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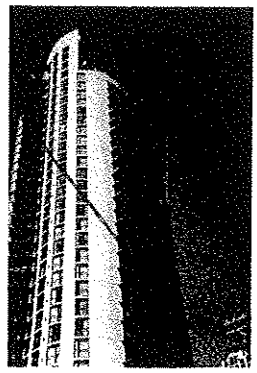
REPORT

The 501 Building Envelope Warranty Review and Update



501 Pacific Avenue
Vancouver, B.C.

Presented to:

The Owners, Strata Plan LMS 4050

c/o Mr. Bob Adams, General Manager
Atlific Property Management Inc.
1110 Howe Street
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1. INTRODUCTION

1.1 Terms of Reference

Morrison Hershfield (MH) was retained by the owners of The 501 (Strata Plan LMS 4050) to undertake a building envelope warranty review and update. This report follows from our First Year Post-Construction Review of the property in a report dated December 21, 2000.

The objective of this report is to review items listed in an 18-point list provided by Atlific Property management Inc. (Atlific) that outline the warranty items that will expire in January 2005 and update the status of items on the MH First Year Post-Construction Review.

1.2 Scope of Work

The scope of our services was outlined in our proposal dated June 22, 2004. Tasks outlined in our proposal are attached in Appendix B for reference purposes.

1.3 Limitations

This report is based on a review of available documents, discussion with the building manager Dave Suggitt, and a visual review of building envelope elements. It is a basic assumption that any correspondence, material, data, evaluations and reports furnished by others are free of latent deficiencies or inaccuracies except for apparent variances discovered during the completion of this report.

This report documents the current condition of elements of the building envelope and may identity factors or mechanisms that lead to the current condition. The report is not intended to provide an opinion regarding responsibility of any party in causing or contributing to the found condition.

Any comments or conclusions within this report represent our opinion, which is based upon the documents provided to us, our field review of physical conditions, specifically identified testing and our past experience.

In issuing this report, MH does not assume any of the duties or liabilities of the designers, builders or owners of the subject property. Owners, prospective purchasers, tenants or others who use or rely on the contents of this report, do so with the understanding as to the limitations of the documents reviewed, the general visual inspection undertaken and understand that MH cannot be held liable for damages which may be suffered with respect to the purchase, ownership, or use of the subject property.

1.4 Documents Reviewed

We have assembled and reviewed the following documents to assist our review of the condition of the building envelope systems:

- Architectural drawings – Hewitt Tan and Kwasnicky Architects Inc., City of Vancouver Archives. Sheets A 1.1.0 to A 5.2.8
- Architectural details and schedules – Hewitt Tan and Kwasnicky Architects Inc., August 17, 1998. Sheets A.1.10 to 10.01

1.5 Details and History of Building

The 501 building complex is located at the intersection of Pacific Avenue and Richards Street in Vancouver. The complex consists of a 33 storey residential tower with a four storey low-rise portion and is built over a four level reinforced concrete underground parking garage. The complex contains 277 units with a swimming pool and central courtyard. The developer, Amacon-Onni Construction Inc. (AOC), provided a 5 year "Weatherguard" warranty expiring January 2005.

The warranty is for 5 years on the building envelope (water penetration) in which the developer warrants "that those exterior portions of the common property in the Project consisting of the roofs and exterior walls of habitable areas and any recreation facilities shall be free from water leaks or ingress through the building exterior or building envelope for a period of five (5) years".

The tower exterior is generally composed of window wall assemblies, spandrel metal panels and balconies. Portions of the north and south tower exposures are also composed of painted concrete walls with openings for "punch" style window units. Curtain wall assemblies are provided at the ground level common area.

The low-rise exterior consists generally of window wall assemblies of the east exposure and painted concrete walls with punched style window units on the west exposure. Roof top decks are provided for each townhouse unit. The ground level commercial units are clad with curtain wall assemblies.

Building Address/Name	The 501, 501 Pacific Avenue, Vancouver, B.C.
Owner	Strata Plan LMS 4050
Property Manager	Mr. Bob Adams, Atlific Property Management Inc.
Building Type	High-rise and low-rise townhouse

Type of Construction	Non-combustible construction - concrete framed. Cast-in-place concrete with window-wall, metal panels, and punch windows
Occupancy	Residential Strata with retail units at lower level
Date of Construction	Completed in 1999
Applicable Building Code	Vancouver 1987
Sprinklered	yes
Number of Suites	277 units
Number of Storeys	Tower: 33, Townhouse: 4
Parking	Four level reinforced concrete below grade
Adjoining Properties	Southwest – Pacific Avenue Southeast – Richards Street Northwest – Back lane Northeast – adjacent building

2. REVIEW OF CURRENT CONDITIONS

2.1 Site Review

On August 17, 2004 we completed a site review of the 501 building complex. We were assisted during our site review by the building manager, Dave Suggitt, and property manager, Bob Adams.

A focus of our site review was to investigate water penetration into the townhouse suites. We were provided access to the following townhouse units: 202, 208, 209, 210. We reviewed leaks into the commercial units of 1375 and 1355 Richards Street.

To review the current overall condition of the complex we were provided access to suite 1909 of the tower, common areas, tower roof, underground parking garage, and mechanical rooms.

2.2 Townhouse Leaks and Commercial Units

We investigated leaks into the townhouses of units 202 and 209. Unit 208 and 210 did not have any reported active leaks.

Similar water damage to the interior finishes was observed in two of the reviewed townhouses.

Water damage was observed below the roof top decks at the location of a window. The pattern of water damage was reported to be typical among many of the townhouse suites. The location of water entry could not be verified, but the likely cause of water entry is associated with a discontinuity in the deck liquid membrane and/or a defect in the window sill detail. The window of townhouse unit 202 has been temporarily repaired by injection of expanding polyurethane grout from the interior by Allstar. The occupant of 202 reported that future exterior repairs to the window and deck membrane are planned. Refer to Photos 1 and 2 in Appendix C.

Another location of water damage was observed in the bedroom closet of the northwest exterior wall of unit 209. Interior exploratory openings have been made into the wall assembly (by others) and the water appears to come from a leak above the 3rd floor bedroom level. Water damage observed at the window head next to the closet was similar to that of unit 202. We lifted the carpet in the closet to review the condition of the wood tack boards and black staining was observed which indicates exposure to moisture (Photos 3 and 5). The path of water entry could not be determined visually. Possible locations of water entry that should be investigated are the wall/wall junctions, horizontal reveals, and sloped roof (Photo 4).

A third location of water entry into the townhouses was observed at the front door sill. The occupant of unit 209 reports that water enters into the interior underneath the door threshold. The concrete pavers are flush with the door threshold and the

likely path of water ingress is behind the upturn of the liquid membrane at the location of the door.

A concrete paver was lifted in front of townhouse unit 210 since it was observed that a liquid membrane was utilized below the concrete pavers and is turned up the adjacent concrete slab without a proper termination (Photo 6). Air pockets were observed behind the membrane which had penetrations through it. This detail is susceptible to water ingress behind the liquid membrane allowing water to be absorbed by the concrete that will allow water to migrate through cracks into the underground parking garage.

Water entry into the commercial units at 1375 and 1355 Richards Street were reviewed. Water damage to 1375 Richards was observed on the interior drywall beside the doorsill (Photo 7). For 1355 Richards the building manager reported that water runs out the door jamb frame at the latch bolt hole. A canopy with a drain is located above the door (Photo 8). It appears that water is entering the window/door frames and water is unable to drain to the exterior.

2.3 Items Identified by Atlific

Atlific provided us with a 18 point list of items that they requested us to review. The list they provided us and our findings is presented below.

1. Townhouse leaks (at decks and roofs)

A discussion of the findings from the investigation into the townhouse leaks is presented above (section 2.2).

2. Planter Membrane (Townhouses)

The planter membranes were observed to be a liquid membrane that extended onto the concrete upstand walls. The liquid membrane was typically completely covered by the soil without a proper termination nor protection (protection mat ends below membrane termination). Air pockets and holes that allow water to be absorbed into the concrete were observed at some locations. Water absorbed into the concrete can result in water migrating through cracks into the underground parking garage and/or drying to the exterior surface of the concrete up stand walls leaving efflorescence at the drying surface (Photos 9 and 10).

3. Dryer vents

Some of the dryer vents have fallen off the building (Photo 11). Corrosion of the fasters and vent hood was observed for one of the recovered fallen vent hoods. We would classify the observed corrosion of the fasteners as moderate considering the building is relativity new with a complete loss of corrosion protection (if any).

4. Front entrance efflorescence and staining

Cracking of the concrete with efflorescence was observed around the base of the tower (Photos 12, 13, 14). Hairline cracking is an aesthetic issue that results from concrete shrinkage without provisions for crack control. If cracking becomes larger than a hairline then the cracks should be routed out, filled with a sealant or epoxy, and painted.

Some staining of the painted concrete was observed below window penetrations and at a parapet wall saddle. The observed staining can be avoided by adding flashing to divert water away from the concrete wall (Photo 15 and 16).

5. "Paint not installed properly"

Painting around the parking garage and planters was taking place during the time of our visit. We did not observe any flaking of paint during our visual review of the perimeter of the building that would indicate improperly applied paint

Some bubbling of the wall coating was observed by the front entrance water fountain (Photo 17). A coating that is more water resistant should be used in this type of application or water must be diverted away from the wall.

6. "Concrete not sealed"

Concrete is a porous material that can store a significant amount of water before becoming saturated. Usually concrete has sufficient storage capacity to safely store moisture until drying can occur. As a result exposed concrete is sometimes designed without being "sealed" or painted. Salt staining on the surface of the concrete may be associated with exposed concrete drying and should be cleaned regularly.

7. Cracks in parking lot

The below grade parking garage was observed to have some signs of water leakage. Leaks were observed both at concrete cracks in the slab and walls (Photos 18 and 19). Where leaks have occurred, there were signs of efflorescence and/or rust stains on the concrete surface.

Based on our visual review, we have not seen conditions that indicate structural distress at the present time. The rust stains observed are indications that the reinforcing steel has begun to corrode and continued water leakage will likely lead to further deterioration and spalling of the concrete. At this time the leaks into the below grade structure are minor and appear to be more of a nuisance than a concern regarding occupant health and safety, but these concerns need to be addressed in the long-term maintenance plan of the building.

8. **"Poor inward sloping door installations in courtyard, stairwell exits to street, commercial units, causing water ingress during rain"**

We did not review all the door thresholds on site, but we did observe some of the low thresholds. Low door thresholds often lead to water ingress and best practice is to provide a curb to raise exposed doors from the ground and lower the risk of water ingress. These doors may be repaired by re-sloping the membrane away from the door, providing overhangs, and/or changing the sill detail (back dam with membrane).

9. **"Concrete slab in pool mechanical room is not graded towards existing drains. Two additional drains are required to prevent flooding in P1 storage below in the event of any leaks resulting from failure of any pool mechanical component, pipe, or pump;"**

We did not verify the ability of water to drain to the existing drains during our visit and if water will pond on the slab. A flood test of the floor could be completed to determine where any ponding may occur in the event of a flood and locate a drain at this location. A more cost effective approach might be to apply a traffic coating to the floor and re-slope to existing drains.

10. **"Paving stone in front of townhouse not installed properly"**

The paving stone was not pointed out to us during our site review since the location of the paving stone was unknown to the building manager at the time of our visit and we have nothing to add to this item.

11. **Elevator floor water leaks**

Allstar Waterproofing has carried out repairs by injecting expanding urethane grout into cracks. There are no known leaks in the elevator floor since the repairs.

12. **"Drain at pool table, (games room) outside?"**

The deficiency in question is unclear and the building manager did not know what the item was referring to. A cover is located outside the billiards room on the sidewalk, but the cover was not lifted to confirm a drain.

13. **33rd floor penthouse review construction of new door**

We were not provided access to the 33rd floor penthouse as the building manager was not able to arrange access as it is a private suite. The property manager reports that a window was replaced and the leak has stopped. Allstar reports that they have done spot repairs to the membrane on the tower roof.

14. Leak in main water entry room

A new floor membrane was observed. Allstar Waterproofing reports that they applied a new traffic membrane Tremco Vulkem (liquid applied polyurethane).

15. 4th Floor Decks

The townhouse 4th floor decks were reviewed. Water ingress into the interior appears to be associated with the 4th floor deck membrane/window sill detail as discussed in section 2.2.

16. Exposed reinforcing beside volley ball court

Rust staining of the concrete wall and delamination of the paint was observed by the volleyball court (Photo 20). We suggest that any spalling concrete be chipped out then grouted and painted.

17. Doorways not painted

This is a maintenance issue that was not reviewed by MH, since we were not directed to doorways that were not painted.

Depending on the material and finish of the doors, painting may be required for the long term durability of the doors or paint could be strictly an aesthetic issue.

18. "Swimming pool caulking"

The pool area was addressed as part of our structural assessment of the pool (Refer to Appendix E).

2.4 Items from Morrison Hershfield First Year Post-Construction Building Review

Our recommendations from our first year post-construction building review and current state of resolution are presented below. It is our opinion, that AOC's primary response with respect to the "5 levels of inspection" does not remove the responsibility of the contractor to comply with contract requirements and sign-off does not necessarily imply that the issues identified are acceptable. For example, the window wall metal panels at the townhouses were required to have weep holes (as per shop drawings) and these were missing.

2.4.1 Additional Investigation

We recommended the following items for further review:

1. *The original design professional and envelope consultant should confirm that the as-built conditions meet the window drainage design intent (sealant applied at the punch window sill). It is a significant detail which requires clarification.*

   This has not been done to our knowledge. AOC has commented, but the issue has not been addressed. See Appendix D.

2. *The original design professional and envelope consultant should confirm that the as-built conditions meet the metal panel drainage design intent (sealant applied at the base of metal panel at low-rise locations)*

   This has not been done to our knowledge. AOC has commented, but the issue has not been addressed. See Appendix D.

3. *The original design professional and envelope consultant should confirm that a) the type of coating applied to the balcony slabs and b) the existing as-built conditions meet the design intent.*

   This has not been done to our knowledge.

   AOC states that the strata was issued a 10 year labour and material warranty. AOC acknowledges the failure of the product and has contacted the supplier who was supposed to have rectified the problem in the spring/summer of 2001.

   We reviewed the balcony of 1901 and no discontinuities in the paint were observed.

4. *The original design professional and envelope consultant should confirm that the sealant joints at the punch window jambs were installed as per drawings (including caulking between the plywood liner and concrete wall and membrane to the plywood liner).*

   This has not been done to our knowledge. AOC has commented, but the issue has not been addressed. See Appendix D.

5. *The original design professional and envelope consultant should confirm that the there is drainage and proper waterproofing details at the planter locations. In particular, the continuity of the as-built waterproofing around the conduit for the light fixtures should be confirmed.*

   This has not been done to our knowledge. AOC has commented, but the issue has not been addressed. See Appendix D.

   The planer waterproofing is discussed above (section 2.3, item 2).

6. *The original design professional and mechanical engineer should confirm that the as-built ventilations and temperature inside the pool mechanical room meet the original deign criteria.*

   This has not been done to our knowledge. AOC states that it meets the original design criteria and conforms to code.

   The mechanical room was warm and did not appear to be ventilated during our site review.

7. *The connection detail between the pool steel beam and building should be reviewed by the original designers and structural engineer to confirm that the as-built construction conforms to the design.*

   This has not been done to our knowledge. AOC has commented, but the issue has not been addressed. See Appendix D.

8. *The ventilation of the common room on the third floor should be reviewed by the original designers and mechanical engineer.*

   This has not been done to our knowledge. A portable air-conditioning unit has been installed in the operable window unit to provide ventilation.

2.4.2 Original Deficiencies

The following building deficiencies were recorded during our initial report.

1. *Apply caulking to all fireplace vent flanges that have not been sealed to the concrete wall*

   The fireplace vent flanges have not yet been sealed to the concrete wall (Photos 21 and 22) for units reviewed in the townhouses and tower.

2. *Install weep holes at the base of any window wall metal panels per window shop drawings where the weep holes have been omitted*

   No weep holes have been observed in the townhouse metal panels (Photo 23). Weep holes are specified in D72 of the window shop drawings. See drawings in Appendix D of our original report.

3. *Tighten the curtain wall pressure plates so that the gaskets are compressed to form an adequate seal*

   There are no reported leaks through the curtain wall and the gaskets were compressed at the time of our review. This is an ongoing maintenance requirement.

4. *Repair and correct (plumb and square) the alignment of the lobby door area*

The billiards room door is still not aligned properly and does not close properly.

5. *Provide door sweep and weatherstripping at the lobby doors*

   The lobby doors are protected under overhangs and largely protected from driving rain. Door sweeps will reduce air leakage and are an operational and maintenance item.

6. *Attach the roof partition wall frames to the building structure instead of the stone pavers*

   The roof partition wall frames to the stone pavers have been relocated approximately 6 inches. They are still attached to the stone pavers.

7. *Protect membrane at the roof thresholds and mechanical penetrations with metal flashing*

   Not completed (Photos 24 and 25).

8. *Review the balcony slabs to ensure that there is a consistent 2% slope as shown on the drawings for drainage and correct where slope is inadequate*

   The slope of the balcony at suite 1901 was adequate. We did not complete a full review of the balcony slopes as the original balcony membrane is still in place and therefore nothing would have been done to re-slope the balconies.

9. *Remove the soil, at townhouse 210, around the copper pipe to investigate the source of the leakage and to correct the problem*

   The current occupant of the unit is unaware of a leak. The leak was reported to be corrected and stopped by the building manager.

10. *Identify and repair the source of the water leakage at the parking garage slabs*

    The leakage into the parking garage is likely associated with the planter membrane termination and/or courtyard membrane upturn.

    The air intake unit has water damaged drywall near parking stall 17 (Photo 26). The protection of the unit from rainwater penetration should be reviewed.

11. *Repaint the yellow areas in the parking garage*

    This is a maintenance issue that does not require input from us and therefore was not reviewed during our site review.

12. *Repair the voids in the membrane applied at the parking garage mechanical room*

    A new floor membrane has been applied (section 2.3, item 14).

13. *Replace missing tiles with new and repair cracks in the grout joints*

    This is a maintenance issue that does not require input from us and therefore was not reviewed during our site review.

2.5 Other Observed Deficiencies

While reviewing the condition of the items from the 18-point list by Atlific and our First Year Post-Construction Review we observed some deficiencies not already identified.

The waterproofing around a stand pipe has deteriorated (Photo 27). Water will be able to run along the pipe directly into the interior.

The window gasket of townhouse suite 210 does not completely seal around the IGU unit (Photo 28). This will allow water into the window frame and if water is not able to easily drain to the exterior, then it may leak into the wall assembly and/or interior causing damage.

3. DISCUSSION

From our visual review of the current conditions of the building complex, a concise description of the issues for each building envelope element and our recommendation for further action is presented below. We have categorized each recommendation as follows:

Type:	Investigation	Further investigation is required (this could include further evaluation, testing or destructive openings).
	Action	A remedial task has been identified for the Strata to address
Priority:	1	Immediate – required because of codes, life safety issues, high liability or damage occurring
	2	Recommended by MH – good practice, to reduce risk of future damage
	3	Owner discretion is appropriate – low risk, immediate action not required
Timeframe:	I	Immediate – High risk of future damage
	II	Plan within 2 to 5 years – Risk of future damage
	III	Timeframe is flexible

3.1 Exterior Wall Cladding

Cracking and staining of the concrete walls is present at a few locations and maintenance/repairs should be completed to keep the walls in good repair (for example cleaning, painting, and providing flashing and drip edges at location of staining).

Generally, the cracking of the concrete is hairline cracking and is likely from shrinkage and/or settlement. Now that the cracks have formed to relieve stresses from shrinkage and settlement this condition is expected to have reached a point of equilibrium; we expect that new cracks will not form or the existing ones will not become larger.

Sealant is still generally not applied between the concrete wall and fireplace vent flange. Corroding of the fasteners for in-slab dryer vents is a particular concern. Corroding fasteners should be replaced with more corrosive resistant fasteners.

The entry point of the leaks into the townhouse wall assembly of the walls orientated to the courtyard (northwest exposure) is not easily identifiable by visual inspection. Further investigation is required to target repairs at stopping the water ingress. Possible locations of water entry that should be investigated are the wall/wall junctions, horizontal reveals, and sloped roof.

The waterproofing around a stand pipe in the courtyard was observed to be deteriorated and will allow water penetration into the wall assembly. We suggest that the waterproofing be repaired and protected by flashing.

Recommendation 1:

Investigate the exact path of water ingress into the townhouses through a testing program, particularly the water entry observed for the exterior walls orientated to the courtyard

Type: Investigation **Priority:** 1 **Timeframe:** I

Recommendation 2:

Replace dryer vent hoods with stainless steel fasteners

Type: Action **Priority:** 2 **Timeframe:** I

Recommendation 3:

Route out cracks and spalling concrete, apply sealant, and paint

Type: Action **Priority:** 2 **Timeframe:** II

Recommendation 4:

Incorporate diverter flashing at saddle intersections

Type: Action **Priority:** 2 **Timeframe:** III

Recommendation 5:

At front entrance water fountain apply a wall coating that is more water resistant or divert water away from the wall

Type: Action **Priority:** 3 **Timeframe:** III

Recommendation 6:

Repair waterproofing around stand pipe in courtyard and protect with flashing

Type: Action **Priority:** 2 **Timeframe:** II

3.2 Windows and Doors

The condition of the windows and doors have not changed since the time of our original report. The as-built construction of the window details still remain in question (through the original design consultant). These questions should be answered because as the building ages, water is more likely to get behind the exterior

caulking and proper drainage will become more important to the performance of the wall assembly.

The window gasket of townhouse unit 210 does not completely seal around the IGU unit. The condition of the window seals and caulking should be regularly monitored and repaired.

Many of the leaks into the townhouses appear to be associated with the windows and doors where there is a low threshold above the balcony membrane. Water entry has occurred at many doors due to low thresholds and the doorsill waterproofing detail. The doors may be repaired by re-slopping the membrane away from the door, providing overhangs, and/or changing the sill detail (back dam with membrane upturn).

The location of water entry at the 4th floor townhouse decks could not be verified visually, but the likely cause of water entry is associated with a discontinuity in the deck liquid membrane and/or a defect in the window sill detail. We suggest that a window at the 4th floor decks be dismantled and the sill waterproofing detail reviewed to determine if the detail conforms to the window shop drawings and if the window detail could be improved.

The recommendations from the original MH report should be followed particularly with respect to the design intent of the windows and metal panel drainage. The caulking is expected to start failing in the upcoming years and maintenance such as caulking renewal will become extremely important for the building envelope performance if proper drainage is not provided.

Recommendation 7:

Regular monitoring of the condition of the window caulking and seals

Type: Action/Investigation **Priority:** 2 **Timeframe:** III

Recommendation 8:

Investigate window sill waterproofing at the 4th floor deck windows

Type: Action **Priority:** 1 **Timeframe:** I

Recommendation 9:

Follow MH original recommendations for additional investigation with respect to window and metal panel drainage

Type: Action **Priority:** 1 **Timeframe:** I

Recommendation 10:

Repair door thresholds that are experiencing water entry or reduce exposure to driving rain

Type: Action **Priority:** 1 **Timeframe:** I

3.3 Roof Assemblies

The issues with the roof assemblies raised in the previous report have not been addressed. The roof partitions remain attached to the pavers (relocated) and the liquid membrane is exposed at some locations.

The leaks into townhouses appear to be associated with the roofs and decks. The sloped townhouse roofs were not reviewed due to access difficulties, but water damage of the northwest townhouse walls may be associated with the roof detail. Other leaks into the townhouse are occurring on the 4th floor decks. From our review of the liquid membrane upturn detail, we suspect that the leaking is associated with the membrane termination and/or window sill detail.

Recommendation 11

Carry out MH's original recommendations with respect to roof partitions and exposed membranes

Type: Action **Priority:** 2 **Timeframe:** III

Recommendation 12:

Improve termination of waterproofing at upturns of 4th floor decks

Type: Action **Priority:** 1 **Timeframe:** I

3.4 Balconies and Planters

The product applied to the balcony slabs went through adhesive failure shortly after construction and delaminated. AOC reported that they have contacted the supplier and rectified the problem in 2001. AOC claims that the "chipping" of the waterproofing paint caused the ponding water and that the balcony slabs were properly sloped. We did not observe any water to be trapped/pooled during our visit, but this is to be expected as our site visit was near the end of a dry summer. We measured the slope of a balcony slab at one location and it was adequately sloped. We suggest that the strata conduct a survey (including all building envelope components) after a rainy period to assess the effectiveness of the balcony repairs and current performance of the balcony waterproofing product. AOC reports that the waterproofing product used on the balcony slabs has a 10 year labour and material

warranty, but the building manager has not been able to locate these documents. This documentation should be provided to /obtained by the strata.

The planter membrane is particularly prone to failure. The liquid membrane was typically completely covered by the soil without a proper termination nor protection (protection mat ends below membrane termination). Air pockets and holes that allow water to be absorbed into the concrete were observed at some locations. Water absorbed into the concrete can result in water migrating through cracks into the underground parking garage and/or drying to the exterior surface of the concrete up-stand walls leaving efflorescence at the drying surface. This is currently largely an aesthetic issue but it is something that the strata should continue to monitor. The parking garage is discussed in more detail below.

Recommendation 13:

Conduct an occupant survey and assess the condition of the repairs to the tower balcony slab waterproofing

Type: Investigation **Priority:** 2 **Timeframe:** I

Recommendation 14:

Obtain documentation for balcony membrane waterproofing warranty

Type: Action **Priority:** 2 **Timeframe:** I

Recommendation 15:

Correct planter membrane termination

Type: Action **Priority:** 3 **Timeframe:** III

Recommendation 16:

Provide cap flashing over planter up stand walls

Type: Action **Priority:** 3 **Timeframe:** III

3.5 Parking Garage

The water ingress observed in the parking garage on the underside of the slab continues to be more of a nuisance rather than a concern for occupant health and safety. Leaks into the reinforced concrete parking garage will slowly corrode the reinforcing bars over time and require maintenance/repairs in the future. The strata should continue to monitor the water leakage, since over time the resulting corrosion may lead to spalling of the concrete and/or loss of structural integrity.

Recommendation 17:		
Repair concrete cracking with urethane crack injection and crystalline slurry		
Type: Action	**Priority:** 2	**Timeframe:** III

3.6 Pool

From our visual assessment of the pool (see Appendix E) our opinion is that other than the presence of a few cracks in the bottom surface of the pool and on the top of the deck slabs, the pool area appeared to be in good condition without any signs of distress or concern for safety. We did not find cracks or any signs of distress when we reviewed the mechanical room and the recreation space below the pool. We believe that the structure supporting the pool is performing well. However, after reviewing the pool drawings the failed joint should be rehabilitated.

Recommendation 18:		
Obtain drawings of the pool area and rehabilitate failed joint in pool area		
Type: Action	**Priority:** 1	**Timeframe:** I

3.7 Interior Review

The ventilation in the meeting room has been addressed by adding an air-conditioning unit in the operable window.

The in-slab dryer vents have been cleaned since the time of the original MH report. Periodic cleaning of the grills should be continued to ensure that the in-slab vents do not become blocked.

Repairs to waterproofing membranes (elevator shaft, mechanical room) have been completed sporadically through the building complex when leaks have been identified.

There has been some problems with the concrete floors not sloping to existing drains. We suggest that the floor be re-sloped to the existing drains as this will likely be more cost effective than adding new drains.

Recommendation 19:		
Re-slope concrete flooring to existing drains		
Type: Action	**Priority:** 2	**Timeframe:** III

4. SUMMARY OF RECOMMENDATIONS

The following recommendations are based on our current visual observations. This report provides a review of the items identified by the property manager and from our original report. Locations requiring further investigation were also noted. We have identified the party responsible in our opinion, for follow-up action and in accordance with the general intent of the five year "Weatherguard" warranty and the one year warranty for the construction and finishing of the building and common facilities provided by the developer (for the items identified in the original MH report).

Not all of the recommendations from the original MH report have been summarised below. An update of the progress of work completed with respect to the original MH recommendations are presented in section 2.4 or this report.

4.1 Immediate Action (First Priority)

No.	Recommendation	Type	Priority	Time-frame
1	Investigate the exact path of water ingress into the townhouses through a testing program, particularly the water entry observed for the exterior walls orientated to the courtyard	Investigation By strata management/ Developer	1	I
8	Investigate window sill waterproofing at the 4th floor deck windows	Investigation By strata management / Developer	1	I
9	Follow MH original recommendations for additional investigation with respect to window and metal panel drainage	Investigation By developer	1	I
10	Repair door thresholds that are experiencing water entry or reduce exposure to driving rain	Action By developer	1	I
12	Improve termination of waterproofing at upturns of 4th floor decks	Action By developer	1	I

18	Obtain drawings of the pool area and rehabilitate failed joint in pool area	Action By strata management	1	I

4.2 Highly Recommended (Second Priority)

No.	Recommendation	Type	Priority	Time-frame
2	Replace dryer vent hoods with stainless steel fasteners	Action By strata management	2	II
3	Route out cracks and spalling concrete, apply sealant, and paint	Action By strata management	2	II
4	Incorporate diverter flashing at saddle intersections	Action By strata management	2	III
6	Repair waterproofing around stand pipe in courtyard and protect with flashing	Action By developer	2	II
7	Regular monitoring of the condition of the window caulking and seals	Action By strata management	2	III
11	Carry out MH's original recommendations with respect to roof partitions and exposed membranes	Action By developer	2	III
13	Conduct an occupant survey and assess the condition of the repairs to the tower balcony slab waterproofing	Investigation By strata management	2	III

No.	Recommendation	Type	Priority	Time-frame
14	Obtain documentation for balcony membrane waterproofing warranty	Action By developer	2	I
17	Repair concrete cracking with urethane crack injection and crystalline slurry	Action By strata management	2	III
19	Re-slope concrete flooring to existing drains	Action By developer	2	II

4.3 Minor Deficiencies (Third Priority)

No.	Recommendation	Type	Priority	Time-frame
5	At front entrance water fountain apply a wall coating that is more water resistant or divert water away from the wall water fountain or divert water away from the wall	Action By strata management	3	III
15	Correct planter membrane termination	Action By developer	3	III
16	Provide cap flashing over planter up stand walls	Action By strata management	3	III

MORRISON HERSHFIELD LIMITED

Patrick Roppel, MASc
Building Science Consultant

Richard F. Taylor, MRAIC
Principal

APPENDIX A:
Glossary

Terminology & Glossary

A number of the terms used in this report have specific meaning in the context of this report and are therefore defined below. All of the terms and abbreviations used are standard in the industry. This glossary may be of some aid for those not familiar with construction terms:

Air Barrier refers to a combination of materials and components, including joints, that control the flow of air through an assembly, limiting the potential for heat loss and condensation due to air movement.

Air Leakage refers to the airflow into or out of a space through the wall assembly. The outward leakage of air is known as exfiltration and the inward leakage is known as infiltration. Exfiltration of warm, humid interior air will carry water vapour into the wall assembly, which may condense on contact with cold surfaces.

Balcony refers to a horizontal surface exposed to the outdoors, but projected from the building so that it is not located over a living space.

Base Coat refers to the initial wet state material, either factory or field-mixed, used to encapsulate the fibreglass-reinforced mesh (in EIFS applications).

Building Envelope refers to those elements of the building that separate inside conditioned space from outside unconditioned space, and includes walls, windows, doors, roofs, balcony decks (over occupied living space) and foundations. Sometimes referred to as "building enclosure" or an "environmental separator" in building codes.

Building Paper refers to a breather-type asphalt sheathing paper, which is rated in minutes (15, 30 or 60), based on preventing water flow through it for number of minutes in accordance with a standard test. Also referred to as moisture barrier.

Built-up Roof (BUR) refers to a waterproof system constructed of multiple felt layers mopped down with hot bitumen.

Capillary Break refers to the gap between parallel layers of material sufficient to break the surface tension of water, which is typically a minimum of 10mm (3/8").

Cladding refers to a material or assembly that forms the exterior skin of the wall. Typical cladding types include; stucco, EIFS, metal panels, brick/stone veneer, wood siding, and vinyl siding.

Deck refers to a horizontal surface exposed to the outdoors, located over a living space, and intended for moderate use but not for access to other areas of the building.

Delamination refers to a separation along a plane parallel to the surface.

Dew Point refers to the temperature at which air containing a constant amount of water vapour reaches the saturation point. As the temperature decreases, the air has a lower

capacity to contain moisture. Condensation can occur at or below the dew point temperature.

Drained Cavity (also **Rainscreen**) refers to a design strategy whereby a positive drainage plane is created immediately behind the exterior cladding material and in front of the moisture barrier. The so-formed cavity is sufficient in width to break the surface tension of water, and allows incidental water entering the wall system to drain by gravity with the aid of flashings and membranes.

Drip Edge refers to a projection detailed to direct water run-off away from wall, window, balcony or roofing element.

Efflorescence refers to the dissolved salts in the material (such as concrete or brick) being transported by water, and redeposited on the surface after evaporation.

EIFS refers to *Exterior Insulated Finish System* and generally consists of layers of rigid insulation adhered or fastened to the substrate, and finished with thin coats (lamina) of reinforced cementitious material and a finish coat of acrylic stucco.

EPDM (Ethylene Propylene Diene Monomer) refers to a waterproofing sheet membrane made of vulcanized rubber. These membranes, usually single-ply applications, may be installed fully bonded to the substrate with an adhesive, or may be "loose-laid" with only the laps and terminations of the membranes adhered.

Face-seal refers to a building envelope strategy where the performance of the exterior wall is dependent on the ability of the exterior surface of the cladding, windows and associated sealant to shed water and prevent its infiltration. This system can not accommodate water that penetrates past the exterior face since a positive drainage path and/or additional continuous waterproof barrier are not provided.

Finish Coat refers to the final wet state material, which provides colour and texture, applied over the reinforced base coat (on stucco or EIFS applications).

Fishmouth refers to a deficiency in the installation of waterproofing membranes (roofing, self-adhering membranes, etc.) which results in a fold in the edge of the membrane, through which water can penetrate.

Flashing refers to sheet metal or other material used in roof or wall construction and designed to shed water (typically sloped outwards, with a drip edge to shed water). Used in conjunction with:

- *Cap* or *Parapet flashing:* top of wall, pier, column or chimney.
- *Saddle flashing* an upturn, sloping transition piece between a horizontal and vertical plane, e.g. balcony cap and wall intersection.
- *Head/sill flashing:* at head or sill of window opening or other penetration.
- *Base flashing:* at bottom edge of wall surface.
- *Cross-cavity* or *Through-wall flashing:* a flashing, which sheds water from the moisture barrier plane to the exterior, through the cladding.

Gum Lip refers to a method of sealing a flashing to a wall surface whereby the top edge of the flashing is bent outwards to form a caulk-filled cavity (typically at the termination of a waterproofing membrane).

Housewrap refers to a sheet plastic material, which is used as a sheathing paper, generally between the wall sheathing material and the exterior cladding. Although recognized as a proprietary term, in this report *housewrap* is used to represent a generic group of materials. One common type of housewrap consists of spun-bonded Polyolefin (SBPO), another is made of perforated polyethylene. Their resistance to liquid water is high, but provides little resistance to water vapour diffusion.

Maintenance refers to a regular process of inspection, cleaning and minor repairs of envelope elements and exterior systems such as roof, walls, windows, gutters, downspouts and drains. Maintenance is performed to ensure proper performance of service life of assemblies or components.

Movement Joint or **Control Joint** refers to a continuous joint in a structure, cladding or other element which allows differential movement of portions of the building structure (expansion joint), or prevents or localizes cracking of brittle materials, such as stucco, where movement needs to be controlled (control joint).

Penetration refers to a hole passing through the building envelope in which ducts, electrical wires, pipe and fasteners are run between inside and outside.

Punch Window refers to the architectural style of the window being expressed as a single "punched" opening surrounded by the cladding material, as opposed to being arranged in vertical or horizontal strips of several window units.

Relative Humidity refers to the ratio (expressed as a percentage) of the amount of moisture within the air to the maximum amount of moisture that the air could possibly contain for a given temperature.

Saddle refers to the transition of small horizontal surfaces, such as the top of a balcony guardrail or parapet wall, with a vertical surface, such as a wall.

Scupper refers to a metal pipe or trough section creating a drainage overflow from a roof or balcony to a downpipe or to a surface below.

Sheathing refers to a material used to provide structural stiffness to the wall framing and to provide structural backing for the cladding and sheathing paper. Typical materials are OSB (oriented strand board), plywood, or gypsum board.

Sheathing Paper (or **moisture barrier)** refers to a material or combination of materials in an exterior wall whose purpose is to retard penetration of incidental water further into the wall structure once past the cladding. Commonly used materials are building paper or housewrap.

Spall refers to a fragment of material, such as concrete or masonry, detached from a larger mass by a physical blow, weather action, internal pressure or efflorescence within the mass (sub-fluorescence).

Strapping refers to the use of wood or metal material, typically 19mm (¾") nominal thickness, to form a drainage cavity and act as a capillary break behind the cladding.

Surfactant refers to an agent (e.g., detergent) that, when mixed with water, breaks the surface tension of water drops, thus enabling easier absorption of water through a material. Without surfactants, water would have a greater tendency to remain as drops on the surface of a given material.

Symptoms refers to visual evidence, such as staining or wetting of surfaces, loss of strength, material delamination or cracking, peeling paint, debonded coatings, etc., which suggests a performance problem within the exterior envelope of a building.

Thermal Bridge refers to a material with higher thermal conductivity transferring more heat through an assembly than the surrounding components. For example, a stud in a wall will transfer more heat that the surrounding insulation.

UV refers to ultra-violet radiation (from the sun), which has a degrading effect on many membrane and sealing materials (asphalt based) unless protected by an appropriate shielding layer.

Vapour Retarder refers to a material having a high resistance to water vapour diffusion that is located within the assembly to control the flow of vapour and limit the potential for condensation due to diffusion.

Weephole refers to an opening placed in a wall or window assembly to permit the escape of liquid water from within the assembly. Weepholes can also act as vents.

Window refers to a manufactured assembly of a frame, sash, glazing and necessary hardware, made to fit an opening in a wall.

- *Windowsill*: horizontal member at the base of a window.
- *Window head*: horizontal member at the top of a window.
- *Window jamb*: either of the vertical members at the sides of a window.
- *Mullion*: A vertical member between the glazed units.
- *Rail:* A horizontal member between the glazed units.
- *Glazing:* The glass portion of the window.
- *IGU:* Insulated glazing unit. Double or triple panes of glass sealed together to provide insulation value. The still gas between the panes acts as the insulation.
- *Condensation track*: a channel at the interior sill level of the window intended to intercept small amounts of water condensing on the interior surface of the glass.

APPENDIX: B:
Proposal

MORRISON HERSHFIELD
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June 22, 2004

MH Ref: 5042 159.99

The Owners, Strata Corporation LMS 4050
c/o Mr. Bob Adams, General Manager
Atlific Property Management Inc.
1110 Howe Street
Vancouver, B.C.
V6Z 1R2

Fax: (604) 684-9970

Dear Mr. Adams:

Re: Building Envelope Warranty Review - Update
The 501, LMS 4050, 501 Pacific Avenue, Vancouver, B.C.

Thank you for the opportunity to provide a proposal for an update to our First Year Post-Construction Review of the property in a report dated December 21, 2000. We confirm our discussion meeting on June 15, 2004 when a response from Amacon-Omi Construction Inc. (AOC) was obtained together with an 18 point list of warranty items that will be the MH update focus. We understand that the current warranty is a five year "Weatherguard" coverage of water ingress via the exterior envelope, that expires in January 2005.

Background Information

The complex consists of a 33 storey residential tower (facing Pacific Avenue) with a four storey low-rise portion fronting onto Richards Street, and is built over a 4-level concrete framed underground parking garage. The residential tower and townhouses totals 277 units. The developer AOC provided a 5 year Weatherguard warranty expiring in January 2005.

Definition of Warranty Provisions

The terms of coverage in general is assumed (Atlific to confirm) to be for 10 years on the building envelope (*water penetration)* including *"any defect in materials and labour supplied for the exterior cladding, caulking, windows and doors that may lead to detachment or material damage to the dwelling unit."*

Scope of Work

The purpose of this proposal is to identify building envelope deficiencies (but not duplicate the tasks carried out under our initial review in December 2000), prior to the expiry of the five-year warranty period but in particular our focus should be the townhouses and any other item of the 18 point warranty item list provided by Atlific. We will review the letter from AOC as a response to the MH First Year Post-Construction Review report, dated December 21, 2000 and identify outstanding deficiencies requiring correction from section 4.2 of that report.

We propose the following scope of services:

1. Review the original architectural drawings, shop drawings and any material or construction warranties prior to visiting the site. Obtain copy of maintenance records or incidents of water ingress and any other building envelope issues, as provided by the owners.
2. Conduct a general visual review (from ground, roof, balcony and podium levels, if accessible) of the building complex, to identify the following:

    - Review items on the MH First Year Post-Construction Review report, dated December 21, 2000 to confirm whether they have been addressed / corrected.
    - Review warranty items listed in an 18-point list provided by Atlific (Appendix A).
    - In particular at the townhouses assess the cracking problem at the decks and determine if this is a significant problem.
    - Coordinate reviews with Allstar Waterproofing who have carried out some interim repairs (in order to become knowledgeable of repairs undertaken).
    - Highlight items which are considered to be major deficiencies that will have a significant impact on the performance of the building.

3. We will undertake two bosun chair drops, to evaluate the caulking, condition of the windows and other penetrations; in order to identify any "changed condition" comparison to our previous report of December 21, 2000.
4. We will focus our comments on the current condition of the cladding assemblies, observable deficiencies and the general performance of the assemblies.
5. Prepare and submit two copies of a professional signed and stamped letter report, which summarizes the review. The letter report will list existing conditions (with sample photographic examples) and recommended actions to correct any identified deficiencies (no budget estimates are included). The report will be issued no later than September 2004.
6. Identify areas where further investigation (such as exploratory openings) is required to determine the extent of observed problems and the possible scope of remedial action required. This type of intrusive work will require the assistance of a contractor to patch the openings made in the exterior wall assemblies for which a separate scope of services and budget can be determined and agreed before proceeding.

Some of our findings will be based on a random sampling and some of the findings will be based on a visual review of actual surface conditions. No other testing, test openings, detailed analysis or design calculations are included in the proposed scope of services. If the need for such testing or procedures is necessitated during the course of the work, they will be identified to the client.

Fees and Expenses

For the above scope of work we propose a fixed fee of **$ 7,800.00** for the review and report (+GST), including all expenses. We have included for one meeting with the strata and Atlific to discuss our findings. We have not included for any meetings or correspondence with the builder/developer (AOC) to discuss or negotiate corrective action by under their warranty. This will be carried out under time and expense in accordance with the attached Standard Rate Schedule. We will not exceed these limits without prior authorization from you.

This proposal is open for acceptance for 60 days. The Goods and Services Tax (GST) will be added to the above fees and will be shown as a separate item on our invoices.

Due to the increased demand of this type of work and our current workload, we will schedule the field investigative work within three (3) weeks of receiving written authorization to proceed. We would request that an authorization to proceed be issued. Our report would be submitted within four to six (4-6) weeks of completing the fieldwork.

Please do not hesitate to contact the writer if you require additional information or if you have any questions regarding our proposal.

Yours very truly,
Morrison Hershfield Limited

Richard F. Taylor, MRAIC
Principal

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APPENDIX C:
Photographs