



Aug 11, 1998  
File: 598-026B

The Chairperson  
Strata Plan VIS 2720  
Suite 417-545 Manchester Road  
Victoria, B.C.  
V8P 5H6

Attention: Roger Taylor

Dear Sir:

**RE: Hampton and Churchill Courts  
Waterproofing Membrane Review**

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## INTRODUCTION

Levelton was retained by Strata Council to investigate water ingress problems, pertaining to the leaks from the waterproofing membrane of the parking garage roof, at Hampton and Churchill Courts. Our scope of work was outlined to be as follows:

- ▶ review available drawings
- ▶ review a previous report done by Thornly Consulting Group
- ▶ conduct our own independent site assessment
- ▶ outline any deficiencies found
- ▶ suggest methods for repair including recommended products
- ▶ prepare a preliminary estimate for the repairs

The following report is based on the aforementioned scope of work.

**Levelton Engineering Ltd.**

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*Construction Materials*  
*Building Science*  
*Geotechnical*  
*Metallurgy and Corrosion*  
*Environmental*  
*Analytical Chemistry*  
*Physical Testing*

## **1. BACKGROUND INFORMATION**

### **1.1 Buildings**

The complex consists of two condominiums, completed in 1993, built over a one level underground parking garage. The garage roof extends out past the footprint of the buildings excluding the southeast half of Churchill Court, where there is no underground parking. The garage roof slopes gently down from the north. Most of the garage roof is landscaped with soil or concrete pavement; shrubs and flowers are planted around the perimeter of the buildings encompassing the grassed areas. Both main entrances are landscaped with paving stones. (vehicle driveways and footpaths).

### **1.2 Thornley report**

In reviewing the report done by Thornley Consulting Group Inc. we generally concur with their assessment of the waterproofing failures causing the water ingress problems. The recommendations for remediation, however, seem to be of temporary nature ("poor man's" repair approach) that may, in our opinion, lead to further problems in the future. Our recommendations for repair are included in the following discussion.

## **2. EXISTING CONDITIONS**

### **2.1 Parking Garage**

A visual inspection of the underground parking garage roof and soffit was conducted to help determine possible areas of water ingress. Several areas, particularly near patio drains, were noted to have cracks in the roof slab that show efflorescence indicating water ingress problems. The patio drains were also noted to show signs of leakage around the area of slab penetration. In the underground locker room an area on the ceiling around the irrigation system water and electrical supply lines showed indications of leakage at the slab penetration seal. In one location in the southwest corner of the locker room at a foundation wall corner, there is a cold joint that has been patched with what appears to be

an epoxy grout. This repaired joint shows signs of leakage radiating from the top corner. The locker room appears to be in the most concentrated area of leakage and a musty odour is very prominent.

Water leakage through cracks in the parking garage roof slab can be detrimental to the structural reinforcing steel, however, we did not see any evidence of rust staining at actively leaking crack locations. Water passing through the slab does carry lime deposits which can result in damage to paint finishes on automobiles within the garage area. Continual water leakage at cracks, if left indefinitely, will eventually result in more substantial repairs being required due to rusting of the reinforcing steel and deterioration of the slab.

## 2.2 Waterproofing Membrane

In order to confirm the as-built installation of the waterproofing membrane, a visual review and several small excavations around the perimeter of both buildings were done. The visual review revealed many areas where the membrane was unbonded to the buildings exterior concrete walls. The protection board, what appears to be a 90 lb roofing felt with a sanded finish, is missing in some areas at the wall upstand and, where present, is in poor condition. At one area excavated, the membrane appeared to be well adhered to the concrete roof slab but the protection board poorly installed with small pieces layered on top of one another. This may not be representative of the entire roof but did indicate poor installation practices. In all the areas excavated the membrane did appear to be well bonded on the horizontal roof slab. At the perimeter walls the roots of some plants are embedding themselves into the membrane surface and in areas of debonding, are finding their way behind the membrane, with the potential to render the seal ineffective.

In discussions with the membrane manufacturer, W.R. Grace Inc., it was determined that the existing waterproofing membrane material was a Grace 5000 series Bituthene, as previously identified in the Thornley Consulting Group report. Although this material is not designed specifically for this application, it appears to be well applied on the horizontal roof slab area and should maintain an adequate waterproof seal, if not disturbed. The

recommended surface protection for Grace 5000 Bituthene is a hot asphalt concrete overlay, not the 90 lb. felt installed. The roof appears to be additionally covered all over with a layer of drain rock, a filter cloth and a layer of sand. This is all buried with landscaping to a varying depth of between four and thirty two inches.

### **3. PRELIMINARY INVESTIGATION**

#### **3.1 Roof Slab**

In the area that the irrigation line and electrical conduit penetrate the roof slab, on the north side of Churchill Court near Suite 107, we excavated at three locations around the inside of the approximate 10 ft x 10 ft area. This is also where the garage roof ends and the foundation wall shows signs of leakage in the locker room. We discovered that a storm sewer drain sump was not installed as indicated on the drawings but in its place a surface drainage system, with a perforated 3 inch pipe has been installed. Upon excavating we discovered that in one area no drainage rock was used around the pipe. The other two areas had drainage rock with filter cloth installed over the assembly. In the area with no drainage rock, clayey soil is packed around the pipe with no protection against infiltration of fines into the pipe.

#### **3.2 Foundation Walls**

In the same area excavated as above, the garage roof ends above the foundation wall area that showed leakage in the locker room. We exposed the edge of the slab at the foundation wall and it showed the membrane to extend down the foundation wall a distance of 12 inches where a liquid membrane seal has been applied to seal the edge. The foundation wall appeared to have a brush applied dampproofing on the surface, extending from under the waterproofing membrane downwards.

### 3.3 Patios

At the patio for Unit #101 in Hampton Court, we tested the drain for leakage by flowing water directly into the drain opening. No leakage occurred during a 15 minute test. We then covered the drain opening and flooded the patio with a 1 inch layer of water. Within several minutes, water appeared in cracks of the garage roof directly under the patio. At this patio the exterior waterproofing goes around the patio walls and does not extend under the patio floor. At two patios checked at Churchill Court, however, the waterproofing membrane appears to be applied to the building exterior walls, around the interior of the patios, covering the garage roof slab with the patio floor and walls poured on top. We did not flood these two as obvious voids around the additional drains from the 4th floor balconies would drain water to the slab area underneath. In all patios examined the drain openings, excluding the additional 4th floor drains, appeared to be installed satisfactorily with proper slopes to drain.

## 4. DISCUSSIONS AND RECOMMENDATIONS

### 4.1 Waterproofing Membrane

Around the exteriors of both buildings, on the vertical walls, the waterproofing membrane seal has been compromised due mostly to prolonged exposure to sunlight, but with poor application and improper material selection adding to the problem. As an effective repair the perimeter of the buildings should be exposed to allow the application of a new waterproofing membrane, joined at the roof slab level and extending up the wall to a newly installed saw cut reglet in the concrete. A metal flashing would protect the top edge from damage while an insulated protection board, installed on the vertical walls, would protect the portion of the membrane above the ground level exposed to the sun's ultraviolet rays.

#### 4.2 Patios

At all the patios examined, the drain openings appeared to be very well installed, with grates in place, cast directly into the concrete surface. The patio flooded had no additional 4th floor balcony drain and as the drain opening was sealed the water had to have leaked onto the roof slab, as evidenced at the cracks below, from around the edges of the poured concrete floor. When we examined the application of the waterproof membrane it appeared to differ between buildings. At Hampton Court, the patio examined showed it was applied around the patio exterior walls. At Churchill Court, however, the waterproofing membrane appears to be applied to the building exterior walls inside the patios, and over the garage roof slab with the patio floor and walls poured on top. An effective seal could be accomplished by reapplying the membrane around the patio exterior walls extending down to the garage roof and then applying an appropriate liquid membrane waterproofing to the patio floors, sealing the edges. This liquid membrane would need some maintenance but would eliminate the need to remove the patio floors and walls.

#### 4.3 Landscaping

On the north sides of Churchill and Hampton courts an area of the landscaping adjacent to the building should be removed and replaced with a drainage trench filled with a layer of sloped concrete and drainage rock to ensure proper drainage away from the building and help provide the required eight inch separation from the top of landscaping to the bottom of the wall. This will also help alleviate the splashing of soil onto the exterior finish. To maintain a clean, trouble free drainage trench, and maintain the pleasing aesthetics of the building grounds, a curb wall could be installed a minimum of two feet from the building to hold back the landscaping. The existing perimeter drain system would be reinstalled at the bottom of the sloped concrete just beyond the curb wall. This wall could be installed before membrane repairs begin and the shrubs, flowers and sprinklers moved behind it, allowing us to save most of the plants and provide easy access for the membrane replacement at the wall upstand.

#### 4.4 Foundation Walls

The only area that appears to show leakage problems on the foundation wall is the patched area as mentioned in the locker room. This is most likely an isolated perforation in the membrane or a poorly applied section of dampproofing in this one small area. At the time of excavation for membrane repairs this spot should be exposed and the required repairs done.

### 5. CONCLUSIONS

#### 5.1 Waterproofing Membrane

As the water ingress problems appear to be directly related to the failure of the waterproof membrane at the building exterior upturns we recommend that the exterior membrane repairs be done as described.

#### 5.2 Patios

The waterproofing of the patio floors is an option as minimal leakage will occur due to the roof protection above them. Therefore, as a minimum it is recommended that the edges of the floors be sealed and the voids around the additional 4th floor drains in the patio floors be grouted in properly.

#### 5.3 Landscaping

The proposed curb walls and drainage trench will allow for lower membrane repair costs in these areas and provide additional means for drainage while maintaining the complex grounds aesthetics. It will also help reduce the splashing of soil onto the buildings exterior.



## 6. COSTS

For the purpose of this preliminary report, we have estimated budgets for the repairs described above. A more accurate estimate may be provided after the contract specifications are prepared.

### 6.1 Waterproofing Membrane

Costs to supply and install the new membrane and flashing reglet are estimated at:  
\$45,000.00

### 6.2 Patios

Costs to supply and install a liquid membrane cover and seal openings are estimated at:  
\$3,000.00

### 6.3 Landscaping

Costs to install the curb wall with drainage system, drain rock trench and move existing landscaping and sprinklers are estimated at:  
\$30,000.00

(Note: Strata Council will be responsible for getting into contractual arrangement with the prospective contractors and paying the contracted sum, (and change orders, if any), directly to the contractor.

### 6.3 Levelton Engineering Ltd.

Preparing Specifications .....	\$1000.00
Tendering Contract .....	\$300.00
Project Management / Inspections @ 15% of contract value.....	\$11,700.00

Total estimated fees (excluding GST) for Levelton's services:  
\$13,000.00





We can begin preparing specifications for the repairs as soon as we receive written confirmation from council to proceed.

We trust Levelton has addressed the problems of your concern on the underground waterproofing for Hampton and Churchill Courts in this report. Levelton will be available to discuss the enclosed information at your convenience, either at our office or at the Council meeting.

Sincerely,

**Levelton Engineering**

A handwritten signature in black ink, appearing to read "Randy Knight", with a long horizontal line extending to the right.

Randy Knight  
Building Scientist

Reviewed by: Anil Bates M.Eng., P.Eng.