

## Water Intrusion Assessment Property Address City, ST 12345

ATTN: I. B. Client





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### **Project Information**

#### Building Envelope Water Intrusion Assessment

Report Date: January 30, 2024

#### PROJECT NAME:

Water Intrusion Assessment Property Address City, ST 12345

#### TYPE OF INVESTIGATION/REPORTING:

Water Intrusion Assessment On site Date: January 14-16, 2024

#### SENIOR INVESTIGATOR/ CONSULTANT:

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#### **REPORT PREPARED FOR:**

I. B. Client, Fleet & Facilities Manager Prop Management Group



#### Introduction

Building Moisture Consultants, Inc (BMCI) was retained by Prop Management Group to perform a Water Intrusion Assessment of the Water Intrusion Assessment property located at Property Address, City, ST 12345.

The three story building structure is clad with brick and stone facade. The purpose of the assessment was to provide non-destructive inspection, testing & analysis services to determine sources of the reported water intrusion issues and develop a suggested scope of work for corrective measures.

The Water Intrusion Assessment building has experienced ongoing water intrusion issues since original construction completed in 2011. Reportedly different leaks occur depending on the direction and duration of the rain. Over the years many efforts have been made in attempt to stop the water intrusion. Reported repair efforts have included roof patches and repairs; caulking at flashings, bricks, stones, etc; limited application of sealers to some brick and stone surfaces; addition of awnings; other misc repair efforts. The efforts have failed to provide any lasting results with several current areas of ongoing leaks and water intrusion. There is an ongoing ceiling tile replacement process in place to minimize visual impacts of leakage. Many personnel utilize paper towels during storms in effort to 'contain' interior water leaks. Within a few days prior to the assessment the area had received near record rainfall with all but two of the leak areas showing evidence of active water intrusion.

On January 14-16, 2024, BMCI was on site to perform assessment and testing of the reported leak areas. BMCI met with John Doe, Fleet & Facilities Manager, who provided water intrusion history along with walking us through the current known leak areas. BMCI also interviewed various personnel in leak areas. Inspection and hydrodynamic water testing were performed in all but one of the leak areas. The next section summarizes the results of the assessment and testing followed by the suggested scope of corrective measures and photo documentation of the leak areas and hydrodynamic water tests.



#### **Assessment Summary**

Visual inspection, testing and analysis identified water intrusion sources including:

#### Failure of Through-Wall Flashing System

Hydrodynamic water testing found that the vast majority of reported leaks share a common primary cause: **the failure of the thru-wall flashing system**. The brick and stone facade along with mortar joints are all porous products, and by design are **not** waterproof, relying on an underlying weather resistive barrier (WRB) to prevent water intrusion into the interior wall cavity and interior components. The blueprints call for a combination of 30lb felt and through-wall flashings with weeps along with exterior sealants to provide the WRB and water intrusion protection. Test after test performed onsite during the assessment showed that if water gets into the wall cavity, the through-wall flashing system failed and interior water intrusion and leaks occurred (see pages 11-13). The water intrusion was duplicated with interior water leakage observed **exactly** where reported. Because of the ongoing leakage, there were water stains and rust stains in leak entry points which were also the entry points observed during our water tests. Descriptions and photo documentation of the reported leak areas and water testing with results can be found on Leak Area pages of this report.

#### Gaps and Cracks in Mortar Joints

There were gaps noted mortar joints of stone and brick along with separation cracks where the mortar joints meet the brick and stone (ex photos 25,26,33-35 others). These gaps and cracks allow additional water intrusion into the wall cavity which exacerbates leakage through the failed through-wall system. In some areas there has been sealants (caulking) applied in attempts to seal the cracks which is improper and inadequate.

#### Unsealed / inadequately sealed roof coping seams & terminations

The roof coping seems were found to not be water tight or adequately sealed and allow water intrusion into the wall cavity below (ex photos 37-38). The blueprints show a through-wall flashing detail below the very top course of stone intended to redirect incidental water intrusion through the coping back to the exterior (photo 3). In a few areas during testing it appeared the upper layer of through wall flashing was functioning while other test areas showed water intrusion through the coping seems a contributing factor to the interior leakage.

#### Missing / Inadequate / Failed Sealants

There were noted inadequate, failed or missing sealant details in leak areas which can be a contributing cause of leakage into the wall cavity and interior areas (ex photos 36,44,45). Proper sealant details are a vital part of any exterior envelope and must be properly maintained as part of normal building maintenance.



#### Suggested Scope of Work

#### 1. Remove and Replace ALL Exterior Sealants

- 1.1. Insure proper removal of existing sealants and cleaning of joint detail in preparation of new sealant application.
- 1.2. Apply new sealants using quality sealants such as Dow Corning 795 following all manufacture guidelines and specifications for all joint preparation, priming and sealant application.
- 1.3. Submit proposed materials, colors and locations, warranties, planned means and methods for approval.
- 1.4. Details should include (not limited to) all expansion joints, isolation joints, transition joints, penetration details, termination joints, window and door perimeter joints, etc.
- 1.5. Seal all coping seams and corners using Dow Corning 123 preformed sealant system following all manufacture specifications for cleaning, prep, priming and application.
- 1.6. Provide mock up adhesion tests in sample typical details and provide 3rd party random adhesion and application tests as per manufactures recommendations.

#### 2. Apply Elastomeric Waterproofing System To All Stone Surfaces

- 2.1. Remove existing sealants used to seal cracks in stone mortar gaps and cracks.
- 2.2. Properly tuck point stone mortar joints to repair cracks / gaps. Dry match mortar colors to insure match existing. Insure proper tuck pointing repair methods and process are followed.
- 2.3. Professionally clean stone surfaces in preparation of water proof coating. Insure product is compatible and follows waterproof coating guidelines to properly prepare the block surfaces for elastomeric coating.
  - 2.3.1. Cleaning product(s) should have ability to remove any previous sealer applications.
- 2.4. Apply high grade elastomeric waterproofing coating system to block as recommended by coating manufacturer.
  - 2.4.1. Submit proposed products, materials and warranties for coating system including planned means and methods as required by manufacturer. Typical quality coating systems include a primer, base and topcoat application.
  - 2.4.2. Apply in 2 test areas as directed to insure proper adhesion.
  - 2.4.3. Color to match existing dry stone color
  - 2.4.4. Insure proper millage to obtain best manufacturer warranty

#### 3. Apply High Grade Siloxane Sealer To All Brick Surfaces

- 3.1. Remove existing sealants used to seal cracks in brick mortar gaps and cracks.
- 3.2. Properly tuck point brick mortar joints to repair cracks / gaps. Dry match mortar colors to insure match existing. Insure proper tuck pointing repair methods and process are followed.



#### Suggested Scope of Work

- 3.3. Professionally clean brick surfaces in preparation of Siloxane application. Insure product is compatible and follows manufacturer guidelines to properly prepare the brick surfaces for Siloxane.
  - 3.3.1. Cleaning product(s) should have ability to remove any previous sealer applications.
  - 3.3.2. Apply high grade Siloxane sealer to brick as recommended by sealer manufacturer.
  - 3.3.3. Submit proposed products, materials and warranties for sealer including planned means and methods as required by manufacturer.
  - 3.3.4. Apply in 2 test areas as directed for approval of application and aesthetics.
  - 3.3.5. INSURE all surrounding components (for example windows) are properly protected as per manufactures specifications to prevent damage to any other products or materials during application of Siloxane.

#### 4. Perform Test Repair For Brick Ledge Detail At Tops Of Windows

- 4.1. Test area will be 2nd floor administration office windows on the south elevation
  - 4.1.1. Remove all materials from existing weep holes.
  - 4.1.2. Insert tight fitting rope into weep holes to be flush with brick surface
  - 4.1.3. Opt 1: Clean joints (gaps) in Ledge angle pieces and inject sealants to prevent water flow through the ledge angle joints to areas below.

Opt 2: Carefully remove brick at ledge angle joints. Clean and prep ledge surfaces. Seal ledge joints to prevent any water intrusion through the joint. Reinstall removed brick with repair mortar dry color matched to existing mortar.

Opt 3: Submit any proposed alternative to above to accomplish goal of sealing gaps at brick ledge joints.

- 4.1.4. Install and seal in place new flashing piece as shown in photo 6 to test area. Color to match window casings.
- 4.1.5. Provide 3rd party hydrodynamic water testing of repair area to verify water intrusion into administrative office windows has been corrected.



#### Leak Area Overview

#### Photo 1



**First Floor** 

Leak Area	Description	Leak Area	Description
1	Inside and Outside Hallway Fleet &	6	Donor Chair & 2nd Floor HR office
	Facility Managers Office		above
2	2nd Floor Administrative Entrance	7	Donor area security camera
3	Administrative Office Windows	8	Drain over front entrance way
4	2nd Floor Atrium Columns	9	Conference room A (training)
5	Interview Rooms		



#### Leak Area Overview



### **Second Floor**

Leak Area	Description	Leak Area	Description
1	Inside and Outside Hallway Fleet &	6	Donor Chair & 2nd Floor HR office
	Facility Managers Office		above
2	2nd Floor Administrative Entrance	7	Donor area security camera
3	Administrative Office Windows	8	Drain over front entrance way
4	2nd Floor Atrium Columns	9	Conference room A (training)
5	Interview Rooms		



#### **Through-Wall Flashing**

Photo 3



System relies on a functioning weather resistant barrier (WRB) of 30lb felt properly lapped over a thru-wall flashing system as shown in blue highlights.

Testing of the various leak areas confirmed failure of the WRB and / or thru-wall flashing system.



#### **Through-Wall Flashing**



Highlighted details. Testing shows that water is able to penetrate through the WRB and thru-wall system. See next photo for water intrusion paths



#### **Through-Wall Flashing**

Photo 5

Wa	ter intrusion paths
	TREATED 2x BLOCKING, CONT.
	WEEPS - TUBES W/ SCREENS @24"O.C. TY
	THRU-WALL MEMBRANE FLASHING EXTEND VERTICALLY 8" BEHIND FELT
To Interior	

Water migrates through stone and brick and then down wall cavity. The failure of the thru-wall flashing (whether through seams, tears, damage, lack of end dams, etc) allows waterflow to enter in below the thru-wall into the angle iron metals and interior components through gaps, holes, bolts, etc.



Through-Wall Flashing

Photo 6

# Suggested Test Repair





#### Leak Area #1: Room 185 / Mechanical Room

Leak area located inside and outside hallway of the Fleet and Facilities Managers office (room 218). Removal of ceiling tiles showed pipe penetrations through the 2nd floor mechanical room above (photos 10,11). Tests of the roof in this area did not produce visible leakage. Test of the wall / cavity above this area resulted in visible leakage into the mechanical room, through the pipe penetrations and visible leakage below both inside the room and the hallway as reported (photos 8,9,15-18). This area has had awnings installed.



Wet ceiling tile in hallway



Wet ceiling tiles inside office



Removal of tiles showed pipe penetrations at 2nd floor (arrows). Visible leakage (circle).



### Leak Area #1: Room 185 / Mechanical Room



Pipe penetrations above leak area. Leakage noted through penetrations below.





Test Area

Photo 12



Mechanical Room directly above Leak area 1 Awning has been installed Photo 14



Water test in progress



### Leak Area #1: Room 185 / Mechanical Room





Visible leakage into mechanical room during tests



Test of through wall flashing produced leakage into the mechanical room and leak area 1 below. Through-wall flashing likely missing proper overlaps and end dams.



Leakage during testing



#### Leak Area #2: Admin Stairwall Entrance

This leak area is located at the SE stairwell doorway to the administrative offices. Water puddles on the stairwell floor at the roof access door (photos 20,24) and migrates down into the ceiling of the entry door area below (photo 21,22). An awning was installed over the door area to reduce weather exposure of the door area (photo 32). There is also much evidence of repair attempts to gaps and cracks using sealants (improper - photos 23,33). Lee stated that there had been some clear sealers applied to the area, but during tests we did not note evidence of sealer ie water surface rejection similar to beading of water like a waxed car. Hydrodynamic water tests of the roof, flashing terminations, and door area did not produce any visible leakage in the stairwell or below. Tests of gaps and cracks in the stone / brick did produce leakage ponding on the stairwell floor (photos 27-31) and then also dripping below in the ceiling area in the exact areas as reported. These tests confirmed a failure of the through wall flashing system.



Leak area #2 at SE stairwell roof access door and administrative office stairwell entryway (also admin conference room).

Photo 20

Water reportedly ponds this whole area. Evidence of ongoing leakage ie water stains and efflorescence.



### Leak Area #2: Admin Stairwall Entrance

Photo 21



Leak area below in ceiling at admin stairwell entryway

Photo 23



Tests of flashing terminations did not produce visible leakage

### - -



Inspection of area above ceiling shows water stains and rust stains.



No visible leakage note with test of roof / doorway and flashings



### Leak Area #2: Admin Stairwall Entrance



Water tests of mortar joints gaps and cracks in stone produced the reported leakage

Photo 27



Leakage onto stairwell floor noted.



Water test of stone joints



Leakage spread across floor and leaked into admin ceiling area below.



### Leak Area #2: Admin Stairwall Entrance



Visible leakage noted during test same area as stains and rust

Photo 31



Visible leakage noted during test. IR (top right) better shows water flow.

#### Photo 30



Water dripping onto carpet during test - same area as stain on ceiling tile.



Awning has been installed to reduce door exposure to weather.



### Leak Area #2: Admin Stairwall Entrance

Photo 33



Example of sealants used in attempt to seal crack in stone mortar joint



Cracks



Example of crack in mortar joint - many noted like this. Can cause capillary suction into wall cavity

Photo 36



Sealants at ALL scupper catch box details and face plates should be professionally resealed to help prevent water intrusion into wall cavity.



### Leak Area #2: Admin Stairwall Entrance





ALL coping seams should be professionally sealed with preformed sealants such as Dow Corning 123 system.



#### Leak Area #3: Administrative Office Windows

Leak area # 3 is along the south elevation 2nd floor administrative office windows (photos 39,40). Several of the windows in several offices show evidence of leakage in the sheetrock at the top header of the windows, streaks down the windows and leaks and stains at and below the window stains (photos 41,42). These leaks reportedly do not appear in every rain but in wind blow rains that wet the south elevation. The administrative personnel use paper towels on a regular basis to absorb leakage which enters from the top of the windows and drips down onto the window and window sills (photo 42). Hydrodynamic water tests of the bottom side of the window head angle ledge did not produce any leakage. This is an indicator that the problem is not with the window itself or perimeter sealants which is also supported by the fact that the leakage comes in above the tops of the windows. Water tests of the top side of the window head angle ledge did produce the reported leakage in exact areas as reported by office personnel. This is an indicator that the through wall flashing system is failed and does not prevent water intrusion into the wall cavity Once water leaks onto the top of the window angle ledger then it can leak into interior below. areas below through gaps / seams and penetrations through the ledge angle (photos 44-47). See the Window head detail on page 3-6 for water flow paths.



Leak area #3 - leakage at tops of various Leakage enters at tops of windows and migrates administrative office windows.



down to window sills.



### Leak Area #3: Administrative Office Windows



Water stains noted various areas at sheetrock at Water ponds at window sills. tops of windows.





Water test area



Noted missing sealants at bottom of angle ledger (blue arrows). Angle iron itself shows some rusting (red)



### Leak Area #3: Administrative Office Windows



Example where sealant stops (blue) although no interior leakage was produced testing this area. Areas above ledge angle and gaps in ledge angle did produce leakage.



### Leak Area #3: Administrative Office Windows



Test of gap in brick angle ledge pieces produced leakage.



Close up of brick angle ledge above windows - test of upper side of angle produced leakage



#### Leak Area #4: Main Lobby Columns 2nd Floor

Leak Area #4 is located at the 2nd floor columns of main lobby near the elevators (photos 48,49). The primary leak in this area wet the ceiling tiles (replaced often), down the column and soak the carpet at the base of the column (photos 50-52). There are a handful of small areas of stained spots on ceiling tiles along this column line in the walkway (photo). Tests of the roof itself did not produce any visible leakage. Tests of the block / brick wall above this area did produce the exact reported leakage down the column and soaking the carpet along with drips from several areas along a single 'corrigated rib' in the roof decking in this area (photos 60-62). This leak is also a result of failure of the through wall flashing system.



Leak Area #4





### Leak Area #4: Main Lobby Columns 2nd Floor

Photo 50



Water stain at north side of column



Wet carpet at base of column. Infra red (bottom right) shows wet.



Photo 53



Wet ceiling tiles north side of column



### Leak Area #4: Main Lobby Columns 2nd Floor





Exterior wall water test areas above leak area



Darkening color of block when wet indicates the stone is not sealed.



### Leak Area #4: Main Lobby Columns 2nd Floor





Water test in progress

#### Photo 59



Example of typical crack in block mortar in test area (many like this)



Water tests of block wall produced leakage.



Leaks produced between seams of roof decks in area directly below wall during tests.



#### Leak Area #4: Main Lobby Columns 2nd Floor





Leakage produced during testing directly above column, water ran down column and wet carpet at base of column.



Leakage noted along roof deck rib further along walkway



### Leak Area #5: Interview Rooms

Photo 63



Interview room small stain





Tile removed for observation during testing





Large gap in stone mortar joint noted at corner



#### Leak Area #5: Interview Rooms



Closeup of large gap above the leak area in the corner interview room

#### Photo 68



Water test of the gap did not produce the reported leakage.





All scupper details should be professionally resealed.

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#### Leak Area #5: Interview Rooms

Photo 71



Close up of scupper shows unprofessional sealant application



All coping seams and corners should be professionally resealed (improper as sealed)





Water test of corner coping seams did produce the reported leakage.

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#### Leak Area #6: Donor Chair / HR Office

Leak Area #6 is directly above donor chair 1 which is also directly below the exterior wall reported leaking in the HR office (photos 75,76). This area did not show evidence of active leakage at the time of the assessment with moisture scans of the stained ceiling tile found dry. Hydrodynamic water testing of this area did not produce any visible leakage in this area. The area has the same details as the other areas utilizing through wall flashing details. It is possible that this leak area had been corrected with roof repairs previously made.

Photo 75



Water stain from previous leakage

Photo 77



Moisture scan of water stain shows area is currently dry.



Exterior directly above leak area





### Leak Area #6: Donor Chair / HR Office



Water tests of various areas above leak area did not produce visible leakage during tests.



Previous repair attempts with sealants (not professional application)



Gaps and cracks note in mortar



Example of cracks in stone mortar



#### Leak Area #7: Donor Area Security Camera N. Wall

Leak Area # 7 is a small stain noted in the ceiling tile at a security camera on the north end of the donor area (photos 83-85). This area was shown dry by infra red scans the first day of the assessment. The last day of the assessment however the area showed wet by infra red scan. There had been blowing rain the previous evening from the north. Tests duplicated this small leak when the gaps in the stone mortar joints were water tested (photos 88-92).

Photo 83



Photo 85



Small leak area at camera



Photo 86



Exterior of Leak area #7

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### Leak Area #7: Donor Area Security Camera N. Wall

Photo 87



Test of roof area and coping above leak area did not produce any visible leakage



Water test of mortar gaps / cracks produced reported leak.

Photo 88



Water test of gaps in the exterior block wall below coping produced leakage in exact location of interior.



Small leak came in at exterior wall roof deck juncture (blue) and ran down the angle iron cross brace and drip to exact area of stain (yellow). Note active water trail visible.



### Leak Area #7: Donor Area Security Camera N. Wall



Typical crack / gap noted in stone mortar joints (area tested)



Typical crack block mortar



#### Leak Area #8: Drain at Front Entrance Way

This small stain was noted in the ceiling tile of the front entryway area. This area has not been a reported leak area. After inspection of the area and with lack of previous problems, we believe the leak is likely related to drain overflow due to the extreme (record) amount of rainfall the area has received in the past several days. Suggest monitor only.





New water stain noted below drain in front entryway



Roof drain directly above stain in front entryway



Removal of tile to inspect leak area.



Elbow in roof drain directly above stain in entryway



### Leak Area #8: Drain at Front Entrance Way Photo 97



Leak area below drain in front entrance foyer showed wet by infra red scan.

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#### Leak Area #9: 1st Floor Conference Room A

Leak Area #9 is located above a window in the Training / Conference Room A (photos 98,99). There was water stains observed in ceiling tiles in the leak area. The area of leaking is precisely below the area where the front lower roof terminates into the exterior wall (photos 99,100). Tests of the roof and coping terminations in this area did not produce any visible leakage. Tests of cracks / gaps in the mortar joints of the bricks did produce the reported leakage (photos 102,104-107).

Photo 98



Leak area



Exterior of leak area. Leak directly below lower roof termination into 2nd floor exterior wall (red)



Roof to wall transition

Photo 101





### Leak Area #9: 1st Floor Conference Room A



Gaps in brick above critical termination.

Photo 104



Leakage during test at transition



Cracks in nearby stone mortar joints



Water leaking in this area during testing



### Leak Area #9: 1st Floor Conference Room A

Photo 106



Visible water dripping during test



Water dripping onto floor during testing.



#### Closing

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### **Closing Signatures**

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