



NATIONAL BUILDING CODE OF CANADA ENGINEERING EVALUATION REPORT

Date | 2022-12-31
Report No. | 0080-1-4-5861
For | Nichiha USA, Inc.
Address | 6465 E. Johns Crossing, Suite 250, Johns Creek, GA 30097

Subject

Nichiha Fiber Cement - AWP Panel and Sierra/Savannah Lap Siding – Exterior Wall Cladding System

Evaluation Scope

This report is provided to assist registered design professionals and building officials in Canada with determining compliance to the performance objectives in the named building codes.

The material(s) and system(s) described herein have been evaluated to the 2020 National Building Code of Canada (NBCC), Division A, Sections 1.2.1.1.(1)(a) for compliance with the objectives and functional statements attributed to the applicable acceptable solutions in Division B, for buildings classified under Part 3/4/5 construction.

CSI DIVISION: 07 00 00 THERMAL AND MOISTURE PROTECTION
SUBDIVISION: 07 46 46 Fiber-Cement Siding

CODE SECTIONS AND STANDARDS:

NBCC Div. B Section	Description	Referenced Standard or Div. B Section ¹	Year
3.1.4.8	Exterior Cladding	3.1.5.5.(1)(b)	-
3.1.5.5²	Combustible Cladding on Exterior Walls	CAN/ULC-S134	2013
3.1.7.1	Determination of (Fire-Resistance) Ratings	CAN/ULC-S101	2014
3.1.12.1.(1)	Determination of (Flame-Spread and Smoke Developed Classification) Ratings	CAN/ULC-S102	2010
4.1.3.5	Limit States Design, Deflection	4.1.8.13	-
4.1.7.1.(5)	Wind Load, Exterior Cladding Strength Attachment	4.1.7.3	-
4.1.8.1.(11)	Earthquake Load and Effects, Analysis	4.1.8.2	-
4.1.8.13	Deflections and Drift Limits	4.1.8.11, 4.1.8.12	-
4.1.8.18.(10)	Elements of Structures, Non-structural Components	4.1.8.3.(6)	-
5.1.4.1	Resistance to Structural and Environmental Loads	5.2.1, 5.2.2, 4.1.3.5, 4.1.8	-
5.1.4.2	Resistance to Deterioration	-	-
5.2.1.3.(3)	Environmental (Wind) Load and Transfer Calculations	4.1.7	-
5.2.2.1	Determination of Structural Loads and Effects	Part 4	-
5.6.1.1	Required Protection from Precipitation	-	-
5.6.2.1	Sealing and Drainage	-	-



5.9.1.1.(1)(b)	Compliance with Applicable Standards	A-5.9.1.1.(1)	-
5.9.3.5²	Water Penetration	ASTM E331	2000
A-5.9.1.1.(1)	Selection of Materials and Components and Compliance with Referenced Standards	-	-
A-5.9.3.2.(1)	Structural and Environmental Loads	ASTM E330	2014

1. Only the applicable reference standards and code sections cited in the main body text are listed. (-) indicates that the main body text covers the full explanation of the objective.
2. AWP Panel models only. See this report Section 2 for further information.

COMPLIANCE STATEMENT:

It is the opinion of Boca Engineering Co. that Nichiha Fiber Cement AWP Panel and Sierra/Savannah Lap Siding Cladding System when installed as described in this report, has demonstrated compliance with the listed sections of the 2020 National Building Code of Canada. Design and performance information can be found in the Product Evaluation section this report.

This report has been prepared and reviewed on behalf of Boca Engineering Co. by:

Christopher Bowness, P.Eng., P.E.

2022-12-31

Date



PRODUCT EVALUATION _____ **Pg. 3 - 8**

ATTACHMENTS:

1. Materials Properties per ASTM C1186 _____ Pg. 9 - 10
2. Wind Load Assembly Design Tables _____ Pg. 11 - 12
3. Diagrams of Cladding Components and Typical Installations _____ Pg. 13 - 18
4. Discussion of Limit States Design Procedure _____ Pg. 19

EVALUATION REPORT TERMS:

1. This report is a general evaluation of the building code section requirements as identified and applies only to the samples that were evaluated. It does not imply any endorsement or warranty, nor that the signatory Engineer is the Designer of Record of any construction project for which the information is used.
2. This Evaluation Report expires Dec. 31, 2023, open to renewal. Up to the renewal date, the report is valid until such time as the named product(s) changes, the Quality Assurance Agency changes, or provisions of the Code that relate to the product change.

CERTIFICATION OF INDEPENDENCE:

1. Boca Engineering Co., it's employees and shareholders, do not have, nor do they intend to or will acquire, a financial interest in any company manufacturing or distributing products that they evaluate.
2. Boca Engineering Co. is not owned, operated or controlled by any company manufacturing or distributing products that they evaluate.



Product Evaluation

1.0 PRODUCT DESCRIPTION:

Nichiha exterior wall claddings are Fiber-cement panels manufactured from a pressed, stamped, and autoclaved mix of Portland cement, fly ash, silica, recycled rejects, and wood fiber bundles. The surface is pre-finished with a variety of colours and textures. Cladding panels and planks are installed on the exterior of buildings.

1.1 AWP PANELS

1.1.1 The AWP series panels are installed using corrosion-resistant metal clips supplied as part of the system, fastened to framing providing a 10 mm air-space between the cladding and wall sheathing.

AWP PANEL SIDING WITH CORROSION-RESISTANT CHANNEL FASTENING CLIPS:

Dimension	Model Name	
	AWP 1818	AWP 3030
Height	455 mm	455 mm
Length	1818 mm	3030 mm
Thickness	16, 18, 21 mm	16 mm
Panel Orientation	Horizontal	Horizontal or Vertical

1.1.2 AWP INSTALLATION COMPONENTS SUPPLIED BY NICHIIHA

Ultimate Clip System:

1. Starter Track: FA 700 (10mm rainscreen) – 10' (3030mm) (I) galvalume coated steel.
2. Panel Clips: JEL 778 "Ultimate Clip II" (10mm rainscreen for most AWP) – Zinc-Aluminum-Magnesium alloy coated steel.
 - a. JEL788 "Ultimate Clip II" (10mm rainscreen for SandStone and VintageBrick only) - Zinc-Aluminum-Magnesium alloy coated steel.
 - b. Joint Tab Attachments (included) – used at all AWP 1818 panel to panel vertical joints.
3. Corner Clips: JE 777C (10mm rainscreen for most AWP Manufactured Corners) -- Zinc-Aluminum-Magnesium alloy coated steel.
 - a. Corner Clips: JE 787C (10mm rainscreen for SandStone and VintageBrick Manufactured Corners only) -- Zinc-Aluminum-Magnesium alloy coated steel.
4. Single Flange Sealant Backer – FHK 1015 R (10mm) – 6.5' (I) fluorine coated galvalume.
5. Double Flange Sealant Backer – FH 1015 R (10mm) – 10' (I) fluorine coated galvalume.
6. Corrugated Spacer – FS 1005 (5mm), FS 1010 (10mm) – 4' (I).

1.2 SIERRA & SAVANNAH LAP SIDING

Lap siding are plank boards installed horizontally, overlapping, and fastened against sheathing to the wall framing, which may include vertical wood straps to form a 10 mm airspace between the cladding and wall sheathing.



PLANK LAP SIDING:

Dimension	Model Name	
	Sierra Shake	Savannah Smooth
Height	225 mm	159, 186, 210 mm
Length	2845 mm	2845 mm
Thickness	12 mm	12 mm
Overlap	32 mm	32 mm

Lap siding planks are installed with the long dimension oriented horizontally.

1.3 MATERIAL PROPERTIES:

The materials properties of AWP Panel and Sierra/Savannah Lap Siding as per ASTM C1186, *Standard Specification for Flat Fiber-Cement Sheets*, are provided in Attachment 1 of this report.

2.0 INSTALLATION:

The cladding system as described in Section 1 is to be installed on to Code-compliant building exterior structural wall framing and sheathing with a water-resistive barrier.

Nichiha USA published installation instructions are available online at:

- <https://www.nichiha.com/docs/Nichiha-Install-Guide-AWP-Horizontal-English.pdf>
- <https://www.nichiha.com/docs/Nichiha-Install-Guide-AWP-Vertical-English.pdf>
- <https://www.nichiha.com/docs/Nichiha-Install-Guide-Savannah-Sierra.pdf>

Manufacturer's installation instructions, building code, and additional details in this report are to be followed.

3.0 CODE SECTIONS REVIEW:

NBCC Div. B Section

Description

3.1.4.8

Exterior Cladding

Specific AWP Panel horizontal applications conform to article 3.1.4.8.(1)(b). See this report comments to NBCC 3.1.5.5.

3.1.5.5

Combustible Cladding on Exterior Walls

Allows for combustible cladding on buildings required to be of non-combustible construction when tested to CAN/ULC S134 conforming to the conditions of acceptance listed in this clause. AWP Panels with a specific wall framing construction assembly detail have been tested to and comply with this code section. Designers and AHJ's should request to Nichiha and obtain a copy of Boca Engineering report 0066-3 and the ULC S134 test report document cited in Section 9 of this report for reference in determining correct detailing for application of testing results in the field. AWP Panel installations where details are not in accordance with the CAN/ULC S134 tested assembly are only suitable for combustible construction applications under Article 3.1.4. Sierra & Savannah Lap Siding has not been evaluated for non-combustible construction, and are only suitable for combustible construction applications under Article 3.1.4.

3.1.7.1

Determination of (Fire-Resistance) Ratings



3.1.12.1.(1) Determination of (Flame-Spread and Smoke Developed Classification) Ratings

See section 5 of this report.

4.1.3.5 Limit States Design, Deflection

Structural testing and engineering studies of wall assemblies with AWP Panel and Sierra/Savannah Lap Siding has been conducted and reported in Boca Engineering report 0066-5 and 0089-1. It is found that when installed in accordance with the manufacturer's instructions and tested assembly details listed in Tables 3-6 of this report, for storey heights up to 3.28 m (10 ft), with building frames structurally designed to Part 4, that the cladding materials do not become damaged or dislodged under these limitations:

- i) in-plane story drift under lateral loading (wind or seismic), up to a recommended seismic design lateral inelastic storey drift maximum of 41 mm (1.6-inch), and,
- ii) out of plane lateral load (wind) wall bending of $L/180$ [18 mm (3/4-inch)], and,
- iii) vertical frame movements, most prominently recognized in wood-framing due to thermal and moisture expansion and contraction, of up to 18 mm (3/4-inch). AWP Panels require expansion joints at each storey to accommodate this vertical movement.

4.1.7.1.(5) Wind Load, Exterior Cladding Strength Attachment

See wind load assembly performance in Attachment 2 of this report, developed following the design methods of NBCC 4.1.7.1.(5).

4.1.8.1.(11) Earthquake Load and Effects, Analysis

See this report comments to NBCC 4.1.3.5.

4.1.8.13 Deflections and Drift Limits

See this report comments to NBCC 4.1.3.5.

4.1.8.18.(10) Elements of Structures, Non-structural Components

It is found that AWP Panel and Sierra/Savannah Lap Siding cladding systems, when installed in accordance with the manufacturer's instructions, do not transfer unaccounted for forces to the primary structure during seismic loading.

The design dead weight of the cladding system components may be taken as AWP: 0.5 kN/m^2 , Sierra/Savannah: 0.3 kN/m^2 , of wall surface area.

5.1.4.1 Resistance to Structural and Environmental Loads

The contents of this evaluation report cover the intent of demonstrating compliance to this article.

5.1.4.2 Resistance to Deterioration

The AWP Panel attachment clip with ZAM coating was tested to ASTM B117 for 2000 hrs of salt spray exposure and found to have equivalent corrosion protection as to what is required by CSA A370-14 Section 5.2.4, Level 3 Corrosion Protection, which provides for acceptable durability in all climate regions of NBCC Div B App C.

The nails or screws as sourced by installers for fastening AWP Panel and Sierra/Savannah Lap Siding must be corrosion resistant and comply with the specifications of the manufacturer's installation instructions and Code.

AWP Panel and Sierra/Savannah Lap Siding have been tested for accelerated exposure to freezing-



thawing, heat-rain, and water soaking, in accordance with and complying with material specification ASTM C1186. See materials properties information in Attachment 1 of this report.

5.2.1.3.(3) Environmental (Wind) Load and Transfer Calculations

The wind load calculations in this report conform to NBCC article 4.1.7.

5.2.2.1 Determination of Structural Loads and Effects

A structural testing and design evaluation was conducted by introducing model design input loads to reach maximum acceptable deflection limits for determining the response of the cladding system when installed on building framing designed to Part 4. Boca Engineering report 0066-5 found that when considering all climatic conditions and loading conditions listed in this article, AWP Panel and Sierra/Savannah Lap Siding do not adversely affect the building framing to where the building framing and cladding will perform as intended to the requirements of the NBCC.

Design wind load limitations are provided in Attachment 2 of this report.

5.6.1.1 Required Protection from Precipitation

The AWP Panel and Sierra/Savannah Lap Siding cladding systems' primary function satisfies this article. See further information in this report comments to NBCC 5.6.2.1.

5.6.2.1 Sealing and Drainage

The AWP Panel and Sierra/Savannah Lap Siding cladding systems, when installed with joint sealants per manufacturer's instructions, generally satisfy article 5.6.2.1.(1)(a).

Where design conditions require a first and second plane of protection with capillary break of the building exterior (commonly known as "rainscreen"), with a drainage plane to satisfy 5.6.2.1.(1)(b);

- i. AWP Panel cladding system is attached with corrosion resistant metal channels that create a 10mm airspace between the back of the cladding panel and the front of the wall sheathing, which provides for a drainage plane.
 - AWP Horizontal clips (AWP 3030 and AWP 1818) are spaced 3-4-in. apart and the clips have ¼-in. weep holes at the top and bottom of the channel spaced at nominal 2.75-in. along the length. The clip spacing and weep holes provide for vertically directed water drainage paths and water vapour evacuation within the drainage plane.
 - AWP Vertical clips (AWP 3030 only) are oriented in the vertical direction and spaced 18-in. apart. The starter track oriented horizontally have ¼-in. weep holes at the top and bottom of the channel spaced at nominal 2.75-in. along the length. The clip spacing and weep holes provide for vertically directed water drainage paths and water vapour evacuation within the drainage plane.
- ii. Sierra/Savannah Lap Siding may be installed over pressure-treated 3/8-in. (10mm) vertical plywood straps @ 8" o/c to create a drainage plane.

Guidance of environmental conditions (moisture index) where prescriptive cladding installations require a second plane of protection with capillary break is given in NBCC Div B, article 9.27.2.2.(5).

5.9.1.1.(1)(b) Compliance with Applicable Standards

See this report comments to NBCC A-5.9.1.1.(1).

5.9.3.5 Water Penetration

The AWP panel system has been tested to and found to meet the requirements of the ASTM E331



water penetration test at 0.3 kPa (6.24 psf) and 0.577 kPa (12 psf) that is cited in this article. AWP has also been tested for and meets the requirements of heat/rain cycling in ASTM C1186. Sierra/Savannah Lap Siding has been tested for and meets the requirements of heat/rain cycling in ASTM C1186.

A-5.9.1.1.(1) Selection of Materials and Components and Compliance with Referenced Standards

This article provides guidance for the applicability of the use of the international standard ASTM C1186 for determining compliance to the performance requirements of Part 5. Article A-5.9.1.1.(1) reads: *“It is important to note that Sentence 5.9.1.1.(1) is stated in such a way that the selection of materials and components is not limited to those traditionally recognized as serving particular functions or those for which a standard is identified in Table 5.9.1.1. This approach permits more flexibility than is provided by similar requirements in Part 9. As long as the selected material meets the performance requirements stated elsewhere in Part 5, the material may be used to serve the required function.”*

A-5.9.3.2.(1) Structural and Environmental Loads

This article states that the applicable laboratory test method for demonstrating adequate structural performance of fenestration (cladding) assemblies is ASTM E330, which is the test method that was used to determine the wind pressure performance of the cladding systems.

4.0 LIMITATIONS:

1. This Evaluation is for the base code requirements of the building system as addressed in this report. In some building applications, additional performance objectives may be required by Code which must be addressed in the building design for those specific cases.
2. Design calculations, drawings, and special inspections are to be furnished for building projects by registered professionals as required by the respective jurisdictional authorities and Codes.
3. The conclusions made of cladding performance and code compliance of applications are limited to:
 - i. the loading and deflection criterion as stated in this report, and,
 - ii. use with only the substrate materials of framing and wall sheathing that the cladding is attached to as detailed in the wind load tables in this report, and,
 - iii. AWP Panel installations on building heights no greater than 30 m (100 ft), and,
 - iv. Sierra and Savannah lap siding installation on building heights no greater than 20 m (65 ft).
4. Wall framing and sheathing to which the cladding is attached must be designed and installed for the applicable wind pressure and other climate and occupancy loads as required by Code for the construction project. Where framing and sheathing details are provided in this report, they are representing the minimum tested or calculated materials for the required strength of attachment for the wall cladding. The wall framing structural design and performance is outside the scope of this report.
5. Wall assemblies must be constructed with water-resistive barrier per NBCC to achieve wall assembly water-resistance performance standards as stated in this report.

5.0 FIRE CLASSIFICATIONS:

Summary of fire performance classifications found by testing to code referenced standards:

Combustible: AWP Panel and Sierra/Savannah Lap Siding are a *combustible* material as defined in NBCC Div A 1.4.1.2.

CAN/ULC S134: Meets conditions of NBCC 3.1.5.5 with specific detailing (AWP Horizontal panels only).

CAN/ULC S101: Acceptable as exterior cladding to not adversely affect any bearing or non-bearing 1-hr rated wall qualified by the methods of NBCC Part 3 or Part 9 (All products).



CAN/ULC S101: Acceptable as exterior cladding to not adversely affect any bearing or non-bearing 1-hr rated wall qualified by the methods of NBCC Part 3 or Part 9 (All products).

CAN/ULC S102: Flame Spread Index (FSI): 0, Smoke Developed Index (SDI): 10 (All products).

More detailed information about the fire testing and code analysis in Boca Engineering report 0066-3.

6.0 QUALITY ASSURANCE ENTITY:

The products evaluated in this report are surveyed at the approved manufacturing locations with third-party quality assurance inspections and product certification labeling by Intertek.

7.0 MANUFACTURING PLANTS:

The manufacturing plants of cladding materials covered in this evaluation report are located in:

Japan (JPN): Iwaki, Fukushima, JPN; Handa-shi, Aichiken, JPN; Nagoya, Aichi, JPN; Narashino, Chiba, JPN; Shimonoseki, Yamaguchi, JPN. Macon, GA, USA.

8.0 LABELING:

Labeling shall be in accordance with the requirements of and bear the certification mark of the Accredited Quality Assurance Agency.

9.0 REFERENCE TESTING AND EVALUATION DOCUMENTS:

Entity	Entity Accreditation ¹	Standards	Report No.	Issue Date
National Research Council	Footnote 2	CAN/ULC-S134	A1-007541.1	2015-Oct-14
Southwest Research Institute	IAS TL-214	ASTM E119	01.23723.01.001	2018-Jul-24
Intertek	SCC Lab No. 54	CAN/ULC-S102	103430554COQ-003K	2019-Jul-08
Fenestration Testing (FTL)	A2LA 3308-02	ASTM E331	12-4127	2012-Oct-15
Intertek	SCC Lab No. 54	ASTM E330	103430554COQ-003J	2020-Jan-06
Intertek	IAS TL-274	ASTM C1185/1186	103430554COQ-003J	2020-Jan-06
Progressive Engineering	IAS TL-178	ASTM C1185/1186	2015-475 (A)	2015-Oct-06
Progressive Engineering	IAS TL-178	ASTM C1185/1186	2016-1872 (G)	2017-May-30
Intertek	SCC Lab No. 54	ASTM B117	103430554COQ-008	2019-May-10
Boca Engineering	Footnote 3	Structural Evaluation	0066-5	2019-Aug-29
Boca Engineering	Footnote 3	Fire Test Evaluation	0066-3-5	2022-Dec-31
Boca Engineering	Footnote 4	Seismic Evaluation	0089-1-3	2022-Dec-31
Intertek	SCC Lab No. 54	ASTM C1186	104715592COQ-010C	2022-Apr-12
Intertek	SCC Lab No. 54	ASTM C1186	104715592COQ-018	2022-Mar-18
Intertek	SCC Lab No. 54	ASTM E84-21A	104625424COQ-002 R0	2022-Apr-11
Intertek	IAS AA-647	Quality Assurance	Spec ID: 45957	2022-Dec-31

1. Testing, certification, evaluation, and inspection agencies referenced have been verified to be accredited by Standards Council of Canada (www.scc.ca), A2LA (www.a2la.org) or International Accreditation Service (www.iasonline.org) for the applicable scope, in good standing on the date of the evaluation, in accordance with ISO 17025 and ISO 17020 international standards for testing and inspection bodies.
2. Federal government laboratory.
3. Professional Engineer sealed report, B.C. P.Eng. License No. 29146.
4. Professional Engineer sealed report, WA P.E. License No. 50363.



ATTACHMENT 1: MATERIAL PROPERTIES

TABLE 1: AWP Panel Siding: ASTM C1186 Materials Properties				
Property	Direction	Requirement	Result	Conformance
Flexural Strength	Dry	≥ 10 MPa	12 MPa	Pass
	Wet	≥ 7 MPa	10 MPa	Pass
Density	-	Report value	1238 kg/m ³	Pass
Dimensional Tolerances	Length	+/- 6 mm of specified	2 mm	Pass
	Width	+/- 6 mm of specified	0 mm	Pass
	Thickness	+/- 1.5 mm of specified	-0.5 mm	Pass
	Squareness	≤ 2.6 mm/m length	0.0 mm/m	Pass
	Edge Straightness	≤ 2.6 mm/m length	0.0 mm/m	Pass
Moisture Movement	Machine Direction	Report value of linear change % over range of 30-90% RH	0.05%	Pass
	Cross Direction		0.05%	Pass
Water Absorption	-	Report value of weight % increase after 48-hr water immersion	17%	Pass
Moisture Content	-	Report value	7.1%	Pass
Water Tightness	-	Shall not form water droplets on underside	No formation of water drops	Pass
Surface Burning Characteristics	-	Report value	ULC S102 test performed in substitution of ASTM version. See section 5 of this report.	
Frost Resistance (Freeze-Thaw)	-	Retain 80% of strength after 50 freeze-thaw cycles	80% Retention	Pass
Warm Water Resistance	Composition	Show no visible cracks or structural alteration	No visible cracks or spalling	Pass
	Machine Direction	Report % strength loss/gain after 56-day warm water immersion	+7%	Pass
	Cross Direction		-11%	Pass
Heat/Rain Resistance	-	Report any cracks or structural alteration after 25 cycles heat/rain	No visible signs of cracking, discoloration, or structural change	Pass



TABLE 2: Sierra/Savannah Lap Siding: ASTM C1186 Materials Properties

Property	Direction	Requirement	Result	Conformance
Flexural Strength	Dry	≥ 10 MPa	12 MPa	Pass
	Wet	≥ 7 MPa	9 MPa	Pass
Density	-	Report value	1256 kg/m ³	Pass
Dimensional Tolerances	Length	+/- 6 mm of specified	0 mm	Pass
	Width	+/- 6 mm of specified	0 mm	Pass
	Thickness	+/- 1.5 mm of specified	0.5 mm	Pass
	Squareness	≤ 2.6 mm/m length	0.0 mm/m	Pass
	Edge Straightness	≤ 2.6 mm/m length	0.0 mm/m	Pass
Moisture Movement	Machine Direction	Report value of linear change % over range of 30-90% RH	0.16%	Pass
	Cross Direction		0.06%	Pass
Water Absorption	-	Report value of weight % increase after 48-hr water immersion	14%	Pass
Moisture Content	-	Report value	5.25%	Pass
Water Tightness	-	Shall not form water droplets on underside	No formation of water drops	Pass
Surface Burning Characteristics	-	Report value	ULC S102 test performed in substitution of ASTM version. See section 5 of this report.	
Frost Resistance (Freeze-Thaw)	-	Retain 80% of strength after 50 freeze-thaw cycles	81% Retention	Pass
Warm Water Resistance	Composition	Show no visible cracks or structural alteration	No visible cracks or spalling	Pass
	Machine Direction	Report % strength loss/gain after 56-day warm water immersion	-10%	Pass
	Cross Direction		+4%	Pass
Heat/Rain Resistance	-	Report any cracks or structural alteration after 25 cycles heat/rain	No visible signs of cracking, discoloration, or structural change	Pass



ATTACHMENT 2: ASSEMBLY WIND LOAD VALUES

TABLE 3: AWP 3030 Horizontal Panel Siding Configurations for Wind Loads						Maximum Reference Velocity Pressure q $1/50 \leq$ (kPa) ^{6,7} Deflection limit of L/180, Max. 10 ft (3.28 m) Wall Height									
FRAMING ¹	SHEATHING ²	STUDS SPACED @	FASTENER SPECIFICATION ³ & SPACING	FASTENER SUB-STRATE	Max. Design Pressure p (kPa) ^{5,6}	Maximum height of installed cladding (m)									
						Rough Terrain					Open Terrain				
						6 m	12 m	20 m	24 m	30 m	6 m	12 m	20 m	24 m	30 m
2x4 SPF No. 2	7/16 in. OSB	16 in.	4 clips / panel, #10 x 1-3/4 in. screw ea stud	Stud	1.6	0.85	0.85	0.75	0.53	0.48	0.66	0.59	0.52	0.37	0.36
2x6 SPF No. 2	7/16 in. OSB	16 in.	4 clips / panel, #10 x 1-3/4 in. screw ea stud	Stud	2.3	1.00	1.00	1.00	0.77	0.69	0.95	0.85	0.74	0.54	0.51
2x4 SPF No. 2	7/16 in. OSB + 5/8 in. Ext. Gyp	16 in.	4 clips / panel, #10 x 2-1/4 in. screw ea stud	Stud	2.3	1.00	1.00	1.00	0.77	0.69	0.95	0.85	0.74	0.54	0.51
2x6 SPF No. 2	7/16 in. OSB + 5/8 in. Ext. Gyp	16 in.	4 clips / panel, #10 x 2-1/4 in. screw ea stud	Stud	2.5	1.00	1.00	1.00	0.83	0.75	1.00	0.92	0.81	0.58	0.56
2x6 SPF No. 2	7/16 in. OSB	24 in.	4 clips / panel, #10 x 1-3/4 in. screw ea clip	Sheathing only	2.0	1.00	1.00	0.94	0.67	0.60	0.82	0.74	0.64	0.47	0.45
3-5/8 x 1-5/8 18 ga steel	7/16 in. OSB	16 in.	4 clips / panel, #10 x 1-1/2 in. screw ea stud	Stud	2.1	1.00	1.00	0.98	0.70	0.63	0.86	0.77	0.68	0.49	0.47
3-5/8 x 1-5/8 18 ga steel	1/2 in. Ext. Gypsum	16 in.	4 clips / panel, #10 x 1-1/2 in. screw ea stud	Stud	1.7	0.90	0.90	0.80	0.57	0.51	0.70	0.63	0.55	0.40	0.38
3-5/8 x 1-5/8 18 ga steel	1/2 in. Ext. Gypsum	24 in.	4 clips / panel, #10 x 1-1/2 in. screw ea stud	Stud	1.2	0.63	0.63	0.56	0.40	0.36	0.49	0.44	0.39	0.28	0.27
3-5/8 x 1-5/8 18 ga steel	None	16 in.	4 clips / panel, #10 x 1-1/2 in. screw ea stud	Stud	1.2	0.63	0.63	0.56	0.40	0.36	0.49	0.44	0.39	0.28	0.27
3-5/8 x 1-5/8 w/ 18 ga z-girt	None	16 in.	4 clips / panel, #10 x 1-1/2 in. screw ea girt	Girt	1.7	0.90	0.90	0.80	0.57	0.51	0.70	0.63	0.55	0.40	0.38

TABLE 4: AWP 3030 Vertical Panel Siding Configurations for Wind Loads						Maximum Reference Velocity Pressure q $1/50 \leq$ (kPa) ^{6,7} Deflection limit of L/180, Max. 10 ft (3.28 m) Wall Height									
FRAMING ¹	SHEATHING ²	STUDS SPACED @	FASTENER SPECIFICATION ³ & SPACING	FASTENER SUB-STRATE	Max. Design Pressure p (kPa) ^{5,6}	Maximum height of installed cladding (m)									
						Rough Terrain					Open Terrain				
						6 m	12 m	20 m	24 m	30 m	6 m	12 m	20 m	24 m	30 m
3-5/8 x 1-5/8 18 ga steel	7/16 in. OSB	16 in.	4 clips / panel, #10 x 1-3/4 in. screw @ 6 in. o/c	Sheathing only	2.1	1.00	1.00	0.98	0.70	0.63	0.86	0.77	0.68	0.49	0.47
3-5/8 x 1-5/8 18 ga steel	1/2 in. Ext. Gypsum	18 in.	4 clips / panel, #10 x 1-1/2 in. screw @ 16 in. o/c	Stud	1.4	0.74	0.74	0.66	0.47	0.42	0.58	0.52	0.45	0.33	0.31

TABLE 5: AWP 1818 Horizontal Panel Siding Configurations for Wind Loads						Maximum Reference Velocity Pressure q $1/50 \leq$ (kPa) ^{6,7} Deflection limit of L/180, Max. 10 ft (3.28 m) Wall Height									
FRAMING ¹	SHEATHING ²	STUDS SPACED @	FASTENER SPECIFICATION ³ & SPACING	FASTENER SUB-STRATE	Max. Design Pressure p (kPa) ^{5,6}	Maximum height of installed cladding (m)									
						Rough Terrain					Open Terrain				
						6 m	12 m	20 m	24 m	30 m	6 m	12 m	20 m	24 m	30 m
3-5/8 x 1-5/8 18 ga steel	7/16 in. OSB	16 in.	2.5 clips per panel, #10 x 1-1/2 in. screw ea stud	Stud	1.8	0.95	0.95	0.84	0.60	0.54	0.74	0.66	0.58	0.42	0.40



TABLE 6: Sierra and Savannah Lap Siding Configurations for Wind Loads							Maximum Reference Velocity Pressure $q_{1/50} \leq (\text{kPa})^{6,7}$ Deflection limit of $L/180$, Max. 10 ft (3.28 m) Wall Height									
FRAMING ¹	SHEATHING ²	STUDS SPACED @	FASTENER SPACING	FASTENER SUB-STRATE	FASTENER ³	Max. Design Pressure p (kPa) ^{5,6}	Maximum height of installed cladding (m)									
							Rough Terrain					Open Terrain				
							6 m	12 m	20 m	24 m	30 m	6 m	12 m	20 m	24 m	30 m
2x4 SPF No. 2	7/16 in. OSB	16 in.	16 in.	Stud	6d 2 in. nail	1.5	0.79	0.79	0.70	NA	NA	0.62	0.55	0.48	NA	NA
2x4 SPF No. 2	7/16 in. OSB	16 in.	16 in.	Stud	#8 x 1-5/8 in. screw	2.2	1.00	1.00	1.00	NA	NA	0.91	0.81	0.71	NA	NA
2x6 SPF No. 2	7/16 in. OSB	16 in.	16 in.	Stud	#8 x 1-5/8 in. screw	2.5	1.00	1.00	1.00	NA	NA	1.00	0.92	0.81	NA	NA
2x4 SPF No. 2	7/16 in. OSB	16 in.	8 in.	Stud & Sheathing	6d 2 in. nail	1.9	1.00	1.00	0.89	NA	NA	0.78	0.70	0.61	NA	NA
2x4 SPF No. 2	7/16 in. OSB w/ vert. strap ⁴	16 in.	8 in.	Stud & Sheathing	6d 2 in. nail	2.7	1.00	1.00	1.00	NA	NA	1.00	0.99	0.87	NA	NA
2x4 SPF No. 2	7/16 in. OSB + 5/8 in. gypsum	16 in.	8 in.	Stud & Sheathing	6d 2.5 in. nails	1.9	1.00	1.00	0.89	NA	NA	0.78	0.70	0.61	NA	NA
2x4 SPF No. 2	7/16 in. OSB	16 in.	8 in.	Sheathing only	#8 x 1-5/8 in. screw	1.8	0.95	0.95	0.84	NA	NA	0.74	0.66	0.58	NA	NA
2x6 SPF No. 2	7/16 in. OSB	16 in.	8 in.	Sheathing only	#8 x 1-5/8 in. screw	2.5	1.00	1.00	1.00	NA	NA	1.00	0.92	0.81	NA	NA

- Nominal framing member size listed. Wood framing must comply with NLGA 2017. Steel framing must conform to CSA S136, with minimum yield strength of 33 ksi and 18 ga (43 mil) thickness. The framing members may be substituted with i) any larger section dimension of the same material, and, ii) with wood, any species/grade of equal or greater specific gravity, and, iii) with steel, any greater yield strength and/or gauge thickness.
- 7/16 OSB to comply with CSA O437. May be substituted with min. 15/32 plywood complying with CSA O325. Wood sheathing may be substituted with thicker profile of up to nominal 1-inch. Gypsum sheathing, where applicable, must comply with ASTM C1396 and be rated by the manufacturer for exterior use; gypsum thickness may not be increased.
- All fasteners are to be corrosion resistant. Nails must comply with ASTM F1667 and are to be of common or box type. Screws are to comply with ASME B18.6.1.
- Vertical straps for "rainscreen" assembly to be minimum 3/8-inch (10mm) x 2-inch pressure treated plywood installed at 8-inch on center.
- The maximum design pressure is the unfactored service pressure taken from tested assembly values as the lesser of the ultimate negative test pressure divided by 2, or the test pressure at $L/180$ deflection multiplied by the wind load service level Importance factor of 0.75. In limit states design, the safety factor of 2 applied to the ultimate tested value may be regarded as equal to the wind load factor divided by resistance factor.
- The maximum design pressure is intended to correspond with the calculated unfactored pressure determined by 4.1.7.3. The maximum $q_{1/50}$ pre-calculated published values on the right side of the table apply only for the conditions listed, and with the inputs of: $U_{LS} I_w = 1$, $S_{LS} I_w = 0.75$, $C_t = 1$, $C_{ei} = -0.45$ to $+0.3$. The values of C_e , C_g , C_p , C_{gi} , C_{pi} were determined using the procedures of 4.1.7.3.
- A maximum $q_{1/50}$ value of 1.0 has been applied.

HOW TO USE THE MAXIMUM $q_{1/50}$ VALUES IN THIS TABLE

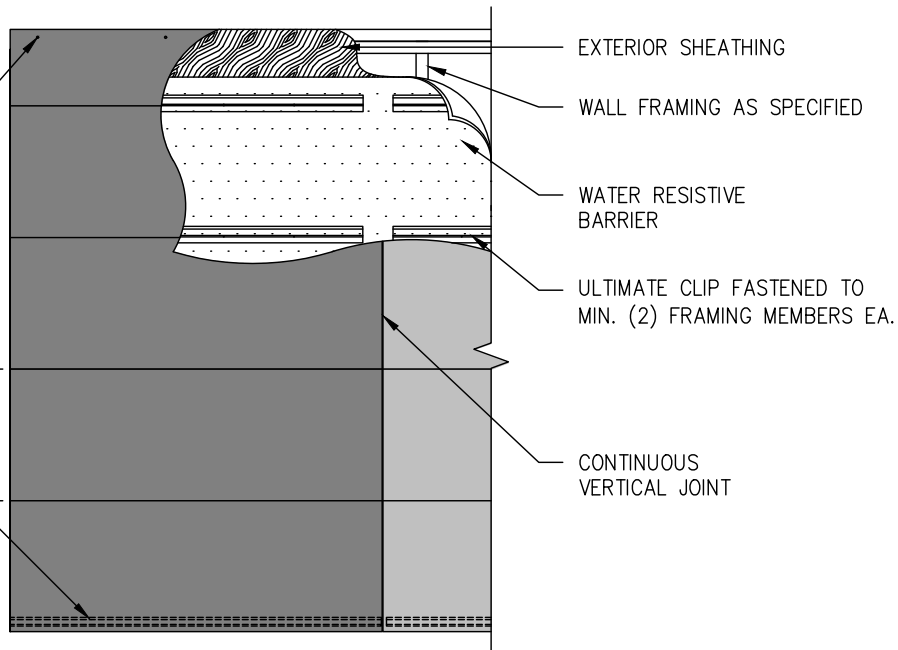
- Determine the $q_{1/50}$ reference wind velocity pressure from NBCC Div B, App C, for the property location.
- Determine if site is Open or Rough terrain as defined in 4.1.7.3.(5).
- Confirm that topographic factor C_t of 1 is appropriate, see 4.1.7.4.
- Confirm that internal pressure coefficient C_{pi} of -0.45 to +0.3 is appropriate, see Table 4.1.7.7.
- Confirm that the midspan in bending deflection limit of $L/180$ is acceptable.
- Find the maximum height above grade that cladding is installed (or use mean roof height of building).
- Find the row in the table of the desired Nichiha cladding assembly detail.
- Find the corresponding cell in the table that lists the maximum $q_{1/50}$ value for the terrain and height.
- Confirm that the maximum $q_{1/50}$ pressure shown in the table for the application does not exceed the project site $q_{1/50}$ found in step 1.



FACE FASTEN @ HORIZ. TERMINATIONS

AWP 3030 HORIZONTAL

ULTIMATE HORIZONTAL STARTER TRACK BEHIND



A
1

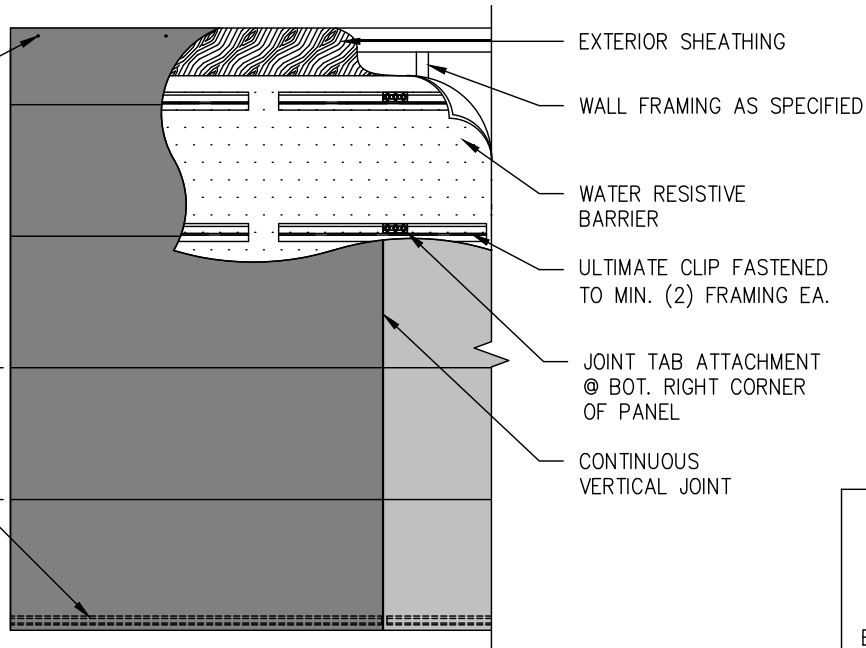
TYP. AWP 3030 HORIZONTAL ELEVATION

NOT-TO-SCALE

FACE FASTEN @ HORIZ. TERMINATIONS

AWP 1818 HORIZONTAL

ULTIMATE HORIZONTAL STARTER TRACK BEHIND



B
1

TYP. AWP 1818 HORIZONTAL ELEVATION

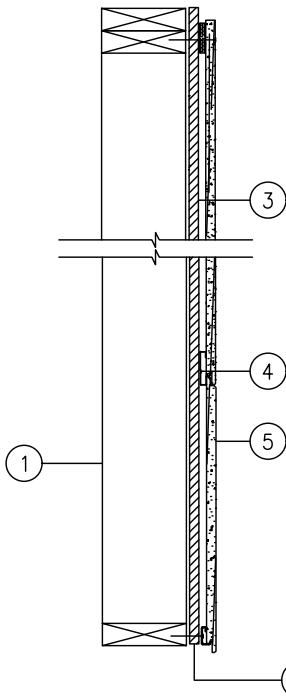
NOT-TO-SCALE

DRAWING FOR ENGINEERING EVALUATION REPORT – NOT FOR USE AS CONSTRUCTION DESIGN DOCUMENTS

COPYRIGHT ©2022 RESERVED. THESE PLANS AND DESIGNS ARE AT ALL TIMES THE PROPERTY OF BOCA ENGINEERING CO. TO BE USED FOR THE PROJECT SHOWN. WRITTEN CONSENT IS REQUIRED FROM THE ENGINEER BEFORE ANY REPRODUCTION.

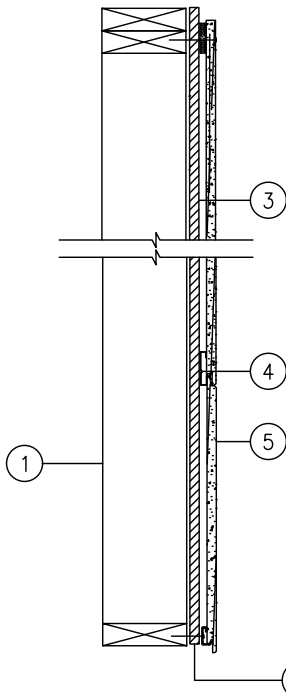
CLIENT: NICHIIHA USA, INC.	PROJECT: NICHIIHA SIDING	TITLE: TYP. AWP HORIZONTAL ASSEMBLY ELEVATIONS
-------------------------------	-----------------------------	---

0	2022/12/31	FOR PUBLICATION	CB
REV	DATE	ISSUE	APP
DRAWING NO. 0080-SK1		DWG SHEET 1 OF 6	
DATE DECEMBER 31, 2022		DES CB	DRN CL
		CHK CB	



AWP 3030 HORIZONTAL COMPONENTS	
1	STUD FRAMING PER EVALUATION REPORT ASSEMBLIES.
2	SHEATHING ATTACHED TO FRAMING PER CODE, MIN. PER EVALUATION REPORT ASSEMBLIES.
3	WATER-RESISTIVE BARRIER PER CODE.
4	NICHIHA CLIPS: 4 CLIPS/PANEL, FASTENERS PER EVALUATION REPORT ASSEMBLIES.
5	NICHIHA AWP 3030 HORIZONTAL PANELS SLOT FIT TO FASTENER CLIPS.

A
2
AWP 3030 HORIZONTAL
NOT-TO-SCALE



AWP 1818 HORIZONTAL COMPONENTS	
1	STUD FRAMING PER EVALUATION REPORT ASSEMBLIES.
2	SHEATHING ATTACHED TO FRAMING PER CODE, MIN. PER EVALUATION REPORT ASSEMBLIES.
3	WATER-RESISTIVE BARRIER PER CODE.
4	NICHIHA CLIPS: 2.5 CLIPS/PANEL, FASTENERS PER EVALUATION REPORT ASSEMBLIES.
5	NICHIHA AWP 1818 HORIZONTAL PANELS SLOT FIT TO FASTENER CLIPS.

B
2
AWP 1818 HORIZONTAL
NOT-TO-SCALE

DRAWING FOR ENGINEERING
EVALUATION REPORT – NOT
FOR USE AS CONSTRUCTION
DESIGN DOCUMENTS

COPYRIGHT ©2022 RESERVED. THESE PLANS AND DESIGNS ARE AT ALL TIMES THE PROPERTY OF BOCA ENGINEERING CO. TO BE USED FOR THE PROJECT SHOWN. WRITTEN CONSENT IS REQUIRED FROM THE ENGINEER BEFORE ANY REPRODUCTION.

CLIENT: NICHIHA USA, INC.	PROJECT: NICHIHA SIDING	TITLE: AWP 3030 HORIZONTAL & AWP 1818 HORIZONTAL COMPONENTS
------------------------------	----------------------------	---

0	2022/12/31	FOR PUBLICATION	CB
REV	DATE	ISSUE	APP
DRAWING NO. 0080-SK1		DWG SHEET 2 OF 6	DES CB
DATE DECEMBER 31, 2022			DRN CL
			CHK CB



FACE FASTEN @ HORIZ. TERMINATIONS

NICHIHA CORNER SPACER

ULTIMATE VERTICAL STARTER TRACK BEHIND

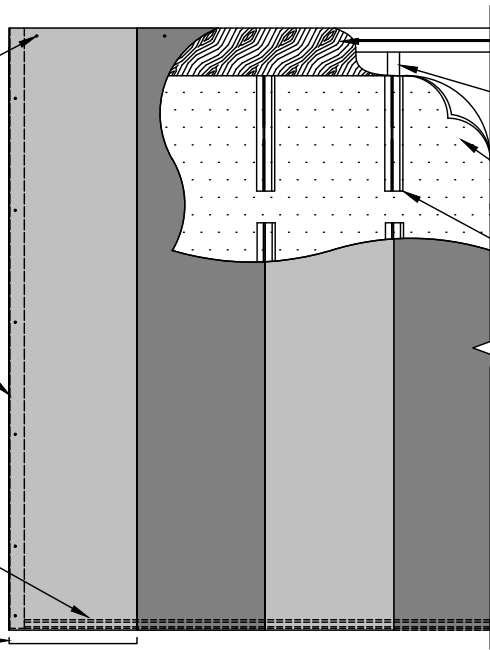
AWP 3030 VERTICAL

EXTERIOR SHEATHING

WALL FRAMING AS SPECIFIED

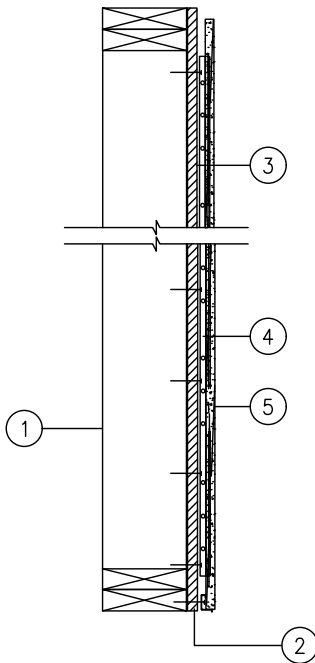
WATER RESISTIVE BARRIER

ULTIMATE CLIPS @ 18" O.C.



A
3

TYP. AWP 3030 VERTICAL ELEVATION
NOT-TO-SCALE



B
3

AWP 3030 VERTICAL
NOT-TO-SCALE

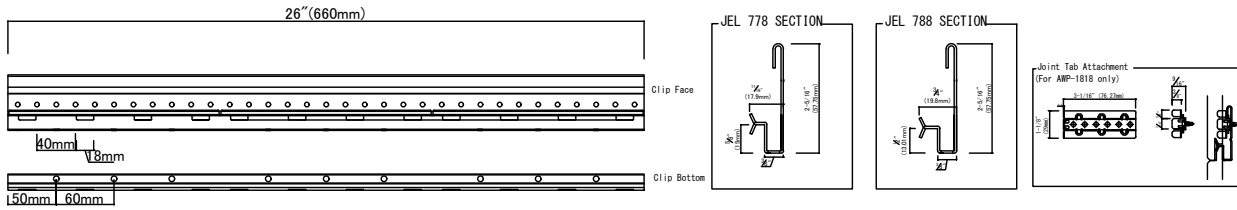
AWP 3030 VERTICAL COMPONENTS	
1	STUD FRAMING PER EVALUATION REPORT ASSEMBLIES.
2	SHEATHING ATTACHED TO FRAMING PER CODE, MIN. PER EVALUATION REPORT ASSEMBLIES.
3	WATER-RESISTIVE BARRIER PER CODE.
4	NICHIHA CLIPS: 4 CLIPS/PANEL, FASTENERS PER EVALUATION REPORT ASSEMBLIES.
5	NICHIHA AWP 3030 VERTICAL PANELS SLOT FIT TO FASTENER CLIPS.

DRAWING FOR ENGINEERING EVALUATION REPORT – NOT FOR USE AS CONSTRUCTION DESIGN DOCUMENTS

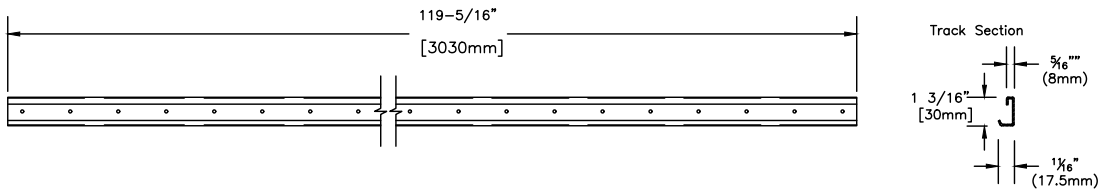
COPYRIGHT ©2022 RESERVED. THESE PLANS AND DESIGNS ARE AT ALL TIMES THE PROPERTY OF BOCA ENGINEERING CO. TO BE USED FOR THE PROJECT SHOWN. WRITTEN CONSENT IS REQUIRED FROM THE ENGINEER BEFORE ANY REPRODUCTION.

CLIENT: NICHIHA USA, INC.	PROJECT: NICHIHA SIDING	TITLE: TYP. AWP VERTICAL ASSEMBLY ELEVATION & AWP 3030 VERTICAL COMPONENTS
------------------------------	----------------------------	---

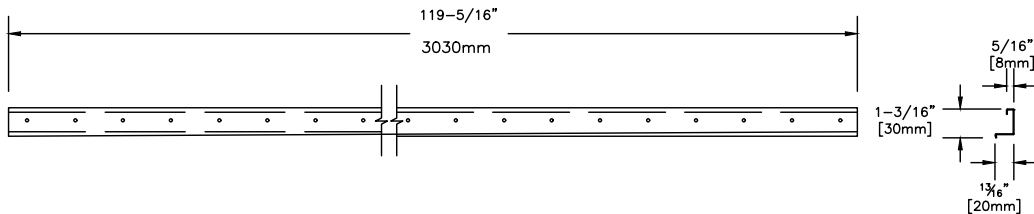
0	2022/12/31	FOR PUBLICATION	CB
REV	DATE	ISSUE	APP
DRAWING NO. 0080-SK1		DWG SHEET 3 OF 6	
DATE DECEMBER 31, 2022		DES CB	DRN CL
		CHK CB	



A
4 AWP CLIPS: JEL778 & JEL788
NOT-TO-SCALE



B
4 ULTIMATE HORIZONTAL STARTER TRACK – FA700
NOT-TO-SCALE



C
4 ULTIMATE VERTICAL STARTER TRACK – FA710T
NOT-TO-SCALE

DRAWING FOR ENGINEERING
EVALUATION REPORT – NOT
FOR USE AS CONSTRUCTION
DESIGN DOCUMENTS

COPYRIGHT ©2022 RESERVED. THESE PLANS AND DESIGNS ARE AT ALL TIMES THE PROPERTY OF BOCA ENGINEERING CO. TO BE USED FOR THE PROJECT SHOWN. WRITTEN CONSENT IS REQUIRED FROM THE ENGINEER BEFORE ANY REPRODUCTION.

CLIENT: NICHIIHA USA, INC.	PROJECT: NICHIIHA SIDING	TITLE: AWP TRACK COMPONENTS
-------------------------------	-----------------------------	--------------------------------

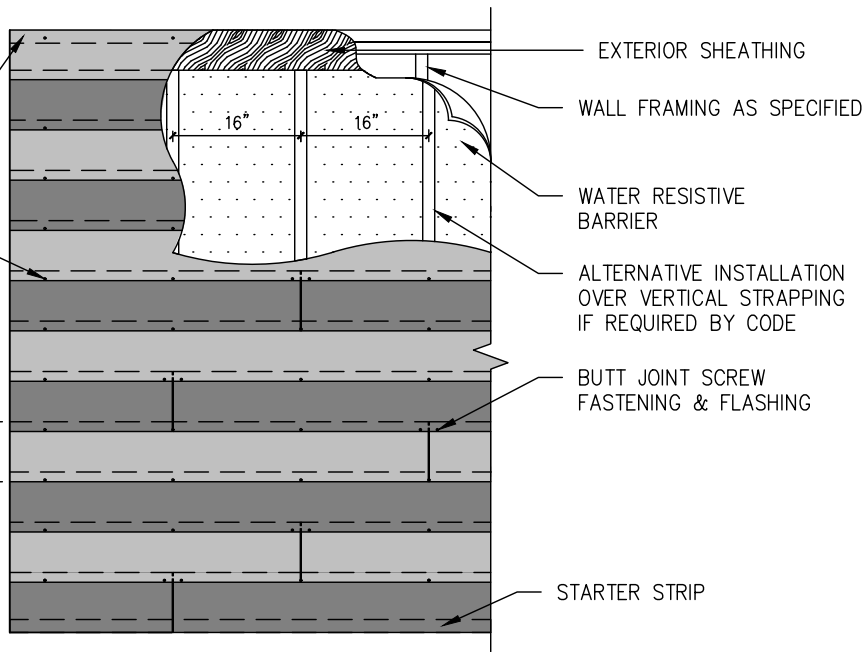
0	2022/12/31	FOR PUBLICATION	CB
REV	DATE	ISSUE	APP
DRAWING NO. 0080-SK1		DWG SHEET 4 OF 6	DES CB
DATE DECEMBER 31, 2022			DRN CL
			CHK CB



NICHIHA SPACER BEHIND

BLIND OR FACE NAIL FASTENING

SIERRA OR SAVANNAH LAP SIDING PANEL



EXTERIOR SHEATHING

WALL FRAMING AS SPECIFIED

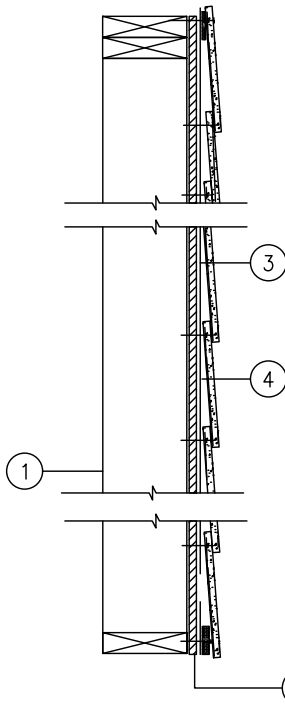
WATER RESISTIVE BARRIER

ALTERNATIVE INSTALLATION OVER VERTICAL STRAPPING IF REQUIRED BY CODE

BUTT JOINT SCREW FASTENING & FLASHING

STARTER STRIP

A
5 TYP. SIERRA/SAVANNAH ELEVATION
NOT-TO-SCALE



SIERRA/SAVANNAH LAP SIDING COMPONENTS	
1	STUD FRAMING PER EVALUATION REPORT ASSEMBLIES.
2	SHEATHING ATTACHED TO FRAMING PER CODE, MIN. PER EVALUATION REPORT ASSEMBLIES.
3	WATER-RESISTIVE BARRIER PER CODE.
4	SIERRA OR SAVANNAH LAP SIDING FASTENED TO EACH STUD, FASTENERS PER EVALUATION REPORT ASSEMBLIES.

B
5 SIERRA/SAVANNAH LAP SIDING
NOT-TO-SCALE

DRAWING FOR ENGINEERING EVALUATION REPORT – NOT FOR USE AS CONSTRUCTION DESIGN DOCUMENTS

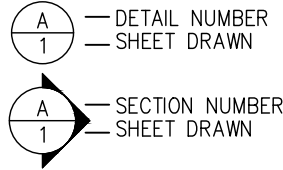
COPYRIGHT ©2022 RESERVED. THESE PLANS AND DESIGNS ARE AT ALL TIMES THE PROPERTY OF BOCA ENGINEERING CO. TO BE USED FOR THE PROJECT SHOWN. WRITTEN CONSENT IS REQUIRED FROM THE ENGINEER BEFORE ANY REPRODUCTION.

CLIENT: NICHIHA USA, INC.	PROJECT: NICHIHA SIDING	TITLE: TYP. SIERRA/SAVANNAH ASSEMBLY ELEVATION & COMPONENTS	0	2022/12/31	FOR PUBLICATION	CB
			REV	DATE	ISSUE	APP
			DRAWING NO. 0080-SK1		DWG SHEET 5 OF 6	
			DATE DECEMBER 31, 2022		DES CB	DRN CL
					CHK CB	



DESIGN LOADS	
LIVE	SEE EVALUATION REPORT
SNOW	
WIND	
SEISMIC	
TEMPERATURE	

LEGEND AND SYMBOLS



INSTALLATION

1. FOR COMPLETE INSTALLATION DETAILS SEE TECHNICAL PRODUCT DATA ON PRODUCT MANUFACTURER'S WEBSITE.

MATERIAL STANDARDS

SHEATHING

- WOOD-BASED STRUCTURAL SHEATHING:
 - PLYWOOD - CSA 0121-17, CSA 0151-17 OR CSA 0153-13
 - OSB - CSA 0437.0-93
 - LUMBER - CSA 0141-05

- GYPHUM SHEATHING: ASTM C1396-17, EXTERIOR TYPE

FASTENERS

- WOOD SCREWS: ASME B18.6.1-81(2016)
- NAILS: ASTM F1667-18A
- METAL SCREWS: AISI S240-15, ASTM C1513-13
- ALL FASTENERS CORROSION-RESISTANT OR STAINLESS STEEL

FRAMING

- WOOD FRAMING: MIN. 2x4 S.G. 0.42, COMPLIANCE WITH CSA 0141-05
- METAL FRAMING: MIN. 18 GAUGE U.N.O., Fy = 33ksi, COMPLIANCE WITH CSA S136-16

ABBREVIATIONS

CONT	CONTINUOUS	O.C.	ON CENTER
EA	EACH	P.T.	PRESSURE TREATED
E/W	EACH WAY	S.G.	SPECIFIC GRAVITY
EXT.	EXTERIOR	SPEC.	SPECIFICATION
INT.	INTERIOR	NO.	TYPICAL
MAX	MAXIMUM	U.N.O.	UNLESS NOTED OTHERWISE
MIN	MINIMUM	W/	WITH
NO.	NUMBER		

DESIGN

- STRUCTURAL WORK HAS BEEN DESIGNED IN ACCORDANCE WITH APPLICABLE CODES AND STANDARDS REFERENCED IN THE EVALUATION REPORT.
- THE STRUCTURAL FRAMING AND SHEATHING SHALL BE DESIGNED AND ANCHORED TO PROVIDE LATERAL BRACING AND PROPERLY TRANSFER ALL LOADS TO THE STRUCTURE. FRAMING DESIGN AND INSTALLATION IS THE RESPONSIBILITY OF THE ENGINEER OR ARCHITECT OF RECORD FOR THE PROJECT OF INSTALLATION.
- THESE DRAWINGS APPLY TO THE TESTED ASSEMBLY ONLY AND DO NOT IMPLY THAT THE SIGNATORY ENGINEER IS THE DESIGNER OF RECORD FOR ANY FUTURE CONSTRUCTION ON WHICH THEY ARE USED.
- SOME NON-STRUCTURAL COMPONENTS NOT SHOWN AND DO NOT IMPACT STRENGTH FOR ATTACHMENT. TO BE INSTALLED PER CODE AND MAY INCLUDE: FLASHING, INSULATION, INTERIOR FINISH.

TESTING AND CODE COMPLIANCE

- THE PRODUCT ASSEMBLY SHOWN HAS BEEN EVALUATED ACCORDING TO THE TEST STANDARDS AS OUTLINED IN THE EVALUATION REPORT.
- THE INSTALLATION DETAILS DESCRIBED ARE OF THE LABORATORY TESTED ASSEMBLY AND MAY NOT REFLECT ACTUAL CONDITIONS FOR A SPECIFIC SITE. IF SITE CONDITIONS DEVIATE FROM THE REQUIREMENTS DETAILED HEREIN, THE LICENSED ENGINEER OR ARCHITECT PREPARED SITE-SPECIFIC DOCUMENTS SHALL BE USED.

INSPECTIONS (FIELD REVIEWS)

- NOTIFICATION FOR INSPECTIONS AND INSTALLATION APPROVAL SHOULD BE COMPLETED AS OUTLINED BY ANY OF THE FOLLOWING APPLICABLE TO THE REFERENCED PROJECT:
 - APPLICABLE LOCAL BUILDING CODE.
 - LOCAL BUILDING AUTHORITY.
 - PROJECT SPECIFICATION DOCUMENTS BY OTHERS.
- FIELD REVIEWS OF INSTALLATION ARE NOT COMPLETED BY THE EVALUATION REPORT ENGINEER.

DRAWING FOR ENGINEERING EVALUATION REPORT - NOT FOR USE AS CONSTRUCTION DESIGN DOCUMENTS

COPYRIGHT ©2022 RESERVED. THESE PLANS AND DESIGNS ARE AT ALL TIMES THE PROPERTY OF BOCA ENGINEERING CO. TO BE USED FOR THE PROJECT SHOWN. WRITTEN CONSENT IS REQUIRED FROM THE ENGINEER BEFORE ANY REPRODUCTION.

CLIENT:	PROJECT:	TITLE:	0	2022/12/31	FOR PUBLICATION	CB
NICHIHA USA, INC.	NICHIHA SIDING	NICHIHA SIDING GENERAL NOTES	REV	DATE	ISSUE	APP
			DRAWING NO.	DWG SHEET 6 OF 6		DES CB
			DATE	DECEMBER 31, 2022		DRN CL
						CHK CB



ATTACHMENT 4: DISCUSSION OF LIMIT STATES DESIGN PROCEDURE

Load Combinations, Load and Resistance Factors, Test Factors

Design of configured structural systems by strength testing of assemblies with a test load (safety) factor in limit states design necessitates the computation of a test load factor for the respective stress and failure type due to loading on to the cladding system. Wall assembly samples are typically stressed to failure in bending of the framing system or disengaging of the wall cladding.

Test Load Factors are computed by:

$$\text{Test Load Factor} = \frac{\text{Combined Load Factor}}{\text{Resistance Factor}}$$

The resistance factor is taken from the materials standard for the respective failure type.

Wind load on cladding is typically taken as acting as an isolated and independent force on the cladding component and its attachment in to framing. Design load combinations used in this evaluation are:

Ultimate (ULS): 1.4 W

Service (SLS): (0.75) W (where 0.75 is the wind importance factor for serviceability)

Where multiple failure modes may occur in testing with a variety of materials that may or may not possess a Canadian national standard with published resistance factors for the stress modes at play, it is convenient to choose a relative system resistance factor based on a test load (safety) factor.

A test load factor of 2 was chosen, that results in an effective system resistance factor of $\phi_f = 0.7$, that would apply for any failure type.

The failure modes observed in the system tests include fastener withdrawal from wood or steel framing, steel framing failure in bending, and shear breakage of fibre-cement. Where fastener or bending failure modes occur, it can be found that the resistance factors published in CSA 086 and CSA S16 are not less than 0.7 for these stress types, and it is confirmed that the test load factor is suitable.

-END-