Additional Information

ATTACHING JAMES HARDIE PRODUCTS TO INSULATED CONCRETE FORMS (ICF)

Considering the proprietary nature of Insulated Concrete Forms (ICF) and the number of ICF manufacturers currently selling product in the US and Canada, James Hardie Building Products cannot calculate or determine the proper fastener for each type of plastic or metal cross-tie flange being used in the field. James Hardie offers the following as a guide to determine the correct siding fastening to be used with the respective ICF system chosen for the project in question.

1. Determine the projects basic wind design, including basic wind speed, wind exposure category, and mean roof height.

2. Find the fastener and frame type within James Hardie's CCMC Report that will meet the project's basic wind design.
   - **a.** Take note of the head diameter, shank diameter, and fastener length for the fastener.

Note: Fastener bearing area is equal to the head area less the shank area.

   - **b.** Take note of the frame type and frame spacing.

3. Go to the ICF system manufacturer and find a fastener that is similar in dimension to the fastener from step 2.1 above.
   - **a.** Basically, the bearing area under the ICF fastener head shall be the same as or greater than the bearing area under the James Hardie fastener head from step 2.

4. Since the James Hardie siding product has to be attached to a structural member, in this case the ICF cross-tie flange, the steps below shall be followed.
   - **a.** The onus is on the ICF system manufacturer to demonstrate that their ICF cross-tie flange holds fasteners, screws or nails, the same as wood or steel framing hold screws or nails.
   - **b.** ICF fastener allowable withdrawal load capacity (applicable factor of safety applied) may be found in an ICC-ES Product Evaluation for the given ICF manufacturer's products, OR
   - **c.** The ICF manufacturer may have testing that shows their fastener's allowable withdrawal load capacity (applicable factor of safety applied) from their cross-tie flange.

5. For the fastener from step 2, a registered design professional shall calculate the allowable withdrawal load (factor of safety applied) from the frame type noted in step 2.2.

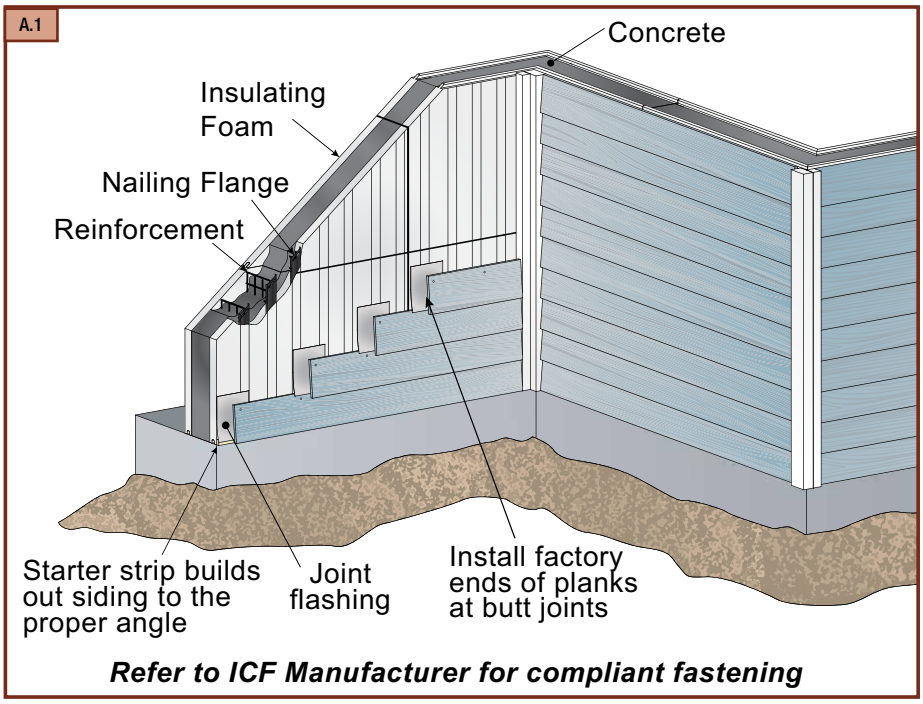
6. A registered design professional shall then make an equivalency statement comparing the ICF fastener withdrawal (step 4.1.1 or step 4.1.2) versus the fastener withdrawal from step 5.

7. When the ICF cross-tie flange spacing differs from the James Hardie frame spacing in step 2.2, a registered design professional shall calculate the maximum siding fastener spacing into the cross-tie flange needed to resist the applicable basic wind speeds published in James Hardie's CCMC Report for the fastener and design from step 2.

Additional Information (continued)

8. When required by the code official and once in possession of the information gathered in the steps above it is the responsibility of the property owner, design professional, contractor, or installer to make his or her case to the Building Official.

A.1



Refer to ICF Manufacturer for compliant fastening

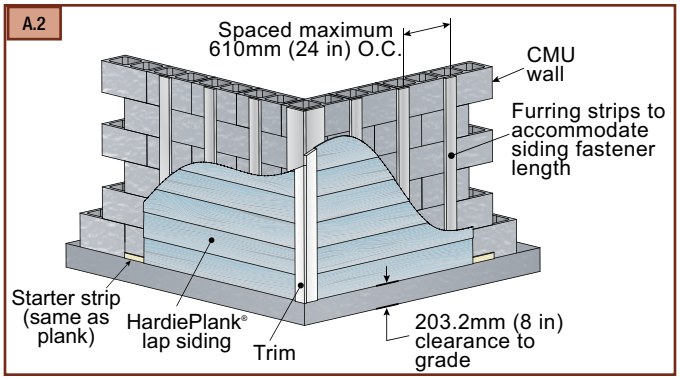
ATTACHING HARDIEPLANK® LAP SIDING AND HARDIETRIM® PRODUCTS TO CONCRETE MASONRY UNITS (CMU)

The application of HardiePlank® Lap Siding and HardieTrim® boards to masonry construction complying with local building codes using Concrete Masonry Units (CMU) complying to ASTM C 90 can be achieved by using one of the following two methods of attachment. All other product specific installation requirements which are not outlined below must be followed.

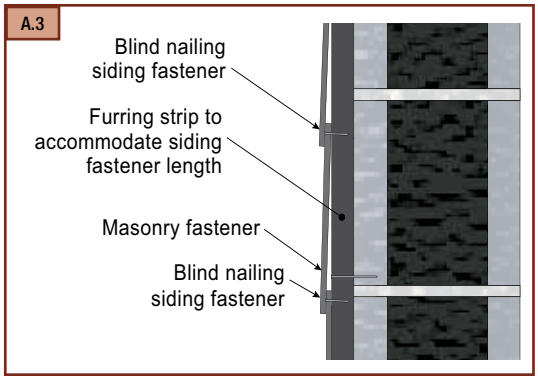
Method 1: Attachment Over Furring

Attach over furring with adequate thickness to allow attachment with approved fastening methods according to local building codes and code compliance documentation. Furring must be attached to ensure it can transfer the wind loads and other necessary forces back to the structure. The mechanical connection of the furring to the structure is the responsibility of the Licensed Design Professional. James Hardie Building Products has no comment on the load carrying capacity of the furring to framing connections.

A.2



A.3

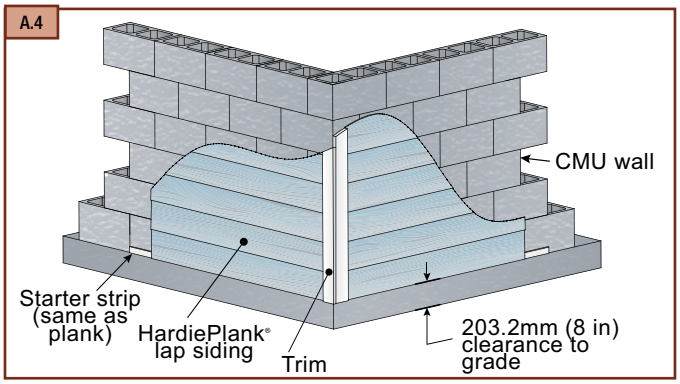


Method 2: Attachment Directly to CMU

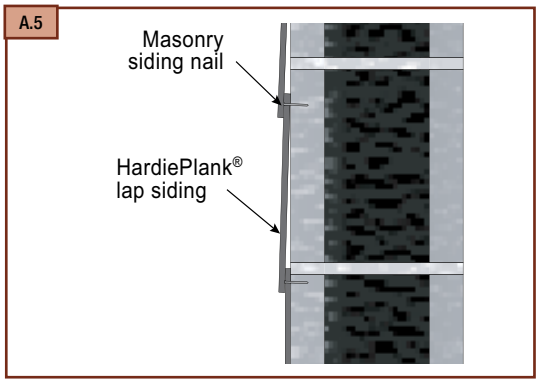
Attach directly to masonry with approved fastening method according to local building codes and code compliance documentation.

Refer to and follow local building codes for water resistive barrier requirements

A.4



A.5



Attachment of HardieTrim® boards

HardieTrim boards can be fastened using hardened finish nails designed for masonry construction. For more information refer to the HardieTrim section of this guide.

Additional Information (continued)

ICC – IBC® & IRC®/2006 – ALLOWABLE FASTENER SPACING (in)

HardiePlank® Lap Siding **fastened to ASTM C 90 Concrete Wall**

Basic Wind Speed	Building Height (feet)	<6½-inch wide			7¼- & 7½-inch wide			8- & 8¼-inch wide			9¼- & 9½-inch wide		
		Exposure			Exposure			Exposure			Exposure		
		B	C	D	B	C	D	B	C	D	B	C	D
161 kph	0-15	24	24	24	24	24	24	24	24	21	24	23	19
	20	24	24	24	24	24	23	24	24	20	24	21	18
	30	24	24	24	24	24	21	24	22	19	24	20	17
	40	24	24	23	24	24	20	24	21	18	24	19	16
	50	24	24	22	24	22	19	24	20	17	24	18	15
	60	24	24	22	24	22	19	24	19	17	23	17	15
177 kph	0-15	24	24	22	24	24	19	24	21	17	23	19	15
	20	24	24	21	24	22	18	24	20	16	23	18	15
	30	24	24	20	24	20	17	24	18	15	23	16	14
	40	24	22	19	24	19	16	23	17	15	21	15	13
	50	24	21	18	24	18	16	22	16	14	20	14	12
	60	24	20	18	23	18	15	21	16	14	19	14	12
193 kph	0-15	24	23	19	24	20	17	21	18	15	19	16	13
	20	24	22	18	24	19	16	21	17	14	19	15	12
	30	24	20	17	24	17	15	21	15	13	19	14	12
	40	24	19	16	22	16	14	20	14	12	18	13	11
	50	24	18	16	21	16	13	18	14	12	17	12	11
	60	23	17	15	20	15	13	18	13	11	16	12	10
209 kph	0-15	24	20	16	21	17	14	18	15	12	16	14	11
	20	24	19	15	21	16	13	18	14	12	16	13	11
	30	24	17	14	21	15	12	18	13	11	16	12	10
	40	22	16	14	19	14	12	17	12	11	15	11	9
	50	21	15	13	18	13	11	16	12	10	14	11	9
	60	20	15	13	17	13	11	15	11	10	13	10	9
225 kph	0-15	21	17	14	18	15	12	16	13	11	14	12	10
	20	21	16	13	18	14	12	16	12	10	14	11	9
	30	21	15	12	18	13	11	16	11	10	14	10	9
	40	19	14	12	16	12	10	15	11	9	13	9	8
	50	18	13	11	15	11	10	14	10	9	12	9	8
	60	17	13	11	15	11	10	13	10	9	12	9	8
241 kph	0-15	18	15	12	16	13	11	14	11	9	12	10	8
	20	18	14	12	16	12	10	14	11	9	12	10	8
	30	18	13	11	16	11	9	14	10	8	12	9	7
	40	16	12	10	14	10	9	13	9	8	11	8	7
	50	15	12	10	13	10	9	12	9	8	11	8	7
	60	15	11	10	13	10	8	11	8	7	10	8	7

Notes to Table:

1. Fasteners shall be ET&F Fastening Systems, Inc. ET&F block Nail (ET & F No. ASM-144-125, head dia. = 0.30 in, shank dia. = 0.14 in, length = 1.25-in long) or Max System block Nail (CP-C 832 W7-ICC, head dia. = 0.30 in, shank dia. = 0.15 in, length = 1.3 in).

2. Maximum basic wind speed shall be 250 kph.

3. Interpolation to address building height and other plank widths is permitted.

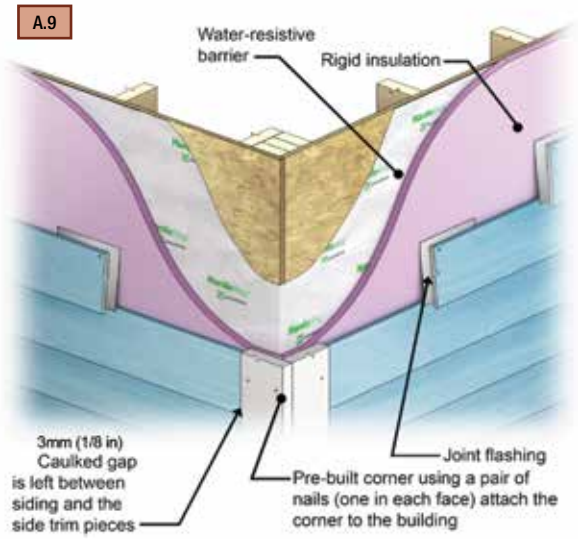
4. The lap conceals the fasteners of the previous course (Blind Nailed).

5. 1 inch = 25.4 mm, 1 foot = 305 mm, 1 mph = 0.44 m/s

WEATHER BARRIER & RIGID FOAM

- When using a weather resistive barrier (WRB) in conjunction with rigid foam insulation, the WRB can be installed underneath the foam as shown, or over the top if more convenient
- Regardless of where the WRB is placed, all flashings must be incorporated into the WRB and drainage plane.
- Some rigid foam insulation products are manufactured with tongue & groove or shiplap joints and can be used as the WRB when properly installed and sealed. When using rigid foam insulation as the WRB refer to manufacturers installation instructions.

A.9



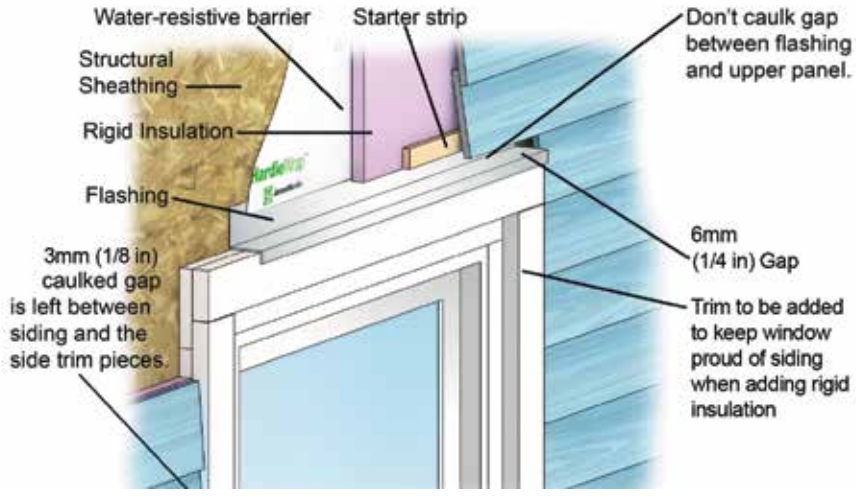
Trim

Depending upon the reveal around windows, doors, and penetrations, the thickness of foam, and the type and thickness of trim used, there will be different techniques to install the siding and trim to ensure the foam is completely concealed.

Flashings

The Z flashing above all horizontal trim must be incorporated into the WRB regardless of WRB position. If the foam is being used per manufacturers instructions as the WRB, all flashings must be incorporated into the drainage plane such that it allows moisture to drain down and out.

A.10



Note: It is recommended to layout the rigid foam insulation such that vertical joints do not occur at the corners of window and door openings or over window heads if possible.

Additional Information (continued)

JOINT FLASHING WITH HARDIEPLANK® LAP SIDING

One or more of the following joint treatment options are required by code (as referenced 2009 IRC R703.3.2)

A. Joint Flashing (James Hardie recommended)
B. Caulking* (Caulking is not recommended for ColorPlus for aesthetic reasons as the Caulking and ColorPlus will weather differently. For the same reason, do not caulk nail heads on ColorPlus products.}
C. "H" jointer cover Flashing behind butt joints provides an extra level of protection against the entry of water at the joint.

James Hardie recommends 6 in. wide flashing that overlaps the course below by 1 in. Some local building codes may require different size flashing. Joint-flashing material must be durable, waterproof materials that do not react with cement products. Examples of suitable material include finished coil stock and code compliant water-resistive barriers. Other products may also be suitable.

The reasons for this are:

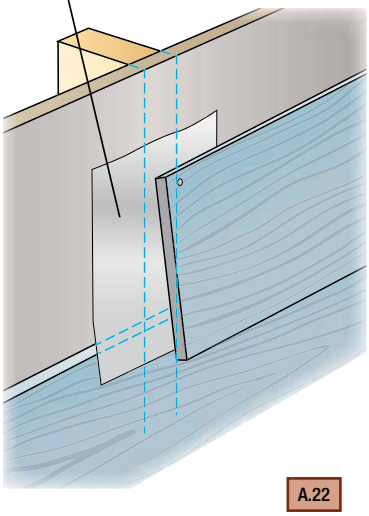
1. The use of joint flashing behind field butt joints is an approved joint treatment method as described in the 2006 International Building Code and is recognized by James Hardie and experts across the building industry to be a superior method.

"1405.17.2 Horizontal lap siding. *Lap siding shall be lapped a minimum of 1 1/4 inches (32 mm) and shall have the ends sealed with caulking, covered with an Hsection joint cover or located over a strip of flashing."*

Experts across the industry recognize flashings as an effective and responsible method for draining a wall system:

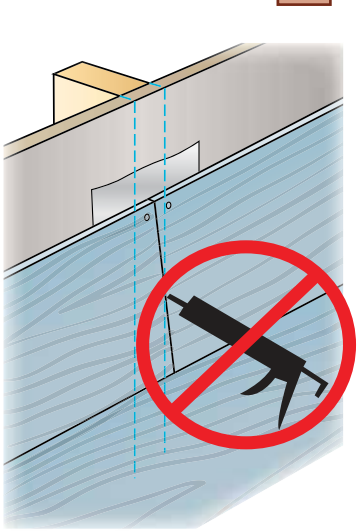
"The fundamental principle of water management is to shed water by layering materials in such a way that water is directed downwards and outwards out of the building or away from the building. The key to this fundamental principle is drainage. The most elegant expression of this concept is a flashing. Flashings are the most under-rated building enclosure component and arguably the most important."

EEBA (Energy & Environmental Building Association™) Water Management Guide By Joseph W. Lstriburek, Ph.D., P.eng. June 2004.



2. Reduced maintenance required by the home owner – It is recognized by James Hardie, several caulking manufacturers, experts across the industry, and experienced home owners that when caulking is used at field butt joints, maintenance will be required. Depending on the specific product and the application, caulked field butt joints will need to be maintained to guarantee continued performance over the life of the building. In addition, several sealant/caulking manufacturers recommend against using their products at butt joints in fiber cement siding for many of the reasons discussed here.

3. Improved appearance – When installed properly, flashing at a field butt joint can create a better looking joint. James Hardie recommends butting field joints together in moderate contact which achieves a more continuous looking joint. When utilizing a caulked butt joint, a gap specified by the caulk manufacturer must be left at the joint. Over time as the caulk ages, this joint can become pronounced on the wall and stand out.



Do not use caulk on HardiePlank® lap siding with ColorPlus® technology

JAMES HARDIE REQUIREMENTS FOR ALTERNATE FASTENERS AND METHODS OF FASTENING

The fastening requirements for each product are stated in one or more of the following technical documents and in some cases fastener products may be referenced. Below are the steps that can be used to demonstrate an alternate fastener's equivalency to the James Hardie published fastening requirements.

1. It is the responsibility of either the property owner, design professional, contractor, or installer to consult:
   - **a.** The fastener Manufacturer for a Product Listing Specification or Code Compliance report that covers the installation method in question, or;
   - **b.** A licensed Architect or Professional Engineer to make an equivalency statement linking the alternate fastener (or fastening method) to the fastening requirements published within the relevant James Hardie technical document;

2. Once in possession of the information gathered in step one it is the responsibility of the property owner, design professional, contractor, or installer to make his or her case to the Building Official[1]

[1] The Building Official reserves the right to approve alternate materials, design and methods of construction, 2006 International Building Code® Section 104.11, 2006 International Residential Code Section R104.11, and 1997 Uniform Building Code Section 104.2.8.

All national, state, and local building code requirements must be followed and where they are more stringent than the James Hardie installation requirements, state and local requirements will take precedence.

Estimating

Siding

All houses can be broken down to triangles, rectangles, and squares. Using these simple shapes it is very easy to estimate the amount of siding required.

1. Break down the portions of the house to be sided into the simple shapes (squares, rectangles, triangles) Figures 12.1 - 12.4.
2. Determine the height and width of each shape.
3. Multiply height x width to determine square footage. For triangles divide the total by 2.
4. Add all of the square footage numbers together.
5. Subtract large items such as garage doors, large doors, large windows, and banks of windows from total.
   Do not remove small windows, doors, vents, or other small areas not being sided.
6. Total all numbers. This gives you the total covered area.
7. Use the coverage charts located in this section to determine the number needed.
8. Add a minimum of 5% for waste. If there are multiple (3 or more) gables, chases, bump outs, or dormers add 10%.*

** Material for starter strip is included in the calculation for waste.*

Trim

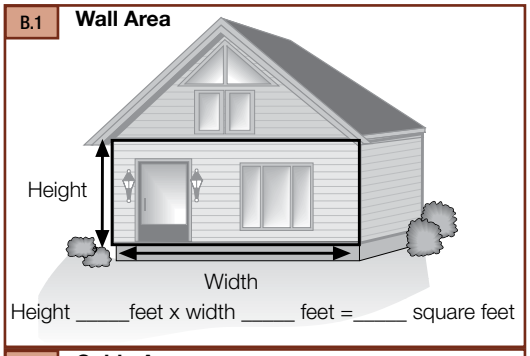
Number of HardieTrim® Boards:

Trim is applied to corners and around doors and windows. Trim is also used for fascia board, rake board, band board, frieze board and other details.

1. Determine which areas are to be trimmed.
2. Measure all openings to be trimmed including doors, windows, vent openings, corners (inside and outside), and other areas.
3. Measure for fascia, rakes, and frieze boards.
4. Add the lengths for corners, fascia, rakes, and frieze and add 5% for waste.
5. Add the lengths for window and door trim and add 10% for waste.
6. Add the total from lines 4 and 5 to determine the amount of trim needed.

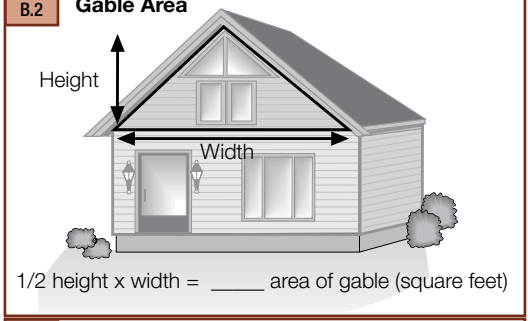
Disclaimer: The estimation methods in this section are meant as a guide. James Hardie does not assume responsibility for over or under ordering of product.

B.1 **Wall Area**



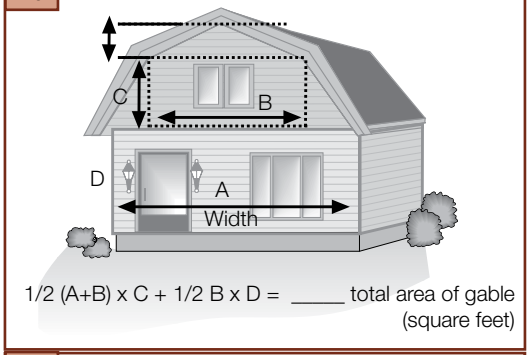
Height _____feet x width _____ feet =_____ square feet

B.2 **Gable Area**



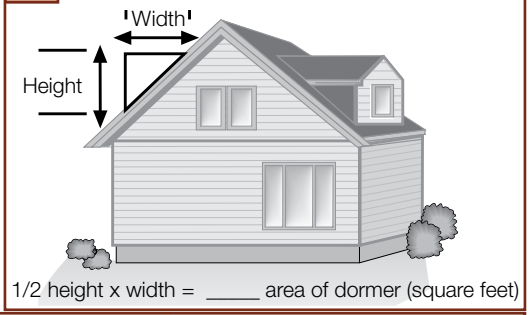
1/2 height x width = _____ area of gable (square feet)

B.3 **Gambrel Roof House**



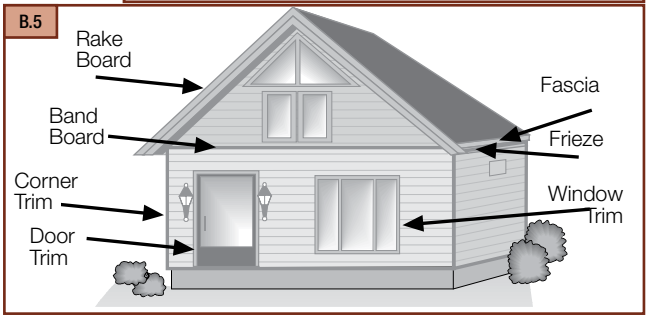
1/2 (A+B) x C + 1/2 B x D = _____ total area of gable (square feet)

B.4 **Dormer Area**



1/2 height x width = _____ area of dormer (square feet)

B.5



HardiePlank® Lap Siding Coverage Chart* (number of planks)

Coverage Area (square feet)	Plank Width (in)					
Width (in)	5.25	6.25	7.25	8.25	9.25	12
Exposure (in)	4	5	6	7	8	10.75
100	25	20	17	14	13	9
200	50	40	33	29	25	19
300	75	60	50	43	38	28
400	100	80	67	57	50	37
500	125	100	83	71	63	47
600	150	120	100	86	75	56
700	175	140	117	100	88	65
800	200	160	133	114	100	74
900	225	180	150	129	113	84
1000	250	200	167	143	125	93
1100	275	220	183	157	138	102
1200	300	240	200	171	150	112
1300	325	260	217	186	163	121
1400	350	280	233	200	175	130
1500	375	300	250	214	188	140
1600	400	320	267	229	200	149
1700	425	340	283	243	213	158
1800	450	360	300	257	225	167
1900	475	380	317	271	238	177
2000	500	400	333	286	250	186
2100	525	420	350	300	263	195
2200	550	440	367	314	275	205
2300	575	460	383	329	288	214
2400	600	480	400	343	300	223
2500	625	500	417	357	313	233
2600	650	520	433	371	325	242
2700	675	540	450	386	338	251
2800	700	560	467	400	350	260
2900	725	580	483	414	363	270
3000	750	600	500	429	375	279

Nail Coverage Chart** (number of nails)

Coverage Area (square feet)	Plank Width (in)					
Width (in)	5.25	6.25	7.25	8.25	9.25	12
Exposure (in)	4	5	6	7	8	10.75
100	250	200	166	143	125	93
500	1250	1000	830	715	625	465
1000	2500	2000	1660	1430	1250	930

Disclaimer

The estimation methods in this section are meant as a guide. James Hardie does not assume responsibility for over or under ordering of product.

** Coverage chart does not include waste. ** Number of nails given are for building framed 16 in. o.c.*

Estimating (continued)

HardiePanel® Vertical Siding Coverage Chart* (number of panels)

Coverage Area (square feet)	Panel Size (ft.) 4 ft x 8 ft (32SF)	4 ft x 9 ft (36SF)	4 ft x 10 ft (40SF)
100	4	3	3
200	7	6	5
300	10	9	8
400	13	12	10
500	16	14	13
600	19	15	15
700	22	20	18
800	25	23	20
900	29	25	23
1000	32	28	25
1100	35	31	28
1200	38	34	30
1300	41	37	33
1400	44	39	35
1500	47	42	38
1600	50	45	40
1700	54	48	43
1800	57	50	45
1900	60	53	48
2000	63	56	50
2100	66	59	53
2200	69	62	55
2300	72	64	58
2400	75	67	60
2500	79	70	63
2600	82	73	65
2700	85	75	68
2800	88	78	70
2900	91	81	73
3000	94	84	75

Disclaimer

The estimation methods in this section are meant as a guide. James Hardie does not assume responsibility for over or under ordering of product. Chart reflects footages rounded up to next full panel.

** Coverage chart does not include waste.*

HardieShingle® Siding

HardieShingle Staggered Edge Notched Panel Coverage

Panels are available in 48 in. lengths. Pieces needed for one square (100 sq. ft.) of product coverage = approximately 50, (depending on ratio of length to height of wall) based on maximum exposure of 6 in..

HardieShingle Straight Edge Notched Panels Coverage

Panels are available in 48 in. lengths. Pieces needed for one square (100 sq. ft.) of product coverage = approximately 43, (depending on ratio of length to height of wall) based on maximum exposure of 7 in..

HardieShingle Half-round Notched Panel Coverage

Panels are available in 48 in. lengths. Pieces needed for one square (100 sq. ft.) of product coverage = approximately 43, based on a maximum exposure of 7 in..

HardieShingle Individual Shingle Coverage*

Shingles are available in 4 3/16 in., 5 1/2 in., 6 3/4 in., 7 1/4 in., 10 in. widths, Bundles needed for one square (100 sq. ft.) of product coverage:

Shingle Width	Number of Bundles	Pieces per Bundle
4-3/16 in	3	15
5- ½ in	6	15
6-¾ in	3	15
7-¼ in	6	15
10 in	3	15

** Individual shingles are not available in all areas. Check you local dealer for availability.*

HardieSoffit® Panels

- For 12 in. and 16 in. width soffits: Divide total lineal footage of soffit and/or eaves by 12.
- For 24 in. width soffits: Divide total lineal footage of soffit and/or eaves by 8.

Disclaimer

The estimation methods in this section are meant as a guide. James Hardie does not assume responsibility for over or under ordering of product. Chart reflects footages rounded up to next full panel.

** Coverage chart does not include waste.*

Glossary of Building Terms

Back Roll - To roll over a freshly spray painted surface with a roller.

Back Sealing/Priming - Back sealing and back priming are used interchangeably in the field and refer to the act of applying a sealer or primer to the back of a cladding material to minimize the potential for water absorption through the backside of the product.

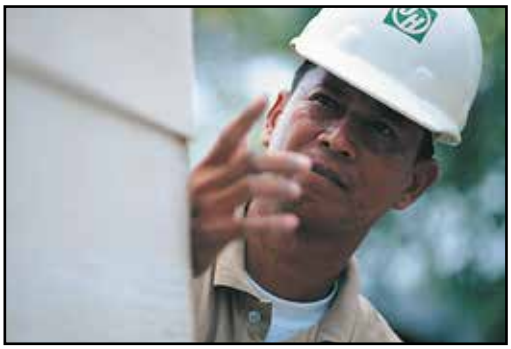
Band Board - A decorative piece of trim placed between two floors along the rim joist.

Bevel Cut - See weather cut

Blind Nailing - The action of placing a fastener through the top edge of lap siding that will be covered by the next course of siding.

Bump Out - A built out protrusion from a building.

Butt Joint - To place materials end-to-end or end-to-edge without overlapping. Also known as a field joint.



Caulk - A compound used to fill cracks, gaps, seams and joints.

Chase - A framed enclosed space around a flue pipe or a channel in a wall, or through a ceiling for something to lie in or pass through.

Course - A row of planks, one plank wide running the length of the house.

Dormer - A gabled extension built out from a sloping roof to accommodate a vertical window.

Drip Cap - A molding or metal flashing placed on the exterior topside of a door or window frame to cause water to drip beyond the outside of the frame.

Drip Edge - A metal or vinyl flashing placed on the top edge of the roof sheathing which directs water away from the structure to prevent seepage under or behind the exterior trim or fascia.

Eave - The lower part of the roof that projects over the exterior wall assembly.

Electro-Galvanized - Covered with zinc using a plating process.

Face - The side of the siding, trim, or soffit showing once the product has been installed.

Face Nailing - The action of placing a fastener through the overlap of a plank. The fastener will be visible.

Fascia Board - A trim board attached to the ends of the rafters.

Finished Grade - The level at which the ground surface meets the foundation of a building.

Flashing - A thin flat metal positioned under/behind roofing, windows, doors, corner posts, etc. to keep draining water from penetrating the house.

Frieze Board - A horizontal member connecting the top of the siding with the soffit

Furring/Furring Strip - Furring strips are long, thin strips of wood, metal or Fiber Cement used to make backing surfaces to support the finished surfaces.

Gable - The end of a wall that is created when a roof line is pitched and slopes in two directions.

Galvanized - Covered with zinc. Either hot-dipped or electro-plated.

Grade - The height of the ground on which something stands.

Horizontal - Parallel to the horizon; on a level.

Joint Flashing - An additional weather resistive barrier placed behind a butt joint.

Lap - To over lap a course of siding with another course of siding.

Level - A position of measurement truly and exactly horizontal, 90° from a plumb surface.

Light Block - Decorative trim item placed under light fixtures and other exterior fixtures.

Miter - To make a diagonal cut, beveled to a specific angle 45° and 22 1/2 ° are common.

Mud Sill - A building member resting and normally attached to the foundation of a building running around the perimeter of the building. Also known as sill plate.

OSB - Oriented Strand Board. A common type of structural panel sheathing.

PEL - Personal Permissible Exposure Limit. The maximum daily exposure level to respirable silica. OSHA's Personal Exposure Limit is 0.1 mg/m3.

Plumb - A position of measurement truly and exactly vertical, 90° from a level surface.

Plunge Cut - The act of driving a saw into the body of a material.

Rafter Tail - The end of a rafter extending past the wall assembly.

Rain Screen Wall - Consists of an exterior cladding, a cavity behind the cladding typically created through the use of furring strips for the purpose of drainage and venting to the outside; an inner wall plane incorporating a weather resistive barrier.

Rake Board - Decorative trim placed at an angle.

Rigid Sheathing - Plywood or OSB.

Rim Joist - The board that the rest of the joists are nailed to. It runs the entire perimeter of the house.

Rip Cut - Cut along the grain, usually lengthwise on a board.

Scroll Work - Decorative trim work.

Sheathing - Sheets of plywood, gypsum board, or other material nailed to the outside face of studs as a base for exterior siding.

Shim - A building material, usually wood, used to even a surface.

Silica - Mineral that is composed of silicon dioxide, SiO2.

Speed Square - Triangle shaped measuring device used in a variety of framing and siding applications.

Stage - To deliver, stack, or store material in a specific location.

Starter Strip - An accessory used under the first course of siding to provide a consistent plank angle.

Sub-Fascia - Framing member attached to the rafter tails used to support the fascia or used to pad out the fascia.

T-Shed – A shed with a single vertical wall and a roof that hangs off that wall on either side. The cross section of the shed is shaped like a 'T'.

Vertical - Being or situated at right angles to the horizon; upright.

Weather Cut- 15° to 45° cut used to join two boards.

Weather-Resistive Barrier- A building paper that protects building materials from exterior water penetration.

Z-Flashing- A piece of flashing bent into the shape of a "z". Used over window trim, band boards, panel intersections, and other vertical surfaces.

CONSTRUCTION

Evaluation Report CCMC 12678-R
HardiePanel® HZ5™ Vertical Siding, HardiePlank® HZ5™ Lap Siding, HardieShingle® HZ5™ Notched Panels and HardieShingle® HZ5™ Individual Shingle

MasterFormat:	07 46 45.01
Evaluation issued:	1995-04-28
Re-evaluated:	2016-06-15
Re-evaluation due:	2019-04-28

1. Opinion

It is the opinion of the Canadian Construction Materials Centre (CCMC) that "HardiePanel® HZ5™ Vertical Siding, HardiePlank® HZ5™ Lap Siding, HardieShingle® HZ5™ Notched Panels and HardieShingle® HZ5™ Individual Shingle," when used as exterior cladding applied to vertical walls of masonry or concrete, as well as cementitious and wood sheathing boards that are attached to wood or steel framing, in new and retrofit construction in accordance with the conditions and limitations stated in Section 3 of this Report, complies with the National Building Code (NBC) of Canada 2015:

- Clause 1.2.1.1.(1)(a), Division A, as an acceptable solution from Division B:
  - Sentence 5.6.1.1.(1), Required Protection from Precipitation
  - Sentence 9.27.1.1.(1), General (Cladding)
  - Sentence 9.27.1.1.(6), General (Cladding)
  - Clause 9.27.2.2.(1)(a), Minimum Protection from Precipitation Ingress (when installed in coastal areas)
  - Sentence 9.27.2.2.(2), Minimum Protection from Precipitation Ingress
  - Sentence 9.27.2.2.(5), Minimum Protection from Precipitation Ingress
  - Article 9.27.2.3., First and Second Planes of Protection
  - Article 9.27.3.1., Elements of the Second Plane of Protection
  - Appendix Note D-4.1.1., Determination of Noncombustibility

- Clause 1.2.1.1.(1)(b), Division A, as an alternative solution that achieves at least the minimum level of performance required by Division B in the areas defined by the objectives and functional statements attributed to the following applicable acceptable solutions:
  - Sentence 9.27.2.1.(1), Minimizing and Preventing Ingress and Damage

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

Ruling No. 95-17-36 (12678-R) authorizing the use of this product in Ontario, subject to the terms and conditions contained in the Ruling, was made by the Minister of Municipal Affairs and Housing on 1995-11-29 (revised on 2012-06-13) pursuant to s.29 of the *Building Code Act*, 1992 (see Ruling for terms and conditions). This Ruling is subject to periodic revisions and updates.

2. Description

The products are fibre cement boards made primarily of hydraulic cement, silica, and other additives and reinforced integrally with cellulose fibres. The products are manufactured using the Hatschek process and steam autoclaved. They are intended for use as an exterior cladding applied to vertical walls of masonry or concrete, as well as cementitious and wood sheathing boards that are attached to wood or steel framing, in new and retrofit construction subject to the conditions and limitations stated in Section 3 of this Report. See also the manufacturer's installation instructions, dated September 2013, for details and restrictions.

In addition to the sizes for each of the products listed below, additional lengths and widths may be available from the manufacturer by special order.

"HardiePanel® HZ5™ Vertical Siding"

"HardiePanel® HZ5™ Vertical Siding" is available in panels that are 2 440 mm to 3 050 mm long, 1 220 mm wide and 7.5 mm thick. The panels are available in a smooth, stucco pattern or a wood grain face texture.

The panels are installed with a drained and vented air space not less than 10 mm deep behind the cladding. Vertical joints of the panels must butt over the framing members (studs).

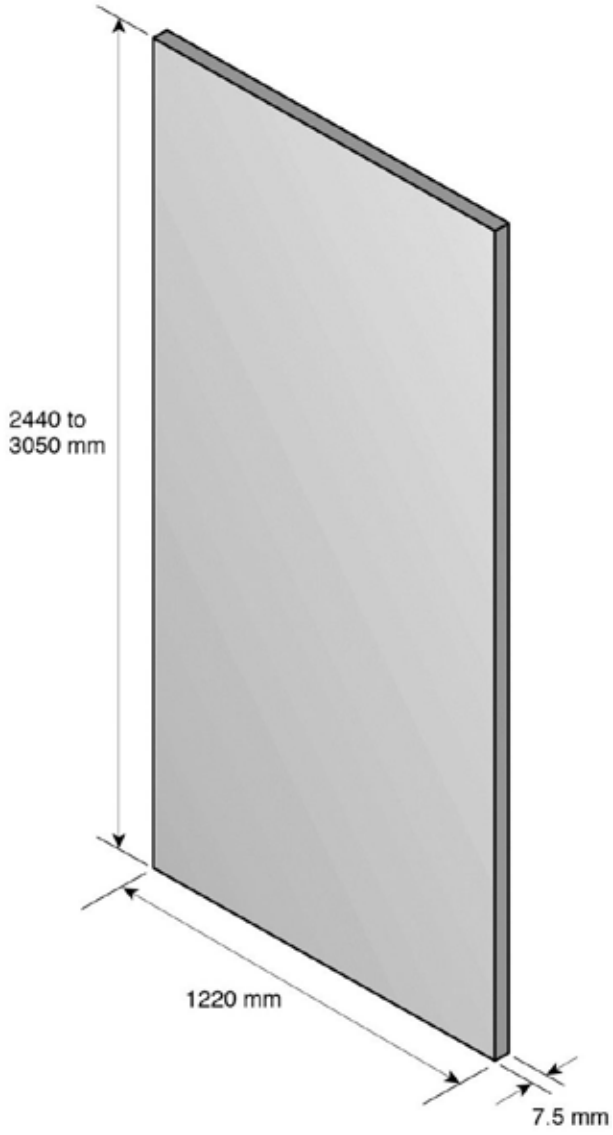


Figure 1. "HardiePanel® HZ5™ Vertical Siding"

"HardiePlank® HZ5™ Lap Siding"

"HardiePlank® HZ5™ Lap Siding" is available in planks that are 3 660 mm long, 133 mm to 305 mm high and 7.5 mm thick. The planks are available in a smooth or wood grain face texture.

The planks are installed beginning from the bottom of the wall with a minimum overlap of 32 mm. Vertical joints of the planks must butt over the framing members (studs). The lap siding is fastened either through the overlapping planks (face nailed) with corrosion resistant nails or screws or through the top edge of the planks (blind nailed).

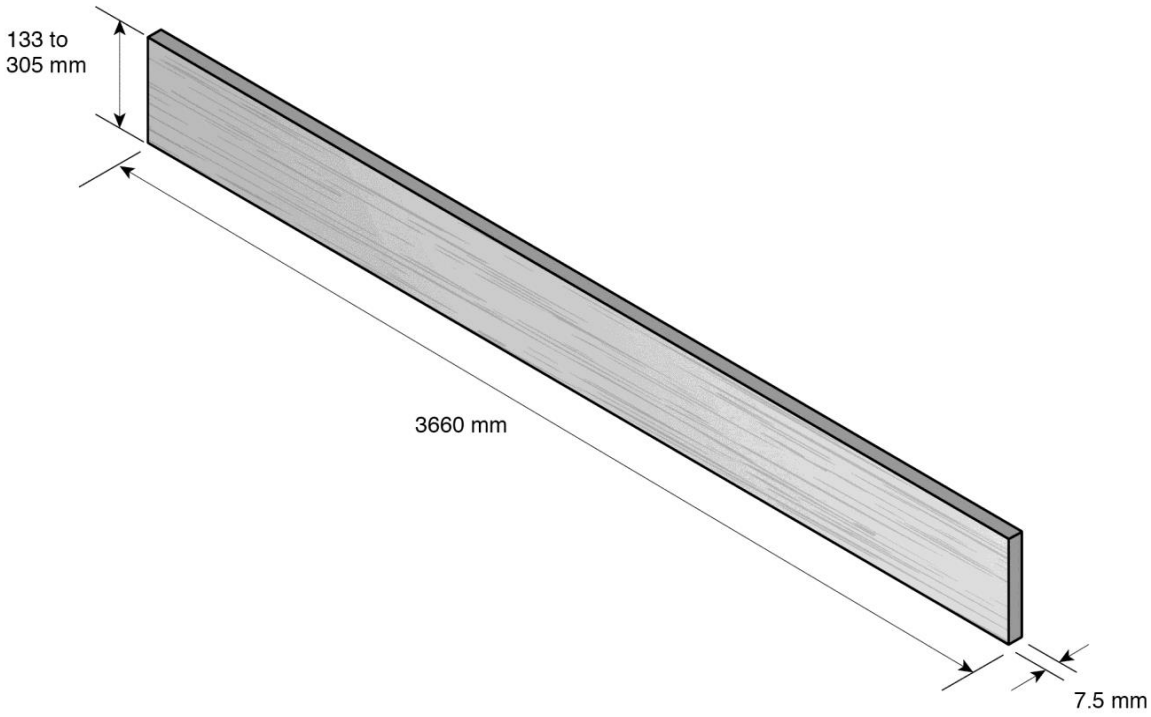


Figure 2. "HardiePlank® HZ5™ Lap Siding"

"HardieShingle® HZ5™ Notched Panels"

"HardieShingle® HZ5™ Notched Panels" are available in three variations: straight edge panel, staggered edge panel and half-round panel. The panels are 404 mm high, 1 220 mm long and 6 mm thick. The panels are available in a wood grain texture.

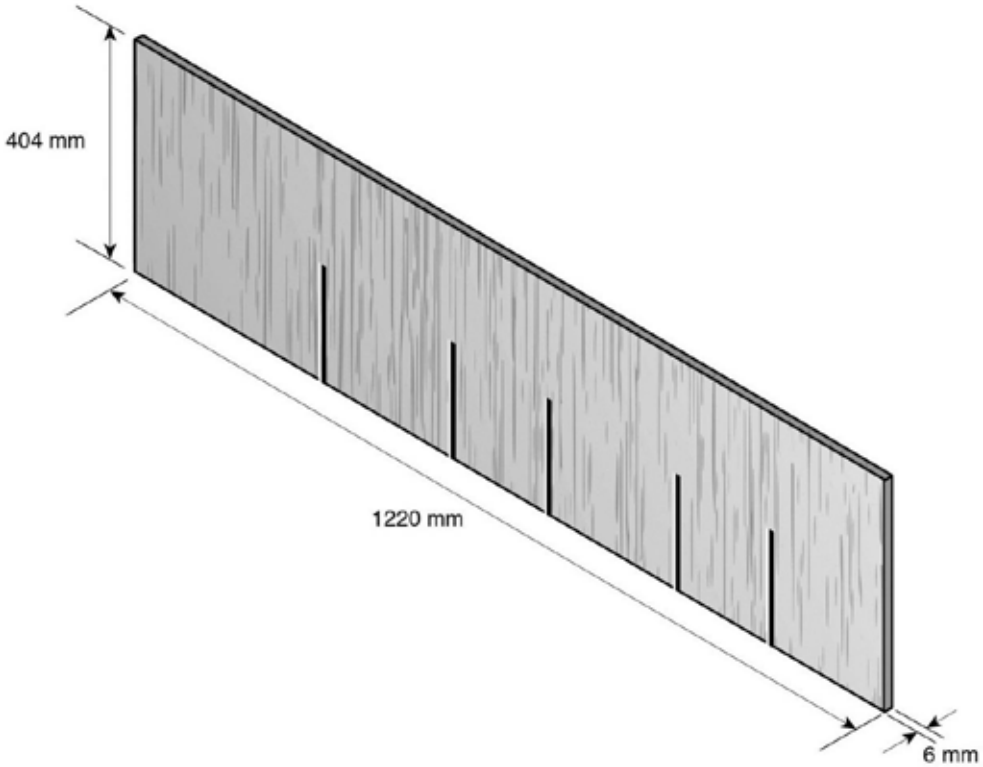


Figure 3. "HardieShingle® HZ5™ Notched Panels" – straight edge

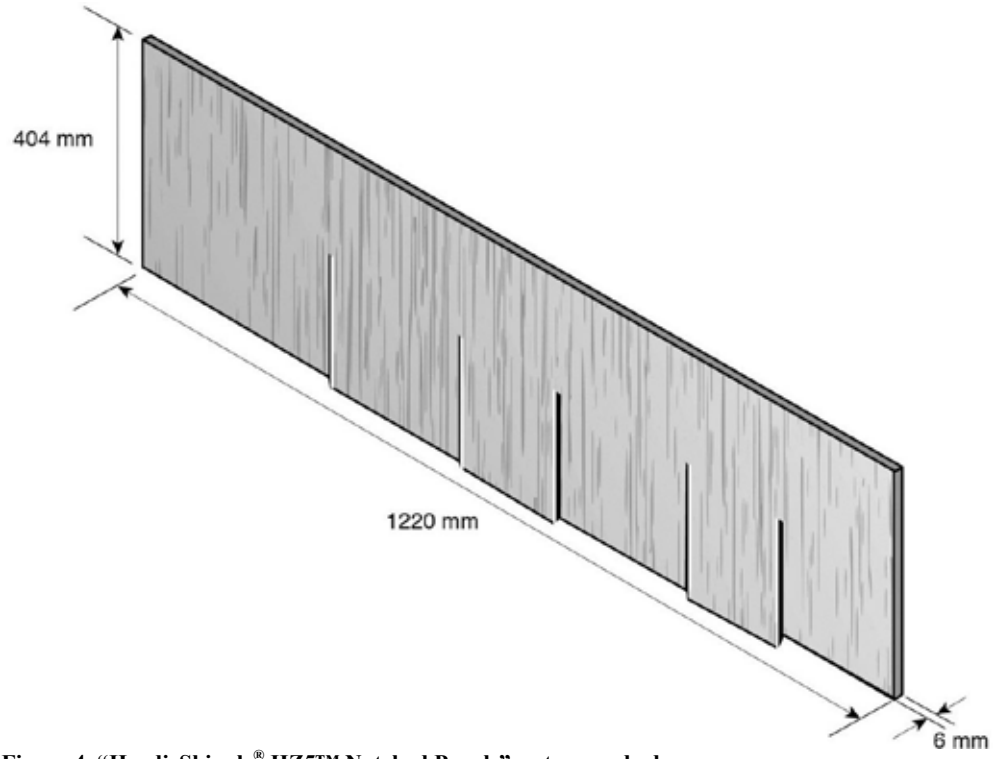


Figure 4. "HardieShingle® HZ5™ Notched Panels" – staggered edge

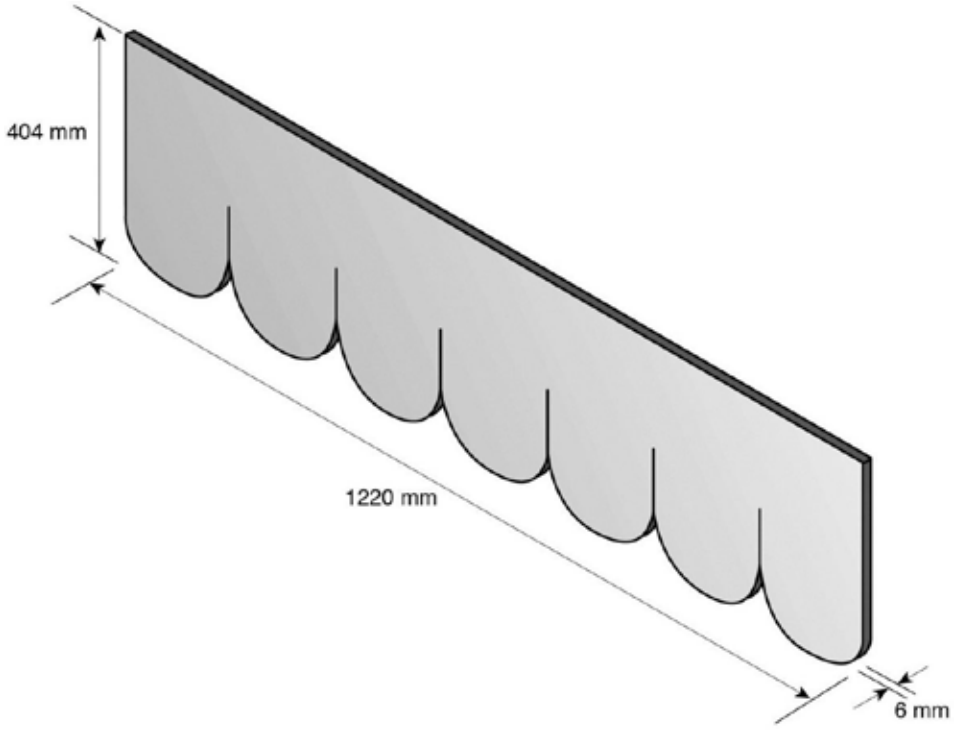


Figure 5. "HardieShingle® HZ5 Notched Panels" – half-round

"HardieShingle® HZ5™ Individual Shingle"

"HardieShingle® HZ5™ Individual Shingle" is available in cladding shingles that are 381 mm high, 105 mm to 250 mm wide and 6 mm thick. The shingles are available in a wood grain texture.

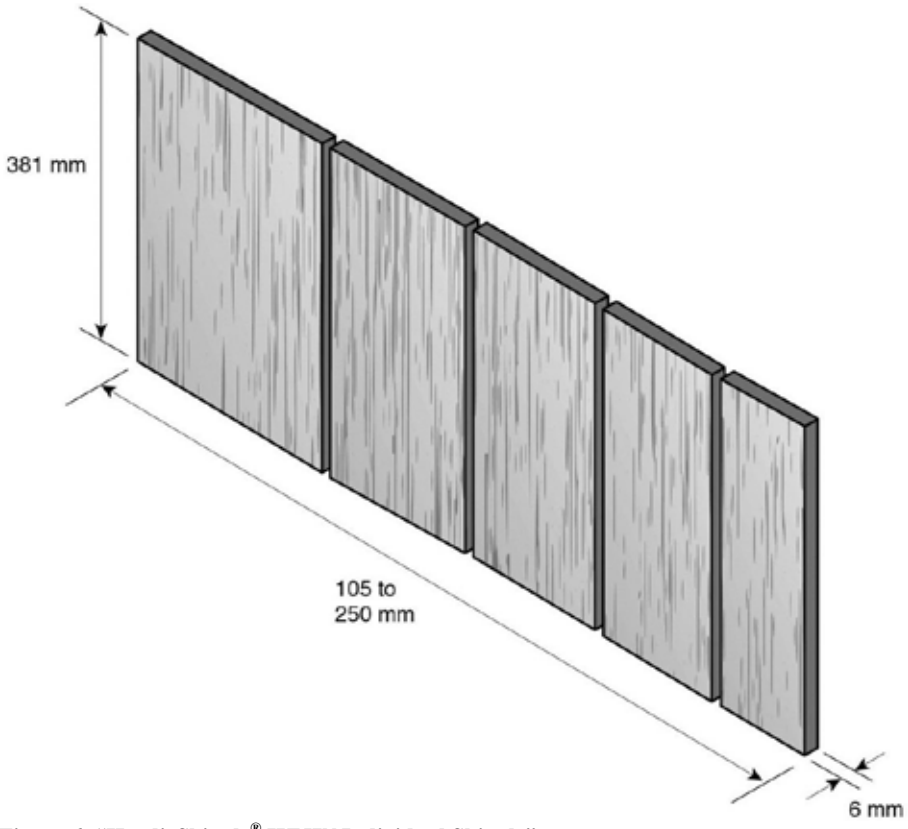


Figure 6. "HardieShingle® HZ5™ Individual Shingle"

3. Conditions and Limitations

The CCMC compliance opinion in Section 1 is bound by the "HardiePanel® HZ5™ Vertical Siding, HardiePlank® HZ5™ Lap Siding, HardieShingle® HZ5™ Notched Panels and HardieShingle® HZ5™ Individual Shingle" being used in accordance with the conditions and limitations set out below.

"**HardiePlank® HZ5™ Lap Siding, HardieShingle® HZ5™ Notched Panels and HardieShingle® HZ5™ Individual Shingle**" **Conditions and Limitations:**

- The products are intended for use as exterior cladding applied over exterior walls of buildings.
- This Report covers the installation of the products limited to the geographical areas with the hourly wind pressures shown in Table 4.3.1.1 and the respective fastening schedule to a wood frame or a steel frame. The performance level shown in Table 4.3.1.1 is for installations limited to non-post-disaster buildings that are three storeys high (12 m) or less.
- The products are permitted in the construction of buildings required to be of combustible or noncombustible construction in accordance with Section 3.1., General (Fire Protection, Occupant Safety and Accessibility) of Division B of the NBC 2015.
- 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 must be applied beneath the cladding products.

Coastal Areas:

- For applications in coastal areas as defined by Sentence 9.27.2.2.(5) of Division B of the NBC 2015, all listed products must be installed over wood strapping creating a drained and vented air space not less than 10 mm deep behind the cladding in conformance with Clause 9.27.2.2.(1)(a), Sentences 9.27.2.2.(2), and 9.27.5.7.(2), Penetration of Fasteners, and Articles 9.27.5.3., Furring, and 9.27.5.4., Size and Spacing of Fasteners, of Division B of the NBC 2015.
- The drained and vented air space described in Clause 9.27.2.2.(1)(a) of Division B of the NBC 2015 must remain unobstructed.

Non-coastal Areas:

- For direct application in non-coastal areas,[1,2] the air space between the substrate and the products that is created as a result of the overlap of the cladding boards must remain unobstructed.
- For direct application of "HardiePlank® HZ5™ Lap Siding" in non-coastal areas, the butt joint must consist of factory-finished ends in conjunction with a joint flashing behind the joint, which consists of a 150-mm-wide Code-prescribed sheathing membrane[2] that overlaps the course below by 25 mm. The butt joint must be lined up and be supported by a stud.

"HardiePanel® HZ5™ Vertical Siding" Conditions and Limitations:

- In all areas (coastal and non-coastal areas), "HardiePanel® HZ5™ Vertical Siding" must be installed over wood strapping creating a drained and vented air space not less than 10 mm deep behind the cladding in conformance with Clause 9.27.2.2.(1)(a), Sentences 9.27.2.2.(2) and 9.27.5.7.(2), and Articles 9.27.5.3. and 9.27.5.4., of Division B of the NBC 2015.

Cladding System Installation Details:

- Installation of the products must meet the requirements of Article 9.27.3.8., Flashing Installation, and Subsections 9.27.4., Sealants, and 9.27.5., Attachment of Cladding.
- The attachment of the cladding conforms to Table 4.3.1.1 of this Report.
- The products must be installed in conjunction with materials conforming to Articles 9.27.3.2., Sheathing Membrane Material Standard, and 9.27.3.7., Flashing Materials, and Subsections 9.27.4. and 9.27.5. of Division B of the NBC 2015.
- The requirements of Article 9.10.16.1., Required Fire Blocks in Concealed Spaces, of Division B of the NBC 2015 must be met.
- The product must be installed in accordance with the manufacturer's current instructions.
- The technical opinion in this Report is limited to uncoated products. The manufacturer may provide primed or prepainted products. Low water vapour permeance coatings may affect the drying potential of the product as well as the substrate on which it is installed. Such a situation could lead to premature deterioration of the substrate and other elements in the wall assembly. The manufacturer's recommendations for type and characteristics of coatings to be used in conjunction with the cladding must be followed.
- The possibility of moisture accumulation within the wall construction is mainly a function of the level of workmanship related to the elements constituting the second plane of protection as defined in Article 9.27.2.3. of Division B of the NBC 2015, such as wall sheathing membrane, flashing, caulking and attachment of siding. A high level of quality control at all stages of the exterior wall construction is imperative for obtaining an acceptable performance.
- This Evaluation Report is applicable only to products identified with "CCMC 12678-R."

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1. A moisture management study performed on "HardiePlank® HZ5™ Lap Siding," "HardieShingle® HZ5™ Notched Panels" and "HardieShingle® HZ5™ Individual Shingle" indicated that these products can be installed with direct application in non-coastal areas.
2. These direct-applied cementitious claddings were not evaluated when in contact with polymer-based sheathing membranes (see limitations in CCMC Reports of polymer-based sheathing membranes). The NBC-prescribed asphalt impregnated paper-based sheathing membranes shall be used.

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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 General

4.1.1 Dimensional Tolerances

Table 4.1.1.1 Results of Testing the Dimensional Measurements of "HardiePanel® HZ5™ Vertical Siding"

Property	Unit	Requirement	Result
Length	mm	± 3.0	2
Width	mm	± 3.0	2
Thickness	mm	± 1.6	0.51
Squareness	mm/m	± 4.0	1.33
Edge straightness	mm/m	± 2.6	0.73

4.2 Prescriptive Requirements

Table 4.2.1 Results of Testing the Prescriptive Requirements of "HardiePanel® HZ5™ Vertical Siding"

Property			Unit	Requirement	Result
Water absorption			%	≤ 40	29.8
Density			kg/m^3	≥ 950	1 388
Dimensional change			%	< 0.20	0.1
Flexural strength		**MD**[1]	MPa	> 7.0	21.0
		XD[1]		> 7.0	13.7
Fastener pull-through resistance			N	≥ 28 × thickness	1 144
Water vapour transmission (water method)			–	> 60 ng/m^2·s·Pa	1 056
Freeze-thaw resistance	**loss of mass**		%	≤ 3	1.42
	loss of flexural strength	**MD**	%	≤ 15	4.1
		XD		≤ 15	12.9
	deleterious effects		–	None	None
Watertightness			–	No drop of water	None
Warm water resistance	**loss of flexural strength**	**MD**	%	≤ 15	–9.4[2]
		XD		≤ 15	–12.0[2]
	deleterious effects		–	No visible cracks	None

Notes to Table 4.2.1:

1 MD refers to machine direction; XD refers to cross-machine direction.

2 The negative values indicate that they gained strength after the warm water resistance test.

4.3 Performance Requirements

4.3.1 Wind Load Resistance

Table 4.3.1.1 Results of Testing the Wind Load Resistance of the Products

Assembly ID	Product	Cladding Dimension	Frame	Sheathing	Stud Spacing[1] (in.)	Vertical Fastener Spacing (in.)	Fasteners	Rating (kPa)	Result
1	"HardiePanel® HZ5™ Vertical Siding"	4 ft. × 8 ft. × 5/16 in.	2 × 4 spruce-pine-fir (S-P-F) wood	None	24	12	6d Common nail	Q_{50} < 0.55	Pass
2		4 ft. × 8 ft. × 5/16 in.	2 × 4 S-P-F wood	None	24	8	2-in. Siding nail; 0.092-in. shank; 0.22-in. head	Q_{50} < 0.55	Pass
3		4 ft. × 8 ft. × 5/16 in.	2 × 4 S-P-F wood	None	24	6	6d Common nail	Q_{50} < 0.75	Pass
4		4 ft. × 8 ft. × 5/16 in.	2 × 4 S-P-F wood	None	24	6	1½-in. Ring shank nail; 0.095-in. shank; 0.219-in. head	Q_{50} < 0.55	Pass
5		4 ft. × 8 ft. × 5/16 in.	20-ga steel	None	24	12	#8 Bugle head screw; 1¼-in. long; 0.323-in. head	Q_{50} < 0.45	Pass

Assembly ID	Product	Cladding Dimension	Frame	Sheathing	Stud Spacing[1] (in.)	Vertical Fastener Spacing (in.)	Fasteners	Rating (kPa)	Result
6		4 ft. × 8 ft. × 5/16 in.	20-ga steel	None	24	12	1½-in. ET&F pin; 0.10-in. shank; 0.25-in. head	$Q_{50} < 0.55$	Fail[2]
7		4 ft. × 8 ft. × 5/16 in.	20-ga steel	None	24	8	1½-in. ET&F pin; 0.10-in. shank; 0.25-in. head	$Q_{50} < 0.55$	Pass
8		4 ft. × 8 ft. × 5/16 in.	18-ga steel	None	16	6	1½-in. ET&F pin; 0.10-in. shank; 0.25-in. head	$Q_{50} < 0.75$	Pass
9	"HardiePlank® HZ5™ Lap Siding"	9.25 in. × 12 ft. × 5/16 in.	2 × 4 S-P-F wood	None	16	–	(Blind nailing)[3] 6d common nail	$Q_{50} < 0.75$	Pass
10		9.25 in. × 12 ft. × 5/16 in.	2 × 4 S-P-F wood	None	24	–	(Blind nailing) 6d common nail	$Q_{50} < 0.55$	Pass
11		9.25 in. × 12 ft. × 5/16 in.	2 × 4 S-P-F wood	None	16	–	(Blind nailing) 1¼-in. roofing nail; 0.120-in. shank; 0.375-in. head	$Q_{50} < 0.75$	Pass
12		9.25 in. × 12 ft. × 5/16 in.	2 × 4 S-P-F wood	None	24	–	(Blind nailing) 2-in. siding nail; 0.092-in. shank; 0.22-in. head	$Q_{50} < 0.55$	Pass
13		12 in. × 12 ft. × 5/16 in.	2 × 4 S-P-F wood	None	16	–	(Face nailing)[4] 2½-in. siding nail; 0.095-in. shank; 0.235-in. head	$Q_{50} < 0.65$	Pass
14		9.25 in. × 12 ft. × 5/16 in.	2 × 4 S-P-F wood	None	24	–	(Face nailing) 6d common nail	$Q_{50} < 0.75$	Pass
15		9.25 in. × 12 ft. × 5/16 in.	2 × 4 S-P-F wood	7/16-in. oriented strand-board (OSB)	24 8 in. on centre (o.c.)[5]	–	(Blind nailing) 1½-in. ring shank nail; 0.095-in. shank; 0.219-in. head	$Q_{50} < 0.55$	Pass
16		7.25 in. × 12 ft. × 5/16 in.	2 × 4 S-P-F wood	None	16	–	(Blind nailing) 6d common nail	$Q_{50} < 0.75$	Pass
17		9.25 in. × 12 ft. × 5/16 in.	2 × 4 S-P-F wood	None	16	–	(Blind nailing) 1½-in. ring shank nail; 0.095-in. shank; 0.219-in. head	$Q_{50} < 0.55$	Pass
18		9.25 in. × 12 ft. × 5/16 in.	2 × 4 S-P-F wood	None	24	–	(Blind nailing) 1½-in. ring shank nail; 0.095-in. shank; 0.219-in. head	$Q_{50} < 0.45$	Pass
19		8.25 in. × 12 ft. × 5/16 in.	20-ga steel	None	16	–	(Blind nailing) 1½-in. ET&F pin; 0.10-in. shank; 0.25-in. head	$Q_{50} < 0.55$	Pass
20	"HardieShingle® HZ5™ Notched Panels"	16 in. × 4 ft. × 1/4 in.	2 × 4 S-P-F wood	None	24	–	(Blind nailing) 1½-in. ring shank nail; 0.095-in. shank; 0.219-in. head	$Q_{50} < 0.55$	Pass

Assembly ID	Product	Cladding Dimension	Frame	Sheathing	Stud Spacing[1] (in.)	Vertical Fastener Spacing (in.)	Fasteners	Rating (kPa)	Result
21		16 in. × 4 ft. × 1/4 in.	2 × 4 S-P-F wood	None	16	–	(Blind nailing) 1½-in. ring shank nail; 0.095-in. shank; 0.219-in. head	$Q_{50} < 0.75$	Pass
22		16 in. × 4 ft. × 1/4 in.	2 × 4 S-P-F wood	7/16-in. OSB	24 14 in. o.c.[6]	–	(Blind nailing) 1½-in. ring shank nail; 0.095-in. shank; 0.219-in. head	$Q_{50} < 0.55$	Pass
23		16 in. × 4 ft. × 1/4 in.	20-ga steel	None	24	–	(Blind nailing) 1½-in. ET&F pin; 0.10-in. shank; 0.25-in. head	$Q_{50} < 0.55$	Pass
24		16 in. × 4 ft. × 1/4 in.	2 × 4 S-P-F wood	None	16	–	(Blind nailing) 1¼-in. roofing nail; 0.120-in. shank; 0.375-in. head	$Q_{50} < 0.75$	Pass
25	"HardieShingle® HZ5™ Individual Shingle"	6 in., 8 in., 12 in. × 18 in. × 1/4 in.	2 × 4 S-P-F wood	7/16-in. OSB	24 Two end nails per shingle[7]	–	(Blind nailing) 1¼-in. roofing nail; 0.120-in. shank; 0.375-in. head	$Q_{50} < 0.75$	Pass
26		6 in., 8 in., 12 in. × 18 in. × 1/4 in.	2 × 4 S-P-F wood	7/16-in. OSB	24 Two end nails per shingle	–	(Blind nailing) 1½-in. ring shank nail; 0.095-in. shank; 0.219-in. head	$Q_{50} < 0.75$	Pass

Notes to Table 4.3.1.1:

1 Stud spacing indicates the horizontal fastener spacing when no sheathing was used. When sheathing was used, the horizontal fastener spacing is shown in the Table.
2 The testing lab indicated that the test failed due to the poor installation of the panel to the structure.
3 Blind nailing is a technique where siding is fastened only at the top by penetrating through one sheet, and fasteners are hidden by the course above.
4 Face nailing is a technique where siding is fastened at the top and the bottom by penetrating through two sheets of overlapped siding, and fastener heads are exposed to the elements.
5 Siding was fastened at the horizontal spacing of 8 in. instead of fastened onto studs.
6 Siding was fastened at the horizontal spacing of 14 in. instead of fastened onto studs.
7 A fastener was nailed at the side ends of the siding on the sheathing.

Table 4.3.1.2 Deflection Measurements from the Wind Load Resistance Test

Assembly ID	Maximum Wind Pressure for Deflection Measurements (Pa)	Deflection Measurements (mm)			
		Assembly[1]		Component[2]	
		Negative Pressure	Positive Pressure	Negative Pressure	Positive Pressure
1	980	–5.37	5.00	–2.39	2.23
2	1 200	–4.93	4.41	–2.20	1.97
3	1 630	–4.90	4.77	–2.19	2.12
4	980	–3.27	3.18	–1.46	1.35
5	1 200	–4.12	4.04	–2.14	2.05
6	1 200	N/A[3]	N/A[3]	N/A[3]	N/A[3]
7	1 200	–4.89	4.79	–2.54	2.40
8	1 200	–2.13	2.05	–0.57	0.50
9	1 630	–5.02	4.99	–0.72	0.65

Assembly ID	Maximum Wind Pressure for Deflection Measurements (Pa)	Deflection Measurements (mm)			
		Assembly[1]		Component[2]	
		Negative Pressure	Positive Pressure	Negative Pressure	Positive Pressure
10	1 200	–6.19	5.85	–2.30	2.17
11	1 200	–5.49	5.47	–0.78	0.71
12	1 200	–5.99	5.87	–2.22	2.09
13	1 200	–4.05	3.89	–2.96	2.84
14	1 630	–7.17	6.30	–3.47	3.05
15	1 200	–4.76	4.05	–1.55	0.42
16	1 630	–5.61	5.35	–0.80	0.76
17	1 200	–3.99	3.71	–0.57	0.53
18	980	–5.17	4.73	–1.92	1.73
19	1 200	–3.76	3.44	–0.63	0.59
20	1 200	–2.70	2.64	–1.09	1.02
21	1 630	–2.31	2.27	–0.36	0.28
22	1 200	–2.31	2.19	–0.82	0.75
23	1 200	–3.20	2.95	–1.51	1.39
24	1 630	–2.31	2.24	–0.36	0.31
25	1 630	–6.21	6.09	–0.31	0.26
26	1 630	–6.66	5.98	–0.33	0.30

Notes to Table 4.3.1.2:

1 The deflection was measured at the mid-height of a 3 000-mm stud and determined with the averaged deflections at the bottom and the top of the stud as a baseline.

2 The deflection was measured at the centre point between two studs and determined with the averaged deflections at those studs as a baseline.

3 N/A = not applicable. The deflection was not measured due to the failure of the specimen.

4.3.2 Impact Resistance

Table 4.3.2.1 Results of Testing the Impact Resistance[1] of the Products

Assembly ID	Safety Impact		Retention of Performance				
	Large Soft 100 N·m	Small Hard 10 N·m	Large Soft 34 N·m	Smaller Soft 60 N·m	Smaller Soft 6 N·m	Small Hard 10 N·m	Small Hard 1 N·m
1	Pass	Pass	Pass	Pass	Pass	Pass	Pass
2	Pass	Pass	Pass	Pass	Pass	Pass	Pass
3	Pass	Pass	Pass	Fail[2]	Pass	Pass	Pass
4	Pass	Pass	Pass	Fail[2]	Pass	Pass	Pass
5	Pass	Pass	Pass	Pass	Pass	Pass	Pass
6	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]
7	Pass	Pass	Pass	Fail[2]	Pass	Pass	Pass
8	Pass	Pass	Pass	Fail[2]	Pass	Pass	Pass
9	Pass	Pass	Pass	Fail[2]	Pass	Pass	Pass
10	Pass	Pass	Pass	Fail[2]	Pass	Pass	Pass
11	Pass	Pass	Pass	Fail[2]	Pass	Pass	Pass
12	Pass	Pass	Pass	Fail[2]	Pass	Pass	Pass
13	Pass	Pass	Pass	Fail[2]	Pass	Pass	Pass

Assembly ID	Safety Impact		Retention of Performance				
	Large Soft 100 N·m	Small Hard 10 N·m	Large Soft 34 N·m	Smaller Soft 60 N·m	Smaller Soft 6 N·m	Small Hard 10 N·m	Small Hard 1 N·m
14	Pass	Pass	Pass	Fail[2]	Pass	Pass	Pass
15	Pass	Pass	Pass	Pass	Pass	Pass	Pass
16	Pass	Pass	Pass	Fail[2]	Pass	Pass	Pass
17	Pass	Pass	Pass	Fail[2]	Pass	Pass	Pass
18	Pass	Pass	Pass	Fail[2]	Pass	Pass	Pass
19	Pass	Pass	Pass	Fail[2]	Pass	Pass	Pass
20	Pass	Pass	Pass	Fail[2]	Pass	Pass	Pass
21	Pass	Pass	Pass	Fail[2]	Pass	Pass	Pass
22	Pass	Pass	Pass	Fail[2]	Pass	Pass	Pass
23	Pass	Pass	Pass	Fail[2]	Pass	Pass	Pass
24	Pass	Pass	Pass	Fail[2]	Pass	Pass	Pass
25	Pass	Pass	Pass	Fail[2]	Pass	Fail[2]	Pass
26	Pass	Pass	Pass	Fail[2]	Pass	Fail[2]	Pass

Notes to Table 4.3.2.1:

1 Large soft bodies are designed to transfer a significant amount of energy to the cladding and to the wall assembly. Small hard bodies are capable of causing localized impact damage without any appreciable transmission of energy to the wall assembly.

Smaller soft bodies are smaller and harder than the large soft bodies, and larger and softer than small hard bodies. They are designed to induce localized damage, as well as transmit energy to the rest of the assembly.

2 The product did not demonstrate capacity to retain the performance of the cladding under impact loads that induce localized damage as well as transmit energy to the rest of the assembly. The product will be limited to applications where such performance is not required or where the cladding system can be repaired or replaced easily. The CCMC Technical Guide specifies that for cladding systems that can be repaired or replaced easily, lower impact resistance values may be accepted down to 6 N·m for small soft impact and 1 N·m for small hard impact.

3 N/A = not applicable. Assembly 6 was not tested for impact resistance because it previously failed the wind resistance test.

4.4 Fire Performance

Table 4.4.1 Results of Testing the Fire Performance[1]

Property	Requirement	Result
Noncombustibility	CAN/ULC-S114	Noncombustible
Flame-spread rating	CAN/ULC-S102	0
Smoke-developed classification		5

Note to Table 4.4.1:

1 Based on the Intertek listing information (SPEC ID: 29928) of "HardiePanel® HZ5™ Vertical Siding."

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