



Evaluation Report CCMC 13206-R

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Sure-Weld™ TPO and Mule-Hide TPO-c

1. Opinion

It is the opinion of the Canadian Construction Materials Centre (CCMC) that “Sure-Weld™ TPO and Mule-Hide TPO-c” when used as a mechanically-fastened roofing membrane for low-slope roofing applications in accordance with the conditions and limitations stated in Section 3 of this Report, complies with the National Building Code 2005:

- Clause 1.2.1.1.(1)(b), 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 5.6.1.2., Protective Material and Component Properties
 - Article 9.26.2.1., Material Standards

This opinion is based on CCMC's evaluation of the technical evidence in Section 4.1 provided by the Report Holder.

2. Description

The “Sure-Weld™ TPO and Mule-Hide TPO-c” is a membrane composed of three layers – a ThermoPlastic polyolefin (TPO) base layer, a polyester-reinforced fabric (scrim) layer and a TPO top layer – and is available in either white or grey.

The membrane is 30.4 m long and 1.16 mm thick and is available in widths of 2.4, 3.0 and 3.6 m.

3. Conditions and Limitations

CCMC's compliance opinion in Section 1 is bound by the “Sure-Weld™ TPO and Mule-Hide TPO-c” being used in accordance with the conditions and limitations set out below.

- The membranes must be mechanically fastened to roof decks with manufacturer-specified fasteners and fastening plates.
- Suitable for use on slopes up to 1:1.5.
- “Sure-Weld™ TPO and Mule-Hide TPO-c” membranes must be stored at temperatures greater than 5°C.
- Where seams are required, a minimum of a 40-mm-wide hot air weld must be made.
- All cut seams must be seam-sealed with the manufacturer's recommended sealer.
- Seam welding must be performed with the equipment and at the speeds specified by the manufacturer.
- The membranes must not be exposed to weather for more than 7 days prior to welding.
- Use of these products is limited to installations where access to the roof is limited to maintenance and repair.
- Use of these products is limited to installations where no fire-resistance rating is required.
- The membranes must be installed in accordance with the manufacturer's installation guide by manufacturer trained and authorized installers.

4. Technical Evidence

CCMC's Technical Guide for “Sure-Weld™ TPO and Mule-Hide TPO-c” 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 NBC 2005. The Report Holder has submitted test reports for CCMC's evaluation. Testing was conducted at independent laboratories recognized by CCMC. The corresponding test results for “Sure-Weld™ TPO and Mule-Hide TPO-c” are summarized below.

4.1 NBC 2005 Compliance Data for “Sure-Weld™ TPO and Mule-Hide TPO-c” on which CCMC Based its Opinion in Section 1

4.1.1 Material Requirements

4.1.1.1 Basic Physical and Mechanical Properties

Table 4.1.1.1

Property	Unit	Requirement	Result
Thickness overall	mm	≥ 1.2	1.16 ⁽¹⁾
Thickness over scrim	mm	≥ 0.25	0.44
Breaking strength	kN/m	≥ 20	36 MD 31 XD ⁽²⁾
Elongation at break	%	≥ 15	16 MD 15.4 XD
Tearing strength	N	≥ 245	400 MD 300 XD
Water vapour permeance	ng/Pa·s·m ²	report value	1.23

Notes to Table 4.1.1.1

- (1) Deemed acceptable; product meets all other basic physical and mechanical property requirements.
- (2) MD - machine direction; XD - cross-machine direction.

4.1.2 Performance Requirements

With loading
 -machine direction
 -cross-machine direction

4.1.2.1 Basic Performance Properties

Table 4.1.2.1

Property	Unit	Requirement	Result
Brittleness	°C	≥ -40	-40
Low temperature flexibility	°C	≥ -40	-40
Static puncture resistance	J	≥ 15	15
Dynamic puncture	J	≥ 20	no puncture
Cone penetration	N	≥ 30	137
Ozone resistance	-	no cracking	pass
Abrasion	g	≤ 0.4	0.71 ⁽¹⁾
Seam strength -initial -after 7-day boiling water	kN/m	≥ 5.0 ≥ 4.0	8.0 6.4
Dynamic wind load resistance -System 1 -System 2	-	report results	B E ⁽²⁾

Notes to Table 4.1.2.1

- (1) Deemed acceptable; product meets all other performance requirements.
- (2) System performance: Dynamic wind load resistance performance rating is based on CSA A123.21-04, “Standard Test Method for the Dynamic Wind Uplift Resistance of Mechanically Attached Membrane-Roofing Systems.” Rating Levels A, B, C, D or E refer to a pressure loading sequence that is comprised of a set of load fluctuations (wind gusts) with specified load-amplitude pressure levels.

Membrane Attachment

System 1, when tested in accordance with the dynamic wind load resistance test protocol, achieved a B rating (pressure resistance 5 363 Pa dynamic loading). This result is valid for installed membranes with a width of 2 438 mm with fasteners spaced at 304 mm. System 1 was fastened with Carlisle #15 HP-X fasteners and 61-mm-diameter round Piranha plates.

System 2, when tested in accordance with the dynamic wind load resistance test protocol, achieved an E rating (pressure resistance 5 746 Pa dynamic loading). This result is valid for installed membranes with a width of 3 073 mm with fasteners spaced at 152 mm. System 2 was fastened with Carlisle #15 HP-X fasteners and 61-mm-diameter round Piranha plates.

4.1.2.2 Effect of Water Absorption

Table 4.1.2.2

Property	Unit	Requirement	Result
Mass increase	%	≤ 3	3
Tearing strength	N	≥ 220	400 MD 300 XD
Breaking strength	kN/m	≥ 18	36 MD 31 XD
Elongation at break	%	≥ 13.5	16 MD 15.4 XD

4.1.2.3 Dimensional Change

Table 4.1.2.3

Property	Unit	Requirement	Result
Without loading -machine direction -cross-machine direction	%	0.5 0.2	-0.12 MD -0.23 XD
With loading -machine direction -cross-machine direction	%	0.5 0.2	-0.06 MD -0.08 XD

4.1.2.4 Effect of Heat Aging

Table 4.1.2.4

Property	Unit	Requirement	Result
Tearing strength	N	≥ 220	395 MD 357 XD
Breaking strength	kN/m	≥ 18	33 MD 29 XD
Elongation at break	%	≥ 13.5	14.9 MD 15.1 XD
Weight change	%	max. ± 2	0.33
Seam Strength	kN/m	≥ 4	7.1

4.1.2.5 Accelerated Weathering Resistance

Table 4.1.2.5

Property	Unit	Requirement	Result
Cracking (7x magnification)	-	no cracking	pass
Crazing (7x magnification)	-	no crazing	pass
Tearing strength	N	≥ 220	366 MD 238 XD
Breaking strength	kN/m	≥ 18	28.9 MD 26.3 XD
Elongation at break	%	≥ 13.5	14.7 MD 13.9XD
Seam strength	kN/m	≥ 4	7.8

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