

# Key Properties of James Hardie Fiber Cement Siding

Technical Brief **13**

## What is Fiber Cement Siding?

- Look and Feel

Products	Notes
HardieSoffit® panels	1/4 inch thick and offered vented and unvented; the unvented soffit panels work well in areas that require WUI compliance for eave overhangs
HardieShingle® Siding	¼ inch thick, available in panels and individual wall shingles
HardiePlank® Siding	5/16 inch thick lap siding.
HardiePanel® Siding	5/16 inch thick panel
Hardie Reveal® Panel	7/16 inch and is part of a modern look system (part of our Aspyre Collection by James Hardie™)
Artisan® Lap Siding	5/8 inch thick premium look lap siding (part of our Aspyre Collection by James Hardie™) with a tongue and groove butt-joint
Artisan® siding with Lock Joint System	5/8 inch thick premium look flat-to-wall product incorporates an interlocking edge joining system with several different joint profiles (V-groove, Bevel Channel, Square Channel, Shiplap). Fasteners are hidden in this product installation and may be installed in vertical or horizontal orientation.

- Ingredients:

- Portland Cement: provides dimensional stability, compressive strength and durability
- Silica Sand: provides superior substrate integrity and dimensional stability
- Cellulose Fiber: cellulose fiber interlocks to provide a flexible mechanical reinforcement
- Water: hydrates the cement and kicks off the chemical curing process
- Proprietary additives: add specific durability characteristics

- Product Specification Standard, ASTM C1186:

- Standard Specification for Flat Fiber-Cement Sheets
- Along with product composition and manufacturing specifications, these performance measures define fiber cement as a material:
  - Flexural Strength
  - Water Tightness
  - Density
  - Surface Burning Characteristics
  - Dimensional Tolerance
  - Frost Resistance
  - Moisture Movement
  - Warm Water Resistance
  - Water Absorption
  - Heat/Rain Resistance
  - Moisture Content

• James Hardie Siding Performance Properties:

General Property	Test Method	Unit or Characteristics	Requirement	Result	
PHYSICAL ATTRIBUTES	Dimensional Tolerances	ASTM C1185	Length	± 0.5% or ±1/4 in	Pass
			Width	± 0.5% or ±1/4 in	
			Thickness	± 0.04 in	
			Squareness	<1/32 in/ft of length	
			Edge Straightness	<1/32 in/ft of length	
	Density, lb/ft <sup>3</sup>	ASTM C1185		As reported	70-83*
Water Absorption, % by mass	ASTM C1185		As reported	32-36*	
Water Tightness	ASTM C1185	Physical Observations	No drop formation	Pass	
Flexural Strength	ASTM C1185	Wet conditioned, psi	>1015 psi	Pass	
		Equilibrium conditioned, psi	>1450 psi		
THERMAL	ASTM C177	Thermal Conductivity (BTU/(hr ft <sup>2</sup> )/inch)	As reported	2.07	
		Actual Thermal Conductivity (K)		3.31 - 6.62*	
		Thermal Resistance (R = 1/ K)		0.48	
		Actual Thermal Resistance (R)		0.15 - 0.30*	
DURABILITY	Warm Water Resistance	ASTM C1185	Physical Observations	No visible cracks or structural alteration	Pass
	Heat/Rain Resistance	ASTM C1185	Physical Observations	No visible cracks or structural alteration	Pass
	Freeze/Thaw Resistance	ASTM C1185	Physical Observations	No visible cracks or structural alteration	Pass
			Mass Loss, %	≤ 3.0%	
			Freeze/Thaw, % strength retention	≥ 80%	
UV Accelerated Weathering Test	ASTM G23	Physical Observations	No cracking, checking, or crazing	Pass	
FIRE CHARACTERISTICS	Surface Burning Characteristics	ASTM E84	Flame Spread Index (FSI)	0	
			Smoke Developed Index (SDI)	≤ 5	
			Fuel Contributed	0	
			NFPA Class	A	
			Uniform Building Code Class	As reported	1
	International Building Code® class		A		
	Noncombustibility	ASTM E136	Noncombustible	Pass/fail	Pass
Fire Resistance Rated Construction	ASTM E119	Fire Resistance Rating	1-hour	Note 1	

\*Table of Individual product values

	5/16 inch thick product Plank Hardie Panel Hardie Shingle	7/16 inch thick Product Reveal Panel	5/8 inch thick product Artisan Lap Siding
Density , lb/ft <sup>3</sup>	83	70	70
Water Absorption, % by mass	36	32	32
Actual Thermal Conductivity (K)	6.62	4.73	3.31
Actual Thermal Resistance (R)	.15	.21	.30

- James Hardie Fiber Cement siding is tested and listed to ASTM C1186 Standard Specification for Fiber Cement Sheets as Grade II Type A, thereby complying with the 2009/2012/2015 International Building Code (Section 1405.16), 2018 IBC (Section 1404.16) and the 2009/2012/2015/2018 International Residential Code (Section R703.10): Grade II

TABLE 1 Flexural Strength Requirements		
Note: The values of Table 1 are lower limit values based on an acceptable quality level (AQL) of 4% at a 90% confidence level.		
Grade	Wet Strength, psi (MPa) min	Equilibrium Strength, psi (MPa) min
I	580 (4)	580 (4)
II	1015 (7)	1450 (10)
III	1885 (13)	2320 (16)
IV	2610 (18)	3190 (22)

Type A

Sheets are intended for exterior applications subjected to the direct action of sun, rain, or snow. They are supplied coated or uncoated.

**Reaction To Fire — James Hardie Siding fire properties:**

- Non-combustibility:  
Section 703 of the International Building Code defines the criteria by which materials are considered noncombustible. It states that elementary materials required to be noncombustible shall be tested to ASTM E136 (“Standard Test Method for the Behavior of Materials in a Vertical Tube Furnace at 750°C.”).<sup>1</sup> James Hardie fiber cement siding is classified as noncombustible when tested in accordance with ASTM E136.
- Flame spread/Smoke developed index:  
ASTM E84 is the standard test method for assessing the surface burning characteristics of building products. The purpose of this test is to observe the flame spread along a sample in order to determine the relative burning behavior of its material. Through the E84 test, both Flame Spread Index (FSI) and Smoke Developed Index (SDI) are reported for a given sample. FSI is the measurement for the speed at which flames progress across the interior surface of a building, while SDI measures the amount of smoke a sample emits as it burns.<sup>2</sup> James Hardie siding is classified as a Class A material, with a Flame Spread Index of 0 and Smoke Developed Index of 5, when tested in accordance with ASTM E84.
- Fire Propagation (NFPA 285)  
The National Fire Protection Agency (NFPA) 285 standard fire test governs the use of foam plastic insulation and water-resistive barriers (WRB) used in exterior walls of construction type I through IV per the International Building Code (IBC). The NFPA 285 standard fire test determines the pass/fail performance of a specific wall assembly by measuring flame propagation by height, width, and temperature over time. James Hardie fiber cement siding is non-combustible and therefore, is not a trigger for NFPA 285 compliance on its own. However, James Hardie siding may be specified in an exterior wall assembly that is required to be compliant to the NFPA 285 test method (e.g. with foam plastic insulation, or combustible WRB). See [JHinsite™ Technical Brief 06 – NFPA 285](#) and James Hardie Siding for detailed information
- Wildland-Urban Interface (WUI) – Compliant for use in high fire hazard severity zones
  - Wildland Urban Interface (WUI) areas are places where built structures bump up against or intermingle with undeveloped natural areas. WUI land is sought after for new houses and other development due to its proximity to unspoiled natural settings. Located all over the U.S., WUI areas are especially vulnerable to wildfires.
  - Non-combustibility is the key attribute for WUI compliance
  - James Hardie siding is noncombustible when tested in accordance with ASTM E136
  - James Hardie Siding is listed with the California State Fire Marshall and classified as noncombustible for use in WUI areas  
See JHinsite™ [Technical Brief 03 – Wildland Urban Interface](#) for additional information

**Resistance To Fire — Fire-resistance rated assemblies:**

ASTM E119, Standard Test Method for Fire Tests of Building Construction and Materials, is used to determine the fire resistance of a complete assembly. For example, a wall system fire rating is measured by constructing a 10 foot by 10 foot section of a total wall system: framing, cavity insulation, sheathing, siding, gypsum wall board, etc. The wall section is installed vertically on a gas furnace, and the wall is exposed to a standard temperature curve for the time period for which a rating is desired, i.e., one, two, three, or four hours. Failure points during time of fire exposure are:

- Flame penetration through the wall section
- An unacceptable temperature increase on the unexposed side of the assembly
- Structural failure or collapse of the assembly

Therefore, a one hour fire resistance rating is taken to mean that a structure incorporating the tested wall construction will not collapse, nor transmit flame or a high temperature, while supporting a design load, for at least one hour after a fully developed building fire.<sup>3</sup> James Hardie lists several 1-hour and 2-hour fire-resistance rated wall assemblies. [https://jhinsite.com/technical\\_literature/#area](https://jhinsite.com/technical_literature/#area)

**Dimensional Stability**

The basic composition of fiber cement sheets (i.e. cement, silica and engineered pulp) is dimensionally stable on the wall when acted upon by temperature (cold & hot) and humidity (high & low). James Hardie Siding is engineered for climate. Hardie Zone 5 (HZ5) is engineered to resist the cold, wet climates prevalent in the North, and Hardie Zone 10 (HZ10) is engineered to resist the warm climates, both humid & arid, of the South and Southwest. For additional information see [Technical Brief 8- Expansion characteristics of James Hardie Siding Products](#)

### Wind and Impact Resistance

- Listed with the ICC-ES in product evaluations ESR-1844, ESR-2290, ESR 2273 with maximum Ultimate Design Wind Speeds over 200 mph.
  - Includes 180+ wall assembly solutions (Including panel, plank, shingle panels and individuals shingle products, vented and unvented soffit panels)
- Listed with the Texas Department of Insurance for recognition in the Texas Windstorm Inspection Program with negative wind pressures up to -100 psf. (reference TDI EC-23 and EC-55)
  - Includes 52 wall assembly solutions (Including panel, plank, shingle panels, individuals shingle products, vented and unvented soffit panels)
- Listed in Miami-Dade County Florida Notice of Acceptance for use in High Velocity Hurricane Zones with negative wind pressures of up to -104psf. The listed assemblies have both large and small missile impact resistance ratings. (reference NOA 17-0821.20 17-0821.21, 17-0724.01, 17-0406.07)
- Listed with the Florida Department of Business and Professional Regulation with Ultimate Wind Speeds of up to 220mph. (reference State of Florida Product Approvals FL13192, FL13223, FL13265, FL10477, FL13265, FL19901)

### Flood Resistance

James Hardie Fiber-cement siding is a class 5 flood resistant material (class 5 is the highest flood resistance rating by FEMA) only Class 4 and Class 5 materials are acceptable for areas below the Base Flood Elevation (BFE) in buildings in special flood hazard areas (SFHAs). FEMA defines class 5 flood resistant materials as those *“Highly resistant to floodwater damage, including damage caused by moving water. These materials can survive wetting and drying and may be successfully cleaned after a flood to render them free of most harmful pollutants. Materials in this class are permitted for partially enclosed or outside uses with essentially unmitigated flood exposure.”*<sup>4</sup>

### R/U Value

- R-Value is the resistance to thermal heat flow and is measured in hr ft<sup>2</sup> °F / Btu.
  - 5/16” thick siding has an R Value of 0.15.
- U-Factor is thermal conductance. The U-Factor is often described as the inverse of the R-Value as has units of Btu / hr ft<sup>2</sup> °F
  - 5/16 thick siding has a U Value of 6.67
- James Hardie Siding can be effectively used in R20 walls in compliance with the International Energy Conservation Code.

See [JHinsite™ Technical Brief 07 – Energy Code Compliance Solutions using James Hardie® Siding Products](#) for detailed information

### Sustainability

- James Hardie siding® products may contribute to the following LEED New Construction points: MR5 (MR4 for Homes), Recycles Content and MR5 (MR4 for Homes) Regional Materials. In addition, the following product attributes contribute to a variety of sustainability and green building programs:
  - Regionally sourced content
  - Avoidance of certain chemicals-Red List compliance
  - Low-Emitting materials
  - Recycled Content
- Green Building Programs include:
  - ASHRAE 189.1
  - CALGreen (BSC, DSA-SS)
  - EarthCraft
  - ICC-700
  - IgCC
  - LEED
  - Living Building Challenge

See [JHinsite™ Technical Brief 04 – James Hardie Compliance with Sustainability Programs](#) for more information

### Paint Adhesion and Preenfinishing

- The dimensional stability of James Hardie Siding provides a highly durable surface for factory finished or field paint. Factory applied ColorPlus Technology comes with a 15-year finish warranty. The climate controlled ColorPlus prefinishing process ensures that every siding board meets James Hardie's high standards, over 40 quality assurance checks are made throughout the manufacturing process. ColorPlus prefinished materials have several other benefits:
  - reduce site liquid waste (waste is minimized and recycled in a factory setting),
  - minimize human exposure to VOCs on the site during construction,
  - help to minimize paint storage at the project site,
  - minimize the impact of weather on the project's timeline to paint.

### Fastening

The strength of cement and silica sand combined with the flexibility of pulp fiber provides a cladding that works with a variety of pneumatic-driven nail, pins, and screws

### Pest Resistance

James Hardie siding is highly resistant to pests including termites, carpenter ants, beetles, as well as larger pests such as woodpeckers and mice.

### Technical Advisory

James Hardie fiber cement siding products are warranted to comply with ASTM C1186 and are rated as non-combustible per ASTM E136. They are suitable for Type I, II, III, IV and V construction. Some cement bonded composites, such as Cement Bonded Particle Board (CBPB), incorporate wood chips within a cementitious matrix. These wood chips are visible on the cut edges. ASTM C 1186, the industry standard for fiber cement cladding products referenced by the ICC, specifically excludes CBPB from its scope. Some CBPB products may be listed as meeting the requirements of ASTM C1186, however they may not have fire resistance properties equivalent to fiber cement per ASTM E136. Caution should be taken when specifying CBPB products in applications requiring non-combustible materials; they may be limited to type V construction only.

### References

<sup>1</sup> [https://www.ul.com/global/documents/corporate/aboutul/publications/newsletters/fire/fsa\\_issue\\_3\\_2008.pdf](https://www.ul.com/global/documents/corporate/aboutul/publications/newsletters/fire/fsa_issue_3_2008.pdf)

<sup>2</sup> <file:///C:/Users/DavidS2/Downloads/Introduction-to-ASTM-E84-BCIBNA004-03.pdf>

<sup>3</sup> [http://www.atlasrwi.com/resources/RWI/RWI%20PIMA%20Bulletins/PIMA\\_TB105-Fire\\_Test\\_Definitions.pdf](http://www.atlasrwi.com/resources/RWI/RWI%20PIMA%20Bulletins/PIMA_TB105-Fire_Test_Definitions.pdf)

<sup>4</sup> Flood Damage-Resistant Materials Requirements for Buildings Located in Special Flood Hazard Areas in accordance with the National Flood Insurance Program Technical Bulletin 2 / August 2008



Additional Installation Information, Warranties, and Safety Information are available at [JamesHardie.com](http://JamesHardie.com)

1 866 442 7343 | [www.jameshardie.com](http://www.jameshardie.com)

**IMPORTANT:** Failure to follow James Hardie written installation instructions and comply with applicable building codes may violate local laws, affect building envelope performance and may affect warranty coverage. Failure to comply with all healthy and safety regulations when cutting and installing this product may result in personal injury.

**DESIGN ADVICE:** Any information or assistance provided by James Hardie in relation to specific projects must be approved by the relevant specialists engaged for the project eg. builder, architect or engineer. James Hardie will not be responsible in connection with any such information or assistance.

© 2018 James Hardie Building Products Inc. All rights reserved. TM, SM, and ® denote trademarks or registered trademarks of James Hardie Technology Limited. The  is a registered trademark of James Hardie Technology Limited. TB1001 07/14