



Evaluation Report CCMC 14092-R DecKorators® Vault, DecKorators® Frontier, SLS and Ultra Light Composite Deck Boards

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1. Opinion

It is the opinion of the Canadian Construction Materials Centre (CCMC) that “DecKorators® Vault”, “DecKorators® Frontier”, “SLS” and “Ultra Light” grooved and solid mineral polypropylene composite deck boards, when used as both exterior decking planks and as stair treads 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)(a), Division A, using the following acceptable solutions from Division B:
 - Article 9.4.2.2, Specified Snow Loads
 - Article 9.4.2.3, Platforms Subject to Snow and Occupancy Loads
 - Article 9.8.9.1., Loads on Stairs and Ramps
- 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 9.4.2.1., Application
 - Article 9.4.3.1., Deflections
 - Article 9.8.9.6., Finish for Treads and Landings
 - Article 9.23.15.5., Subfloor Thickness or Rating

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

2. Description

The products have co-extruded proprietary inorganic (mineral) fillers, a virgin polypropylene core and a thin layer of polypropylene cap. The products are a rectangular solid deck board with rounded corners and slotted edges. The DecKorators® Vault and DecKorators® Frontier boards have an average thickness of 21.1 mm with an average width of 139.2 mm, while the SLS and Ultra Light boards have an average thickness of 20.3 mm and an average width of 132.1 mm. DecKorators® Vault boards have minor colour streaking in the cap. The DecKorators® Vault and DecKorators® Frontier boards are available in five colours (satchel brown, gray, hickory, prairie and woodland). The SLS and Ultra Light boards are available in two colours (chestnut brown and flagstone gray).

The boards are intended to be used as exterior decking installed over traditional structural wood framing (see Figures 1 and 2).

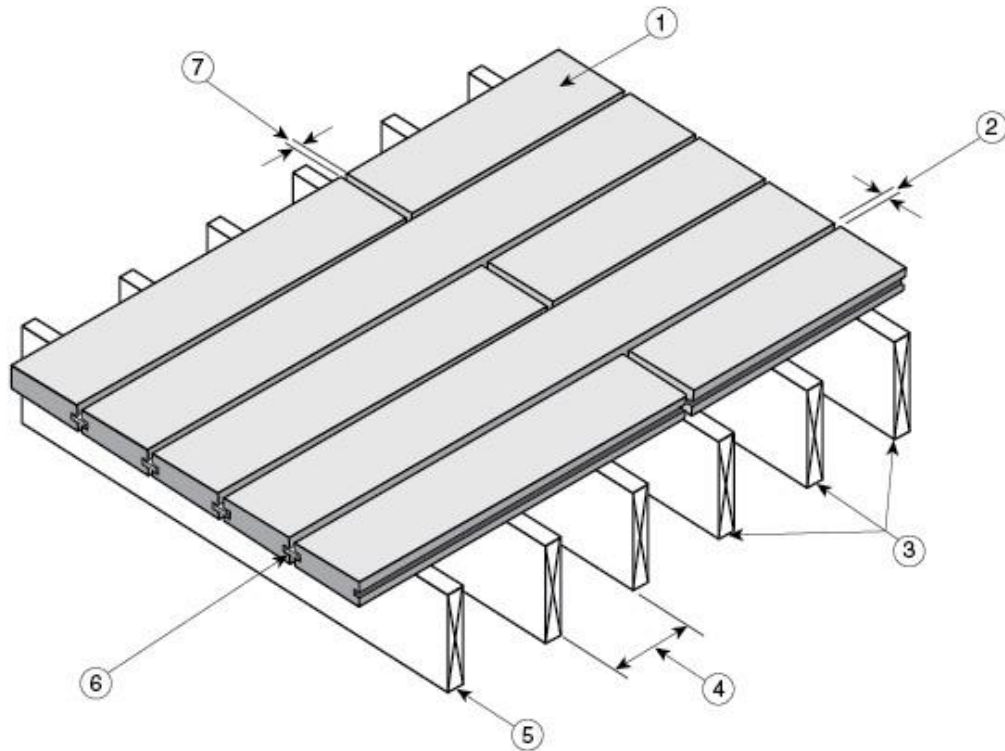


Figure 1. “DecKorators® Vault, DecKorators® Frontier, SLS and Ultra Light Composite Deck Boards” with hidden fastener system

1. “DecKorators® Vault, DecKorators® Frontier, SLS and Ultra Light” deck boards
2. 3.2 to 4.8 mm minimum spacing between sides of the planks, depending on temperature at installation
3. minimum of three joists per plank
4. maximum joist spacing: 300 mm on centre (o.c.)
5. joist designed to support applicable loads
6. DecKorators® Stowaway™ hidden fasteners provided by manufacturer
7. 1.6 to 3.2 mm minimum spacing between ends of the planks, depending on length of plank and temperature at installation

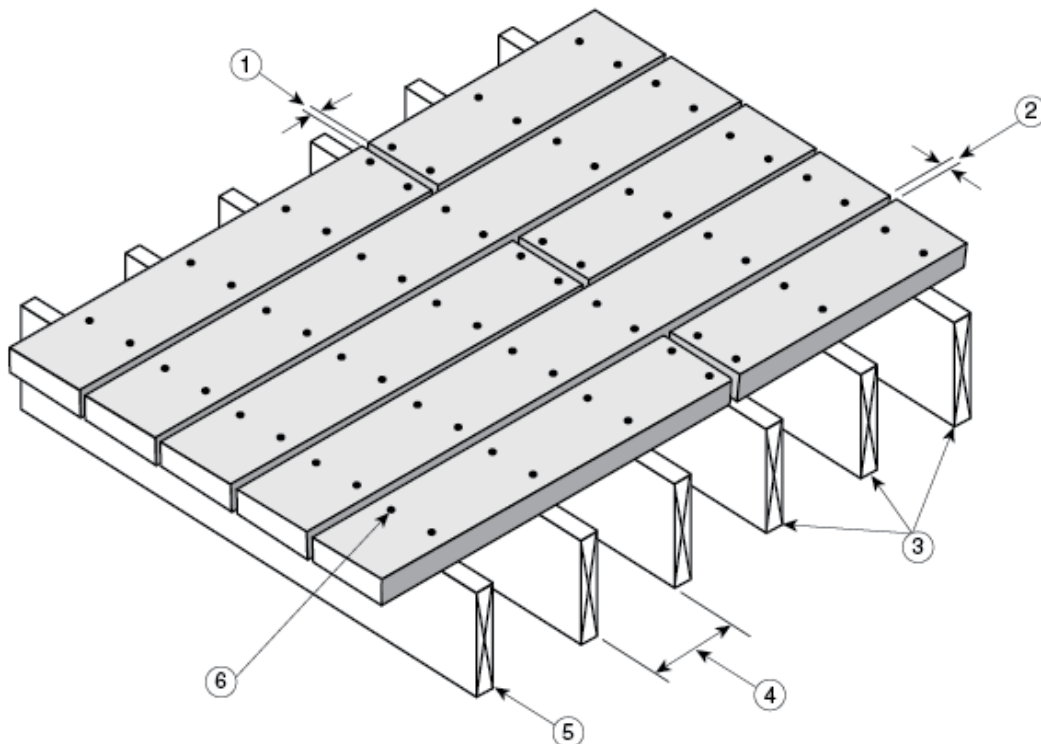


Figure 2. “DecKorators® Vault, DecKorators® Frontier, SLS and Ultra Light Composite Deck Boards” with fasteners

1. 1.6 to 3.2 mm minimum spacing between ends of the planks, depending on length of plank and temperature at installation
2. 3.2 to 4.8 mm minimum spacing between sides of the planks, depending on temperature at installation
3. minimum of three joists per plank
4. maximum joist spacing: 300 mm o.c.
5. joist designed to support applicable loads
6. two 63.5-mm-long fasteners per support

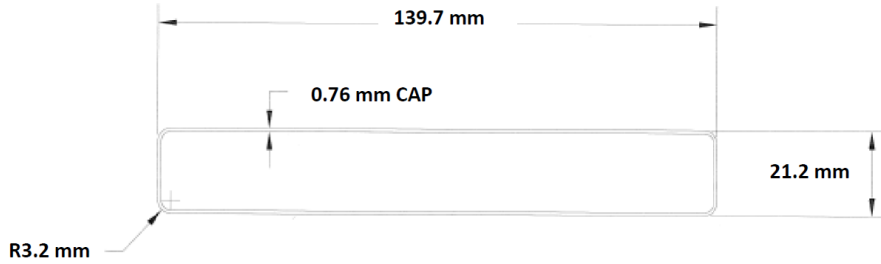


Figure 3. “DecKorators® Vault and DecKorators® Frontier” solid profile

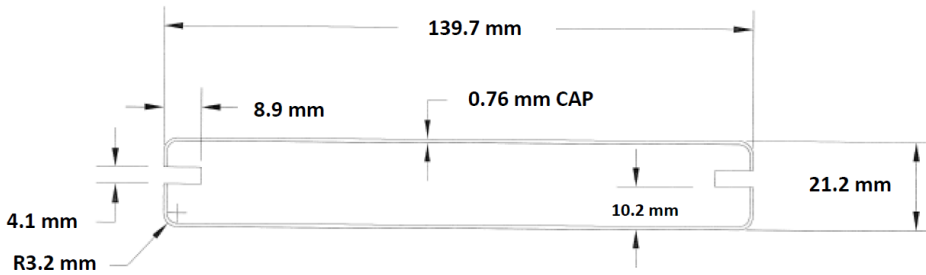


Figure 4. “DecKorators® Vault and DecKorators® Frontier” grooved profile

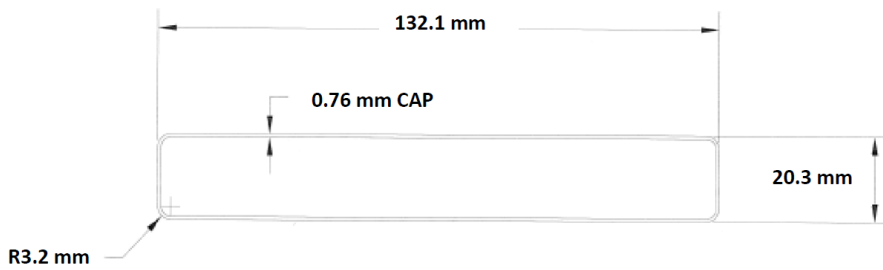


Figure 5. “SLS and Ultra Light” solid profile

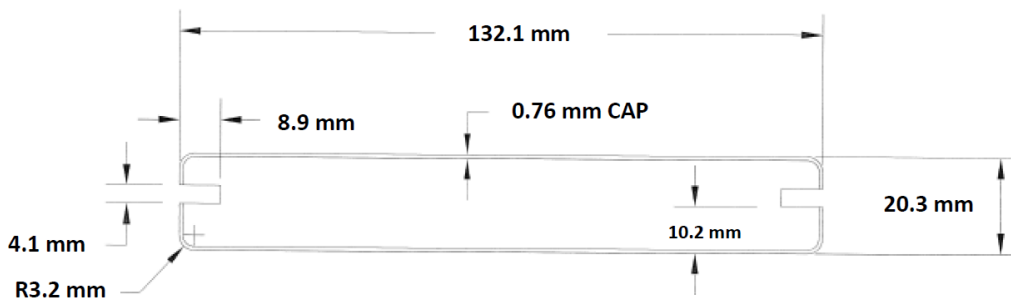


Figure 6. “SLS and Ultra Light” grooved profile

3. Conditions and Limitations

The CCMC compliance opinion in Section 1 is bound by the “DecKorators® Vault, DecKorators® Frontier and SLS and Ultra Light Composite Deck Boards” being used in accordance with the conditions and limitations set out below:

- The planks must be installed with supports spaced at no greater than 300 mm o.c.
- The products must be fastened to the wood joists with fasteners conforming to Article 9.23.3.1., Standards for Nails and Screws, of Division B of the NBC 2015. The fasteners must have a corrosion protection coating⁽¹⁾ or be made of stainless steel. The planks must be fastened with a minimum of two fasteners 63.5 mm in length per support.
- The products can also be installed using the DecKorators® Stowaway™ hidden plastic fastening system as supplied by the manufacturer.
- The products must be gapped end to end based on the length of the plank and the temperature at installation. The end-to-end gapping must be a minimum of 1.6 mm for installations at temperatures above 0°C and a minimum of 3.2 mm for installations at temperatures below 0°C.
- The width-to-width gapping must be a minimum of 3.2 mm at a temperature above 0°C and a minimum of 4.8 mm for installations at a temperature below 0°C.
- The products are not to be considered equivalent to dimensional lumber.
- The planks with a solid profile (section) can be used as stair treads at 230 mm (9 in.) o.c. spacing.
- The products should be installed by a knowledgeable person familiar with the product installation guide.
- Where possible, the label or packaging of the products must be identified with the manufacturer’s name or logo and the phrase “CCMC 14092-R.”

(1) As of January 2004, pressure-treated lumber requires specific hot-dipped galvanized fasteners for satisfactory performance.

4. Technical Evidence

The Report Holder has submitted technical documentation for the CCMC evaluation. Testing was conducted at laboratories recognized by CCMC. The corresponding technical evidence for this product is summarized below.

4.1 Performance Requirements

4.1.1 Basic Physical and Mechanical Properties

Table 4.1.1.1 Results of Testing the Basic Physical and Mechanical Properties of the Products

Property		Unit	Requirement	Result
Dimensional change	coefficient of linear expansion (thermal) longitudinal	°C ⁻¹	≤ 2 × 10 ⁻⁵	0.96 × 10 ⁻⁵
	coefficient of linear expansion (thermal) cross-sectional			7.03 × 10 ⁻⁵⁽¹⁾
Strength and stiffness	modulus of elasticity (MOE)	MPa	≥ 750	2 466
				Vault and Frontier SLS and Ultra Light
	modulus of rupture (MOR)	MPa	≥ 9	34
				Vault and Frontier SLS and Ultra Light
	impact resistance	J/m	≥ 53.4	1 224.3
	hardness	kN	≥ 1.8	3.1
	creep, recovery and load duration ⁽²⁾	%	≤ 25% for creep	45 ⁽³⁾
			≥ 75% for recovery	80
			No specimen failure in Step 6	No specimen failure
	impact resistance (after weathering)		≥ 75% of non-weathered value	97.1
MOE (after accelerated aging)		≥ 50% of non-aged value	87.0	
MOR (after accelerated aging)		≥ 50% of non-aged value	98.4	

Table 4.1.1.1 Results of Testing the Basic Physical and Mechanical Properties of the Products (cont.)

Property		Unit	Requirement	Result
Fastener holding capacity ⁽³⁾	fastener withdrawal strength	deck screws	≥ 600	1 712
		proprietary hidden fastening system		1 037
	lateral fastener strength	deck screws	≥ 720	3 263
		proprietary hidden fastening system		2 701
Flame-spread rating		No unit	≤ 200	100
Smoke developed classification			Report	385

Notes to Table 4.1.1.1:

- (1) The results are deemed as acceptable based on the manufacturer's gapping installation instructions.
- (2) Creep, recovery and load duration has been tested at 400 mm o.c. joist spacing.
- (3) The results are deemed acceptable with the limitation of 300 mm o.c. joist spacing.

4.1.2 Performance Under Concentrated Static and Impact Loads**Table 4.1.2.1 Results of Testing the Concentrated Static Load for "DecKorators® Vault and DecKorators® Frontier"⁽¹⁾**

Property		Requirement		Result ⁽²⁾	
		Minimum Ultimate Load (kN)	Maximum Deflection under 0.89 kN Load for 400 mm Span (mm)	Ultimate Load (kN)	Deflection under 0.89 kN Load (mm)
Concentrated load	decking at 50°C	2.45	2.00	4.78	6.83 ⁽³⁾
	decking at 20°C			6.44	4.59 ⁽³⁾
	decking at -35°C			9.04	2.62 ⁽³⁾

Notes to Table 4.1.2.1:

- (1) The results have been given for only grooved sections since the results for grooved section were more conservative compared to the results for solid sections.
- (2) The results are for planks with supports at 400 mm o.c.
- (3) The results are deemed acceptable. The planks must be installed with supports no greater than 300 mm o.c. Each plank must be supported by at least three supports.

Table 4.1.2.2 Results of Testing the Concentrated Static Load for "SLS and Ultra Light"⁽¹⁾

Property		Requirement		Result ⁽²⁾	
		Minimum Ultimate Load (kN)	Maximum Deflection under 0.89 kN Load for 300 mm Span (mm)	Ultimate Load (kN)	Deflection under 0.89 kN Load (mm)
Concentrated load	decking at 50°C	2.45	1.62	5.50	4.14 ⁽³⁾
	decking at 20°C			6.97	2.63 ⁽³⁾
	decking at -35°C			9.49	1.90 ⁽³⁾

Notes to Table 4.1.2.2:

- (1) The results have been given for only grooved sections since the results for grooved section were more conservative compared to the results for solid sections.
- (2) The results are for planks with supports at 300 mm o.c.
- (3) The results exceed the requirements. The additional deflection will not impact the overall performance.

Table 4.1.2.3 Results of Testing the Impact Load for “DecKorators® Vault and DecKorators® Frontier”⁽¹⁾

Property		Requirement		Result ⁽²⁾	
		Minimum Ultimate Load following Impact Load of 100 N·m (kN)	Maximum Deflection under 0.89 kN Load following Impact Load for 400 mm Span (mm)	Load of 1.78 kN following Impact Load of 100 N·m	Deflection under 0.89 kN Load following Impact Load (mm)
Impact load	decking at 50°C	1.78	2.00	No break	4.41 ⁽³⁾

Notes to Table 4.1.2.3:

- (1) The results have been given for only grooved sections since the results for grooved section were more conservative compared to the results for solid sections..
- (2) The test results are for planks with supports at 400 mm o.c.
- (3) The results are deemed acceptable. Although this result exceeds the 2.00 mm requirement, the additional deflection is not considered significant for material at 50°C.

Table 4.1.2.4 Results of Testing the Impact Load for “SLS and Ultra Light”⁽¹⁾

Property		Requirement		Result ⁽²⁾	
		Minimum Ultimate Load following Impact Load of 100 N·m (kN)	Maximum Deflection under 0.89 kN Load following Impact Load for 300 mm Span (mm)	Load of 1.78 kN following Impact Load of 100 N·m	Deflection under 0.89 kN Load following Impact Load (mm)
Impact load	decking at 50°C	1.78	1.62	No break	2.88 ⁽³⁾

Notes to Table 4.1.2.4:

- (1) The results have been given for only grooved sections since the results for grooved section were more conservative compared to the results for solid sections.
- (2) The test results are for planks with supports at 300 mm o.c.
- (3) The results are deemed acceptable. Although this result exceeds the 1.62 mm requirement, the additional deflection is not considered significant for material at 50°C.

Table 4.1.2.5 Results of Testing the Performance of Stair Treads under a Concentrated Static Load for “DecKorators® Vault and DecKorators® Frontier”⁽¹⁾

Property		Requirement		Result ⁽²⁾	
		Minimum Ultimate Load (kN)	Maximum Deflection under 1 kN (mm)	Applied Ultimate Load (kN)	Deflection under 1 kN (mm)
Concentrated static load	stair tread	5 ⁽³⁾	0.75	12.54	1.68 ⁽⁵⁾
	stair tread nosing	5 ⁽⁴⁾		6.76	

Notes to Table 4.1.2.5:

- (1) This test was conducted only on planks with solid sections. Only the specified planks (with solid sections) may be used as stair treads.
- (2) Test results are for a 50°C test condition for stair stringers spaced at 230 mm o.c. Three specimens were submitted for each test.
- (3) Applied through a 75-mm-diam disk positioned at the centre line of the plank and midway between stringers.
- (4) Applied through a 38-mm-diam disk positioned along the outside edge of the nosing at the stringer location.
- (5) Although the deflection is slightly higher than the allowed limit, the applied ultimate load was 150% higher than the minimum required ultimate load. Therefore, this deflection result was deemed acceptable.

Table 4.1.2.6 Results of Testing the Performance of Stair Treads under a Concentrated Static Load for “SLS and Ultra Light”⁽¹⁾

Property		Requirement		Result ⁽²⁾	
		Minimum Ultimate Load (kN)	Maximum Deflection under 1 kN (mm)	Applied Ultimate Load (kN)	Deflection under 1 kN (mm)
Concentrated static load	stair tread	5 ⁽³⁾	0.75	12.22	1.75 ⁽⁵⁾
	stair tread nosing	5 ⁽⁴⁾		8.15	

Notes to Table 4.1.2.6:

- (1) This test was conducted only on planks with solid sections. Only the specified planks (with solid sections) may be used as stair treads.
- (2) Test results are for 50°C test condition for stair stringers spaced at 230 mm o.c. Three specimens were submitted for each test.
- (3) Applied through a 75-mm-diam disk positioned at the centre line of the plank and midway between stringers.
- (4) Applied through a 38-mm-diam disk positioned along the outside edge of the nosing at the stringer location.
- (5) Although the deflection is slightly higher than the allowed limit, the applied ultimate load was 144% higher than the minimum required ultimate load. Therefore, this deflection result was deemed acceptable.

4.1.3 Durability**Table 4.1.3.1 Results of Testing the Durability of the Products**

Property	Requirement	Result	
		SPF Lumber	DecKorators Vault® and Frontier®
MOE	Mean percentage loss in MOE and MOR after UV exposure ⁽¹⁾ . Accelerated aging ⁽²⁾ must be less than or equal to spruce lumber.	14.5%	6.1%
MOR		43.6%	0.1%

Notes to Table 4.1.3.1:

- (1) 4 000 h of Cycle 1 as outlined in Appendix X3.1 of ASTM G 155-13, “Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials.”
- (2) The accelerated aging cycle, which includes wetting, freezing, thawing and drying, is repeated five times.

4.1.4 Walking Surface Finish Quality and Slip Resistance**Table 4.1.4.1 Results of Testing the Slip Resistance Properties of the Products**

Property		Requirement	Result	
			Parallel to Planks	Perpendicular to Planks
Slip resistance (longitudinal)	dry condition	> 0.5 (ASTM F 1679-04)	0.73	0.74
	wet condition		0.66	0.69

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