



March 17, 2023

Rim Rock Village II Strata Council**RE: Rim Rock Village II Roof Replacement
Structural Verification – Revision 2****Attn: Lars Shearer**

Dear Mr. Shearer,

BASIS Engineering Ltd. (BASIS) has been engaged by the Strata Council for Rim Rock Village II to investigate the structural capacity of the existing roof systems as pertaining to options for reroofing the buildings, and to conduct a snow shedding analysis per RMOW requirements. We have conducted partial inspections of the typical roof support structural systems, performed calculations of loading and capacities for the existing roof system, and performed a snow shedding analysis. This letter provides our assessments and recommendations for the roof replacement design.

1 BACKGROUND

Rim Rock Village II is located on 2640 Whistler Road, Whistler. The 13-suite complex, comprising 6 duplex units (Unit Types A and B) and one single unit (Unit Type C), was constructed circa 1989. The timber structures are founded on a concrete foundation, with an existing roof system comprising 2x10 rafters with metal roofing. Most of the roof is sloped at 12:12, with some roof sections at 6:12. Originally the roofs appear to have had no snow retention, and snow was allowed to slide off. Over time, snow stops were added to the roof for safety and convenience. The BC Building Code, both now and at the time of design, allows for substantially lower design loads for steeply sloped “slippery” metal roofs. The snow retention and resulting higher snow loads may not have been intended by the original structural designer and may have increased the snow loads from anticipated. BASIS have therefore undertaken an analysis of the roof rafter system.

2 ASSESSMENT OF EXISTING ROOF STRUCTURE

During inspection of the roof framing members of Unit 3, a design Unit Type ‘B’, it was found that the rafters were spaced closer than specified on the original drawings. This included the main rafters being spaced at approximately 14” rather than 24”, and the side-panel rafters being spaced at 21” rather than 24”. Inspection of 2 other units indicated similar spacings, so it appears this was standardized for the all the units.

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Calculations are based on these measurements, as shown in Figure 1, and are assumed to apply to the entire complex's roof systems. This difference permits greater structural capacity than what could have been expected with the original design. The supporting walls are also adequate for the loads. Inspection will be required during construction to confirm the joist spacing, and additional strengthening may be required in some locations.

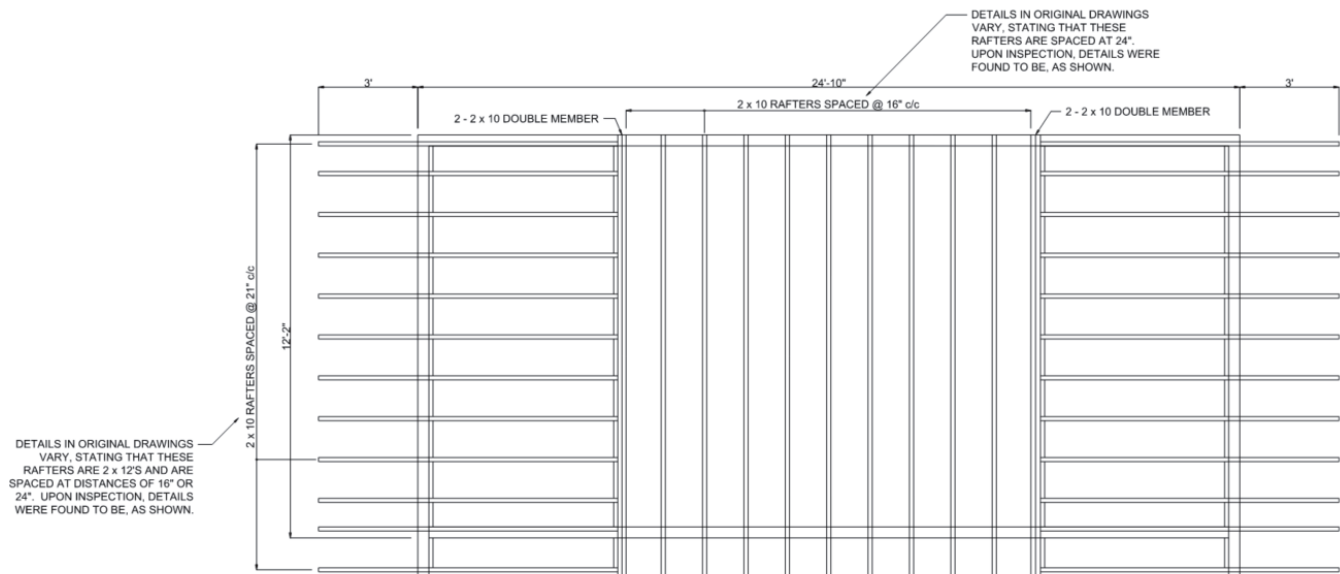


Figure 1 – Typical Roof Framing

We understand two roofing systems are under consideration:

1. Metal roofing with snow stops, similar to existing, with the metal attached directly to the strapping on top of the rafters
2. Asphalt shingles (duroid), with snow clips, attached to 5/8" plywood sheathing on the strapping and rafters

Both systems do not allow snow to slide and therefore are subject to higher snow loads. Calculations in accordance with BCBC 2018 indicate that the existing roof system has the structural capacity to support either of these roofing systems. The roof approaches its serviceable capacity based on the code's deflection limits, which has a serviceability limit of cracking drywall near the midspan of the rafters during large snow events. For the asphalt shingle system, the plywood sheathing will act compositely with the rafters, substantially reducing deflections. Therefore, the plywood sheathing and asphalt is a superior system from a structural standpoint.

We recommend that this roof replacement use asphalt shingles, with 5/8" plywood sheathing, on top of the existing 1x4 strapping and framing members. Snow clips are recommended as a snow retention system and over the full extent of the new roof to retain snow and prevent "snow shedding". The snow clip type,

spacing, and connections have been designed by the supplier, Snow Management Systems Ltd. Sheathing nailing requirements have been recommended and are included in the specifications in Appendix I.

3 SNOW SHED ANALYSIS

In Whistler during the winter there is always a risk of falling snow and icicles from building roofs that could cause injury or property damage. The intent of a snow shed analysis is to identify those risks, and to identify reasonable potential mitigation measures that can be taken to reduce them.

The existing Rim Rock roof has metal roofing, with snow stops that we understand were installed subsequent to the original roof construction to protect against snow sliding onto areas between adjacent buildings that could impact those buildings and their decks. The areas between buildings are accessible in most cases, but are not generally used in the winter. The snow stops have performed well and there are no reported significant problems with the performance of the existing snow retention system.

New asphalt shingle roofs with slopes of 12:12 and 6:12 may allow “snow shedding” into certain areas around each building. The primary mitigation system proposed is “snow clips”. This system creates effective friction preventing snow movement on the roof, thus retaining snow and dispersing its load over the full roof extent. Although the clips will not eliminate snow shedding altogether, they will prevent most shedding, and limit the trajectory of any snow shedding to near vertical. The clips can be expected to provide equivalent or better protection than the existing snow stop system.

Gables protect each entrance way. Snow shedding between the gable pairs on the fronts of the duplexes will fall onto landscaped areas and present a minimal hazard. The main roofs could shed snow into accessible areas between units and impact adjacent buildings and decks, as shown in Figure 2. Installation of snow clips over the entire roof will retain the snow on the roofs preventing most of this snow shedding, and limiting the velocity of the snow, and the trajectory to near vertical.

This system does not prevent snow shedding entirely, and during high snow periods the unit owners and strata should monitor the snow pack and where practical undertake local snow trimming of snow overhangs that could present a hazard.

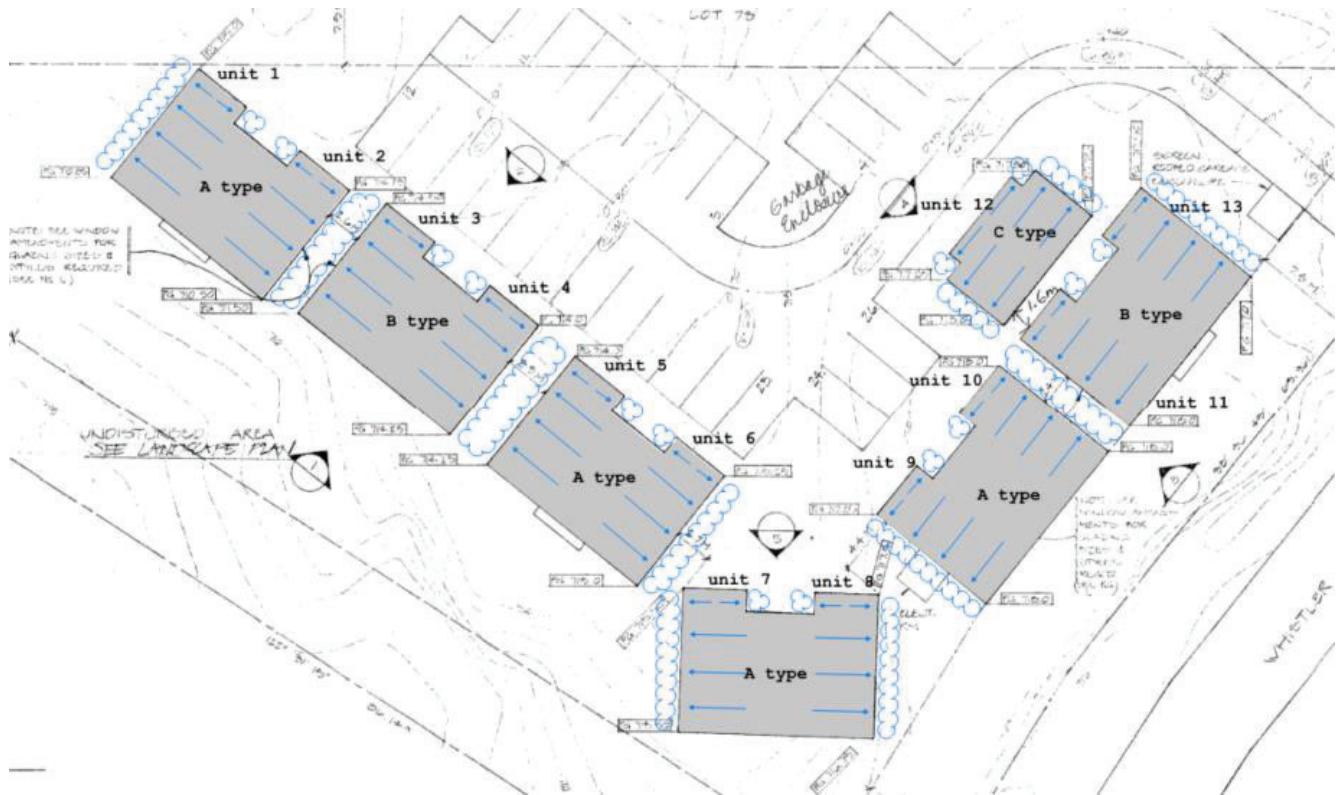


Figure 2 – Snow shedding hazard areas

4 CONCLUSIONS AND RECOMMENDATIONS

The existing roofing should be replaced with asphalt shingles on new 5/8” plywood sheathing, on top of the existing 1x4 strapping and framing members. Snow clips as designed by Snow Management Systems Ltd should be installed over the full extent of the new roof.

During the reroofing BASIS should inspect the roof rafter systems. BASIS should be given a minimum of 72 hours’ notice in advance of any stripping of the existing metal roof. Upon inspection of the framing members, BASIS will advise as to any local strengthening that is required.

This report is an instrument of service of BASIS Engineering Ltd. (BASIS). The report has been prepared for the exclusive use of Rim Rock Village II or the specific application to the structural aspects only of the 2023 reroofing project, and it may not be relied upon by any other party without BASIS's written consent. Refer to the attached addendum for additional information on the agreed specifications.

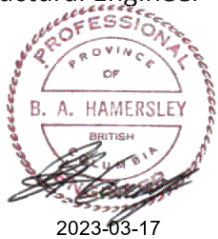
BASIS has prepared this report in a manner consistent with the level of care, skill and diligence ordinarily provided by members of the same profession for projects of a similar nature at the time and place the services were rendered. BASIS makes no warranty, express or implied.

Should you have any questions regarding the contents of this report, please call us.

BASIS Engineering Ltd.



Adam Nightingale, EIT
Structural Engineer



EGBC PTP#1000338

Bruce Hamersley, P.Eng.
President, Principal Engineer

APPENDIX I

GENERAL

Work Included:

Removal, disposal and replacement of all roof systems and their related flashings on all buildings at the above mentioned address as described in this specification.

Quality Assurance:

Workmanship Standards:

Conform to the latest BC Building Code, this specification, and manufacturer's installation instructions as applicable.

Continuance of work: When commenced work is to progress continuously, weather permitting, until complete. All work is to be completed before September 30 2023

Independent Inspection:

Perform using an independent inspection company acceptable to owner, namely Quality Auditing Institute

Inspection costs will be paid directly by the owner and are not included in this contract.

Site Requirements:

- Disposal containers are limited to Parking area in locations designated by Owners. Coordinate with and notify owners of all activity.
- Any roof top storage of material must be secure and designed not to damage the structure and secure from falling to ground areas.
- Any permits required for site access or parking are the responsibility of the roofing contractor.
- Disposal of materials from the roof is to be by proprietary chutes or mechanical lowering only.
- Portable sanitary restroom facilities are to be provided by the contractor for the workers on site
- Smoking of any substances or consumption of any alcohol or illegal drugs is not permitted on site.
- Daily clean up of all ground and parking areas is required.
- Provide notice to individual unit owners when their unit will be worked on.
- Copy of this specification is to be kept on site for reference.

Submittals:

Provide the owner and consultant with one set of any required Material Safety Data Sheets (MSDS) prior to commencement of work, for review and posting on job site.

Provide the owner and consultant with proof of material source, i.e. bill of lading from manufacturer or broker

Provide the Owner with evidence of current WorkSafe BC coverage and current minimum 5 million dollar liability insurance.

Provide the Owner with a CCDC 11 document with bid submission. A completed CCDC 2 document is required from the successful bidder

Product Delivery, Storage, and Handling:

Deliver and store shingle materials in original bundles with manufacturer's labels and seals intact.

Store all materials elevated from contact with ground and moisture, and protected from weather.

Store membrane rolls on end, one pallet high, and selvage edge up; do not store in a leaning position.

Where climatic conditions warrant, store asphalt shingles and/or membrane rolls in heated enclosures prior to use, as recommended by manufacturer; bring only enough material for immediate use to work area.

Avoid prolonged exposure of light and heat sensitive materials to sunlight.

Store combustible materials away from heat and open flame.

Guarantee/Warranty

Provide a workmanship Guarantee for ten years

Provide the manufacturer's standard material warrantee.

PRODUCTS

Roofing Materials:

Deck overlay: Plywood sheathing, construction grade minimum 5/8" thickness. Nails shall be 2 3/8" minimum length .113 galvanized Paslode framing nails or approved equivalent. Two nails shall be driven through the plywood and wood strapping at each strapping/joist intersection. If areas with plywood as the original deck material are found the new plywood and nails shall be installed over with nail pattern at the same frequency

Infill strapping: Nominal 1x4 #2 or better SPF lumber

Additional skylight curbs: 2"x 6" nominal #2 or better SPF lumber

Additional framing and blocking, if required by the consultant: #2 or better SPF lumber at dimensions specified (See separate price)

Asphalt Shingles: Malarkey Legacy Architectural Shingles; Certaineed Northgate Architectural Shingles, color to be chosen from manufacturer's available range by Owners

Full Underlayment: Self-adhered modified bitumen membrane; Malarkey 401 Arctic Seal, Soprema Lastobond Shield HT, FT Synthetics Platinum HTSA, or Titanium PSU 30.

Pipe flashings: lead flashings with lead settle caps or storm collars as applicable

Cement: Plastic cement to CGSB 37-GP-5Ma

Sheet Metal Flashings: minimum 0.56 mm (26 ga) factory coated galvanized steel, color chosen by Owner

Menzies Roof Gable flashing (2"); Eave Flashing (3"x 1½") with drip edges, Colour chosen by owners from standard range

New Attic vents: 24 gauge galvanized steel, fully soldered or welded seams, 12" minimum diameter at the outlet, 6" minimum flange on all sides, 36" tall cone flashing with wind deflector cap. 22 ga cross bracing.

Roofing nails: 14 gauge corrosion-resistant roofing nails ; hot-dipped galvanized steel or [See 'Separate Price'] stainless steel, Type 304 or 316 to CSA B 111-1974, length sufficient to penetrate 19 mm (3/4") into deck.

Low slope/cricket membrane: 2-ply SBS modified bitumen membrane 180g/m sq polyester reinforced, self adhered modified bitumen, top ply granulated. Prime all surfaces with manufacturer's recommended primer

EXECUTION

Preparation:

Remove all existing roof systems, metal flashings, and snow fences and dispose of same. Roof deck (spaced sheathing) is to be effectively cleaned and re-nailed as necessary prior the commencement of roofing.

Location of disposal bins and/or trucks is to be as permitted by the Owner. Any/all damage or debris build-up on the grounds or building are to be repaired and cleaned to the satisfaction of the Owner.

Ensure that the substrate is rigid, dry, smooth, compatible, free of fins and sharp edges, and clean of all debris and foreign matter.

Remove wood siding/stucco from walls at roof intersections to access metal flashings to a minimum of 6" above the new roof surface. Cut in an even straight line parallel to the roof surfaces (New trim lumber is required upon completion)

Install new skylight curbs if requested by owners (see Separate price). Curbs are to be made of 2"x 6" nominal lumber sized to fit skylight unit provided by Owner. Structural upgrade of roof deck to BCBC requirements to be included as needed. Interior framing and finish to be provided by owner

Ensure all openings, walls, and projections through the roof are firmly affixed.

Install any additional framing/blocking if required by the Structural EOR in a manner as directed. Provide separate price

Install 5/8" plywood sheathing to all areas fastened with nails through to all underlying trusses/joists at each strapping joist intersection using 2 specified Paslode nails. If plywood decking is found on roof areas the new plywood shall be installed over top of existing with fastening at the same maximum spacing. No plywood sheathing is to be installed in less than 24"x 48" in size. All edges are to be fully or intermittently supported by strapping. All adjacent runs of plywood are to be offset by a minimum of 16". Plywood spacing between sheets is to be 1/8" to 3/16"

Install infill strapping where spacing is more than 16" o/c and replace deteriorated/damaged pieces using minimum 4' lengths. (provide separate price per length installed)

All wood work is to conform to BC Building Code Part 9

Install specified Menzies rake edge and eave edge flashing to all perimeters as applicable. Overlap adjacent pieces a minimum of 2"

Full underlayment must consist of one ply of specified self adhered membrane . The membrane must be extended a minimum 5" up all adjacent walls with existing wall membrane overlapping. Membrane is to extend to the outside edge of all perimeter trim metal. Membrane is to be carried to the top of all

skylight curbs and dormer valley tops with all corners double wrapped. All flanged flashings are to have a top strip of membrane sealed to the field membrane

Valleys

Metal valley sheets shall be 610 mm (24") minimum width pre-finished steel, Colour chosen by owners. All edges of valley metal are to be stripped into the field underlayment with a minimum 6" strip of the same material. Overlap valley sheets a minimum of 6" with sealant between sheets.

Shingles extending into the valley shall be cut to the proper mitre. Manufacturer's instructions for trimming and sealants are to be followed

Valley shingle cut out is to be cut at a taper of 2% widening from top to bottom. Minimum total width at the top 4". Bottom of valleys is to extend to edge of the first course of shingles with the bottom edge hemmed.

Top of adjoining valleys is to be capped extending under shingles above and 12" down the valley.

Flashings

Vertical Upright Flashing must be installed at all vertical intersections.

Apron flashing shall extend a minimum 125 mm (5") up vertical surfaces, 100 mm (4") over the roof material and 100 mm (4") around the corners.

Step flashing shall extend a minimum 125 mm (5") up vertical surfaces above the finished roof surface, 100 mm (4") between courses of roofing and have a 75 mm (3") headlap. Step flashing shall extend a minimum 75 mm (3") beyond the down slope corners and be folded, but not cut.

Backpan flashing shall extend a minimum 150 mm (6") up vertical surfaces, 450 mm (18") up the slope and 100 mm (4") beyond the corners. Corners must be folded down, but not cut. If the upstand is more than 750 mm (30") wide, a crickets saddle is required. Apply sealant under corners and cut drip tabs.

Roof slope transitions are to be metal flashed. Metal flashing is to extend a minimum 12" under the upper shingles and extend a minimum 6" over the lower shingles. Underlayment is to be carried through under the assembly and a new course started overlapping the flashing.

Skylights are to have trim flashing under the edge that overlaps the base flashings a minimum of 3"

Adjacent walls are to have a metal trim flashing that extends under the existing siding and overlapping the base flashings to within 1 1/2" of the finished roof surface.

Metal vents or vent flashing shall have a minimum 100 mm (4") flange for the roof material on all sides and a minimum vertical sealed height of 75 mm (6") above the finished roof surface. All seams must be fully soldered or welded.

Plumbing vent flashings shall have a minimum 100 mm (4") flange on all sides. The flashing must allow for thermal movement of the vent pipe. Settle caps or storm collars to be installed as applicable. Acceptable plumbing vent flashings must be formed of lead and conform to CSA B272

New specified 36" tall cone attic vent flashings are to be installed 12" down from the high ridge on each unit at the centre of the ridge. Vents are to be installed in pairs on opposite sides of the ridge and cross braced together with 2" 90 degree bent 22 gauge galvanized steel.

Shingle installation

Each shingle shall be secured with 14 ga corrosion resistant roofing nails; hot-dipped zinc galvanized, or stainless steel, Type 304 or 316 (**See separate price**) placed in strict accordance with the manufacturer's instructions. Nails shall be of sufficient length to penetrate the completely through the sheathing. Nail heads shall be driven flush and tight but not so the nail head crushes or penetrates the shingle.

Power nailers utilizing hot-dipped galvanized (or stainless steel, see separate price) may be used provided they are maintained and adjusted properly to drive nails flush.

All crickets at chimneys and other low slope areas are to have a specified two ply SBS membrane installed and integrated with the asphalt shingles. Membrane is to be carried up a minimum 18" under shingles installed up slope and adhered to a minimum 6" strip of fastened, hemmed metal where overlapping shingles.

All work is to conform to CSA 123.51 and BC Building code when not defined by this specification

Wall Cladding

After new roof is installed replace removed trim and cut away siding with new trim lumber painted to match existing. New trim is to neatly abut siding and have a minimum 3/4" clearance above the new roof system.

Remove and replace any broken or deteriorated siding above roof surfaces with dimensional and color matched cedar siding. (Provide unit pricing per 8"length). Need for replacement to be verified by QAI Laboratories.

Snow Guards

Supply and install proprietary asphalt shingle style intermittent snow clips designed and provided by Snow Management Systems (Doug Andrew 250 851 5211) according to their specified layout and directions.

— END OF SECTION —