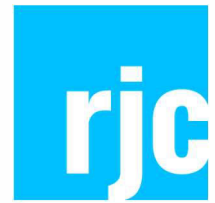


May 12, 2023



Engineers

Michelle Blattner
Resort Municipality of Whistler
4325 Blackcomb Way
Whistler, BC V8E 0X5
mblattner@whistler.ca

Dear Michelle Blattner,

**RE: Roof Condition Assessment Report
Whistler Waste Water Treatment Plant – Primary Building
1135 Cheakamus Lake Road, Whistler, BC**

RJC No. VAN.130859.0002

1.0 Introduction

As requested, Read Jones Christoffersen Ltd. (RJC) has conducted a roof condition assessment of the Primary Building at the Whistler Wastewater Treatment Plant (WWTP) located at 1135 Cheakamus Lake Road, Whistler, BC. RJC met with Michelle Blattner and Ty MacFayden from the Resort Municipality of Whistler (RMOW) on April 18, 2023 to conduct the assessment. Skyler Doornberg and Damien Grayda from RJC were in attendance.

The purpose of this report is to outline the existing roofing systems, their current condition, identify observed defects, provide specific recommendations for replacement or maintenance, and describe the recommended scope of work, as well as an Opinion of Probable Cost (OPC) to conduct the recommended work. A photo appendix has been prepared and is located in Appendix A.

1.1 Scope of Work

A brief description of the work undertaken by RJC is outlined below:

- .1 Reviewed existing drawings to gain an understanding of the design intent and existing structure. The following drawings were reviewed:
 - .1 Stage II A Expansion - Architectural Drawings dated April 1991, prepared by Dayton & Knight Ltd.
 - .2 Stage III Expansion – Architectural Drawings dated April 1996, prepared Dayton & Knight Ltd.

- .2 Attended the site on April 18, 2023 to conduct a visual review of the roof areas.
- .3 Reviewed known problem areas on the roofs as indicated by the building manager and/or other persons familiar with the building.
- .4 Prepared a written report including observations, conclusions, recommendations, Opinions of Probable Costs, and photo appendices.
- .5 Engaged and coordinated a Professional Quantity Surveyor to provide an AACE Class 3 estimate which is incorporated into the Opinions of Probable Costs.

1.3 Site and Building Description

Originally constructed in 1976, the Primary Building at the Whistler Waste Water Treatment Plant is a two storey concrete structure with a prefinished corrugated steel cladding system on the second floor. The building houses four primary sedimentation tanks and various waste water processing areas. Since construction, several expansions have been completed at the Primary Building. Areas outlined in Figure 1 represent roof areas over occupied space and is approximately 6000 sq. ft.

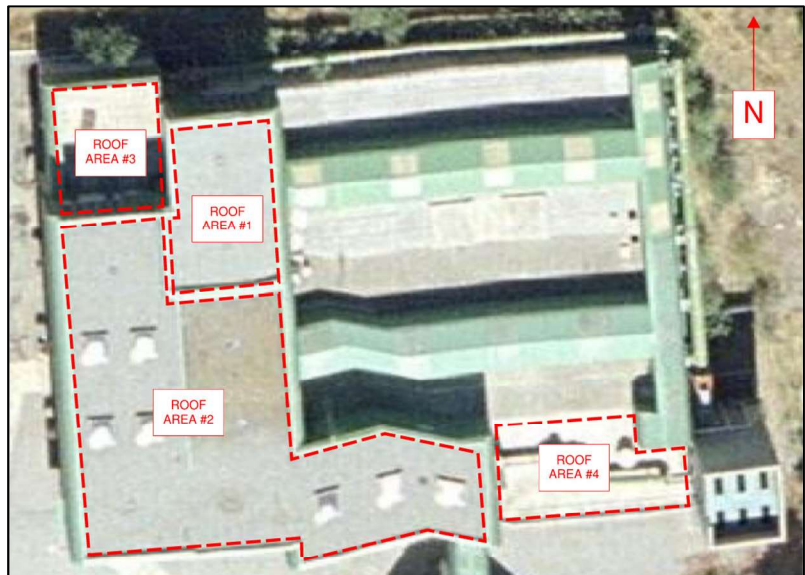


Figure 1 – Primary Building at the Whistler Waste Water Treatment Plant.
Image courtesy of Google.

There are four types of roof assemblies installed at the building. They consist of a conventionally insulated modified bitumen membrane assembly (Roof Area #1), a conventionally insulated, ballasted, modified bitumen membrane assembly (Roof Area #2), an inverted, concrete topped, modified bitumen membrane assembly (Roof Area #3), and an insulated, concrete topped assembly (Roof Area #4). The remainder of building's footprint are constructed from precast concrete hollow-core slabs and walkways covered by corrugated panels.



2.0 Observations and Comments

Our review of the roof systems included a visual review from the interior and exterior of the roof areas. The client indicated many areas that were experiencing leaks throughout the building. While reviewing the roof, we observed the following four roofing assemblies:

Roof Area #1:

Exterior

- 2-Ply SBS Modified Bitumen Membrane
- 4" Rigid Insulation with slope package*
- Vapour Barrier*
- Concrete Deck

Interior

Roof Area #2:

Exterior

- Roof Ballast
- Filter Fabric
- 2-Ply SBS Modified Bitumen Membrane
- 4" Rigid Insulation*
- Vapour Barrier*
- Concrete Deck*

Interior

Roof Area #3:

Exterior

- Concrete Pavers
- 6 mil. Slip Sheet*
- 3" Rigid Insulation*
- 2-Ply SBS Modified Bitumen Membrane
- Concrete Deck*

Interior



Roof Area #4

Exterior

- Concrete Topping
- 4" Rigid Insulation*
- 2-Ply SBS Modified Bitumen Membrane*
- Concrete Deck*

Interior

Note: Items with "" were not observed during the visual review but are based on the Stage III Expansion – Architectural Drawings dated April 1996, prepared Dayton & Knight Ltd.

OBSERVATIONS:

The following is a summary of the photo Appendix A.

- Observed gutters installed at the interior of the building at several locations between room 117 and the thickener room on the 1st floor of the building.
- Staining was observed on CMU wall's directly above interior gutters.
- The Owner has constructed a plywood structure with roof membrane at the underside of the concrete deck on the interior of the thickener room. This area of the building is actively leaking.
- Observed staining and evidence of water ingress at several exterior doors on the 2nd floor.
- Observed precast concrete hollow-core slabs above primary sedimentation tank #1 with concrete patch material between several joints. No waterproofing system was observed. Organic growth was observed along base of wall upturn.
- The following observations were made at Roof Area #4:
 - An existing waterproofing field membrane could not be visually observed and we did not observe any waterproofing tie-ins around the concrete perimeter.
 - Observed floor drains installed that are not intended for roof areas.
 - Observed evidence of ponding water around drains.
 - Observed a sealant joint between concrete curb and adjacent hollow-core slabs.
 - Observed wet concrete and localized organic growth around perimeter of roof area.
 - These perimeter issues were observed to be located above gutter systems in the interior space below.



- Observed access walkways constructed from precast concrete hollow-core slabs.
 - No waterproofing system was observed.
 - Localized organic growth was observed throughout area.
 - Holes for lift anchors were observed in the slab panels.
- Corrosion and staining was observed at a ceiling penetration in the 2nd floor Primary Headworks Area.
- Isolated area of organic growth was observed at roof area #1.
- Observed a missing metal flashing and failed membrane stripping at a parapet on the south-west corner of roof area #2. Large holes in the stripping were observed at the top of the parapet.
- Observed tenting of the cap sheet membrane stripping at several locations along parapets of roof area #2.
 - After cutting into the membrane, water began to spill out of the membrane.
- Seven (7) skylights were observed throughout roof area #2. They appeared to be in fair condition and no evidence of leaks were observed from the interior.
- Observed localized organic growth throughout roof area #3.
- Observed modified bitumen membrane fastened with termination bar to the concrete substrate at roof area #3.
- Observed sealant at pipe penetration membrane detailing at roof area #3.
- Observed spray foam insulation applied around pipe penetration to wall interface at roof area #3. It appears this may have been installed due to leaks at the wall as the green cladding appears to have been cut to access the area.
- Client indicated that 2nd floor compressor room gets washed down frequently.
- Client indicated they are experiencing leaks within the 1st floor electrical room below the compressor room.



3.0 Conclusions and Recommendations

Roof Area #2 has failed in many locations along the parapets on the south end of the roof area and is actively leaking. As such, we recommend the Owner engage a Roofing Contractor to provide repairs to the failed membrane at the parapets surrounding Roof Area #2. Due to the systemic issue observed at Roof Area #2, we recommend the Owner budget for replacement within the next year. The work would involve removing the existing roof down to the structural deck, and installing a new, high performance 2-Ply SBS Modified Bitumen Roof Assembly with new metal flashings, sealants, and skylights (if desired). The expected service life for this type of roof assembly would be 25-30 years. An OPC for this work has been provided in Section 4.0.

Roof Area #1 appears to have been replaced since the original expansion in circa 2009 and is in good condition with no indications of leaks. The expected service life of a well-maintained 2-Ply modified bitumen roof assembly is 25-30 years. Roof Area #1 has an estimated remaining service life of 11-16 years. We recommend the Owner continue to maintain the roof. If desired by the Owner, Roof Area #1 can be replaced at the same time as Roof Area #2 in order to capitalize on better economies of scale, and one contractor's mobilization cost. As such, the OPC provided for budgetary purposes in Section 4.0 below includes an allowance for this roof area.

Based on the photos received from the RMOW, Roof Area #3 appears to be in fair condition while experiencing age related defects and excessive organic growth. We do not know the roof's actual age but we do not believe it is original to the building's 1976 construction. Although we were not made aware of issues beneath the roof area, we recommend the client considers replacement this roof area at the same time as Roof Area #2. Similar to the reasons provided above, we recommend this approach due to their proximity to each other, and better economies of scale for a single contractor's mobilization and access cost. We recommend installing a new, protected 2-Ply SBS Modified Bitumen Membrane Assembly. The expected service life of this type of roof is 30-40 years. An OPC for this work has been included in Section 4.0.

Roof Area #4 is in poor condition and is actively leaking into occupied space. Although we were not able to visually confirm the presence of a waterproofing membrane under the concrete topping, we did not observe evidence of water ingress within the field (centre) of the concrete deck's soffit; however, we did not observe roofing tie-ins at the perimeter of the roof area (base of wall, parapet, etc.). Consequently, several leaks within the interior space below are situated directly beneath areas of visibly wet concrete along the perimeter of this roof area. As such we recommend replacing the roof with a new 2-Ply SBS modified bitumen assembly with proper tie-ins to the perimeter of the roof area. Similar to Roof Area #2, we recommend conducting this work within the next year. As such, the OPC provided in Section 4.0 includes an allowance for this roof area.



It is our opinion the leaks in the 1st floor electrical room are unrelated to the condition of the roof. Although we observed failed membrane on the upper roof, there is a low likelihood that water ingress from the roof would be able to travel past the 2nd floor and cause a noticeable leak in the 1st floor. Considering its direct proximity to the compressor room, it is our opinion that these leaks are caused by water travelling down interior walls when the compressor room is washed. We did not observe a membrane applied to the compressor room floor. While this is outside the scope of our review, we recommend installing a urethane coating to the compressor room floor.



4.0 Disclaimers

This report documents the current condition of the assemblies described above, and has been prepared in accordance with generally accepted engineering practices. No warranties, either expressed or implied, are made as to the professional services provided under the terms of our scope of work and included in this report.

A structural design review was not conducted as it was beyond RJC's scope of work. Review of seismic aspects, mechanical, electrical, and fire safety systems, means of egress, and identification of mould-like substances were also beyond RJC's scope of work.

Neither RJC, nor any company with which it is affiliated, nor any of their respective directors, employees, agents, servants or representatives shall in any way be liable for any claim, whether in contract or in tort including negligence, arising out of or relating in any way to mould, mildew or other fungus, including the actual, alleged or threatened existence, effects, ingestion, inhalation, abatement, testing, monitoring, remediation, enclosure, decontamination, repair, or removal, or the actual or alleged failure to detect mould, mildew or other fungus.

5.0 Closing

This Report was prepared for the Resort Municipality of Whistler. It is not for the use or benefit of, nor may it be relied upon, by any other person or entity, without written permission of RJC.

We trust the information contained within this report satisfies your current requirements. Should you have any comments, questions or concerns, please contact the undersigned.

Yours truly,

READ JONES CHRISTOFFERSEN LTD.

EGBC Permit to Practice No. 1002503 *Reviewed by:*

A handwritten signature in green ink, appearing to read 'D Grayda'.

Damien Grayda, BEng, EIT
Design Engineer



Skyler Doornberg, BAsC, P.Eng., RRO
Project Engineer

DMG/jpy

Encl. Appendix A – Site Photographs
Appendix B – AACE Class 3 Cost Estimate



Engineers

APPENDIX A

SITE PHOTOGRAPHS

TABLE A1 – ROOF OBSERVATIONS

Observed gutters installed at the interior of the building at several locations between room 117 and the thickener room on the 1st floor of the building.

Staining was observed on CMU wall's directly above gutters.

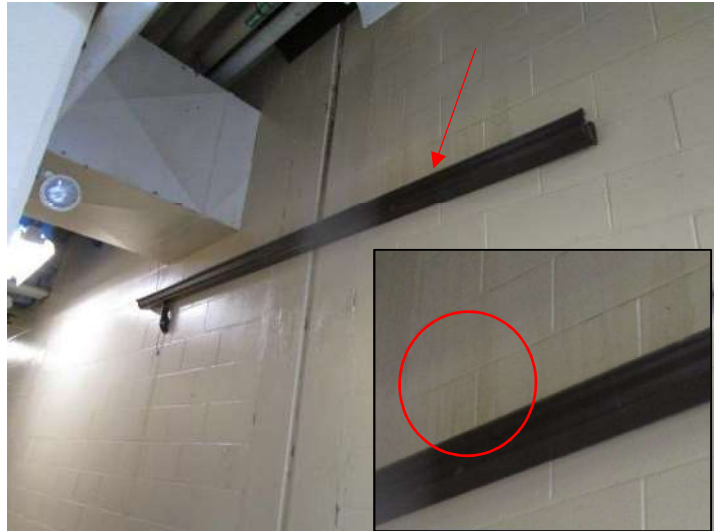


Photo 1

The Owner has constructed a plywood structure with roof membrane at the underside of the concrete deck on the interior of the thickener room. This area of the building is actively leaking.



Photo 2

TABLE A1 – ROOF OBSERVATIONS

Observed staining and evidence of water ingress at several exterior doors on the 2nd floor of the building.



Photo 3

Overview of the 2nd floor exterior walkway above Primary Sedimentation Tank #1. Observed precast concrete hollow-core slabs with concrete patch material between the joints. See Photo 5 for base of wall conditions.



Photo 4

TABLE A1 – ROOF OBSERVATIONS

Base of wall beneath corrugated steel cladding system. No waterproofing system was observed. Organic growth was observed along upturn.



Photo 5

Overview of Roof Area #4. Observed concrete topping. This area is above occupied space and the existing waterproofing membrane could not be visually confirmed. No tie-ins were observed at the base of the wall, at the parapet, or at the curb connecting to the hollow core panels above Primary Sedimentation Tank #1.



Photo 6

TABLE A1 – ROOF OBSERVATIONS

Observed floor drains installed that are not intended for roof areas. Observed ponding water around drains at roof area #4.



Photo 7

Observed a sealant joint between concrete curb and adjacent hollow-core slabs. Observed wet concrete and localized organic growth around perimeter of roof area. These areas are located above gutter systems in the interior space below. See Photo 9.

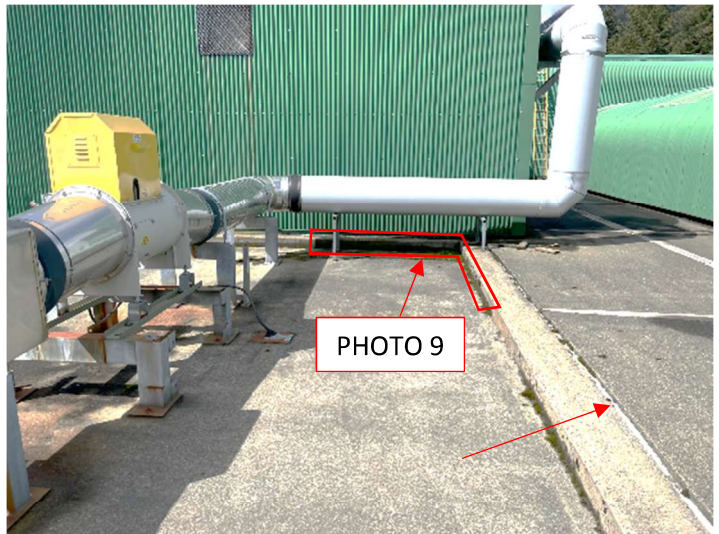


Photo 8

TABLE A1 – ROOF OBSERVATIONS

Corresponding gutter and plywood structure located beneath area shown in Photo 8.



Photo 9

Overview of access walkway above Primary Sedimentation Tank #2 and #3. Observed precast concrete hollow-core slabs with no waterproofing installed over top.



Photo 10

TABLE A1 – ROOF OBSERVATIONS

Localized organic growth was observed throughout hollow core slab area. Holes for lift anchors were observed in the slab panels.



Photo 11

Overview of access walkway above Primary Sedimentation Tank #4. Observed precast concrete hollow-core slabs with no waterproofing installed over top. Localized organic growth was observed throughout the area.



Photo 12

TABLE A1 – ROOF OBSERVATIONS

Corrosion and staining was observed at a roof drain pipe penetration



Photo 13

Overview of roof area #1.



Photo 14

TABLE A1 – ROOF OBSERVATIONS

Isolated area of organic growth was observed at roof area #1.



Photo 15

Overview of Roof Area #2.



Photo 16

TABLE A1 – ROOF OBSERVATIONS

Observed a missing metal flashing and failed membrane stripping at a parapet on the south-west corner of roof area #2. Large holes in the stripping were observed at the top of the parapet



Photo 17

Observed tenting of the cap sheet membrane stripping at several locations along parapets of roof area #2. A small cut was made at the arrow. See Photo 19.



Photo 18

TABLE A1 – ROOF OBSERVATIONS

After cutting into the membrane observed in Photo 18, water began to spill out of the membrane.



Photo 19

Seven (7) skylights were observed throughout roof area #2. They appeared to be in fair condition and no evidence of leaks were observed from the interior.



Photo 20

TABLE A1 – ROOF OBERVATIONS

Overview of roof area #3.
Photos of this area provided by RMOW.



Photo 21

Observed localized organic growth throughout roof area #3.



Photo 22

TABLE A1 – ROOF OBSERVATIONS

Observed modified bitumen membrane fastened with termination bar to the concrete substrate at roof area #3.



Photo 23

Observed sealant at pipe penetration membrane detailing at roof area #3.



Photo 24

TABLE A1 – ROOF OBERVATIONS

Observed spray foam insulation applied around pipe penetration to wall interface at roof area #3. It appears this may have been installed due to leaks at the wall as the green cladding appears to have been cut to access the area.



Photo 25