



Evaluation Report CCMC 14366-R Nichiha Architectural Wall Panels

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1. Opinion

It is the opinion of the Canadian Construction Materials Centre (CCMC) that “Nichiha Architectural Wall Panels,” when used as an exterior cladding in accordance with the conditions and limitations stated in Section 3 of this Report, comply with the National Building Code (NBC) of Canada 2015:

- Clause 1.2.1.1.(1)(a) of Division A, as an acceptable solution from Division B:
 - Subsection 9.27.2., Required Protection from Precipitation
- 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:
 - Subsection 9.27.5., Attachment of Cladding
 - Subsection 9.27.9., Hardboard

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

2. Description

The products are cement-bonded particleboard composed primarily of hydraulic cement, other cementitious materials, fibrous wood particle, pigment and paint. The products are cast in moulds that produce different textures and then cured in an oven.

“Nichiha Architectural Wall Panels” are available in many different textures and styles, but are mainly available in two different sizes, “AWP-1818” and “AWP-3030.” “AWP-1818” is 1 818 mm in length, 455 mm in width and 16 mm, 18 mm or 21 mm in thickness. “AWP-3030” is 3 030 mm in length, 455 mm in width and 16 mm in thickness. Examples of “AWP-1818” and “AWP-3030” are shown in Figures 1 and 2, respectively. The cross-sections of “AWP-1818” and “AWP-3030” are shown in Figures 3 and 4, respectively.



Figure 1. "AWP-1818"



Figure 2. "AWP-3030"

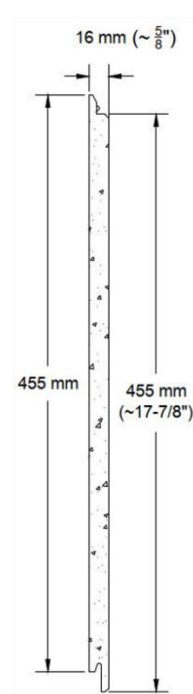


Figure 3.
"AWP-1818"
Cross section

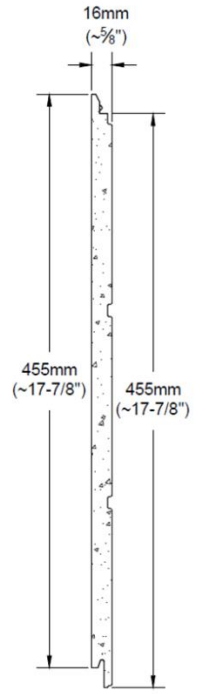


Figure 4.
"AWP-3030"
Cross section

The "Nichiha Architectural Wall Panel" products are mechanically attached to the supporting structure using metal clips and metal fasteners. The Nichiha metal starter track is attached to the bottom of the first row of "Nichiha Architectural Wall Panel" products. The metal clips are called "Ultimate Clip II" and engage the top and bottom edges of "Nichiha Architectural Wall Panel" products that are shiplapped. "Ultimate Clip II" is 660 mm long. The Nichiha metal clips are ZAM[®] (zinc-aluminum-magnesium alloy, Commercial Steel Type B, ASTM A 1046M, ZMM275, Type 1, chemically treated, non-oiled) coated steel, and the fasteners are minimum #10 pan head (head diameter 0.365") stainless steel wood screws. The clips are designed to create a 10-mm-deep drained and vented air space behind the cladding (i.e., a rainscreen system). Figures 5 and 6 illustrate a typical installation with clip layouts of "AWP-1818" and "AWP-3030", respectively. "AWP-3030" can also be installed vertically with the same clip ("Ultimate Clip II") as a horizontal installation.

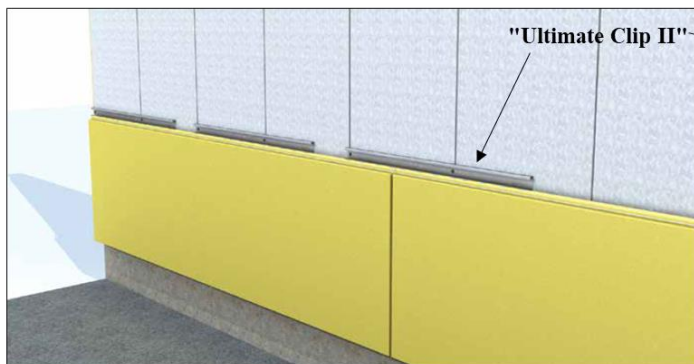


Figure 5. A typical installation with clip layout for "AWP-1818"



Figure 6. A typical installation with clip layout for "AWP-3030"

3. Conditions and Limitations

The CCMC compliance opinion in Section 1 is bound by "Nichiha Architectural Wall Panels" being used in accordance with the conditions and limitations set out below.

3.1 General

- The products are limited to be used as exterior cladding for the buildings falling within the scope of Part 9, Housing and Small Buildings, of Division B of the NBC 2015.
- The products are limited to use in new construction with either lightweight wood frame or steel frame as shown in Table 4.1.2.1.
- “AWP-1818” shall be installed horizontally.
- This Report covers the installation of the products limited to the geographical areas with the hourly wind pressures (HWP) shown in Table 4.1.2.1 and the respective fastening schedule to a wood or steel frame.
- The performance level shown in Table 4.1.2.1 represents installations limited to non-post-disaster buildings with a maximum building height of 12 m, 20 m or 40 m, depending on the geographical area and the respective HWP. The performance level in Table 4.1.2.1 for the building height of 20 m or 40 m is shown for information purposes only for use in the engineering design by a professional engineer.
- Buildings up to three storeys high (12 m) fall under the scope of Part 9 of Division B of the NBC 2015.
- Buildings higher than 12 m fall under the scope of Part 4, Structural Design, of Division B of the NBC 2015. In accordance with the NBC 2015, the engineering design shall be prepared by a professional engineer who is licensed to practice in Canada and has expertise in a relevant area.
- A clearance of not less than 200 mm shall be provided between finished ground and the product.
- At least one layer of wall sheathing membrane conforming to Article 9.27.3.2., Sheathing Membrane Material Standard, of Division B of the NBC 2015, shall be applied beneath the cladding products.
- Where no sheathing is used, at least two layers of sheathing membrane shall be applied beneath the cladding products in accordance with Article 9.27.3.5., Sheathing Membrane in lieu of Sheathing, of Division B of the NBC 2015.
- If sheathing is required as part of the structure of the wood-frame construction (e.g. braced walls), a proper second plane of protection shall be provided in accordance with Subsection 9.27.3., Second Plane of Protection, of Division B of the NBC 2015.
- Installation of the products shall meet the requirements of Article 9.27.3.7., Flashing Materials; Article 9.27.3.8., Flashing Installation; and Subsection 9.27.5., Attachment of Cladding, of Division B of the NBC 2015.
- Cladding attachments shall conform to Sentence 9.27.5.1.(1), Attachment (of Cladding), and Article 9.27.5.5., Fastener Materials, and Article 9.27.5.7., Penetration of Fasteners, of Division B of the NBC 2015.
- The 10-mm air space that is created by the metal clips shall remain unobstructed to form a clear drainage layer behind the products.
- The requirements of Article 9.10.16.1., Required Fire Blocks in Concealed Spaces, of Division B of the NBC 2015 shall be met.
- Fire blocks shall be installed in accordance with the requirements of Article 9.10.16.2., Required Fire Blocks in Wall Assemblies, of Division B of the NBC 2015.
- The attachment of the cladding shall conform to Table 4.1.2.1 of this Report.
- The products shall be installed in accordance with the manufacturer’s current installation instructions:
 - “Horizontal Installation Guide – October 2020” for horizontal installation of “AWP-1818” and “AWP-3030”, and
 - “Vertical Installation Guide – October 2020” for vertical installation of “AWP-3030.”
- The horizontal installation of “AWP 1818” and “AWP 3030” is limited to geographical areas depending on 1-in-50 HWP. Refer to Table 4.1.1.2. for the maximum HWP for each test assembly.
- The vertical installation of the “AWP 3030” is limited to geographical areas depending on 1-in-50 HWP. Refer to Table 4.1.1.2. for the maximum HWP for each test assembly.
- If the fastening schedules in the manufacturer’s installation instructions differ from those tested and reported in Table 4.1.2.1 of this Report, the ones in Table 4.1.2.1 supersede.
- The clips shall be ZAM® (zinc-aluminum-magnesium alloy, Commercial Steel Type B, ASTM A 1046M, ZMM275, Type 1, chemically treated, non-oiled) coated steel, and the fasteners shall be minimum #10 pan head (head diameter 0.365”) stainless steel wood screws.
- The products shall be applied in geographical areas where the spectral response acceleration $S_a(0.2)$ is 1.2 or less and the building is on a Class C site or better, as defined in Article 4.1.8.4., Site Properties, of Division B of the NBC 2015. For the geographical areas where the spectral response acceleration $S_a(0.2)$ is greater than 1.2, the pre-engineered designs have been developed. Please refer to Section 4.2 for more details.
- In the event of any damage resulting from impact, the cladding units shall be replaced immediately.
- To obtain acceptable performance, a high level of quality control at all stages of the exterior wall construction is imperative.

- This Evaluation Report is applicable only to products identified with “CCMC 14366-R.”

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 Requirements

4.1.1 Material Requirements

Table 4.1.1.1 Results of Testing the Prescriptive Requirements of “Nichiha Architectural Wall Panels”

| Property | | Unit | Requirement | Result |
|----------------------------------------------------------|------------------------------------------|---------------------------|---------------------------------------------------------------------|--------|
| Dimensional tolerances | length | mm | $\leq \pm 3$ | Pass |
| | width | mm | $\leq \pm 3$ | Pass |
| | thickness | mm | ≤ 1.6 | Pass |
| | squareness | mm/m | $\leq \pm 1.3$ | Pass |
| | edge straightness | mm/m | $\leq \pm 1.3$ | Pass |
| Density | | kg/m ³ | Report Value | 1 238 |
| Water absorption | | % | ≤ 40 | 17 |
| Flexural strength | equilibrium conditioning ⁽¹⁾ | MPa | > 7.0 | 12 |
| | wet conditioning ⁽²⁾ | MPa | > 7.0 | 10 |
| Dimensional change in length | 30% RH to 90% RH | % | < 0.20 | 0.05 |
| | 48 h immersion in water | % | < 0.20 | 0.10 |
| Water vapour permeance | desiccant method | ng/(Pa·s·m ²) | Report Value | 10 |
| | water method | ng/(Pa·s·m ²) | Report Value | 118 |
| Watertightness | | – | No drops of water | Pass |
| Warm water resistance ⁽³⁾ | loss in flexural strength ⁽⁴⁾ | % | ≤ 15 | 11 |
| | deleterious effects | – | No visible cracks or spalling | Pass |
| Freeze-thaw resistance (unidirectional) ⁽⁵⁾ | loss in mass | % | ≤ 3 | 0.3 |
| | deleterious effects | – | No visible deterioration such as delamination, spalling or cracking | None |
| Freeze-thaw resistance (multidirectional) ⁽⁶⁾ | loss in mass | % | ≤ 15 | 3 |
| | deleterious effects | – | No visible deterioration such as delamination, spalling or cracking | None |

Notes to Table 4.1.1.1:

- (1) The specimens were conditioned at $23 \pm 2^\circ\text{C}$ and $50 \pm 5\%$ RH for 4 days.
- (2) The specimens were immersed in water at $23 \pm 4^\circ\text{C}$ for 48 hours.
- (3) The specimens were immersed in water at $60 \pm 2^\circ\text{C}$ for 56 ± 2 days.
- (4) The flexural strength was conducted in cross-machine direction.
- (5) The specimens were exposed to 12 freeze-thaw cycles between 20°C and -20°C and another 12 freeze-thaw cycles between 20°C and -5°C .
- (6) The specimens were exposed to 50 freeze-thaw cycles between 20°C and -20°C .

4.1.2 Performance Requirements

Table 4.1.2.1 Results of Testing the Wind Load Resistance of the Products for Non-post-disaster Buildings

| Assembly ID ⁽¹⁾ | Product | Product Dimension, mm | Product Installation Orientation / Joint Alignment | Frame, mm | Sheathing | Stud Spacing, On Centre, mm | Number of Clips ⁽²⁾ | Fastener Spacing, mm | Fasteners / Fastened Substrate | Maximum Building Height ⁽³⁾ , m | Hourly Wind Pressure (HWP), Q ₅₀ , kPa |
|----------------------------|----------|-----------------------|----------------------------------------------------|---------------------------|---------------------------------------|-----------------------------|--------------------------------------------|----------------------|----------------------------------------|--------------------------------------------|---------------------------------------------------|
| 1 | AWP 1818 | 455 × 1 818 × 16 | Horizontal / Staggered at 914 mm | 41 × 92 (18-ga steel) | 11.1-mm oriented strandboard (OSB) | 406 | 2.5 clips per full panel length (1 818 mm) | 406 | #10 × 1-1/2" / on stud | 12 | Q ₅₀ < 1.00 |
| | | | | | | | | | | 20 | Q ₅₀ < 1.00 |
| | | | | | | | | | | 40 | Q ₅₀ < 0.45 |
| 2 | AWP 3030 | 455 × 3 030 × 16 | Horizontal / Aligned | 41 × 92 (18-ga steel) | 11.1-mm OSB | 406 | 4 clips per full panel length (3 030 mm) | 406 | #10 × 1-1/2" / on stud | 12 | Q ₅₀ < 1.00 |
| | | | | | | | | | | 20 | Q ₅₀ < 1.00 |
| | | | | | | | | | | 40 | Q ₅₀ < 0.45 |
| 3 | AWP 3030 | 455 × 3 030 × 16 | Horizontal / Aligned | 41 × 92 (18-ga steel) | 12.7-mm exterior gypsum board | 406 | 4 clips per full panel length (3 030 mm) | 406 | #10 × 1-1/2" / on stud | 12 | Q ₅₀ < 1.00 |
| | | | | | | | | | | 20 | Q ₅₀ < 1.00 |
| | | | | | | | | | | 40 | Q ₅₀ < 0.45 |
| 4 | AWP 3030 | 455 × 3 030 × 16 | Horizontal / Aligned | 41 × 92 (18-ga steel) | 12.7-mm exterior gypsum | 610 | 4 clips per full panel length (3 030 mm) | 610 | #10 × 1-1/2" / on stud | 12 | Q ₅₀ < 0.85 |
| | | | | | | | | | | 20 | Q ₅₀ < 0.85 |
| | | | | | | | | | | 40 | Q ₅₀ < 0.45 |
| 5 | AWP 3030 | 455 × 3 030 × 16 | Horizontal / Aligned | 41 × 92 (18-ga steel) | None | 406 | 4 clips per full panel length (3 030 mm) | 406 | #10 × 1-1/2" / on stud | 12 | Q ₅₀ < 0.85 |
| | | | | | | | | | | 20 | Q ₅₀ < 0.85 |
| | | | | | | | | | | 40 | Q ₅₀ < 0.45 |
| 6 | AWP 3030 | 455 × 3 030 × 16 | Horizontal / Aligned | 38 × 89 S-P-F No. 2 wood | 11.1-mm OSB | 406 | 4 clips per full panel length (3 030 mm) | 406 | #10 × 1-3/4" / on stud | 12 | Q ₅₀ < 1.00 |
| | | | | | | | | | | 20 | Q ₅₀ < 1.00 |
| | | | | | | | | | | 40 | Q ₅₀ < 0.45 |
| 7 | AWP 3030 | 455 × 3 030 × 16 | Horizontal / Aligned | 38 × 89 S-P-F No. 2 wood | 11.1-mm OSB + 12.7-mm exterior gypsum | 406 | 4 clips per full panel length (3 030 mm) | 406 | #10 × 2-1/4" / on stud | 12 | Q ₅₀ < 1.00 |
| | | | | | | | | | | 20 | Q ₅₀ < 1.00 |
| | | | | | | | | | | 40 | Q ₅₀ < 0.45 |
| 8 | AWP 3030 | 455 × 3 030 × 16 | Horizontal / Aligned | 38 × 140 S-P-F No. 2 wood | 11.1-mm OSB | 610 | 4 clips per full panel length (3 030 mm) | 165 ⁽⁴⁾ | #10 × 1-3/4" / on sheathing panel only | 12 | Q ₅₀ < 1.00 |
| | | | | | | | | | | 20 | Q ₅₀ < 1.00 |
| | | | | | | | | | | 40 | Q ₅₀ < 0.45 |
| 9 | AWP 3030 | 455 × 3 030 × 16 | Vertical / Aligned | 41 × 92 (18-ga steel) | 11.1-mm OSB | 406 | 4 clips per full panel length (3 030 mm) | 152 ⁽⁵⁾ | #10 × 1-3/4" / on sheathing panel only | 12 | Q ₅₀ < 1.00 |
| | | | | | | | | | | 20 | Q ₅₀ < 1.00 |
| | | | | | | | | | | 40 | Q ₅₀ < 0.45 |
| 10 | AWP 3030 | 455 × 3 030 × 16 | Vertical / Aligned | 41 × 92 (18-ga steel) | 12.7-mm exterior gypsum | 457 | 4 clips per full panel length (3 030 mm) | 406 | #10 × 1-1/2" / on stud | 12 | Q ₅₀ < 1.00 |
| | | | | | | | | | | 20 | Q ₅₀ < 1.00 |

| Assembly ID ⁽¹⁾ | Product | Product Dimension, mm | Product Installation Orientation / Joint Alignment | Frame, mm | Sheathing | Stud Spacing, On Centre, mm | Number of Clips ⁽²⁾ | Fastener Spacing, mm | Fasteners / Fastened Substrate | Maximum Building Height ⁽³⁾ , m | Hourly Wind Pressure (HWP), Q ₅₀ , kPa |
|----------------------------|----------|------------------------|----------------------------------------------------|-----------------------------------------------------------|-----------|-----------------------------|------------------------------------------------|----------------------|--------------------------------|--------------------------------------------|---------------------------------------------------|
| | | | | | | | | | | 40 | Q ₅₀ < 0.45 |
| 11 | AWP 3030 | 455 × 3 030 × 16 | Horizontal / Aligned | 41 × 92 (18-ga steel) with 18-ga steel z-girt | None | 406 | 4 clips per full panel length (3 030 mm) | 406 | #10 × 1-1/2" / on girt | 12 | Q ₅₀ < 1.00 |
| | | | | | | | | | | 20 | Q ₅₀ < 1.00 |
| | | | | | | | | | | 40 | Q ₅₀ < 0.45 |

Notes to Table 4.1.2.1:

- (1) Some of the assemblies and fastening schedules listed in the table are not covered by the manufacturer's installation instructions.
- (2) "Ultimate Clip II" is 660 mm long.
- (3) Buildings up to three storeys high (12 m) fall under the scope of Part 9 of Division B of the NBC 2015. Buildings higher than 12 m fall under the scope of Part 4 of Division B of the NBC 2015. In accordance with the NBC 2015, the engineering design shall be prepared by a professional engineer who is licensed to practice in Canada and has expertise in the relevant area.
- (4) Four screws were fastened per clip at 165 mm on centre (o.c.) along the clip through sheathing panel only. The fastening spacing between the last screw of a clip and the first screw of the next clip is 295 mm.
- (5) Four screws were fastened per clip at 152 mm o.c. through sheathing panel only.

Table 4.1.2.2 Deflection Measurements from Wind Load Resistance Test

| Assembly ID ⁽¹⁾ | Wind Pressure at Deflection Measurements ⁽²⁾ , Pa | Deflection Measurements ⁽³⁾ , mm | |
|----------------------------|--------------------------------------------------------------|---------------------------------------------|----------------------------------|
| | | Negative Pressure ⁽⁴⁾ | Positive Pressure ⁽⁵⁾ |
| 1 | 2 410 | 22.86 | 28.37 |
| 2 | 2 410 | 24.25 | 28.64 |
| 3 | 2 410 | 25.27 | 29.83 |
| 4 | 2 050 | 32.62 | 48.05 |
| 5 | 2 050 | 32.62 | 48.05 |
| 6 | 2 410 | 30.27 | 43.16 |
| 7 | 2 410 | 30.51 | 35.32 |
| 8 | 2 410 | 22.03 | 25.73 |
| 9 | 2 410 | 18.85 | 22.47 |
| 10 | 2 410 | 28.16 | 39.63 |
| 11 | 2 410 | 18.66 | 27.10 |

Notes to Table 4.1.2.2:

- (1) Assembly ID corresponds to that of Table 4.1.2.1.
- (2) Deflection measurement was taken at the gust wind pressure.
- (3) Maximum deflection values among 12 sensor locations
- (4) "Negative Pressure" denotes the positive wind load.
- (5) "Positive Pressure" denotes the negative wind load.

Table 4.1.2.3 Results of Testing the Impact Resistance of the Products

| Impact Body | | Requirements | | Results | |
|---------------------------------|------------|------------------|-------------|-------------------------------|-------------------------------|
| | | Dynamic Mass, kg | Energy, N·m | Assembly #6 ⁽¹⁾⁽²⁾ | Assembly #9 ⁽¹⁾⁽²⁾ |
| Safety impact | large soft | 50 | 100 | Pass | Pass |
| | hard | 1 | 10 | Pass | Pass |
| Retention of performance impact | large soft | 50 | 34 | Pass | Pass |
| | small soft | 3 | 60 | Pass | Pass ⁽³⁾ |
| | hard | 1 | 10 | Pass ⁽³⁾ | Pass ⁽³⁾ |

Notes to Table 4.1.2.3:

- (1) Assembly ID corresponds to that of Table 4.1.2.1.
- (2) Assemblies #6 and #9 were tested to demonstrate the impact resistance of the products in a typical installation.
- (3) Some cracks were observed with several specimens; however, the specimens retained their functional characteristics and overall appearance. In the event of any damage resulting from impact, the cladding units shall be replaced immediately.

4.2 Additional Performance Data

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

4.2.1 Fire Performance

Table 4.2.1.1 Results of Fire Performance Testing⁽¹⁾

| Property | Test Method | Results |
|-----------------------------------------------------|--------------|------------------------|
| Flame-spread rating (FSR) ⁽²⁾ | CAN/ULC-S102 | 0 |
| Smoke developed classification (SDC) ⁽²⁾ | | 10 |
| Flame-spread distance ⁽³⁾⁽⁴⁾ | CAN/ULC-S134 | 2.5 m |
| Heat flux ⁽³⁾⁽⁴⁾ | | 25.4 kW/m ² |

Notes to Table 4.2.1.1:

- (1) Refer to each test for details of the results.
- (2) Based on Intertek Test Report 103430554COQ-003K (issued July 8, 2019).
- (3) Based on NRC Test Report A1-007541.1 (issued October 14, 2015).
- (4) The test was performed on a back-up wall consisting of 16 mm Type X drywall, 51 mm × 102 mm wood studs and 16 mm plywood sheathing with 89 mm thick glass fibre insulation in the stud cavities.

4.2.2 Pre-engineered Design Solutions

The manufacturer has commissioned three (3) pre-engineered designs for a 3-storey multi-family building in a high seismic zone: La Malbaie, QC, $S_a(0.2) = 1.73$, a high wind zone: Cowley, AB, $q_{1/50} = 1.01$ kPa, and a high snow load: Whistler, B.C., $S_s = 9.5$ kPa. The engineering analysis was conducted by BOCA Engineering CO. Report No. 0066-5, dated August 29, 2019. Contact the manufacturer to obtain these pre-engineered building designs.

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