



# Evaluation Report

## CCMC 13200-R

<b>MASTERFORMAT</b>	06 73 15.01
Issued	2005-07-21
Re-evaluated	2008-04-04
Revised	2009-01-07
Re-evaluation due	2011-07-21

---

## *Millennium Decking™*

### 1. Opinion

It is the opinion of the Canadian Construction Materials Centre (CCMC) that “Millennium Decking.” when used as exterior decking in accordance with the conditions and limitations stated in Section 3 of this Report, complies with the National Building Code of Canada (NBC) 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 9.23.14.5., “Subfloor Thickness or Rating,” when subjected to the loading and deflection limits implied in,
  - Subsection 9.4.2., “Specified Loads,” and
  - Article 9.4.3.1., “Deflections.”

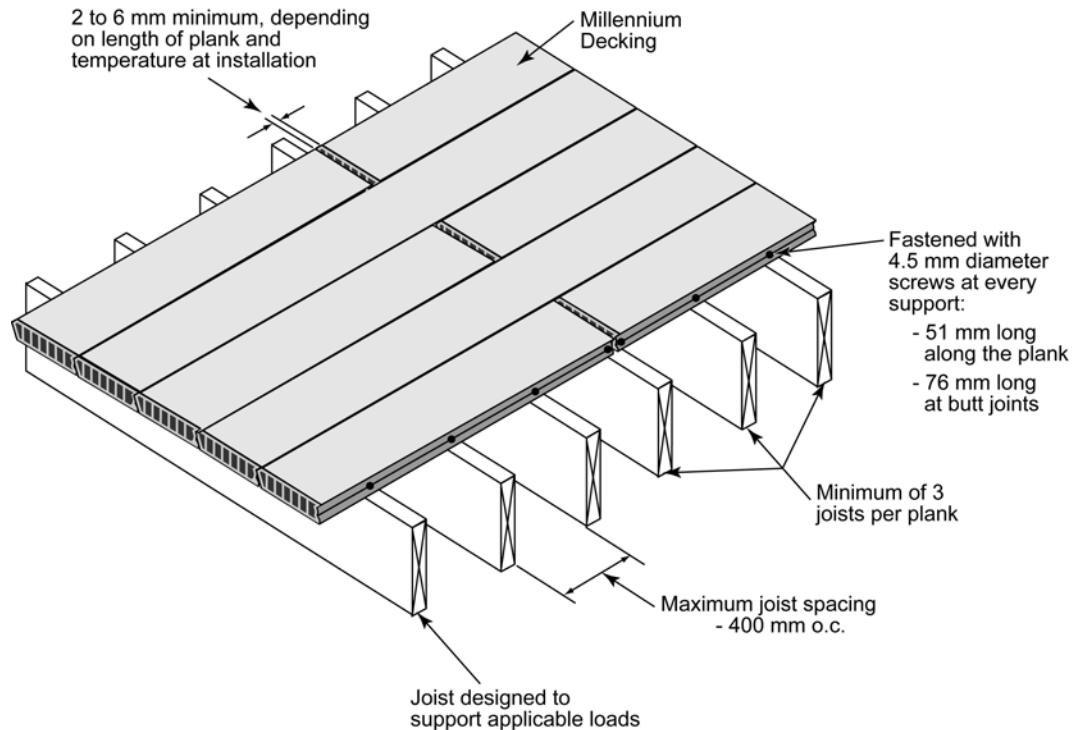
This opinion is based on CCMC’s evaluation of the technical evidence in Section 4.1 provided by the Report holder.

Ruling No. 08-12-197 (13200-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 09 December, 2008 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

“Millennium Decking” is a cellulosic/polymer composite made primarily of reclaimed polyvinyl chloride (PVC) and wood flour. The composite product is manufactured through a continuous extrusion process into tongue and groove planks with hollow cross-sections. The planks are manufactured in nominal dimensions of 25 mm x 150 mm and are available in lengths of 3.66 m, 4.88 m and 6.10 m.

“Millennium Decking” is intended to be used as exterior decking installed over traditional structural wood framing (see Figure 1).



**Figure 1. Installation details for “Millennium Decking.”**

### 3. Conditions and Limitations

CCMC’s compliance opinion in Section 1 is contingent upon “Millennium Decking” being used in accordance with the conditions and limitations set out below.

“Millennium Decking” may be used as exterior decking in combustible construction for residential occupancies, falling within the scope of Part 9 of Division B of the NBC 2005 when installed in conjunction with traditional structural wood framing designed to carry the applicable loads. The product must be installed in accordance with the manufacturer’s usage guidelines for the Canadian market, and in accordance with the following limitations.

- “Millennium Decking” shall be installed with supports spaced no greater than 400 mm on centre (o.c.). Each plank must be supported by at least three supports.
- “Millennium Decking” shall be fastened to the wood joists with screws that conform to Sentence 9.23.3.1.(2) of Division B of the NBC 2005. The screws must have a corrosion protection coating or be made of stainless steel.<sup>(1)</sup> The planks must be fastened with 4.5-mm-diameter screws at every support, and the fasteners must be at least 51 mm long along the plank and 76 mm long at butt joints.

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

- “Millennium Decking” shall be gapped end-to-end, according to the length of the plank and the temperature at installation, as follows:

Temperature	Plank Length		
	3.66 m	4.88 m	6.10 m
	Gapping		
T > 15°C	2 mm	3 mm	4 mm
5°C < T < 15°C	3 mm	4 mm	5 mm
T < 5°C	4 mm	5 mm	6 mm

- “Millennium Decking” decking is permitted to be used where termite and decay protection is required as per Article 9.3.2.9. of Division B of the NBC 2005.
- “Millennium Decking” may be used as stair treads when installed in accordance with the manufacturer’s installation instructions. The stair stringers shall be spaced no greater than 305 mm o.c. It is recommended that the nosing trim be fastened, as the friction fit trim may loosen over time due to weathering.
- “Millennium Decking” is **not** to be considered as an equivalent to dimensional lumber.

The product must be identified with the following information:

- manufacturer’s name or logo; and
- the phrase “CCMC 13200-R.”

#### 4. Technical Evidence

CCMC’s Technical Guide for Cellulosic/Polymer Composite Exterior Decking (Hollow Cross-Section) 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 results for CCMC’s evaluation. Testing was conducted at an independent laboratory recognized by CCMC. The corresponding test results for “Millennium Decking” are summarized below.

**4.1 NBC 2005 Compliance Data for “Millennium Decking” on which CCMC Based its Opinion in Section 1**

**Table 4.1. Basic Physical and Mechanical Properties of “Millennium Decking”**

Property	Unit	Requirement	Result <sup>(1)(2)</sup>
<b>Dimensional Change</b>			
Coefficient of linear expansion (swelling) - oven dry to vacuum pressure soak	%	< 0.5 by 80% of specimens	0.05
<b>Strength and Stiffness</b>			
Flexural rigidity (EI) • span-to-depth ratio within 18 to 21	kN·mm <sup>2</sup>	> 300 000	480,000
Moment capacity (Mr) • span-to-depth ratio within 18 to 21	N·mm	> 190 000	446,000
Creep, recovery and load duration	%	< 25 for creep > 75 for recovery No failure	12 80 Passed
<b>Strength and Stiffness After Aging</b>			
Weathering • impact resistance	%	> 75 of non-weathered value	94
Accelerated aging • EI and Mr	%	> 50 of non-aged value	78 (EI) 92 (Mr)
<b>Fastener Holding Capacity</b>			
Nail withdrawal strength	N	> 600	3,647 <sup>(3)</sup>
Lateral nail strength - parallel to length - perpendicular to length	N	> 720	1,216 1,633
<b>Flame-Spread Rating</b>			
Flame-spread Smoke development	No unit	< 200 Report Value	60 440

**Notes to Table 4.1.1:**

- (1) Average test results of six specimens, except for the “Creep, recovery and load duration” results, which are from three specimens.
- (2) Test results were obtained to classify the product and are not intended to be used as engineering design properties.
- (3) 4.5-mm-diameter screws installed at 45° through the groove of the tongue of the plank and 76mm from the end of the test specimens.

**Table 4.1.2. Performance Under Both Concentrated Static Loads and Impact Loads**

Property	Requirement		Result <sup>(1)</sup>	
	Minimum Ultimate Load (kN)	Maximum Deflection Under 0.89-kN Load (mm)	Ultimate Load (kN)	Deflection Under 0.89-kN Load (mm)
Concentrated load • decking at 50°C • decking at 20°C • decking at -35°C	2.45	2.0	4.55 6.47 9.03	1.67 1.24 1.08
	Minimum Ultimate Load Following Impact Load of 102 N·m (kN)	Maximum Deflection Under 0.89-kN Load Following Impact Load of 102 N·m (mm)	Ultimate Load Following Impact Load of 102 N·m (kN)	Deflection Under 0.89-kN Load Following Impact Load of 102 N·m (mm)
Impact load • decking at 50°C	1.78	2.0	No break	1.89

**Note to Table 4.1.2:**

(1) Test results for profiled planks with supports at 400 mm o.c.

**Table 4.1.3. Resistance to Uplift Force - Decking**

Property	Requirement	Result <sup>(2)</sup>
	Minimum Ultimate Load (kN)	Ultimate Load (kN)
Concentrated load	0.2 <sup>(1)</sup>	6.01

## Notes to Table 4.1.3:

- (1) Applied through a 75-mm-diameter disk positioned along the tongue edge of the centre plank and midway between the middle supports of a four-support test rig.
- (2) Test results are from six test specimens, each from different manufacturing runs, with supports at 400 mm o.c.

**Table 4.1.4. Performance Under Concentrated Static Load – Stair Tread**

Property	Requirement		Result <sup>(3)</sup>	
	Minimum Ultimate Load (kN)	Maximum Deflection Under 1-kN (mm)	Minimum Ultimate Load (kN)	Deflection Under 1-kN (mm)
Concentrated load				
• stair tread	5 <sup>(1)</sup>	0.75	6.92	0.79
• stair tread nosing <sup>(4)</sup>				
• without riser	5 <sup>(2)</sup>		5.96	
• with riser			9.42	

Notes to Table 4.1.4:

- (1) Applied through a 75-mm-diameter disk positioned at the centre line of the plank and mid-way between stringers.
- (2) Applied through a 38-mm-diameter disk positioned along the outside edge of the nosing of the plank and mid-way between stringers.
- (3) Test results are for 50°C test condition for stair stringers spaced at 305 mm o.c. Three specimens were tested for each test.
- (4) Testing was done without adhesive between the nosing trim and stair tread plank.

**Table 4.1.5. Durability Requirements for “Millennium Decking”**

Property	Requirement	Result
Flexural rigidity Moment capacity	Mean percentage loss in EI and $M_r$ after UV-exposure <sup>(1)</sup> and accelerated aging <sup>(2)</sup> must be less than or equal to spruce lumber	Passed

Notes to Table 4.1.5:

- (1) 4000 hours of cycle 1 of Appendix X3.1 of ASTM G 155-05a, “Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials.”.
- (2) 5 cycles of accelerated aging (wetting, freezing, thawing and drying).

**Table 4.1.6. Decay and Termite Resistance for “Millennium Decking”**

Property	Requirement	Result
ASTM D 3345-74(1999), “Standard Test method for Laboratory Evaluation of Wood and Other Cellulosic Materials for resistance to Termites” rating	Rating must be equal to or better than preservative-treated wood conforming to CAN/CSA-O80.1-M97, “Preservative Treatment of All Timber Products by Pressure Processes”	Passed
% loss in weight Compressive strength	Mean percentage loss in weight and compressive strength after exposure to decay-causing fungi must be equal to or better than preservative-treated wood conforming to CAN/CSA-O80.1-M89	Passed <sup>(1)</sup>

Note to Table 4.1.6:

- (1) Data presented was not in accordance with CCMC’s evaluation requirements, but demonstrated a resistance to decay-causing fungi that was deemed to meet the intent of CCMC’s requirements.

**4.2 Additional Performance Data for “Millennium Decking”**

Data in this section does not form part of CCMC’s opinion in Section 1.

**Table 4.2. Additional Performance Data**

Property	Unit	Reference Value	Result
Coefficient of linear expansion (thermal) <ul style="list-style-type: none"> <li>• longitudinal</li> <li>• cross-sectional</li> </ul>	cm/cm/°C	$< 2 \times 10^{-5}$	$2.7 \times 10^{-5}$ <sup>(1)</sup> $3.0 \times 10^{-5}$ <sup>(1)</sup>
Impact resistance (Izod impact, notched)	J/m	$> 53.4$	29.1 <sup>(2)</sup>
Hardness (11.28-mm-diameter ball)	kN	$> 1.8$	1.0 <sup>(3)</sup>
Slip resistance (longitudinal) <ul style="list-style-type: none"> <li>• dry condition</li> <li>• wet condition</li> </ul>		$> 0.5$ ASTM F 1679-04, “Standard Test Method for Using a Variable Incidence Tribometer (VIT)”	Passed

**Conditions and limitations related to Table 4.2:**

Failure to conform to the conditions and limitations set out hereunder does not invalidate CCMC’s opinion concerning “Millennium Decking’s” compliance with the NBC 2005.

- (1) Manufacturer’s gapping installation instructions shall address the linear expansion values.
- (2) The Izod impact is a small-scale test used to characterize the material. Very low performance values show sensitivity to a loss of impact strength when product is significantly damaged by a notch, cut or split. The results of the large-scale impact floor tests are the primary performance indicator with respect to floor impact loads.
- (3) Due to its low hardness value, “Millennium Decking” may not meet all occupant expectations where the decking is to be exposed to concentrated puncture loads, see Table 4.3 below.
- (4) All surface finishes meet the 0.5 criterion. This criterion may not meet all occupant expectations. The manufacturer may be contacted for further information.

### 4.3 Additional Performance Data Required by the Authority Having Jurisdiction (AHJ)

Data in this section does not form part of CCMC’s opinion in section 1.

**Table 4.3. Additional Performance Requirements for “Millennium Decking” for the Province of Ontario**

Property	Indenter/Heel Diameter	Requirement <sup>(1)</sup> Ultimate Load kN (lbf)		Result Ultimate Load kN (lbf)
Heel puncture resistance • circular flat bottom indenter simulating heel	6 mm	1.22 kN (275 lbf)		1.24 kN (279 lbf)
	12.5 mm	1.22 kN (275 lbf)		1.75 kN (367 lbf)
Property <sup>(2)</sup>	L/360	L/240	L/180	Ultimate Load <sup>(2)</sup>
Load applied on 12.5mm indenter, on “Millennium Decking” at 400 mm o.c. span, to meet deflection criterion	0.71 kN (160 lbf)	1.11 kN (250 lbf)	1.51 kN (340 lbf)	2.17 kN (488 lbf)
Load applied on 12.5mm indenter, on 15.5mm oriented strand board (OSB) subfloor at 400 mm o.c. span, to meet deflection criterion	0.62 kN (140 lbf)	0.90 kN (202 lbf)	1.17 kN (263 lbf)	2.34 kN (526 lbf)

**Conditions and limitations related to Table 4.3:**

The additional performance requirements outlined in Table 4.3 are presented at the request of the Ontario Ministry of Municipal Affairs and Housing for their consideration.

1. Cautionary note: This criterion of 1.22 kN (275 lbf) using a 12.5 mm (1/2”) indenter has been used by the aircraft industry to qualify the heel puncture resistance of thin composite floor panels. The 6 mm (1/4”) data is provided for comparison purposes. This performance criterion has provided satisfactory performance for the aircraft industry and is being used as benchmark for decking performance. This is to be considered as a minimum performance criterion and may not satisfy all occupant expectations.
2. “Millennium Decking” as demonstrated equivalency to a 15.5-mm OSB subfloor for strength and deflection under Table 4.1.2., A load/deflection comparison is presented here when subjected to 12.5mm-diameter heel loads. At the ultimate load, for both “Millennium Decking” and OSB, failure was reached without indenter puncture but fracture of the top surface of the decking.

Report Holder Millennium Decking Inc.  
1408 – 7<sup>th</sup> Street  
Nisku, Alberta  
T9E 7P9

Tel.: (780) 955-3525  
Fax: (780) 955-7075

Plant: 1408 – 7<sup>th</sup> Street  
Nisku, Alberta  
T9E 7P9

*This Report is issued by the Canadian Construction Materials Centre, a program of the Institute for Research in Construction at the National Research Council of Canada. The Report must be read in the context of the entire CCMC Registry of Product Evaluations, including, without limitation, the introduction therein which sets out important information concerning the interpretation and use of CCMC Evaluation Reports.*

*Readers must confirm that the Report is current and has not been withdrawn or superseded by a later issue. Please refer to <http://irc.nrc.gc.ca/ccmc>, or contact the Canadian Construction Materials Centre, Institute for Research in Construction, National Research Council of Canada, 1200 Montreal Road, Ottawa, Ontario, K1A 0R6. Telephone (613) 993-6189. Fax (613) 952-0268.*

***NRC has evaluated the material, product, system or service described herein only for those characteristics stated herein. The information and opinions in this Report are directed to those who have the appropriate degree of experience to use and apply its contents. This Report is provided without representation, warranty, or guarantee of any kind, expressed, or implied, and the National Research Council of Canada (NRC) provides no endorsement for any evaluated material, product, system or service described herein. NRC accepts no responsibility whatsoever arising in any way from any and all use and reliance on the information contained in this Report. NRC is not undertaking to render professional or other services on behalf of any person or entity nor to perform any duty owed by any person or entity to another person or entity.***