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CCMC

*EVALUATION
REPORT*

DIVISION 03820

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Re-Evaluation
in process

Lap Siding/Panel Siding

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1. Purpose of Evaluation

The proponent sought confirmation from the Canadian Construction Materials Centre (CCMC) that "Lap Siding/Panel Siding" can serve as a cladding in compliance with the intent of the National Building Code of Canada (NBC) 1995.

2. Opinion

Subject to the limitations and conditions stated in this report, test results and assessments provided by the proponent show that "Lap Siding/Panel Siding" complies with Part V of Section 5.0 of CCMC's Technical Guide for Fibre Reinforced Cementitious Board, Masterformat number 03820, dated 00-03-08, and provides a level of performance equivalent to that required in:

This Report contains no endorsement, warranty, or guarantee, expressed or implied, on the part of the National Research Council of Canada for any evaluated material, product, system or service described herein. NRC accepts no responsibility for the performance of any product described herein if manufactured and/or used outside the purpose of the CCMC evaluation. Readers should not infer that NRC has evaluated the product for any purpose or characteristic other than stated herein.

- NBC 1995, Article 9.27.2.1.

Ruling No. 03-14-103 (12987-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 10 October, 2003 pursuant to s.29 of the Building Code Act, 1992 (see Ruling for terms and conditions).

Canada Mortgage and Housing Corporation permits the use of this product in construction financed or insured under the *National Housing Act*.

“Lap Siding” planks are 3657 mm to 4877 mm long, 210 mm to 305 mm wide, and 6.5 mm to 11 mm thick.

The “Panel Siding” boards are 2438 mm to 3657 mm long, 1219 mm wide, and 6.5 mm to 11 mm thick. “Lap Siding/Panel Siding” are factory-primed on the exterior side and have available various textured and embossed surfaces.

The “Lap Siding/Panel Siding” fibre-cement boards and their installation are illustrated in Figure 1.

3. Description

“Lap Siding/Panel Siding” are fibre-cement boards made mainly of hydraulic cement, and reinforced integrally with cellulose fibres.

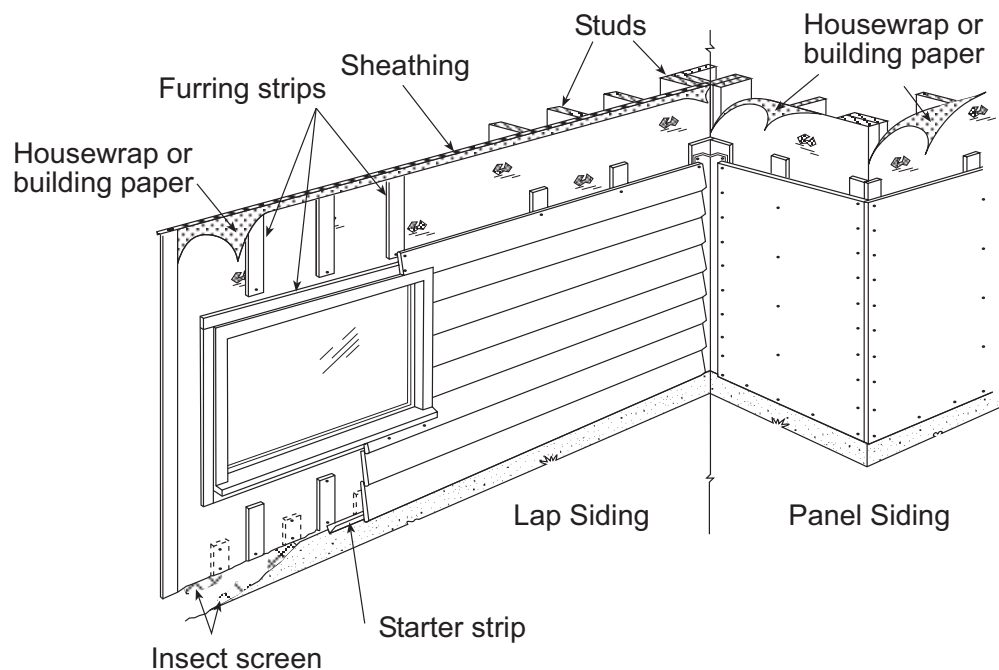


Figure 1. “Lap Siding/Panel Siding” board

4. Usage and Limitations

“Lap Siding/Panel Siding” are intended for use as exterior cladding applied over strapping to vertical walls made of masonry/concrete and wood or steel framing, in new and retrofit construction subject to the following conditions:

- “Lap Siding/Panel Siding” are permitted in the construction of buildings required to be of combustible or noncombustible construction in accordance with Articles 3.2.3.7. and 9.10.14.11. of the National Building Code of Canada 1995.

- At least one layer of wall sheathing membrane conforming to Article 9.23.17.1. of the NBC 1995 must be applied beneath the “Lap Siding/Panel Siding.” The sheathing membrane must be installed in accordance with Subsection 9.23.17. of the NBC 1995.
- The “Lap Siding/Panel Siding” shall be installed over strapping in conformance with Articles 9.27.5.3., “Furring”; 9.27.5.4., “Size and Spacing of Fasteners”, 9.27.5.7., “Penetration of Fasteners, and in accordance with the manufacturer’s current instructions.” The air space between the sheathing membrane and the “Lap Siding/Panel Siding” that is created as a result of the furring strips under the siding planks and panels shall remain unobstructed and drained to the outside.

Note: The possibility of moisture accumulation within the wall construction is mainly a function of the level of workmanship related to the elements constituting the cladding and first and second lines of defense such as wall sheathing membrane, flashing, caulking and attachment of siding. A high level of quality control, at all stages of the exterior wall construction is imperative for obtaining an acceptable performance.

- The installation of the “Lap Siding/Panel Siding” must meet the requirements of the NBC 1995, Subsection 9.27.3., Flashing and Subsection 9.27.4., Caulking.
- “Lap Siding/Panel Siding” must be used in conjunction with materials conforming to Subsections 9.23.17. Wall Sheathing Membrane, 9.27.3., Flashing, 9.27.4., Caulking, and 9.27.5., Attachment of Cladding.

- The requirements of the NBC 1995, Subsection 9.10.15. for Fire Stops in Concealed Spaces, shall be respected.
- The installation of “Lap Siding” shall be limited to geographical areas where the wind design value is $Q_{10} < 0.80$ kPa (to be installed with a face nail configuration) or $Q_{10} < 0.60$ kPa (to be installed in a blind nail configuration).

The installation of “Panel Siding” shall be limited to geographical areas where the wind design value is $Q_{10} < 0.80$ kPa.

For applications over concrete, or masonry, the wind design value corresponding to the type and size of fasteners recommended by the manufacturer shall be determined by a professional engineer skilled in structural design and licensed to practice under the appropriate provincial or territorial legislation.

- This evaluation covers textured, primed or unpainted products. Low permeance coatings may affect the drying potential of the product.
- This Evaluation Report is applicable only to products identified with: “CCMC # 12987-R.”

5. Performance

Testing and assessments were conducted by independent laboratories recognized by the Canadian Construction Materials Centre.

The results of testing the “Lap Siding/Panel Siding” are summarized in Tables 1, 2, 3(a), 3(b) and 3(c).

Table 1. Test Results for physical properties of “Lap Siding/Panel Siding”

Property	Requirements	Results
Dimensional Tolerance		
Lap Siding		
Length (mm)	± 3.0	0
Width (mm)	± 3.0	0
Thickness Tolerance (mm)	± 1.6	0.1
Squareness (mm/m)	± 4.0	0
Panel Siding		
Length (mm)	± 3.0	0.5
Width (mm)	± 3.0	0
Thickness Tolerance (mm)	± 1.6	0.3
Squareness (mm/m)	± 4.0	1.6
Water Absorption (%) (by mass)	≤ 40	27.41
Density (kg/m ³)	≥ 950	1453.5
Dimensional Change at 50 - 90% RH (%)	< 0.20	MD 0.10 XD 0.19
Flexural Strength (MPa)	7.0 (tested in wet condition)	MD 21.62 XD 12.53
Fastener Pull Resistance (N)	28 Z ⁽¹⁾	1482
Freeze-Thaw Cycling (100 cycles as per ASTM C 666-92, Method B)	Loss of mass <3% & Loss in flexural strength < 45%	Passed MD 40 XD 30
Watertightness	No formation of drops of water on underside	Passed
Warm Water Resistance	No visible cracks & Reduction in flexural strength < 45%	Passed MD 27 (Loss) XD 11 (Gain)
Rain Penetration Resistance	Prevent water entry into the innermost face of the wall	Passed

⁽¹⁾ Z is the board thickness in millimetres.

Table 2. Test Results for Impact Resistance

Impact Body	Dynamic Mass (kg)	Energy (N·m)	Result
<u>Safety Impact</u>			
Large Soft	50	100	Passed
Hard	1	10	Passed*
<u>Retention of Performance Impact</u>			
Large Soft	50	34	Passed
Small Soft	3	60	Passed
Hard	1	10	Passed**

Table 3 (a) Test Results for Wind Load Resistance (Lap Siding) Face-Nailed

Positive/Negative Pressure (Pa)	Deflection Point				
	1*	2	3	4	5
Sustained Loads	Deflection (mm)				
100	0.0/0.0	0.0/0.0	0.0/0.0	0.0/0.0	0.5/0.7
200	0.0/0.0	0.0/0.0	0.0/0.0	0.0/0.0	1.1/1.3
300	0.0/0.0	0.1/0.1	0.0/0.0	0.1/0.0	1.8/2.0
400	0.0/0.0	0.1/0.1	0.0/0.0	0.1/0.0	2.4/2.9
500	0.0/0.1	0.10/0.10	0.03/0.03	0.19/0.05	3.99/3.66
600	0.0/0.1	0.1/0.1	0.1/0.1	0.2/0.1	4.5/4.6
700	0.0/0.1	0.2/0.1	0.0/0.0	0.2/0.1	4.9/5.4
800	0.0/0.1	0.2/0.2	0.0/0.0	0.3/0.2	5.7/6.1
15 min. @ 800 Pa	0.0/0.0	0.2/0.2	0.0/0.0	0.3/0.2	5.9/6.4
30 min. @ 800 Pa	0.0/0.0	0.2/0.2	0.1/0.0	0.3/0.2	6.3/6.5
45 min. @ 800Pa	0.1/0.0	0.2/0.2	0.1/0.0	0.3/0.2	6.4/6.6
60 min. @ 800 Pa	NM**/0.0	NM/0.2	NM/0.0	NM/0.2	NM/6.6
Residual Deflection	0.0/0.0	0.1/0.0	0.0/0.0	0.0	1.1/0.7
Cyclic Loads 2000 cycles @ 1060	Passed	Passed	Passed	Passed	Passed

* Gauge 1, and 3 are located at mid section at the right and left side of the wall specimen, gauges 2 and 4 are located at bottom and top of specimen, gauge five is located at the centre of the specimen.

NM** Not measured

Note: The test was conducted on a wall assembly consisting of 50 mm x 100 mm (2" x 4") studs, @ 400 mm (16") on centre with 11 mm OSB sheathing covered with Tyvek Homewrap. The siding was pneumatically nailed to the wall with #6 by 50 mm (2") nails. This description applies as well to the results of table 3(b) and 3(c).

Note: Safety Positive Gust @ 1600 Pa with max. deflection of 12.54 mm
 Safety Negative Gust @ 1600 Pa with max. deflection of 10.58 mm
 Max. positive deflection at 3.3 times Q_{10} wind pressure (2640 Pa) is 20.15 mm
 Max. negative deflection @ 3.3 times Q_{10} wind pressure (2640 Pa) is 18.87 mm

Table 3 (b) Test Results for Wind Load Resistance (Lap Siding) Blind-Nailed

Positive/Negative Pressure (Pa)	Deflection Point				
	1	2	3	4	5
Sustained Loads	Deflection (mm)				
100	0.2/-0.2	0.0/0.1	0.1/-0.1	0.0/0.0	0.6/-0.6
200	0.5/-0.5	0.1/0.1	0.2/-0.2	0.0/0.0	0.9/-1.1
300	0.6/-0.8	0.1/0.0	0.28/-0.3	0.1/0.0	1.5/-1.6
400	0.7/-1.1	0.1/0.0	0.4/-0.5	0.1/-0.0	1.8/-2.1
500	0.9/-0.1	0.2/-0.0	0.4/-0.6	0.1/-0.0	2.1/-2.7
600	0.9/-1.7	0.2/-0.0	0.5/-0.7	0.18/-0.0	2.6/-3.3
700	0.9/-2.0	0.3/-0.0	0.6/-0.9	0.2/-0.1	2.9/-3.8
800	1.0/-2.3	0.3/-0.1	0.7/-1.0	0.3/-0.1	3.4/3.9
15 min. @ 800 Pa	1.0/-2.4	0.4/-0.0	0.7/-1.0	0.3/-0.0	3.4/-3.9
30 min. @ 800 Pa	1.1/-2.5	0.3/0.0	0.7/-1.0	0.4/-0.1	3.6/-3.9
45 min. @ 800Pa	1.1/-2.5	0.4/0.0	0.7/-1.0	0.4/-0.1	3.6/-3.9
60 min. @ 800 Pa	1.1/-2.5	0.5/0.0	0.7/-1.0	0.4/-0.1	3.5/-3.9
Residual Deflection	0.3/-0.6	0.3/-0.0	0.2/-0.3	0.1/-0.0	0.4/0.9
Cyclic Loads 2000 cycles @ 1060	Passed	Passed	Passed	Passed	Passed

Note: Cycling Test: 2000 cycles, positive and negative direction @ 1060 Pa with no permanent damage
 Safety Positive Gust @ 1600 Pa with max. deflection of 12.9 mm
 Safety Negative Gust @ 1600 Pa with max. deflection of 12.3 mm
 At 3.3 times Q_{10} positive wind pressure (2640 Pa), nail pull through (failure)
 At 3.3 times Q_{10} negative wind pressure (2640 Pa), nail pull through (failure)

Table 3 (c) Test Results for Wind Load Resistance (Panel siding)

Positive/Negative Pressure (Pa)	Deflection Point					
	1	2	3	4	5	6
Sustained Loads	Deflection (mm)					
100	-0.1/0.1	0.0/0.0	-0.0/0.0	0.5/0.4	0.6/0.4	-0.0/0.0
200	-0.1/0.1	0.1/0.0	-0.1/0.0	1.0/1.1	0.9/1.0	-0.1/0.0
300	-0.2/0.2	0.1/0.0	-0.1/0.0	1.6/1.7	1.3/1.6	-0.1/0.1
400	-0.2/0.3	0.1/0.1	-0.1/0.0	2.2/2.3	1.8/2.2	-0.1/0.1
500	-0.3/0.3	0.1/0.1	-0.1/0.0	2.9/3.0	2.1/2.9	-0.1/0.2
600	-0.4/0.3	0.2/0.1	-0.1/0.0	3.6/3.5	2.6/3.34	-0.2/0.2
700	-0.4/0.4	0.2/0.1	-0.1/0.0	0.2/4.2	4.0/4.0	-0.2/0.2
800	-0.5/0.4	0.2/0.2	-0.1/0.0	0.3/5.0	4.8/4.8	-0.2/0.2

Table 3 (c) Test Results for Wind Load Resistance (Panel siding)

Positive/Negative Pressure (Pa)	Deflection Point					
	1	2	3	4	5	6
	Deflection (mm)					
15 min. @ 800 Pa	-0.5/0.4	0.2/0.2	-0.1/0.0	12.6/5.2	5.3/5.0	-0.2/0.2
30 min. @ 800 Pa	-0.5/0.4	0.3/0.2	-0.1/0.0	5.0/5.3	5.4/5.1	-0.2/0.2
45 min. @ 800Pa	-0.5/0.4	0.3/0.2	-0.1/0.0	5.0/5.4	5.4/5.1	-0.2/0.2
60 min. @ 800 Pa	-0.5/0.4	0.3/0.2	-0.1/0.0	5.1/5.4	5.4/5.2	-0.2/0.2
Residual Deflection	0.0	0.1/0.1	0.0	0.9/1.2	0.9/1.1	0.0/0.0
Cyclic Loads 2000 cycles @ 1060	Passed	Passed	Passed	Passed	Passed	Passed

Note: Safety Positive Gust @ 1600 Pa with max. deflection of 7.5 mm
 Safety Negative Gust @ 1600 Pa with max. deflection of 5.2 mm
 Max. positive deflection at 3.3 times Q_{10} wind pressure (2640 Pa) is 15.2 mm
 Max. negative deflection @ 3.3 times Q_{10} wind pressure (2640 Pa) is 16.2 mm

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Note: Readers are asked to refer to limitations imposed by NRC on the interpretation and use of this report. These limitations are included in the introduction to CCMC's Registry of Product Evaluations, of which this report is part.

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