

- **Unit 2602:** The following observations were made in this unit:
 - Systemic failure of the caulking, glazing tape at windows and sliding door, and difficult operation of the sliding door.
 - A crack has developed in concrete at the junction between the curb with the stucco cladding and the full height concrete wall.
 - Cracks were also found on the balcony floor outside the bedroom window.
 - There was a substantial amount of algae growing on the inside of the balcony parapet wall possibly due to water runoff off of the glass skylight onto the parapet wall.
 - There were signs, which were also confirmed by the owner, of water running down the wall behind/underneath the skylight awning.
 - The owner indicated that water ponded against the building wall at the sliding door and at the cracked curb under the stucco wall.
 - There appeared to be a gap between the top of the sliding door unit and the slab above.
 - Owner indicated that roof leaks has appeared in the unit in the bedroom as well as the entrance hallway.

Figure 17: Observations in Unit 2602


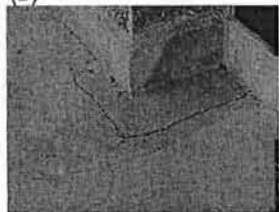



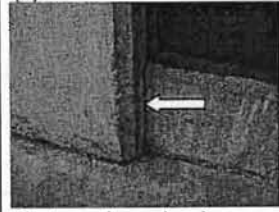








<p>(A)</p>  <p>Crack at the junction between the curb and the full height concrete wall. This area also appears to be the low spot where water typically collects after the rain as advised by the owner.</p>	<p>(B)</p>  <p>Cracks on balcony floor outside bedroom window.</p>	<p>(C)</p>  <p>Algae growth on the concrete balcony parapet wall.</p>	<p>(D)</p>  <p>More evidence of algae growth on the balcony parapet wall.</p>
<p>(E)</p>  <p>Photograph showing water running down the wall below the skylight awning indicating failed seal.</p>	<p>(F)</p>  <p>Photograph showing an unsealed pour joint at the junction of the different height walls.</p>	<p>(G)</p>  <p>Photograph showing conditions at top of pre-cast panel. Rusting of elements of the skylight indicates moisture running down the wall underneath the skylight, which can also potentially run in behind the concrete cant installed over the panel.</p>	<p>(H)</p>  <p>Photograph showing existing condition of how the pre-cast panel interfaces with the cast-in-place parapet wall and adjacent metal panel.</p>

Figure 17: Observations in Unit 2602

<p>(I)</p> 	<p>(J)</p> 	<p>(K)</p> 	<p>(L)</p> 
<p>Existing condition at top of pre-cast panel. There also appears to be a gap between the slab at the top and the sliding door unit.</p>	<p>Photograph showing rusted exposed reinforcing steel on the parapet wall.</p>	<p>Photograph showing the gasket between the glazing and the frame hanging loose at the skylight awning.</p>	<p>Cut test revealed efflorescence on surface of concrete suggesting a previous leak as well as moisture damage on an interior drywall.</p>

- **Unit 106** : The following observations were made in this unit:
 - Interior conditions at window sill contained moisture related staining.
 - Glazing tape was "squeezing out" between the window frame and the glazing.
 - A cut test was performed in the unit which revealed plywood sheathing behind the metal panel. Moisture content of the sheathing read 15%, which is within acceptable limits.

Figure 18: Observations in Unit 106

<p>(A)</p> 	<p>(B)</p> 
<p>Window sill with signs of rusting.</p>	<p>Cut test revealing plywood sheathing and moisture stained insulation.</p>

3.3 Exploratory Openings

We conducted a visual review of the interior of several suites and carried out exploratory openings at several locations. The exploratory openings were conducted in order to identify the composition and condition of the components present behind the interior drywall. Selection of the suites for exploratory openings was based on information provided related to water infiltration and a random selection such that at least one suite on each floor and one suite in each vertical architectural 'bay' of suites was selected.

In addition to our visual review, we also took moisture content readings of either the exterior sheathing (gypsum board or plywood) or interior gypsum wall. The moisture content was recorded using a "Delmhorst BD-10" moisture meter (Ser.No.: 23900). This instrument uses electrical resistance between two points a fixed distance apart to measure the moisture content of the material into which its probes are inserted.

The actual moisture content of wood or any other product is determined by measuring the ratio of the weight of water in the material, divided by the oven dry weight of the material (multiplied by 100 to express as a percentage). This is an absolute method used on small specimen in a laboratory setting. As this is impractical for materials still in service, moisture 'meters' are used, that measure moisture content of materials based on varying electrical resistivity. When calibrated, these moisture meters will provide a reasonable value for the actual moisture content and a good indication of relative moisture content on different locations of the same building.

The range of moisture content readings for wood can be interpreted as follows:

- 0% - 18%: Expected moisture content of unaffected wood components.
- 19% - 27%: Indicates the presence of excessive moisture. Rain water penetrating the cladding is absorbed by the sheathing.
- 28% & up: Rotting of wood components is suspected.

There are two scales in the moisture meter and the reading is taken depending on the material that the meter is inserted into. For wood products, the moisture scale is calibrated to take direct readings off the meter and to compare them to the range discussed above. For other products, the reading is taken from a relative scale reading and the reading is then compared to a calibration for the material that is being probed. In the case of gypsum board, the scaled reading was compared to a chart published by CMHC that calibrates the scale readings from the BD-10 to moisture content readings for gypsum board.

The range of moisture content readings for gypsum board can be interpreted as follows:

- 0% - 0.4%: Gypsum is within expected dry range.
- 0.4% - 1.1%: Gypsum is at an increased humidity and this can accommodate possible growth of some established mould colonies.
- 1.1% & up: Gypsum is possibly exposed to liquid water and the likelihood of active mould growth and corrosion of fasteners or adjoining metal is likely.

The following table presents the results of the moisture content readings taken at cut tests.

Exploratory Opening Number	Exposure	Location	Moisture Content	Comments
1	East	T-2702 on Exterior Board	0.6% in Gypsum	This moisture content suggests increased humidity and possible growth of established mould colonies
2	East	T-4601 in the east bedroom under the window.	9% in Plywood	Signs of water ingress which appears to be from a past leak.
3	West (?)	Tower Unit 2504	NA	Blackened insulation
4	North	Tower Unit 1807 Left Cut	0.2% in Gypsum	Right Cut-Concrete wall Assembly-Gypsum board is within the dry expected range.
5	North	Tower Unit 1807 Right Cut	0.5% in Gypsum	
6	South	Tower Unit 2403 at Exterior Drywall	0.2% in Gypsum	The drywall removed was found to be slightly moldy
7	North	Tower Unit 2602 at Living Room at first layer of drywall	0.2% in Gypsum	Gypsum board is within the dry expected range.

Exploratory Opening Number	Exposure	Location	Moisture Content	Comments
8	North	Tower Unit 2602 at Living Room at first second of drywall	0.2% in Gypsum	Gypsum board is within the dry expected range.
9	North	Tower Unit 2602 at Bedroom	0.2% in Gypsum	Gypsum board is within the dry expected range.
10	North	Tower Unit 106	0.1% in Gypsum	Gypsum board is within the dry expected range.

3.4 Exploratory Roof Openings

We conducted a visual review of the roof of the tower at Discovery Place Phase II. In addition, we conducted exploratory openings throughout the area of the roof in order to identify the composition and condition of the roof assembly.

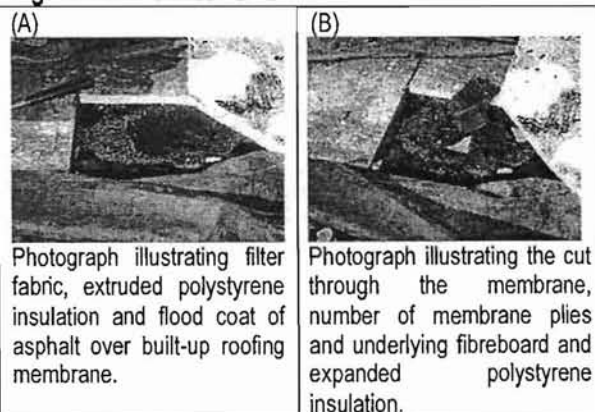
Roof Cut Numbered 1:

Location: Approximately 7 feet in from overflow scupper located in central area of South elevation parapet wall.

Roof Construction: Crushed stone ballast on
Filter Fabric on
1" extruded polystyrene insulation spot adhered to membrane on
4 Ply Built up Roof (BUR) system consisting of a flood coat of asphalt installed over alternating of organic felt and layers of asphalt on
½" fibreboard on
8" of expanded polystyrene insulation (tapered for drainage) on
1 layer of asphalt and felt (vapour barrier) on
Concrete deck

Comments: Roof system is in good condition at cut location, with no evidence of water penetration or deterioration of components forming roof assembly.

Figure 19: Cut Test Number 1



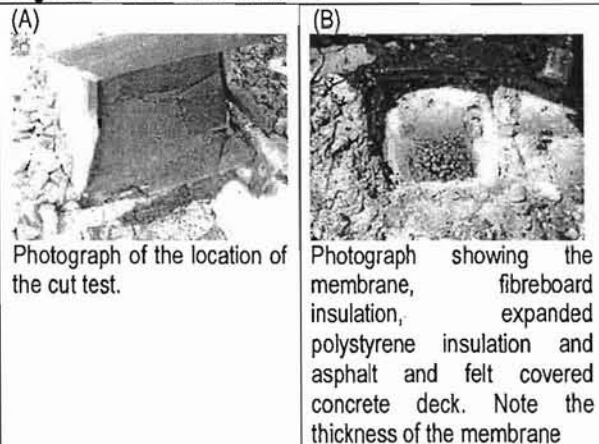
Roof Cut Numbered 2:

Location: West side of roof adjacent to South parapet wall return

Roof Construction: Crushed stone ballast on
Filter Fabric on
1" extruded polystyrene insulation spot adhered to membrane on
Built up Roof (BUR) system consisting of a flood coat of asphalt installed over alternating plies of organic felt and layers of asphalt (approximately 7 to 8 layers altogether since the cut went through both the stripping plies and membrane) on
½" fibreboard on expanded polystyrene insulation on 1 layer of asphalt and felt (vapour barrier) on
Concrete deck

Comments: Felt plies of roof system felt damp to the touch. Fibreboard insulation was damp.

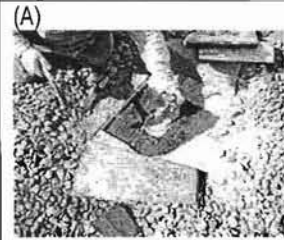
Figure 20: Roof Cut Number 2

**Roof Cut Numbered 3:**

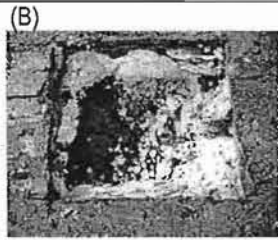
Location: Near South-West roof drain close to South-west corner of mechanical penthouse.

Roof Construction: Crushed stone ballast on
Filter Fabric on
1" extruded polystyrene insulation spot adhered to membrane on
4 Ply Built up Roof (BUR) system consisting of a flood coat of asphalt installed over alternating plies of organic felt and asphalt on
½" fibreboard on
2" of expanded polystyrene insulation (tapered for drainage) on
1 layer of asphalt and felt (vapour barrier) on
Concrete deck

Comments: Roof system is in good condition at cut location, with no evidence of water penetration or deterioration of components forming roof assembly.

Figure 21: Cut Test Number 3

Photograph showing ballast, filter fabric, extruded polystyrene insulation, roof membrane, fibreboard insulation, and expanded polystyrene insulation.



Photograph showing the cut through the membrane, number of membrane plies and underlying fibreboard and expanded polystyrene insulation.

4.0 Discussion and Recommendations

4.1 Stucco Clad Walls:

As mentioned in a previous section, the stucco clad walls at this complex have been installed in a "face-sealed" system. Performance of a "face-sealed" stucco clad wall relies on the exterior surface to protect the wall assembly from moisture penetration, and therefore it is critical that all interfaces and penetrations in the wall are properly sealed and maintained.

A "face-sealed" system does not perform well in the type of climate that we experience on the West Coast, however, most of the stucco walls on this project are well protected by overhangs which minimizes its exposure to the weather.

At this time, we are not aware of any water ingress issues through this wall system. Therefore in order to ensure acceptable performance over the long term, the caulking at all joints and penetrations through the wall system should be replaced, and the wall must be monitored and maintained on an ongoing basis.

4.2 Concrete:

In several locations throughout the building at the areas of cast-in-place concrete, primarily at balconies, corroding reinforcing steel is exposed. Reinforcing steel becomes exposed when it rusts and expansionary forces associated with the rusting causes the concrete cover outboard of the reinforcing steel to crack and spall. This condition is progressive in nature since as cracks develop in relation to the rusting of the embedded steel, additional steel becomes accessible for water creating additional corrosion. Corrosion of embedded reinforcing steel is in many cases attributed to lack of sufficient concrete depth or "cover" outboard of the reinforcing steel combined with the absence of a protective coating or membrane.

Chatwin recommends that the next steps to address this problem is to carry out a thorough survey and identify all areas where the concrete has spalled or where there is evidence of loose (hollow sounding) concrete, and then carry out the repairs. Repairs would consist of the complete removal of all loose concrete, both at slab edge and balcony locations, cleaning off the rust on the metal, addition of more reinforcing if necessary and properly patching of the areas of removed concrete.

4.3 Window Wall System (with Metal Panels) and Sliding Glass Doors:

The window wall system includes the windows and the metal panels that are located below them.

No cut tests were carried out on the metal panels in the window wall system. The drawings do not illustrate the construction of the metal panel wall assembly. The screws that hold the metal panels to the wall assembly behind have rusted in numerous locations around the facade of the building. In addition, there are screw heads that sit proud of the metal. Without fitting tightly to the metal panel, wind driven rain can enter in behind the metal panel at screw locations and potentially cause moisture damage to the underlying components.

The windows and sliding glass doors on the project are non-thermally broken aluminum framed units. The glazing consists of double glazed sealed insulating glass units (IGUs), with the glass panes separated by a perimeter metal spacer bar (the metallic separator between the inner and outer pane of glass in the same window).

One of the common problems noted on a number of windows and sliding glass door units was the presence of condensation within the sealed glass units. This is a result of the seal between the window panes deteriorating over time, thus allowing moisture to build up between the glazing. When the moisture dries it leaves a white film on the inside of the glass.

The other issue with the windows and doors of the entire project was that the glazing tape material installed between the glazing and framing has extruded or "squeezed out" onto the glazing in locations, due to a combination of repeated cycles of heat and wind-pumping action.

A typical issue with the sliding glass doors was that the doors were found to be relatively difficult to operate, which appears to be associated with the rollers installed along the bottom of the door not operating properly.

All the above noted problems are common symptoms considering the age of these units. The units are nearing the end of their design service life and therefore it would be recommended to have them replaced. The window wall system and the doors should be considered for replacement within the next 5 to 7 years.

These units can be replaced at the same time or phased over a number of years. Owners may wish to defer this capital investment for several more years through aggressive caulking and gasket replacement of all joints within the frame and around the frame perimeter. Extruded glazing tape is typically repaired by removing squeezed out portion of tape and installing a "cap bead" of compatible caulking material. Certain joints aren't accessible without uninstalling the frame. Should the frame have to be uninstalled, it is likely more cost-effective to install a new unit than refurbish the original unit.

4.4 Balconies:

The balcony slabs are constructed of poured concrete. The balcony structure consists of both a slab and a short concrete parapet wall with a glazed guard above or a slab and a full height glazed guard. Spalling of concrete was typically noticed to be present in varying degrees of severity on most of the balconies and the parapet walls.

There are a few balconies that have had a paint coating applied over the surface. The surface at the majority of the balconies consists of exposed concrete. The absence of a membrane has contributed to the damage to the surface of the balcony where the concrete has started to delaminate from around the reinforcing steel.

During the construction of the balconies, a groove was formed into the underside of the slab (soffit) near the edge to act as a drip channel and prevent water from travelling along the underside of the slab after running down the face of the balcony. The spalling of the concrete on the underside has reduced the effectiveness of the drip channels in locations. This is apparent by the presence of efflorescence on the underside of the slabs. The drip channel should be repaired with any loose concrete removed and the rust on the reinforcing steel cleaned. Any additional reinforcing that is needed should be added and concrete repair material installed.

Another item to note was the presence of exterior grade carpet on some of the balconies. This can accelerate the deterioration of the unprotected balcony slabs as they can retain the water close to the slab for extended periods of time, thereby not allowing the concrete to dry out as easily.

Repairs recommended for the balconies, after addressing the delaminated concrete issues, should be to install a liquid waterproofing membrane over the balcony surface to protect the concrete.

There are a few balconies on the building that are protected by a full metal guard rail instead of the typical combination of concrete parapet wall and metal guard. We accessed balconies where these railings were loose such that they could easily be rocked back and forth. This condition presents a potential safety hazard and should be reviewed structurally.

4.5 Exhaust Vents:

A common problem with the exhaust vents is that water can get into or around the duct from which the units are vented for the kitchen, dryer and bathroom. The concrete surrounding the opening in the slab edge in many locations has been damaged and is poorly detailed in regard to flashing to prevent water from entering the duct. Also present were several problems with the vent cover, where in most cases they were also damaged, allowing insects and birds to enter the vent cavity.

It is unclear if the damaged concrete around the vents occurred during construction, although some appeared to have occurred during construction and that in many instances was completely broken away. There is also a possibility that during construction, the venting ductwork themselves could have been crushed by the concrete pouring onto them.

Chatwin recommends that all chipped concrete around the vents be patched; making sure that the concrete patch is fixed to the existing concrete. It is also our recommendation to replace all the vent covers with a "hooded" cover, making sure to clean all debris from the vent chamber during vent cover replacement. A proper head flashing should also be installed along the top of the vents.

We also recommend that the owners/ renters be educated with regard to using lint traps in the dryers to reduce the amount of lint building up and potentially plugging the exterior exhaust vent cover. In addition, the strata should consider checking the vents either on an annual or a biannual basis for plugging and damage.

4.6 Caulking:

A common problem with the entire building is the failure of most of the caulking joints. The age of the building alone has an effect on condition of the caulking, and without regular maintenance, it will fail. All the caulking joints, from the windows, doors, metal panel locations and the interfaces where the rock dash stucco meets the concrete needs to be re-caulked to ensure a weather tight seal. Over the course of time with continuous exposure and repeated cycles of heating and cooling the caulking becomes brittle and has cracked creating areas where water can infiltrate into the wall assembly. Localized, minor re-caulking has occurred at various locations around the building, but it is unknown if at the time of re-caulking that the original caulking had been removed. Without removal the new caulking can't adhere to the required surfaces, and a proper seal will not be achieved.

Complete removal of all existing caulking and proper cleaning of the area to ensure adherence of the new caulking is required.

4.7 Roofing:

Overall the roof system on the tower building appeared to be in generally good condition with minor maintenance required at this time to extend the economic service life. The maintenance required should include the following:

1. Replacing split or deteriorated caulking
2. Routing out sealing cracks in the perimeter parapet walls.
3. Remove the organic debris.
4. Redistribute ballast as required to provide uniform coverage.
5. Ensure caulking at mechanical line penetrations through the roof forms proper seal.
6. Consider installing a membrane and cap flashing system along the top of the perimeter parapet walls.
7. Further investigation is required to determine the cause and extent of damp membrane/fibreboard at roof cut numbered 2.

Given the age and current condition of the roof, it is our opinion that the remaining economic service life of the roof system, provided that maintenance is carried out as recommended, and that a program of periodic maintenance implemented, is approximately 5 to 7 years.

The roof of the townhouse building is covered with sections of newly installed 2 ply SBS membrane system as well as the original roofing consisting of built up asphalt and felt. For the newly applied membrane system, a blister was detected in front of the window of T4601 and it is our recommendation that this be addressed by cutting it out and repairing the membrane. If this roofing was completed recently, the strata may wish to have the installer address this deficiency under the terms of the warranty.

Asphalt and felt roofing areas are carrying a substantial amount of moss growth. These areas should be monitored on a continual basis and all such growth as well as any other debris removed, as otherwise that could affect the performance of the roofing membrane.

4.8 Awning at Penthouse Units:

The current condition of the awning installation over the balconies at the penthouse units is allowing water to run down the face of the building. It appears that the seal at the top of the awning against the parapet wall above has deteriorated. It is accelerating the rusting of the metal awning and staining the concrete wall and parapet.

We recommend that a flashing be installed above the awning terminated in a reglet that would shed water away from the wall and along the awning. This work should be performed in the near future to prevent further rusting of the awning structure. Prior to the flashing being installed the awning should be removed, primed and repainted to inhibit any further deterioration.

4.9 Below Grade Membrane:

Another common issue with the complex is the failure of the below grade membrane. In many locations it has hardened and become very brittle where exposed for review at the base of the building wall. In other locations it has delaminated from the wall and allows water to seep into the cavity that it creates. Of particular interest are the planters on the townhouses as they butt up against the walls of the townhouses and can allow water into the units.

Complete removal of the existing membranes and cleaning of the surface prior to installation of new membranes is recommended.

4.10 Recommended Repairs for issues observed in T4601:

In addition to the recommendations suggested in the above items, and based on the observations in the unit, we recommend the following additional items be considered:

- There appears to be water ingress at the base of the glass block window. In addition, the detailing of the stucco above the glass block window was questionable as it was not sealed adequately. It is our recommendation that the glass blocks be removed and replaced complete with proper flashings and waterproofing of the opening.
- The window located in the shower on the top floor can potentially allow moisture to penetrate into the wall system due to its exposure to moisture from both sides. It is our recommendation that this window be removed or relocated to avoid future damage to the wall underneath.
- One of the windows has a loose window trim which should be re-attached and sealed to prevent moisture penetration.

- There is substantial amount of moss growth at the base of a rainwater leader. We recommend that the moss be cleaned, and that roof drains be reviewed to ensure that water from the rainwater leader does not pond and that it can be drained away.
- The paint on the chimneys has delaminated in various spots and we recommend that these areas be recoated.

4.11 Summary of Recommendations:

Figure 22 is a summary of the recommendations contained within this section.

Figure 22 : Summary of Recommendations for Repair	
1	Seal all joints and penetrations in the stucco "face-sealed" walls.
2	Repair all spalled and loose concrete, including cleaning of the rusted reinforcing steel
3	Replace all sliding door units as well as window wall units with new thermally broken aluminum-framed, double glazed window wall systems and sliding doors.
4a	Strip the balconies of all existing finishes, clean and repair all damaged concrete and install a liquid applied waterproof membrane.
4b	Consider having the full height aluminum guard rails be reviewed for safety.
5	Repair damaged concrete at all exterior vents and replace all vents with new hooded vents.
6	Complete removal and replacement of caulking.
6a	Carry out roof repairs including, replacing split or deteriorated caulking, routing out sealing cracks in the perimeter parapet walls, removing all organic debris, redistributing ballast as required to provide uniform coverage, and ensuring caulking at mechanical line penetrations through the roof forms proper seal.
6b	Consider installing a membrane and cap flashing system along the top of the perimeter parapet walls.
6c	Carry out further investigation to determine the cause and extent of damp membrane/ fibreboard at roof cut numbered 2.
6d	Repair bubbled area at the window of T4601
7	Install a regletted flashing at the top of the Awning at the penthouse level and remove, clean, and repaint the rusted structure to mitigate the further deterioration of the awning.
8	Replacement of the below grade membranes as necessary.
9a	Replace glass block windows including waterproofing the opening and providing better interfacing details with the stucco cladding.
9b	Remove window located in the shower, or relocate to a different wall.
9c	Reinstate loose trim at the window.
9d	Ensure roof drainage is adequate between the rainwater leader and the drain on the roof, otherwise extend rainwater leader closer to the drain.
9e	Recoat area of delaminated coating on the chimneys.

4.12 Prioritized Repairs:

We have summarized the various recommendations for repair in order from most critical to least critical.

Figure 23 Priority of Recommendations		
Time Frame	Recommendation #'s	Reason for Priority
Immediate	4b (Railing)	Replace/repair guard railings that may be a safety hazard
Within 1 year	1 and 6 (Caulking)	The Caulking on the entire building has failed and is providing no defence against water infiltration into the wall systems.
	6a,b,c and 9d(Roof)	Maintenance of the roof needs to be carried out to allow its performance to extend longer.
	7 (Awning)	This work can be done at the same time as the caulking and roofing.
Within 2 years	2 (Concrete)	Exposure of the reinforcing steel to the elements will continue further degradation.
	5 (Vents)	This work can be carried out at the same time as concrete repairs
	9a, b and c (Glass Block Window, window in shower, window trim)	This work needs to be carried out to avoid further damage to the walls.
	9e (chimneys)	This work needs to be carried out to avoid deterioration of the metal.
Within 5 years	3 (Doors/Window Wall)	Water is entering the building at some windows and doors, but does not seem to be causing noticeable deterioration of the building. The windows and doors are reaching the end of their service life.
	4a (Balconies)	Protection of the balconies should commence after all the concrete repairs on the balconies are completed.
	8 (Below Grade Membrane)	There are no immediate concerns noted as a result of the failed membrane

5.0 Closure

Basis for this Report:

The conclusions and recommendations detailed in this report are based upon the information available at the time of preparation of the report. No investigative method eliminates the possibility of obtaining imprecise or incomplete information. Professional judgement was exercised in gathering and analyzing the information obtained and in the formulation of our conclusions and recommendations.

Except where otherwise indicated, conditions noted throughout this report are general in nature, and a record of every location at which any one defective condition is present, has not been made. This report is not intended to investigate, identify or confirm any components as to their ability to fully perform their intended functions.

Reliance on this report:

The observations and recommended repair work presented in this report are based on the level of effort of investigation agreed upon by the client. It is difficult in the building rehabilitation project to positively identify all of the contributing factors that may relate to building envelope performance problems without carrying out extensive exploratory work to the building envelope.

The material presented in this report reflects Chatwin Engineering Ltd's best judgement in light of the information available to us at the time of preparation. This report was prepared by Chatwin Engineering Ltd. for the exclusive use of Strata Plan NW 2364 and their authorised agents, and may not be used in whole or in part by any third party. Any use which a third party makes of this report, or any reliance placed on it or decisions made based on it, are the responsibility of such third parties. Chatwin Engineering Ltd. accepts no responsibility for damages that may be suffered by any third party as the result of decisions made, or action taken, based on this report without the written consent of Chatwin Engineering Ltd.

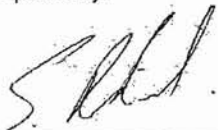
Chatwin Engineering Ltd. wishes to thank you for your assistance and cooperation with this investigation and look forward to providing further assistance upon request. We trust that the foregoing information is sufficient for your present needs and will be pleased to review the contents of this report in greater detail should you so require.

Should you have any questions, or require further elaboration/clarification of our findings and recommendations, please feel free to contact the undersigned at your earliest convenience.

Respectfully,

CHATWIN ENGINEERING LTD.

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Shakir Rashid, P. Eng.

Reviewed by:



Dan Walters, B. Tech., A.Sc.T.
Victoria Branch Manager

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APPENDIX A Proposal

DISCOVERY PLACE II

3970 Carrigan Court, Burnaby, BC

Consultant Proposal

Building Envelope Condition Assessment

June 17, 2006
Our Reference No. 007



June 17, 2006

The Owners of Strata NW 2364
c/o Ms. Julia Beschea
Baywest Property Management Services
300 - 1770 Burrard Street
Vancouver, BC V6J 3G7

HAND DELIVERED

**RE: Consultant Proposal - Building Envelope Condition Assessment
Discovery Place II, 3970 Carrigan Court, Burnaby, BC
Our Reference No. 007**

Dear Ms. Beschea:

Further to a request by Mr. Peter Abley, we are pleased to submit our proposal to perform a Building Envelope Condition Assessment of Discovery Place II as detailed below.

1. Project Information

The referenced property consists of a concrete condominium tower, concrete townhouse building, and three levels of concrete below grade parkade. We understand that the condominium building is 26 storeys high and consists of approximately 207 units, and that the townhouse building has 12 two-storey units. We further understand that the building was constructed in around 1983.

Cladding on the buildings is comprised of a combination of several elements including exposed concrete, stucco, tiles, and a system of metal panels and glazing installed in a window wall system configuration. Cantilevered balconies are present at every floor and the guard walls consist of a glazed metal guardrail system mounted on a knee-high concrete parapet wall.

We understand that:

- No building envelope related systemic problems have been reported by the owners.
- There were leaks detected in the parkade which have now been repaired.
- The main roof is being monitored and maintained by the strata council.

We have been informed that the owners would like to have a review carried out in order to assess, in general terms, the condition of the existing building envelope. The owner's intent in authorizing a building envelope review is to pro-actively identify any maintenance related work that may be required to the buildings.

2. Scope Of Work

In order to fulfill the owners requested building envelope assessment, we propose that a comprehensive visual investigation proceed and that it be supplemented with both invasive and non-invasive testing.

The investigation and testing of the wall assemblies will allow the identification of existing and potential areas of water ingress. It will be aimed at understanding the 'as-built' construction of the existing building envelope assemblies and identifying the condition and performance of the components of the assemblies.

The specific services that we plan to undertake include the following:

- 2.1 A cursory review of the existing design drawings, as-built drawings, and any other available documentation (i.e. maintenance records and previous reports) as they relate to the original design intention and existing performance of the building envelope. Note: The Strata Council to provide the drawings and reports.
- 2.2 Subsequent to the review of the drawings and reports, a strategy will be confirmed for carrying out a site investigation. The site investigation will include, but not be limited to, the following:
 - 2.2.1 Visual inspection of the building envelope assemblies from ground level, swing stage, and balconies of accessed suites (we propose to gain access to approximately 20 suites and review the building envelope over the entire height of the building, via swing-stage, at two locations):
 - 2.2.2 Removal of small areas of gypsum board from areas within the suites to identify the composition and condition of the components within the wall system. We propose to carry out about approximately 10 cut tests. The sections of gypsum board would be temporarily fastened back in place.
 - 2.2.3 Small sections of flashing may be removed and reinstalled at the exterior for the purpose of identifying the composition and condition of the components underlying the flashing.
 - 2.2.4 Carry out adhesion tests of the sealants at various interfaces. This will entail removal and replacement of small sections of existing sealants.
 - 2.2.5 Perform a hammer tap survey of the exposed concrete balcony slabs in order to identify locations of delaminated concrete.
- 2.3 The activities of the site investigation process will be documented with photographs.

2.4 A report will be prepared and will include:

- 2.4.1 Comments on the original design drawings of the building envelope.
- 2.4.2 Comments on the review of documents provided by the Strata.
- 2.4.3 Findings of the visual reviews.
- 2.4.4 Findings of the various tests performed.
- 2.4.5 Comments on the as-constructed design of the building envelope.
- 2.4.6 Annotated photos of conditions of interest.
- 2.4.7 Comments on the significance of all of the findings.
- 2.4.8 General recommendations on ways to proceed including the next steps that may be required and general recommendations regarding current maintenance / remediation requirements.
- 2.4.9 Submission, to the Strata, of three copies of the report.

2.5 One meeting with the Strata Council to present the report.

3. Scheduling

Subject to our workload at the time of proposal acceptance, it is anticipated that work on the Building Envelope Condition Assessment will:

- Commence within 3 weeks of the signing of the Consultant / Client contract.
- Take approximately 8 weeks for commencement to report submission.

APPENDIX B Glossary of Terms

Appendix B - Glossary

A

Air Barrier - A system of materials that enclose a volume of air with minimal air leakage between the enclosed air and the exterior. The air barrier defines the pressure boundary (The pressure boundary is defined as the location where 50 percent or more of the air pressure drop across the assembly occurs). The effectiveness or adequacy of the air barrier can be measured by the volume of air (in cubic feet per minute) that must be added or removed from the enclosure to maintain a certain pressure difference across the pressure boundary.

Alligatoring - Coarse checking pattern characterized by a slipping of the new paint coating over the old coating to the extent that the old coating can be seen through the fissures.

Assembly - Refers to the collective layers of components and materials, which together comprise the complete cross section of the wall or roof.

Awning window - A window that is hinged near the top so the bottom opens outward.

B

Balcony - Refers to a horizontal surface exposed to outdoors, and is intended for pedestrian use but, projects from the building so that it is not located over a living space.

Base, baseboard - A board placed along the bottom of a wall next to the floor.

Base Flashing - Refers to the part of the roofing that is turned up at the intersection of a roof with a wall or another roof penetration. It may be made of the same material as the main roofing membrane or of a compatible material.

Batt insulation - Flexible, blanket like pieces, usually fiberglass used for thermal or sound insulation. As opposed to loose fill insulation which is blown in place.

Beam - Any major horizontal framing member designed to carry a load from a set of joists or a roof and spanning an opening space. Usually 6" x 6" or 4" x 10" or larger.

Blisters - Raised circular or oblong spots on finished surfaces.

Bottom or sole plate - The bottom framing member of a wall, usually either 2 x 4 or 2 x 6. The plate is nailed to the bottom of the studs and to the floor joist or sheathing below it.

Bow - The distortion in a board that is no longer

flat lengthwise, but has remained flat across its faces.

Building Codes - Municipal and/or Provincial rules regulating safe building practices and procedures. The codes generally encompass structural, electrical, plumbing, and mechanical remodeling and new construction. Inspection may be required to confirm adherence to local codes.

Building Envelope - The shell of the building that separates what is inside from what is outside. Elements of the building envelope are the exterior walls (including windows and doors), the roof and the floor of the lowest level of the building. The building envelope has a number of functions: it holds the building up; keeps the rain and the ground water out; it keeps the wind out; it keeps water vapour out; and it controls the transfer of energy (heat) between the inside and the outside.

Butt joint - A square-cut joint where the ends of two pieces meet.

C

Calcium Carbonate or Efflorescence - A white chalky material which is often found in concrete basement walls and other concrete or masonry surfaces where water has leached some of the chemicals out of the cement. Usually a sign of past or present moisture penetration.

Casement window - A window that is hinged at one side so the opposite side opens outward.

Casing - The trim around a door or window. A Cased opening is an open doorway with trim around it. A cased window is a window with trim around it.

Caulking - A flexible material used to seal a gap between two surfaces i.e. Between pieces of siding or the corners in tub walls.

Cladding - Refers to a material or component of the wall assembly, which forms the outer surface of the wall and is exposed to the full force of the environment.

Clearance - The amount of space needed for the proper and/or safe use of various installations- for opening appliance and cabinet doors and drawers, for example.

Column - A vertical support (often square, rectangular, or cylindrical), as for roofs or ceilings.

Concrete apron - The section of concrete where a garage floor joins the driveway. Aprons allow for a smooth transition from a lower driveway to an elevated garage floor.

Condensation - In a building, beads or drops of water that accumulate on the inside of the exterior covering of the building. Condensation occurs when warm, moisture-laden air from the interior reaches a point where the temperature no longer permits the air to sustain the moisture it holds.

Control joints - Grooves that are tooled or cut into the surface of wet concrete to make it crack in straight lines at planned locations, rather than cracking randomly.

Corner bead - A light-weight metal angle used to shape and reinforce outside corners in drywall, or sheetrock, construction.

Counterflashing - A flashing usually used on chimneys at the roofline to cover shingle flashing and to prevent moisture entry.

Crawl space - A shallow, unfinished space beneath the first floor of a house that has no basement. Used for visual inspection and access to pipes and ducts.

Cripple stud - (1) A short framing stud that is cut off to make an opening for a door or window. (2) Short stud over a window or door between the top of the header and the bottom of the top plate. Also, the short stud between the top of the bottom plate and the underside of a window frame.

Cross Cavity - Intercepts and directs any water flowing down the cavity of a wall assembly to the exterior.

D

Decay - Disintegration of wood or other substance through the action of fungi or bacteria.

Defect - Any imperfection occurring in or on wood that may lower its quality.

Delamination - The separation of layers of plies through the failure of adhesive bond.

Detail - A drawing showing special information about a particular part of the construction- Details are usually drawn to a larger scale than the other views and are sometimes section views.

Dewpoint - Temperature at which a vapor begins to condense. Applies especially to moisture in the air.

Diffusion - The movement of the individual molecules through a material. The movement occurs because of the kinetic energy of the individual molecules, independent of airflow. Kinetic energy increases as the temperature increases.

Dimension lumber - Lumber at least 2" but less than 5" thick, and 2" or more wide. Includes joists, rafters, studding, planks, and small timbers. (see also Dimension stock.)

Double glazing - An insulating windowpane formed of two thickness' of glass with a sealed air space between them.

Downspout - A pipe, usually metal, for carrying rainwater from roof gutters.

Drainage - Refers to a water management principle that utilizes surfaces of the assembly to drain water away from the assembly.

Drainage Cavity - Space provided behind exterior cladding to allow for drainage of water penetration back to the exterior. Also acts to aid in drying within the wall assembly through venting.

Drip - (1) A member of a cornice or other horizontal exterior-finish course that has a projection beyond the other parts for throwing off water. (2) A groove in the underside of a sill or drip cap to cause water to drop off on the outer edge instead of drawing back and running down the face of the building.

Drip cap - A molding placed above the exterior of a door or window frame, causing water to drip beyond the outside of the frame.

Drip edge - Metal trim installed at the edge of a roof to stop water from running back under the edge of the roof deck.

Dry rot - A term loosely applied to any crumbly decay of wood, but especially to that which, when in an advanced stage, allows the wood to be crushed easily to a dry powder. The term does not accurately describe decay. Since fungi which cause the rot require considerable moisture for growth.

Drywall, Gypsum Wallboard (GWB), Sheet rock or Plasterboard - A wall finish consisting of a manufactured panel made out of gypsum plaster and encased in a thin cardboard. Usually ½" thick and 4' x 8' or 4' x 12' in size. The panels are nailed or screwed onto the framing and the joints are taped and covered with a 'joint compound'. 'Green board' type drywall has a greater resistance to moisture than regular (white) plasterboard.

Dry-wall returns - A type of construction in which the windows have drywall installed from the interior wall surface to the window unit. Another method of trimming windows is to have wood returns from the window to the wall surface. With wood returns you need window casing to frame the inside of the window. With drywall returns you have a cornerbead drywall corner and no window casing.

E

Eaves - The overhang of a roof projecting over the walls.

Efflorescence - See Calcium Carbonate.

Elevation - A drawing that shows vertical dimensions- it may also be the height of a point,

usually in feet above sea level.

Exterior plywood - Plywood in which the plies are bonded together using exterior or waterproof glue.

F

Fall - The slope of a drain line, ensuring proper flow. Minimum fall is 1/4 inch per foot.

Finish grade - Final ground level around a building.

Flashing - The building component used to connect portions of a roof, deck, or siding material to another surface such as a chimney, wall, or vent pipe. Often made out of various metals, rubber or tar and is mostly intended to prevent water entry.

Floor joists - Framing pieces that rest on outer foundation walls or interior beams or girders, to support the floor.

Floor plan - A drawing showing the arrangement of rooms, the locations of windows and doors, and complete dimensions- A floor plan is actually a horizontal section through the entire building.

Flush - Even, or in the same plane (with reference to adjacent surfaces of two materials).

Flush door - A door having flat surfaces.

Footing - A masonry section, usually concrete, in a rectangular form wider than the bottom of the foundation wall or pier it supports. It can be level, stepped level, or follow the contour of the ground.

Foundation - The part of a building or wall which supports the superstructure.

Frame - (1) The surrounding or enclosing woodwork, as around windows or doors. (2) The skeleton of a building; that is, the rough structure of a building, including interior and exterior walls, floor, roof, and ceilings.

Frame construction - Construction in which the structural parts are of wood or depend on a wood frame for support.

Framing - The rough structure of a building, including interior and exterior walls, floor, roof, and ceilings. Wall framing is usually made out of 2" x 4" or 2" x 6" studs.

Fungal Wood Rot - A common wood destroying organism which develops when wood containing material is exposed to moisture and poor air circulation for a long period of time. Often incorrectly referred to as dry rot.

Fungicide - A chemical that is poisonous to fungi.

Furring - Narrow strips of wood attached to a surface for the purpose of creating a plumb or level surface for attaching the wall, ceiling, or floor surface.

G

Galvanized - A zinc coating used to prevent

rusting.

Gauge - A standard unit of measurement for the diameter of wire or the thickness of sheet metal.

Glazing - Fitting glass into windows or doors.

Glazing compound - Caulking compound used especially for holding window glass in place because it remains soft underneath the surface.

Grade - (1) The designation of quality, as of logs or plywood or (2) The ground level or elevation. Also the slope of the surface of a lot or a road.

Grain - The direction, size, arrangement, and appearance of wood or veneer fibers.

Groove - A long, hollow channel, cut by a tool, into which a piece fits or in which it works. Carpenters have given special names to certain forms of grooves, such as dadoes and housings.

Gusset - A triangular or trapezoidal piece of wood or metal fastened to the exterior of a joint

Gypsum wallboard - Drywall materials made of gypsum encased in paper to form boards.

H

Headers - Double wood pieces supporting joists in a floor or double wood members placed on edge over windows and doors to transfer the roof and floor weight above the openings to the studs at the side.

Heel (of a rafter) - The end, or foot, that rests on the wall plate.

House Wrap - A brand name is "Tyvek" A fabric like material that lets moisture vapour pass through but stops air from passing. It is installed on the outside of houses under the siding or brick to slow air infiltration and therefore make them more energy efficient.

I

Inflammable - Not easily set on fire.

Insulated glazing - Two or more pieces of glass in a single sash with air space between them for the purpose of insulation.

Insulation - Any material which resists the transfer of electricity, heat, or sound. For example, thermal insulation is placed in the walls, ceilings, or floors of a home to reduce the rate of heat flow.

Insulation board (fiberboard) - A low-density board made of wood, sugar cane, cornstalks, or similar material. It is dried and usually pressed to a thickness of 1/2" or 25/32".

Isometric - A kind of drawing in which horizontal lines are 30 degrees from true horizontal and vertical lines are vertical.

J

Jack rafter - Rafter between the outside wall and a hip rafter or the ridge and a valley rafter.

Jack Stud - Shorter stud in window or door framing that supports the header over the opening.

Jamb - Side members of a door or window frame.

Joint - The junction of two pieces, as of wood or veneer.

K

Kerf - The void created by the width of a saw blade as it cuts.

Kiln-dried - Artificially dried lumber, a method that produces lumber superior to the more commonly air-dried product.

L

Lag screw or bolt - Heavy-duty screw with a bolt head for attaching structural members to a wall or to material too thick for a machine bolt to go through.

Lap joint - A joint composed of two pieces, one overlapping the other.

Lath - A building material of wood, metal, gypsum, or insulating board that is fastened to the frame of a building to act as a plaster base.

Layout - A full-sized drawing showing arrangement and structural features.

Level - (1) A term describing the position of a line or plane which is parallel to the surface of still water. (2) An instrument or tool used in testing for horizontal and vertical surfaces and in determining differences in elevation.

M

Maintenance - Is used to implement regularly scheduled work and inspections to insure the products used will operate effectively during their life. It forms a part of the buildings daily operation.

Manufacturers specifications - The written installation and/or maintenance instructions which are developed by the manufacturer of a product and which may have to be followed in order to maintain the product warranty.

Mastic - The thick adhesive used to hold wall and floor tiles in place.

Membrane roof - Roofing consisting of a single waterproof sheet.

Metal lath - Sheets of metal slit and drawn out to form openings. Used as a plaster base for walls and ceilings and as reinforcing over other plaster bases.

Mil - One-thousandth of an inch.

Miter - A joint in which the ends of two pieces of wood are cut at equal angles (typically 45°) to form a corner.

Miter joint - A joint formed by fitting together two panels or pieces of wood that have been cut at the same angle.

Modified Bitumen Membrane - See Torch On Roof.

Moisture barrier - Treated paper or membrane that retards or bars moisture from passing into walls or floors.

Moisture Content (M/C) - The amount of water in a material such as wood, expressed as a percentage of the oven-dry weight of the material.

Molding (moulding) - In building construction, a strip of wood, often decorative, such as that on top of a baseboard or around windows and doors.

Mortar - Cement and aggregate mixture for bonding masonry units together.

Mullion - The vertical bar between the window in a frame which holds 2 or more windows.

N

Nail pops - Caused by shrinkage of framing members after wallboard is installed.

Nailer - A piece of wood used in any of several places to provide a nailing surface for other framing members.

Notch - A crosswise rabbet at the end of a board.

O

O.C. (on center) - The measurement of spacing for studs, rafters, joists, and similar members in a building from the center of one member to the center of the next.

OSB(Oriented Strand Board), Wafer Board, or Chip Board - The newest chipboard that has the long axis of the strands of the wood chips aligned with the long dimension of the materials (such as the 8 foot measurement in a 4x8 sheet of OSB) The old chip board was not structural while OSB is structural just like plywood.

Oxidation - The process of combining with oxygen.

P

Plans - See Blue Prints.

Plate - The horizontal framing members at the top and bottom of the wall studs.

Ply - A term used to denote a layer or thickness, as of building or roofing paper, or a layer of wood in plywood.

Plywood - A wood product made by fastening together layers of veneer or a combination of veneer layers and a lumber core. The layers are joined with an adhesive. Adjoining plies are usually laid with grains at right angles to each other, and almost always an odd number of plies are used.

Polyvinyl Chloride (PVC) - A type of plastic formulation. Thin, flexible sheets of PVC plastic are used for pond liners. Rigid PVC plastic pipe is used for water supply lines. Also used for vinyl window frames.

Portland cement - Finely powdered limestone material used to bond the aggregate together in concrete and mortar.

Post - A vertical framing member usually designed to carry a beam. Often a 4" x 4", 6" x 6", or a metal pipe with a flat plate on the top and bottom.

Preservative - Any substance that, for a reasonable length of time, is effective in preventing the development and action of wood-rotting fungi, borers of various kinds, and insects that cause deterioration in wood.

Pressure treated lumber - A process of forcing preservatives into wood. One commonly used pressure treatment is waterborne chromated copper arsenate (CCA). CCA specified for above ground use is labeled LP-2 or .25. CCA rated for ground contact is labeled LP-22 or .40.

R

Rabbet - An L-shaped groove cut into the edge of a board to receive the edge of another board and form a corner joint.

Rainscreen - Rainscreen refers to a strategy for rain penetration control that relies on deflection of the majority of water at the cladding but also incorporates a cavity that provides a drainage path, for water that penetrates past the cladding.

Relative Humidity - The amount of moisture in a volume of air as a percentage of the maximum amount of moisture which can be held in that air at a certain temperature - cold air can't hold as much moisture as warmer air.

Remediation - Reconstruction or restoration of an existing rundown building.

Renewal Plan - A renewal plan, is a list of expected costs for the replacement of building components over the life of the building based upon life expectancy of the products and the average inflation rate in the previous five years. It is used to help prepare a budget for some of the expected costs and replacements that will be required at certain intervals during the life of the building.

Reveal - A term used for doors and windows that means the amount of space (gap) between the door and its frame. The reveal should be equal all around if the unit is installed properly.

Roof - The covering or upper part of a building.

Roof sheathing - Boards or sheet material, fastened to the roof rafters, on which the shingles or other roof covering is laid.

Roofing - Material put on a roof to protect it from wind and water.

Roofing felt - A black, paper-like product applied

between the roof sheathing and the shingles.

Runoff - Water traveling across the ground surface, caused by heavy rains or irrigation.

S

Saddle - Two sloping surfaces meeting in a horizontal ridge, used between the back side of a chimney or other vertical surface and a sloping roof. Also called a cricket.

Scaffold - A temporary structure or platform for workers to sit or stand on when working at a height above the floor or ground.

Scratch coat - The first coat of plaster, which is scratched to form a bond for the second coat.

Scupper - The drain in a downspout or flat roof, usually connected to the downspout.

Sealer - A finishing material, either clear or pigmented, that is usually applied directly over uncoated wood. It prevents subsequent coats of paint or varnish from seeping into the wood.

Section - A drawing that shows the "cut-through" view of a building or object.

Section view - A drawing showing what would be seen by cutting through a building or part.

Setback - The distance from a street or front property line to the front of a building.

Sheathing - The wooden covering on the exterior of walls and the roof. Typically made of 1/2 inch construction-grade plywood; older homes may have shiplap boards or planks.

Sheathing Membrane - Refers to a material in an exterior wall assembly, whose purpose is to retard penetration of moisture further into the wall assembly. Waterproof type sheathing membranes can also perform both, breather type sheathing membranes such as sheathing paper and house wraps, and waterproof sheathing membranes.

Sheathing paper - A building material, generally paper or felt, used in wall and roof construction to retard the passage of air and sometimes moisture.

Shim - A thin, tapered piece of wood used for leveling purposes.

Siding - The finish covering of the outside wall of a frame building. It may be made of horizontal weatherboards, vertical boards and battens, shingles, or other material. Cement Siding is the newest material, which is very resistant to decay. It needs to be painted. It comes in lap and shake patterns. Hardi-Plank and Hardi-Shake are brand names of cement siding.

Sill - The framing member in contact with a masonry or concrete foundation.

Single Ply Roof - See Torch on Roof

Site conditions - A term used when describing the conditions of a construction site. Examples would be: level, sloping, rocky, wet.

Site plan - The drawing that shows the boundaries of the building, its location, site utilities.

Skylight - An opening in the roof covered with thick glass the function of which is to light the area below.

Sliding window - A window with two or more sash that slide horizontally past one another.

Slope - The incline of a roof, expressed as inches of rise per foot of run.

Soffit - A ceiling like space, often out doors such as the underside of the roof overhang.

Span - The horizontal dimension between vertical supports- The span of a beam is the distance between the posts that support it.

Specifications - Detailed, precise engineering instructions that include the kinds of materials to be used and the method of construction.

Stack effect - Buoyancy of warm gases within a chimney or space.

Stain - A die used for finishing wood surfaces. shingles, or other material. Cement Siding is the newest material, which is very resistant to decay. It needs to be painted. It comes in lap and shake patterns. Hardi-Plank and Hardi-Shake are brand names of cement siding.

Storey - That part of a building which is between any floor and the floor or roof next above.

Stucco - Most commonly refers to an outside plaster made with portland cement as it's base.

Stud - Vertical member of a frame wall, placed at both ends and most often every 16" on center.

Subfloor - (1) Boards or sheet material laid on joists, and over which a finish floor is to be laid. (2) The first layer of rough flooring applied to the floor joists.

Subflooring - Plywood or boards nailed directly to the floor joists to form a base for the finish flooring.

Subsurface water - Water below ground that is caused by heavy rainfall.

System - Describes a combination of materials and components that perform a particular function such as an air barrier system or moisture barrier system.

T

T & G - Tongued and grooved.

Thermal-break window - Window with a metal frame that has the interior and exterior separated by a material with a higher R-value.

Through-wall Flashing (A.K.A. Cross-Cavity Flashing) - Refers to a water proof membrane or

metal flashing placed under segmented pre-cast concrete, stone masonry, or brick units known as copings close to the tops of masonry walls to prevent water from entering the wall at joints in the coping. Through-wall flashing is also used to prevent capillary water transfer of moisture through porous materials such as concrete or masonry if they extend from high moisture locations such as below grade.

Top plate - Piece of lumber laid horizontally on top of the studs to tie them together and form a base for the framing above which may be a floor or a roof.

Torch On Roof, Single Ply, or Modified Bitumen - A newer roofing material mostly used on flat roofs. This material usually comes in rolls and is applied to the roof with an open flame or 'torch'.

Treated Lumber - A wood product which has been impregnated with chemicals to reduce damage from wood rot or insects. Often used for the portions of a structure which is likely to be in ongoing contact with soil and water. Wood may also be treated with fire retardant.

Trim - (1) Finish materials, such as moldings, applied around openings (window trim, door trim). (2) Unmolded strips of wood used alone or in combination with molding.

Trimmers - The double framing members at the sides of an opening.

U

Ultraviolet light (UV) - Invisible rays at the extreme violet end of the sun's light spectrum, which causes color fading and deterioration of certain materials, such as plastics. Most pond liners have chemical additives to inhibit the effects of UV rays.

Underlayment - (1) Any material installed over the subfloor to provide a smooth surface over which floor covering will be installed or (2) used in waterproofing in the roofing application.

V

Vapour barrier - Sheet material used to prevent water vapor from passing through a building surface.

Vent pipe - A pipe that allows gas to escape from plumbing systems.

W

Wall sheathing - Sheets of plywood, gypsum board, or other material nailed to the outside face of studs as a base for exterior siding.

Warranty - In Construction there are two general types of warranties. One is provided by the manufacturer of the product such as roofing material or an appliance. The second is warranty

for the labor. For example, a roofing contract may include a 30 year material warranty and a 5 year labour warranty.

Water stain - A colored dye that is soluble in water.

Weather stripping - Metal, wood, plastic, or other strips installed around door and window openings to prevent air infiltration.

Weep holes - Through-wall drainage holes used to prevent water from backing up behind retaining walls and brick veneers on framed houses.

Wood preservative - A clear or semitransparent coating used on wood to show the grain.