



Product Test Summaries

Nichiha Fiber Cement Products

Brick, Stone & Block™ Panels

Brick, Stone and Block Panel Certifications

Test Summaries

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Nichiha Brick, Stone and Block Panels shall meet or exceed requirements of the following:

1. ICC Evaluation Service, Inc. (ICC-ES) Evaluation Report No. ESR-1694.
2. ICC-ES Legacy Report No. 5915
3. Canadian Construction Materials Centre (CCMC) Evaluation Report No. CCMC 13083-R.
4. City of New York Department of Buildings Report No. MEA 561-06-M.
5. Transverse Load Test Report No. RAD-3808.

For a copy of complete testing and certification documentation, please call Nichiha Technical Department toll free at 1.866.424.4421.

ASTM C 518 Steady-State Heat Flex & Thermal Tests

Date Of Test: February, 1998

Test Agency: Commercial Testing Company
1215 South Hamilton Street, Dalton, GA 30722

Test Method: ASTM C 518 Steady-state heat flux measurements and thermal transmission properties by means of the heat flow metal apparatus.

Test Specimen: Nichiha Brick, Stone & Block™ Fiber Cement Panels

Specimen Specifications: *Thickness: 25mm (nominal 1").*

Test Procedure: The test apparatus consists of a hot plate, a cold plate, a heat flow meter, and the necessary electronic measurement devices. The test specimen is held between the two temperature controlled plates, of which the lower can be raised or lowered to the desired specimen thickness.

Test Results: The test results show the Nichiha Brick, Stone & Block Fiber Cement Panels to have a thermal resistance or R Value of 1.23. This data is shown below. The hot plate temperature record was 99.88°F and the cold plate temperature record as 51.18°F. The mean temperature recorded during the test was 75.53°F.

$K=SE: (\Delta X/t_1-t_2)$
 S: Calibrated constant derived from the SRM.
 E: Heat flow output in millivolts.
 ΔX : Specimen thickness.
 t1: Hot plate temperature.
 t2: Cold plate temperature.
 Thermal resistance, R is the reciprocal of k.

Element	Measurement
Hot Plate	99.88 °F
Cold Plate	51.18 °F
Mean Temperature	75.53 °F
E	15.555
ΔX	0.626
k	0.816
R	1.23

ASTM C 1185 Physical Properties Tests

Date Of Test: October, 2006

Test Agency: Intertek Testing Services NA Ltd.
1500 Brigantine Drive, Cocquittlam, BC V3K7C1, Canada

Test Method: ASTM C 1185 Durability tests including linear variations with change in moisture content, water tightness, wet flexural strength, freeze/thaw, warm water, and heat/rain.

Test Specimen: Nichiha Brick, Stone & Block™ Fiber Cement Panels

Specimen *Thickness:* 16mm (nominal 5/8").

Specifications: *Width:* Various.

Length: Various.

Test Procedure: The test was performed in accordance to ASTM requirements.

Test Results: The test results show the Nichiha Brick, Stone & Block Fiber Cement Panels successfully comply with the requirements specified in ICC-ES.

Property	Test Result	Requirement	Pass/Fail
Dimensional Tolerances:			
Length, in.	0.02	+/- 0.25	Pass
Width, in.	0.02	+/- 0.13	
Squareness Direction #1, in.	0.05	+/- 0.19	
Squareness Direction #2, in.	0.02	+/- 0.19	
Thickness, in.	0.02	+/- 0.06	
Water Absorption, % by mass	19.8	Report value	Report value
Moisture Content, %	4.8	Report value	Report value
Density, in./ft.	76.1	Report value	Report value
Dimensional Stability, % 50-90% Relative Humidity After Water Immersion	0.01 0.08	Report value	Report value
Flexural Strength (machine direction)			
Dry, psi	1281	580	Pass
Wet, psi	778	580	Pass
Freeze/Thaw, % Retention	102	80	Pass
Warm Water, % Retention	121	Report value	Report value
Water Tightness	No drop formation	No drop formation	Pass
Warm Water Resistance	No apparent changes	No visible cracks or structural alteration	Pass
Heat/Rain Resistance	No apparent changes	No visible cracks or structural alteration	Pass

ASTM E 84 (UL 723)/CAN/ULC S102-07 Surface Burning Characteristics

- Date Of Test:** October, 2000
- Test Agency:** UL (Underwriters Laboratories, Inc.)
333 Pfingsten Road, Northbrook, IL 60062
- Test Method:** ASTM E 84 / UL 723 Standard test method for surface burning characteristics of building materials, sometimes referred to as the Steiner Tunnel test.
- Test Specimen:** Nichiha Brick, Stone & Block Fiber Cement Panels
- Specimen Specifications:** *Thickness:* 18mm (nominal 3/4").
Width: 455mm (nominal 18").
Length: 610mm (nominal 2').
- Test Procedure:** The panels were physically self-supporting and required no additional sample preparation. A total of 16 panels, each measuring 18 inches in width and 2 feet in length were placed end-to-end on the ledges of the tunnel furnace to mark up the 24 foot test sample. Testing was performed in accordance with ASTM.
- Test Results:** *Flame Spread Index*
- The maximum distance the flame spreads along the length of the sample from the end of the igniting flame is determined by observation.
 - The Flame Spread Index (FSI) of the material is determined by rounding by Calculated Flame Spread (CFS) as described in UL 723. The CFS is derived by calculating the area under the flame spread distance (ft.) versus time (min.) curve, ignoring any flame front recession, and using one of the calculation methods as described below.
 - If the total area (At) is less than or equal than 97.5 min.-ft., the CFS shall be 0.515 times the total area. (FSI=0.515 AT).
 - If the total area (At) is greater than 97.5 min.-ft., the CFS is to be 4900 divided by 195 minutes the total area. (FSI=4900/(195-At)).

Test Sample	Maximum Flame Spread (ft.)	Time of Maximum Flame Spread (min.)	CFS	FSI
Nichiha Brick, Stone & Block Fiber Cement Panels	0.0	-	0.0	0

- Test Results:** *Smoke Developed Index*
- The Smoke Developed Index is determined by rounding the Calculated Smoke Developed (CSD) as described in UL 723. The CSD is determined by the output of a photoelectric circuit operating across the furnace flue pipe. A curve is developed by plotting values of light absorption (decreased in cell output) against time. The CSD is derived by expressing the net area under the curve for this material as a percentage of the net area under the curve for untreated red oak.
 - The CSD is expressed as: $CSD = (A_m/A_{ros}) \times 100$.
 - A_m : The area under the curve for the test material.
 - A_{ros} : The area under the curve for untreated red oak.

Test Sample	CDS	SDI
Nichiha Brick, Stone & Block Fiber Cement Panels	3.2	5

ASTM E 119/CAN/ULC S101-07 Fire Resistance of Wall Assembly

Date Of Test: May, 1999

Test Agency: Southwest Research Institute
6220 Culebra Road, San Antonio, TX 78228

Test Method: ASTM E 119 Standard practicing for fire tests of building construction and materials.

Test Specimen: Nichiha Brick, Stone & Block Fiber Cement Panels

Specimen Specifications: *Thickness:* 18mm (nominal 3/4").
Width: 72" trimmed as needed for tests.
Length: 185" trimmed as needed for tests.
Other: 1/4" inch bead of hot melt caulk (identified as Type H-67564BB) provided as sealant between panels.

Test Panel Structure: *Base Wall:* Standard gypsum base wall assembly, comprising of 2x4 stud at 16" spacing. One layer of 5/8", Type X gypsum was attached to the interior side using 1-3/4" gypsum wallboard nails at 7" o.c. A single layer of 5/8", Type X gypsum, 15 lb. felt paper was attached to the exterior side.
Nichiha Panel: The panels were assembled to the base wall with fasteners and clips provided by Nichiha.

Test Procedure: The test panel was secured to the test fixture in accordance with the requirements of ASTM. The test exposes a wall assembly to a standard fire exposure controlled to achieve specified temperatures throughout a specified time period. The fire exposure may be followed by a standard hose steam test, which subjects the specimen to impact, erosion, and cooling effects of the water stream.

Test Results: The wall was evaluated with the exterior (Nichiha face) exposure. The walls successfully endured a 60 minute fire exposure without developing excessive unexposed surface temperatures or allowing flaming on the unexposed side of the assembly. The data is shown below. At the conclusion of the 60 minute fire exposure, the maximum unexposed surface temperature was 163°F, and the maximum average surface temperature was 156°F. The wall met the requirements for a 1 hour fire resistance rating under load bearing conditions of 300 lb./ft.

Time (min:sec)	Observations
00:00	Sample wall loaded to 900 lb./ft., instrumentation verified, test started.
04:00	Light ignition of exposed side.
07:00	Uniform burning of exposed side.
26:00	Continued burning on exposed side, material separating at seams.
41:00	Exfoliation of material on top left corner of the exposed side.
45:00	Gypsum visible on more than 40% of exposed side.
60:00	Test concluded. No passage of flames or hot gases to the unexposed side.
60:00+	Hose steam test conducted for 65 sec. No passage of water to unexposed side.

ASTM E 119/CAN/ULC S101-07 Fire Resistance of Wall Assembly

Date Of Test: May, 1999

Test Agency: Southwest Research Institute
6220 Culebra Road, San Antonio, TX 78228

Test Method: ASTM E 119 Standard practicing for fire tests of building construction and materials.

Test Specimen: Nichiha Brick, Stone & Block Fiber Cement Panels

Specimen Specifications: *Thickness:* 18mm (nominal 3/4").
Width: 72" trimmed as needed for tests.
Length: 185" trimmed as needed for tests.
Other: 1/4" inch bead of hot melt caulk (identified as Type H-67564BB) provided as sealant between panels.

Test Panel Structure: *Base Wall:* Standard gypsum base wall assembly, comprising of 3-5/8", 18GA metal C-stud at 16" spacing. One layer of 5/8", Type X gypsum was attached to the interior side using 1-1/4" screws at 8" perimeter and 12" field centers. A single layer of 1/2", Type X gypsum, 15 lb. felt paper was attached to the exterior side.
Nichiha Panel: The panels were assembled to the base wall with fasteners and clips provided by Nichiha.

Test Procedure: The test panel was secured to the test fixture in accordance with the requirements of ASTM. The test exposes a wall assembly to a standard fire exposure controlled to achieve specified temperatures throughout a specified time period. The fire exposure may be followed by a standard hose steam test, which subjects the specimen to impact, erosion, and cooling effects of the water stream.

Test Results: The wall was evaluated with the exterior (Nichiha face) exposure. The walls successfully endured a 60 minute fire exposure without developing excessive surface temperatures or allowing flaming on the unexposed side of the assembly. The data is shown below. At the conclusion of the 60 minute fire exposure, the maximum unexposed surface temperature was 219°F, and the maximum average surface temperature was 213°F. A second wall was evaluated for hose team requirements. The exterior (Nichiha face) exposed assembly met the performance requirements for a 60 minute rating.

Time (min:sec)	Observations
01:45	Flash fire along interior of wall, light flames over exposed surface.
02:30	Exposed surface fire is reduced.
15:00	Flaming along edges and seams of wall panels only.
23:00	Edges along center line of sample are curling away from the base wall.
36:00	Exposed face curling away from base wall and falling from the surface. Felt paper is exposed and burning.
48:00	Exposed face is completely exfoliated, continued light burning.
60:00	Test concluded. No apparent deflections.

ASTM E 228 Physical Properties Test

Date Of Test: January, 2002

Test Agency: RADCO, Inc., Listing & Testing Division (Resources, Applications, Designs and Controls, Inc.)
3220 East 59th Street, Long Beach, CA 90805

Test Method: ASTM E 228 this test measures mean coefficient of linear thermal expansion.

Test Specimen: Nichiha Brick, Stone & Block Fiber Cement Panels

Specimen Specifications: *Thickness:* 18mm (nominal 3/4").
Width: Various.
Length: Various.

Test Procedure: The test was performed in accordance to requirements of ASTM.

Test Results: The Nichiha Brick, Stone and Block Fiber Cement Panels successfully comply with the requirements specified in ICC-ES.

ASTM	Test Performed	AC 90 Req.	Test Result
E 228	Mean coefficient of linear thermal expansion.	Maximum 1.0×10^{-5} in./in./F	Maximum $1.0 \times 3.18 \times 10^{-6}$ in./in./F

ASTM E 330 Positive & Negative Transverse Load Tests - 2x4 Wood Frame, 24" o.c.– Open Stud

Date Of Test: August, 2004

Test Agency: RADCO, Inc., Listing & Testing Division (Resources, Applications, Designs and Controls, Inc.)
3220 East 59th Street, Long Beach, CA 90805

Test Method: ASTM E 330 Standard test method for structural performance of exterior windows, curtain walls, and doors by uniform static air pressure difference.

Test Specimen: Nichiha Brick, Stone & Block Fiber Cement Panels

Specimen *Thickness:* 16mm (nominal 5/8").

Specifications: *Width:* 455mm (nominal 18").

Length: 1,820mm (nominal 6").

Test Panel Structure: *Support Frame:* 4 feet (1,219mm) in width x 8 feet (2,438mm) in height frames were constructed from 2x4 nominal stud grade (38mm x 76mm) Spruce-Pine-Fir (SPF) placed on 24" o.c.

Frame Cover (Sheathing): Open stud (no sheathing).

Nichiha Panel: Each panel was fastened using Nichiha short clips (JE 550) at each frame member, and was fastened using Nichiha long clips (JEL 551) at the panel vertical joint locations.

- Test Procedure:**
- The panels were tested both in the positive and negative direction. In the positive direction the pressure was uniformly applied to the panels. In the negative direction the pressure was uniformly applied to the back of the studs.
 - The load was applied by evacuating the air below the test specimen using a vacuum pump. The applied load was measured with a digital manometer capable of reading in 0.1 inch (2.54mm) increments of water column.
 - Deflections were taken using digital dial indicators capable of reading in 0.0001 inch (0.00254mm) increments. Deflection readings were taken at five locations.
 - The loads were applied in increments so that a minimum of six load increments were obtained. The load was held at each load increment for 30 seconds, and then released to zero. Deflection readings were taken at each load increment, and after the load was released (set).

Test Procedure: The ultimate loads achieved in each panel and the allowable load is shown below.

Test Sample	Positive Load		Negative Load	
	Ultimate Load (psf)	Allowable Load (psf)	Ultimate Load (psf)	Allowable Load (psf)
1	111.80	32.21	48.88	32.08
2	107.64	30.84	49.92	37.02
3	101.40	26.91	36.92	31.02
Average	106.95	29.99	45.24	33.37

ASTM E 330 Positive & Negative Transverse Load Tests - 2x4 Wood Frame, 24" o.c.– OSB Sheathing

Date Of Test: August, 2004

Test Agency: RADCO, Inc., Listing & Testing Division (Resources, Applications, Designs and Controls, Inc.)
3220 East 59th Street, Long Beach, CA 90805

Test Method: ASTM E 330 Standard test method for structural performance of exterior windows, curtain walls, and doors by uniform static air pressure difference.

Test Specimen: Nichiha Brick, Stone & Block Fiber Cement Panels

Specimen *Thickness:* 16mm (nominal 5/8").

Specifications: *Width:* 455mm (nominal 18").

Length: 1,820mm (nominal 6").

Test Panel Structure: *Support Frame:* 4 feet (1,219mm) in width x 8 feet (2,438mm) in height frames were constructed from 2x4 nominal stud grade (38mm x 76mm) Spruce-Pine-Fir (SPF) placed on 24" o.c.

Frame Cover (Sheathing): 7/16" thick OSB.

Nichiha Panel: Each panel was fastened using Nichiha short clips (JE 550) at each frame member, and was fastened using Nichiha long clips (JEL 551) at the panel vertical joint locations.

- Test Procedure:**
- The panels were tested both in the positive and negative direction. In the positive direction the pressure was uniformly applied to the panels. In the negative direction the pressure was uniformly applied to the back of the studs.
 - The load was applied by evacuating the air below the test specimen using a vacuum pump. The applied load was measured with a digital manometer capable of reading in 0.1 inch (2.54mm) increments of water column.
 - Deflections were taken using digital dial indicators capable of reading in 0.0001 inch (0.00254mm) increments. Deflection readings were taken at five locations.
 - The loads were applied in increments so that a minimum of six load increments were obtained. The load was held at each load increment for 30 seconds, and then released to zero. Deflection readings were taken at each load increment, and after the load was released (set).

Test Procedure: The ultimate loads achieved in each panel and the allowable load is shown below.

Test Sample	Positive Load		Negative Load	
	Ultimate Load (psf)	Allowable Load (psf)	Ultimate Load (psf)	Allowable Load (psf)
1	153.92	42.58	94.12	37.92
2	131.56	39.18	83.72	37.94
3	133.12	37.77	117.52	37.49
Average	139.53	39.84	98.45	37.78

ASTM E 330 Positive & Negative Transverse Load Tests - 2x4 Wood Frame, 16" o.c.– OSB Sheathing

- Date Of Test:** January, 2002
- Test Agency:** RADCO, Inc., Listing & Testing Division (Resources, Applications, Designs and Controls, Inc.)
3220 East 59th Street, Long Beach, CA 90805
- Test Method:** ASTM E 330 Standard test method for structural performance of exterior windows, curtain walls, and doors by uniform static air pressure difference.
- Test Specimen:** Nichiha Brick, Stone & Block Fiber Cement Panels
- Specimen Specifications:** Thickness: 18mm (nominal 3/4").
Width: 455mm (nominal 18").
Length: 1,820mm (nominal 6').
- Test Panel Structure:** *Support Frame:* 4 feet (1,219mm) in width x 8 feet (2,438mm) in height frames were constructed from 2x4 nominal stud grade (38mm x 76mm) Spruce-Pine-Fir (SPF) placed on 16" o.c.
Frame Cover (Sheathing): 7/16" thick OSB.
Nichiha Panel: Each panel was fastened using Nichiha short clips (JE 550) at each frame member, and was fastened using Nichiha long clips (JEL 551) at the panel vertical joint locations.
- Test Procedure:**
- The panels were tested both in the positive and negative direction. In the positive direction the pressure was uniformly applied to the panels. In the negative direction the pressure was uniformly applied to the back of the studs.
 - The load was applied by evacuating the air below the test specimen using a vacuum pump. The applied load was measured with a digital manometer capable of reading in 0.1 inch (2.54mm) increments of water column.
 - Deflections were taken using digital dial indicators capable of reading in 0.0001 inch (0.00254mm) increments. Deflection readings were taken at five locations.
 - The loads were applied in increments so that a minimum of six load increments were obtained. The load was held at each load increment for 30 seconds, and then released to zero. Deflection readings were taken at each load increment, and after the load was released (set).

Test Procedure: The ultimate loads achieved in each panel and the allowable load is shown below.

Specimen	Positive Load / Ultimate Load (psf)	Negative Load / Ultimate Load (psf)
1	132.60	126.36
2	165.36	108.68
3	146.12	125.84
Average	148.03	120.29
Allowable Average	49.34	40.10

Mode Of Failure: *Positive Load Tests:* Outside studs broke and studs withdrew partially or sheared away from stud/ plate connection.
Negative Load Tests: OSB substrate was pulled away from wood studs and center stud broke.

ASTM E 330 Positive & Negative Transverse Load Tests - 2x6 Wood Frame, 16" o.c.– OSB Sheathing

Date Of Test: April, 2004

Test Agency: RADCO, Inc., Listing & Testing Division (Resources, Applications, Designs and Controls, Inc.)
3220 East 59th Street, Long Beach, CA 90805

Test Method: ASTM E 330 Standard test method for structural performance of exterior windows, curtain walls, and doors by uniform static air pressure difference.

Test Specimen: Nichiha Brick, Stone & Block Fiber Cement Panels

Specimen Thickness: 16mm (nominal 5/8").

Specifications: Width: 455mm (nominal 18").

Length: 1,820mm (nominal 6').

Test Panel Structure: *Support Frame:* 4 feet (1,219mm) in width x 8 feet (2,438mm) in height frames were constructed from 2x6 nominal stud grade (38mm x 140mm) Spruce-Pine-Fir (SPF) placed on 16" o.c.

Frame Cover (Sheathing): 7/16" thick OSB.

Nichiha Panel: Each panel was fastened using Nichiha short clips (JE 550) at each frame member, and was fastened using Nichiha long clips (JEJ 505) at the panel vertical joint locations. In addition, #6 by 2 inch long flat head wood screws were driven through the panels, and used as face fasteners, at 16" o.c. and 3" from the bottom edge at all courses, taking care to leave a 2" distance between the screw and the siding edge at both sides. At the vertical joints four (4) #6 x 2" long flat head wood screws were driven through the panel at 2" on both sides from the joint, and 3" from the top and bottom edges of the course.

Test Procedure:

- The panels were tested both in the positive and negative direction. In the positive direction the pressure was uniformly applied to the panels. In the negative direction the pressure was uniformly applied to the back of the studs.
- The load was applied by evacuating the air below the test specimen using a vacuum pump. The applied load was measured with a digital manometer capable of reading in 0.1 inch (2.54mm) increments of water column.
- Deflections were taken using digital dial indicators capable of reading in 0.0001 inch (0.00254mm) increments. Deflection readings were taken at five locations.
- The loads were applied in increments so that a minimum of six load increments were obtained. The load was held at each load increment for 30 seconds, and then released to zero. Deflection readings were taken at each load increment, and after the load was released (set).

Test Procedure: The ultimate loads achieved in each panel and the allowable load is shown below.

Test Sample	Positive Load		Negative Load	
	Ultimate Load (psf)	Allowable Load (psf)	Ultimate Load (psf)	Allowable Load (psf)
1	439.90	181.80	208.00	208.00
2	437.30	193.70	249.10	200.60
3	436.30	183.60	199.70	180.40
Average	437.83	186.37	218.93	196.33

Mode Of Failure: *Positive Load Tests:* The maximum capacity of the loading equipment was reached before failure in any panel. The loads shown in the table are the maximum applied loads, not ultimate or failure loads.

Negative Load Tests: The failure was a combination of siding sheared through screw heads and siding sheared away from clips.

Analysis of Results: The allowable wind design pressure determined from transverse load testing as described above, Brick, Stone and Block configuration is 73 psf (3.50 kPa). The design and wind velocity (3 second gust) based on the 2000 International Building Code and Section 6 of ASCE 7-98 is 153.6 mph (247.2 km/hr) for Exposure C at a mean height of 33 feet (10m).

ASTM E 330 Negative Windload Test - 18 GA Metal Frame, 16" o.c. – Open Stud

- Date Of Test:** March, 2010
- Test Agency:** Progressive Engineering, Inc.
58640 State Road 15, Goshen, IN 46528
- Test Method:** ASTM E 330 Standard test method for structural performance of exterior windows, curtain walls, and doors by uniform static air pressure difference.
- Test Specimen:** Nichiha Brick, Stone & Block Fiber Cement Panels
- Specimen Specifications:** Thickness: 18mm (nominal 3/4").
Width: 455mm (nominal 18").
Length: 1,820mm (nominal 6').
- Test Panel Structure:** *Support Frame:* 4 feet (1,219mm) in width x 8 feet (2,438mm) in height frames were constructed from 18 GA, 6" (89mm) x 1-5/8" (41mm) C-metal studs placed 16" o.c.
Frame Cover (Sheathing): Open stud (no sheathing).
Nichiha Panel: Each panel was fastened using Nichiha short clips (JE 402) at each frame member, and was fastened using Nichiha long clips (JE403) at the panel vertical joint locations.
- Test Procedure:** The data acquisition system was initiated and set to record at 4 samples per second. An initial reading was taken with no load on the specimen. The load was then increased to 15 psf and held for 10 seconds and then the linear transducer readings were again recorded. The load was then released for one (1) minute and the linear transducer readings were again recorded. The above process was continued in 15 psf increments until a failure occurred. Failure is considered, board flexural failure, board pull-over at a fastener, fastener withdrawal from the frame, and/pr frame failure. The maximum load, in psf, was recovered from the data acquisition system. The load was applied a gradual rate of approximately 0.5 psf per second, and not in excess of 2.0 psf per second.
- Test Conclusion:** Based on the wall constructed as per above, the 3/4" panels, and JE402 and JE403 panel clips fastened to 18-gage steel framing set 16" o.c., achieved an average ultimate negative test pressure of **131 psf**.
In accordance with Section 4.1(1) of ICC-ES AC90 the allowable load for this design is 43.7 psf.

ASTM E 331 Water Penetration Test - 1/2" R3 Foam Insulation Board Sheathing 24" o.c.

- Date Of Test:** May, 2001
- Test Agency:** UL (Underwriters Laboratories, Inc.)
333 Pfingsten Road, Northbrook, IL 60062
- Test Method:** ASTM E 331 Standard test method for water penetration of exterior windows, curtain walls, and doors by uniform static air pressure difference.
- Test Specimen:** Nichiha Brick, Stone & Block Fiber Cement Panels
- Specimen Specifications:** *Thickness:* 18mm (nominal 3/4").
Width: 455mm (nominal 18").
Length: 610mm (nominal 2').
- Test Structure:** *Support Frame:* 8 feet (2,438mm) in width x 8 feet (2,438mm) in height frames were constructed from 2x4 nominal (38mm x76mm) Spruce-Pine-Fir (SPF) studs placed on 20" o.c.
Frame Cover (Sheathing): 1/2" R3 foam insulation board sheathing.
Nichiha Panel: Each panel was fastened using Nichiha short clips (JE 402) at each frame member, and was fastened using Nichiha long clips (JE403) at the panel vertical joint locations. *Nichiha aluminum clips are no longer available, Nichiha now offers stainless steel clips.*
- Test Procedure:**
 - Each test specimen was sealed against the test chamber with the fiber cement sheathed facing the test chamber. The stud cavities of the back side of the sample was visible to inspection for water penetration.
 - A positive pressure of 6.3 psf was applied to the samples and the water spray system was turned on to deliver a minimum water spray of 5 gal./sq. ft. h uniformly against the 8' (2,438mm) x 8' (2,438mm) exposed surface of the test specimen. The test duration was 15 minutes.
- Test Results:** The test result is shown in the table below.

Specimen	Observed Water Leakage Into Wall Cavity
1	No
2	No
3	No

ASTM E 331 Water Penetration Test - Open Stud 16" o.c.

- Date Of Test:** May, 2001
- Test Agency:** UL (Underwriters Laboratories, Inc.)
333 Pfingsten Road, Northbrook, IL 60062
- Test Method:** ASTM E 331 Standard test method for water penetration of exterior windows, curtain walls, and doors by uniform static air pressure difference.
- Test Specimen:** Nichiha Brick, Stone & Block Fiber Cement Panels
- Specimen Specifications:** *Thickness:* 18mm (nominal 3/4").
Width: 455mm (nominal 18").
Length: 610mm (nominal 2').
- Test Structure:** *Support Frame:* 8 feet (2,438mm) in width x 8 feet (2,438mm) in height frames were constructed from 2x4 nominal (38mm x76mm) Spruce-Pine-Fir (SPF) studs placed on 16" o.c.
Frame Cover (Sheathing): Open stud (no sheathing).
Nichiha Panel: Each panel was fastened using Nichiha short clips (JE 402) at each frame member, and was fastened using Nichiha long clips (JE403) at the panel vertical joint locations. *Nichiha aluminum clips are no longer available, Nichiha now offers stainless steel clips.*
- Test Procedure:**
 - Each test specimen was sealed against the test chamber with the fiber cement sheathed facing the test chamber. The stud cavities of the back side of the sample was visible to inspection for water penetration.
 - A positive pressure of 6.3 psf was applied to the samples and the water spray system was turned on to deliver a minimum water spray of 5 gal./sq. ft. h uniformly against the 8' (2,438mm) x 8' (2,438mm) exposed surface of the test specimen. The test duration was 15 minutes.
- Test Results:** The test result is shown in the table below.

Specimen	Observed Water Leakage Into Wall Cavity
1	No
2	No
3	No

ASTM G 23 Weather Resistant Test

Date Of Test: November, 2000

Test Agency: UL (Underwriters Laboratories, Inc.)
333 Pfingsten Road, Northbrook, IL 60062

Test Method: ASTM G 23 Standard practice for operating light-exposure apparatus (Carbon-Arc Type) with and without water for exposure of nonmetallic materials.

Test Specimen: Nichiha Brick, Stone & Block Fiber Cement Panels

Specimen *Thickness:* 18mm (nominal 3/4").

Specifications: *Width:* 455mm (nominal 18").

Length: 229mm (nominal 9").

Test Procedure:

- The test procedure followed the "Method 1" operating schedule as referenced in ASTM G 23 which requires continuous exposure to light and intermittent exposure to water spray.
- The specimens were mounted in the drum of the test apparatus to receive the greatest uniformity of radiant exposure.
- The tests were conducted for 2000 with cycles of 102 minutes of light followed by 18 minutes of light and water spray.
- Black panel temperature was $145\pm 5^{\circ}$ (62.8° C).

Test Results:

- Each test sample was viewed under 5x magnification upon completion of the testing. There was no cracking, checking, crazing, erosion or other detrimental effects observed.
- Observation of the test samples after the accelerating weathering test showed no characteristics that would adversely affect the performance of the panels as exterior covering materials.