



Evaluation Report CCMC 13473-R FlexStone

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1. Opinion

It is the opinion of the Canadian Construction Materials Centre (CCMC) that “FlexStone,” when used as a cold, liquid-applied polyurethane membrane for balconies and flat roof decks, in accordance with the conditions and limitations stated in Section 3 of this Report, complies with the National Building Code (NBC) of Canada 2015:

- Clause 1.2.1.1.(1)(b) of Division A, as an alternative solution that achieves at least the minimum level of performance required by Division B in the areas defined by the objectives and functional statements attributed to the following applicable acceptable solutions:
 - Article 9.26.2.1., Material Standards (Roofing Materials)

This opinion is based on CCMC’s evaluation of the technical evidence in Section 4 provided by the Report Holder.

Ruling No. 15-04-325 (13473-R) authorizing the use of this product in Ontario, subject to the terms and conditions contained in the Ruling, was made by the Minister of Municipal Affairs and Housing on 2015-09-29 pursuant to s.29 of the *Building Code Act*, 1992 (see Ruling for terms and conditions). This Ruling is subject to periodic revisions and updates.

2. Description

The product is a 90 mil to 100 mil thick 4-ply membrane system consisting of three distinct layers of liquid-applied polyurethane coatings that, once cured, form a seamless, monolithic membrane that is used for balconies and flat roof decks.

The base coat (TUFF) is a water-catalyzed, aromatic urethane. The middle layer (COLORCOAT AR) is a single-component, aliphatic polyurethane. The top layer (MULT-I-GLAZE) includes acrylic flakes overlaid with a clear coat of single-component, aliphatic polyurethane (isocyanate saturated with polyester backbone).

3. Conditions and Limitations

CCMC’s compliance opinion in Section 1 is bound by “FlexStone” being used in accordance with the conditions and limitations set out below.

- The product must be installed on a concrete or plywood substrate that provides positive drainage, where the minimum roof slope is 1 in 50 and the maximum is 1 in 25.
- When the product is used in buildings requiring a fire classification as per the NBC 2015, the product must be tested in accordance with the criteria in CAN/ULC-S107-10, “Methods of Fire Tests of Roof Coverings” in order to determine the product’s fire classification.
- When the product is used in a roof assembly that requires a fire-resistance rating, the rating must be determined based on the results of tests conducted in conformance with CAN/ULC-S101-14, “Standard Methods of Fire Endurance Tests of Building Construction and Materials.”
- The substrate must be free of debris, clean, and dry prior to installing the product.
- The product must be installed by manufacturer-approved installers.
- The product must be installed in accordance with the manufacturer’s installation instructions.

- The packaging for the product containers must be identified with the following information:
 - manufacturer’s name or logo; and
 - the phrase “CCMC 13473-R.”

4. Technical Evidence

CCMC’s Technical Guide for “Cold-Applied, Liquid, Elastomeric Roofing ” sets out the nature of the technical evidence required by CCMC to enable it to evaluate a product as an acceptable or alternative solution in compliance with the “National Building Code of Canada 2015.” The Report Holder has submitted test results for CCMC’s evaluation. Testing was conducted at an independent laboratory recognized by CCMC. The corresponding test results for “FlexStone” are summarized below.

4.1 Performance Requirements

Table 4.1.1 Results of Testing of Physical Properties of “FlexStone”

Property	Material Layer	Unit	Requirement	Result
Linear dimensional change in length	FlexStone	%	$\leq \pm 1$	-0.5
Linear dimensional change in width	FlexStone	%	$\leq \pm 1$	-0.4
Water absorption	Base coat with middle coat	%	$\leq \pm 3$	2
Tensile strength (tension)	Base coat	MPa	Report value	2.55
	FlexStone		≥ 1.86	2.92
Elongation	Base coat	%	Report value	364
	FlexStone		≥ 200	250
Water vapour permeance	FlexStone	ng/(Pa·s·m ²)	Report value	69.4
Flexibility – mandrel bend	Base coat	–	No cracking or flaking	Pass
Tear resistance	Base coat	kN/m	≥ 5.8	10.0
Abrasion resistance	FlexStone	mg	≤ 50	8
Indentation hardness	Base coat	Durometer units	Report value	58
	FlexStone		82 ± 5	69 ⁽¹⁾
Static puncture	Base coat	N	4 out of 5 samples ≥ 150 and must pass watertightness test	5 out of 5 at $23 \pm 2^\circ\text{C}$
	Base coat			5 out of 5 at $-15 \pm 2^\circ\text{C}$
Dynamic impact (puncture)	Base coat	J	20 out of 24 samples ≥ 9 and pass watertightness test	24 out of 24 at $23 \pm 2^\circ\text{C}$
	Base coat			24 out of 24 at $-15 \pm 2^\circ\text{C}$
Peel adhesion	Base coat	N/m	≥ 875 concrete	1 043
	Base coat		≥ 525 plywood	1 303
Crack bridging as received	Base coat	–	No evidence of cracking, splitting, pinholes or loss of adhesion	Pass
Crack bridging after heat aging	Base coat	–	No evidence of cracking, splitting, pinholes or loss of adhesion	Pass

Note to Table 4.1.1:

- (1) Hardness property performance deemed acceptable as the product passes static puncture and dynamic impact, and the watertightness test after static puncture and dynamic impact tests.

Table 4.1.2 Results of Testing of Performance Properties of “FlexStone”

Property	Material Layer	Unit	Requirement	Result
Retention of tensile strength after H ₂ O solution	Base coat	% of original	≥ 70 average	90 (2.30 MPa)
Retention of tensile strength after NaCl solution	Base coat	% of original	≥ 70 average	85 (2.17 MPa)
Retention of tensile strength after heat aging	Base coat	% of original	Report value	90 (2.30 MPa)
Retention of tensile strength after heat aging	FlexStone	% of original	≥ 90 average	95 (2.77 MPa)
Retention of elongation after heat aging	Base coat	%	Report value	56 (204% of original)
Retention of elongation after heat aging	FlexStone	%	≥ 90 average	90 (225% of original)
Retention of tensile strength after accelerated weathering FL/UV – 5000 hours	Base coat	% of original	Report value	85 (2.17 MPa)
Retention of tensile strength after accelerated weathering FL/UV – 5000 hours	FlexStone	% of original	≥ 90 average	85 ⁽¹⁾ (2.48 MPa)
Retention of elongation after accelerated weathering FL/UV – 5000 hours	Base coat	%	Report value	47 (171% of original)
Retention of elongation after accelerated weathering FL/UV – 5000 hours	FlexStone	%	≥ 90 average	82 ⁽²⁾ (205% of original)
Glass transition before heat aging	Base coat	°C	Report value	-49.7
Glass transition after heat aging	Base coat	°C	Report value	-44.4
Change in glass transition (ΔTg) from before and after heat aging	Base coat	°C	≤ ± 8	5.3
Glass transition before accelerated weathering FL/UV – 5000 hours	Base coat	°C	Report value	-49.7
Glass transition after accelerated weathering FL/UV – 5000 hours	Base coat	°C	Report value	-46.3
Change in glass transition (ΔTg) from before and after accelerated weathering FL/UV – 5000	Base coat	°C	≤ ± 8	3.4
Watertightness after static puncture	Base coat	–	No leakage	Pass at 23 ± 2°C
	Base coat		No leakage	Pass at -15 ± 2°C
Watertightness after dynamic impact (puncture)	Base coat	–	No leakage	Pass at 23 ± 2°C
	Base coat		No leakage	Pass at -15 ± 2°C

Notes to Table 4.1.2:

- (1) Property performance deemed acceptable as the tensile strength is maintained at a level above the minimum tensile strength requirement.
- (2) Property performance acceptable as the elongation is maintained at a level above the minimum elongation requirement.

Report Holder

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