MONITORING OF VARIOUS NON-VENTED AND VENTED VAULTED ROOFING SYSTEMS IN A VANCOUVER HOME

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EXTENDED ABSTRACT

Current residential re-shingling projects are often completed through shingle removal and concurrent replacement with similar shingle products, without improvement in air tightness or insulation value. This is because the driving force of shingle replacement amongst homeowners is low cost. Adding further insulation or airtightness may add to the cost, as the activity may require roofing contractors to acquire additional permits, coordinate with additional sub-trades, and further extend the install time on most project sites.

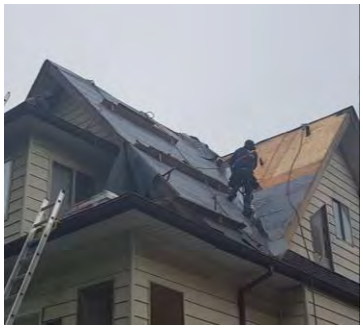

Figure 1: Sample Shingles only re - Roof Project Vancouver 2017

In receiving four quotations for roof re-shingling, not one roofing company suggested adding additional external or internal insulation, or improving the air barrier while shingling the single family home. The added insulation would involve additional contractors and possible design services, or delay the project delivery, resulting in the roofing contractor being higher priced than others.

This project will serve as a showcase of insulation methods to re-roof vaulted ceiling spaces in marine climates, with limited to no ventilation, in comparison to a ventilated roof on the same building. Moisture content and temperature sensors have been installed for analysis of the comparison between the various insulation and ventilation methods, and also for early detection of conditions that may lead to long-term mold and wood rot of the sheathing and roof trusses.

The objective was to re-shingle a Vancouver, BC home, while adding airtightness and insulation to the vaulted ceilings. The home is typical of other historical Vancouver neighbourhood homes, with the attic areas having been renovated to include a living space, with dormers added to increase the overall living space. The full height dormer roofs constructed in 2006 shown as (decks 4 & 5) shall remain a conventional control study vented cold attic roof with poly vapour retarder and fibreglass batt insulation.

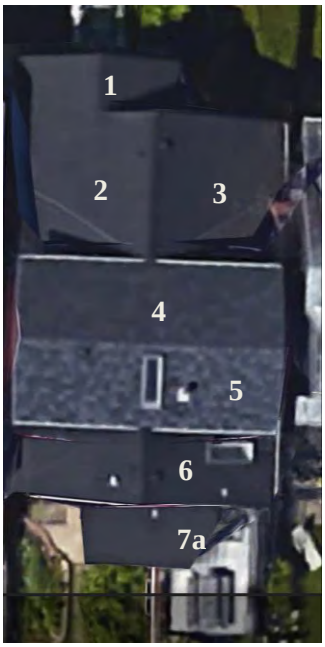

Figure 2: Existing Assemblies
Area 1, 2, 3 & 6: Unvented Vaulted Ceilings
Area 4 & 5 : 2006 Dormer Extension: Area 7:– Open to below – no insulation

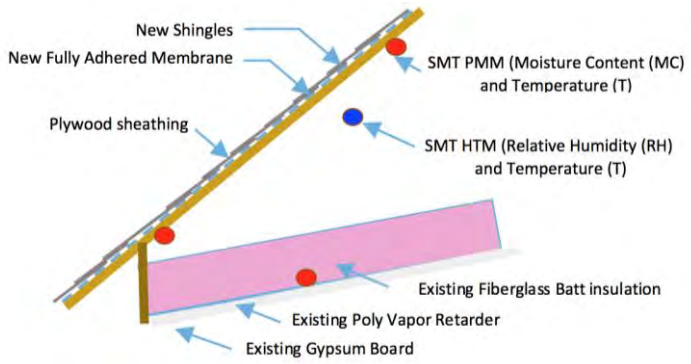

Figure 3: Roof Area 4 & 5 - Vented Dormer Extensions with cold attic space

In the late 1970s, the attic space was insulated to become living space. The existing vaulted ceiling roof decks is comprised of a non-intact poly vapour retarder, fibreglass batt insulation, and air leakage around the knee wall access door as well as along the wall to roof interfaces.

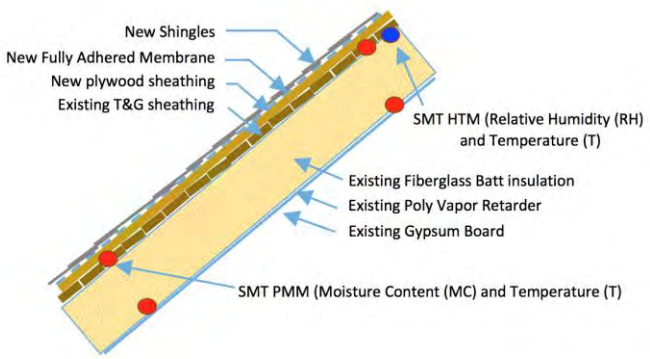

Figure 4: Existing vaulted ceiling assembly remains in Roof Areas 2 & 3

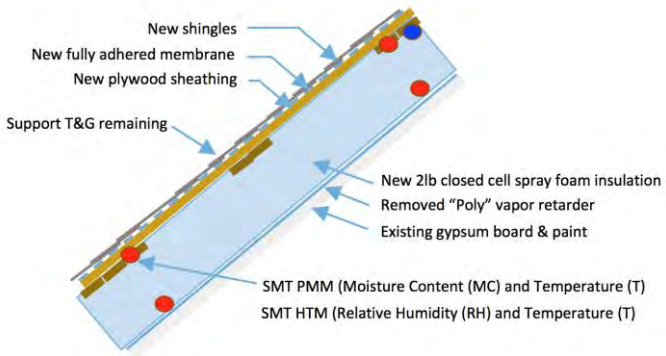

Figure 5: Closed Cell Spray Foam added from the exterior in Roof Area 6

The spray foam that was added to the truss space was applied only to roof deck 6. Installation of the closed cell spray foam occurred from the outside –without disruption to the occupants or the gypsum to the interior of the building.

The presentation at CCBST 2017 shall contain video content of this installation process.

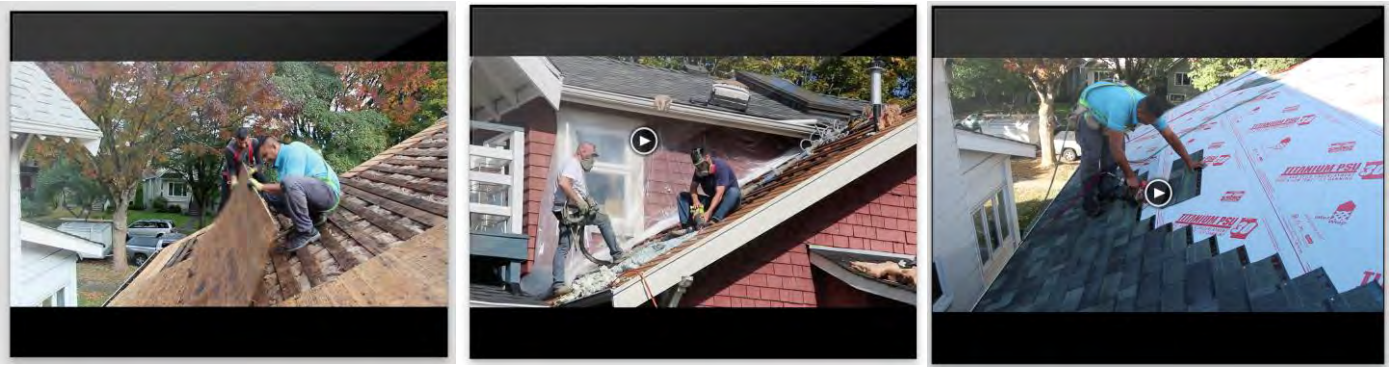

Figure 6: Screenshots of Installation Video

The installation consisted of three (3) types of shingle products for long-term evaluation with various insulation venting types below them, and the various strategies for algae mitigation and aging qualities. The three various architectural shingles provided by the same manufacturer were color matched to blend with each other.

Table 1: Shingle Type and Color Index for Figure 7 & 8

Shingle Brand / Color	Shingle Type	Cover Protection	Warranty
Malarkey Legacy XL	Flexor™ asphalt: polymer modified asphalt	Scotchgard™ Protector	15 year
Malarkey Vista AR	Nexgen™ asphalt: utilizes a blend of Flexor™ asphalt with post-consumer recycled polymers	Security against algae staining	12 year
Malarkey Highlander	Traditional asphalt	Security against algae staining	10 year

The various life span of the shingles will be evaluated yearly by photographic comparison and inspection. The shingles were installed in October 2016, and therefore this presentation will not cover these aging factors – looking for more of this continued research in the future.

Sensor placement was chosen to minimize the disruption to the re-roofing schedule, and also provide valuable data for the moisture and temperature profile of the various assemblies.

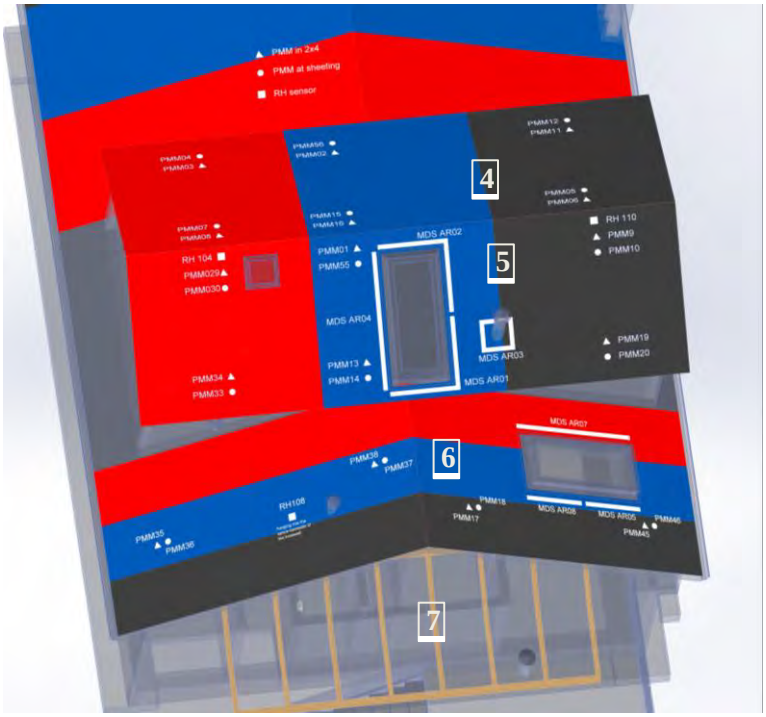

Figure 7: South perspective of roof with sensor location and shingle type

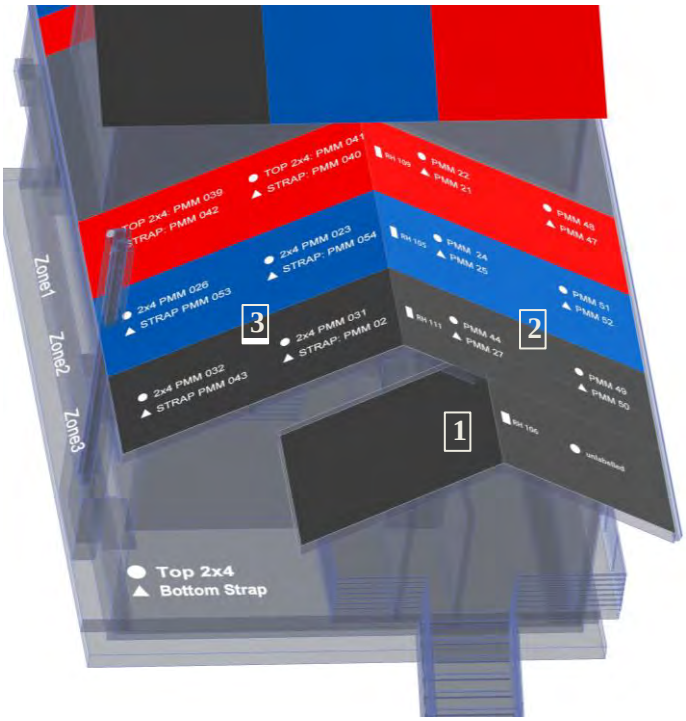

Figure 8: North perspective of roof with sensor locations and shingle type

Moisture Content Results

The moisture content measurements taken from the Point Moisture Monitoring sensor includes the un-insulated screws of the sheathing and truss below the insulation layer. All moisture content readings are in wood moisture % and temperature compensated.

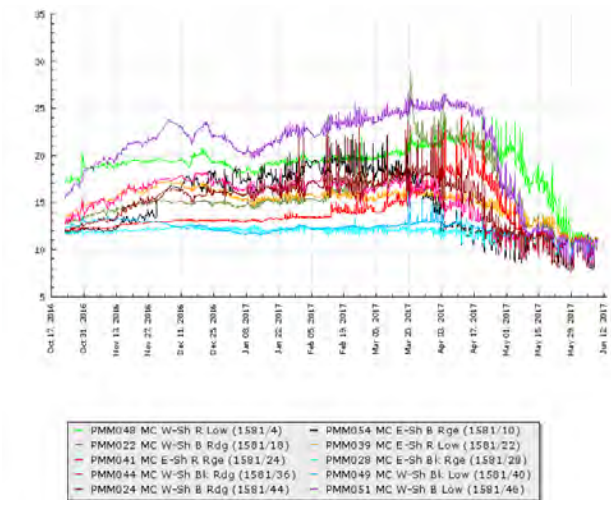

Figure 9: Moisture Content of existing roof areas 2 & 3 with no venting, limited air barrier

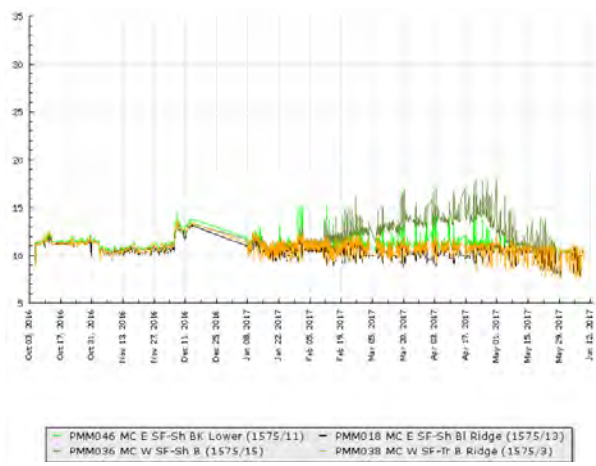

Figure 10: Moisture Content of sheathing roof area 6 with closed cell spray foam added to the assembly from above

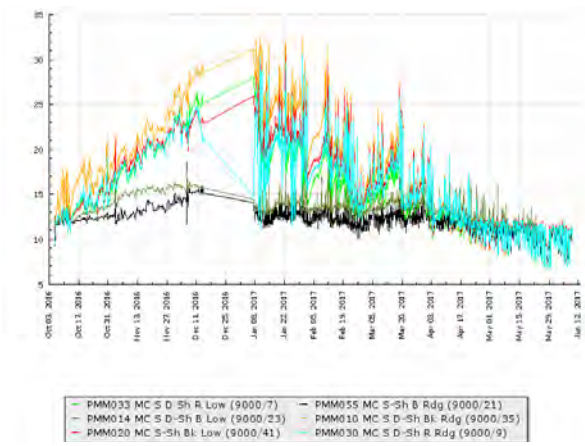

Figure 11: Moisture content of roof sheathing in ventilated attic dormer roof area 5 - South Facing Roof

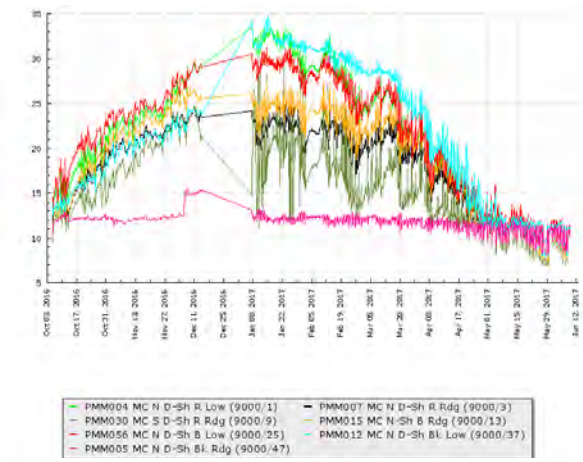

Figure 11: Moisture content of roof sheathing in ventilated attic dormer roof area 6 - North Facing Roof

The moisture content of the ventilated attic space sheathing at the lower eve vent areas are well over the desired 25% moisture content for wood products to remain healthy long term. The roof sheathing on the 2006 vented dormer expansion did show signs of minimal mould growth, which was only on the underside of the sheathing. The top side of the sheathing was in pristine condition. For the Nov 2017 CCBST presentation, there shall be further analysis of the moisture and temperature data in comparison to condensation related events to night sky radiation, external weather sources, and related information.

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Ridge Vent,
SMT Research: Sensors & Data Acquisition

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