NRC·CNRC
Institute for Research in Construction

Evaluation Report

CCMC 13304-R

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TimberTech® Solid Core Decking – 5/4 Plank, TwinFinish® and EarthWood™

1. Opinion

It is the opinion of the Canadian Construction Materials Centre (CCMC) that "TimberTech® Solid Core Decking – 5/4 Plank, TwinFinish® and EarthWood™" 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.

2. Description

"TimberTech® Solid Core Decking – 5/4 Plank, TwinFinish® and EarthWood™" is a wood thermoplastic composite made primarily of high-density polyethylene and hardwood fibre/flour. The composite product is manufactured through a continuous extrusion process in planks of solid cross-section. The "5/4 Plank" and "TwinFinish®" planks measure 25 mm thick x 138 mm wide. The "EarthWood™" planks measure 25 mm thick x 136 mm wide, manufactured in nominal dimensions of 32 mm x 140 mm. The plank finishes are as follows:

- TwinFinish®
  - One side is embossed with a simulated wood grain pattern that has been mechanically abraded, called "Vertigrain," and one side is a smooth extruded surface that has been mechanically abraded, called "Brushed," both sides are intended as a walking surface.

- EarthWood™
    - One side is embossed with a simulated wood grain pattern intended as the walking surface, and the under surface is longitudinally serrated (9 mm from extrusion die) and not intended as a walking surface.
- 5/4 Plank
    - One side has the "Brushed" finish intended as the walking surface, and the under surface is smooth and not intended as a walking surface.

"TimberTech® Solid Core Decking – 5/4 Plank, TwinFinish® and EarthWood™" is intended to be used as exterior decking installed over traditional structural wood framing (Figure 1).

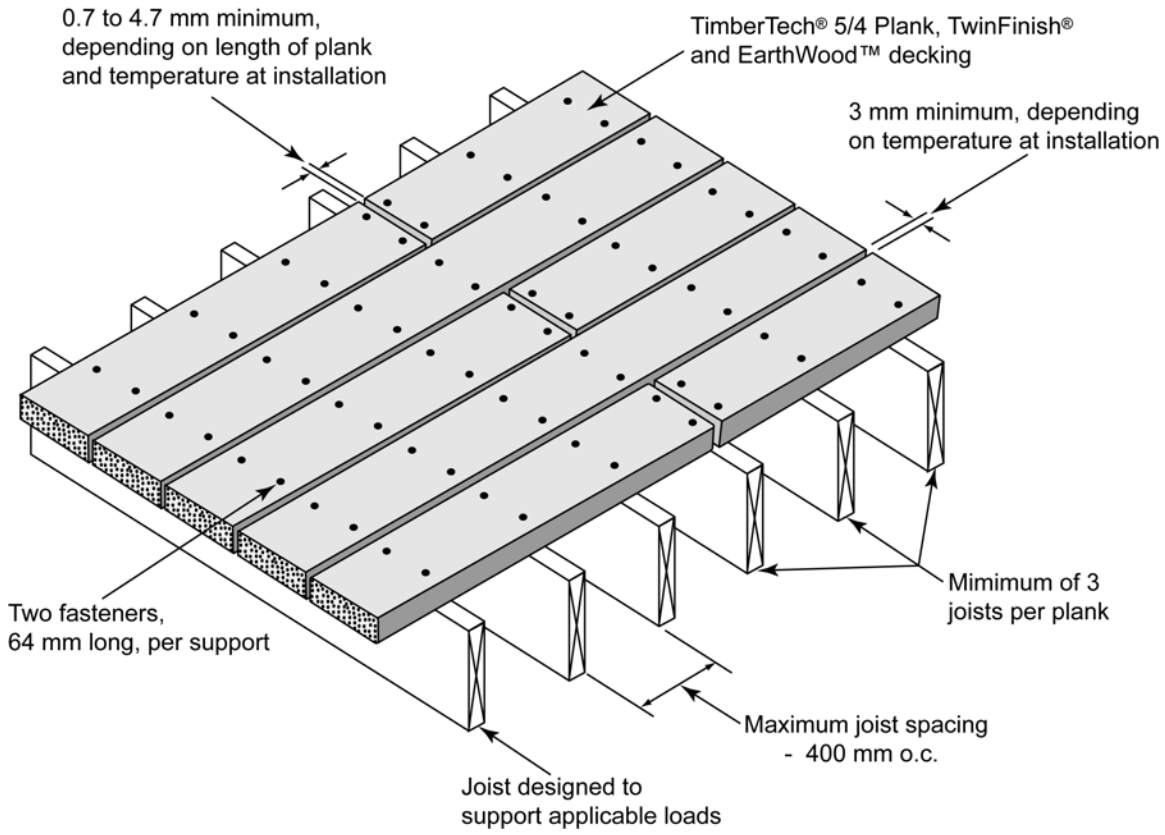

Figure 1. Installation details for "TimberTech® 5/4 Plank, TwinFinish® and EarthWood™."

3. Conditions and Limitations

CCMC's compliance opinion in Section 1 is contingent upon "TimberTech® Solid Core Decking – 5/4 Plank, TwinFinish® and EarthWood™" being used in accordance with the conditions and limitations set out below.

"TimberTech® Solid Core Decking – 5/4 Plank, TwinFinish® and EarthWood™" may be used as exterior decking in combustible construction for light-duty applications, such as in residential occupancies, falling within the scope of Part 9 of Division B of the NBC 2005, when it is 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.

- The planks must be installed with supports spaced no greater than 400 mm on centre (o.c.). Each plank must be supported by at least three supports.

- "TimberTech® Solid Core Decking – 5/4 Plank, TwinFinish® and EarthWood™" must be fastened to the wood joists with fasteners specified by the manufacturer and conforming to Article 9.23.3.1. of Division B of the NBC 2005. The fasteners must have a corrosion protection(1) coating or be made of stainless steel. The planks must be fastened with at least two fasteners per support, and the fasteners must be at least 64 mm long.

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

- "TimberTech® Solid Core Decking – 5/4 Plank, TwinFinish® and EarthWood™" must be gapped end-to-end, based upon the length of the plank and the temperature at installation. The end-to-end gapping must be 4.7 mm (3/16") for installations below 0°C, 3.1 mm (1/8") for installations between 0.5°C to 23.3°C and 0.7 mm (1/32") for installations over 23.8°C. The width-to-width gapping must be 3.1 mm (1/8").

- "TimberTech® Solid Core Decking – 5/4 Plank, TwinFinish® and EarthWood™" 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.

- "TimberTech® Solid Core Decking – 5/4 Plank, TwinFinish® and EarthWood™" is permitted to be used as stair treads.

- "TimberTech® Solid Core Decking – 5/4 Plank, TwinFinish® and EarthWood™" 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 13304-R."

4. Technical Evidence

CCMC's Technical Guide for Cellulosic/Polymer Composite Exterior Decking (Solid 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 "TimberTech® Solid Core Decking – 5/4 Plank, TwinFinish® and EarthWood™" are summarized below.

4.1 NBC 2005 Compliance Data for "TimberTech® Solid Core Decking – 5/4 Plank, TwinFinish® and EarthWood™" on which CCMC Based its Opinion in Section 1

Table 4.1. Basic Physical and Mechanical Properties of "TimberTech® Solid Core Decking – 5/4 Plank, TwinFinish® and EarthWood™"

Property	Unit	Requirement	Result[(1)(2)]
Dimensional Change			
Coefficient of linear expansion (swelling) • oven-dry to vacuum pressure soak	%	< 0.5, by 80% of specimens	0.0
Strength and Stiffness			
Modulus of elasticity (MOE) • span-to-depth ratio within 18 to 21	MPa	> 750	4 220
Modulus of rupture (MOR) • span-to-depth ratio within 18 to 21	MPa	> 9	23.4
Creep, recovery and load duration	%	< 25 for creep > 75 for recovery No failure	35[(3)] 81 Passed
Strength and Stiffness After Aging			
Weathering • impact resistance	%	> 75 of non-weathered value	101
Accelerated aging • MOE and MOR	%	> 50 of non-aged value	79 (MOE) 96 (MOR)
Fastener Holding Capacity			
• nail withdrawal strength • lateral nail strength	N N	> 600 > 720	527[(4)] 3 867
Flame-Spread Rating			
Flame-spread • smoke development	No unit	< 200 Report	61 351

Notes to Table 4.1:

(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) The product creep (deformation under constant load) will be greater than that of lumber planks for sustained loads.

(4) The nail withdrawal value is slightly lower that the target. The manufacturer specifies screws for installation with higher capacity.

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

Property	Requirement		Result[1]	
	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	 4.02 4.76 5.53	 1.75 1.27 1.48
	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	>1.78	1.8

Note to Table 4.1.2:

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

Table 4.1.3. Durability

Property	Durability Requirement	Result[3]	
		Spruce Lumber	TimberTech Solid Core Decking
Bending stiffness	Mean percentage loss in bending stiffness (EI) after ultraviolet (UV) exposure[1] and accelerated aging[2] must be less than or equal to spruce lumber	17.5%	20.2%[3]
Bending strength	Mean percentage loss in bending stress (MOR) after UV exposure[1] and accelerated aging[2] must be less than or equal to spruce lumber	35.5%	6.8%

Notes to Table 4.1.3:

(1) 4 500 hours of Xenon-Arc exposure following Cycle 1 of ASTM D 2565-99, "Standard Practice for Xenon Arc Exposure of Plastics Intended for Outdoor Applications."
(2) Five cycles of accelerated aging (wetting, freezing, thawing and drying).
(3) Deemed as an acceptable performance in comparison to percentage loss of stiffness in lumber after aging.

Table 4.1.4. Decay and Termite Resistance

Property	Requirement	Result
Decay resistance • % 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-M97, "Preservative Treatment of All Timber Products by Pressure Processes"	Passed
Termite resistance	Rating must be equal to or better than preservative-treated wood conforming to CAN/CSA-80.1-M97	Passed

Table 4.1.5. Performance Under Concentrated Static Load – Stair Tread

Property	**Requirement**		**Result**[(1)]	
	Minimum Ultimate Load (kN)	Maximum Deflection Under 1-kN (mm)	Applied Ultimate Load (kN)	Deflection Under 1-kN (mm)
Concentrated load: • stair tread • stair tread nosing w/no nosing	5[(2)] 5[(3)]	0.75	5.63 7.29	0.69

(1) Test results are for 50°C and 80% RH test condition for stair stringers spaced at 305 mm o.c. Three specimens were tested for each test.

(2) Applied through a 75-mm-diameter disk positioned at the centre line of the plank and mid-way between stringers.

(3) Applied through a 38-mm-diameter disk positioned along the outside edge of the nosing at the stringer location.

4.2 Additional Performance Data for "TimberTech® Solid Core Decking – 5/4 Plank, TwinFinish® and EarthWood™"

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) • longitudinal • cross-sectional	cm/cm/°C	$< 2 \times 10^{-5}$	3.6×10^{-5}[(1)] 6.1×10^{-5}[(1)]
Impact resistance (Izod impact, notched)	J/m	> 53.4	31.1[(2)]
Hardness (11.28-mm-diameter ball)	kN	> 1.8	8.7
Slip resistance (longitudinal) • dry condition • wet condition	> 0.5 ASTM F 1679-04, "Standard Test Method for Using a Variable Incidence Tribometer (VIT)"		Passed Passed[(3)]

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 "TimberTech® Profiled Decking – Floorizon™"'s compliance with the National Building Code 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 a 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) All surface finishes met the 0.5 criterion except for the simulated wood grain pattern finish, which fell below 0.43 under the wet conditions. This criterion may not meet all occupant expectations. The manufacturer may be contacted for further information.

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