transition is at the approximate midpoint of the west wall in both bedrooms, with the interior wall separating the two bays of windows as seen on the exterior (Photograph 36). The vinyl siding to the south side (at the middle bedroom) and to the north (at the north bedroom) of the bump-out section of the wall is not firmly backed and moves inward when light hand pressure is applied (Photographs 37 and 38). The vinyl siding easily separates from the corner molding, and debris falls to the ground when pressure is applied (Photograph 39). A gap up to ¼ inch is between the siding and the veneer at these corners, and the fabric house wrap is visible in the separation (Photograph 40). At the top of the veneer, the metal flashing is rotated upward through the midsection, and drops within ¼ inch of the top of the wall at the corners (Photographs 41 and 42). Algae stains and debris is along the back (house) side of the flashing under the J-channel (Photograph 43).

Ms. Goebel directed the study to the north exterior wall of her unit in building A3 to the north of the subject building. The north exterior wall of building A3 has brick veneer up to approximately 36 inches as opposed to 8 feet as on the previous building. The veneer capstone and flashing has been replaced with a capstone that slopes down away from the exterior wall. Gaps are between the J-channel and the capstone at the ends of the veneer wall (Photographs 44 through 46). The vinyl siding in this location, to the north of the Ms. Goebel's unit lacks solid backing and moves inward with light hand pressure (Photograph

47). The brick veneer around the adjacent unit to the east (the east end unit in building A3) has been removed around the patio and replaced with vinyl siding.

No weepholes are in any of the exterior brick veneer walls. The veneer bears on the concrete footer on all sides of the building. No flashing extends out below the lower course of brick veneer.

Key Concepts

Brick Veneer Annular Space

The Brick Industry Association (BIA) classifies exterior wood stud walls with anchored brick veneer attachments as "drainage wall systems." This classification indicates that brick veneer, while providing good weather-resistant qualities, is not by itself waterproof. Unglazed brick and mortar are porous and are able to absorb water, which can then pass through the veneer system into the wall cavity. Therefore, the walls must be constructed in such a way as to drain moisture that collects within the cavity of the wall. Figure R703.7 of the *International Residential Code* (IRC) shows the proper construction of brick veneer over wood stud framing (Figure 1).

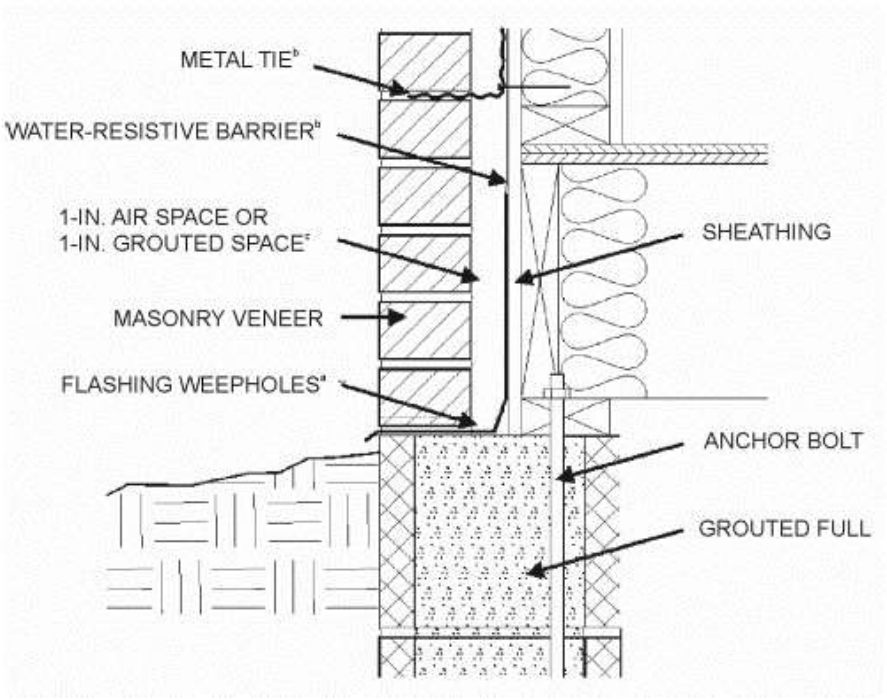

Figure 1: Brick Veneer Construction

Table R703.7.4 of the 2012 IRC states, "The veneer shall be separated from the sheathing by an air space of a minimum of 1 inch (25.4mm) but not greater than 4.5 inches (114mm)." Technical Note 28 from the BIA also requires that an air space between the brick veneer and exterior wall sheathing be provided. Providing an adequate air space and keeping this space free from construction debris and mortar are crucial to providing a path for drainage of absorbed or trapped water to the base of the wall.

Section R703.7.4.2 of the 2012 IRC states.

> As an alternative to the air space required by Table R703.7.4, grout shall be permitted to fill the air space. When the air space is filled with grout, a water-resistive barrier is required over studs or sheathing. When filling the air space, replacing the sheathing and water-resistive barrier with a wire mesh and *approved* water-resistive barrier or an *approved* water-resistive barrier-backed reinforcement attached directly to the studs is permitted.

Once the collected water has successfully reached the bottom of the wall, the water must be provided with an adequate means of escape from the wall through the proper installation of flashing and weep holes. In general, flashing and weep holes should be above and as near to grade as possible at the bottom of the wall, above all openings, and beneath sills. Section R703.7.5 of the IRC states, "Flashing shall be located beneath the first course of masonry above finished ground level above the foundation wall or slab and at other points of support, including structural floors, shelf angles, lintels."

Section R703.7.6 of the IRC states, "Weepholes shall be provided in the outside wythe of masonry walls at a maximum spacing of 33 inches (838 mm) on center. Weep holes shall not be less than 3/16-inch (4.8 mm) in diameter. Weep holes shall be located immediately above the flashing." Similarly, BIA *Technical Note 28* states, "Weep holes must be located in the head joints immediately above all flashing. Clear, open weep holes should be spaced no more than 24 in. (600 mm) o.c. Weep holes formed with wick materials or with tubes should be spaced at a maximum of 16 in. (400 mm) o.c."

Brick Windowsills

The primary function of a windowsill is to direct water away from the structure. The Brick Industry Association (BIA) specifies that masonry windowsills should slope down away from the building at a minimum angle of 15 degrees from horizontal and extend a minimum of 1 inch beyond the exterior face of the wall (Figure 2).[1] This equates to a slope of approximately 28 percent.

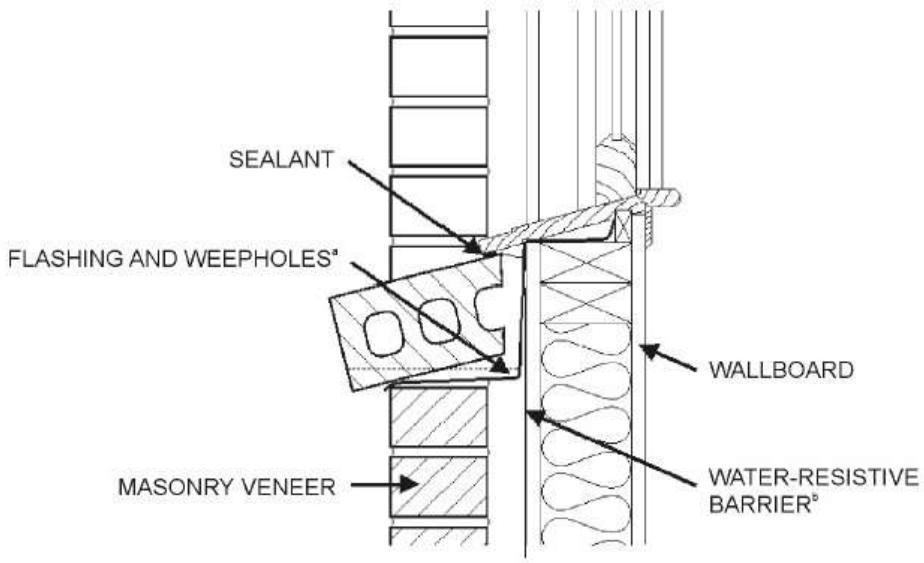

Figure 2: Flashing Detail at Window Sill

Caulking is often found around windows to minimize water entering the wall at the brick-to-window junction. Preferably, and as required by building codes, the windowsill and window head should have proper through-wall flashing and weeps to direct any water that penetrates the brick veneer back to the exterior. The through-wall flashing should extend to the first head joint beyond each side of the sill, be turned up at least 1 inch at both ends of the flashing, and be overlapped by the housewrap and/or the window flashing. The construction method for the weeps may vary, but a weep hole should be at least every 24 inches on center and directly above the through-wall flashing.

[1] The Brick Industry Association (BIA) Technical Notes on Brick Construction. *Technical Note 36 – Brick Masonry Details, Sills, and Soffits. Revised January 1988*

Brick Ties

Brick ties in a veneer wall exist to transmit lateral loads to the structural wall and/or to other wythes of masonry. They essentially serve as structural reinforcement of the masonry in the horizontal direction, while permitting vertical movements related to varying rates of differential expansion and contraction. For a brick tie to dependably serve its intended purpose, it must be securely attached or embedded at both ends, adequately rigid to transfer load with minimal deflection, and corrosion resistant. Deficiencies with any of the above three requirements can result in catastrophic failure. Failure of the brick ties typically occurs from either brick ties pulling out of the substrate (sheathing), brick ties pulling out of the mortar joints, or corrosion of brick ties. Corrosion resistance of a brick tie is most often provided by using a stainless steel or galvanizing carbon steel.

Section R703.8.4.1 of the *International Residential Code* (IRC) states that each tie shall be spaced no more than 32 inches on center horizontally and 24 inches vertically and shall not support more than 2.67 square feet of wall area. Section R703.8.4.1.1 states that ties shall be placed around all wall openings greater than 16 inches and that the ties shall be spaced no more than 36 inches on center and no more than 12 inches away from the opening. Brick ties should be embedded at least 1 ½ inches into the brick mortar joint. When attaching metal brick ties to the bearing stud walls, annular threaded (ring-shank) nails should be used that are at least 2 inches long, penetrate at least 1 ⅛ inches into each stud, and are within ½ inch of the 90-degree bend in the anchors (where the ties are bent to extend toward the back of the veneer).[2]

Dry Rot

Dry rot is a common term used to describe the decay of wood caused by brown rot fungi.[3] Brown rot fungi consume the cellulose and hemi-cellulose components of wood but do not consume the lignin. Advanced wood decay from brown rot fungi creates a cubical, brown material that is dry and powdery to the touch.

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[2] The Brick Industry Association (BIA), *Technical Notes on Brick Construction – Technical Note 28,* November 2012.
[3] "Wood as an Engineering Material, General Technical Report FPL-GTR-113", United States Department of Agriculture

The term "dry rot" is inaccurate, because wood must be damp to decay. Decay occurs when the moisture content of wood is at the fiber saturation point or above.[4] The fiber saturation point is typically around 30-percent moisture content for North American wood species.

Evaluation and Conclusions

The primary cause of water intrusion into the building is improper installation of the brick veneer and deficient flashing around the top and sidewalls of the brick veneer. The brick veneer and mortar bed are directly in contact with the fabric house wrap, lacking the required air void. The air void can be negated if the house wrap is replaced with a water-resistant barrier; however, that was not done in this case. The wall also lacks weepholes and flashing within the wall cavity to shed water away from the sheathing. In addition, no brick ties are between the brick veneer and the wall sheathing, allowing for differential displacement of the wall claddings. This differential movement has allowed the flashing to bind against the back of the wall, resulting in the rotation of the flashing. The rotation forces water to drain to the ends of the wall section, penetrating the wall through the corner and end wall transitions where the veneer intersects the vinyl siding. Since the end walls lack additional flashing to deflect this water away from the wall, the water penetrates the wall envelope, saturating the OSB and the interior cavity of the wall.

The flashing cap on the wall should have a minimum of a 15-degree slope away from the outer wall, and the end of the flashing should be turned upward to prevent water from shedding off the ends into the end wall framing. Additional flashing, and the use of butyl tape, can prevent water intrusion at the end walls.

The same scenario is noted around the patio doors; however, in these locations, the flashing deflects water into the separation over the doorframe. This allows water to enter the wall through the top of the frame, passing down the sides of the frame to the floor.

On the north side of the adjacent building, the floor/wall framing and siding have reportedly been replaced due to a previous, but similar issue. The vinyl siding on the exterior Ms. Goebel's unit flexed in a manner similar to that on the subject building, indicating that similar issues may still be ongoing within her unit.

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[4] Prevention and Control of Decay in Homes, Verrall, Arthur F., and Terry L Amburgey, Southern Forest Experiment Station, Gulfport, MS.

The brick veneer capstone was replaced to direct water away; however, the capstone terminates behind the vinyl siding. Without proper flashing to redirect water away form the wall sheathing, the water passing behind the sheathing at the corners can still saturate the framing. The siding (or interior drywall) can be removed for a more thorough inspection of sheathing.

Summary of Conclusions

In summary, based on what is known at this time, I am of the opinion that:

- The primary cause of water intrusion into the building is improper installation of the brick veneer and deficient flashing around the top and sidewalls of the brick veneer.
- Brick and mortar are in direct contact with the sheathing, lacking a required air void or an approved water-resistant barrier.
- No weepholes or flashing are within the wall/cavity to provide drainage.
- No brick ties are installed between the veneer and the exterior sheathing.
- Improper flashing on the top and sides of the brick veneer deflects water into the wall cavity, resulting in the saturation and deterioration of the wall framing.
- Flexing of the vinyl siding on the north wall of the Goebel unit is an indication of potential water intrusion. The vinyl siding (or interior drywall) should be removed for a more thorough inspection.

This report is based on relevant information known to Donan at the time the report is issued. Donan reserves the right to amend or supplement this report if additional relevant information becomes available.

Donan Engineering hereby certifies that this damage assessment report has been prepared by a licensed Professional Engineer in the State of Illinois in accordance with the requirements of the Illinois Professional Engineering Act. Any observations related to the structural integrity of the building are provided for

reference and, if necessary, a licensed Structural Engineer under the Illinois Structural Engineering Act shall be retained to perform all required structural engineering services.

We appreciate your confidence in our professional services.

Sincerely,

DONAN ENGINEERING CO., INC.

Steven Little, P.E.
Forensic Engineer
Illinois P.E.: 062.066357
Expires: November 30, 2019

Photograph 1: East elevation faces Thornhill Circle.

Photograph 2: South elevation faces Thornhill Drive.

Photograph 3: West elevation faces Cobblefield Drive.

Photograph 4: Overview of the west wall in the living room.

Photograph 5: Deterioration and discoloration of the wall to the south of the patio doors.

Photograph 6: Deterioration of the bottom plate and framing around the door.

Photograph 7: Deterioration of the subfloor in front of the doors.

Photograph 8: Discoloration and deterioration of the framing to the north of the patio doors.

Photograph 9: Overview of the west wall in the adjacent bedroom to the north.

Photograph 10: Discoloration and deterioration of the wall framing to the south of the interior corner.

Photograph 11: Discoloration and deterioration of the framing and sheathing to the north of the interior corner.

Photograph 12: Deterioration and section loss of the sheathing and framing.

Photograph 13: Daylight exposure between the brick and vinyl siding.

Photograph 14: Discoloration and deterioration of the floor framing.

Photograph 15: Overview of the west wall in the north end bedroom.

Photograph 16: Daylight exposure between the vinyl and brick veneer.

Photograph 17: Top of the brick veneer and the metal flashing cap.

Photograph 18: Deterioration of the subfloor and floor framing. Note the lack of a bottom plate on the wall.

Photograph 19: Displacement and deterioration of the floor covering on the overhang.

Photograph 20: Discoloration and deterioration of the wall sheathing.

Photograph 21: Deterioration of the sheathing.

Photograph 22: The deterioration coincides with the top of the brick veneer and flashing.

Photograph 23: Deterioration of the floor framing at the base of the wall.

Photograph 24: Deterioration of the floor framing at the base of the wall.

Photograph 25: Overview of the patio and patio doors.

Photograph 26: Discoloration of the framing over the door.

Photograph 27: Discoloration of the framing over the door.

Photograph 28: Discoloration of the doorframe.

Photograph 29: Discoloration of the doorframe.

Photograph 30: Discoloration of the doorframe.

Photograph 31: Discoloration of the doorframe.

Photograph 32: Displacement of the veneer flashing.

Photograph 33: Displacement of the veneer flashing.

Photograph 34: Displacement of the veneer flashing, rotated upward and binding at the backside of the veneer.

Photograph 35: Gap between the frame and the J-channel.

Photograph 36: Exterior wall outside the bedrooms. Solid line indicates the height of the veneer, while the dashed line indicates the separating wall between bedrooms.

Photograph 37: Veneer to vinyl intersection to the south at the bedrooms. Soft area is outlined.

Photograph 38: Veneer to vinyl intersection to the north at the bedrooms. Soft area is outlined.

Photograph 39: Gaps between the vinyl siding and the brick veneer at the interior corners.

Photograph 40: Gaps between the vinyl siding and the brick veneer at the interior corners.

Photograph 41: Gaps in the flashing at the low spot over the interior corner.

Photograph 42: Low-spot at the end of the flashing at the end, terminating behind the vinyl siding.

Photograph 43: Debris and algae-staining between the J-channel and flashing.

Photograph 44: Overview of the north wall of the Goebel unit

Photograph 45: Short veneer wall terminates behind the vinyl siding.

Photograph 46: Short veneer wall terminates behind the vinyl siding.

Photograph 47: Flex in the wall behind the vinyl siding.