July 22, 2021

The Owners, Strata Plan NW 3355
c/o FirstService Residential
700 – 200 Granville Street
Vancouver, BC V6C 1S4

Attention: Beverly Kapush, Strata Manager Email: Beverly.Kapush@fsresidential.com

Dear Beverly,

Re: The Metropolitan, 5885 Olive Avenue, Burnaby
Building Enclosure Evaluation *Sense's* Project No. 18R085A

We are pleased to provide you with our report for the Building Enclosure Evaluation for The Metropolitan.

We trust you will find this report to be comprehensive, yet easy to understand, and useful as a tool to assist in managing your building enclosure.

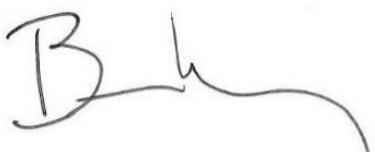
We suggest that you start by reviewing the Executive Summary of the report and then working through the rest of the report and appendices.

Thank you for your business and we look forward to hearing from you.

Yours truly,

Hyejoo Koh, EIT, M.Eng.
Project Associate (604) 362-7113
Sense Engineering Ltd.

Alana Frost, DipIT., LEED AP
Project Manager (778) 552-1245
Sense Engineering Ltd.



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Principal (604) 365-3664
Sense Engineering Ltd.

BUILDING ENCLOSURE EVALUATION FOR

THE METROPOLITAN

5885 OLIVE AVENUE, BURNABY

PREPARED FOR:

The Owners, Strata Plan NW 3355
c/o FirstService Residential
700 – 200 Granville Street
Vancouver, BC V6C 1S4

PREPARED BY:

Sense Engineering Ltd.
104 – 788 Copping Street
North Vancouver, BC V7M 3G6

July 22, 2021

Project Number: 18R085A

sense engineering

EXECUTIVE SUMMARY

The Owners of Strata Plan NW 3355 retained *Sense Engineering* to prepare this building enclosure evaluation for The Metropolitan at 5885 Olive Avenue, Burnaby. The primary purpose of our evaluation was to better understand the building enclosure conditions, so the Strata can plan for future maintenance and repairs.

We identified the following general concerns which should be addressed in upcoming projects:

- The majority of the suites reviewed have condensation and/or water leakage issues through window framing and glazing, causing pooling in the window frame tracks.
- The majority of the suites reviewed have failed window insulating glazing units (IGUs).
- Generally, exterior caulking around window sills and jambs is aged and failed and appears to be contributing to water leakage into the building at many locations.
- Hinges and cam handle damage is affecting window operation and are contributing to window leakage issues at some locations.
- The penthouse roof decks are allowing active water leakage into living rooms and causing damage to floor finishes.
- There is an active leak into PH-03's upper level bathroom which comes from the open joints at the arched window frames.
- There was an active leak into PH-01 master bedroom which was caused by poor waterproofing tie-in details at the sliding door sill.
- Balcony waterproofing membrane is failing at many suites and replacement is required.
- Some of balcony drain covers are missing, increasing the risk of clogged drains and ponding.
- Balcony soffits have reinforcing steel chair staining that is visually undesirable to some the Owners.
- The exterior concrete wall acrylic finish has localized water-filled blisters.
- There are stucco blisters throughout the main sloped roof parapet walls.
- The pool room has active leakage through the joints between the metal frame and ceiling intersection, causing the ceiling coating to peel off and damage to wood handrail.
- Canopy roofs appear to be actively leaking, causing stucco on the soffits to blister.

These findings and related repair projects have been detailed in Sections 3, 4 and 5 within this report.

Some of the specific sources of the active leakage into the building at windows, roof decks, and penthouse walls are difficult to identify without further investigation and testing. Our report recommends completing some additional testing and investigation work so an appropriate repair strategy for these issues can be developed. In the meantime, our report provides budget costs for some assumed repairs that we expect will be required.

We recommend the following projects, in the priority and timing indicated:

Priority	Project Description	Timing	Opinion of Cost
1	PH-3 and PH-6 Leak Repairs	2020	$161,000
2	Roof Deck Replacement	2021	$857,000
3	Window and Pool Room Investigation	2021	$139,000
4	Window Repairs / (Window Replacement)	2022	$1,037,000 / ($8,559,000)
5	Balcony Repairs	2025	$1,182,000
6	Exterior Wall Maintenance	2027	$576,000

TABLE OF CONTENTS

APPENDICES

1.0 BACKGROUND

The Metropolitan is a 25-storey building with a total of 132 residential suites, constructed in 1991. The building is concrete with post-tensioned floor slabs. The building exterior generally consist of aluminum-framed windows on concrete curb walls. There are smaller wall areas that are clad with stucco, and brick masonry veneer. There are 105 balconies from the ground to 22nd floor levels and 4 lower roof decks and 6 upper roof decks at the 6 penthouse suites.

Photo 1: General photo of The Metropolitan.

There has been a history of water leakage through the window, balconies and roof decks. Past repairs include caulking the window frames and exterior cladding, replacing Insulated Glass Units (IGUs), and installing new waterproofing membrane at roof decks and balconies.

2.0 SENSE ENGINEERING'S SCOPE OF REVIEW

We completed our initial site review on November 27, 2018 as follows, as per our proposal, dated October 1, 2018:

- Issued a questionnaire to residents to better understand the scale of concerns of the problems and to identify specific locations that should be reviewed on site. A summary of the questionnaire responses is included in Appendix B.

- Reviewed the interior of 22 suites to help identify damage or concerns related to water leakage or condensation. Suite review included recording interior conditions (temperature and relative humidity), air leakage testing, and non-destructive moisture detection.

  As part of our review, we accessed the following suites:
  #2401, #2403, #2405, #2406, #2306, #2206, #2101, #2005, #1903, #1706, #1601, #1504, #1404, #1004, #903, #805, #702, #602, #603, #404, #203, and #101.

- Visually reviewed exterior walls, windows, doors, and balconies from grade, balconies, roof decks, and from four rope access drops (one per elevation).

Photo 2: Rope drop at east elevation.

Photo 3: Rope drop at south elevation.

Photo 4: Rope drop at west elevation.

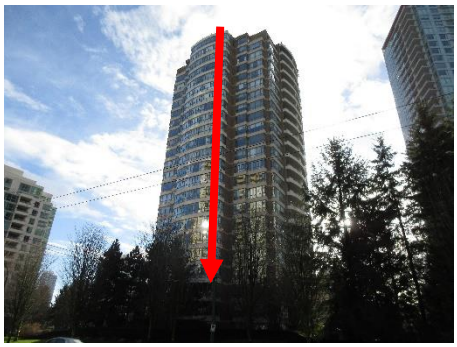

Photo 5: Rope drop at north elevation.

- Attended a follow-up meeting with the Strata's Building Committee on October 1, 2019 to discuss the draft report.

In addition to our proposal scope, we completed localized visual review of the sloped roof by looking through one of the roof hatches, and visual review of the entrance drive way canopy from Suite 303's balcony.

Following the Building Enclosure Evaluation, we completed roof deck openings and water testing at suites PH-1, PH-3, and PH-6 to investigate ongoing active water leakage into these suites. The investigations included the following work:

<u>PH-1 investigation, design, and repairs (Repairs completed on September 26, 2019)</u>

- Water-tested PH-1 upper roof deck and sliding doors to identify source(s) of leakage into the suite;
- Instructed a contractor to make a roof opening and a drywall opening to help us identify the leak location;
- Prepared repair details and specifications to address the leakage, and assisted the Strata with obtaining a quotation from a contractor;
- Reviewed samples of the repair work during construction;
- Completed post-repair water-testing to check that the repair work has addressed the leakage where originally identified.

<u>PH-3 and PH-6 investigation, design, and tender (Tender closed on October 30, 2019)</u>

- Completed leakage investigation and water-testing to identify the sources causing leakage into PH-3 and PH-6;
- Instructed a contractor to make roof openings and a drywall opening during the investigation to help us identify the leak location;
- Prepared repair details and specifications to address the leakage, and assisted the Strata with obtaining a quotation from a contractor.

Following the investigations above, we completed a localized roof deck re-waterproofing project to address active leaks at Suites PH-1, PH-3, and PH-6.

3.0 FUNDAMENTAL FINDINGS

3.1 Windows and doors

3.1.1 General Construction

The window systems consist of double-glazed, insulating glazing units (IGU's) set within aluminum framing, secured to the building concrete window rough opening. The building has punched windows at sheltered balcony locations, and windows that make up the majority of the exterior wall areas.

The window assemblies are glazed from the exterior (i.e., glazing is installed into the frames from the outside of the building), and there are "dry" rubber gaskets between the glazing retainers and the outside face of the glass, and "wet" butyl tape seal between the glass and window frame on the interior side. The windows are typically drained. The window frames are non-thermally broken. There are operable casement sashes throughout the window assemblies.

The punched windows are also non-thermally broken aluminum framed windows and include sliding operable sashes and double-glazed IGUs.

Sliding doors at balconies and roof deck are aluminum framed with double-glazed IGU's. The sliding doors are constructed similar to the windows, and have fibrous fin-and-pile weather stripping.

There are also exterior wood framed swing doors at balconies and roof decks throughout the building. The doors are outward swing, with IGU's. There are aluminum thresholds at these door sills.

Photo 6: Typical window sill from exterior.

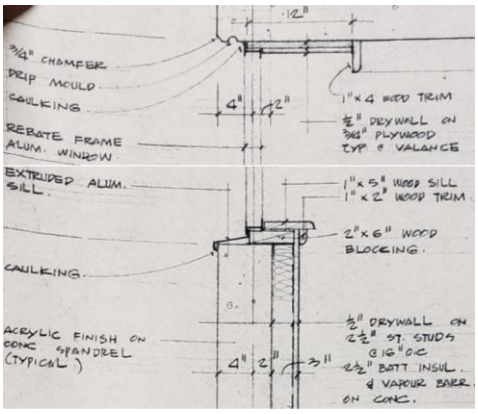

Photo 7: Typical window sill and head details.

Photo 8: Typical sliding door at balcony.

Photo 9: Typical wood swing door at balcony.

3.1.2 Condition and Performance

3.1.2.1 Many suites have water leakage through window framing

Many of the suites reviewed had evidence of water leakage through the window framing and/or at operable sashes. This is evident by the amount of pooling water sitting in the condensation tracks of the window frames, and staining and wetting on the interior finishes and window frames. Some Owners have reported that water runs down the interior side of the window framing and IGU's during rain events and they are able to collect large amounts of water in a large bowl in about an hour (reported at suite PH-03). Other Owners have indicated that they generally find large amounts of pooling water in the sill condensation tracks following rain events (reported at suite 2306, 2206, 2101, 1504 and 1404). Some suites had damaged, stained, and wet/moist drywall and flooring below windows (identified at suite 1903). The architectural drawings indicate that the window rough opening lacks a sub-sill membrane and water leakage through the window framing is likely traveling under the windows, through the wall cavity, to flooring finishes at some locations. There are also several locations where the concrete wall finish is blistering directly below windows on the exterior possibly as a result of window cracks.

Photo 10: Pooling water in window track at PH-05.

Photo 11: Damaged and moist drywall below window at Suite 1903.

Based on our review, it appears there are several items that may be contributing to water leakage into the windows and becoming trapped. These items include failed or shrunken exterior glazing gaskets, failed caulking at and around windows, unsealed window framing joints, blocked, poorly placed or lack of window drain holes, and operable sashes that do not close properly or tightly (refer to 3.1.2.2, 3.1.2.3, 3.1.2.4, and 3.1.2.5, for further discussion on these findings). Once water is inside the windows, there is an increased risk of water entering the building because of the lack of a sub-sill membrane as discussed above.

Photo 12: Typical window with varying caulking at exterior at North Elevation.

In order to better isolate the causes of the water leakage and confirm what repairs are provided, systematic water testing should be completed at two sample windows with leakage issues. Window water testing would allow us to simulate wind driven rain, while focusing the water at specific locations such as vulnerable exterior window joints. Water testing would also allow us to observe how the windows manage water, and if the drain holes are effective in relieving the system of water. Once the causes of the window leakage are better defined, an appropriate repair strategy can be developed. Management strategies may include caulking replacement and additional window sealing, gasket replacement, drainage modifications, and operable window adjustment; however, these management strategies cannot be recommended until the mechanisms causing the window leakage area known. Testing may also revise that the windows can not be practically repaired to reasonably manage water ingress issues.

Alternatively, the Strata could consider a window replacement program which would allow for renewal of a large portion of the building envelope. Window replacement would provide the opportunity for the windows to be upgraded to more modern systems that provide improved thermal, water resistance, structural, and acoustical performance, as well as allow for re-detailing improvement of the window rough openings and how the assemblies interface with the rest of the building envelope. Window replacement would also help to address the other window issues noted in this section (Section 3.1) of this report. As window replacement is very costly and disruptive, a phased approach can also be considered for this management strategy, but this would mean that some Owners would receive the benefit of new windows sooner than others.

3.1.2.2 Caulking at and around windows is aging and beginning to fail at several locations, which may be contributing to leakage through windows

Caulking installed at the exterior of windows ranges in age, material type, and quality of installation. Some framing joints appear to be caulked in an effort to address leakage. The window sill and jamb caulking is beginning to de-bond at several locations, with the worst conditions typically at the west and south elevations. The caulking between the aluminum framing joints is generally cracked and crazed throughout. Water may be entering through the de-bonded joints at these locations, traveling through the window frame and leaking into the building. Further, the window sill to flashing joints, and the underside of the sill flashing is continuously caulked, so any water that gets under the window framing or flashing may not drain outwards, and as a result may be directed into the suites.

Photo 13: Debonding caulking at window sill.

Replacement of caulking at and around window is recommended if a window repair program is implemented. New caulking should include drain slots to allow water below framing to drain to the exterior. But this should be confirmed by water testing.

3.1.2.3 Shrinking exterior gaskets and open window joints may be contributing to leakage through windows

There are several locations where the exterior window frame to glass gaskets have shrunk, or are missing at corners, leaving open gaps. There are some locations where caulking has been applied at these corners to close off the gaps. There are other locations where exterior glazing stops are bent/damaged resulting in gaps between the glazing stops and window framing. These gaps may be a point of entry where water is making its way into the window framing. Gaskets and strips should be replaced where damaged or caulking installed at gaps.

Photo 14: Shrunk/missing exterior glazing gasket at window sill and drain hole with visible water sitting in framing (arrow).

Photo 15: Gaps between window frame and exterior glazing stop.

3.1.2.4 Window drain holes vary throughout the window assemblies

The presence of window drain holes is generally inconsistent throughout the window assemblies reviewed. Drain holes were generally present on the exterior of the window frames at the sills but varied at higher sections of the window assemblies. Drain holes at the interior side of the windows was also inconsistent throughout the building. At some locations there were drain holes through the framing of the condensation track, and at other locations there was no visible interior drain hole. At some locations where there were interior drain holes, some Owners have sealed over or blocked them, as they reported that the drain holes were actually allowing large amounts of water to make its way to interior side of the windows, rather than draining the water out.

In order to better understand how the windows, manage water and the effectiveness of the drain holes, we recommend completing window testing as discussed in 3.1.2.1 above, including removing some of the exterior window components to better review the intended drainage paths through the window assemblies.

Photo 16: Typical exterior window drain hole at window sill.

Photo 17: Interior drain hole filled with caulking.

3.1.2.5 Operable window sashes do not close tightly at several locations throughout the building

Several operable windows reviewed had damaged hardware, including bent hinges, broken guides, broken cam handles and worn compression gaskets, resulting in the operable windows not closing tightly. If the compression gasket on the operable window does not fully engage, water and air leakage is more likely to occur. In most cases, hardware damage appears to be the result of normal wear and tear. The window hinges, guides, cam handles, and gaskets should be replaced or repaired depending on the issues, to allow the compression gaskets to fully engage when the window is closed. This work can be incorporated into a window repair program, should window testing demonstrate that the window repair is practical.

Photo 18: Operable windows not closing tightly.

3.1.2.6 Some suites have condensation on window framing and IGU's

Fifteen suites reported in questionnaire that they have condensation on the interior side of the window framing and glazing. But we noticed condensation on almost all windows. So, it is likely that some residents are not noticing the condensation. This is evident by the visible moisture formation of the interior window frame and glass surfaces.

Condensation forms when humid air contacts a cold surface, causing the water vapour in the air to condense on the surface. Water vapour is generated from regular occupant activities, such as cooking, bathing, cleaning, etc. Most suites we reviewed with condensation issues had a high relative humidity (between 50% and 60%) with an average temperature of 20℃. The relative humidity can be reduced by increasing the ventilation and air circulation within the suite and, in particular, over window and door surfaces.

If not addressed, condensation can lead to mold/mildew growth and potential health hazards. To reduce the risk of condensation we recommend that residents carry out the following:

Photo 19: Condensation on window framing.

- Run bathroom exhaust fans (or allow the humidistat to operate where they have been installed) to maintain a relative humidity level between 25% and 40% (with the indoor temperature around 18℃ to 24℃). The windows should be monitored for condensation and the humidistat setting adjusted, if needed. To prevent condensation from occurring during significantly cold outdoor temperatures, lower humidity levels may be required. Installation of a humidistat at all bathrooms could also be considered, to automatically regulate humidity levels at this area of the suite.
- Keep bedroom and bathroom doors open to promote air circulation.
- Open blinds and curtains often and avoid placing furniture close to windows, to allow air to freely circulate over the windows.
- Check that dryer lint traps are clean before each use.
- Run kitchen fans while cooking.
- Open windows to help ventilate air.
- Keep fans in good running condition.

Notices or pamphlets could be distributed to the residents with information on how to implement the above suggestions for reducing interior humidity and controlling condensation. We have included a bulletin from The Homeowner Protection Office with information on how Owners can avoid condensation in their homes which the Strata can distribute to the residents (refer to Appendix D).

3.1.2.7 Failed IGUs (insulating glazing units) throughout the building impact visibility and could be reducing overall performance of building envelope

The majority of the suites reviewed had at least one or more failed IGU, where there is visible moisture or moisture staining trapped between the two panes of glass. Some suites had newer IGUs which were installed around 1999; however, the failed IGUs appeared to be limited to the original IGUs date stamped 1990.

Photo 20: Typical failed IGU.

IGU failure generally occurs when the glazing seals holding the glass to the spacer bar become compromised (i.e. if the seals become brittle/cracked over time, damaged from movement, or were poorly installed, etc.), allowing air and/or moisture to enter the space within the IGU. Failure can occur without any visible signs, as IGUs generally have desiccants placed in the spacer bar to absorb moisture within the air space. However, as the desiccants in the failed IGUs are expended over time, moisture can begin to build up and become trapped in the air space, forming condensation on the glass surfaces.

The air space in the IGUs provides the insulating properties for the IGUs. Once the sealed air space is compromised, the overall thermal performance of the IGUs is reduced. As such, the suites with failed IGUs may be experiencing increased heat loss and/or heat gain through failed IGUs, and are also more susceptible to condensation forming on the interior glass surface.

IGUs typically have a service life of around 25 years. As IGUs approach the 25-year mark, the glazing seals generally start to become brittle, resulting in failure of the IGUs. The original IGUs are currently around 28 years old. As such, the IGU failures are typical for the age of the units. IGUs without visible signs of failure may have already failed or are about to fail. As such, an IGU replacement program should be implemented if the windows are not going to be replaced in the near future.

3.1.2.8 Failing Interior glazing seals

The interior glazing seals around the perimeter of the IGUs have shrunk or are seeping out of the window frames at several suites, compromising the window air and water seal at that location. Air leakage can also facilitate condensation within the window frame. The internal glazing seals should be cut back where they are beginning to seep out of the window framing, and where there is limited seal remaining, the interior glazing seals should be replaced or caulked.

Photo 21: Interior glazing sagging out of window frame.

3.1.2.9 Failed caulking and open joints at the PH-3 upper roof deck arched window caused active leakage into the suite. A sealant repair project at the arched window was completed in 2020.

The arched window at the PH-3's upper roof deck had deteriorated caulking and open joints at the window frames. The majority of the exterior window frame joints was generally cracked, split, and failed throughout. The Suite Owners also had reported active leakage at and below the window during rain events. Previous water testing of the window also confirmed that the window was actively leaking at failed joints.

To address the leakage, all existing sealant was replaced and unsealed joints were sealed. This work was completed throughout the entire arched window assembly and extended over to the adjacent suite, as the window assembly spans across the two suites.

Photo 22: PH-3 upper roof deck arched window

3.1.2.10 Sliding Doors are performing adequately

The sliding doors throughout the building are generally well sheltered within the balconies; as such, the reduced exposure has limited damage to seals and finishes. The large balcony overhangs above the doors have also limited the risk of water leakage through the doors. Some Owners have reported issues with opening and closing the doors, and missing hardware, which is expected for the age of the door assemblies. Regular maintenance such as cleaning, replacing weather seals, adjusting rollers, replacing or repairing hardware when needed is suggested in order to maintain the doors, and extend the service life of the assemblies.

3.1.2.11 Wood balcony and roof deck swing doors are not suitable for high-rise construction

There are wood swing doors throughout the building to access roof decks and balconies. Wood doors are generally not durable enough for use on high-rise buildings, as they are not built to withstand the wind pressures that high buildings are typically exposed to. Further, the glazing stops on the exterior of the doors are plastic, and are discolored (yellowing), brittle and cracking at several locations, compromising the retention of the glazing in the doors. The door frames are also not caulked to the exterior cladding at most locations reviewed, which may be allowing drafts into the suites around the doors. Highrise buildings are also intended to be primarily constructed on non-combustible materials for fire-safety reasons, which the doors are not.

Photo 23: Wood door frame to brick cladding joint not caulked.

The door perimeters should be caulked to reduce the potential for water and air infiltration at these unprotected joints. Alternatively, the Strata may want to consider upgrading the swing doors with more durable assemblies, such as metal doors.

3.1.2.12 Condensation forms on single pane door in the pool room

The pool room has a single pane double swing door, where condensation is forming on the interior side of the glass due to humid air in the space settling on the cold surface of the glass. Excess condensation forming on these doors will require regular cleaning in order to reduce the risk of mold growth on these surfaces. The single pane glass is also reducing the overall thermal performance of the pool area.

Consideration can be given to replacing the single pane glass with insulating glazing units in order to reduce the occurrence ongoing condensation and improve thermal performance of the doors.

Photo 24: Single pane double swing door.

3.2 Roofs and Roof Decks

3.2.1 General Construction

There is a sloped metal roof at the top of the building, over the upper level of the penthouse suites, and part of the pool room roof. Based on *Sense Engineering*'s review of the original architectural building drawings, the sloped roof is constructed as follows (from top to bottom):

- Pre-finished sheet metal cladding;
- 7/8" - 20-gauge furring channels;
- 1-1/2" steel deck and support structure;
- R-12 spray insulation on underside of steel deck; and
- 6/8" type X drywall.

Photo 25: Section of building's sloped metal roof.

There are concealed gutters, protected with EPDM membrane at the base of the sloped roof. There are stucco clad walls on the outside of the gutters.

The remainder of the building is protected by the penthouse roof decks. Based on the roof openings, the roof decks are constructed as follows (from top to bottom):

- Concrete pavers;
- Rigid insulation;
- Drainage mat;
- Asphalt Modified Polyurethane Liquid applied membrane; and
- Concrete slab.

Photo 26: Penthouse upper roof deck.

There are aluminum and glass guardrails secured to the side of a concrete parapet curb wall.

A localized roof deck re-waterproofing project was completed by a contractor at PH-1, PH-3, and PH-6 to address active leaks into the building in 2019 and 2020. Two ply modified bitumen roofing was installed in replacement of the asphalt modified polyurethane and detailing was improved by extending the roofing under masonry columns and walls.

3.2.2 Condition and Performance

3.2.2.1 Inadequate roof deck membrane tie-in detailing below PH-1's master bedroom west sliding door had resulted in ongoing active leakage. Sliding door membrane tie-in repair was completed in 2019.

Photo 27: PH-1 master bedroom sliding door

Inadequate roof deck membrane tie-in detailing below the west sliding door of the master bedroom at PH-1 had resulted in ongoing leakage into the suite. The source of leakage was identified through additional leakage investigation and water testing completed after our initial building enclosure review. Removal of the exterior metal flashing at the door sill revealed that the roof deck waterproofing membrane did not upturn and extend under the door sill, and the door sill was not sealed to the curb below. As such, water or snow that builds up at the base of the sliding door or wind driven rainfall falling on the door was able to leak into the suite through the joint between the door sill and curb.

Following the investigation and testing, we recommended having the sliding door removed so membrane repairs can be completed below the sliding door and onto the roof deck. Installation of a back-dam angle was included as part of the repair design, to direct water that makes its way below the sliding door sill to the exterior. This work was completed by a contractor, and the door was re-tested following the repairs to confirm the repairs were successful. The costs for the repair work is not included in the budgets in this report.

3.2.2.2 Failed membrane around a gutter drain, above PH-1's upper bedroom sliding door caused an active leak into the roof soffit space

Photo 28: Water stain above PH-1 sliding door head, roof soffit space.

Waterproofing membrane tie-in failure around a gutter drain of the main sloped roof gutter has caused a leak above the sliding door head at PH-1's upper bedroom. Where reviewed, the leaking water was traveling down within the roof soffit space and traveled along metal tracks supporting the drywall ceiling above the sliding door head.

The membrane around the drain was repaired as part of the PH-1 leak repair work completed in Summer 2019, to address the leakage.

We recommend regularly checking all gutter drains, and the condition of the membrane around the gutter drains in order to identify any potential issues which may result in leakage. This review should be completed as part of any regular exterior maintenance work completed around the building.

Photo 29: Gutter drain above PH-1 sliding door head

3.2.2.3 Leakage into PH-3 and PH-6's living room was the result of water being absorbed by the brick cladding and poor roof deck membrane upturn detailing onto the brick cladding. Brick cladding and roof deck repairs were completed in 2020 to address active leaks.

Photo 30: Brick cladding column and unprotected brick on a horizontal surface

The brick cladding around the roof decks at PH-3 and PH-6 was absorbing water at the top of the brick wall and on the vertical wall surfaces. The absorbed water was able to travel behind the brick face and into the suites. The roof deck membrane at the base of the brick wall had been upturned onto the outside face of the brick cladding and allowed water traveling behind the brick to bypass the roof and enter the interior of the building.

Sense Engineering had prepared repair details to modify the base of brick cladding to roof deck to address the leakage. The repair design included installing a new concrete curb to support the brick cladding, and upturning the waterproofing membrane onto the curb and behind the brick cladding to direct water behind the cladding outwards. The repair design also included repointing mortar joints and waterproofing the top of the brick cladding at the parapets to reduce the amount of bulk water getting behind the brick cladding. This repair work was completed in Spring 2020. The costs for the repair work is not included in the budgets in this report.

Photo 31: Waterproofing membrane upturns onto the outside surface of the brick cladding.

3.2.2.4 Roof deck waterproofing membrane is generally blistered at roof opening locations

Seven roof deck openings were made throughout PH-1, PH-3, and PH-6 as part of leakage investigations at these suites. There are water filled blisters in the membrane at all roof deck openings, suggesting that this may be a general condition of the roof deck membrane throughout. The water that has bypassed the membrane is now being trapped against the concrete roof slab, increasing the risk of water finding its way into the concrete slab, and/or leaking into the building if the water is able to find its way through cracks in the concrete. The membrane is generally thin and peeling at parapet walls where it is exposed above the roof deck pavers. Long term exposure of the membrane to ultra-violet light leaves it susceptible to pre-mature failure.

As the roof slabs are post-tensioned (a system where high-strength, steel cables are embedded in slab the concrete slab and tensioned to allow for greater spans of the concrete slabs), it is important that the roof slabs are protected from moisture to mitigate the risk of significant structural capacity loss and costly repairs. As such, we recommend the Strata plan for general roof deck waterproofing replacement. Localized re-sloping should be completed as part of roof deck membrane replacement to address ponding issues.

Further, the Strata should also have the post-tensioning reviewed to better understand the current condition of the building structure and to check that moisture has not made its way into the cables. If post-tensioning review has already been completed, a copy of the report should be forwarded to *Sense Engineering* to check if further review of the post-tensioning system is required.

Photo 32: PH-1 upper roof deck opening.

Photo 33: Ponding water and deteriorate membrane at roof opening at PH-1 upper roof deck

Photo 34: Waterproofing membrane with blisters at PH-6 roof deck.

Photo 35: Flaked/peeled waterproofing membrane at PH-3 roof deck parapet wall

3.2.2.5 Active leak at the south-west corner in the pool room.

There is an active leak through the roof of the pool room at the south-west corner. The leakage is causing the ceiling finish to blister and peel, and the wood handrail below is beginning to deteriorate. It is likely that the EPDM roof gutter has a leak. The roof area above the leakage location should be investigated, and localized repairs completed in order to mitigate ongoing leakage.

Photo 36: Blistered and peeling ceiling paint in pool room below roof leak.

3.2.2.6 Sloped metal roof appears to be performing adequately

Although review of the sloped metal roof was limited, the roof generally appears to be performing adequately. There were no visible signs of leakage into the mechanical room where the underside of the roof decking was visible. Regular maintenance of the metal roof such as checking that gutter drains are clear and draining, and checking for loose, corroded or missing fasteners is recommended.

3.2.2.7 Canopy roofs appear to be leaking, causing stucco blistering and staining on the soffits

The canopy roofs appear to be leaking causing stucco blistering and staining on the canopy soffit. As we did not have safe access to the canopy roofs, the roofs were only visually reviewed from the balcony of Suite 303; as such the membrane type and condition is not known. However, we understand the membrane is original to the building, and is likely a similar asphalt modified polyurethane membrane as the penthouse roof decks. Given the visual evidence of leakage below the entrance canopy, it is likely that the membrane is in similar condition to the roof decks, and the Strata should plan to replace this membrane at the same time as the roof decks.

Further, one of the curved acrylic sheets is also cracked, and has a hole in it, which is generally unsightly given its location over the building's entrance. The Strata should consider replacing the damaged sheet to restore the aesthetics of the building's entrance way.

Photo 37: Canopy over the front entrance

Photo 38: Canopy roof soffit

3.3 Balconies

3.3.1 General Construction

Based on *Sense Engineering*'s visual review and the original architectural drawings, the balconies appears to be post-tension concrete slabs with a liquid applied coating. Many suites have tiles installed over the balconies, which do not appear to be original to the building.

There are aluminum and glass guardrails secured to the side of a concrete parapet curb wall.

Photo 39: Typical balcony with tile finish.

3.3.2 Condition and Performance

3.3.2.1 Balcony waterproofing is nearing end of its serviceable life throughout leaving post-tensioned slabs vulnerable to damage from water leakage

The balcony membrane is generally failed at balconies where the membrane is exposed. Failure of the membrane leaves the concrete balcony structure exposed to leakage and damage from water. As the building structure is post-tension, it is important to maintain protection over the concrete to minimize the risk of future leakage, and damage to the post-tensioning cables embedded in the slabs. However, there was little water leaking through balcony slab and minimal amounts of visible concrete damage observed at balconies reviewed. Based on review of the balcony soffits, the concrete does not appear to contain many cracks. Minimal cracking of the structure helps reduce leaks as water can not readily travel through the concrete structure if cracks are not present.

Photo 40: Failed balcony waterproofing membrane.

As it appears the slabs have been exposed for some time, due to failure of the membrane at many balcony locations, the Strata should have the post-tensioning reviewed to better understand the current condition of the building structure. Should the Strata have already had this work completed, a copy of the report should be forwarded to *Sense Engineering* to determine if further review of the post-tensioning system is required.

The balconies should be re-waterproofed in order to restore protection to the exposed concrete slabs. This work would likely include removal of any loose existing costing, and installing a new liquid membrane system over the existing.

The condition of the membrane at tiled balconies was not reviewed, as membrane at these locations were concealed by the tile finish. Replacing the balcony membranes would require many Owners to remove their balcony tile finishes.

3.3.2.2 Balcony drain covers are missing

Many balconies were missing drain covers over their balcony area drains. Open area drains have a higher risk of becoming clogged, which can result in water ponding or flooding on the balconies, and cause damage to the drain piping. Balcony drains should be checked for clogging, and missing drain covers should be replaced, in order to reduce the risk of balcony drainage issues. We assume work would be completed as part of maintenance and have not included in cost for this work in section 5.

Photo 41: Missing balcony drain cover.

3.3.2.3 Reinforcing steel/post tension cables staining on soffits

There is reinforcing steel/post tension cables chair staining on the soffits of the balconies, due to limited concrete cover over the reinforcing steel/post tension cables at the bottom of the concrete slab. The stains neither affect the structural or envelope performance and are generally more of an aesthetic issue. If the appearance of the rust staining is an issue to the Owner, the Strata could consider re-painting soffits every 5 to 7 years to conceal the rust staining.

Photo 42: Rebar staining on soffits.

3.4 Exterior Walls

3.4.1 General Construction

There are generally three types of exterior wall assemblies at the building: concrete walls, steel stud walls with brick veneer cladding, and steel stud walls with stucco cladding. Based on review of the original building drawings, the walls are described to be constructed as follows:

<u>Concrete Walls (from outside to inside):</u>

- Concrete wall with acrylic finish;
- Steel stud framing
- Batt insulation in stud spaces;
- Vapor barrier; and
- Interior drywall.

Photo 43: Typical concrete curb wall.

Steel Stud Walls with Brick Veneer Cladding (from outside to inside):

- 100mm brick veneer with brick ties;
- 25mm air space;
- Building paper;
- 13mm gypsum sheathing;
- Structural steel studs;
- Batt insulation in stud spaces;
- Vapor barrier; and
- Interior drywall.

Photo 44: Typical brick veneer clad wall.

Steel Stud Walls with Stucco Cladding (from outside to inside):

- Acrylic finish stucco;
- Metal lath;
- 2 layers building paper;
- 13 mm gypsum sheathing;
- Structural steel studs;
- Batt insulation in stud spaces;
- Vapor barrier; and
- Interior drywall.

Photo 45: Stucco clad wall at penthouse roof deck.

3.4.2 Condition and Performance

3.4.2.1 Localized water-filled blistering of textured acrylic coating on concrete walls

There is blistering occurring at the textured acrylic coating of the concrete curb walls below the windows, indicating that water is trapped behind the coating. The location of the blistering is potentially another indication that water is getting below the window framing and sill flashing.

Localized repairs of the wall coating should be completed, in order to relieve the water build-up against the concrete and preventing further blistering or peeling of the coating and providing this risk of cracks into building.

Photo 46: Blistered acrylic coating on concrete wall.

3.4.2.2 There are stucco blisters at the penthouse level main roof parapet walls

There are stucco blisters along the main roof parapet walls which are being caused by moisture finding its way behind the stucco cladding. A section of cap flashing between the gutter and parapet wall was removed above PH-1 where there was blistered stucco, which revealed that the gutter membrane does not extend over the top of the parapet wall. As such, if water is able to find its way past the metal flashing joints, or fill up in the gutter, the water can find its way behind the stucco at the top of the wall where it is not protected with waterproofing.

Photo 47: Blistered stucco at the main sloped roof parapet wall.

At PH-1, the section of blistered stucco was removed and replaced with a new drained stucco cladding assembly. The top of the wall was waterproofed, and tied in with the gutter membrane and a new metal cap flashing installed. We recommend this repair also be completed at the rest of the stucco wall areas below the main roof gutters, in order to address the blistering stucco, and improve the durability and water resistance performance of these walls.

3.4.2.3 Caulked weep holes and sheet metal at brick cladding

In general, the brick cladding appears to be performing adequately. We did not note any water leakage through the brick walls and identified only limited staining on the masonry at the exterior. However, a lot of the weep holes within the assembly have been caulked over, and there are sheet metal flashings at each floor level over the bricks at some elevations. It is not clear whether this work was completed to address past issues with the brick veneer cladding assemblies, or just some preventative maintenance work. The Strata should forward past repair documentation to *Sense Engineering* so the risks associated with modifications is getter understood. Clear drainage should also be maintained at the brick cladding at the base of each floor level, in order to mitigate damage to the brick cladding and leakage into the building from water build-up behind the brick cladding.

Photo 48: Caulked weep hole at brick veneer cladding.

3.4.2.4 Wall flashings over brick veneer cladding at every floor appear to have been installed to address past leakage

There are sheet metal wall flashings over brick veneer cladding at every floor. After our initial review of the masonry, it was not clear whether the flashing was installed to cover issues such as cracks in the masonry or to address leakage.

Photo 49: Wall flashing over brick veneer cladding.

Typically, brick veneer cladding is supported by a metal angle at every floor, and there is a gap below the metal angle to allow for building movement. The gap is typically sealed and does not get covered with flashing. As there were concerns that the wall flashing may be concealing brick and mortar cracking related to compression issues in the masonry, we removed two flashing panels to check the concealed condition of the masonry.

At the opening locations we did note not brick or mortar cracking, or sealant bulging which would indication compression issues. As such, we suspect the flashings were likely installed to address past leakage which may have been occurring through the masonry weep holes.

3.4.2.5 Exposed brick at parapets require protection

There are masonry parapets and caps at the upper roof decks of the penthouses. The masonry caps appears to be absorbing and allowing water behind the cladding, resulting moss growth and staining on the brick caps. There was also water continuously dripping from the weep holes at the base of the brick cladding during our visit below some of these areas.

Consideration should be given to installing a waterproofing membrane and sheet metal flashing over the brick caps in order to provide protection to the parapet wall.

Photo 50: Brick clad parapet wall at penthouse roof deck.

3.4.2.6 Back sloped wall flashings at penthouse roof decks is holding water against walls and doors

There are a few locations at the upper penthouse roof decks where the base of wall and sliding door sill flashings are back sloped and directing water back towards the building. The improperly directed water can find its way past the doors and walls at failed or improperly sealed joints. Repairs to these flashings is recommended in order to provide positive slope of the flashings, and direct water away from the building.

Photo 51: Back-sloped balcony flashings.

4.0 DISCUSSION

There are several building enclosure repair and maintenance items that should be considered by the Strata. Some items are more urgent than others. Below is a prioritized list of our recommended repair and maintenance work with justification for the priority. Consideration has been given to grouping certain repair and maintenance items together, as there would be cost savings by mobilizing these repairs together. Repair options provided in Section 5 are based on our list of recommended maintenance and repairs but included different approaches to repair so the Strata can choose and approach that best fits desired management plans.

Priority	Maintenance / Repair Item	Justification for Priority	General Project Name
1	**Roof Deck Replacement**	The roof deck membrane is generally blistered and not well bonded throughout the roof decks. These membrane defects will likely allow water leak into a post-tensioned roof concrete slab and increase the risk for further structural damage. As such, the roof deck membrane replacement should be completed.	Window and Roof Deck Repairs
2	**Post-tensioning System Evaluation**	As the roof and floor slabs have had prolonged exposure to moisture due to failed membrane at the roof decks and balconies, the post-tensioning system should be monitored in order to identify if any damage to the building structure has occurred due to water leakage.	
3	**Window Testing and Trial Repairs**	The source(s) causing the active water ingress into the suites through the windows are difficult to identify and repair programs are difficult to develop by visual review alone. Systematic water testing should be completed at two sample window locations, in order to identify and isolate the potential source(s) of leakage and to develop a repair. Once the source(s) are identified, trial repairs should be completed, and the windows re-tested to check if the repairs were effective. If the repairs are found to be successful at addressing the leakage, a scope of repairs can be developed, and the repairs implemented throughout the building.	

Priority	Maintenance / Repair Item	Justification for Priority	General Project Name
4	**Window Repairs / Replacement**	Once the leakage source(s) and any other window issues are identified through testing and trial repairs, a scope of repairs can be developed. Repair strategies may include caulking replacement and additional window sealing, gasket replacement, drainage modifications, operable window adjustment, and failed IGU replacement. Alternatively, the Strata could consider a window replacement program which would allow for renewal of a large portion of the building envelope. Window replacement would provide the opportunity for the windows to be upgraded to more modern systems that provide improved thermal and moisture resistance, structural, and acoustical performance, as well as allow for re-detailing of the window rough openings and how the assemblies interface with the rest of the building envelope. Window testing and trial repairs (as described in Priority Item 1) would not be required if the Strata proceeds with window replacement. Replacement would be considerably more expensive than repairs.	
5	**Pool Room Investigation and Local Repairs**	A roof crack is causing the pool room ceiling finish to blister and peel, the wood handrail below is beginning to deteriorate, and concealed damage inside the wall and roof may also be occurring. The roof area above the leakage locations should be investigated, and localized repairs completed in order to mitigate ongoing leakage and damage.	Pool Room Investigation and Local Repairs
6	**Balcony Re-waterproofing**	At balconies where the membrane is exposed, the membrane is generally failed and requires replacement in order to restore protection over the concrete balcony structure. However, the membrane failure does not appear to have resulted in widespread concrete damage and leakage at this time; as such, this work has been included in a lower priority.	Balcony Repairs
7	**Balcony Door Sealing**	The unsealed balcony swing door perimeters should be caulked in order to reduce the risk of water and air leakage at these unprotected joints.	

Priority	Maintenance / Repair Item	Justification for Priority	General Project Name
8	**Balcony Soffit Repainting**	There is staining occurring from corrosion of the rebar chairs on the balcony soffits. Re-painting the soffits will freshen the look of the soffit.	
9	**Exterior Wall Maintenance**	The walls should be cleaned and repainted every few years to maintain protection on the wall and freshen the look of the building.	Exterior Wall Maintenance

5.0 REPAIR OPTIONS

We have prepared three options for building enclosure repairs. The first option includes additional testing and investigation work for windows in order to provide a value driven approach that addresses issues cost effectively with less concern and is presented in a phased approach. The second option select window replacement solutions which comes with higher performance and higher cost, and is presented in a phased approach. The third option includes all the higher performance solutions in Option 2, but presented as single window project that is completed at one time in order to compare the overall costs when savings related to economies of scale can be incorporated. Breakdowns for the Opinion of Costs can be found in Appendix A.

We have carried an allowance for a Hazardous Materials Assessment, which is required by WorkSafeBC when construction work will disturb existing materials. If you have already completed this survey for your building, then these costs may not apply. Budgets for abatement of hazardous materials have not been included in the Opinion of Cost.

5.1 Option 1 – Value Driven Repair and Maintenance Approach – Phased over 7 years

General Description:

This option includes water testing at windows to help identify and isolate the sources of water leakage. Once the sources causing the leakage are better known, trial repairs of the windows can be completed, and the windows re-tested to check if the repairs will be effective.

The repairs presented in this option maintains the existing window systems, but a proper repair scope can not be developed until testing is completed. As the actual repairs required at the windows is not known, this strategy includes some assumed repairs that may occur at the windows so that some budgets for the work can be provided.

This option also includes the cost for balcony re-waterproofing and pool room leakage repairs.

Scope of Work:

Roof Deck Membrane Replacement in 2021

- Post-tensioning system evaluation
- Re-roofing at all roof decks, excluding areas where localized roof deck re-waterproofing work was completed at PH-1, PH-3, and PH-6
- Roof deck parapet wall cap flashing installation over brick cladding

Window, Pool Room and Canopy Investigation in 2021

- Water testing two sample windows with leakage issues.
- Trial window repairs
- Re-test windows
- Pool room leakage investigation and repairs
- Canopy leakage investigation and repairs

Window Repairs in 2022

- Localized water-filled blister repair on concrete curb wall (below windows only)
- Rout and seal cracks in concrete curb walls (below windows only)
- Caulking replacement at windows
- Exterior window gasket replacement
- Window drainage modifications
- Operable window adjustment
- IGU replacement

Balcony Re-waterproofing in 2025

- Balcony re-waterproofing
- Balcony door caulking
- Repainting balcony soffits

Exterior Wall Maintenance in 2027

- Wall Cleaning
- Concrete and Finish Repairs
- Repaint all concrete and stucco walls

Advantages/Benefits:

- Address most immediate water leakage issues first.
- Lower cost repair approach.

Disadvantages/Risks:

- Condensation related issues will not be addressed on windows and window frames.
- Higher risks of future water leakage reoccurring.
- Greater effort to maintain windows and roof decks.

Opinion of Costs: $4,505,000

Year	2021	2022	2023	2024	2025	2026	2027
Costs	Roof Deck - $839,000 Window and Pool Room - $129,000	$1,216,000			$1,187,000		$1,134,000

5.2 Option 2 – High Performance and Cost Approach – Phased Window Replacement Project

General Description:

This option generally replaces systems (i.e., windows are replaced and roof deck membranes are entirely re-waterproofed) and includes general repair approaches (i.e., local exterior wall repairs and maintenance, balcony re-waterproofing and, pool room leakage repair as same as Option 1.)

Window replacement project in this option is phased over 4 years to alleviate the financial burden to the Strata.

Scope of Work:

Roof Deck Membrane Replacement in 2021
- Same as Option 1

Pool Room and Canopy Investigation in 2021
- Pool room leakage investigation and repairs
- Canopy leakage investigation and repairs

Window Replacement phased in 2022 - 2024
- Localized water-filled blister repair on concrete curb wall (below windows only)
- Rout and seal cracks in concrete curb walls (below windows only)
- Replace existing window with new aluminum framed windows

Balcony Re-waterproofing in 2025
- Same as Option 1

Exterior Wall Maintenance in 2027
- Same as Option 1

Advantages/Benefits:

- Brings all windows to a renewed condition.
- Improves general aesthetics of building.
- More completely address both leakage and condensation issues.
- Improves thermal efficiency and reduces noise transmittance at windows.
- Less immediate financial burden to Owners compared to option 3.

Disadvantages/Risks:

- More expensive than option 1 due to replacement approach
- Overall costs will be higher than Option 3 due to the inflation with deferred projects and additional costs for remobilizing for each project
- Longer period of construction and less convenient to the residents

Opinion of Costs: $16,302,000

Year	2021	2022	2023	2024	2025	2026	2027
Costs	Roof Deck - $839,000 Canopy and Pool Room - $97,000	$6,341,000		$6,704,000	$1,187,000		$1,134,000

5.3 Option 3 – High Performance and Cost Approach – Replace All Windows at Once

General Description:

This option includes all repair/replacement items listed on Option 2. However, the window replacement works will commence as a single project to reduce overall costs.

Scope of Work:

Roof Deck Membrane Replacement in 2021
- Same as Option 1

Pool Room and Canopy Investigation in 2021
- Same as Option 2

Window Replacement in 2022
- Same as Option 2 but complete all window replacement in 2022

Balcony Re-waterproofing in 2025
- Same as Option 1

Exterior Wall Maintenance in 2027
- Same as Option 1

Advantages/Benefits:

- Allows for cost savings due to economies of scale and avoiding future inflation costs regarding window projects

Disadvantages/Risks:

- Increased financial burden to the Strata in the year of 2022.

Opinion of Costs: $15,764,000

Year	2021	2022	2023	2024	2025	2026	2027
Costs	Roof Deck - $839,000 Canopy and Pool Room - $97,000	$12,507,000			$1,187,000		$1,134,000

6.0 CLOSING

We expect this report meets your immediate needs. Should you have any questions or concerns regarding our report, please feel free to contact either Hyejoo or Alana at the numbers below. Should you require our assistance with implementing the recommended repairs, we would be pleased to assist. As per the Opinion of Costs, we could assist with preparing a detailed scope of work, acquiring contractor pricing, and reviewing the work as it is completed.

Yours Truly,

Hyejoo Koh, EIT, M.Eng.
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Sense Engineering Ltd.

2021-07-22

Brennan Vollering, M.A.Sc., P.Eng., LEED AP
Principal (604) 365-3664
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The following are our opinion of costs for the remedial work described in this report. They are calculated using quantities obtained from the building drawings and during our evaluation and information we have obtained from similar projects. As *Sense Engineering* has no control over contractor pricing, actual costs will vary depending upon the time of tender, schedule of work and conditions under which the work must be carried out. Final construction costs may vary as concealed conditions may differ from assumptions made at the time of our evaluation.

Sense Engineering has not investigated the presence of pollutants, contaminants and hazardous materials that may be encountered during the work. Depending on the materials present, additional funds may be required for remediation measures.

As every project has its own peculiarities, actual costs can only be established by obtaining bids, preferably on the basis of competitive tenders, from specialized contractors. The costs provided herein should only be used for comparison of options and general budgeting.

All costs have been rounded up to the nearest $1,000, unless otherwise shown.

To escalate the cost of future repairs, we have used an annual inflation rate of 3%. This number is highly variable and could fluctuate in any given year.

Option 1 - Value Driven Repair and Maintenance Approach – Phased over 7 years

Option 1 (Phase 1) - Roof Deck Membrane Replacement in 2021

Item No.	Description	Opinion Of Cost
1	**Access and Mobilization**	$80,000
2	**Post-tensionning System Evaluation**	$15,000
3	**Roof Deck Membrane Replacement at All Roof Decks**	$471,000
4	**Miscellaneous Repairs (Allowance)**	$50,000
5	**Bonding**	$19,000
	Construction Cost Sub-Total:	$635,000
6	**Engineering**	
6.1	Project Management, Construction Review, and Contract Administration	$54,000
6.2	Reimbursable Expenses	$2,000
7	**Hazardous Materials Testing Allowance**	$3,000
8	**Engineering and Construction Contingency (15%)**	$105,000
	Sub-Total Including Soft Costs:	$799,000
9	**Taxes**	$40,000
	Option 1 (Phase 1) Total:	$839,000

Option 1 (Phase 2) - Window and Pool Room Investigation 2021

Item No.	Description	Opinion Of Cost
1	**Access and Mobilization**	$6,000
2	**Window Water Test Contractor Allowance (before and after trial repairs)**	$3,000
3	**Window Trial Repair** Re-caulk Window Small Joints, Caulk Internal Drain Holes and Coupling Joints, Realign Operables and Replace Damaged Hardwares	$15,000
4	**Canopy Roof Leakage Investigation and Repairs**	
4.1	Contractor Allowance for Assisting with Canopy Roof Leakage Investigation	$3,000
4.2	Canopy Roof Repairs	$45,000
5	**Contractor Allowance for Assisting with Pool Room Leakage Repair**	$5,000
6	**Miscellaneous Repairs (Allowance)**	$1,000
	Construction Cost Sub-Total:	$78,000
7	**Engineering**	
7.1	Prepare Specifications and Drawings	$7,000
7.2	Project Management, Construction Review, and Contract Administration	$17,000
7.3	Reimbursable Expenses	$1,000
8	**Hazardous Materials Testing Allowance**	$3,000
9	**Engineering and Construction Contingency (15%)**	$16,000
	Sub-Total Including Soft Costs:	$122,000
11	**Taxes**	$7,000
	Option 1 (Phase 2) Total:	$129,000

Option 1 (Phase 3) - Window Repairs in 2022

Item No.	Description	Opinion Of Cost
1	**Access and Mobilization**	$60,000
2	**Window Repairs**	
2.1	Caulking Replacement	$378,000
2.2	Localized Gasket Sealing	$32,000
2.3	Drainage Modifications	$11,000
2.4	Operable Window Adjustment	$72,000
2.5	IGU replacement	$252,000
2.6	Localized Water-Filled Blister Repair on Concrete Curb Walls (below windows only)	$7,000
2.7	Rout and Seal Cracks in Concrete Curb Walls (below windows only)	$7,000
3	**Miscellaneous Repairs (Allowance)**	$50,000
4	**Bonding**	$27,000
	Construction Cost Sub-Total:	$896,000
5	**Engineering**	
5.1	Prepare Specifications and Drawings	$8,000
5.2	Project Management, Construction Review, and Contract Administration	$68,000
5.3	Reimbursable Expenses	$3,000
6	**Hazardous Materials Testing Allowance**	$3,000
7	**Engineering and Construction Contingency (15%)**	$147,000
	Sub-Total Including Soft Costs:	$1,125,000
8	**Inflation**	$34,000
9	**Taxes**	$57,000
	Option 1 (Phase 3) Total:	$1,216,000

Option 1 (Phase 4) - Balcony Re-waterproofing in 2025

Item No.	Description	Opinion Of Cost
1	**Access and Mobilization**	$90,000
2	**Balcony Repairs**	
2.1	Balcony Re-waterproofing	$500,000
2.2	Concrete Repairs Allowance	$30,000
2.3	Balcony Re-sloping Allowance	$30,000
2.4	Balcony Tile Removal Allowance	$55,000
2.5	Balcony Door Caulking	$8,000
2.6	Repaint Balcony Soffits	$53,000
3	**Miscellaneous Repairs (Allowance)**	$20,000
4	**Bonding**	$24,000
	Construction Cost Sub-Total:	$810,000
5	**Engineering**	
5.1	Prepare Specifications and Drawings	$6,000
5.2	Project Management, Construction Review, and Contract Administration	$56,000
5.3	Reimbursable Expenses	$2,000
6	**Hazardous Materials Testing Allowance**	$3,000
7	**Engineering and Construction Contingency (15%)**	$132,000
	Sub-Total Including Soft Costs:	$1,009,000
8	**Inflation**	$127,000
9	**Taxes**	$51,000
	Option 1 (Phase 4) Total:	$1,187,000

Option 1 (Phase 5) - Exterior Wall Maintenance in 2027

Item No.	Description	Opinion Of Cost
1	**Access and Mobilization**	$120,000
2	**Wall Maintenance**	
2.1	Wall Cleaning	$25,000
2.2	Concrete and Finish Repairs	$50,000
2.3	Stucco and Concrete Wall Repainting	$506,000
3	**Miscellaneous Repairs (Allowance)**	$20,000
4	**Bonding**	$22,000
	Construction Cost Sub-Total:	$743,000
5	**Engineering**	
5.1	Prepare Specifications and Drawings	$5,500
5.2	Project Management, Construction Review, and Contract Administration	$23,000
5.3	Reimbursable Expenses	$1,000
6	**Hazardous Materials Testing Allowance**	$3,000
7	**Engineering and Construction Contingency (15%)**	$117,000
	Sub-Total Including Soft Costs:	$892,500
8	**Inflation**	$196,000
9	**Taxes**	$45,000
	Option 1 (Phase 5) Total:	$1,134,000

Option 2 - High Performance and Cost Approach – Phased Window Replacement Project

Option 2 (Phase 1) - Roof Deck Membrane Replacement in 2021

Item No.	Description	Opinion Of Cost
1	**Access and Mobilization**	$80,000
2	**Post-tensionning System Evaluation**	$15,000
3	**Roof Deck Membrane Replacement at All Roof Decks**	$471,000
4	**Miscellaneous Repairs (Allowance)**	$50,000
5	**Bonding**	$19,000
	Construction Cost Sub-Total:	$635,000
6	**Engineering**	
6.1	Project Management, Construction Review, and Contract Administration	$54,000
6.2	Reimbursable Expenses	$2,000
7	**Hazardous Materials Testing Allowance**	$3,000
8	**Engineering and Construction Contingency (15%)**	$105,000
	Sub-Total Including Soft Costs:	$799,000
9	**Taxes**	$40,000
	Option 2 (Phase 1) Total:	$839,000

Option 2 (Phase 2) - Pool Room and Canopy Investigation 2021

Item No.	Description	Opinion Of Cost
1	**Access and Mobilization**	$6,000
2	**Canopy Roof Leakage Investigation and Repairs**	
2.1	Contractor Allowance for Assisting with Canopy Roof Leakage Investigation	$3,000
2.2	Canopy Roof Repairs	$45,000
3	**Contractor Allowance for Assisting with Pool Room Leakage Repair**	$5,000
4	**Miscellaneous Repairs (Allowance)**	$1,000
	Construction Cost Sub-Total:	$60,000
5	**Engineering**	
7.1	Prepare Specifications and Drawings	$7,000
7.2	Project Management, Construction Review, and Contract Administration	$9,000
7.3	Reimbursable Expenses	$1,000
8	**Hazardous Materials Testing Allowance**	$3,000
9	**Engineering and Construction Contingency (15%)**	$12,000
	Sub-Total Including Soft Costs:	$92,000
10	**Taxes**	$5,000
	Option 2 (Phase 2) Total:	$97,000

Option 2 (Phase 3) - Window Replacement at East and North Elevation in 2022

Item No.	Description	Opinion Of Cost
1	**Access and Mobilization**	$850,000
2	**Site Protection**	$30,000
3	**Window Repairs**	
3.1	Demolition	$7,000
3.2	Window Replacement (Windows only)	$3,458,000
3.3	New Sill Flashing Installation	$218,000
3.4	Localized Water-Filled Blister Repair on Concrete Curb Walls (below windows only)	$7,000
3.5	Rout and Seal Cracks in Concrete Curb Walls (below windows only)	$7,000
4	**Miscellaneous Repairs (Allowance)**	$50,000
5	**Trades and Street Permits (Allowances)**	$10,000
6	**Bonding (May Be Deleted by Owner)**	$140,000
	Construction Cost Sub-Total:	$4,777,000
7	**Building Permit**	$10,000
8	**Engineering**	
8.1	Prepare Specifications and Drawings	$12,000
8.2	Consulting Fees to Apply for Building Permit	$2,000
8.3	Project Management, Construction Review, and Contract Administration	$84,000
8.4	Reimbursable Expenses	$3,000
9	**Hazardous Materials Assessment (Allowance)**	$3,000
10	**Engineering and Construction Contingency (20%)**	$979,000
	Sub-Total Including Soft Costs:	$5,870,000
11	**Inflation**	$177,000
12	**Taxes**	$294,000
	Option 2 (Phase 3) Total:	$6,341,000

Option 2 (Phase 4) - Window Replacement at West and South Elevation in 2024

Item No.	Description	Opinion Of Cost
1	**Access and Mobilization**	$850,000
2	**Site Protection**	$30,000
3	**Window Repairs**	
3.1	Demolition	$7,000
3.2	Window Replacement (Windows only)	$3,458,000
3.3	New Sill Flashing Installation	$218,000
3.4	Localized Water-Filled Blister Repair on Concrete Curb Walls (below windows only)	$7,000
3.5	Rout and Seal Cracks in Concrete Curb Walls (below windows only)	$7,000
4	**Miscellaneous Repairs (Allowance)**	$50,000
5	**Trades and Street Permits (Allowances)**	$10,000
6	**Bonding (May Be Deleted by Owner)**	$140,000
	Construction Cost Sub-Total:	$4,777,000
7	**Building Permit**	$10,000
8	**Engineering**	
8.1	Prepare Specifications and Drawings	$12,000
8.2	Consulting Fees to Apply for Building Permit	$2,000
8.3	Project Management, Construction Review, and Contract Administration	$84,000
8.4	Reimbursable Expenses	$3,000
9	**Engineering and Construction Contingency (20%)**	$978,000
	Sub-Total Including Soft Costs:	$5,866,000
10	**Inflation**	$544,000
11	**Taxes**	$294,000
	Option 2 (Phase 4) Total:	$6,704,000

Option 2 (Phase 5) - Balcony Re-waterproofing in 2025

Item No.	Description	Opinion Of Cost
1	**Access and Mobilization**	$90,000
2	**Balcony Repairs**	
2.1	Balcony Re-waterproofing	$500,000
2.2	Concrete Repairs Allowance	$30,000
2.3	Balcony Re-sloping Allowance	$30,000
2.4	Balcony Tile Removal Allowance	$55,000
2.5	Balcony Door Caulking	$8,000
2.6	Repaint Balcony Soffits	$53,000
3	**Miscellaneous Repairs (Allowance)**	$20,000
4	**Bonding**	$24,000
	Construction Cost Sub-Total:	$810,000
5	**Engineering**	
5.1	Prepare Specifications and Drawings	$6,000
5.2	Project Management, Construction Review, and Contract Administration	$56,000
5.3	Reimbursable Expenses	$2,000
6	**Hazardous Materials Testing Allowance**	$3,000
7	**Engineering and Construction Contingency (15%)**	$132,000
	Sub-Total Including Soft Costs:	$1,009,000
8	**Inflation**	$127,000
9	**Taxes**	$51,000
	Option 2 (Phase 5) Total:	$1,187,000

Options 2 (Phase 6) - Exterior Wall Maintenance in 2027

Item No.	Description	Opinion Of Cost
1	**Access and Mobilization**	$120,000
2	**Wall Maintenance**	
2.1	Wall Cleaning	$25,000
2.2	Concrete and Finish Repairs	$50,000
2.3	Stucco and Concrete Wall Repainting	$506,000
3	**Miscellaneous Repairs (Allowance)**	$20,000
4	**Bonding**	$22,000
	Construction Cost Sub-Total:	$743,000
5	**Engineering**	
5.1	Prepare Specifications and Drawings	$5,500
5.2	Project Management, Construction Review, and Contract Administration	$23,000
5.3	Reimbursable Expenses	$1,000
6	**Hazardous Materials Testing Allowance**	$3,000
7	**Engineering and Construction Contingency (15%)**	$117,000
	Sub-Total Including Soft Costs:	$892,500
8	**Inflation**	$196,000
9	**Taxes**	$45,000
	Option 2 (Phase 6) Total:	$1,134,000

Option 3 - High Performance and Cost Approach – Replace All Windows at Once

Option 3 (Phase 1) - Roof Deck Membrane Replacement in 2021

Item No.	Description	Opinion Of Cost
1	**Access and Mobilization**	$80,000
2	**Post-tensionning System Evaluation**	$15,000
3	**Roof Deck Membrane Replacement at All Roof Decks**	$471,000
4	**Miscellaneous Repairs (Allowance)**	$50,000
5	**Bonding**	$19,000
	Construction Cost Sub-Total:	$635,000
6	**Engineering**	
6.1	Project Management, Construction Review, and Contract Administration	$54,000
6.2	Reimbursable Expenses	$2,000
7	**Hazardous Materials Testing Allowance**	$3,000
8	**Engineering and Construction Contingency (15%)**	$105,000
	Sub-Total Including Soft Costs:	$799,000
9	**Taxes**	$40,000
	Option 3 (Phase 1) Total:	$839,000

Option 3 (Phase 2) - Pool Room Canopy Investigation 2021

Item No.	Description	Opinion Of Cost
1	**Access and Mobilization**	$6,000
2	**Canopy Roof Leakage Investigation and Repairs**	
2.1	Contractor Allowance for Assisting with Canopy Roof Leakage Investigation	$3,000
2.2	Canopy Roof Repairs	$45,000
3	**Contractor Allowance for Assisting with Pool Room Leakage Repair**	$5,000
4	**Miscellaneous Repairs (Allowance)**	$1,000
	Construction Cost Sub-Total:	$60,000
5	**Engineering**	
5.1	Prepare Specifications and Drawings	$7,000
5.2	Project Management, Construction Review, and Contract Administration	$9,000
5.3	Reimbursable Expenses	$1,000
6	**Hazardous Materials Testing Allowance**	$3,000
7	**Engineering and Construction Contingency (15%)**	$12,000
	Sub-Total Including Soft Costs:	$92,000
8	**Taxes**	$5,000
	Option 3 (Phase 2) Total:	$97,000

Option 3 (Phase 3) - Window Replacement in 2022

Item No.	Description	Opinion Of Cost
1	**Access and Mobilization**	$1,700,000
2	**Site Protection**	$53,000
3	**Window Repairs**	
3.1	Demolition	$14,000
3.2	Window Replacement (Windows only)	$6,915,000
3.3	New Sill Flashing Installation	$436,000
3.4	Localized Water-Filled Blister Repair on Concrete Curb Walls (below windows only)	$14,000
3.5	Rout and Seal Cracks in Concrete Curb Walls (below windows only)	$14,000
4	**Miscellaneous Repairs (Allowance)**	$70,000
5	**Trades and Street Permits (Allowances)**	$10,000
6	**Bonding (May Be Deleted by Owner)**	$277,000
	Construction Cost Sub-Total:	$9,503,000
7	**Building Permit**	$15,000
8	**Engineering**	
8.1	Prepare Specifications and Drawings	$12,000
8.2	Consulting Fees to Apply for Building Permit	$2,000
8.3	Project Management, Construction Review, and Contract Administration	$112,000
8.4	Reimbursable Expenses	$3,000
9	**Hazardous Materials Assessment (Allowance)**	$3,000
10	**Engineering and Construction Contingency (20%)**	$1,930,000
	Sub-Total Including Soft Costs:	$11,580,000
11	**Inflation**	$348,000
12	**Taxes**	$579,000
	Option 3 (Phase 3) Total:	$12,507,000

Option 3 (Phase 4) - Balcony Re-waterproofing in 2025

Item No.	Description	Opinion Of Cost
1	**Access and Mobilization**	$90,000
2	**Balcony Repairs**	
2.1	Balcony Re-waterproofing	$500,000
2.2	Concrete Repairs Allowance	$30,000
2.3	Balcony Re-sloping Allowance	$30,000
2.4	Balcony Tile Removal Allowance	$55,000
2.5	Balcony Door Caulking	$8,000
2.6	Repaint Balcony Soffits	$53,000
3	**Miscellaneous Repairs (Allowance)**	$20,000
4	**Bonding**	$24,000
	Construction Cost Sub-Total:	$810,000
5	**Engineering**	
5.1	Prepare Specifications and Drawings	$6,000
5.2	Project Management, Construction Review, and Contract Administration	$56,000
5.3	Reimbursable Expenses	$2,000
6	**Hazardous Materials Testing Allowance**	$3,000
7	**Engineering and Construction Contingency (15%)**	$132,000
	Sub-Total Including Soft Costs:	$1,009,000
8	**Inflation**	$127,000
9	**Taxes**	$51,000
	Option 3 (Phase 4) Total:	$1,187,000

Options 3 (Phase 5) - Exterior Wall Maintenance in 2027

Item No.	Description	Opinion Of Cost
1	**Access and Mobilization**	$120,000
2	**Wall Maintenance**	
2.1	Wall Cleaning	$25,000
2.2	Concrete and Finish Repairs	$50,000
2.3	Stucco and Concrete Wall Repainting	$506,000
3	**Miscellaneous Repairs (Allowance)**	$20,000
4	**Bonding**	$22,000
	Construction Cost Sub-Total:	$743,000
5	**Engineering**	
5.1	Prepare Specifications and Drawings	$5,500
5.2	Project Management, Construction Review, and Contract Administration	$23,000
5.3	Reimbursable Expenses	$1,000
6	**Hazardous Materials Testing Allowance**	$3,000
7	**Engineering and Construction Contingency (15%)**	$117,000
	Sub-Total Including Soft Costs:	$892,500
8	**Inflation**	$196,000
9	**Taxes**	$45,000
	Option 3 (Phase 5) Total:	$1,134,000

APPENDIX B - SUMMARY OF OWNER QUESTIONNAIRES

A questionnaire was prepared by *Sense Engineering*. The questionnaire included questions on building enclosure performance from the people who spend the most time around the exterior walls, windows, roofs and balconies, i.e., the residents. The questionnaire was distributed to all suite Owners.

The following summarizes the responses of the returned questionnaires.

WALLS AND CEILINGS:

SUITE #	HAVE YOU NOTICED ANY DARK STAINING OR CONDENSATION ON THE INTERIOR OF YOUR WALLS OR CEILINGS, PARTICULARLY NEAR THE EXTERIOR WALLS OR ROOFS? (YES / NO / COMMENTS)	HAVE YOU NOTICED ANY CRACKS IN YOUR WALLS OR CEILINGS? (YES / NO / COMMENTS)	HAVE YOU NOTICED ANY CRACKS, STAINING OR DISPLACEMENT IN THE EXTERIOR FINISHES OF YOUR BUILDING? (YES / NO / COMMENTS)	HAVE YOU NOTICED ANY WATER LEAKS INTO YOUR SUITE FROM THE CEILING OR FROM THE BASE OF WALLS? IF YOU CAN, INDICATE IF THE LEAKS OCCUR ONLY WHEN IT RAINS AND THE LOCATION. (YES / NO / COMMENTS)
101	No	No	No	No
203	Yes	No	Cannot see from inside so I cannot answer this question	No
404	No	No	No	No
602	Yes.	No	No	No
604	No	No	No	No
805	Yes			
903	NO	NO	NO	YES, in the corner that close to the balcony door , inside my suite.
906	no	no	No major cracks noticed, but some staining perhaps due to water or rain.	no
1004	No	No	No	No
1103	No, in the sense that, if any, the problem is not sufficient to worry me. We are blessed with no such businesses as restaurants (particularly those staining producing cooking restaurants) on the street level of our building - unlike some buildings in the vicinity. So, thankfully.	No, not at all.	No. I don't pay the kind of attention to notice any; so there might be cracks.	No.
1202	No	No	No	No
1204	no	no	no	no
1504	No	No	No	No

SUITE #	HAVE YOU NOTICED ANY DARK STAINING OR CONDENSATION ON THE INTERIOR OF YOUR WALLS OR CEILINGS, PARTICULARLY NEAR THE EXTERIOR WALLS OR ROOFS? (YES / NO / COMMENTS)	HAVE YOU NOTICED ANY CRACKS IN YOUR WALLS OR CEILINGS? (YES / NO / COMMENTS)	HAVE YOU NOTICED ANY CRACKS, STAINING OR DISPLACEMENT IN THE EXTERIOR FINISHES OF YOUR BUILDING? (YES / NO / COMMENTS)	HAVE YOU NOTICED ANY WATER LEAKS INTO YOUR SUITE FROM THE CEILING OR FROM THE BASE OF WALLS? IF YOU CAN, INDICATE IF THE LEAKS OCCUR ONLY WHEN IT RAINS AND THE LOCATION. (YES / NO / COMMENTS)
1601	no	no	no	no
1602	No	No	No	No
1705	no	no	no	no
1706	No	No	No	No
1902	NO	NO	NO	NO
1903	No	Yes, on interior of exterior wall near bottom of wall, cracking drywall	Yes, probably previous exterior wall leakage	No
1904	No	No	No	No
1904	no	yes, ceiling in front of unit entry door	no	no
2001	no	no	no	no
2003	No	No	No	No
2005	NO	YES. In the hallway on the 20th floor, wallpaper seam coming apart a bit - south side.	NO	NO
2101	No	No	No	No
2206	No.	No.	No.	Yes, at the base of my window frame when it rains.
2401		no	Yes. I live on the penthouse on the building, facing west to the city and north to the mountain. I noticed on the upper deck of my unit, there are two areas that have cracks. 1. On the upper deck, on the exterior upper wall facing north, just outside of my sliding door, there is a big round hole on this wall. Rain water could get in. This is urgent. It needs to be fixed before this winter. 2. On the outside upper deck, there is a wall separating my unit PH1 with PH6. the walls has cracked and debris is all over the floor. This is not urgent. It can wait until next Spring.	I have two levels. The upper level is my bedroom. Three years ago, I had water came into the floor of my bedroom facing north and west. The problem was fixed. But it shows there is a weakness in the membrane and drainage system of the roof (or my upper deck). Please check when you are there.
2403	Yes	Yes	Not sure	Yes

SUITE #	HAVE YOU NOTICED ANY DARK STAINING OR CONDENSATION ON THE INTERIOR OF YOUR WALLS OR CEILINGS, PARTICULARLY NEAR THE EXTERIOR WALLS OR ROOFS? (YES / NO / COMMENTS)	HAVE YOU NOTICED ANY CRACKS IN YOUR WALLS OR CEILINGS? (YES / NO / COMMENTS)	HAVE YOU NOTICED ANY CRACKS, STAINING OR DISPLACEMENT IN THE EXTERIOR FINISHES OF YOUR BUILDING? (YES / NO / COMMENTS)	HAVE YOU NOTICED ANY WATER LEAKS INTO YOUR SUITE FROM THE CEILING OR FROM THE BASE OF WALLS? IF YOU CAN, INDICATE IF THE LEAKS OCCUR ONLY WHEN IT RAINS AND THE LOCATION. (YES / NO / COMMENTS)
2405	NO	NO	YES (on the walls between two patios)	YES (but it can't be sure because I judge it only by the darkened wood floor happening every time after rain, and that is the problematic part of the base of wall that was repaired two years ago)

WINDOWS AND DOORS:

SUITE #	ARE ANY OF YOUR WINDOWS OR DOORS FOGGY BETWEEN THE GLASS PANES? (YES / NO / COMMENTS)	DOES CONDENSATION FORM ON OR AT THE BASE OF YOUR WINDOWS WHEN IT IS COLD? (YES / NO / COMMENTS)	DO YOUR DOORS OR WINDOWS LEAK WHEN IT RAINS? INDICATE IF IT IS A DOOR OR WINDOW THAT LEAKS? (YES / NO / COMMENTS)	DO YOU HAVE DIFFICULTY OPENING AND CLOSING WINDOWS OR DOORS? INDICATE IF IT IS A DOOR OR WINDOWS THAT ARE PROBLEMATIC. (YES / NO / COMMENTS)	ARE YOUR WINDOWS OR DOORS MISSING OR HAVE DISPLACED COMPONENTS LIKE HANDLES, LOCKS OR SEALS ON OPENABLE WINDOW? (YES / NO / COMMENTS)	HAVE YOU NOTICED DRAFTS AROUND YOUR WINDOWS? (YES / NO / COMMENTS)
101	Yes, few are.	Not entirely sure. It's a maybe	No	1. The door(glass door) to the yard. it's difficult to open mabe due to age and or dusts.	1. The same door mentioned, the lock is very un-realiable.	Tiny. From the same door.
203	Yes	Yes	Window (however, not sure if it is the water leak or steam from the temperature difference indoor and outdoor)	No	Window handles	Yes so that in the winter, it is cold
404	No	No	No	Yes	No	No
602	No	Yes; water comes inside.	No	Yes -- windows	Yes -- window missing handle	No
604	Yes, thus far, one small window	Don't remember at this point in time	No	No	Yes, one is missing one handle	Don't remember
805	Yes					
903	YES. One window in our kitchen	NO	NO	NO	NO	YES. Windows in the kitchen and living room
906	Yes, a few foggy windows in the living room	No	No	Yes, all the windows in living room and kitchen are hard to open due to hinges	One window handle is broken	Sometimes during winter there's water in the window sill

SUITE #	ARE ANY OF YOUR WINDOWS OR DOORS FOGGY BETWEEN THE GLASS PANES? (YES / NO / COMMENTS)	DOES CONDENSATION FORM ON OR AT THE BASE OF YOUR WINDOWS WHEN IT IS COLD? (YES / NO / COMMENTS)	DO YOUR DOORS OR WINDOWS LEAK WHEN IT RAINS? INDICATE IF IT IS A DOOR OR WINDOW THAT LEAKS? (YES / NO / COMMENTS)	DO YOU HAVE DIFFICULTY OPENING AND CLOSING WINDOWS OR DOORS? INDICATE IF IT IS A DOOR OR WINDOWS THAT ARE PROBLEMATIC. (YES / NO / COMMENTS)	ARE YOUR WINDOWS OR DOORS MISSING OR HAVE DISPLACED COMPONENTS LIKE HANDLES, LOCKS OR SEALS ON OPENABLE WINDOW? (YES / NO / COMMENTS)	HAVE YOU NOTICED DRAFTS AROUND YOUR WINDOWS? (YES / NO / COMMENTS)
1004	Yes	Yes	No	No	Yes	No
1103	No, after the window glass work last year.	I think this problem is much less noticeable after the window glass work last year.	No	No.	No	Yes. A little bit; hardly perceptible. Not alarming at all.
1202	Yes - one window in the master room is foggy between	Yes	No	No	Yes - one handle is loose	No
1204	Yes, a bit, when it's been cold or rainy for a while.	Yes, sometimes.	no	no	yes, 1 missing, 1 broken	yes, when it's cold and/or windy - windows
1504	Yes. Windows	No	No	Yes. Windows	Yes. Window	Yes. Windows
1601	yes replacements have been done several times.one currently in need.	no	no	no	no	yes limited to sliding patio door.deep winter.not a real concern.
1602	No	Yes, some do but mainly on the metal members.	No	No	No	No
1705	might have a few	especially in winter	I am not aware of	I am not aware of	I am not aware of	I am not aware of
1706	Yes (window in the kitchen has water vapour between glass panes)	No	No	Yes. Windows	Yes. Windows and balcony sliding door	Yes. Both windows and doors
1902	NO	NO	NO	YES	YES	NO
1903	Yes, 6 window units	some condensation	no	Yes, one window is out of square, and does not close properly	Yes, but we have replaced the handles, some windows are difficult to open	yes, near sliding door in bedroom
1904	Yes	Yes. But some of window stay foggy forever.	No	Yes. Kitchen window.	No. Replaced by myself	No
1904	yes, one in living room? one in the kitchen	yes, and stayes forever	no	yes, small bedroom (construction improper)	yes, but I replaced handle in kitchen twice already	no
2001	no	no	no	no	no	no

SUITE #	ARE ANY OF YOUR WINDOWS OR DOORS FOGGY BETWEEN THE GLASS PANES? (YES / NO / COMMENTS)	DOES CONDENSATION FORM ON OR AT THE BASE OF YOUR WINDOWS WHEN IT IS COLD? (YES / NO / COMMENTS)	DO YOUR DOORS OR WINDOWS LEAK WHEN IT RAINS? INDICATE IF IT IS A DOOR OR WINDOW THAT LEAKS? (YES / NO / COMMENTS)	DO YOU HAVE DIFFICULTY OPENING AND CLOSING WINDOWS OR DOORS? INDICATE IF IT IS A DOOR OR WINDOWS THAT ARE PROBLEMATIC. (YES / NO / COMMENTS)	ARE YOUR WINDOWS OR DOORS MISSING OR HAVE DISPLACED COMPONENTS LIKE HANDLES, LOCKS OR SEALS ON OPENABLE WINDOW? (YES / NO / COMMENTS)	HAVE YOU NOTICED DRAFTS AROUND YOUR WINDOWS? (YES / NO / COMMENTS)
2003	No	No	No	No, not difficult, only a bit tight when opening the windows.	Yes, one window in the kitchen is missing a lower handle.	No.
2005	YES, just one small window pane in the living room got slightly foggy all the time ever since the last window cleaning from outside.	YES	NO	NO	YES. one window latch broken, the secure latch in the living room window gliding door vent.	NO
2101	Yes - One	No	Yes - NW corners slight	Yes - W window near balcony door fro living room is stiff. I don't open it	No	No
2206	My windows are foggy and water accumulates at the base when it rains .	Yes.	My windows leak at the when it rains.	No.	Yes, my window screen in my kitchen is missing handles.	Yes, I have noticed drafts around my windows.
2401	no.	no.	no.	The sliding door going out to the upper deck was difficult to open.	yes. my sliding door in the upper level is missing a handle.	no.
2403	Yes	Yes	Window	Bathroom door and downstairs bedroom door	The locks on the forementioned doors are displaced	
2405	YES (but not obvious)	YES (but not obvious)	YES (but not sure) WINDOWS	YES (WINDOWS)	YES	NO

BALCONIES AND TERRACES:

SUITE #	DOES WATER POND ON YOUR BALCONY? IS THE PONDING NEAR A WALL OR THE EDGE OF THE BALCONY? (YES / NO / COMMENTS)	HAVE YOU NOTICED ANY BLISTERED, TORN OR OTHERWISE DAMAGED BALCONY WALKING SURFACE? (YES / NO / COMMENTS)	DOES YOUR GUARD RAIL SEEM LOOSE? (YES / NO / COMMENTS)	IS YOUR GUARD RAIL MISSING PARTS? (YES / NO / COMMENTS)
101	No	It's old. Can't say it's damaged or just old age.	The guardrail seems not lubricated, really hard to open or close.	Probably not.
203	No balcony in our unit	No balcony in our unit	No balcony in our unit	No balcony in our unit
404	No	No	No	No
602	NA	NA	NA	NA
604	No	No	No	NO
903	NO	NO	NO	NO
906	No	no	no	no
1004	No	No	No	No
1103	Ponding a little bit; not a problem I worry. Not near any wall or the edge of the balcony.	No	No	No
1202	N/A	N/A	N/A	N/A
1204	no	no	no	no
1504	Yes. Edge of balcony	No	No	No
1601	no	no my balcony has bee tiled with ceramic outdoor tiles.	no	no
1602				
1705	I am not aware of	I am not aware of	I am not aware of	I am not aware of
1706	Yes. Near edge	No	No	No
1902	NO	NO	NO	NO
1903	yes, minor ponding in middle	Yes, some pealing of floor sealing	no	no
1904	Yes. Next to drainage	Yes. But it happened to my one re-painting.	No	No
1904	yes, around drainage	yes, but it is paint I applied by me	no	no
2001	no	no	no	no
2003	Yes. Only one small area near the edge of the balcony. It appeared to be caused by uneven surface.	Yes. One spot, 1” by 1.5” in size.	No.	No.
2005	YES, near the edge of the balcony.	YES, the original paint on the walking surface near the hand rail got blistered and cracked.	NO	NO

SUITE #	DOES WATER POND ON YOUR BALCONY? IS THE PONDING NEAR A WALL OR THE EDGE OF THE BALCONY? (YES / NO / COMMENTS)	HAVE YOU NOTICED ANY BLISTERED, TORN OR OTHERWISE DAMAGED BALCONY WALKING SURFACE? (YES / NO / COMMENTS)	DOES YOUR GUARD RAIL SEEM LOOSE? (YES / NO / COMMENTS)	IS YOUR GUARD RAIL MISSING PARTS? (YES / NO / COMMENTS)
2101	No	No	No	No
2206	No.	No.	No.	No.
2401	Three years, I had a flood in my upper level from the upper balcony. Water came into the floor of my bedroom facing northwest and stained the wooden floor. They flooded the whole deck/balcony and put in new membrane. Nothing was done to the roof which may be also causing the problem. Please check the roof of our building to make sure it drains properly.	yes. I noticed there is a round hole on the outside wall just above my sliding door in the upper balcony. Water could came. It needs to be patched as soon as possible.	not noticeable.	no
2403	No	No	No	No
2405	NO	NO	NO	NO

ADDITIONAL COMMENTS:

SUITE #	DO YOU HAVE ANY OTHER INFORMATION THAT YOU THINK MIGHT BE HELPFUL?
101	
203	
404	Building entrance overhang cracked
602	Condensation problem in bedroom resulting in water dropping and wall damage.
604	
903	NO
906	
1004	No
1103	I think generally the exterior things and issues this survey considers are generally working for this respondent.
1202	No
1204	no
1504	No
1601	glass block wall separating balconies.grout may be in need of repair.balcony light fixtures are rusted and could be replaced.vent covers from kitchen and bathrooms might need some maintenance or replacing.
1602	No

SUITE #	DO YOU HAVE ANY OTHER INFORMATION THAT YOU THINK MIGHT BE HELPFUL?
1705	nothing
1706	
1902	
1903	Windows gaskets have squeezed out of exterior window frames
1904	No
1904	
2001	no
2003	No.
2005	YES. The screen door on the balcony, access to the master bedroom, hard to open and close, derailed easily, so I keep the screen door closed all the time. Also, the glass door to the balcony from the living room scraping the rail and drop metal powder. Also, the door catch is warped, so I dare not latch it.
2101	No
2206	Not at the moment.
2401	no
2403	Have massive water ingress into second level bedroom and bathroom, first floor living room
2405	

1.0 INTRODUCTION TO CONDENSATION

Condensation forms on surfaces when moist air comes into contact with cool surfaces that are at or below the dew point temperature (i.e., the temperature when condensation begins to form). Condensation typically forms during the winter months and usually first appears on windows and doors as they typically get colder than the rest of the building envelope. Locations with poor air circulation are also prone to condensation, such as outside wall corners, closet walls, exhaust fan ducts, behind furniture or baseboards.

If the amount of condensation is small, there may not be any adverse affects as the condensate water will evaporate back into the air as the surface temperature warms and/or humidity level drops (similar to how it disappears from bathroom mirrors after showering). However, severe and repeated condensation can damage interior finishes and promote mould growth.

2.0 TIPS ON HOW TO MANAGE CONDENSATION

To control condensation, it is best to limit interior moisture/humidity and promote air circulation at the exterior walls and windows. Helpful tips include:

- The relative humidity in homes should be between 30% to 50%. When outdoor temperatures fall below -10 degrees Celsius, the indoor relative humidity should be around 30%. Humidifiers should not be used unless the relative humidity falls below these levels;
- Avoid hanging wet clothes indoors;
- Regularly check and clean the clothes dryer lint trap;
- Where possible, wash full loads of clothes and dishes in the dishwasher;
- Use a lid when boiling water;
- Use kitchen and bathroom exhaust fans during cooking and showering activities, and a minimum of 30 minutes afterwards;
- Take short (maximum 5 minute) showers;
- In highrise buildings, do not weather-strip the suite entrance doors (as the gap around the door is how drier fresh air is delivered into the individual suites);
- Keep blinds and drapes open to allow air to circulate freely over the windows and doors;
- Direct heat towards the exterior walls and windows/doors;
- Keep furniture away from exterior walls;
- Consider using artificial instead of live plants;
- Ensure exhaust fans are properly working and consider upgrading the fans with higher flow rates; and
- Open windows periodically to allow fresh air into the home.

3.0 REFERENCE DEW POINT TEMPERATURES

As reference, the following table identifies the dew point temperature at different relative humidity levels (based on an interior temperature of 23˚C):

RELATIVE HUMIDITY	DEW POINT TEMPERATURE (TEMPERATURE WHEN CONDENSATION FORMS)
30%	4˚C
40%	9˚C
50%	12˚C
60%	15˚C
70%	17˚C
80%	19˚C

- In issuing this report, *Sense Engineering* 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 and understand that *Sense Engineering* cannot be held liable for damages which may be suffered with respect to the purchase, ownership, or use of the subject property.

- The scope of our work and responsibilities related to our work are defined in our project authorization ("Conditions of Assignment").

- Any user accepts that decisions made or actions taken based upon interpretation of our work are the responsibility of only the parties directly involved in the decisions or actions.

- No party other than the Client shall rely on the Consultant's work without the express written consent of the Consultant, and then only to the extent of the specific terms in that consent. Any use which a third party makes of this work, or any reliance on or decisions made based on it, is the responsibility of such third parties. Any third party user of this report specifically denies any right to any claims, whether in contract, tort and/or any other cause of action in law, against the Consultant (including Sub-Consultants, their officers, agents and employees). The work reflects the Consultant's best judgement in light of the information reviewed by them at the time of preparation. It is not a certification of compliance with past or present regulations. Unless otherwise agreed in writing by *Sense Engineering*, it shall not be used to express or imply warranty as to the fitness of the property for a particular purpose. No portion of this report may be used as a separate entity; it is written to be read in its entirety.

- Only the specific information identified has been reviewed. No physical or destructive testing and no design calculations have been performed unless specifically recorded. Conditions existing but not recorded were not apparent given the level of study undertaken. Only conditions actually seen during examination of representative samples can be said to have been appraised and comments on the balance of the conditions are assumptions based upon extrapolation. Therefore, this work does not eliminate uncertainty regarding the potential for existing or future costs, hazards or losses in connection with a property. We can perform further investigation on items of concern if so directed.

- The Consultant is not responsible for, or obligated to identify, mistakes or insufficiencies in the information obtained from the various sources, or to verify the accuracy of the information.

- No statements by *Sense Engineering* are given as or shall be interpreted as opinions for legal, environmental or health findings. *Sense Engineering* is not investigating or providing advice about pollutants, contaminants or hazardous materials.

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- Budget figures are our opinion of a probable current dollar value of the work and are provided for approximate budget purposes only. Accurate figures can only be obtained by establishing a scope of work and receiving quotes from suitable contractors.

- Time frames given for undertaking work represent our opinion of when to budget for the work. Failure of the item, or the optimum repair/replacement process, may vary from our estimate.